VII. INTERNATIONAL SCIENTIFIC CONGRESS OF PURE, APPLIED AND TECHNOLOGICAL SCIENCES

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ÖNSÖZ

Rimar Academy ile İstanbul Gedik Üniversitesi arasında **8-9-10** Kasım **2022** tarihlerinde yapılan "İstanbul Gedik Üniversitesi'nin paydaş olduğu **7**. Uluslararası Fen, Uygulamalı ve Teknolojik Araştırmalar Kongresi (**MINAR KONGRESİ**) kurum ve kuruluşların kararlı işbirliğinin, çalışmalarının, maddi ve manevi katkılarının sonucunda gerçekleştirilmiştir. Rimar Academy Türk dünyasının farklı akademik çalışmalarını ortak bir zeminde buluşturmaktadır. Bilim dünyasının değerli insanlarını farklı çevrelere ilişkin; eğitim, edebi, kültürel, sosyal, siyasi, ekonomi ve diğer konulardaki gelişme düzeyinin artırılmasına, ikili ya da bölgesel sorunların çözümüne dair alternatiflerin sunulmasına yönelik bilimsel çalışmaları paylaşmak kongrenin asıl amaçlarından biridir. Rimar Academy Kongre Bildiri Kitabı, bilimsel üretimin geleceğe birikim ve katkı olarak aktarılması hedefiyle hazırlanmıştır. Bu kongreye yurtdışı ve yurtiçinde olmak üzere toplamda 122 kişi başvurmuştur. 67 kişi bilim kurulu tarafından kabul edildiği; kabul edilen bildirilerin 2'ü Türkiye'den, 65'i Türkiye dışından **5** ülkeden katılım sağlanmıştır. Online 37 katılımcı yüz yüze, 30 katılımcı online olarak kongreye katılmıştır. Kongreye 29'u tam metin bildiri, kalan diğer makaleler Minar Journal dergisinde yayınlanmaya bilim kurulunca uygun görülmüştür. Kongremize değerli katkılarından dolayı tüm bilim insanlarına, teşekkür ediyor ve saygılarımı sunuyorum.

Editör

Prof. Dr. Ghuson Hameed MOHAMMED

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MORPHOLOGICAL AND ANATOMICAL COMPARISON AMONG FOUR PLANT SPECIES OF THE GENUS OPUNTIA

May Taha Hamid AL-WATTAR [1]
Hala Muzhur YAGUB
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Abstract:

Four species belonging to the genus *Opuntia* (*Opuntia ficus indica; O.monacantha; O.microdaysis; O.stricta*) of the Cactaceae family were collected and compared morphologically and anatomically, The results of the phenotypic comparison revealed a variation in the shapes of phylloclade from ovoid flat phylloclade in *Opuntia ficus indica* and *O.stricta* to ovoid and branched in *O.microdaysis* and cylindrical with dendroid branching. dimensions of the flat leafy (phylloclade) stems also varied from (10 – 25 cm) height and from (2.5 - 8 cm) in width, differences in a number of spins and glochids were founded and in each species, *O.microdaysis* didn't show spines, only glochids, Anatomical study found that all the species under study possess the areole, which is a phenotypic and anatomical characteristic of Cactaceae plant family, as well as the anatomical similarity in terms of the sequence of tissue layers in the cross-section.

Key words: Cactaceae, Opuntia, Taxonomy, morphology, anatomy.

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Introduction:

The word "cactus" is derived, from the ancient Latin and Greek Kaktus, which is the name used by the scientist Theophrastus for a spiny plant whose identity is not yet known (Johnson, &Stockdale,2019) The cactus was discovered about 15,000 years ago in Chile through some cave drawings in Brazil and seeds found in gemstones(Anderson and Edward,2001).

The cactus family includes about 127 genera with about 1,750 known species of Caryophyllales order. Cacti are usually occure in dry and semi-arid areas. Desert or arid with moderately high range temperatures during the day and cool nights, cacti are spread from Canada to Argentina mostly in the warm and arid regions of the South and North American continents across a large and different regions such as deserts along sandy coastlines, grasslands, deciduous dry forests, and high plains in Tropical and alpine rainforest. (Gibson and Nobel 1986; Barthlott and Hunt, 1993 ; Nyffeler, 2001) .

Mexico, Argentina and southwestern USA , are the most important centers of diversity , Mexico being one of the richest and most widespread regions (Boyle and Anderson, 2002; (Ortega Baes and GodínezAlvarez, 2006) Family Cactaceae is classified into four subfamilies (Opuntioideae, Maihueenioideae , Cactoideae, & Pereskioidea) (Schumann, 1899 ; Barthlott and Hunt, 1993) .

Cacti leaves are more like thorns, The main body is composed of articulated stems called cladodes, pads, (*nopalitos*) and have a flattened padded growth form (Novoa *et al.*, 2015) Many types of cacti bloom at night, where they are pollinated by insects or small animals, mainly mites mentioned that the flowers of this family are generally single, lateral to the site, and the petals are undifferentiated to cup and corolla either they are petals or sepals arranged in a spiral and attached to the Cuban quilt from its base (Almeida *et al.*, 2010) under the conditions of stressf, plants often become purplish, reddish, pinkish, or, reddish, especially around the areoles (Majure & Puente 2014) . Many species of cacti are used as food, feed, dyes and energy sources, and they have a role in ecosystem treatment (Small and Catling, 2004).

Cacti has many traditional medicinal uses such as the genus *Opuntia* spp. However, the plant parts of *Opuntia* spp. It is rarely used in nutrition and modern medicine. It also has applications in the pharmaceutical industry (Stintzing and Carle, 2005). Prickly pear is *Opuntia monacantha* commonly used as a folk medicine for edema and indigestion. It was found that

the effect of the fruit extract is better than that of the stem extract (Choi *et al.,* 2002) as well as it is possible that *Opuntia* can be considered as effective functional foods or nutrients, capable of preventing or slowing the progression of chronic diseases and promoting better health and vitality, and some studies confirmed its anti-inflammatory properties. It is a lipid, anti-diabetic, and anti-toxic drug, as well as its ability to slow down the proliferation of tumor cells. *Opuntia ficus indica* is used as a nutritional and medicinal agent in various food products. Although there are differences in the phytochemical composition between the genera of this plant, all *Opuntia* plants (fruit, roots, seeds and juice) have beneficial properties mainly due to their high content of flavonoids. Antioxidants, ascorbate), pigments (carotenoids, betalains) and phenolic acids. betalain pigments is produced in high concentration (Broc kington *et al.*., 2015) In 2009, studies showed that taking cacti orally can be effective in lowering blood sugar in diabetic patients and may also contribute to lowering the level of fats if they are high (Hassan *et al.,*2011).

The research aimed to-make a morphological and anatomical comparison and find the points of similarity and difference between them, as a taxonomic indicators .

Materials and methods

Sample collection

The samples were collected from several places in Mosul city, and placed in a sunny room under lighting from behind the window glass with small amounts of watering.

Samples check

The samples were first examined with the naked eye and different measurements were taken of them with 10 replicates for each measurement, then examined using an optical microscope of the type (Olympous) and also examined using a dissecting microscope of the type (Ogawa seikitxpeBosk 1844) and the pictures were taken using a digital camera .

Samples Diagnostics

Specimens were identified using the taxonomic key (Majure, 2017) and species-specific sources. (Chinnock, 2015).

Tissue sections preparation

To prepare temporary slides, sections were prepared using a sharp blade and through several attempts until the thin sections of the stem and leaf were obtained and stained with safranin stain very dilute and examined with a compound optical microscope of the type (Olympous) at the magnification power of 4x, 10x and 40x. The spines were dissected using forceps and a dissecting needle and using a microscope Dissecting microscope.

Results and Discussion:

The sampling results, resulted in the collection of four species belong to the genus *Opuntia, as* shown with their scientific taxonomy and common name:

Scientific Classification

Kingdom: Plantae, Clade: Tracheophytes, Clade: The genus *Opuntia* belong to; Family: Cactaceae Order: Caryophyllales Eudicots,

Subf .: Opuntioideae K.Schum., tribes Cylindropuntieae Doweld, G: *Opuntia* Mill

***Opuntia ficus indica* (L.) Mill. Barbary fig**

The Indian fig cactus, Barbary fig or the Canary pear, It appears as succulent plant or tree ranging (1.5-4) m but it can reach (5) m, the branches are leafy stem that is flat and gray to green in color each branch (30-60) cm in length and (5-6) cm in width, and the young branches to the tops of the leave are minute and shed early, and the color of the flowers is conspicuous bright yellow, orange or red color, Fruits type berries that are edible at maturity, They become red in color about (8) cm long, and cover with cluster of true thorns (Griffith, 2004) .

***Opuntia monacantha* (Willd.)Haw. (cochineal prickly pear) Drooping prickly pear)**

It is a fast-growing cactus shrub or tree-like and can reach a length of more than 3 meters and has a short trunk with a diameter of up to 20 cm. Stem cut elongated to oval in shape, tapering towards the base, dark green in color, with irregular edges, thorns (1-2.1), thin, brawn and gray in color, can reach about 4 cm in length. From 4 cm in width and 10 cm. Fruits are pear- shaped, reddish or purple in color, more than 7.5 cm in length, and up to 5 cm in diameter (Mondragon *et al.*, 2105).

***Opuntia microdaysis* (Lehm.) Pfeiff (angel-wings) (Polka-dot cactus) (Bunny - ear cactus Rabbit's ear)**

Rabbit's ear It is a small, hairy plant that forms dense shrubs (40-60) cm tall consisting of a pillow-like stem (6-15) cm long and (4-12) cm wide. In addition to the thorns, it has white or yellow glochids. They are (2-3) mm long, in dense clusters, and are barbed, thinner than human hair. It separates in large quantities with the slightest touch and if it is not removed, it causes skin irritation. Therefore, the plant must be handled with caution. Its yellow flowers are rare and are grown abundantly because of the small plant shape that resembles a rabbit's head (Harrison, 2012).

***Opuntia stricta* (Haw.) Haw. Henopleestricto, Erect prickly pear**

Erect prickly pear. It is a shrub-standing plant that extends to more than(2)m in height. Its flowers are lemon-yellow that appears in spring and summer, and its fruits are purple-red. It blooms quickly in a hot environment, and sandy soils. The blade is flat, oval, pointed at the base, the shoot is bluish-green, the areole is brownish, is found in the living part of the epidermis, and it contains one or more thorns, yellowish near the tip towards the apex, and bears smooth, short spines, glochid,(2-6) mm long, and has single yellow flowers consisting of several membranous parts. A gel inside the stem leaves is used to treat burns, and its fruits confirm its efficiency (Bernad, 2013).

A

B

C

D

7.65

Fig.(1): Morphology of the four studied species of the genus *Opuntia*

A. *Opuntia ficus-indica* B.*Opuntia microdasys*. C. *Opuntia microdasys*. D. *Opuntia monocantha* *Opuntia stricta* .

Table (1): General morphological characteristics of studied *Opuntia* species .

species	Shape of phylloclade	Av.Height (cm) phylloclade	Av.Width(cm) phylloclade	Av.No. of spines\ areole	Av. No. of glochis\ areole	Av.Plant height (m)
Opuntia ficus-indica	ovoid flat	25	8	1	10 - 15	1. 3 - 3
Opuntia microdasys	ovoid flat like pillow	10	2.5	0	25	0.40 - 0.60
Opuntia monacantha	elongated oval	13	4	4	3-5	3
Opuntia Stricta	oval flat	15	8	2	25 - 30	2

From the table (1) four species under study showed a disparity in morphology from oval flat in *O. ficus indica and O.stricta* fig.(1.a –d) to elongated oval in *O. monacantha* fig (1 .c) to ovoid like pillow in *O.microdasys* fig (1.b)*,* also showed variation in phylloclade dimensions from big phylloclade in *O. ficus indica* which have more height (25cm) and width (8 cm)*,* and ovoid like pillow which have the lowest height (10 cm) and width (2.5 cm)*,* plant height varied among studied species from (1.5 – 3) m for the species *O. ficus indica* and (3) m for *O. monacantha,* and (40- 60) cm for the species *O.microdasys,* (Harrison, 2012) . One of the most important phenotypic and anatomical characteristics of the cactus family is the presence of areoles, which are external growths (sowllen) that produce trichomes, spins and leaves, as well as glochids, which are smaller and shorter than thorns, which are easy to uprooting with the slightest touch, giving additional protection to the plant (Arrud and De-penna*,* 2016). The species under study showed wide variations in terms of possessing these two types of

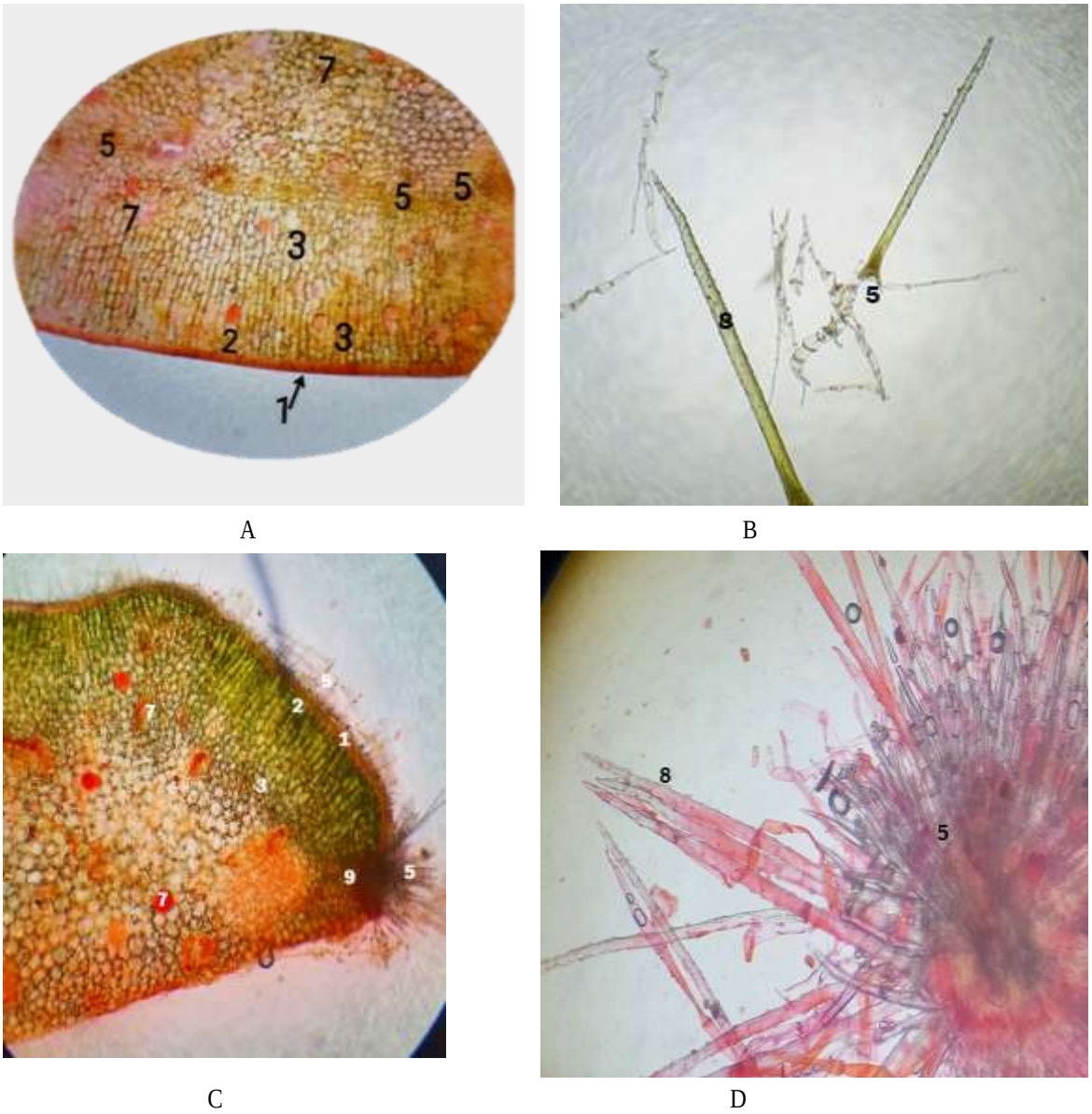
outgrowth with respect to single areoles. Spines are modified leaves consisting of (47.9%) cellulose, (48.4%) hemicellulos, lignin, ashes, and wax in small quantities, in addition to the cuticle layer that gives the spine (Ventura, 2017) . The species under study showed two types of spines (thorns) emerging from the single areole, one or more large thorns surrounded by small glochids.

Number of spines per areole also showed variation among studied species, *O.microdasys* didn't show spines only glochids about (25) glochides in each areole fig. (2.b) table (1) It was mentioned by (Arrud and De-pinna 2016) that the species *Opuntia microdasys*

shows transitional evolutionary anatomical traits, and these traits play a role in water storage and plant resistance, *O. ficus indica* has only one spine with (10-15) glochids fig. (2. a), *O.stricta* has (2) spines with (25-30) glochids fig. (2.d),while *O. monacantha* shoewed (4) spines and (3-5) glochids, fig.(2.c) . Areoles in genus *Opuntia* species produce specialized deciduous hair –like, spines and glochids in the stem tissue Table (1) (Mauseth, 2006).

In general, cacti are desert plants. xerophytes, like other desert plants, show anatomical adaptations that enable them to retain water for long periods. They are found in desert areas that occupy a quarter of the world's surface (Majure *et al.,* 2017). Among these anatomical characteristics are the formation of thick outer walls in multi-layered epidermal cells and their cells are compact, and this is what all the anatomical sections of the species showed Figure (2) is under investigation, as well as the presence of a thick layer of cuticle covered with a layer of wax well as skin trichomes in certain areas such as the areole Fig.2 (a,b) fig.3(a,b) The visible stomata are below the surface level of the epidermis with the presence of many bristles. The species under study were characterized by the low surface area of the leaves, which were often spines (Torres-Silva *et al.,*2020) (Castellano *et al.*,2021) confirmed that the mucilage and spines are characteristic features of these plant.

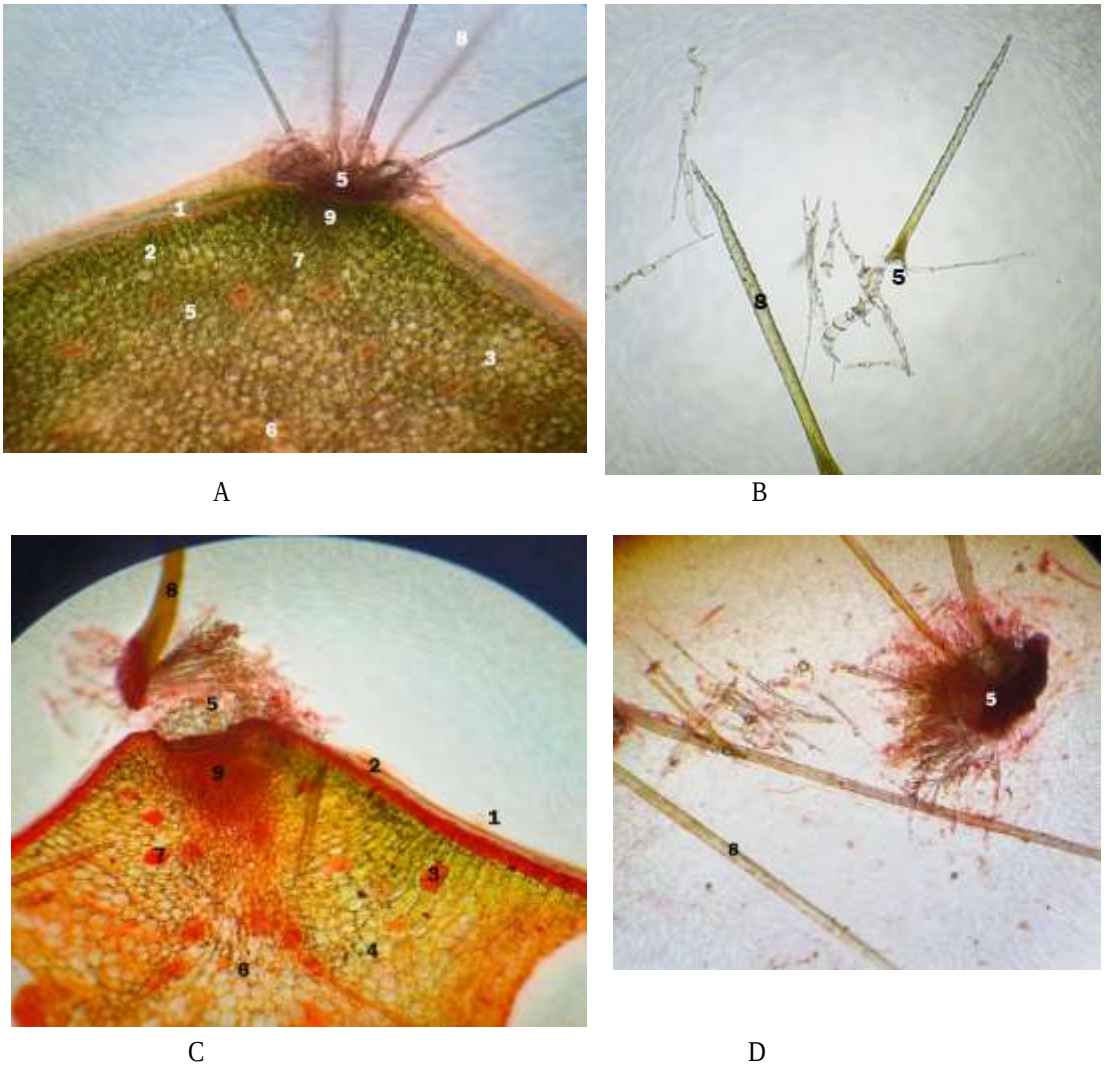
Anatomical results of investicated species of the genus Opuntia showed that the cross-section of the stem consists of that the stem has a thick cuticle that composed several layers of cells, followed by a layer of mesophyll cells, and the epidermal cells contain many crystals. Regarding the anatomical modifications of cork thorns, can be a basic characteristic for the classification of spieces, and it is one of the traits that gives a wide variation in terms of number, shape and texture (Mosco, 2009) (Fig. 2,3) It has multi-shaped bristles .



Fig(2): Anatomical features of the four investicated *Opuntia* species

A. *Opuntia ficus-indica* stem cross section B . *Opuntia ficus-indica* spines and glochids.(4x) . C. *Opuntia microdasys* cross section . D. *Opuntia microdasys* glochids (10x) .

1. Cuticle
2. Epidermis
3. Collenchyma
4. Chlorenchyma
5. Vascular Bund
6. Parenchyma
7. Mucilage
8. Thorne
9. Areole



Fig(2): Anatomical features of the four investigated *Opuntia* species (4x)

A. *Opuntia monocantha* cross section .B. *Opuntia monocantha* spines and glochids . C. *Opuntia stricta* cross section. D. *Opuntia stricta* spines and glochids .

The stem of *Opuntia* contains several layers of collenchyma up to(8) rows, followed by a layer of photosynthetic parenchyma and then a ring of vascular bundles of the collateral type. For resistance to drought to sugar polymerization and the ability of the mucillage to resist dehydration Fig. (2,3) (Ventura, 2017).

From the Fig. (2,3) where the cuticle covered with chitin and a thin layer of photosynthetic parenchyma followed by two layers of cells of the collenchyma tissue, then the mesophyll region, storage parenchyma and a ring of vascular bundles, and in the center is the cortex area composed of parenchyma tissue .Spines also showed phenotypic variation in the studied species, spines in *O.ficus indica* has shourt spines with serrate edge, and

segmented glochids (fig.2,b), in contrast *O.stricta* has tall spines with slightly serrate edge (fig.3, d), the speceis *O.monocantha* showed tall spines with smooth edge and and segmented glochids (fig.3,b), on the other hand the speceis *O.microdasys* didnt show spines but needle-like glochids have white color easily detach which have tufts in the areoles cover the stem approximately in addition to trichomes (fig.1,d) .

Conclusion

Species of *Opuntia* plants in the city of Mosul are many, and most of them are not registered in the botanical flora of the city or Iraq as a whole, because they are imported from outside Iraq and are found in the homes of citizens as ornamental plants and in commercial nurseries. All types of areoles form spins, glochids, and trichomes, all of which are considered defensive structures for the plant .

Recommendation:

Conducting many chemical studies of the plant of the cactus family because it contains a large number of pharma ceutically active compounds Interest in its cultivation in the vast desert areas in Iraq, because it is resistant to drought and extreme heat conditions in Iraq, in addition to that it bears medicinally useful fruits and is widely used as food outside Iraq And they are expensive.

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MANUSCRIPT TITLE: A COMPARATIVE STUDY OF SOME VITAL SIGNS OF INFECTED PREGNANT WOMEN COVID-19 WITH THOSE OF NON - INFECTED PREGNANT WOMEN

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MANUSCRIPT TITLE: A COMPARATIVE STUDY OF SOME VITAL SIGNS OF INFECTED PREGNANT WOMEN COVID-19 WITH THOSE OF NON - INFECTED PREGNANT WOMEN

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Batool Abd AL AMEER BAQER [2]
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Abstract:

While pregnant, the mother and fetus coexist, which is a unique physiological state.Disruption of maternal-fetal connection leads to diseases of pregnancy and the infant This study aims to present current developments that may help in the early detection of issues, highlight the difficulties in measuring vital signs accurately in pregnancy, and estimate typical ranges for maternal vital signs throughout pregnancy. Additionally, the study focuses on the association between SARS-CoV-2 infection during pregnancy and unfavorable pregnancy outcomes. A higher risk of preeclampsia, premature birth, and other unfavorable pregnancy outcomes may be linked to COVID-19. The vital signs of Covid-19-contaminated expectant mothers, particularly respiration, pulse, and temperature, were found to differ significantly at p values of (0.0001*, 0.0001*, and 0.001*).

The research demonstrated how Covid 19 affected expectant mothers who were at risk for preeclampsia, stillbirth, premature birth, and NICU hospitalization. It is believed that changes to vital indicators (Heart rate, blood pressure, temperature, oxygen saturation, and respiratory rate)occur both during and right after pregnancy. especially when a pregnant woman contracts the Corona infection. With COVID-19, we seek to synthesize the body of research on changes in vital signs throughout pregnancy so that fresh centile charts could be made for every stage of pregnancy and the first few weeks following delivery.

Key words: Vital Signs, COVID-19, Pregnancy, Physiological State.

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Introduction:

The exceedingly contagious respiratory sickness is brought on by the coronavirus-2, which also causes severe acute respiratory syndrome recognized as COVID-19 (SARS-CoV-2). Pregnant women are thought to be more susceptible to severe viral respiratory infections because of changes to their anatomy and physiology. (1).

The new coronavirus disease of 2019 is escalating on a global scale. Due to their unique immunological states, pregnant women and newborns require specific attention. There is a case of a pregnant woman who exposed herself to SARS-CoV-2 at 34+1 weeks gestation and decided to carry the baby to term. Due to physiological changes and weakened immune systems, respectively, pregnant women and babies are potential vulnerable groups. According to several research, viral infection increases the risk of obstetric problems and unfavorable perinatal outcomes in pregnant women. (2,3)

Due to the unique immunological state that pregnancy creates, pregnant women are categorized as a specific demographic category because they are more prone to respiratory infections like COVID-19 and associated consequences. (1)

Although COVID-19 vertical transfer from mother to fetus has not yet been established, newborns are nonetheless susceptible to a number of illnesses, COVID-19-positive pregnant women are more likely to require intensive care unit (ICU) support while hospitalized, indicating that childbearing women are more susceptible to experiencing serious COVID-19-related issues. Pregnant women with COVID-19 appeared to have a greater frequency of CSs, premature births, low birth weight, and neonatal ICU admissions. (3).

Measuring vital signs is essential to enable the early identification of shock since hemorrhage and sepsis are the leading causes of maternal death. Inadequate tissue perfusion, which is what shock is known as, is traditionally characterized by the occurrence of tachycardia, hypotension, and subsequently, poor end-organ perfusion (4) The physiological changes that occur during pregnancy, such as the increased circulating blood volume, can make it more difficult to detect shock. Accordingly, substantial blood loss can occur prior to clinical decompensation (5). As a result, it's possible that physiological shock measurements employed during pregnancy are not directly equivalent to those utilized outside of it..

Vital signs are frequently recorded on paper-based Early Warning Systems (EWS) in high-income environments. These systems allow for the tracking of vital signs in accordance with

physiological parameter criteria. The color of the paper (often yellow or red) indicates the severity of divergence from normal when abnormal vital signs are found and plotted, indicating the need to intensify care. According to reports, EWS enhances HCPs' ability to communicate with one another and provides justification for escalating care despite considerable cultural barriers and hierarchy that prevent prompt treatment. However(6), It is acknowledged that accurate vital sign measurement, correct documentation, and effective communication are necessary for the EWS to function well (7) The biggest obstacles to their utilization are believed to be staffing constraints, and this is probably true. Approximately 10% of pregnant women have hypertension (> 140/90). after 20 weeks of pregnancy, pre-eclampsia, new hypertension with proteinuria, or end-organ damage (8,9) are all possible. can appear even when no physical symptoms are present. the measurement of blood pressure remains the most significant and common screening test performed during the antenatal period despite promising advances (biomarkers). It is crucial to enable the timely transfer to higher care facilities, the detection and monitoring of pre-eclampsia, antihypertensive and preventive anticonvulsant medication, and the delivery of the baby on schedule. In fact, failing to properly measure, comprehend, and respond to high blood pressure during pregnancy increases mortality and morbidity, which is even more significant in overburdened, low-resource contexts. (10).

In conclusion, Despite this, reducing maternal mortality is still a top priority on the global agenda. significant progress over the past ten years. Vital sign assessment is a crucial first step in detecting fetal anomalies so that timely treatment can start, potentially saving lives. It may take longer to identify pregnancy issues if there is insufficient access to precise, dependable technology combined with pressure on skilled health care professionals. EWS could be helpful in informing HCPs of unusual outcomes. Innovative technology like traffic signal warnings could offer a practical solution. This might be most helpful in areas with limited resources if there is a lot of task sharing among HCPs that have less formal training. [11].

Methods:

80 samples for the study were taken from pregnant women(noni vaccinated women) Between 15 and 34 weeks of pregnancy at the Baghdad Teaching Hospital, 50 samples from

those who were infected with Covid 19, and A CT scan revealed that the afflicted patient already had the COVED-19 virus (Simens Co.). 30 samples were non infected with civid 19 .

The following vital signs were determined using recognized medical procedures:

1-Body temperature

Normal range: 36 - 37.5 c

Average: 37.2 c

Methods:

-Oral method (time:3-5 min)

-axillary (time:8-10 min)(+ 0.5 degree)

-tympanic (time: few seconds)

-rectal (time: 2 min)(- 0.5 degree)

2-Pulse rate

Normal rangre:60-100 p/min

Average: 72 p/min

Sites include the posterior tebial, carotid, apical, brachial, radial, femoral, popliteal, and dorsalis pedis.,

3-Respiratory rate

Normal range :12-20 breath/min

- After calculating the pulse rate, keep your fingers in place to measure the patient's pulse while you keep an eye on their breathing.

4-Blood preassure

Average of BP: 120/80 mmHg

-Blood pressure checked by

sphygmomanometer and stethoscope

Oral method (time:3-5 min)

-axillary (time:8-10 min)(+ 0.5 degree)

-tympanic (time: few seconds)

-rectal (time: 2 min)(- 0.5 degree)

Statistical Analysis

The experiment results were exhibited as means± standard deviations. One-way ANOVA was used in analysis of variance, and differences among the means were determined for significance at p <0.05 Morgan *et al*., (12).

Results and Discussion

Bbecause of physiologic modifications in the immune system, heart, and lungs pregnant women in their third trimester are more prone to experience more severe symptoms after contracting respiratory infections. Pregnant women with COVID-19 were observed to experience higher incidence of obstetric problems. Poor obstetric outcomes in infected patients have been linked to excessive inflammatory response, hypoxia, inadequate cytokine production, and coagulation abnormalities. These pathophysiological events were all taken into consideration. (13)

Pregnant women are more likely to get more severe symptoms from respiratory infections because of physiological changes in the immune system, heart, and lungs during pregnancy. Pregnant women with COVID-19 were observed to experience higher incidence of obstetric problems. Poor obstetric outcomes in infected patients have been linked to very active inflammatory reaction, hypoxia, inadequate cytokine production, and coagulation abnormalities. These pathophysiological events were all taken into consideration.

Table (1) Vital signs variables in pregnancy

Group / Parameters	Mean ± SD		P-value
	Control	Patients	
Blood pressure	1.529±0.121	1.759±0.176	0.0001*
Body temperature	36.878±0.337	37.815±0.378	0.0001*
Respiratory rate	18.04±1.374	23.33±1.718	0.0001*
Pulse rate	73.58±7.529	62.80±25.607	0.035*

***P<0.01**

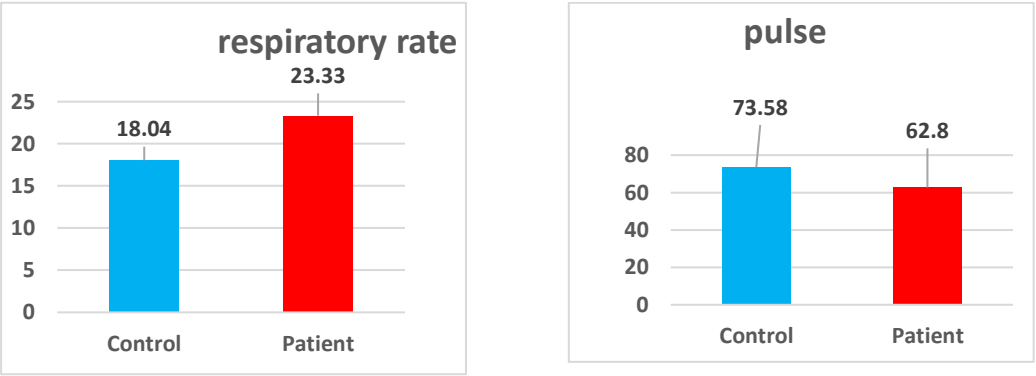

figure (1) Vital signs variables respiratory rate and pulse , blood pressure in pregnancy

Oestrogen and progesterone produced by the placenta affect the cardiovascular system , Between 32 and 34 weeks of pregnancy, the volume of blood in circulation reaches its peak (14).Lower hemoglobin concentrations and hemodilution result from red blood cell volume growth that is greater in serum (40–50%) than in red blood cells (20–30%)..

Progesterone, a hormone that is continually created while pregnant, tells the body to breathe more quickly and deeply Because of this, a pregnant woman exhales more carbon dioxide to maintain a low level. She may also breathe more quickly because her lungs can't expand as much as she inhales due to her growing uterus. The woman's chest diameter marginally increases..(15).

The study also revealed that the blood pressure factor for pregnant women in the table and figure (1) differs significantly, with a p value of 0.0001*, and the cause of this is Because the heart is working harder, some heart murmurs and heart rhythm abnormalities may manifest. These irregularities might occasionally be felt by pregnant women. These alterations are typical throughout pregnancy. Other aberrant heart rhythms and sounds, which are more common in pregnant women (including diastolic murmurs and a quick, irregular heartbeat), may call for medical attention. Heart murmurs known as diastolic heart murmurs happen right before the heart contracts.

Some heart flutters and abnormal heart rhythms may occur as a result of the heart's increased effort. Pregnant women may occasionally experience these irregularities. These changes occur often throughout pregnancy. additional abnormal heart rhythms and sounds, including as diastolic murmurs and a rapid, irregular heartbeat, which are more common in pregnant women, may require medical care. Before the heart contracts, there are heart murmurs called diastolic heart murmurs. The blood volume virtually doubles during pregnancy. Blood volume increases more quickly than the red blood cell count does. Blood

tests so reveal a small amount of anemia, which is common., Despite the fact that red blood cells are more numerous. Because of unidentified reasons, the quantity of white blood cells, which fight infection, steadily rises throughout pregnancy and rises significantly during labor and the first few days after delivery..

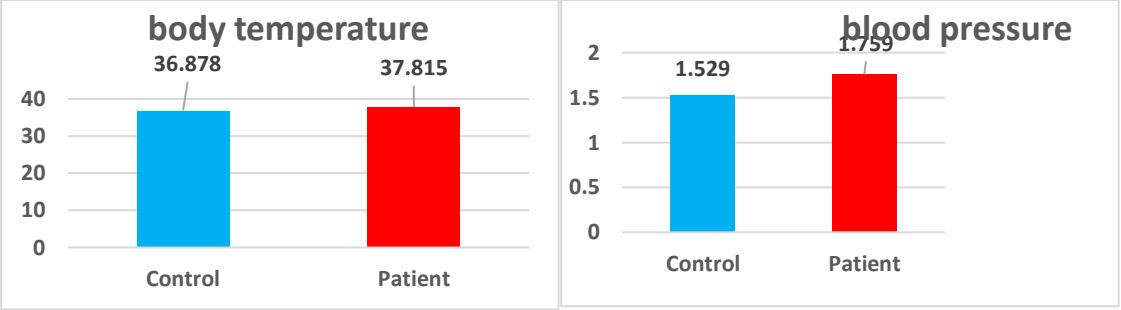

figure (2) Vital signs variables (body temperature, blood pressure) in pregnancy

At any stage of lifeHigh blood pressure, also referred to as hypertension, can have negative health effects. High blood pressure symptoms are not frequently present. Pregnancy-related severe or uncontrolled high blood pressure can be harmful to both you and your unborn child. The study concentrated on the change in blood pressure in pregnant women (table 1, figure 2) because there was a significant difference in the high blood pressure level of pregnant women compared to the control group (p value 0.0001*). The airways constrict slightly as a result of the increased blood flow because the lining receives more blood and expand.

Additionally, as a result, the eustachian tubes, which join the middle ear to the back of the nose, may become obstructed, occasionally making the nose seem stuffy. These effects have the potential to subtly alter the woman's voice's tone and quality. (16).

Pregnant women may be more likely to develop more severe symptoms after a respiratory virus infection because of physiological changes in the immune and cardiovascular systems during pregnancy. Most studies found that few pregnant women contracted severe cases of the coronavirus disease 2019 (COVID-19) pandemic at the early stages; nevertheless, current data suggests that they may experience high morbidity and mortality.

The vital signs of Covid-19-infected pregnant women were observed at (p value 0.0001*, 0.0001*, 0.001*), including respiration, pulse, and temperature. Table 2; Figures 3, 4

Women who have COVID-19 during pregnancy are more prone to encounter issues that could impair the development of the unborn child. premature birth, NICU admission, birth defects, Increased rates of fetal distress have all risen in correlation with pregnancy-related COVID-19 infection in the mother.. Infants born to SARS-CoV-2-positive moms and newborns infected with the virus typically appear with a fever, inadequate eating, or respiratory distress, yet there have been sporadic case reports of white matter damage and prolonged pulmonary hypertension in these newborns.(17). Several investigations have reported pathological evidence of fetal and maternal vascular malperfusion and large-vessel thrombosis inside the placentas of SARS-CoV-2-infected women., These results, which were obtained without an actual placental SARS-CoV-2 infection point to a maternal condition that may have been hyper-inflammatory or hypercoagulable. Pregnancy-related pneumonia has been linked to poor newborn outcomes in the past, including an increased risk of preterm birth and low birth weight54, as well as other illnesses that cause maternal hypoxia, like cyanotic heart disease or placental abruption. (18).

Table (2) Vital signs variables in pregnancy infection with covid 19

Group / Parameters	Mean ± SD		P-value
	Control	Patients	
Blood pressure	1.408±0.1793	1.450±0.3386	0.766
Body temperature	37.000±0.5000	38.444±0.5113	0.0001*
Respiratory rate	20.00±1.000	94.65±3.517	0.0001*
Pulse rate	89.86±11.495	108.67±2.658	0.001*

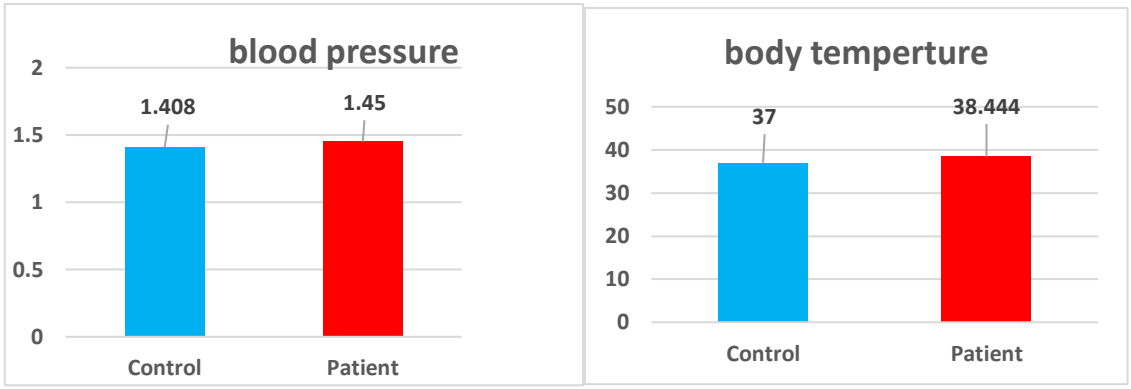

figure (3) Vital signs variables (Blood pressure, Body temperature) in pregnancy infection with covid 19

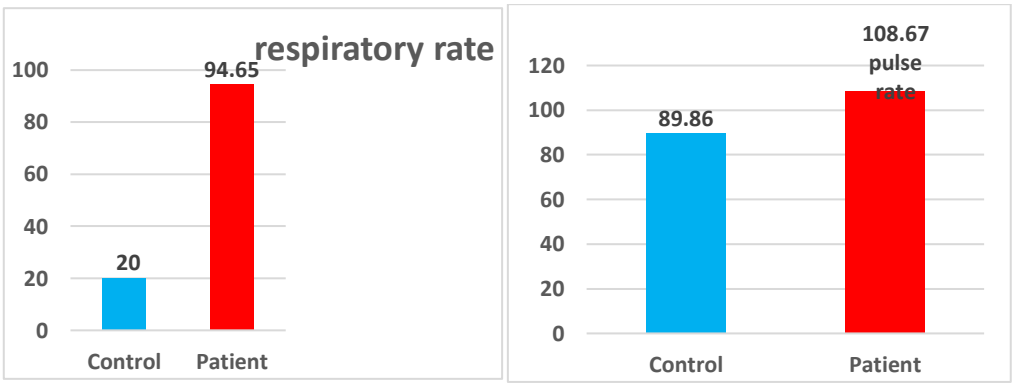

figure (4) Vital signs variables (Respiratory rate, Pulse rate) in pregnancy infection with COVID-19

Conclusion:

In this retrospective study, COVID-19 may be linked to higher risks of preeclampsia, preterm birth, and other unfavorable pregnancy outcomes. It also highlights the difficulties in accurately measuring vital signs during pregnancy and discusses recent developments that may help in earlier spotting complications. to calculate the ranges of typical values for the mother's vital signs throughout pregnancy. Additionally, the study focuses on the association between SARS-CoV-2 infection during pregnancy and unfavorable pregnancy outcomes. In a high-risk population, the immunization rates among pregnant women are lower than anticipated, and significant efforts should be made to raise public knowledge of the benefits and safety of COVID-19 vaccinations. The risk of preeclampsia, premature birth, and other unfavorable pregnancy outcomes may be enhanced by COVID-19(19).

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IMPROVING THE WEAR-RESISTING OF DRY-SLIDE FRICTION OF NOVALAC-GRAPHENE NANO COMPOSITES

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FADHIL K. FARHAN
ZAINB F. NAZIL

IMPROVING THE WEAR-RESISTING OF DRY-SLIDE FRICTION OF NOVALAC-GRAPHENE NANO COMPOSITES

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Zainb F. NAZIL[3]

Abstract:

In this work, Nano composites were prepared from Bakelite-type Novalac powder supplemented with graphene. The pin-on-disc technique was used to test the wear resistance, where loads of 20 N and time of sliding were applied (2, 4, 6) min on samples with dimensions of one centimeter in diameter and three centimeters in length at room temperature. The results showed a significant improvement in the wear rate resistance of all reinforced Nano composites compared to the matrix material Bakelite.

Key words: Nano Composites, Novalac , Graphene, Pin-On-Disc and Wear Rate.

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Introduction:

Nano composites are considered one of the advanced materials, which is one of the most important prosperity of the industrial revolution in the current century. Scientists have been interested in developing materials in this field, as they relied on the synthesis of nanomaterial's of various shapes and dimensions for the purpose of including them in arming and strengthening other materials with low properties. About its components [1, 2, 3]. What distinguishes the nan composites is that the base material is made of resins, either in the form of powders or in the form of liquids, and this part of the composites is called the matrix of the base of the composites, where it has a higher volume or weight ratio than the other materials that make up the composites [4, 5, 6]. As for the supporting or reinforced materials for the composites, they are in the form of particles, tubes, sheets or fibers, and all of them are at the Nano scale, which is estimated at about (1-100) Nano [7, 8)].The use of nano-composites in industrial applications, including civil and military, has contributed to reducing dependence on other materials such as metals and alloys. The Nano-composites have shown unique properties in transmission tools in all equipment and devices that work on mechanical movement, as these materials are characterized by high resistance to corrosion and wear, light weight and hardness. The high quality made it an applied material alternative to traditional materials in industries and construction materials [9, 10, and 11]. Recently, researchers have been interested in developing Nano composites based on polymers and supported by types of nanomaterial's, according to their applications in industry. Graphene is one of the forms of carbon, so it is considered the main material in the formation of the polymer used in this work. And the fact that graphene powder is composed in the form of layers or sheets, it works to reduce the friction coefficient arising between the prepared overlays and the hard contact surface. The lubricating property that graphene powder possesses has a major role in increasing the resistance of the Nano composites that contain it, in addition to reducing the heat generated between the two friction surfaces [11, 12]. Working in the field of tribological applications (wear, lubrication and friction) [13]. The aim of the study is to manufacture and develop Nano composites based on Nonvlak resin and reinforced with graphene sheet powder, which are used in the applications of mechanical equipment and devices with high speed and wear resistance in harsh environmental conditions.

Nano composites. Preparation:

The Nano composites were prepared using the liquid mixing method, where the bakelite powder was first dissolved in ethanol until it became a liquid of moderate consistency, i.e. with low viscosity, and then mixed by weight percentages of graphene powder with bakelite (0%, 1%, 2%, 3%, 4%,). An ultrasonic device was used for the purpose of mixing and spreading the powder within a dilute solution of Bakelite, and then the mixture was poured into molds prepared for that according to the standard ASTM G-99 specifications of the examination devices used in this work, which is a pin-on-disc device. The Pin – on – Disc system was used to calculate the sliding wear of the matrix and Nano composites .The samples were created with dimensions of 1 cm in diameter and 3 cm in length. Using the following equations [13], [14], the final wear rate was calculated:

$$W_r = \Delta m / S_D \ldots\ldots (1)$$

Where **Wr** is the wear rate (g/cm),

$$\Delta m = m_1 - m_2 \ldots\ldots (2)$$

Where **Δm** is Wear loss (g) before (m_1) and after (m_2) taste. Sliding distance can be calculated from following equation:

$$S_D = 2\pi.N.\ r.\ T \ldots\ldots (3)$$

Where, S_D is Sliding distance (cm), **N** is 2950 (rive/min), **D** is Routing distance (cm) = 0.06 m*,* **T**: Sliding time (min) = (2, 4, 6 min).

Result and Discussions:

Table. 1 and figures (1, 2, 3, and 4) shows a summary of the practical results that were taken from the use of the examination system and according to the above equations. The examination system is characterized by the fact that it is equipped with a rotating disc made of a high-hardness alloy linked to a thermal sensor through which it can stop operation in the event of a major breakdown or deformation of the samples. The results shown in the table represent the dry sliding wear rate at time (2, 4, 6) minutes, accompanied by a sliding distance of 222136 meters, 444623 meters, and 666936 meters, respectively, with the applied load fixed at 10 Newton's. It is noticed from the results that a significant improvement in the wear resistance of all Nano composites at a time of 2 minutes, especially the percentage is 3% compared to the base material (polymer). Increases wear resistance. When the time period

was increased, the wear resistance of the composites decreased at the time of 4 and 6 minutes. The reason is due to the high temperatures and the increase in the coefficient of friction, but at the same time and at the times 4 and 6 minutes, we notice that there is a wear resistance of the Nano composites when the percentage of graphene increases, and this means that the wear resistance increases with increasing The addition to the powder, but at a certain percentage, which is 3% for all times. Fig.s (1-4) show the figures show the behavior of the wear rate for times 2, 4 and 6 minutes for nanocomposites supported by graphene nanopowder compared to the polymer base material type of Noflak resin. Where it was found that all the overlays were significantly improved by the graphene powder, which led to the lubrication of the interfacial joints of the polymer components and reduced the friction coefficient and the heat generated between the two contacting surfaces. Therefore, the role of the graphene was as lubricating the nanocomposites.

Table 1: Show the Wear rate properties of Matrix and Nano composites.

Samples Code	M1	M2	M1-M2 ΔM g	W_R at 2min $x10^{-7}$ g\ cm	W_R ~~at 4 min~~ $x10^{-7}$ g \ cm	$W_{R.}$ at 6min $x10^{-7}$ g \ cm
0% G	3.5543	3.1435	0.4108	18.5	9.23	6.1560
1% G	3.6894	3.6653	0.0241	1.08	0.542	0.3630
2% G	3.8965	3.8843	0.0122	0.55	0. 274	0.1890
3% G	4.2343	4.2330	0.0015	0.075	0.034	0.0224
4%G	4.4563	4.4535	0.0028	0. 13	0.063	0.0419

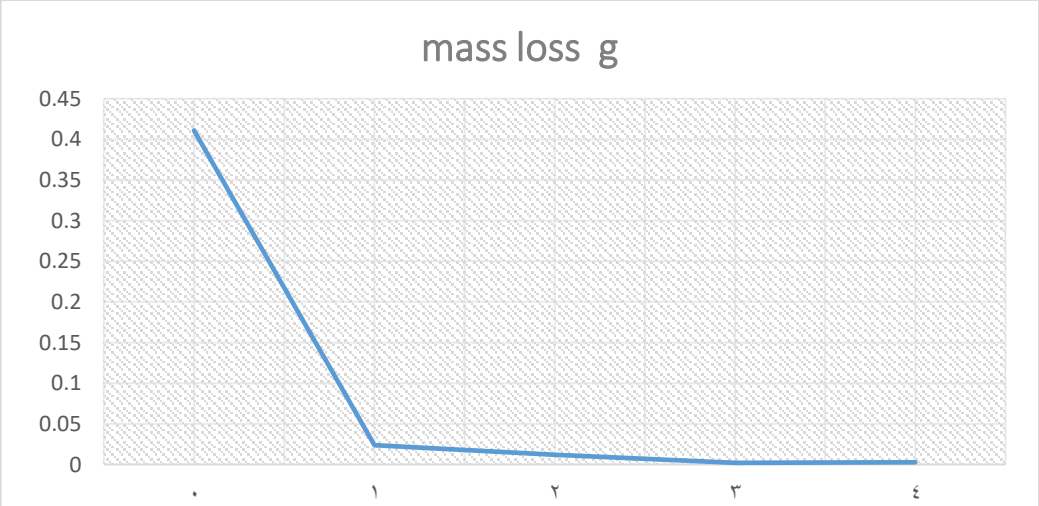

Fig.1: Relation between mass loss (g) and percentage weight of Graphine

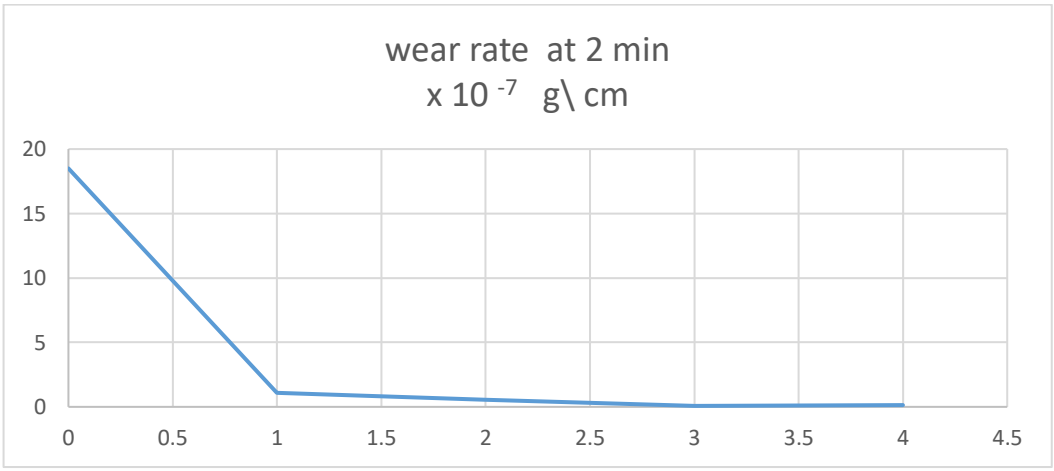

Fig. 2: wear rate value at 2 min with percentage of Graphine powder.

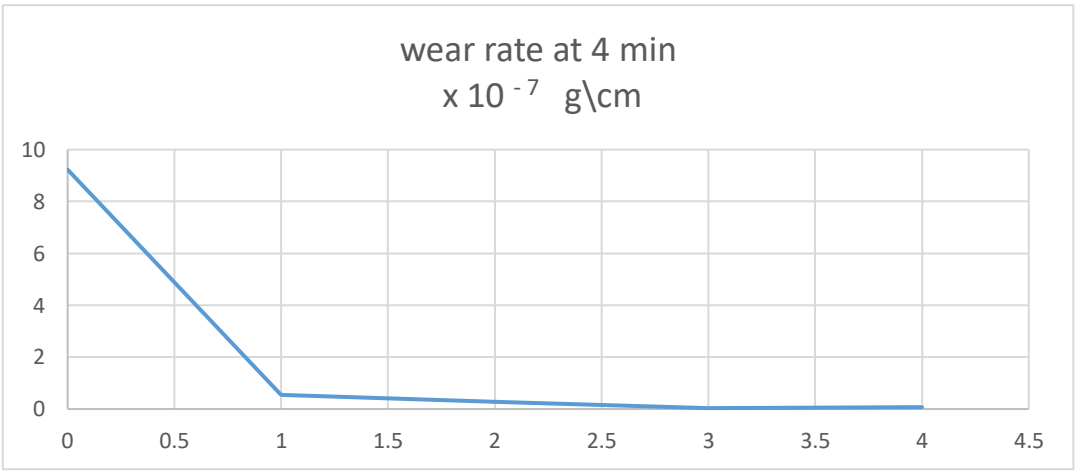

Fig. 3: wear rat value at 4 min with percentage Graphine powder.

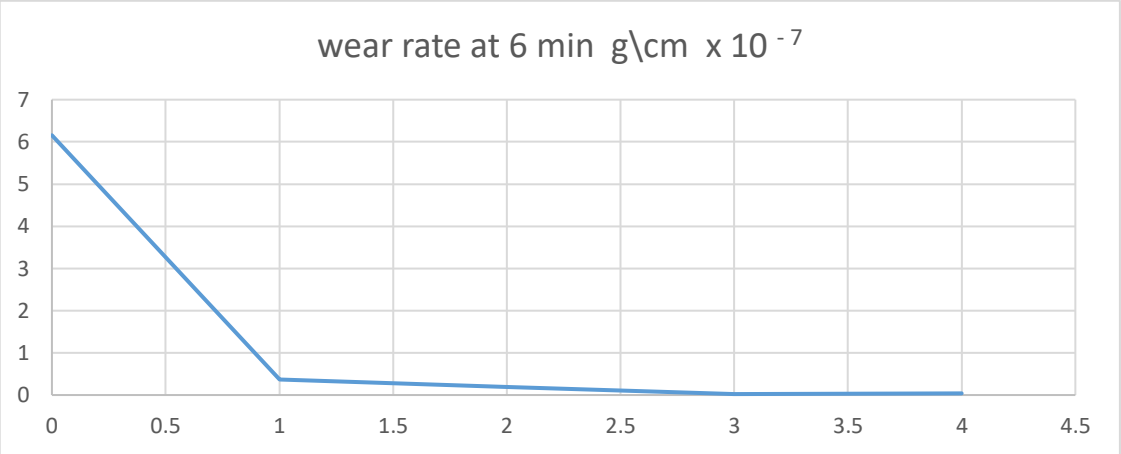

Fig. 4: wear rate value at 6 min with percentage Graphine powder.

Conclusions:

By reviewing the practical results, the following can be concluded:

1- All the prepared Nano composites have high wear resistance

2- The wear resistance values of all samples are affected by increasing the operating time

3- All Nano composites are significantly improved by increasing the percentage of the additive and up to 3%.>

4. The role of graphene powder is to reduce the coefficient of friction generated between the two surfaces in contact, in addition to reducing the heat generated as it acts as a lubricant between the surfaces.

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SOLVING SECOND ORDER ORDINARY DIFFERENTIAL EQUATION BY FINITE DIFFERENCE METHOD , ADOMIAN DECOMPOSITION METHOD AND GALERKIN-METHOD

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SOLVING SECOND ORDER ORDINARY DIFFERENTIAL EQUATION BY FINITE DIFFERENCE METHOD , ADOMIAN DECOMPOSITION METHOD AND GALERKIN- METHOD

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Abstract:

In this study ,three numerical methods presented for solving ordinary differential equations of the second order: Finite Difference Method (FDM), Domain Analysis Method (ADM) and Galerkin Method. Then we conduct a comparative study between the three methods with the -exact solution-. The study was conducted through illustrative examples. The study showed that ADM is identical to the exact solution. Therefore, ADM is a safe and effective numerical technique for solving problems in various sciences.

Key words: Finite Difference Method[FDM], Adomian Decomposition Method[ADM]'', Galerkin Method, Differential Equation.

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Introduction:

With the advancement of computer technologies, differential equations have become one of the most widely used mathematical techniques for solving models used for building simulations that describe different phenomena that arise in different sciences[1-2]. Thus everything in universe is based on 'differential equation' when they are formulated in mathematical terms. In differential equations there are two types of variables, the dependent variable (the variable whose value is affected or whose value depends on other variables) and the independent variable (the variable that affects the dependent variable or determines its value)[3]. If a differential equation depends in its derivatives on only one independent variable' then it is called an ordinary differential equation, whereas if a differential equation' depends in its derivatives on 'more than one independent variables' it is called a -partial differential equation[4].

There are foure goals to used differential equations, (1) form differential equation to know the relation between variables (dependent and independent variables),(2) to test whether there is impact of independent variable to dependent variable, (3) to study the behavior of the model, and (4) to predict the values of variable dependent based on independent variables that have been specified. The formation of the solution is done by estimating the value of a dependent variable. In solving problems, there are main techniques that are divided into three kinds: experimental, analytical and numerical[5]. The first kind is often not used', the experimental, because the experiments require a long time and can be expensive or the model is complex, influenced by many factors, or of high dimensionality so a numerical approach is used. To save time, effort, and money, scientists and researchers resorted to creating models that represent the problem of interest, and to study the characteristics and behavior of that problem, simulation is used. The model is solved by two way an analytic and a numerical approach. The analytical method gives an accurate solution to the problem, but in some complex problems or problems that are affected by many factors' for example if the area to be studied has a complex or nonhomogeneous shape, and if the described limits are time-dependent or of a mixed type that cannot be solved analytical. For this 'purpose the numerical approach is used. Adomian decomposition methodis a numerical method developed by Dr. Adomian in 1993[6], which is' used to solve' boundary problems that arise in physics. ADM is applied to solve linear and nonlinear ordinary and partial differential equations' of various orders[7]. Finite difference method' is a common method in

'numerical analysis 'used to solve ('differential equations), where these equations are converted into linear equations that are easy to deal with and solve easily and do not require high mathematical skills[8]. Galerkin method is a new type derived from Finite element methods which was proposed by Reed and Hill in 1971 [9] to solve differential equations numerically. In order to know the best and safest method used to solve the models, 'the results' of the three numerical methods are compared with the results of the analytical' values. In this paper, two examples of the three scalar methods are solved to find out which numerical method is close to exact values that can be used and generalize with confidence to all models of different dimensions and higher order, whether the model is complex or simple.

The main objectives of this study including: (1) to solve the ordinary differential equations of the second order using analytical method ,FDM, Galerkin method and ADM (2) discover the best numerical method that matches or approximates the exact solution.

2. The basic idea of numerical methods

In this section the basic ideas of the finite difference method , Adomian Decomposition Method and Galerkin method are briefly presented.

2.1 Finite difference method(FDM)[10]

Derivatives for the finite difference method are derived from the-Taylor series. where we assume that the function y is C^2 is continues in the 'neighborhood' of x. For any $h > 0$ we have:

$$y_{n+1} = y_n + hy'_n + \frac{h^2}{2} y''_{n+1} \qquad (1)$$

and

$$y' = \frac{y_{n+1} - y_{n-1}}{2h} \qquad (2)$$

Thus

$$y'' = \frac{y_{n+1} - 2y_n + y_{n-1}}{h^2} \qquad (3)$$

With the boundary conditions:

$$y(x_0) = \rho \ , \ y(x_1) = \mu \ , \ y'(x_n) = \vartheta \qquad (4)$$

2.2 Adomian Decomposition Method (ADM)[11]

The general form can be written for boundary value problems of the second order as follows:

$$y''(x) = F(x, y(x), y'(x)) \, , x \in y(0) = y_0 \, , y'(0) = y_1 \quad (5)$$

In a simple mathematical expression, the function can be written using ADM as follows

$$y(x) = y_0(x) + y_1(x) + y_2(x) + \cdots, \qquad (6)$$

Or it can be written as an infinite series as:

$$y(x) = \sum_{n=0}^{\infty} y_n(x) \qquad (7)$$

Where

$y(x) = y_0 + y_1 x + L^{-1}(f(x))$ and

$$y_{n+1} = L^{-1}(\int_0^x K(x,t)y(t)dt) \qquad (8)$$

Where $L^{-1}(.) = \int_0^x (.)dx$

In simple words, the idea of applying ADM in ordinary equations is to integrate according to the order of the differential equation after that we use the initial conditions.

2. 3. Galerkin method[12]

consider the second order -differential equation as

$$\frac{d^2y}{dx^2} = F\left(x, y, \frac{dy}{dx}\right), y(0) = y_0 \, , y'(0) = y_1 \qquad (9)$$

The solution method using the 'Galerkin method' we follow the following steps:

1- power (n) = order differential equation.

2- Polynomial (n+1).

3-Applying boundary conditions in step2.

4- We put 'arbitrary constants' in the -polynomial, and derive the polynomial according to the order of the given 'differential equation- to get R.

5-Applying formula $\int_0^x w_i \, R dx$, to get a function.

4.Examples

4.1 Example

Consider second order ordinary differential equation

$$y'' - y = 0, y(0) = 1, y'(0) = 1 \quad 0 \le x \le 4 \qquad (10)$$

Solution: The exact solution of equation (10) as

$$y(x) = e^x \qquad (11)$$

Applying Finite difference method to get

$$n = 0$$

$$y_1 - 3y_0 + y_{-1} = 0 \qquad (12)$$

Obtained $y_{-1} = 2 + y_1$ from $y'(0) = 1$ (13)

Equation (13) is put into (12) thus

$$y_1 - 3y_0 + 2 + y_1 = 0$$

$$2y_1 - 5 = 0$$

get to

$y_1 = 2.5$, same way n=1 and n =2,

we get to $y_2 = 6.2, y_3 = 17$

$$y_4 = 44.5$$

Applying Galerkin method' to get

Power(n) = 2

polynomial(n+1) = 3

$$y = c_0 + c_1 x + c_2 x^2 + c_3 x^3 \qquad (14)$$

Applying boundary conditions to get

$$c_0 = 1, c_1 = 1$$

$$y = 1 + x + c_2 x^2 + c_3 x^3$$

$$y'' = 2c_2 + 6c_3 x \qquad (15)$$

R is $c_2\ (2 + x^2)$ +$c_3(6 - x^3) - 1 - x = 0$

Applying$\int_0^4 \mathrm{w_i}\ \mathrm{Rdx}$ to get

$c_2 = 0.51730\ and\ c_3 = 0.07695$, polynomial become as

$$y(x) = 1 + x + 0.51730x^2 + 0.07695x^3 \qquad (16)$$

$y_4 = 18.2016$ and$y_3 = 10.7,\ y_2 = 5.7\ y_1 = 2.6,$

Applying Adomian Decomposition (ADM) to get

form equation- (10) the operator becomes

$$Ly(x) = y(x) \qquad (17)$$

differential L is given by $\frac{\mathrm{d}^2}{\mathrm{dx}^2}$ and the inverse of can written $L^{-1}(.) = \int_0^x \int_0^x (.)dxdx$, therefore

$$y_0 = 1 + x$$

$$y_1 = L^{-1}(y_0) = \int_0^x \int_0^x (y_0)dxdx = \frac{x^2}{2} + \frac{x^3}{6}$$

$$y_2 = L^{-1}(y_1) = \int_0^x \int_0^x (y_1)dxdx = \frac{x^3}{6} + \frac{x^4}{12}$$

Then

$$y(x) = 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^3}{6} + \frac{x^4}{12} + \cdots) \quad (18)$$

and in a closed form by

$$y(x) = e^x \qquad (19)$$

Thus

$$y_1 = 2.7, y_2 = 7.4, y_3 = 20.0 \text{and}\ y_4 = 54.6$$

Table 1 shows a comparison of -the results' obtained- using the three numerical methods with the 'exact solution'.

Table1

X	Exact Solution	FDM	Error	ADM	Error	Galerkin method	Error
0	1	1	0.0	1	0.0	1	0.0
1	2.7	2.5	0.2	2.7	0.0	2.6	0.1
2	7.4	6.5	0.9	7.4	0.0	5.7	1.7
3	20.0	17	3.0	20.0	0.0	10.7	9.3
4	54.6	44.5	10.1	54.6	0.0	18.2016	36.3984

4.2 Example

$$y'' + y' - 6y = 0, y(0) = 1, y'(0) = 2 \ 0 \le x \le 3 \quad (20)$$

The 'exact solution' of equation(20) is

$$y(x) = e^{2x} \quad (21)$$

To solve the equation (20) by the finite difference method apply equation (2) and (3)

n=0 we get $y_1 = 5$, $n = 1$ we get $y_2 = 26.33$ and if $n = 2$ we get $y_3 = 138.76$

if we applying Galerkin method to get

Power(n) = 2 , polynomial(n+1) = 3

$$y = c_0 + c_1 x + c_2 \ x^2 + c_3 x^3 \quad (22)$$

-Applying boundary conditions to get-

$$c_0 = 1, c_1 = 1$$

$$y = 1 + x + c_2 \ x^2 + c_3 x^3 \quad (23)$$

$$y'' = 2c_2 \ + 6c_3 x \quad (24)$$

R is $c_2 \ (2 + 2x - 6x^2)$ +$c_3(6x + 3x^2 - 6x^3) - 6x - 5 = 0$

Applying $\int_0^3 \mathrm{w_i} \ \mathrm{Rdx}$ to get

$c_2 = 0.62400 \ and \ c_3 = -1.95023$, polynomial become as

$$y(x) = 1 + x + 0.62400\,x^2 - 1.95023x^3 \quad (25)$$

$y_3 = -43.0421$ and $y_2 = -10.10584\, y_1 = 0.67377,$

Applying 'Adomian Decomposition' (ADM) to get

form equation (20) the operator becomes

$$Ly(x) = y(x) \quad (26)$$

-differential L is given by $\frac{d^2}{dx^2}$ and the inverse of can written $L^{-1}(.) = \int_0^x \int_0^x (.)dxdx$, therefore

$$y_0 = 1 + 3x$$

$$y_1 = L^{-1}(y_0) = \int_0^x \int_0^x (y_0)dxdx = -x - \frac{3x^2}{2} + 3x^2 + 3x^3$$

Then

$$y(x) = (1 + 2x + \frac{2x^2}{2} + \frac{4x^3}{3} + \cdots) \quad (27)$$

and in a closed form by

$$y(x) = e^{2x} \quad (28)$$

Thus

$y_1 = 7.389, y_2 = 54.598$ and $y_3 = 403.429.$

Table 2 shows a comparison of the results obtained using the three numerical methods with the exact solution

Table 2

X	Exact Solution	FDM	Error	ADM	Error	Galerkin method	Error
0	1	1	2.5	1	0.0	1	0.0
1	7.3	5	2.3	7.3	0.0	0.674	6.626
2	54.598	26.33	28.268	54.598	0.0	-10.106	64.704
3	403.429	138.76	264.669	403.429	0.0	-43.040	446.469

5. Conclusion

In this paper, the -solution of second order is studied by using three kinds of numerical methods: FDM, ADM and Galerkin method. The results of the three numerical methods were compared with the 'results' of the 'exact solution' (analytical method). The results of the study found that the Adomian decomposition' is simple and easy method and gives reliable results. Therefore, we believe the efficiency of ADM gives it wide application in various sciences.

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PREDICTION OF WEIGHT IN IRAQI DOMESTIC YOUNG DELL FROM MILK PRODUCTION AND COMPOSITION IN THEIR MOTHERS AND DESCRIPTION OF GROWTH CURVE WITH NON-LINEAR FUNCTION

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Abstract:

A study has been carried out on a sample of 102 Iraqi local dell and their offspring for the period 2021-2022 to study the growth prediction of lambs through the production of milk and its main components, the results obtained from this study after adjusting for factors are as follows., there is a positive relationship between weight gain at weaning age and at 6 months and an increase in the percentage of protein in milk at a significant (P≤0.05)and (P≤0.01) respectively. The regression coefficient of weight gain for age at weaning and age at 6 months on maternal milk production was by 3.208 and 3.821 Kg, respectively, at a significant (P≤0.05).in this study applied some exponential equation according to the simple non- linear structure analysis with calculation and recording of the Determination coefficient R2 of growth in domestic goats the results showed that the relationship resulting from the regression of the weight at age of 6 months on the weight at weaning according to the formula $WWT^{\wedge}=a + bBWT^{2}$ is the best according to the coefficient of determination which was 0.58.
We conclude that daily milk production and the ratio of protein and fat of milk can be used to forecast development between the age of weaning and the age of six months, and that the use of nonlinear equations can produce useful findings for describing growth curves, particularly between those two ages.

Key words: Iraqi domestic young dell, milk production, growth curve.

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Introduction:

Milk production in female goat is one of the main factors in the growth of lambs after birth to the age of weaning. Because they depend on it at this critical stage in their development, animal welfare experts are very concerned about milk production in newborns and fetuses[1].A few weeks (2–3 weeks) after birth, variations in lambs' weights start to become noticeable and have an impact on subsequent weights. It has been shown that between 3 and 12 weeks, 70% of the variations in a lamb's weight gain occur, and they primarily depend on the mothers' milk intake (Jones, et al. 2011)

Numerous genetic factors, such as breed, and environmental factors, such as the productive year and the birth season, which include the effects of climate, nutrition, pasture, health status, the age of ewes, the type of birth, the sex of the newborn, and herd management systems, affect the production of milk and its constituents in goat (Assan, 2020).

In order to raise the productive performance of herds, it is necessary to improve the animal's surroundings, evaluate and select the animal's parents, and genetic improvement (Kiplagat, et al. 2012). The best method for characterizing growth curves is to use nonlinear mathematical functions because they are efficient for modeling individual growth, assist mathematical models in minimizing the short-term effects of the environment, and alter the nonlinear relationship between age and live weight or body size. Animals' development rates from birth through physical maturity are estimated and predicted using the correct growth function parameters, which are then utilized to create the best administrative plan for the animals (Shakeel & Yasir, 2013).Through selection, the enhancements are intended to increase goat productivity from milk and meat. Herd productivity varies depending on the purpose of breeding and specialization, but the breeder's goal is to maximize his herd's productivity and generate a high rate of return on investment (Pulina, et al. 2018). The process of selecting high genetically efficient agricultural animals is essential in animal husbandry because it uses corrected appearance values and individual comparisons to estimate the educational values of qualities of economic importance and in accordance with the productive efficiency of meat and milk as well as macroeconomic efficiency (Qtaishat, et al. 2012). The current study aimed to forecast the growth of postpartum pregnancies by using milk production and its components.

1- Materials and method

The experiment began in September of 2021. Due to the newborns of goat being separated from their mothers at 8 p.m., the amount of milk produced from birth up to three months after delivery was measured twice a month depending on the morning ring. The measurement was then taken the following morning. (12 hours after the animal separation process), she milked the ewes to ensure that the dose was completely empty of milk, weighed the amount of milk, added the difference between the two weights, and multiplied by two to get the amount of milk produced, and then weighed the lambs after leaving them with their mothers to nurse for 15 minutes. The difference in weight between the two measurements represents the amount of milk consumed during pregnancy.

Estimate milk Components

For three months following delivery, milk components were produced once a month for each dell. Once a month for each site, one sample of milk from each ewe was collected in the morning. After the milk was weighed and thoroughly mixed in clean 50ml plastic boxes with tight hoods, the samples were sent to the Abu Ghraib Dairy factory for inspection and analysis by a milk component analysis device.

Statistical Analysis:

It was statistically analyzed according to the SAS(2012) program to study the fixed factors by applying the (Least Square Means) according to the (General linear model-GLM) to compare significant differences between the means. The regression of each growth characteristic on milk production and its components was also measured. Also we measured Prediction equation.

The first mathematical model: the factors affecting milk production, its main components and growth characteristics:

$y_{ijklm} = \mu + A_i + S_j + T_k + O_i + L_m + e_{ijklm}$

Sinse ,y_{ijklm} = Observation value m,μ= the general average of the trait, A_i= The effect of the mother's age at birth, S_j=effect of type o sex newborn, T_k=effect of the type of the birth(single or twin),O_i=effect of the month of birth ,L_m=effect of the year of the birth, e_{ijklm}= Normally and independently distributed random error with a mean of zero and a variance of s2e.

Curvature of the growth has been describe by the nonlinear regression models

First equation (Brody Ecuation)

Wt= A*(1-B*(-K*t))

Second equation (Logistic ecuation)

Wt= A*(1+B*e(-K*t))

Since: Wt= living weight at a specific age, A= age at prediction of matured weight, B=the point of changing ingrowth as a factor at zero time (t=0), e= logarithm of the starting weight, K=average of growth between the starting weight and weight of the age at prediction, t= time

Also we measured the exponential equation according to a simple nonlinear regression with collected R^2

Regression of weight at weaning(WWT) on the weight at birth (BWT)

$WWT^=a+bBWT^2$

Regression of weight at six month(WT6) on the the weight at birth (BWT)

$WT6^=a+bBWT^2$

Regression of weight at six month(WT6) on the the weaning weight (WWT)

$WT6^=a+bWWT^2$

4- Results and discussion

4-1 weight at weaning

Table 1 demonstrates that there is an increase in weaning weight of 3,208 kg when milk supply rises by one kilogram per day. This gain is positive and statistically significant ($P\leq 0.05$) for lambs. The relationship's determination coefficient R^2 was 0.22, meaning that ewes' daily milk output can account for 22% of their weight at weaning. Mothers are typically left without milking in goat herds, including those under study, so that the mother's milk can be used to benefit the newborn and be reflected in growth. This is in line with study which found that mother's milk production has an impact on dell (Flores-Najera, et al. 2020)

Also the regression coefficient between weight and percentage of lactose at significance level ($P\leq 0.01$)was (-1.271) with Determination coefficient R^2 0.15

This is This is different from study which found that increasing the percentage of lactose in milk mother's an impact on dell (Flores-Najera, et al. 2020)

Table 1: Prediction of weight at weaning (kg) in domestic goat breeders by milk production Daily and main milk ingredients

coefficient of determination (R^2)	Regression coefficient	) Prediction equation(	Regression coefficient)b(	Recorded qualities of mothers
0.22	*	Y^= 9.96 +3.208X	3.208	Daily milk production(gm)
0.07	NS	Y^= 11.74 +0.0266X	0.0266	Fat in milk (%)
0.15	**	Y^= 20.86 -1.271X	-1.271	lactose in milk (%)
0.15	*	Y^= 16.47 +0.398X	0.398	Protein in milk (%)
0.17	*	Y^= 19.83 +0.282	0.282	non-fat milk solids in milk (%)
) *P≤0.05) **,(P≤0.01 ,(NS :not significant				

The findings of the present study revealed a significant (P≤0.05) positive regression coefficient in the weight of dell at 6 months of age on the production of daily milk, with an average of (3,821 kg/kg)

4-2 Weight at the age of 6 months:

As we show in (table 2). This may be attributed to the positive correlation between weights at an early age and the posterior weight, including the weight at weaning, which was significantly impacted by the production of breast milk in this study with weight at the age , This is consistent with research that found a statistically significant link between birth weight and later weight.(Menezes, et al. 2016)

Also this study results showed that weight weaning had a positively high statistically significant association with percentage of fat (r = -0.0277) while the $R^2$was 0.12

While it was (r=0.749) with R^2 0.35 in regards to weight weaning and percentage of protein

Table 2: Prediction of weight at the age of 6 months (kg) in domestic goat by Daily milk and main milk ingredients

coefficient of determination (R^2)	Regression coefficient	(Prediction equation)	Regression coefficient (b)	Recorded qualities of mothers
0,09	*	Y^= 22.76+3.821X	3.821	Daily milk production(gm)
0.12	*	Y^= 25.63 -0.012X	-0.0277	Fat in milk (%)
0.05	NS	Y^= 33.79 -1.554X	-1.554	lactose in (%) milk
0.35	**	Y^= 28.61 +0.749X	0.749	Protein in milk (%)
0.08	NS	Y^= 31.37 +0.404X	0.287	Non-fat milk solids in (%) milk
not significant :NS ,(P≤0.01) **,(P≤0.05) *				

4-3 Weight gain between weaning and 6 months of age:

Through the production of daily milk and the main components of milk the results of the current study showed that there is a positive significant (P≤0.05) regression coefficient in the age of lambs between birth and 6 months on the percentage of protein and non-fatty solids milk, with an average r= (0.208 and 0.225 kg/kg) with R^2 0.19 , 0.08 respectively (table 3)

This is in line with study (Morgan, et al. 2007) which discovered a link between birth and weaning weight and proposed that it could be due to variations in the amount and composition of breast milk production in dams.

Table 3: prediction of weight gain between weaning and 6 months of age (kg) in goat breeders

coefficient of determination (R^2)	Regression coefficient	(Prediction equation)	Regression coefficient (b)	Recorded qualities of mothers
0.12	*	Y^= 13.67 +2.277X	2.277	Daily milk production(gm)
0.05	NS	Y^= 12.81 -0.0185X	-0.0185	Fat in milk (%)
0.06	NS	Y^= 12.77 +1.096X	1.096	Lactose in milk (%)
0.19	*	Y^= 9.967 +0.208X	0.208	Protein in milk (%)
0.08	*	Y^= 12.03 +0.225X	0.225	Non-fat milk solids in milk(%)
.Not significant :NS ,(P≤0.05) *				

4-4 Description of growth curves:

The exponential equation were applied according to a

simple nonlinear regression with the calculation of factor to determine) R^2(for the growth of young goats so that the weight of weaning on the weight at birth according to the formula of Prediction equation WWT^=a + bBWT² has been shown positive amount to 0.159 with R^2 0.22

While the weight at sex months on the weight at birth and the weight at sex months on the weight of weaning according to the formula WWT^=a + bBWT² were 0,183 amount with R^2 0.35 , and amount 0,317 with R2 0.58 Respectively ,

Thus, evaluating and predicting weight at sex months on weaning weight is appropriate, especially given that this age is one of the marketing ages, as well as its positive association with subsequent weights.This is consistent with what was stated in the study about that[3] (Esp, 2017). The most appropriate age to predict weight the relationship between weaning weight

and weaning at 6 months in sheep shows that weaning weight is a crucial element of weaning capacity and has a significant impact on growth and feed efficiency from weaning to market.

Table 4: Description of growth curves of domestic goat breeds by exponential equations

coefficient of determination (R^2)	Regression coefficient	Prediction) (equation	Regression (b) coefficient	Recorded qualities of mothers
0.22	*	Y^= 13.58 +0.159 BWT^2	0.159	weight of weaning on the weight at birth
0.35	*	Y^= 21.76 +0.183 BWT^2	0.183	weight at sex months on the weight at birth
0.58	**	Y^=16.04 +0.317 WWT^2	0.317	weight at sex months on the weight of weaning
.(P≤0.01) **,(P≤0.05) *				

4-5 Average expected weights from birth to 6 months of age:

Table 5 shows that the expected animal weights at birth were predicted by the mother's weight at birth while the weight at weaning and at the age of 6 months is an approach to the real weights in domestic goats by applying two functions Brody Equation ,Logistic Equation

Furthermore, this result reflects the reliability of the Brody function and the second degree Logistic function in predicting lamb weight up to 6 months, with the possibility of applying it to the age of the year.The R^2 factor of weight at birth and weaning and at the age of 6 months 0.77 , 0.70 , 0.81 respectively when applying Brody Equation function while the R2 reached with the application Logistic Equation to 0.73 ,0.62 ,0.75 respectively. Other research have verified that there are growth functions available.the metric for describing

growth potential Equational models (Logistic, Brody) which condense the most significant growth traits. These nonlinear models work well since growth takes the sigmoid shape (Hojjati, & Ghavi Hossein-Zadeh, 2018).

Table 5: Average real and expected weights from birth to 6 months of age for domestic goat

standard error ± Average expected		Average standard ±real error	Character
Logistic Equation	Brody Equation		
0.07± 2.72	0.11± 2.76	0.08± 2.87	Weight at birth
0.73	0.77	-	Coefficient of (R^2) determination
0.16± 13.44	0.20±13.61	0.17±13.52	Weight at weaning
0.62	0.70	-	Coefficient of (R^2) determination
0.51±22.31	0.41±22.64	22.75 0.48±	Weight at the age of 6 months
0.75	0.81	-	Coefficient of (R^2) determination

Conclusions:

We conclude that the protein-to-fat ratio in milk and the daily milk production of maternal goats can be used to predict development between the ages of weaning and six months. Nonlinear equations can also be used to describe growth curves, particularly those occurring between those two ages.

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EVALUATING THE CHANGE DETECTION OF(NDVI) FOR BABYLON CITY USING REMOTE SENSINGAND GIS TECHNIQUES (2015-2020)

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Noor Zubair KOUDER
A.A.R.NIEMA

EVALUATING THE CHANGE DETECTION OF(NDVI) FOR BABYLON CITY USING REMOTE SENSING AND GIS TECHNIQUES (2015-2020)

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Abstract:

The normalized difference vegetation index (NDVI) is an effective graphical indicator that can be used to analyze remote sensing measurements using a space platform, in order to investigate the trend of the live green vegetation in the observed target. In this research, the change detection of vegetation in Babylon city was done by tracing the NDVI factor for temporal Landsat satellite images. These images were used and utilized in two different terms: in March 19th in 2015 and March 5th in 2020. The Arc-GIS program ver. 10.7 was adopted to analyze the collected data. The final results indicate a spatial variation in the (NDVI), where it increases from (1666.91 $km2$) in 2015 to (1697.01 $km2$)) in 2020 between the two observed periods. About 25 X106 m2 as a new area that is covered with vegetation between the two observed terms (2015) and 2020). The increased trends can be explained by the evolution of agricultural styles that used by farmers..

Key words: Babylon city, Normalized vegetation difference index (NDVI), Remote Sensing (RS).

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Introduction:

The RS plays an important part in agriculture that affording timely spectral knowledge that would be help to estimate officially the value of the Biophysical indicators of the plants health. The physiological fluctuations occur in plants because of the stress. These could change the spectral reflectance or emission properties and stress amenable can be detected via remote sensing methods. [1]. Crop growth should be frequently monitored in order to both forecast any potential production losses from anticipated stress factors and to take convenient measures. Numerous factors have an impact on the growth phases and development of crops. For instance, soil moisture, the date of the crop was planted, the air temperature in the study region, the soil conditions, and the duration of the day [2]. The plant conditions and productivity are influenced by the later factors. During the pollination process, high temperatures can have negatively influence on corn crop yields. Thus, the temperature measurements during the pollination process can introduce a prediction about corn yields [3,4].

2. Vegetation Indices

The amount of solar energy that plants reflect is influenced by their morphological and chemical properties[5]. The light reflected in each spectral band is influenced differentially by the kind of plant, water content, and canopy properties. Many different vegetation indices have been developed using reflected light measured in the ultraviolet, visible (blue, green, and red), near- and mid-infrared sections of the spectrum. These measurements give significant information on the conditions and structure of plants[6]. Vegetation indices are mathematical expressions that integrate observed reflectance in a variety of spectral bands to get a value that aids in evaluating crop growth, vigor , and a number of other vegetation attributes including biomass and chlorophyll content. Understanding the spatial-temporal variations in crop conditions can be aided by mapping these indices; figure (1) shows the spectral reflectance curve [7].

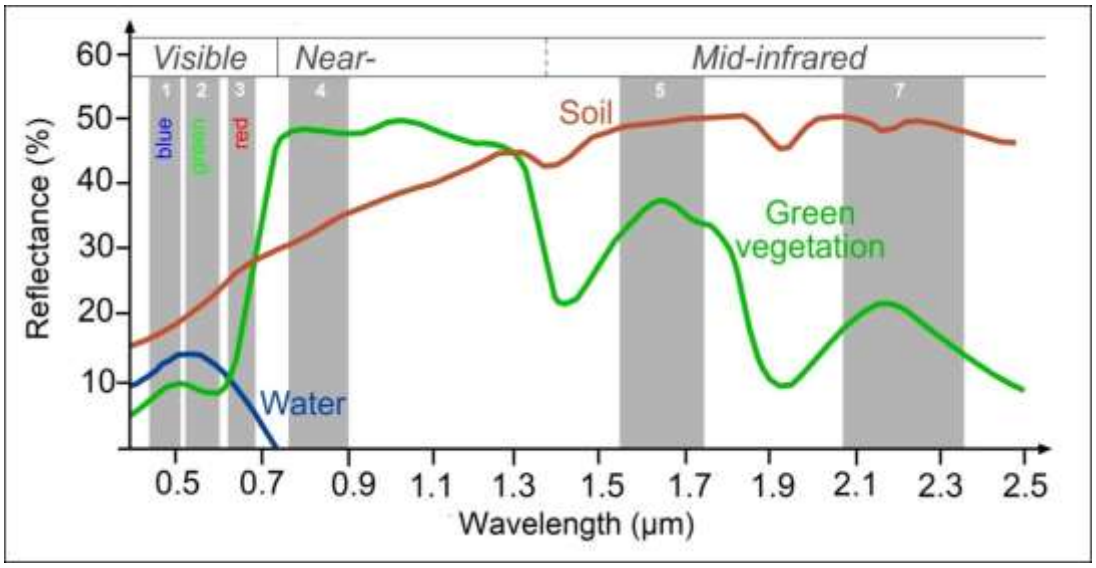


Figure (1): The spectral reflectance curve

3. The Normalized Difference Vegetation Index (NDVI)

When analyzing remote sensing data from a space station, the NDVI is a useful graphical indication, in order to investigate the trend of the live green vegetation in the observed target. The 3-band satellite image (Green, Red and NIR) has a variety of features that may be identified using the NDVI technique [8]. Given that this indication is a simple and significant digital signal, it may be used to evaluate RS measurements from a remote platform and determine whether or not the target or item under observation contains living, green vegetation [9,10].

In order to calculate the NDVI the following formula is applied [11]:

$$NDVI = \frac{(NIR - R\,Visible)}{(NIR + R\,Visible)} \qquad (1)$$

Where:

NDVI = Normalized difference vegetation index.

NIR =The near infrared band.

Red =The red band.

$$In\ Landsat\ 8, \qquad NDVI = \frac{(Band\ 5 - Band\ 4)}{(Band\ 5 + Band\ 4)} \qquad (3)$$

The NDVI values have typically ranged from (+1 to -1), where a positive value denotes the presence of vegetation cover, and the higher the resulting positive value, the greater the vegetation, and the density of the plants and have healthier. The converse is true for negative values, which denote non-vegetation**[12,13].**

Methodology and study area

1. Downloading Bands for Babylon city

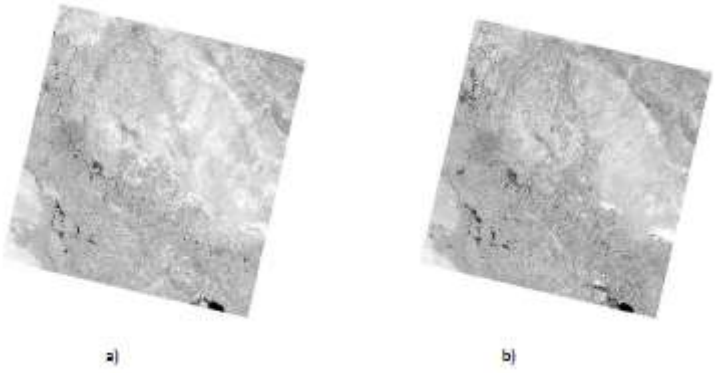


Figure (2): scene Two : a) Shows the band 4 from landsite 8 17/8/2015 .

b) show the band 4 from landsite 8 30/8/2020

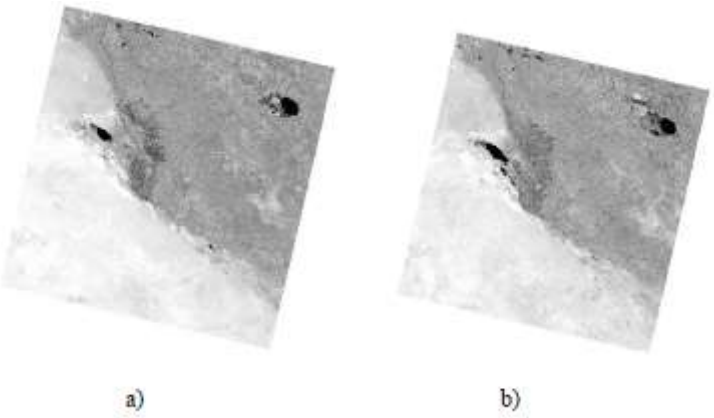


Figure (3): scene Two : a) Shows the band 5 from landsite 8 17/8/2015 .

b) show the band 5 from landsite 8 30/8/2020 .

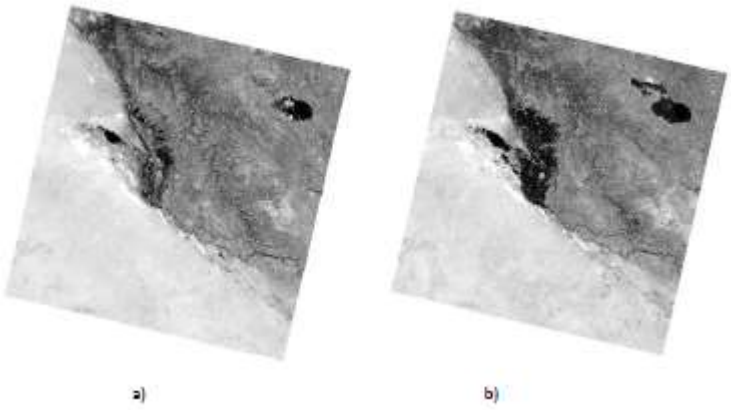


Figure (4): scene Two: a) Shows the band 4 from landsite 8 17/8/2015 .

b) show the band 4 from landsite 8 30/8/2020 .

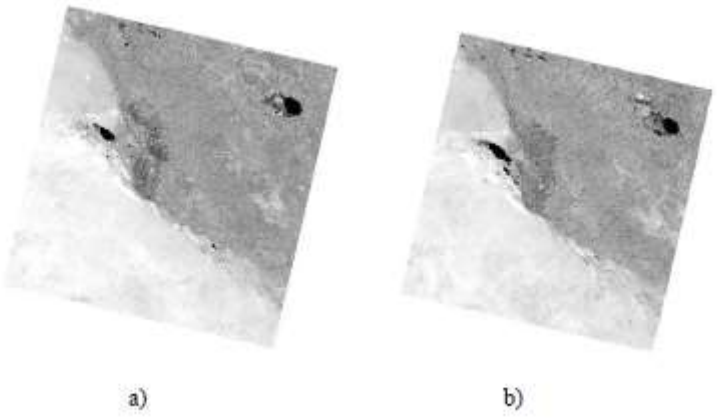


Figure (5): scene Two : a) Shows the band 5 from landsite 8 17/8/2015 .

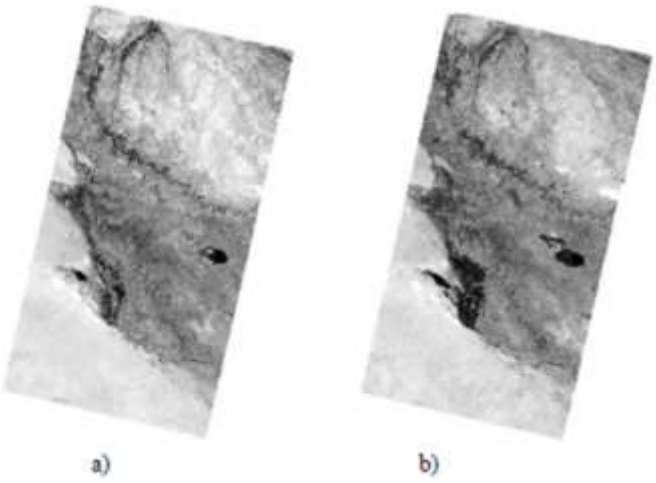
b) show the band 5 from landsite 8 30/8/2020 .

2. Mosaic for the Imageries.

After downloading images by Landsat 5 and Landsat 8, with two scenes for each year of the study duration (2015, 2020), the mosaic process was applied for each couple of imageries in each year, in order to get a real scene of the study area for the Babylon city.

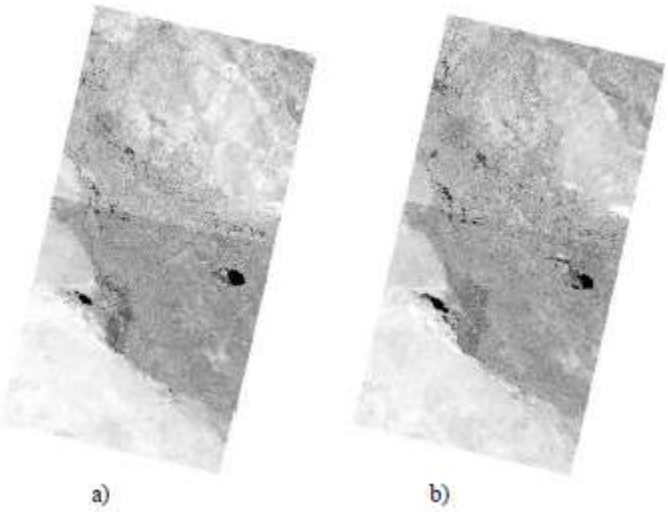
2.1 **Mosaic for the Band Landsat 8**.

The following figures represented the Mosaic process of two part clipping of band to the Babylon city for the Landsat 8.



Figure(6) : a) mosaic Two scene image band 4 17/8/2015

b) mosaic Two scene image band 4 30/8/2020

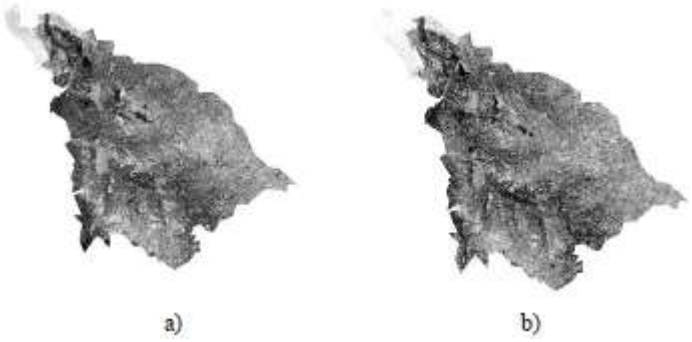


Figure(7) : a) mosaic Two scene image band 5 17/8/2015

b) mosaic Two scene image band 5 30/8/2020

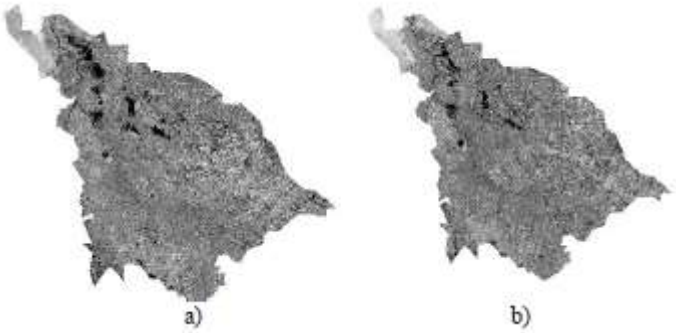
3. Extraction for the Band 4 & 5 Landsat 8

The following figures represented the Extraction process of two part clipping of band to Babylon city for the Landsat 8.



Figure(3.7) : a) extraction Two scene image band 4 17/8/2015

b) extraction Two scene image band 4 30/8/2020



Figure(3.8) : a) extraction Two scene image band 5 17/8/2015

b) extraction Two scene image band 5 30/8/2020

4. Calculation NDVI for the Studied Area from Landsat 8

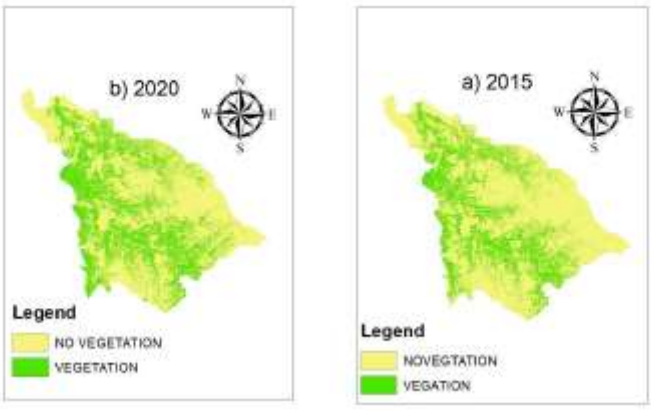


Figure (10): shows the results of Normalized different vegetation index.

Table (1): Show the statistical analysis by applied NDVI for Babylon city in 2015 –2020

	Normalized different vegetation index			
	2015		2020	
Class	Area km^2	Area %	Area km^2	Area %
No vegetation	3917.28	70.15 %	3587.18	67.89 %
Vegetation	1666.91	29.85 %	1697.01	32.11 %
Sum	5584.19	100	5284.19	100

5. Change normalized different vegetation indies

Chang normalized different vegetation		
Class	Area km^2	Area %
No vegation	**-330.1**	**-2.26**
Vegetation	**30.1**	**2.26**

6. Conclusions

The use of Landsat 8 in diverse years duration can provide a perfect evaluation for land changes in the agriculture sector in the Babylon city, and give sufficient perceptions of the changes in the future. The results of this study clearly show the state of land changes, where the NDVI indices values can be highly useful, due to the ability of providing accurate information about the vegetation condition and enable more precise and spatially. In addition to the consideration of society activities and climate fluctuations, it can be considered as a measure of future agricultural land degradation, that shows:

1. The study gave a highlight on the needing of developing plans during short term and long term in order to address the state of the changes land.

2. The (NDVI) distribution over the years (2015-2020) showed a positive pattern of no vegetation is (3917.28 $km2$) and by (70.15 %) ,vegetation is (1666.91 $km2$) and by (29.85 %). In 2020 in the area of no vegetation is (3587.18 $km2$) and by (67.89 %) ,vegetation is (1697.01$km2$) and by (32.11 %) .

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INVESTIGATE THE RELATIONSHIP BETWEEN EPIDEMIC HIV/AIDS VIRUS DISEASE TRANSMISSION AND SPREAD AND HEALTH STAFF KNOWLEDGE AND PRACTICE AT BASRAH TEACHING HOSPITAL IN IRAQ

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INVESTIGATE THE RELATIONSHIP BETWEEN EPIDEMIC HIV/AIDS VIRUS DISEASE TRANSMISSION AND SPREAD AND HEALTH STAFF KNOWLEDGE AND PRACTICE AT BASRAH TEACHING HOSPITAL IN IRAQ

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Abstract:

According to recent studies, health professionals still have stigmatizing attitudes toward patients living with HIV/AIDS. Because healthcare workers play an important role in preventing HIV/AIDS transmission, HIV/AIDS education is an important part of improving community health care. The aims of this study are to evaluate practice, examine and describe healthcare personnel's HIV/AIDS knowledge, and attitudes toward people living with HIV/AIDS .This study is a non-experimental descriptive cross-sectional study conducted from December 2021 to February 2022. The samples were collected from health staff (n = 25) is nurses, (n = 25) is midwives, and (n = 25) is technical analyst employed at Basrah Teaching Hospital located in Basrah City, Iraq. A questionnaire include in the 1st part Sociodemographic Characteristics Participant, the majority of participants are female; n = 50 (66.7%), high percentage of high Nursing School students n= 30 (40%) and the majority of healthy staff in each group n = 48 (64%) had no prior training in AIDS prevention methods , In the 2nd part include assessment of healthy staff knowledge of HIV Disease Transmission showed no significant difference (p≤0.05) between the results of nursing, midwifery and technical analyst staff on all items, but the results of the technical analyst staff were better than the results of the other staff. All of the items in the 3rd part of the questionnaire include evaluation of knowledge and practice of Healthy Staff in Hospital Units for HIV/AIDS patients showed no significant difference (p≤0.05) in all of the results between each health staff member. We conclude there was little information among the staff about the mechanism and transmission of the disease. Furthermore, incorrect methods Collection of blood samples , especially ways to draw blood and transfer the sample.

Key words: Acetamiprid, Quercetin, Hesperidin, MAPK8, NFKB, Flavonoids.

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Introduction:

The virus that infects white blood cells is known as the Human Immunodeficiency Virus (HIV), and Acquired Immunodeficiency Syndrome (AIDS) is the disease's latter stage ,the federal Centers for Disease Control and Prevention (CDC) reported five gay males with pneumocystic carini pneumonia, an uncommon form of pneumonia [1]. Heterosexual couples could catch GRID sickness, too, according to the CDC. Acquired Immunodeficiency Syndrome (AIS) was the new label given to the illness previously known as Gay Related Immune Deficiency (GRID) (AIDS). To add three new "indicator diseases," the US Federal Office of Health and Human Services (HHS) broadened the definition of AIDS in 2002, According to the Federal Office, HIV-infected patients should have less than 200x 106 T-helper cells per liter of blood to be considered to have AIDS. According to the Federal Office, the stricter criteria will cause the number of new AIDS cases to roughly double. [2].

Following the discovery of the AIDS virus, researchers discovered how the disease spread and developed a method to screen for it [3]. In 1996, the first medication to stop the progression was released, and the availability of medication altered the scenario for HIV-positive individuals. Before, they had to accept that they had a terminal illness, but now that there are new therapeutic possibilities, they may anticipate the future [4]. Today, antiretroviral medications are used to treat HIV as a chronic condition for which there is no known cure and which throws a heavy burden on the patient ,the patient must comprehend the treatment and have faith in it, as their compliance is essential to its success , if the patient stops receiving therapy, the illness will spread and their health will worsen. [5,6].

Nurses make up the majority of the various cadres of health-care employees in most nations. Their profession requires them to be on the front lines of care, putting them in close contact with the blood and other bodily fluids of patients, as a result, they're at risk of catching HIV/AIDS and other blood diseases while at work. Occupational exposure among health-care workers is linked to a modest number of accidents, but it poses a significant risk to health-care professionals' health, careers, families, and patients under their care, according to the World Health Organization (WHO)[2,7].

Safer practices, barrier safeguards, better needle devices, and other advances are the best way to avoid HIV and other blood borne/body fluid infections , TB and other infectious diseases are making a resurgence, adding a new dimension to the rise in occupational dangers, a nurse faces additional psychosocial challenges as a result of the stigma and discrimination

associated with occupationally acquired HIV , as a result, assessing and reducing their occupational HIV risk necessitates a thorough understanding of their work habits,the following goals guided a study that was done. [8,9].

The problem in this study is that the medical staff's careless handling of patients—who may have HIV/AIDS disease—and lack of understanding expose them to the disease, as do their improper procedures for taking blood and transporting it to the laboratory, so, the aim of the research is evaluating the knowledge and information of the health staff (nurses, midwives, technical analysts) on HIV transmission methods, and evaluating the scientific skills of the living cadre on how to deal with patients in general, whether he has AIDS or others to avoid the disease.

2. Methodology

2.1 Subjects

2.1.1 Research design

This study is a none experimental descriptive cross-sectional study in one hospital (Basrah teaching Hospital) located in Basrah city.

2.1.2 Research questionnaire

In this Correlation study a questionnaire composed of three parts (Appendix 1) included of:

Part 1- Sociodemographic Characteristics of participants.

Part 2 - Evaluation of knowledge of healthy Staff for HIV Disease Transmission

Part 3- Evaluation of knowledge and practice of healthy staff in hospital Units

2.2 Methods

2.2.1 Study sample and setting

75 sample were collected from health staff employed in Basrah teaching Hospital wards {(n=25) Nursing, (n=25) Midwives and (n=25) technical analyst }. The data collection was carried out from December 2021 to February 2022.

All these sample from both sexes, and from different levels education (Bachelor, Diploma, High Nursing School).

2.3 Statistical analysis

Analysis was made by using SPSS, data was expressed in (percentage and frequency) and chi squire test.

3. Result & Discussion

3.1 Sociodemographic Characteristics of participants

The acquired immunodeficiency syndrome, also known as AIDS, is one of the most challenging medical issues of the twenty-first century. The global growth of the AIDS epidemic, which is now in its third decade, puts the entire world's population in danger. More than 12.2 million women have contracted HIV since the pandemic began, making about 42% of the 30.6 million individuals living with HIV globally now.

In the twenty-first century, one of the most challenging health issues is AIDS. A menace to the entire global population, the AIDS epidemic is already in its third decade and has spread globally, more than 12.2 million women have acquired HIV since the pandemic began, making up 42% of the 30.6 million individuals living with the disease today [10].

Of the total of 75 healthy staff {nursing n= (25), midwives n= (25) and technical analyst n= (25)} invited at Basrah teaching Hospital, response rate = 100%. Their demographic characteristics are shown in Table (1), the majority of participants were female n=50 (66.7%). Regarding age between 20-60 years , high percentage n=55 (73.3%) were 20- 40 years. As well as for education level, high percentage n= 30(40%) are High Nursing School, their year service between from 1-40 years but high percentage between 1-20 years 50 (66.7%). Most of health staff from each group do not have previous training toward AIDS prevention methods n=48 (64%), not engaged in any professional development activity currently are unsatisfactory, Nurses make up the majority of the various cadres of health-care employees in most nations. The nature of their job necessitates that they work directly with patients' blood and other physiological fluids. Thus, they are more susceptible to blood disorders like HIV/AIDS and hepatitis. There are only a small number of occupational exposure-related incidents among health-care employees, but they pose a major risk to the health, careers, families, and patients under their care of health-care professionals (WHO) [10].

Table (1): **Demographic characteristics of the participants**

Characteristic of Participants	**Categories / Grouping**	**Frequency = n (%)**
gender	Male	25 (33.3%)
	Female	50 (66.7%)
Age in year	20-40	55 (73.3%)
	41-60	20 (26.7%)
Level of education	Bachelor	19(25.3%)
	Diploma	26(34.7%)
	High Nursing School	30(40%)
Years' service	1-20 years	50 (66.7%)
	21-40 years	25 (33.3%)
Do Have previous training toward AIDS prevention methods.	yes	27 (36%)
	no	48 (64%)

3.2 Evaluation of knowledge of health Staff for HIV Disease Transmission

In the 2nd part of questionnaire including 15 items, in the Table (2) showed all answers of healthy staff for all items no difference ($p<0.05$) between nursing, midwife and pathological analyzes staff. questions no. 1 to 6 respectively, The evaluation of knowledge of healthy Staff for HIV Disease transmission were recorded high percentage for each healthy staff, Furthermore, questions no.7 to 15 respectively were recorded low percentage for each healthy staff and technical analyst result's better than other staff (nursing and midwives' staff).

HIV is a contagious disease that can be spread from one person to another, Sexual intercourse, contact with contaminated blood, sperm, cervical and vaginal secretions, or contact with contaminated blood, sperm, or cervical and vaginal secretions (vaginal, anal, and oral). This is the most prevalent method of HIV transmission in the world, and it can be given from one infected person to their sexual partner (man to woman, woman to man, man to

man, and, less likely, woman to woman), When additional sexually transmitted diseases (STDs), particularly those that cause vaginal ulcers, are present, more mucosal membranes are exposed to the virus. As a result, the risk of HIV transmission rises, mother to infant transmission of HIV/AIDS can occur during pregnancy, labor, and delivery, or as a result of breast feeding [10]. Skin piercing and injection equipment, as well as needles and syringes, can be infected with HIV. Sneezing or coughing, insect bites, kissing, touching or hugging, water or food, public baths, handshakes, work or school interactions and using telephones and swimming pools are all ways HIV can be transferred [11,12].

Table (2): Comparison knowledge between of healthy Staff for HIV Disease Transmission

No.	Item	Nursing staff n= 25	Midwives staff n= 25	l analyst staff n=25
		frequency of correctanswer n= (%)	frequency of correctanswer n= (%)	cy ofcorrect answer n= (%)
1	Infection spreads through infected blood, sperm, cervical secretions, and vaginal fluids.	23 (92%)	22 (88%)	25 (100%)
2	Injecting equipment, such as needles or syringes, or skin piercing equipment, can expose you to HIV.	24 (96%)	21 (84%)	25 (100%)
3	Transmission of the disease from themother to faint about conceptive or Brest feeding	23 (92%)	16 (64%)	25 (100%)
4	Sexual intercourse	25 (100%)	25 (100%)	25 (100%)
5	Blood transfusion product	25 (100%)	25 (100%)	23 (92%)
6	Public bathroom	25 (100%)	21 (84%)	21 (84%)
7	BY coughing or sneezing and kissing	13 (52%)	13 (52%)	16 (64%)
8	Insect Bites	18 (72%)	16 (64%)	20 (80%)
9	Water or Blood	17 (68%)	18 (72%)	23 (92%)
10	Work or school contact	16 (64%)	10 (40%)	14 (56%)

11	Swimming pool	17 (68%)	15 (60%)	19 (76%)
12	Shared glasses or dishes	15 (60%)	15 (60%)	19 (76%)
13	By Handshake	10 (40%)	12 (48%)	20 (80%)
14	Touch or hugs	18 (72%)	15 (60%)	22 (88%)
15	Use phone	16 (64%)	16 (64%)	22 (88%)
Total		**285 (76%)**	**238 (63.5%)**	**294 (78.4%)**

Chi.- square=6.641 df=2 Asymp.sig.=0.036 p≤ 0.005

3.3 Evaluation of knowledge and practice of healthy staff in hospital Units

In the 3rd part of questionnaire including 3 items, these items are evaluation of practice healthy staff who employed in hospital unit towards any patient including HIV disease patient's, Table (3) showed no significant difference (p≤0.005) for all results between each healthy staff and showed low Percentage for question 1 and 3, and good results for question 2.

Methods of blood transfusion from the patient to the laboratory should be more careful because the nurse, midwife or laboratory does not know that the patient is suffering from AIDS to avoid infection, the method of taking blood from the vein and placing it in the test tubes and not paying attention to the blood drops that contaminate the tube and hand , method of wrapping them with information paper Patient is mistake , blood contamination of this tube and information paper leads to the transmission of the disease to other staff, Most healthy staff do not commit to wearing gloves while drawing blood and transporting it in tubes or during analysis, This is very dangerous for healthy staff in other units.

Scientists in France discovered the virus that causes AIDS in 1983, and the transmission channels were established. Human immunodeficiency virus was the name given to the virus later on (HIV). HIV is divided into two categories ,HIV-1 the most common type found worldwide, and HIV-2 found mostly in West Africa [13].

The context and environment in which health care is delivered has an impact not just on the quality of care provided, but also on the safety and well-being of caregivers ,Provision of protective equipment such as gloves, goggles, plastic aprons, gowns, and other protective devices, as well as appropriate disinfectants to clean up spilled blood and other body fluids, increased accessibility of puncture resistant "sharps" containers, maintaining appropriate staffing levels, and providing post-operative care are all examples of measures that promote

a safe anesthetic procedure, Controlling shift lengths and supervising inexperienced workers; addressing healthcare; Providing HIV-positive personnel with flexible work assignments and ensuring that they remain employed as long as possible whether or not they can take part will be determined by their overall health, the demands of their jobs, and the necessity to safeguard them from diseases like tuberculosis [13,14].

Table (3): comparison Evaluation of knowledge and practice healthy staff towards blood transferring and type of HIV virus

No.	Item	Nursing staffn= 25	Midwives staff n= 25	Technical analyst staffn=25
		frequency of correct answer n=(%)	Frequency of correct answer n= (%)	frequency of correct answer n= (%)
1	What are the methods of Transferring blood sample for testing	1 (4%)	0	0
2	Where are the injecting placed after completing the blood draw	23 (92%)	25 (100%)	23 (92%)
3	Dose the first type of HIV1 Cause the diseaseor Second HIV2	9 (36%)	17 (68%)	12 (48%)
Total		**33 (44%)**	**42 (65%)**	**35 (46.7%)**

Chi.- square=1.000df=2

Asymp.sig. 0.607 p≤0.005

4 Conclusions

We concluded from this research that there is no way to spread awareness and train health personnel about the seriousness of the disease and the methods of its spread, especially for diploma and institute holders; most of their answers are wrong; they show little knowledge of the mechanism and means of transmission of the disease; they follow incorrect methods of taking samples, especially ways to draw blood and transfer the sample incorrectly; they use the traditional methods of the laboratory without wearing gloves, and this leads to disease transmission.

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EVALUATION THE ANTIOXIDANT ACTIVITY OF ALEO VERA LEAVES EXTRACTS

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EVALUATION THE ANTIOXIDANT ACTIVITY OF ALEO VERA LEAVES EXTRACTS

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Abstract:

Certain chemical compounds, such as biologically active molecules, can be produced and found in high concentrations in plants. Aloe vera plant consists mainly of more than 90% water and many chemical compounds, such as polysaccharides, due to its ability to adapt to desert conditions and environments. More than 200 nutritional substances were found to be exist in aloe vera, including vitamins, enzymes, minerals, polysaccharides, lignin, antioxidants and amino acids. flavonoids and phenols, among the important compounds, play an important and vital role as antioxidants by their function as free radicals' scavengers. The current research is aiming to investigate the value of total polyphenols , flavonoids and antioxidant activities of magnetized water, non-magnetized water and alcoholic extracts of fresh Aloe Vera leaves .The study showed that the extracts of ethanol and magnetized water are much better than non-magnetized water.

Key words: Aloe Vera Leaves, Antioxidant, Magnetic Water.

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Introduction:

Medicinal plants are considered to be unconventional crops, used by man throughout the ages for various purposes, especially as a medicine, and in the middle and modern ages it was clear how important the medicinal plants are in the treatment of many diseases that affect humans. Therefore, the reason for the acceleration and increase in the frequency of use and application of pharmaceutical drugs as complementary or alternative medicines to treat or alleviate many diseases is attributed to the fact that plant medicine is considered safer and less causative of side effects than synthetic drugs (1). Aloe vera is a perennial herbaceous plant, which is from the family *Asphodelaceae* and belongs to the genus *Aloe* and is characterized by its thick green leaves, and contains a sticky white sap. Aloe vera plant contains many antioxidant and anti-microbial compounds such as viruses, bacteria, fungi, it is used in inhibiting microbes and acts as a very effective antioxidant antitumor, anti-diabetic and inhibition of proliferation (2). For the purpose of adapting to difficult desert environmental conditions, aloe vera plant stores water and various chemical compounds inside its swollen leaves, which make them an excellent source of phytochemicals (3). Compounds such as polyphenols, anthranoids, pyrons derivatives, saponins, steroids, fibers, salicylic acid, minerals (Ca, Cr, Fe, Mn, K, P, Na, and Z), as well as vitamins (C, E, β-carotene, B1, B2, B3, B6, B12, folic acid) can be found in aloe vera leaves (4). The most important of which are flavonoids, which play a major role in antioxidants activity and can act aginst allergies, inflammations, free radicals, platelet aggregation, microbes, ulcers, hepatoxins, microbes and tumors. Likewise, the primary role that phenols play is being antioxidants, which is attributed to the presence of redox properties that provide them with the proficiency to act as reducing compounds, hydrogen donors, monocular oxygen quenchers, and metal chelators (5). Magnetic water (MW) technology is a modern technology in which magnetization apparatuses are used, these devices create a very intense concentration of the magnetic field through the wall of the pipes to reach the water and contribute to its treatment. This strong and very intense magnetic field contribute to alter the properties of water as it affects the hydrogen bonds in the water which are greatly affected by the magnetic field, hence, leads to a change in the physical or chemical properties of water (6) and (7).

The aim of the present study is to compare the properties of magnetized aqueous extract with the non-magnetized and alcoholic aqueous extract of fresh aloe vera leaves in

terms of the total content of phenols and flavonoids in addition to assess the antioxidant activity of the extracts.

Materials and Methods

Aloe vera Leaves were purchased from local markets; thirty gram of material was used for preparing the extract by 250 ml ethanol or distilled water at boiling point, under reflex for one hr. extracts were filtered and evaporated at 50Cº until complete dryness.

Preparation of magnetized water:

Magnetized water was prepared by passing tap water through tubes under a magnetic field with a strength of about 600 Gauss, which was approved and did not cause pathologic injuries. (8)

Extracts Analysis

Total Phenolic Content (TPC) Assay:

Total phenolic content in the extracts of Aloe vera leaves were determined according to (9). 100 ml of extract was dissolved in 6 ml of distilled water and 500 ml of Folin-Ciocalteau reagent followed by mixing for 5 mins. In a 10 ml flask, 2 mL of 7.5% Na_2CO_3 was added; and distilled water was then added up to the mark. The solution was mixed and incubated at a room temperature for 25 mins. Shimadzu 1650 UV-vis spectrophotometer was used for measuring the absorbance at 760 nm wavelength. TPC was expressed as gallic acid equivalents (GAE) in 0.01 to 1 mg/ml of extract.

Total Flavonoid Content (TFC) Assay:

Five grams of dried aloe vera leaves and (100 ml) of methanol and 5 grams of calcium carbonate were used for the preparation of alcoholic extract by boiling for 1 hour (10). Whatman filter paper was used for filtration, then, methanol was vaporized under lowered pressure to obtain the aqueous extracts. Afterwards, (50 ml) of boiling water was used to retrieve the dry extract. Filtration and fractioning of the aqueous extracts were executed according to solvent – solvent extraction method. Diethyl ether and ethyl acetate were

firstly used followed by n-butanol, through a Pyrex separating funnel. In addition, all portions were dehydrated and concentrated to a constant weight using a vacuum oven at 45 °C and followed by storing at 4 °C.

Antioxidant Activity

Reducing Power Assay:

Antioxidant capacity of Aloe vera leaves was determined according to chou (11) method. (2.5 ml) of 1% potassium ferricyanide and (2.5 ml) of 0.2M (PH.6.6) sodium phosphate buffer were mixed with 1ml of (0.5-10 mg/ml) extract, followed by incubation at 50°C for 20min. Afterwards, (2.5 ml) of 1% trichloroacetic acid (TCA) was added to the mixture and the final mixture was then centrifuged for 10 mins at 3000 rpm to terminate the reaction. After that, (0.5 ml) of the supernatant was mixed with (1 ml) of 1% ferric chloride and stored for 10 min. Shimadzu 1650 UV-vis spectrophotometer was used to measure the absorbance at 700 nm wavelength. The reference material used was butylated hydroxytoluene (BHT).

Chelating Ability Assay:

For the determination of chelating ability, the method described by (12) was used with some modification. (0.2 ml) of 2 Mm ferric chloride and (0.2 ml) of 5 Mm 8-hydroxyquinoline were mixed with (1 ml) of extract (0.5-10 mg/ml). The absorbance was then determined at (562nm) after 10 min at room temperature. Reference material used was EDTA-$Na_{2.}$

Result and Discussion:

Aloe vera is a member of genus of plants with high medical significance due to their high content of chemical compounds, such as phenolic compounds and flavonoids (13). The most important of which are phenols that have been known to act as antioxidant which have a major role in free radical scavenging, where its reducing role is commonly linked to the occurrence of reduction agents (14). The molecular structure of phenols comprises an aromatic ring, with hydroxyl group/s. phenolic compounds are considered as effective hydrogen donors due to the scavenging ability of their hydroxyl groups, therefore, several data were reported regarding the substantial obvious association between total phenols and

antioxidant activity in many plant species (15). Table (1) summarizes the qualitative investigation of the Aloe vera leaf extract.

Table (1): Total phenolic and flavonoids compounds present in Aloe vera leaves extracts.

Extraction	Phenolic content %	Flavonoids content %
Aqueous(non-magnitude)	1.7	2
Aqueous(magnitude)	1.9	2.9
Ethanolic	2.7	4.1

Fig. (1) represents a comparison between magnetized and non-magnetized aqueous extracts of Aloe vera leaf in term of total flavonoids and phenols yield. The figure clearly shows an increase in total flavonoids and phenols yield in magnetized aqueous extract over non-magnetized aqueous extract. On the other hand, the total flavonoids and phenols in ethanolic extract were higher than corresponding magnetized and non-magnetized extracts. The variations between three extraction procedures may be due to the solvent utilized in the extraction and the yielding compounds during and after the reducing reaction (14).

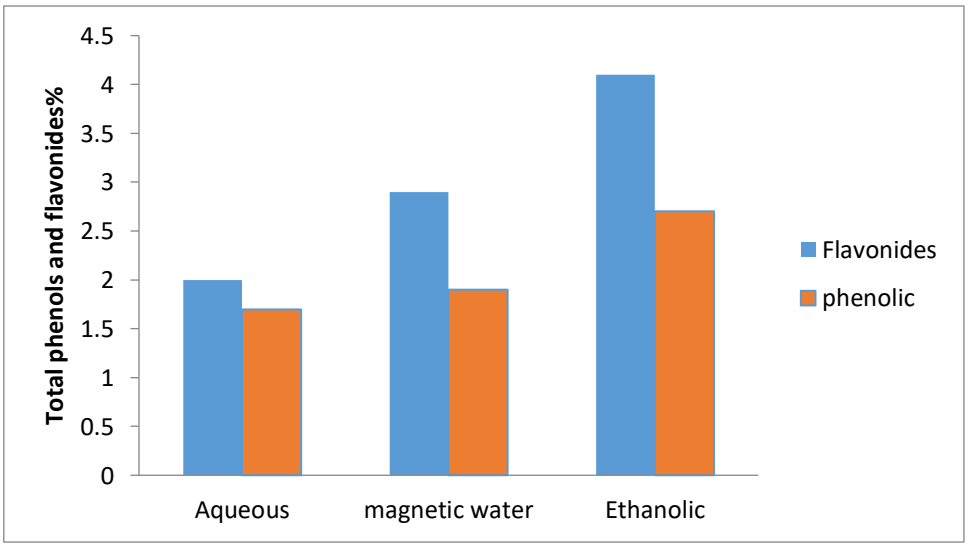

Fig. (1): total phenols and flavonoids content compression between extracts of Aloe vera leaves.

The antioxidant properties of medical plants can be affected by the magnetic field as a result of two factors, the first being the direct effect of magnets on chemical components and the second is the indirect effect of magnets on the electrical properties of water as water is the main element in plants (16). Furthermore, various mechanisms, for instance prevention of chain initiation, peroxides breaking down, inhibition of continuous hydrogen removal, binding of transition-metal ion catalysts, free radical scavenging, and reducing power, could have an impact on the antioxidant activity (17).

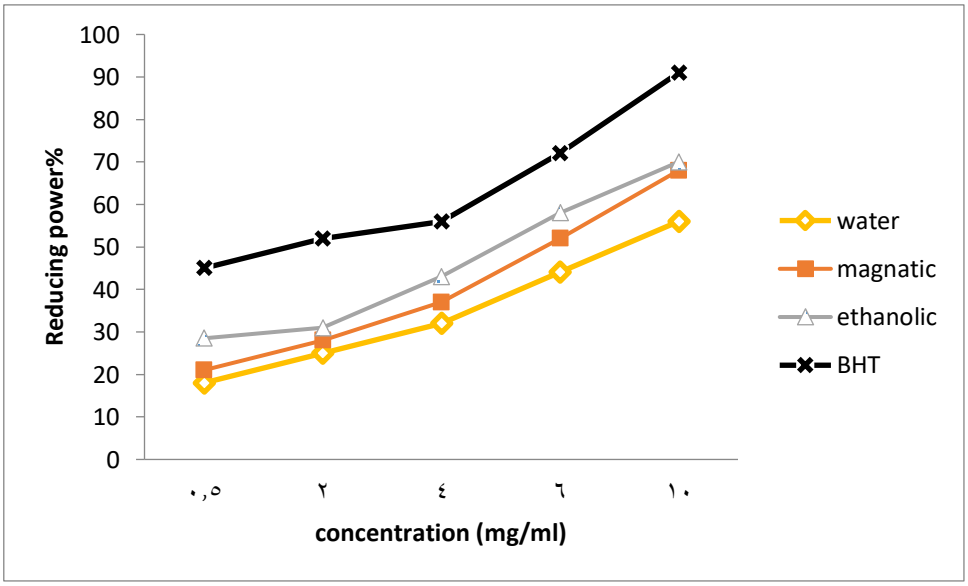

Fig. (2): Reducing ability of aqueous and ethanolic of Aloe vera leaves extracts.

Reducing ability can be attributed to the presence of electron donor compounds that can behave as primary antioxidants to prevent the formation of oxidants; and secondary antioxidants which act as ROS scavengers (18). Fig.(2) displays the reducing ability of aqueous (magnetized and non-magnetized) and alcoholic extracts of Aloe vera leaves (compared to BHT). From the previous results, it can be concluded that the increasing in concentration of samples led to the increase in reducing ability. Here, higher reducing capacity was shown from the ethanolic extract compared to aqueous extract, which can be credited to the existence of higher amounts of phenols and flavonoids. These results are consistent with those of the study by (19) which showed that the reduction power is directly proportional to the increase in total phenolic concentration in plant extract. On the other hand, the magnetized water extract exhibited more reducing power compared to non-magnetized extract and this outcome can be attributed to the produced oxygen anion

molecule (OH- + OH- → H2 O + O-), which have an important role in free radical scavenging and in turn will lead to the obstruction of the cycle of the free radicals. Hence, this could be sensible explanation for the observed changes in the reducing ability in the current study (16).

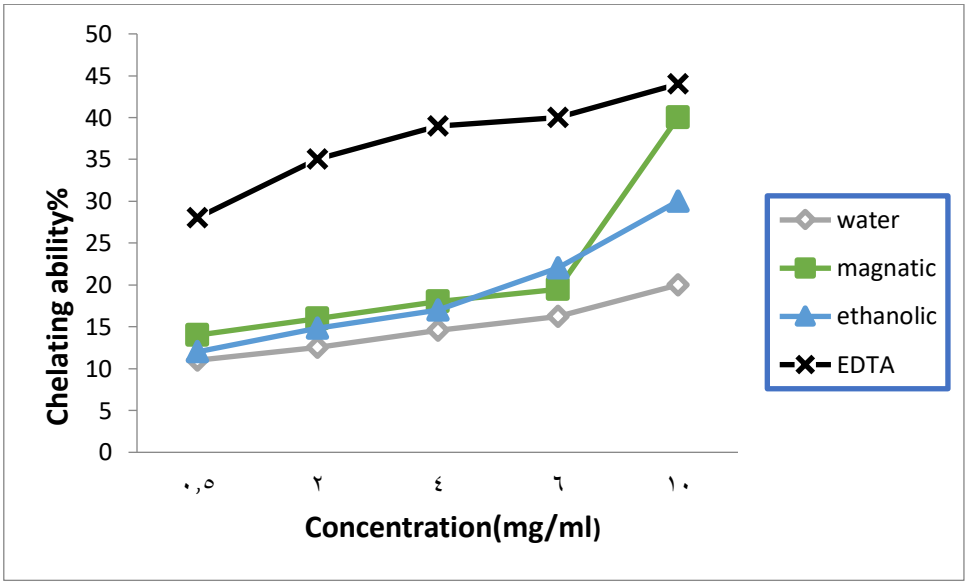

Fig. (3): Aloe vera leaves aqueous and alcoholic extracts chelating ability of compared to EDTA at the same concentration.

The catalytic transition metal is less concentrated due to metal chelating activity, especially in lipid peroxidation through the Fenton reaction (20). As shown in Fig. (3), all extracts exhibited 50% lower metal chelating activities. Likewise, Aloe vera leaves extracts chelating capacity of aqueous and alcoholic extract is less than its reducing capacity (comparing with EDTA as a reference). Several previous studies suggested that metal chelating ability plays a subordinate role in the total antioxidant activities of some polyphenols (21), (22). These studies stated that chelating ability of phenolic compounds was much lower compared to that of EDTA.

Conclusion:

This study evaluated the total phenolic and flavonoids contents, and confirmed the antioxidant activities in ethanolic, magnetic and non-magnetized water extracts of Aloe vera leaves. Results showed the presence of antioxidant potential in the leaves of the aloe vera plant and the magnetic polar extract of this plant is promising natural resource for the search for new compounds that are useful in the prevention and/or management of diseases linked to or caused by oxidative stress.

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DETECTION OF IL19 AND IL22 IN PATIENTS WITH VITILIGO

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DETECTION OF IL19 AND IL22 IN PATIENTS WITH VITILIGO

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Abstract:

Purpose: This study aims to measure the levels of both interleukin 22 and interleukin 19 in vitiligo patients and to know the age group most susceptible to infection.

Method: The stream analysis study the assortment of 50 samples from vitiligo patients who attended Al-Hilla Teaching Hospital and Marjan Hospital for both sexes. They were 30 men and 20 samples from women, ages 10-70 years.

Results: The results found the number of male were highest than female reach 60%.The concentration of interleukin 19 increased with the increase in the age group (61-70) years compared to control. With an increase in the age group, interleukin 22 concentration increased. With an increase in the age group, interleukin 22 concentration increased (61-70) compared to control.

Conclusion: Levels of cytokines IL22 and IL19 were increased significantly with the increased age group.

Key words: IL19, IL22, vitiligo.

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Introduction:

Vitiligo is a disease that causes spots to appear in which the skin loses its color. It is described by the eclectic lack of melanocytes, which go around guide to dye reduction in the influenced regions of the skin (1) .The specific lesion is a macular white, entirely non-calcified, and has clear margins. Our understanding of the pathophysiology of vitiligo has lately made significant strides, and it is now obvious that it is a category of autoimmune illnesses linked to hereditary and environmental factors, metabolic and oxidative stress, and cell detachment. Between 0.5 and 2 % of people worldwide suffer with vitiligo (2).Which include where is types. Modern insights on the causes of vitiligo are evident. Numerous hypotheses exist now regarding segmental vitiligo. There have been questions raised about whether or whether some mechanisms, such as neurological mechanisms, somatic mosaics, and skins micro vascular direction, result in the autoimmune death of melanocytes (3) Interleukin (IL)-19 is a cytokine that appears to belong to the IL-10 family. Interleukin19 is stimulated by epithelial cells with activation of inflammation. A feature of interleukin-19 is ability to increase itself, only those who undergo an inflammatory process will constantly release the cytokine. (4). Central association of a polymorphism of genes from the interleukin-19 clusters and their vitiligo sense, signaling for a portion of IL19 and the IL20RB sensor gene in pathogenesis (5) The IL-10 family, to which IL-22 belongs, is important in a variety of inflammatory and infectious illnesses. Th22 cells are the primary source of IL-22 in many disorders .The induction of IL-22 is widely established to treat a number of chronic inflammatory diseases, including skin disorders (6).

Materials and methods

This study included the collection of 50 samples from vitiligo patients who attended Al-Hilla Teaching Hospital and Marjan Hospital for both sexes. They were 30 men and 20 samples from women, ages 10-70 years. Blood was drawn from these people through a wine syringe and placed in a coagulant gel tube and then a centrifuge. The serum was extracted to measure the concentrations of both IL-19 and IL22 using an ELISA device

Statistical Analysis

In this study analysis results are statistically calculated according to Factorial experimental with completely randomized design by LS.D,. *P* value of <0.05 (7).

Results

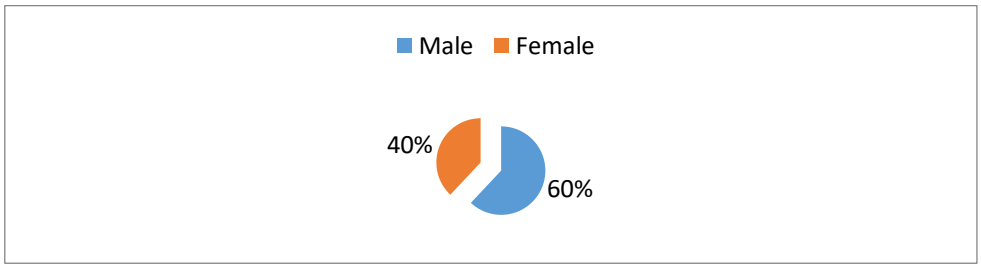

Figure (1): show male and female percentage in patients with vitiligo.

Table 1: effect of vitiligo on IL19 in different age periods.

Age group	patients	control
10-20	42.00±21.00	10.36±9.01684
21-30	89.36±5.63	72.04±3.330
31-40	173.00±13.52	127.00±27.055
41-50	456.66±49.32	295.66±5.131
51-60	279.00±6.00	254.00±6.557
61-70	234.66±5.50	204.00±16.37

LSD=5

Table2: effect of vitiligo on IL22 in different age periods

Age group	patients	control
10-20	39.66± 6.50	6.66± 4.163
21-30	62.33± 7.02	27.3333± 4.725
31-40	356.66± 37.85	89.66± 9.50
41-50	442.33± 39.06	154.00± 4.582
51-60	420.00± 20.00	320.66± 10.06
61-70	637.33± 54.60	478.33± 11.59

LSD=6.4

Discussion:

These results of the study showed that the number of male was raiser than females, reaching 62%, compared to males, reaching 44%.This results identical to the research (6) and (8).yet This study does not agree with the researches (9) who found that males and females were evenly influenced. According to other surveys, there are more women than men in this population. (10). However, their studies are on a hospitalized people, who typically deviates from population-based studies. Women may work particularly hard to discover a treatment since they are frequently more concerned about changes in the hue of their skin. This could be the cause of the high proportion of female patients in their research is higher than average (11).In this research, the concentration increased in different age groups compared to healthy people, and the highest concentration reached in the age group(61-70) years compared to control. This study suit with the studies (12) we see IL19 concentration increased with age .IL-19 rise the production of Th2 cytokines in T-lymphocytes and induces expression of IL-10 in monocytes (13) noticed that the prevalence of vitiligo increased with age, progressively increasing from 0.10 percent in the 0–9 age group to 1.74 percent in the 70+ age group (14).This study is in convention with the studies (15) where they found an increase in vitiligo in all age groups, and the highest age group was greater than 50 years old compared to younger than 50 years old. Due to the fact that vitiligo is typically a chronic condition and is life-long in severe patients, the cause of the disease's growth with age may be related to accumulated impact (12).IL22 was measured in patients with vitilgo we found rises level of interleukin 22 in all class group compared with control the highest concentration in class age (61-70) years.This study agreed with study (15, 16) they noticed rise interleukin-22 concentration in the patients of the vitiligo contrast with normal skin . Immune cells such CD4+ T cells, -T cells, NK cells, NKT cells, and lymphoid tissue inducers all produce IL-22. The gastrointestinal system, lung, kidney, and skin all have high levels of the interleukin 22 complex receptors (17). Who initially believed interleukin 22 to be a cytokine linked with Th1 cells, but with the discovery of Th17 cells, it was discovered that this distinct subgroup expresses it the highest levels. (18).

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ADSORPTION OF Pb+2 FROM WASTEWATERE BY(ZnO)AND((TiO2)NANOPARTICLES: (PROCESS STUDY, EADSORPTIONE BEHAVIOR, AND THERMODYNAMICS

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Nooralhuda Aladdin JASIM

ADSORPTION OF Pb^{+2} FROM WASTEWATERE BY(ZnO)AND (TiO2)NANOPARTICLES: (PROCESS STUDY, EADSORPTIONE BEHAVIOR, AND THERMODYNAMICS)

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Nooralhuda Aladdin JASIM [2]

Abstract:

This study contrasts titanium dioxide with zinc oxide for the adsorption of lead from water (TiO2). ZnO and TiO2 both have zero charge points at 7.28 and 7.09, respectively. Using batch experiments, it was determined what impact the variables “pH, adsorbent dose, contact time, initial concentration ns, and temperature had. These parameters—6, 8, 2 g/L, 120 min, 100 ppm, and 41 °C—were ideal”. The best effects came from these. The best removal efficiencies were achieved by ZnO and TiO2, with values of 98.43%, 96.45%, and 85.50%, respectively. Adsorption kinetics, processes, and isotherms were all the subject of isothermal investigations that were also carried out. With an R2 correlation coefficient of 0.96 for all adsorbents, it was strongminded that the “pseudo-second-order model best represented the Pb(II) uptake for the Pb(II) adsorption kinetics”. When the Lead(ii) adsorption data were evaluated to very good models, the "Langmuir model (R2 0.96)", which had optimum adsorption ability of 55.07 mg/g for TiO2 and 58.9 mg/g for ZnO, respectively, provided the best explanation for the absorbing of “Pb(II)” by such materials. The “isotherm” analysis identifies the film systems as the adsorption phase of the process that is constrained. Since all of the adsorbents had high enthalpy (H° 30) values, the heat of Pb(II) adsorption experiment demonstrated that the adsorption is endothermic. The “surface structure” and chemical composition of the adsorbents were investigated using "SEM (scanning electron microscopy) and EDX (energy-dispersive X-ray spectroscopy)".

Key words: ZnO, TiO2, Eadsorptione Behavior, Ande Thermodynamics.

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Introduction:

There are some pollutants that cannot be biodegraded is one of the largest environmental issues. Even at very low concentrations, some harmful heavy metals, particularly lead, can poison and severely harm humans and other species [1, 2]. The development of several polluting businesses, such as coke plants, tanneries, battery factories, fertilizer, and pesticide manufacture, only exacerbates this issue in emerging nations [3]. Adsorbents include substances like carbon-based adsorbents, among others [4]. Because biological systems cannot break down heavy metals, one of their significant environmental issues is the contamination of aquatic habitats. Even at very low levels, a number of toxic heavy metals, particularly lead, can cause harm to people and other species [1, 2]. This issue is made worse in emerging nations because a number of polluting industries are expanding, such as coke factories, tanneries, battery manufacturing, fertilizer manufacturing, and pesticide manufacturing [3]. It can be included that using different adsorbents as a type of treatment for removing heavy metals. These adsorbents come in a variety of forms, such as carbon-based, biobased, and others [4]. In order to remove lead, various adsorbents were used, including residual pea peel [14], reduced graphene [8, modified alginate aerogel with melamine/chitosan [11], and activated carbon [13]. Because of its availability, usage, nontoxicity, resistance to caustic chemicals, and potent affinity for metal ions employed in wastewater treatment, substances like zinc oxide (ZnO) and titanium dioxide (TiO2) have demonstrated their efficacy at removing a variety of components from wastewater [15]. Utilizing ZnO and TiO2 nanoparticles, heavy metals can truly be eliminated [16, 17, 18]. Despite the aforementioned investigations, relatively little study has focused on the lead removal from zinc oxide, its capacity to adsorb lead under identical circumstances. Despite the above findings, very little research has looked at the lead removal from zinc oxide, its capacity to adsorb lead under identical conditions, and the thermodynamics of these metallic nanoparticles in this particular scenario (TiO2). This paper aims at reviewing and assessing the utilization of several metallic nanoparticles for lead diffusion water lead removal. Adsorbent dosages and pH effects Regarding the elimination of lead, contact time, initial amounts, and temperatures were considered. “Pseudo-first order (PFO), pseudo-second order (PSO)”, and the “intraparticle diffusion model” were used to analyze the experimental data (PSO). The behavior of adsorption efficiency on metal oxides was further

defined by analyzing the equilibrium results using a variety of isotherm models, including Langmuir and Freundlich.

2. "Material and Experimental Work"

2.1 "Materials"

"A list of the substances used in the experiments is provided in Table 1":

Table (1) substances

Compound	Formula	Vender
Zinc oxide	ZnO(NPs)	Loba Chemie Pvt. Ltd , India 99% pure
Titanium dioxide	TiO_2 (NPs)	Anatas, Changsha santech comp. 99.8% Size 30 ±5 nm
Lead nitrate	$Pb(NO_3)_2$	Thomas baker chemicals India
Sodium hydroxide	NaOH	CDH Ltd India 98%
hydrochloric acid	HCL	Radel-dehean 99%
Sulfuric acid	H_2SO_4	Radel-dehean 99%

2.2. experimental approach

Using 1.6 g of lead nitrate and 1 liter of filtered water, a synthetic Pb (II) solution was made. The concentration of lead in this solution was 1000 ppm. After the Pb(II) solution had been hydrolyzed, 10% (v/v) hydrochloric (HCl) was added, and the mixture was then applied for 24 hours to prevent Pb(II) from precipitating. This solution was diluted to produce additional to offer liquid between "50 and 150 mg/L" of Pb (II). The addition of HCl or sodium chloride (nacl (NaOH)) solutions altered the pH of any experimental solutions. Additionally employed as adsorbents were zinc oxide and 99% pure titanium dioxide. Scanning electron microscopes were used to analyze the materials' surfaces using X-ray energy-dispersive spectroscopy (EDX). The pH drift values in the cost-free areas for each individual adsorption in the two ZnO and TiO2 were discovered to be, respectively, 7.1 and 6.9 [23, 24]. The optimal value for each batch of the adsorption tests is established for a particular parameter that has an impact on the adsorption mechanism within the range under investigation. All of the initial Pb(II), pH, heat, substrate, and contact time of the solution parameters were examined. Using 0.1M of nitric acid (H2 SO4) and NaOH, the "pH"

of the liquid was changed from 3 to 9, allowing the effects of pH to be studied. Adsorbent under test received a dosage of 0.01 to 0.05 g. consequences of contact hours was studied, the time available was increased from 5 to 120 minutes. Investigated were starting concentrations between 50 and 150 ppm and the impact of temperatures between eighteen to forty-one degrees. The liquid flasks were shaken for each batch to ensure the eventual success of the solution (maximum adsorption capacity). Atomic absorption spectroscopy was used to analyze the solution after centrifuging it and filtering it using filter paper in order to estimate the final lead concentration in the waste water samples (AAS). "Equations (1) and (2) can be used to calculate the adsorption capacity and absorption rate, respectively". [26]:

$$\text{Adsorption percentage}\% = \frac{C_\circ - C_e}{C_\circ} * 100 \qquad (1)$$

$$qe = \frac{C_\circ - C_t}{m} * V \qquad (2)$$

"Where qe is the equilibrium mass of metal ions adsorbed per unit weight of the adsorbent (mg adsorbate/g adsorbent), m is the mass of the adsorbent, Ce is the optimal concentration of the metal ion (mg/L), V is the volume of the metal ion solution (mL), and Ce is the equilibrium mass of metal ions (mg/L) (mg)".

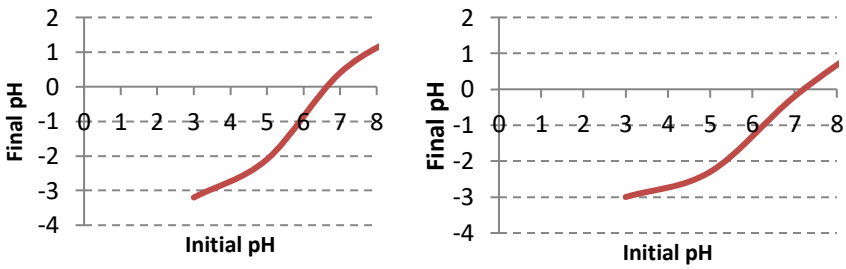

Figure 1: pH drift method for all adsorbents.

3. "Results and Discussion"

3.1 "Effect of pH"

With merely 0.02 g of starting reaction mass and 25 mL of contaminated solution, the effects of the solution's initial acidity on the elimination of Pb were examined. 3, 5, 7, and 9 were the pH numbers (II). Pb(II) was found at a starting temperature of 29 °C and a quantity of 100 ppm. The mixture was constantly shaken at 150 rpm for 120 minutes. The equation was used to calculate the adsorption % using the data on the final Pb(II) concentration (1). Figure 1 displays the best removal efficiencies, which were 94.66% for ZnO and 87.97% for TiO2, respectively. The initial concentration of the medium changed from pH 3.0 to pH 7.0, increasing the sorption capacity for the utilized adsorbents. force magnetic (ion exchange) The likelihood that the metal ions would scatter away from the adsorbent surfaces increased with the negative charge of the metal ions. The increase in adsorption% shown in Figure 3 and the succeeding processes are caused by interactions between Pb(II), Pb(OH)+, and Pb(OH)2 and the functional groups located on the surface of the sorbent materials [27]. Ion exchange procedure.

$$2(-ROH) + Pb^{+2} \rightarrow 2(RO)Pb + H^{+} \quad \rightarrow (3)$$
$$-ROH + Pb(OH)^{+} \rightarrow (-RO)Pb(OH) + H^{+}$$

"Hydrogen bonding"

$$2(-ROH) + Pb(OH)_2 \rightarrow (-ROH)_2 + Pb(OH)_2 \rightarrow (4)$$

The appearance of accessible hydroxyl molecules caused the sorption process in ZnO and TiO2 to decrease at higher pH values (7.0–9.0). according to Figure 2. As the pH of the solution increases, more Pb(II) metal ions may be absorbed as the adsorbent surface loses its positive "electrostatic charge". It is established that the subsequent batches should have a pH of 7.0. At pH levels outside of this ideal range, lead compounds hydrolyze, which promotes precipitation and inhibits quantitative adsorption. Below this ideal range, interactions between Pb(II) ions and H3O+ reduce the efficiency of adsorption.

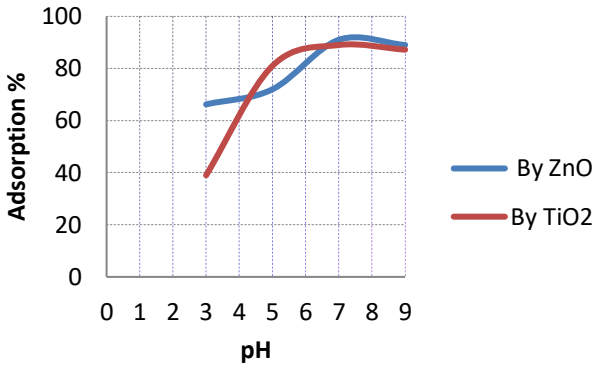

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Figure 2: "the impact of pH on Pb (II) removal effectiveness by ZnO and TiO_2".

3. 2 "Effect of Adsorbent Dosage"

In a 25 mL solution, the effects of various adsorbent dosages of 0.01, 0.02, 0.03, 0.04, and 0.05 g at the perfect starting pH were investigated. 120 minutes were spent shaking and swinging the material at 150 rpm. The starting solution included Pb(II) at an amount of 100 ppm at a temperature of 29 °C. The equation was applied in order to determine the adsorption % from the final Pb(II) concentration, which was measured (1). With model can effectives of 95.27 percent, 90.46 percent, and 70.8 percent at a concentration of 0.05 g, ZnO and TiO2 had the best removal efficiency. As the doses of all the employed adsorbents increase from 0.01 to 0.05 g in the solution, the sorption percentage rises. These findings indicate a pattern of growth.

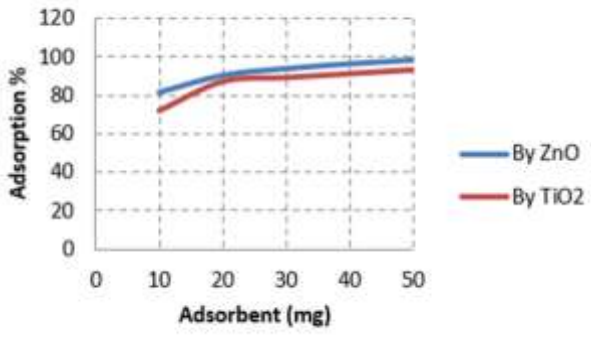


Figure 3: "the impact of adsorbent quantity on the effectiveness of Pb (II) removal by ZnO and TiO_2".

3.3 "Effect of Initial Concentration of Pb(II)"

In earlier batches, 25 mL of contaminated mixture at 29 °C ambient temperature was used to study the consequences of various initial Pb(II) levels, including 50, 75, 100, 125, and 150 ppm, at the ideal pH level and the correct adsorbent dose. The mixture was swirled for 120 minutes at a steady 150 rpm. The final Pb(II) visualize the data and the adsorption percentage were computed using the equation (1). Figure 4 demonstrates that ZnO and TiO2 exhibited maximum removal efficiency of 96.17% and 91.75, respectively, at an initial concentration of 100 ppm. The findings show that as the initial Pb(II) level climbs above a given threshold, a higher percentage of the originating Pb(II) is destroyed by adsorption. The rise in Pb initial content was accompanied by an increase in the adsorption percentage. jump from 93.55 to (II) From 1 to 100 ppm, the percentages of ZnO and TiO2 increase by 85.88, to 91.75% and 96.17%, respectively. As soon as the initial Pb(II) concentration exceeds 150 ppm, the proportion of Pb(II) removal starts to decline. As a result, when using the same amount of adsorbent, the proportion of Pb(II) removal via adsorption decreases when the initial Pb(II) concentration is high. This is because there are more exposed nanoparticles on the surface of the adsorbent than there are active binding sites.

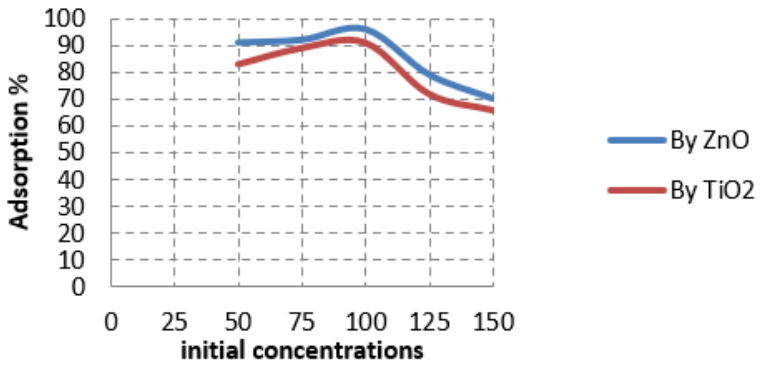


Figure 4: "the impact of initiating Pb(II) concentrations on the effectiveness of removal by ZnO and TiO_2".

3.4 Effect of Temperature

the effects of a variety of temperatures, such as 18, 29, and 41 °C, at a recommended pH of 7.0, a dose of adsorbent materials of 0.05 g, and a preferred starting level of 100 ppm Pb(II) in the tainted liquid of 25 mL. 120 minutes of constant 150 rpm shaking of the mixture. To determine the adsorption percentage, a calculation and readings of the final Pb(II) level were required (1). The highest clearance rates for ZnO and TiO2 are also true. The outcomes are shown in Figure 2 and are 98.43% and 96.45%, respectively, for all adsorbent materials at 41°C (e). According to the results, more Pb(II) is adsorbable released as the temperature rises. It was shown that the adsorption percentage for ZnO increased from 88.55 to 98.43% and that of TiO2 increased from 87.46 to 96.45% as the temperature increased from 18 to 41°C. This suggests that all adsorbents have the ability to engage in endothermic adsorption.

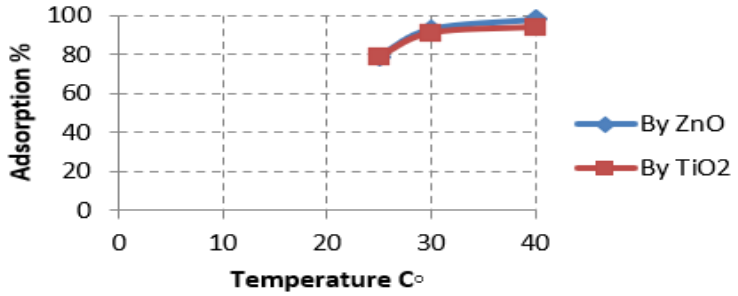


Figure 5: "the effect Temperature on removal efficiency by ZnO and TiO_2"

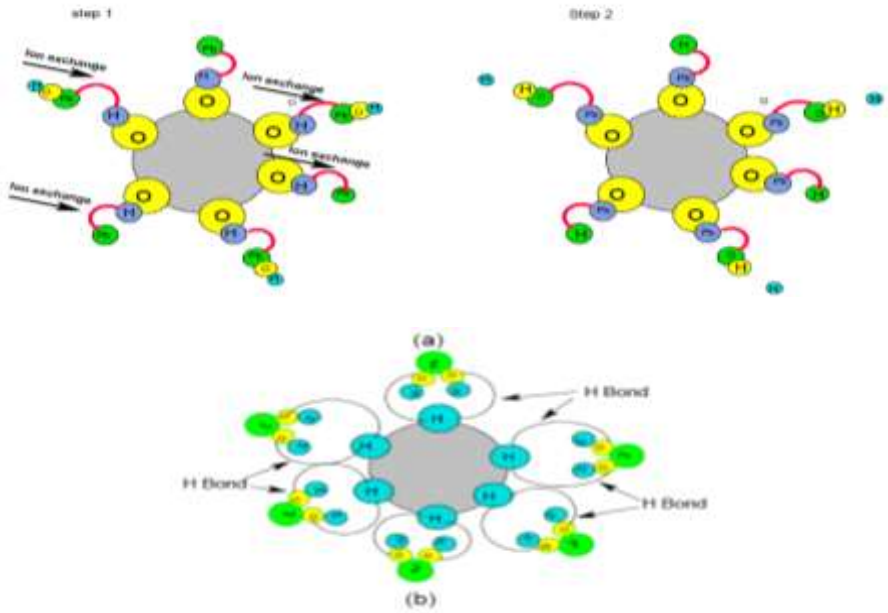


Figure 6: "Pb(II) adsorbs on metal adsorbent surfaces through two different processes: on exchange and hydrogen bonding".

4. "Kinetic Researc"

The amount of Pb(II) ions that are extracted from water can be calculated using adsorption kinetics. Using Pb(II) adsorption data at various contact times, two mathematical models—pseudo-first order (PFO) and pseudo-second order—were used to fit the uptake rate (PSO). Equations (5) and (6), respectively, express the PFO model and the PSO model [28–30].

$$.\log(q_{e-}\, q_t) = \log q_{e-} \frac{k1}{2.303}\, t \qquad (5)$$

$$\frac{t}{q_t} = \frac{1}{k_2} + \frac{1}{q_e}\, t \qquad (6)$$

"In the PSO equation, k2 is the rate constant and qe is the mass of absorbed pollutant per unit weight of adsorbent at stability (mg/g), qt is the amount of adsorption that has been adsorbed at time t (mg/g), t is time (min), and kt is the amount of adsorption that has been adsorbed at time t. It appears that the kinetics of the adsorption process are better captured by the PSO model since its correlation coefficient (R2) with the adsorption findings was higher than that of the PFO model. Additionally, as shown in Figures 7(a)-4, this demonstrated that chemical adsorption was the reaction's predominant component. Table 2 provides an overview of the kinetic properties of various models".

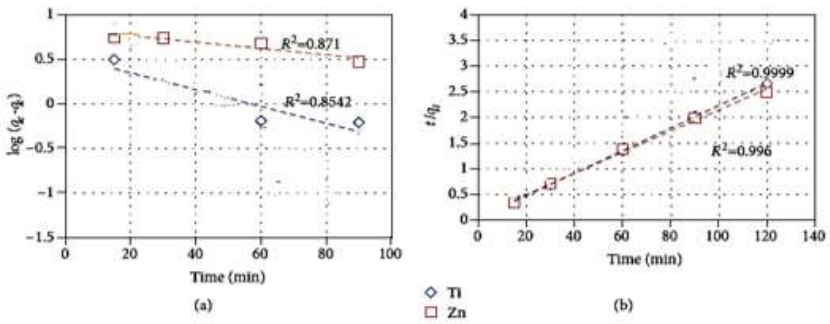


Figure 7: "PFO and PSO are two models for the rates of Pb(II) adsorption on to all the adsorbents".

Table 2: "Kinetic parameters for Pb(II) adsorption onto various adsorbents utilizing PFO, PSO".

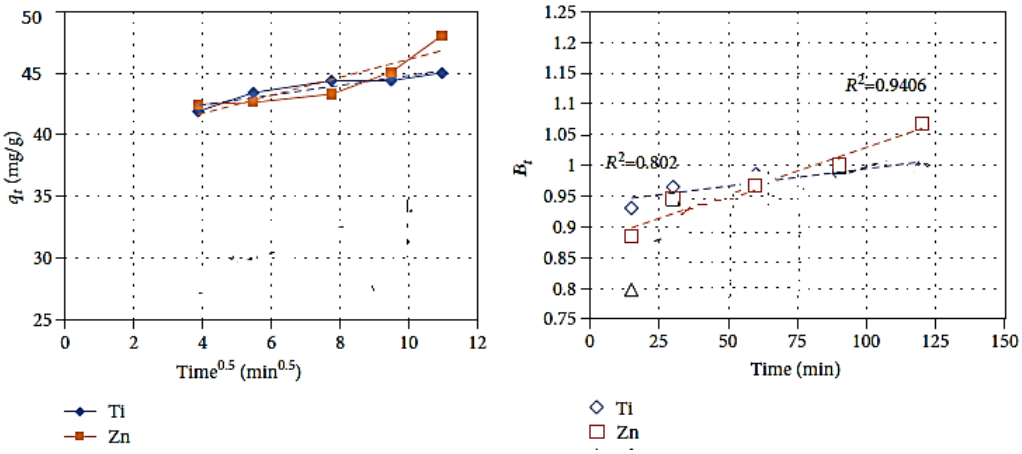
Kinetic models	Kinetic parameters	ZnO	TiO_2
pseudo-first order	$k1(min^{-1})$	$8{:}25 \times 10^{-3}$	$2{:}17 \times 10^{-2}$
	$q_{e,cal}(mg/g)$	6.79	3.4
	R^2	0.871	0.8542
pseudo-second order	$k1(min^{-1})$	$9.3 \times 10{-}4$	$1.8 \times 10{-}3$
	$q_{e,cal}(mg/g)$	48.58	45.37
	R^2	0.9960	0.9999

5. Adsorption Mechanisms

The three variables that regulate an adsorption process are film diffusion, intraparticle diffusion, and surface adsorption. By means of molecular diffusion from the fluid medium, the insoluble precipitate is moved from the inside to the surface of the adsorbent. Through surface adsorption, the adsorbate is delivered to the inner active sites. The adsorption sites are repeatedly contacted by these metal ions. The operation's total adsorption rate advances slowlyest throughout the limitation phase. The adsorption process is proven to be the process' limiting stage using several kinetic models. Included would be the intra-particle diffusion and Boyd models, which are widely used to study the rate-limiting phase. The adsorption process was ascertained using the intra-particle diffusion model. "The intra - particle diffusion model was used to determine the adsorption mechanism. the example given by Equation (8) [32]".

$$q_{t=k_{id}} * t^{0.5} + C \qquad (6)$$

"where qt is the quantity of Pb(II) adsorbed at time t (mg/g), C is a constant that represents the thickness of the boundary layer, and kid is the intra-particle dissemination rate constant (mg/gmin0.5). Figure 8(a) illustrates that the graph of Pb(II) absorption versus t1/2 is not a direct line from the origin, indicating that factors other than intraparticle diffusion drive the adsorption process. The picture is split into two linear parts for each of the two adsorbents to show the multistep character of the adsorption mechanism [32-35]. Film diffusion controls the first linear segment, whereas intraparticle diffusion controls the second".



(a) (b)

Figure 8: "Pb(II) For all adsorbents, effects that result include the Boyd reaction kinetics and the intra - particle diffusion model".

5. "Equilibrium Isotherms"

The position of equilibrium between a solution's concentration in the liquid phase and the solid phase is known as an isotherm. The "Langmuir and Freundlich" formulas are two illustrations of mathematical techniques that can be used to establish a material's maximum adsorption capacity. Utilize adsorption isotherms to evaluate an adsorbent's ability to absorb pollutants. In systems for solid-liquid adsorption, these isotherms are widely employed to describe the system. An equation is used to explain every one of these isotherms in turn (10 and 11). 1/n is the system's adsorption intensity, aL is the Langmuir isotherm, and KF is the "Freundlich adsorption" characteristic (mg/g (mg/L)1/n). The transcription factor affinities L/mg value and the constant KL are connected. Each isotherm based its predictions on a different set of the circumstances under which adsorption occurs. occurs. The Langmuir isotherm assumes that adsorption occurs on a suitable substrate through multilayer adsorption processes, whereas the "pseudo second-order isothermic adsorption" hypothesis assumes that highest restricting adsorptions occur at a pre-defined amount of available places on the adsorbent with the same energy available at all adsorption sites [41, 42]. Figures 6(a)-5 display the pertinent values (R2) that were found for each absorbent. The ZnO and TiO2 adsorption properties were better explained by the Langmuir isotherm. The outcomes of tests investigating the equilibrium of Pb(II) uptake using ZnO and TiO2 are displayed in in Figures 6(a)-5. The ZnO and TiO2 properties and characteristics were better explained by the Langmuir isotherm. Table 3 displays the outcomes of tests to look into the

equilibrium of Pb(II) uptake using ZnO and TiO2. To compare the various adsorbents used in this experiment with those used in other studies, Table 3 was made. The advantages of metal oxides are highlighted by this comparison.

Table 3: "The Pb(II) adsorption on adsorbents' isotherm parameters".

Adsorption isotherms	Isotherm parameters	ZnO	TiO_2
Langmuir	q_{max} mg/g	55.04	58.88
	a_L L/mg	0.429	0.144
	R^2	0.9946	0.9619
Freundlich	K_f mg/g $(mg/L)^{-1/n}$	26.94	17.26
	n	5.40	3.38
	R^2	0.4712	0.5012

Table 3: "comparing the Pb(II) adsorption capacities of different adsorbents".

Material Adsorption	capacity (Q_{max}) mg/g	Reference
PDA@rGO/Fe_3O_4	95.2	[9]
Metal-organic framework MIL-100(Fe)	22.864	[1]
Carbon aerogel	0.75	[43]
Zeolite-CuO NCs	45.0	
Zeolite-Fe_3O_4 NCs	50.0	
Nanocomposite of carbon nanotubes/silica	13.0	
Carbon derived from waste rubber	26.0	
ZnO-talc	48.30	
Manganese oxide-coated CNTs	78.74	
TIV	63.29	[44]
Chitosan/magnetite nanocomposite beads	63.3	
4-Aminoantipyrine immobilized bentonite	55.5	
Chitosan crosslinked with epichlorohydrin	34.1	
Pine cone activated carbon	27.53	
Barley straw	23.20	
ZnO	55.04	[This paper]
TiO_2	58.88	

6 . "Thermodynamics Studies"

It is crucial to look into the kinematics of the adsorption process. By adjusting the equilibrium constants with temperature, "the thermodynamic constants of (1) Gibbs free energy (G°), (2) enthalpy (H°), and (3) entropy (S°)" were investigated to ascertain the underlying energetic changes connected with the adsorption process. Equation (14), in

addition to Equation, are used to apply to derive the distribution coefficient (15). (15). (Kd) [45]:

$$K_d = \frac{q_e}{c_e} \qquad (7)$$

$$\ln k_d = \frac{\Delta S^\circ}{R} - \frac{\Delta H^\circ}{RT} \qquad (8)$$

"Figure 7 demonstrates how to plot ln Kd versus 1/T, compute the resulting slopes, and find the interception of a Van't Hoff chart in order to acquire the values of enthalpy (H°) and entropy (S°). To calculate the Gibbs energy (G°) of adsorption", use the formulas below:

$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$ (9)

Table 4: Thermodynamic conditions for Pb(II) adsorption on all adsorbents.

T(°C)	T(K)	Adsorbent	K_d	ΔG° (kJ/mol)	ΔH° (kJ/mol)	ΔS° (kJ/mol/K)
18	291	ZnO	3.869	-72.509	69.169	249.409
29	302		12.549	-75.252	69.169	249.409
41	314		31.449	-78.242	69.169	249.409
18	291	TiO_2	3.489	-47.764	44.957	164.957
29	302		5.558	-49.571	44.957	164.957
41	314		13.596	-51.543	44.957	164.957

Table 4 provides a list of the thermodynamic properties of the Pb(II) adsorption onto ZnO, TiO2, and Al2O3. The Pb(II) adsorption by ZnO, TiO2, and Al2O3 is thought to be an endothermic reaction based on positive enthalpy estimations. The high enthalpies (H° > 20 kJ/mol) [46] further show that the chemisorption process functions as an ion exchange step in the adsorption process. Entropy levels that are positive indicate an excess of randomness brought on by adsorption at the interface between two phases. The process is spontaneous, and this spontaneity rises with temperature, according to the negative values of the Gibbs energy.

7. "The Morphological and Chemical Composition of the Adsorbents"

The findings of the SEM test showed that the adsorbents' surface shapes changed both before and after the adsorption process (see Figures 9(a)–9). The SEM images revealed that ZnO and TiO2's rigid, uneven surfaces have flexible holes before the adsorption process. The porous pores on the ZnO and TiO2 surfaces were filled after the adsorption process. A change in shape can be seen in the SEM images of ZnO and TiO2 before and after Pb(II) absorption, proving that adsorption took place. Using EDX analysis, it is possible to gauge a

sample's elemental and chemical makeup as well as the quantity of trace elements it contains. The data were supplemented by the EDX analysis's findings.

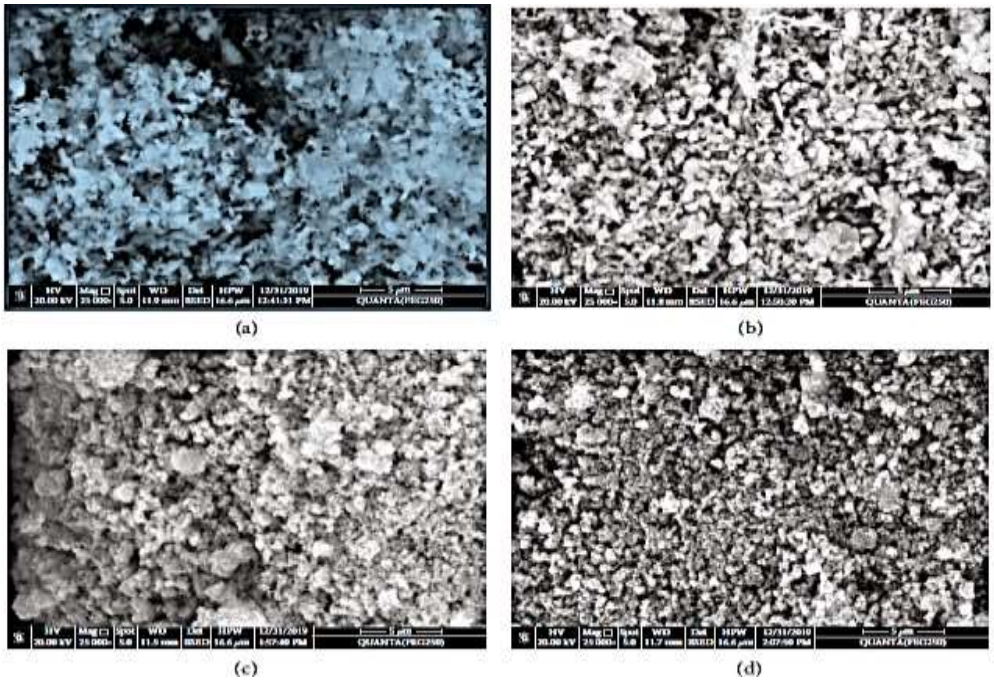


Figure 9: "SEM micrograph: (a) unloaded ZnO at 25000x magnification, (b) loaded ZnO at 25000x magnification, (c) unloaded TiO_2 at 25000x magnification, (d) loaded TiO_2 at 25000x magnification".

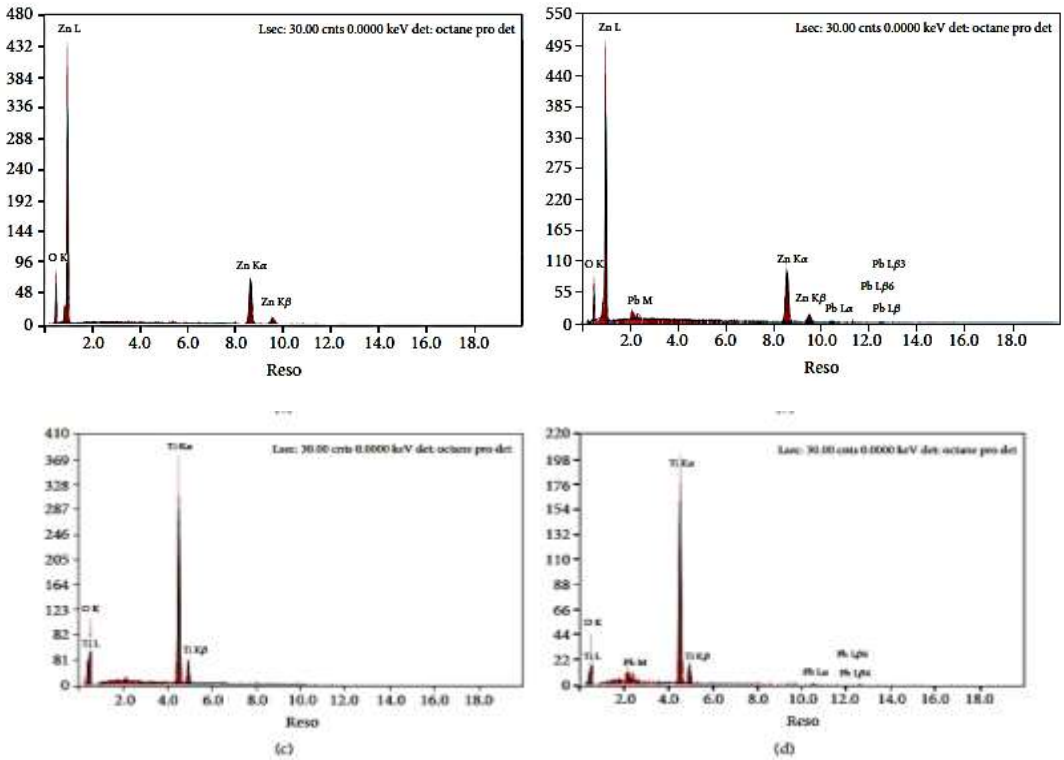


Figure 9: "EDX pattern: (a) unloaded ZnO, (b) loaded ZnO, (c) unloaded TiO_2, (d) loaded TiO_2".

8. Conclusions

According to the results of the SEM test, which was used to look at the morphological of the adsorbents' surface (see Figures 9(a)-9), the morphology of the adsorbents had changed both before and throughout the adsorption process. The SEM photos demonstrate flexible gaps on hard, uneven surfaces in ZnO and TiO2 prior to adsorption. in contrast to The porous spaces between the ZnO and TiO2 surfaces were filled after the adsorption process. ZnO and TiO2 SEM images show a form change both before and after Pb(II) absorption, proving adsorption to have occurred. It is possible to ascertain a sample's chemical and elemental composition, as well as how many trace elements are present, using EDX analysis. The EDX study gave more information. Studies on the thermodynamics of endothermally and spontaneously adsorbing lead on ZnO and TiO2. Then, SEM and EDX methods were used to evaluate the adsorbents' physical and chemical composition. The ZnO and TiO2 surfaces have incredibly porous surfaces, according to the SEM scans. The changed morphologies of the adsorbents led to adsorption. The occurrence of lead signals, the existence of ZnO and TiO2 nanoparticles, and the EDX spectra all provided proof that the surfaces underwent adsorption-induced lead ion production. In conclusion, it can be claimed that TiO2 and ZnO are the favored minerals for removing lead from aqueous systems via adsorption under the ideal conditions used in this work.

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REVIEW OF THE ANATOMICAL STRUCTURES AND ROLES OF THE BIRD'S DIGESTIVE SYSTEM

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Abstract:

The goal this reviews was to determined the influence of the diet on digestive system in the birds and roles of digestive tract. Birds have a very complex digestive system, which is thought to have a significant impact on how well they utilize the nutrition that they consume. It is expected that the stomach, intestines, cecum, proventriculus, and gizzard of herbivorous birds will be larger than those of carnivorous birds, whereas herbivorous birds tend to have longer, more complex digestive tracts. This may be due to herbivorous require high time and energy to the breakdown of cellulose. Their digestive processes were described for birds with different diets.. The proventriculus' size impacted by the diet, not the intestines, gizzard, or cecum. Insectivores had the largest proventriculi, whereas herbivores had the smallest, and omnivores had a proventriculus of a medium size. The function of the avian digestive organs in regulating the gut bacteria, fermenting unabsorbed nutrients, recycling nitrogen from urine, and maintaining gut health. Through aiding food uptake, and interactions with the immune system, gastrointestinal microbiota play a crucial role in maintaining organism health. Only tiny and/or soluble particles, along with digestive juices and urine, will reflux into the caeca due to anatomical and physiological adaptations. Salts and water will be reabsorbed here, and the rich bacteria will ferment uric acid and carbohydrates into ammonia and volatile fatty acids. The caeca may thereby affect the bird's nutritional health. Starch and proteins can be consumed, stored, and partially digested in the early section of the avian digestive system. With the exception of the absence of lacteals, the avian gut has a comparable anatomy to other monogastric animals. The microvilli in the avian intestine are covered by a noticeable glycocalyx. The mammalian liver's actual lobular structure is absent from the avian liver. Around the bile caniculi, hepatocytes are organized

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in plates two layers thick of cells. Acinar cells, that produce digesting enzymes to the pancreatic ducts, endocrine cells, that secrete hormones to the bloodstream, are found in the two main lobes and two smaller lobes of the avian pancreatic structure. The colon structure is similar to that of intestine except the poor enervation.

Key words: Avian; Digestive Organs, Immunity, Fermentation, Review.

Introduction:

Although animal matter is easily digested and assimilated, herbivores and carnivores have different nutritional and digestive problems. The majority of the energy in plant material is found in fibrous components like cellulose, to which all vertebrates lack the enzymes to break it down. As a result, the majority of herbivores have symbiotic bacteria that can ferment fibrous components (Godoy-Vitorino, et al., 2008). The herbivore absorbs the fermentation's byproducts, which considerably help it meet its daily energy needs, size and digesta retention time, both are influenced by the structure and function of gut, play roles in how well bacteria are able to ferment the material food, an expanding storage space on the chicken's neck base where can stay to 12 hours. Food trickle down from the crop to the proventriculus or gizzard, it is physically ground and given a boost of digestion enzymes (Blanco, 2014). the stomach, is a muscle area breaks down grains and fiber to smaller, easier to digest piece use grit (Waite and Taylor, 2015). Comparative studies show that herbivores and carnivores have quite different gut functions and structures. The large intestine in particular is typically longer and more capacious in herbivores than it is in carnivores of comparable size.

Any animal's digestive system play a crucial role in transform the food they eat into the nutrient their bodies require for growth, maintenance, and production (such as the generation of eggs) (Godoy-Vitorino, et al., 2008). Food broken down in animal's body mechanically and chemically. Chewing; mechanical motion in body; since birds lack teeth, the bodies of it use many mechanical processes. The digestive system's has numerous organs release fluids and enzymes as part of chemical action. Nutrients; dispersed throughout an animal's body after being freed from food during digestion (Bergmann, et al., 2015). Food is transferred from esophagus to crop, an expanding storage space at the neck base where it can stay to 12 hours. Food trickles down from the crop into the proventriculus or gizzard, where it is physically ground and given a boost of digestion enzymes (Blanco, 2014). Tiny, hard pebbles and sand particles, a component of the muscular stomach, used by gizzard to break down food into smaller digest pieces (Waite and Taylor, 2015).

Literature review

The mouth, esophagus, crop, proventriculus, gizzard, intestines, and the cloaca are portions of the avian gastrointestinal tract. Most bird species store their food in their

esophagus and crop. The gizzard; muscular stomach breaks down food mechanically, whereas the proventriculus an acidic environment which chemically digests of food. Birds' uniqueness is a direct outcome of their evolutionary background. In early Triassic epoch, or millions of the years after mammal have already separated from reptiles, birds began to split from their reptilian progenitors (Ostrom 1975). These means that compared to mammals, birds have extremely few derived traits in common. Mammals and birds have highly distinct gut morphologies because of their separate evolutionary histories. In contrast to mammals, which have teeth for physically break down of food, swallow food chunks and employ three important digestive organ to do the same. A crop use by many birds, to temporarily store amount of the food before fly to a safer for start digesting it, the proventriculus uses powerful stomach acids to digest the food. Last but not least, huge pieces of food are mechanically ground in the gizzard. (Turk 1982; Hird, *et al*., 2015).

The cloaca is most often sampled part of the gastrointestinal tract in wild avian despite not having a digestive role, exposed to substances and microbial cell in the reproductive, urogenital, and digestive systems (Benskin, *et al*., 2009). The size of proventriculus's and diet are related. Before enters of food the gizzard, broken down in the proventriculus by enzymes. The proventriculus tended to larger in insectivores birds than in other diet type in the birds under investigation. Due to the necessity for more digestive enzymes to digest gritty insects, insectivorous avian have a developed proventriculus. This is consistent with studies showing that whereas coarser food particles lead to a well-developed proventriculus, finer food particles can adversely impair its development. (Waite and Taylor, 2014; Wilkinson, *et al*., 2016).

The size of other digestive organs also the entire digestive system not change with diet, despite an association between diet and proventriculus size. However, some investigations did demonstrate distinct alterations in gut morphology in relation to food. For example, to both specific types (Davidson and Scott 1988); across species, the size of the gizzard grew as the percentage of the seeds and plants in diet increased (Barnes, et al., 1987). Overall, the gizzards and ceca of herbivorous animals were consistently heavier than those of carnivorous or omnivorous species. (Paulus 1982, DeGolier, *et al*., 1999). More studies show which birds have a modest increase in size of gut in autumn and winter seasons. Season, community makeup, and prey availability are a few other factors in

addition to individual and taxonomic variability that might alter digestive morphology (Whyte and Bolen 1985).

Different bird species have different levels of stomach acidity, carrion-eating avians like vultures have extremely acidic stomach (Roggenbuck, et al., 2014). Even poultry research is scarce on the subject of microbial populations and function in proventriculus and gizzard of wild birds. Neotropical birds' gizzard microbiomes were primarily made up of Proteobacteria, Actinobacteria, and Bacteroidete (Garcia-Amado, et al., 2018). By species and food, the bacterial community and alpha diversity varied, and hypothesized microbial activity suggested a role in the gizzard's amino acid and vitamin metabolic pathways. Crop microbiome and chicken gizzard microbiota shared several similarities. In the digestive system of domestic chickens, 43% of the gizzard microbiota was made up of lactobacilli (Garcia-Amado, et al., 2007). Since lactobacilli are acid-tolerant and acid-producing bacteria, they are anticipated in the gizzard.

In the avian gut, the small intestine is divided into three undifferentiated portions and is situated between the gizzard and ceca (duodenum, jejunum and ileum). Similar to the small intestine in mammals, the avian small intestine processes food by secreting enzymes and bile from the liver and pancreas while also absorbing nutrients. Because of its placement in the digestive tract, which prevents non-lethal samples, the small intestine's microbiota investigation is particularly difficult. The tiny amount of information that is currently available in the microbiota of the intestine comes from domestic chickens and shows that Lactobacilli and Clostridia predominate in all parts of small intestine (Amit-Romach, *et al*., 2004). Ceca found in the digestive tracts of the majority of birds. on the junction of small and large intestines, where they link to the gut, are the ceca, long, blind pouches. The ceca's size and width vary widely across and within species, tend to be longer in herbivorous avians, and sometimes exhibit facultative adaptation for changing seasonal diets. (Garcia-Amado, *et al*., 2018).

The mouth is where the chicken's digestive system starts, and it comprises a number of significant organs before ending at the cloaca. Mouth: This is where it all begins. Food transported from the oral cavity to stomach by esophagus. Food momentarily store in the crop, a pouch in the esophagus, before passing on to the stomach. Generally speaking, the stomach is food is dispersed to smaller portions, storage proventriculus and gizzard are two component parts (Bennett, et al., 2013). Grit used by the muscular gizzard to break down

food and fiber into smaller parts to digestion and nutrient absorption is small intestine divided into ileum, jejunum, and duodenum. Liver is the body's largest glandular organ. helps in the metabolism of proteins, lipid, and carbs. Undigested food that is moving through the intestine is broken down thanks to bacterial activities in the ceca. Large intestine's main purposes are for absorb the water, dry indigestible meals, and expel waste. Where digestive, and uroreproductive tracts converge is the cloaca (Zilber-Rosenberg and Rosenberg, 2008). The intestine of the carnivores is short and straight because meaty food can digestion more readily than that the vegetable ones (Khadse and Gadhikar, 2017).

In most avian, the entrance of gastrointestinal tract marked by crop, that serves as a temporary storage area to food that is swallowed. Birds may use food source which is hard to digest, including high cellulose plant material, because food is retained in crops for a long time. (Godoy-Vitorino, *et al*., 2008). Microbial community similar for bovine rumen may be found in the hoatzin's crop, which also contains eukaryotic protozoa, methanogenic archaea, and rumen bacteria (Godoy-Vitorino, et al., 2012). When Waite et al. (2012) took samples of crop from the herbivorous kakapo Strigops habroptila, they found that the bacterial communities were different from those of the hoatzin. Different Proteobacteria subphyla, notably, and -Proteobacteria, predominate in the microbiota of the kakapo and hoatzin crops. The majority of the bacteria in hoatzin, according to a second study, are from the genera Bacteroidia and Clostridia. The only wild bird species for which crop microbiota have been examined are the kakapo and the houtzin, which are both distinct in terms of nutrition and inborn low microbial diversity. (Waite and Taylor, 2014). Firmicutes, Actinobacteria, and Proteobacteria dominated the crop microbiota of captive-bred Japanese quail, which are domesticated birds, microbiomes are dominate by firmicutes (Lactobacillaceae and Micrococcaceae), followed by -Proteobacteria, but male microbiomes were more evenly distributed among Proteobacteria. (Wilkinson, *et al*., 2016).

The muscular gizzard and the glandular proventriculus make up the two components of the avian stomach. Before food particles enter the gizzard, food and enzymes are combined in the proventriculus region of the stomach. The gizzard, where food is mechanically ground up and digested, init muscular walls, and swallowed grit. The proventriculus often has an acidic pH, which probably favors acidophiles in the microbiota. The digestive tract's first significant point of selection for bacteria is probably the acidic proventriculus (Waite and Taylor, 2015).

The birds colon is situated among the point where the ceca are connected to the gastrointestinal system and the cloaca, and the large intestine of birds is short. The major job of the large intestine in birds is to absorb water and electrolytes. The ceca and crop are the primary sites of fermentation in the birds digestive tract (Lei, *et al*., 2012). Although most sequences remained unidentified, the taxa, Bacteroides, Ruminococcus, and Clostridium dominated the colon of domesticated Japanese quail (Wilkinson, et al., 2016). Fecal microorganisms are typically thought for reflect the colon microbiota, the fecal microbiota of quails contained organisms with both colonic and cecal origins, showing that the microbes from various parts of the digestive tract were mixed together. Due to semi-aerobic environment also the flow the waste from numerous organ systems, the cloaca; which serves as the cavity for the digestive, reproductive, and urogenital tract may have a distinct microbiome. Sexually transmitted microorganisms, fecal bacteria, and maybe environmental germs linked to eggshell, material, or environmental elements like water and dirt are all exposed to the cloaca. Proteobacteria, Bacteroidetes, and Actinobacteria dominated the cloacal microbial common in wild birds. In three Procellariiform seabird species, Firmicutes and then Proteobacteria exhibited the highest relative abundance. (Dewar, *et al*., 2014 b). In contrast, insectivorous *Hirundo rustica* has the opposite pattern, with *Proteobacteria* outnumbering Firmicutes in a 2:1 ratio (Dewar, *et al*., 2014 a).

In young avian, bursa of Fabricius, an outgrowth of intestine close to the cloaca, is where pathogen-specific antibody-produce B-lymphocytes originate. Before birds achieve sexual maturity, B-lymphocyte production takes place in the bursa; once they do, it primarily happens in bone marrow (Garcia-Amado, *et al*., 2007), bursa atrophies also ceases to function as an adult. After hatching, bacteria infiltrate the bursa and may contribute to the development of the bird's immune system (Blumstein et al., 2017). Additionally, firmicutes may contribute to the avian T-lymphocyte immune system's development. Early-life antibiotic administration in chickens decreased the relative number of Firmicutes, but increasing the abundance of Proteobacteria (Simon, et al., 2016). Additionally, later in life, decrease T-lymphocyte antibody titers were seen in antibiotic treatment group compared to untreated chicks, showing that these bacterial phyla may play a role in adaptive immunological function.

Conclusion, We find that whereas carnivorous birds have smaller digestive systems, herbivorous birds often have longer, more complicated digestive systems. One functional explanation for the long tract is that some dietary components take a long time to digest and require more exposure to digestive enzymes over a longer period of time; This phenomenon may be supported by evidence showing that the intestine's large diameter is necessary to increase food storage capacity, to finish the digestive process, and to absorb nutrients. Intestinal elongation also increases the surface area available for food absorption, and we have identified the role of birds gut microbiota in the physiology and immunology.

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STUDY OF SOME HEALTH INDICATORS OF FEEDING ON WHITHE SOFT CHEESE FORTIFIED WITH SELENIUM IN LABORATORY WHITH MICE

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Abstract:

Selenium (Se) is one of the rare and necessary elements with multiple and important biological applications, especially its effective role in the treatment of many chronic diseases and cancers, and that its deficiency causes health problems, and for this the current study was conducted and aimed to manufacture Iraqi soft cheese supported with two levels of Se, which are 100 and 200 µg / 1 kg of coagulame. represented by T1 and T2 treatments respectively, which used in a feeding of laboratory mice Which caused an artificial rise in the level of blood fats (Hyperlipidemia) in order to evaluate the feeding of selenium-fortified cheese on some nutritional and health indicators ,the most important results that were obtained: Se limited the daily weight gain and final weight gain of experimental animals fed a diet rich in fat with daily oral doses of selenium-fortified cheese treatment T1 and T2, respectively, compared with C+ positive control group mice fed a diet rich in fat without se and very close to C-negative control mice fed a standard diet only. Se also reduced the levels of total cholesterol TC, triglycerides TG, bad fats Low-Density Lipoprotein LDL and Very-Low-Density Lipoprotein VLDL, and raised the values of good fats High-Density Lipoprotein HDL significantly at (P≤0.05). The two groups T1 and T2 outperformed in some indicators even on the C- . Se reduced the glucose content in the blood and the levels of liver enzymes GOT, GPT and ALP. And improved the activity and effectiveness of the enzyme glutathione peroxidase and the efficiency of the immune system by increasing the total numbers of

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white blood cells and increasing the level of hemoglobin and the percentage of the volume of compressed cells.

Key words: Selenium, Soft Cheese, Blood Glucose, Liver Enzymes, White Blood Cells.

Introduction:

Selenium (Se) is one of the important elements of human health, it is a micronutrient found in very small quantities that an individual needs for the growth of the body and the prevention of several diseases. Se works to prevent damage to the heart muscle, liver and many cancers (Narotzki *et al*., 2012). In recent years, Se has been given great attention due to its role as an agent in preventive chemotherapy, as epidemiological studies indicate that Se is a chemical agent for the prevention of some types of cancers such as prostate and lung, as well as its role in preventing the occurrence of several other diseases (McIntosh, *et al.,* 2014).Se plays an important role in the action of the enzyme glutathione peroxidase and thioredoxin reductase, two of the most important enzymes in the human body, as well as in the synthesis of some amino acids called selenoproteins (Fraga, 2005). And its development, such as the production and growth of new skin cells, strengthening the immune system , memory, the functions of the nervous system and the hormonal activity of men (Lipinski, 2015). Se is one of the nutritional supplements that must be taken at a rate of 200 micrograms/day, and it was found that this dose increases the activity and numbers of immune cells controlling cancer tumours (Kiremidjian and Roy., 1998). Studies have shown that the effect of se intake reduced gastrointestinal cancer, including cancer of the oesophagus, stomach, intestine, colon, pancreas, liver, and bile duct. These cells' growth inhibition percentage due to Se intake ranged between 25-60% (Qiao, et al., 2009). Other studies indicated Se role in reducing breast and skin cancer (de Miranda et al., 2014). International organizations including WHO and FAO, are trying to treatment the defeciency of trace nutrients which was necessary for human health by fortifying food, especially the most consumed such as bread, dairy products and tea; Turkish white cheese was fortified with two levels of Se in Turkey (Gulbas and Saldamli, 2005), and yoghurt was fortified with Se in both Sweden and Russia to fill the deficiency in the members of those countries (Skripleva and Arseneva, 2015). Cheese fortified with selenium and zinc was also produced in Turkey, which was characterized by its long shelf life, low oxidation, and improved quality of the cheese produced (Gulbas and Saldamli, 2005), And yoghurt fortified with selenium was produced in Russia to treatment the deficiency of Se and to enhance the immunity, yoghurt fortified with selenium worked as blood sugar reducer to peoples with diabetes (Skripleva and Arseneva, 2015). Statistics from the W.H.O indicate that there are about one billion people in the world suffering from a Se deficiency(WHO, 2016). Selenium deficiency has

become one of the dangerous signs of human health. As its deficiency causes a decrease in the activity of Glutathione peroxidase enzyme , the deficiency leads to oxidative damage to many organs of the body, including the skeletal and cardiac ones, as well as several problems that are related to infections and lead to problems in many organs such as liver, kidneys and pancreas. this study was aimed to fortifying one of the most widely consumed types of food, namely cheese with50 and 100% of the daily need of Se , A nutritional experiment was conducted using mice to study the effect of eating cheese fortified with Se on nutritional and immune indicators included average weight of mice, glucose level, cholesterol level, Tg , HDL, LDL, VLDL, level of liver enzymes GPT, GOT and ALP, the activity of glutathione peroxidase enzyme, blood cell count,haemoglobin concentration and volume ratio of compressed cells.

Materials and working methods

Milk Source

Raw cow's milk which used in cheese manufacturing was from the dairy factory, Department of Food Sciences - College of Agricultural Engineering Sciences - University of Baghdad.

Selenium Source: yeast Selenium produced from Saccharomyces cerevisiae was used in this study and prepared by Jamison Company of Canadian origin.

Milk Tests: The components of raw milk estimated using milko tester, The amount of selenium in milk was also estimated using an atomic absorption device, as stated in (Horwitz, and Catimer., 2005).

Soft Cheese Manufacturing: Cheese manufactured according to the method adopted by Tamime(2006) as follows: A quantity of raw, full-fat cows milk, was received from the Dairy Factory - Department of Food Sciences - College of Agricultural Engineering Sciences - University of Baghdad The milk was pasturized at 63 °C for 30 minutes, then cooled to 42 °C, rennin was added and wait to the complet couaglation ,the whey was drane the coagulame was divided into two partes 100 µg/kg of selenium was added to the first half represented by the T1 treatment. the other half 200 µg/kg of selenium represented by the T2 treatment. The samples were mixed well the other stepes of cheese making was completed , and left using it in feeding laboratory mice.

Nutritional Experience

Experimental Animals

For this study, 40 male white Albino BALB/C mice obtained from the National Center for Drug Research and Control / Baghdad were used. The mice used in the experiment were 5 weeks old and weighed 26±2gm mature. The animals were placed in controlled conditions in terms of ventilation and temperatures that ranged around (25 ± 2) ºC, and the lighting was 12 hours of darkness and 12 hours of light.The mice were placed in cages made of plastic. The mice were provided with food, and sterile water was always available when the animal needed it (ad-labium). Food was left in their cages for three days before starting the experiment to adapt (adaptation) to the conditions of the experiment, Weigh the animals and food consumed for each group for the duration of the experiment (twice a week). The experimental animals were randomly distributed into four groups, with 10 mice per group, placed in special breeding cages. At the beginning of the experiment, all the treatments were fed on a standard diet shown in the first column in Table (1) for three days, then the first group was left only on the standard diet and returned as a C-negative control experiment, and the other three groups were fed on a diet rich in fat to induced Hyperlipidimia as in Table (1) for 28 days and after the end of the experiment. then the animals were divided into four groups as follows:-

1- The first group: The negative control group C^- the mice were fed a standard diet only for the duration of the experiment.

2-The second group: The positive control C^+ mice were fed on a diet rich in fat throughout the experiment.

3- The third group: Treatment T1 , mice were fed on a diet rich in fat throughout the experiment with an oral dose of 0.1 ml of selenium-fortified cheese at a concentration of 100 µg/day for the duration of the experiment.

4- The third group: Treatment T1 , mice were fed on a diet rich in fat throughout the experiment with an oral dose of 0.1 ml selenium-fortified cheese at a concentration of 200 µg/day for the duration of the experiment.

Preparing Mice Feeding Ration

The ration for feeding mice was prepared according to AIN's nutritional and physiological requirements (1993), and all the rations contained the following components, as stated in Table (1).

Table (1) Components and proportions of the basic ration used to feed mice (gm/100gm).

Components	*C- 100/g	**C+ 100/g	***T1 100/g	****T2 100/g
Casino	20	20	20	20
corn oil	7	7	7	7
sucrose	18.5	10	10	10
Cellulosic fibers	3	3	3	3
Mixture of vitamins	1	1	1	1
alloy metal	3.5	3.5	3.5	3.5
Collin	0.2	0.2	0.2	0.2
milk fat	0	6.5	6.5	6.5
cholesterol	-	2	2	2
Corn Starch	46.8	46.8	46.8	46.8

Note: - supplement the diet to 100 gm using sucrose.

The .blood sample collection: At the end of the experiment, the mice were prevented from eating for about 8 hours (fasting), then they were anesthetized with ketamine (with Xylazine) injection into a muscle, then blood was drawn from the heart using Syringe volume 1 ml of blood was placed In dry, sterile test tubes; the blood was divided into two parts:

The first (plasma): an anticoagulant substance (EDTA)was added to it, ethyl diamine tetra acetic acid, and this blood was used to conduct normal blood tests on it.Second (serum): Leave the blood to clot in the refrigerator for 30 minutes and then separate it by centrifuge at 3000 g for 15 minutes. Withdraw the serum with a Pasteur pipette. Divide the serum into small volumes in Eppendorf tubes to be used directly or keep in deep freeze at -20 C until use to preserve its components and prevent contamination with bacteria and fungiwas put into dry, sterile test tubes, and an anticoagulant substance, Ethyl diamine (EDTA) tetra acetic acid was added to it. This blood was used for normal blood tests.

Biochemical Analysis:

Estimation of Serum total cholesterol Level: Method of enzymatic decomposition of cholesterol according to the method done by (Young, 1995).

Estimation of Serum Triglycerides Level: The method of enzymatic hydrolysis of triglycerides was followed according to the. method(Young, 1995) .

Estimation of Serum HDL Level:followed method of enzymatic hydrolysis (High Density Lipoproteine Cholesterol) according to the method of Burstein et al., 1970)) developed by the British company (Randox) and according to the instructions of the supplied company.

Estimation of Serum LDL and VLDL Level

The level of both LDL and VLDL was measured by Freid's mathematical equation (Al-Shurafani, 2006) as follows:

[LDL_Cholestrol] = [Total - Cholestrol] – [HDL- Cholestrol] + [Triglyceride / 5]

[Triglyceride / 5] = [VLDL- Cholestrol] .

Estimation of Serum Glucose Level: Method of Bablock *et al,* (1988) The glucose concentration was calculated in 100 milliliters of blood serum after filtering the device on the Blank and calculated according to the following equation:

$$glucose\ concentration = \frac{Read\ absorbance\ model}{Read\ the\ absorbance\ of\ a\ standard\ solution} * (100) Standard\ solution\ concentration\ \left(\frac{mg}{100ml}\right).$$

Determination Of Glutamate Oxaloacetate Transaminase (GOT) and Glutamate Pyruvate Transaminase (GPT) activity.

colorimetric method from Reitman and Frankel.(1957) which developed by the French company (Biomerux) was followed and according to the instructions of the supplied company.

$$Efficiency\ of\ GPT\ (Units/L) = \frac{Absorbance\ rate}{number\ of\ minutes} * 1745.$$

Measurement of the level of alkaline phosphatase in the serum of mice was followed by the colourimetric method mentioned by Schlebusch et al., (1974) and developed by the Swiss company (AGAPPE).

Estimation of glutathione peroxidase GPx

The enzymatic activity of glutathione peroxidase in plasma was estimated by colorimetric method according to Rotruck *et al*., (1973).

Estimation of the total number of white blood cells:

The total number of white blood cells: were estimated according to the method mentioned by Haen, (1995).

Determination of haemoglobin concentration: The measurement of haemoglobin was determined using the method (Makarem, 1974 .).

Estimation of the volume ratio of compressed cells: The volume of the compacted cells was measured using the Haematocrite Reader (Hillman and Ault, 2002).

The Results and discussion

The chemical composition of the milk used in the manufacture of cheese

Table (2) shows the percentage rates of moisture, fat, protein, total solids, and non-fat solids for raw whole cow's milk, which are 87.21, 3.52, 3.55, 12.79, and 9.27%, respectively, while the pH , total acidity and the specific weight were 6.63, 0.16 and 1.029, respectively. The total solids and the non-fat solids were 86.01, 3.70, 4.10, 13.99, and 10.29%, respectively. As for its selenium content, it is 0.02 µg / kg, and these percentages are within the normal limits of milk and close to what was found (Yilmaz-Ersan and Kurdal, 2014 and Al-Badrany, 2016).

Table (2): Chemical composition of raw whole cow's milk.

components	full-fat milk
moisture%	87.21
Fat%	3.52
protein%	3.55
total solids%	12.79
non-fat solids %	9.27
pH	6.63
Total Acidity (as lactic acid) %	0.16
Specific weight	1.029
Selenium content: µg/1kg	0.02

***Each number in the table represents an average of three replicates**

Nutritional indicators and biological analyzes of experimental mice

Study of the effect of feeding on cheese fortified with selenium on weight of mice.

Table (3) show the effect of selenium-fortified cheese on the daily weight gain rate at the start of the experiment and the final weight gain rate after 28 days for groups of mice fed a standard diet represented by the negative control group C- and a diet rich in fat represented by the positive control group C+, and a diet rich in fat with oral administration of the therapeutic cheese product supplemented with selenium at the concentration of 100 and 200 micrograms of selenium/day represented by the T1 and T2 groups respectively. The results show that the highest rate of daily weight gain recorded by the group of positive control mice C + of 0.2443 g / day, and the final weight gain after 28 days is 6.84 g, which is higher than The results of the C- group of 0.1437 g/day for the daily increase and 4.02 g for the final increase. The reason for these clear differences in outcomes between treatment, C- and C+ is due to the nature of the diet provided to each group. In the positive control C+ treatment, the diet was rich in fat, which led to A higher weight gain. This result is consistent with what was found by Kalaivanisailaja *et al* (2003).

Table (3): Average weight gain of groups of mice with different treatments after 28 days.

group	body weight (gm)		Increase or decrease in body weight after 28 days (gm)	The average daily increase in body weight (gm)
	Average starting weight (gm)	Average weight after 28 days (gm)		
Negative control group fed standard diet C- -	27.00a	31.02a	4.02a	0.1437a
Positive control group fed a diet rich in C+ . fat	26.60a	33.44b	6.84b	0.2443b
Treatment group fed on a diet rich in fat + cheese containing 100 µg/day of selenium, T1 treatment.	26.41a	30.98a	4.56a	0.1631a
Treatment group fed on a diet rich in fat + cheese containing 200 mcg/day selenium T2 treatment	26.89a	30.95a	4.06a	0.1451a
L.S.D value ($P \leq 0.05$)	NS 0.6275	0.778*	0.923*	0.03296*

NS (non-significant difference). *($P \leq 0.05$) significant difference.

Averages carrying different letters within the same column mean that there are significant differences between them.

It indicated that the final weight of the group of a mice fed on a diet with a high-fat content increased compared to the group that was fed a standard diet, where the final weight gain after 28 days was 6.09 g, as agreed with what Al-Badrany found, (2016). The highest weight gain was after 28 days in the group of mice fed a diet rich in fat of 6.110 g

compared with the group provided a standard diet of 3.210 g, and the result was in agreement with what was found by Aggarwal and kansal, (1992), which indicated a high The final weight of the group of rabbits that were fed a diet rich in a cholesterol compared to the group fed a standard diet. It is noted from the results that the process of providing selenium-containing cheese, although the diet is rich in fat intended to reduce weight gain in direct proportion to the concentration of selenium taken as the rate of increase reached. The daily and final weights of the T1-treated group of mice were 0.1631 g/day and 4.56 g, respectively, As for the T2 group, the daily and final weight gain was 0.1451 g/day and 4.06 g, respectively, and when compared with the group of C+ positive control mice that were fed a diet rich in fat, we notice a significant decrease in the weight of this group, which indicates that selenium has an effective role in contributing to the reduction From the weight gain at the same time, it maintained normal growth with a significant increase in this group compared to the C-negative control group, or the reason for the decrease in weight in the treatment of T1 and T2 might be that selenium increased T3 hormone as this hormone increases catabolism on construction. This result does not agree with what was found by Choct *et al*, (2004), which indicated a non-significant increase in the weight of chickens fed a diet fortified with organic selenium at a concentration of 0.25 mg/kg of body weight. The results of the statistical analysis indicated that there were no significant differences ($P \leq 0.05$) in the mean of the initial weight of mice and a significant difference ($P \leq 0.05$) after 28 days of The start of the experiment between the treatment of C + and the rest of the treatments, as well as the presence of a significant difference in the final increase and the rate of daily weight gain between the treatment of C + and the treatment of C-, and the absence of a significant difference between the treatment of C- and between T1 and T2.

Effect of selenium-fortified cheese on the levels of total cholesterol, triglycerides, HDL, LDL, and VLDL

Table (4) shows the effect of cheese fortified with selenium on cholesterol, triglycerides, HDL, LDL, and VLDL for C-, C +, T1, and T2 treated mice after 28 days. This is due to the nature of the diet provided to this group, which is a diet rich in fat compared to its level in the C-treatment of 94 mg/100 ml. It was high in fat compared with mice fed a standard diet, which amounted to 162.21 and 96.04 mg/100ml, respectively, as it agreed

with what was found by Huang et al, (2004), who noted a high percentage of total cholesterol in the blood of mice fed a high-fat diet reaching 114 mg/100ml. 100ml.

Table (6): Bercentages of TC, TG, HDL, LDL, and VLDL in the serum of experimental mice after (28) days.

Group	Total cholesterol mg/100 ml	Triglycerides TG mg / 100 ml	High-density lipoproteins HDL mg/100 mL	Low-density lipoproteins (LDL) 100 mg/ml	Very Low-Density Lipoproteins (VLDL) mg/100 ml
Negative control group fed standard diet C- -	94.0a	132.0c	58.88c	45.39a	28.50b
Positive control group fed a diet rich in C+ . fat	186.0c	181.0d	34.54a	83.95c	34.12c
Treatment group fed on a diet rich in fat + cheese containing 100 µg/day of selenium, T1 treatment.	123.5b	89.0b	43.57b	62.50b	30.60bc
Treatment group fed on a diet rich in fat + cheese containing 200 mcg/day selenium T2 treatment	103.5a	78.0a	72.15d	46.10a	18.48a
L.S.D value ($P \leq 0.05$)	16.09*	4.314*	3.901*	6.57*	3.993*

***(P ≤ 0.05) significant difference.**

Averages carrying different letters within the same column mean significant differences between them.

The statistical analysis results in Table (4) indicate a significant difference (p≤0.05). Compared with mice fed a standard diet of 46 mg / 100 ml, the total cholesterol level of the T1 and T2 group of mice was 123.5 and 103.5 mg / 100 ml, respectively, and these values were significantly lower (p≤0.05) compared to the C+ treatment. This result is in line with what was found by Karakilcik *et al*, (2003), which indicated a significant decrease in cholesterol levels when mice were given selenium alone or selenium with vitamin E. Between the C + treatment and the rest of the treatments, there was no significant difference between the C- treatment and the T2 treatment, which indicates that selenium at a concentration of 200 µg/day contributed to lowering the proportion of cholesterol to the normal limit. Triple TG, the highest level of TG was recorded in the serum of the C + group of mice, which amounted to 181 mg / 100 ml, and the reason for this is due to the high-fat

content in the diet of this group. Mahfouz and Kummerow, (2000) indicated that the percentage of TG increased to three times its value when rabbits were fed on a diet rich in fat for one month, and the result is consistent with what was found by Kalaivanisailaja et al, (2003) who indicated that the percentage of TG increased when feeding mice on a diet It is rich in fat, reaching 103.25 mg/100ml, compared to mice fed a standard diet of 40.71 mg/100ml, As for the TG level of the control group of mice treated with C-, it reached 132 mg/100 ml, while the group of T1 and T2 treated mice reached 89 mg/100 ml and 78 mg/100 ml, respectively. It is noted that the lowest concentration of TG was in the group of T2-treated mice, as it outperformed even the negative control treatment. This decrease is due to the role of selenium as it works to increase the effectiveness of T3 hormone, and thus this hormone works to oxidize fatty acids instead of acetylating them and thus reduces triglycerides TG (Darlow and Austin, 2003). The statistical analysis results indicate significant differences ($p \leq 0.05$) in the level of TG between treatment T1 and T2 compared with C+ and C-. 100 ml to 97 mg / 100 ml in the group of rats dosed with selenium at a concentration of 200 µg / day compared to the control rats. This reinforces the important role that selenium plays in lowering triglycerides.As for the values of high-density lipoprotein HDL, its highest concentration was recorded in the serum of T2-treated mice, which amounted to 72.15 mg / 100 ml, followed by treatment C-, which reached 58.88 mg / 100 ml, while the treatment of T1 reached 43.57 mg / 100 ml, and the lowest level recorded From the C + treatment, which amounted to 34.54 mg / 100 ml, the value of this type of lipoproteins decreased in the C + treatment and increased in the C-, T1 and T2 treatments, which caused this decrease in the weight gain of the C + mice, and this is consistent with what was mentioned by Miller (1977), who indicated That the weight gain of experimental animals is associated with a decrease in the level of HDL, and as agreed with what was mentioned by Kok *et al,* (1996) who indicated that the increase in weight of experimental animals is associated with a decrease in the level of HDL, so we note an increase in the final consequences of the C + group mice due to the low levels of HDL Compared with C- mice, the result is in agreement with what was found by Kalaivanisailaja et al, (2003), which indicated a decrease in the levels of benign HDL in the blood plasma of mice fed a diet high in fat content and attributed the reason to the reduction of the activity of the enzyme Lipoprotein lipa se and lecithin cholesterol acyl transferase, while an increase in HDL values was found in the blood plasma of rats fed a diet supplemented with selenium.The results of the statistical analysis in Table (4) indicate that

there is a significant difference (P≤0.05) between the treatment of C + and the treatments of T1 and T2, as the effect of selenium.

As for the low-density lipoprotein LDL serum, which is the bad type of serum lipoprotein, its lowest level was recorded in the C- at 45.39 mg / 100 ml, and the highest level in the C + at 83.95 mg / 100 ml. The reason for its high level in C + treated mice is that the diet of this group is rich in fat, while its value for T1 and T2 treated mice was 62.5 and 46.10 mg / 100 ml, respectively. The results indicate a significant decrease (P≤0.05) in these values compared with C + even though the ratio on which the T1 and T2 groups feed is rich in fat, but this decrease is due to the action of selenium added to the ration as well as the role of Badi bacteria. It is noted from the results of the statistical analysis that there are significant differences in LDL values between group C- and group C + and T1 and not significant between C- and T2, and that the decrease in the values of group T1 and T2 is a positive indicator of the action of selenium, since LDL is a bad fat in the blood and that its increase constitutes a danger On health. As for the level of VLDL, the highest level was recorded in the group of treated C+ mice that were fed a diet rich in fat, amounting to 34.12 mg / 100 ml. It was noticed from the results that there was a significant decrease in VLDL values for groups of treated mice fed a diet rich in fat and fortified with selenium The values for T1 and T2 were 30.60 and 18.48 mg/100ml, respectively, while for C-treated rats, it was 28.5 mg/100ml. It is clear from the results that the lowest value recorded by treatment T2 was even outperformed by treatment C-. The statistical analysis results indicate a significant difference (P≤0.05) in VLDL values between group C + and group C-, T1 and T2, and no significant differences between group C- and group T1.

From the overall results that were reached and presented in Table (4), it can be said that the diet rich in fat that was fed to mice treated with the positive control C + led to an increase in the proportions of total cholesterol, TG, LDL and VLDL, which is directly responsible for the occurrence of obesity and the increase in the weight of mice This group and other fat-related disorders, while the supplementation with selenium that was introduced into the diet of treatments T1 and T2 had a significant effect in preventing excessive weight gain and reducing the levels of TG and total cholesterol and making them within normal limits, and increasing the proportion of good fats HDL and reducing the levels of harmful fats LDL and VLDL.

Effect of selenium-fortified cheese on glucose, GOT, GPT, ALP liver enzymes, and GPx enzyme activity.

Cells from using glucose, which leads to a decrease in glucose metabolism through insulin. Table (5) shows the results of the effect of cheese supplemented with selenium on the blood glucose level of C-, C+, T1 and T2 treated mice after 28 days. It is noted from the results that the highest concentration of glucose level is in the serum of mice treated with C+ of 113 mg / 100 ml, and this result is consistent with what was found by Akiyama *et al,* (1996), which indicated that feeding mice on a high-fat diet led to a high level of glucose In the blood plasma, it reached 196 mg/100 ml compared to the group fed a standard diet. Significantly decreased at the level (≤0.05.P) when compared with the group of treated rats C+, while the lowest sugar content was recorded from the group of mice treated with negative control C-fed on a standard diet was 76 mg/100 ml.

Table (5): Levels of glucose, liver enzymes GOT, GPT, and GPx enzyme activity for groups of experimental mice after 28 days.

groups	glucose mg/100 ml	GOT unit/liter	GPT unit/liter	ALP unit/liter	GPx IU/ml
Negative control group fed standard diet C- -	76.00a	43.33ab	33.67b	79.33ab	19.53b
Positive control group fed a diet rich in C+ . fat	113b	48.67b	38.00c	85.33b	13.07a
Treatment group fed on a diet rich in fat + cheese containing 100 µg/day of selenium, T1 treatment.	80.33a	42.67ab	31.00a	78.67ab	24.77c
Treatment group fed on a diet rich in fat + cheese containing 200 mcg/day selenium T2 treatment	76.67a	40.00a	30.00a	76.67a	29.37d
L.S.D value ($P \leq 0.05$)	5.462*	6.028*	1.719*	7.07*	0.4547*

***(P ≤ 0.05) significant difference.**

Averages carrying different letters within the same column mean significant differences between them.

It is noted from the results that mice being fed with selenium-fortified cheese at concentrations of 100 and 200 mcg/day contributed to lowering blood glucose to a normal level. The reason for this may be due to an increase in the viscosity of the intestinal contents and an increase in the thickness of the intestinal layer, especially in the fasting person, and

then obstructing or inhibiting the absorption of sugars (Kim and Shin, 1998), this result is consistent with what was found by Kielczykowska et al, (2014) who observed that selenium at a concentration of 0.5 mg/kg body weight improved the blood glucose level to a normal level when rats were exposed to lithium poisoning. The statistical analysis results indicate no significant differences in blood glucose values between C-, T1 and T2 treated mice, while there are substantial differences between the C+ group and the T1 and T2 groups, as well as between the C- and C+ groups.

Table (5) presents the concentration of liver enzymes GOT and GPT for C-, C +, T1 and T2, after 28 days. A diet rich in fat, which amounted to 48.67 units/liter, followed by the group of C-treated mice, which were fed a standard diet of 43.33 units/liter, and the lowest percentage was in the group of T2-treated mice, which amounted to 40.00 units/liter, followed by the T1 group, which amounted to 42.67 units/liter. The statistical analysis results indicate a significant difference (0.05.≤P) between the C+ and the two groups T1 and T2, while the differences were not significant between the C- and the two groups T1 and T2. These indicators are evidence that selenium has a major role in reducing or maintaining the enzyme GOT is within the normal level, and this result is consistent with what was found by Flora *et al,* (1982), who indicated that rats dosed with selenium showed protection against nephrotoxicity and cadmium-induced hepatotoxicity and the maintenance of the liver enzymes GOT and GPT in normal form. The highest level of transaminase was in the serum of C+ mice fed a diet rich in fat, as it reached 38 units/liter, followed by the treatment of C-, which reached 33.67 units/liter, and the lowest level was recorded with the group of T2 mice, which reached 30 units/liter. The T1 group was 31 units/liter, indicating a decrease in the level of GPT enzyme in the groups fed a diet rich in fat compared to the treatment group C-. Represented by the treatment of C-, T1 and T2, there was no significant difference between the T1 and T2 group, This enhances the vital role of selenium in maintaining liver function and keeping it at its normal level, and this result is consistent with what was found by Othman and El-Missiry, (1998), which indicated that selenium provided good protection for mice against lead poisoning, as selenium maintained normal cholesterol levels. And liver enzymes GOT, GPT and ALP, and also noted that selenium enhances the endogenous antioxidant capacity of cells by increasing Glutathione reductase and cellular glutathione content, reducing the concentration of lipid peroxides in both liver and kidney. As for the level of the enzyme Alkaline phosphatase ALP, its concentration in the C- was 79.33

units/liter, while the highest level was recorded in C+ mice, which reached 85.33 units/liter. High fatty, while the results show a decrease in its concentration in the groups fed a diet rich in fat, but it contains a percentage of selenium, as its concentration in T1 treated mice was 78.67 units/liter, and the lowest rate was recorded in the T2 which amounted to 76.67 units/liter. The statistical analysis results indicate significant differences ($P \leq 0.05$) between treatment C+ and treatments T1 and T2. Liver tissue enzymes have long been considered effective biochemical markers for assessing the health status of the liver, and an elevated level of ALP enzyme in the circulatory system indicates a defect in the liver membrane (Plaa, 2010), as this enzyme is secreted into the blood after disorders that occur in the liver (Gokcimen *et al*., 2007). The results indicate an increase in ALP enzyme in the C + group and a decrease in the T1 and T2 coefficients fortified with selenium to reach its normal percentage compared to the C- group after 28 days from the start of the treatment, and this is a good indicator of selenium, which maintained the stability of the liver membrane. As for the values of glutathione peroxidase GPx, the highest concentration was recorded in the serum of T2-treated mice, which amounted to 29.37 µmol / ml, followed by the T1 group which amounted to 24.77 µmol / ml, then the C- which amounted to 19.53 µmol / ml, which is less Significantly ($P \leq 0.05$) than in the group of T1 and T2 mice, while the lowest concentration recorded by the C+ group of mice was 13.07 µmol/ml, a significant decrease ($P \leq 0.05$) compared with the treatment of C- and T1 and T2 groups, and this result agrees with what was found by Mahfouz and Kummerow, (2000), which indicated a significant decrease in the concentration of glutathione peroxidase enzyme in the blood serum of rabbits when feeding on a diet rich in fat.The results of the statistical analysis of the current study indicate a significant increase in the concentration of glutathione peroxidase for treatments T1 and T2 and significantly (≤ 0.05) compared to the C+ and C- groups, which highlights the role of selenium in enhancing the immune system, as this result agrees with what was found by El-Demerdash and Nasr, (2014), which indicated that the concentration of glutathione peroxidase was significantly increased ($P \leq 0.05$) in the serum of mice when they were given selenium at a concentration of 200 µg/day.

Effect of selenium-fortified cheese on the number of white blood cells (W.B.C), hemoglobin (Hb) and Percentage of Compact cells volume (P.C.V).

The results in Table (6) show the effect of cheese supplemented with selenium on the number of white blood cells W.B.C, haemoglobin Hb and the volume of compacted cells P.C.V for mice of groups C-, C +, T1 and T2 after 28 days, which recorded the highest level of white blood cell numbers W.B.C.White blood cells in the T2-treated group of mice amounted to 8.1 x 103 cells/ml, and this significant increase at the level ($P \leq 0.05$) compared with the C- and C-treated group, which amounted to 5.6 x 103 and 5.867 x 103 cells/ml, respectively, the results of the analysis indicate; statistically, there were significant differences ($P \leq 0.05$) between T1 and T2 groups compared to C+ group and not significant with C- group. It was noted that the number of white blood cells increased in T1 and T2 groups supplemented with selenium compared with group C +, proving that selenium has a role in increasing the number of white blood cells. White blood helps the body fight infections and viruses such as cold and influenza and more dangerous cancer cells. These results are consistent with what was found by Yazdi *et al*, (2013), who observed an increase in the number of white blood cells in mice after giving selenium supplements at a concentration of 100 µg / day, which amounted to 8.320 x 103/ml after 30 days compared to its ratio before giving selenium supplements, which amounted to 5.990 x 103/ml, and within the normal limits. It was noted that selenium supplementation provides cellular immunity against cancerous tumours and other bacterial and fungal infections. As for the level of haemoglobin Hb, the highest level was recorded in the T2 group, which amounted to 12.03 g / dL, and this significant increase was at the level ($P \leq 0.05$) compared with the C + group of 9.33 g / dL, while the T1 group reached 11.27 g / dL. Deciliter, and group C- reached 11.23 g/dL;

Table (6):The total number of white blood cells (W.B.C), the level of (Hb) and the volume of (P.C.V). In the blood of experimental mice after (28) days.

groups	Total number of white blood cells cell/ml 103) x W.B.C)	hemoglobin HB g/dl	Percentage of Compact cells volume %P.C.V
Negative control group fed standard diet C-	5.600a	11.23b	32.50b
Positive control group fed a diet rich in fat C+ .	5.867a	9.33a	29.00a
Treatment group fed on a diet rich in fat + cheese containing 100 µg/day of selenium, T1 treatment.	7.133ab	11.27b	33.67b
Treatment group fed on a diet rich in fat + cheese containing 200 mcg/day selenium T2 treatment	8.100b	12.03c	33.00b
L.S.D value ($P \leq 0.05$)	2.119*	0.2427*	3.438*

.*($P \leq 0.05$) significant difference.

the statistical analysis results indicate a difference ($P \leq 0.05$) between the different groups. This demonstrates that selenium contributed to an increase in haemoglobin to the normal limit compared to the treatment of C +, which was fed a diet rich in fat. A deficiency of selenium may lead to the risk of anaemia in humans, especially those infected with HIV (Kupka et al., 2009)). The results of The current study found that supplementing with selenium at a concentration of 100 and 200 µg/ml contributed to an increase in haemoglobin percentage compared to C + treatment and maintained normal levels of haemoglobin compared with C- and this enhances the vital role of selenium as it had a positive effect and is an indicator of good health.Table (6) results refer to the percentages of packed cell volume P.C.V in the previous groups. The highest percentage was recorded in the T1 which amounted to 33.67%, followed by the T2 group of 33%, the C- group of 32.5% and less. A percentage recorded by the C + group amounting to 29%, and it is noted from the results of the statistical analysis that there is a significant difference ($P \leq 0.05$) between C + and the rest of the groups represented by C-, T1 and T2, and there is no significant difference between the C- group and the two groups T1 and T2 supplemented with selenium, El-Mokadem *et al*, (2013) showed that selenium supplementation contributed to a significant increase in haemoglobin concentration, red blood cell count and PCV volume compared with the absence of selenium supplementation.

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CHARACTERIZATION, MECHANISM OF ACTION, SOURCES TYPES AND USES OF THE ANTIMICROBIAL PEPTIDES IN DOMESTIC ANIMALS, REVIEW

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CHARACTERIZATION, MECHANISM OF ACTION, SOURCES TYPES AND USES OF THE ANTIMICROBIAL PEPTIDES IN DOMESTIC ANIMALS, REVIEW

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Abstract:

This review aimed to identify the general characteristics of , mechanism of action, types and uses of antimicrobial peptides in animals, antimicrobial peptides were lass of small peptides that widely exist naturally, they varied greatly in structure, composition are found in the animal's species, and were standard structural features, twenty to sixty residue long, cationic and amphipathic peptides, have a positive charge that interacted with negatively charged molecules on the bacterial cell surfaces, a have an expansive field of inhibitory effects and were made as the first line of protection by both multicellular organisms. An essential component of the innate immune method of various organisms can have broad movement to instantly destroy bacteria, parasites, yeasts, fungi, viruses, and even cancer cells, Several antimicrobial peptides were expressed in the gastrointestinal mucosa of the animals where they can modulate innate immune responses and the intestinal microbial, act some protective microbial species and modulate an immune response. Its interactions with innate immunity and the intestinal microbial reveal attractive drug targets, act as a new therapeutic approach against gastrointestinal infections, damage, and inflammations, and modulate obesity and metabolic diseases. In addition, its acts as a biomarker of gastrointestinal diseases. They have been useful parts of the host's defense systems for a long time. Because microbes become resistant to antimicrobial peptides more slowly than to traditional antibiotics, they could be used as alternative treatments in the future. Several thousand antimicrobial peptides have been isolated from microorganisms, plants, insects, crustaceans, creatures, and even humans. Conclusion: Antimicrobial peptides are small proteins found in plant and animal species. They are the first defense against infections

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caused by microorganisms. and work against a wide range of bacteria, fungi, and viruses, both gram-positive and gram-negative. They are related together to innate immunity and adaptive immunity.

Key words: Antimicrobial Peptides, Animals, Innate Defense, Proteins.

Introduction:

The oldest and most popular antimicrobial peptide the nisin peptide, is first describe in the year 1928 (Zasloff, 2002). This residue 34-peptides are generated by a strain of the lactic acid bacteria, *Lactococcus lactis* (Gaynes, 1997). It belongs to the antibiotics, class of highly post translational modified bacteriocins (Lai and Gallo, 2009). Multicellular organisms have the natural ability to devises defensive strategies against their nurse attacks Scocchi, *etal*., 1999). The cathelicidin peptides are part of an inbuilt defense system, mainly coming from splitting (Scocchi, *etal*., 1997).

Most f the peptides are important proteins are related to each are innate and adaptive immunity (Gazit, *etal*., 1995; Ramanathan, *etal*., 2005). The antimicrobial peptides are evolutionarily conserved weapons against pathogenic organisms (Vunnam, *etal*., 1997). The host defense peptides are also known as "Host Defense Peptides" due to their potential to confer non-specific immunity on the animal host (Lee, *etal*., 1989). The systematic examination of subwoofers in many animals has allowed the discovery of many antimicrobial peptides (Ramanathan, *etal*., 2004), and some of the peptides which have proven effective such as a broad spectrum (Powers and Hancock, 2003).

Antimicrobial peptides are very important for an organism's immune system. Without them, the host would be unable to fight off bacteria, fungi, and viruses. Antimicrobial peptides from animals were usually short, consisting of ten to fifty amino acids, and had very low sequence homology. The antimicrobial peptide has attracted increased care of the study Owings to their broad spectrums (Vunnam, etal., 1997), their antimicrobial activity, and, more importantly, the fact that antimicrobial peptides may be able to beat by antimicrobial resistance, which makes it a possible alternative therapeutic agent for humans, animals or a commute for the conventional antibiotics (Lee, etal., 2001).

Literature reviews

The overuse of antibiotics in medicine, agriculture, and animal husbandry particularly in developing nations. leads to increased antibiotic resistance among all microorganisms (Zasloff, 2002). Piscidin has strong antimicrobial activity against many pathogens in the lab, including bacteria, fungi, and viruses. It is also important to the innate immune response to bacterial challenges. It is the first line of defense for many species and is becoming

increasingly known as a key part of the host's defense against infection. (Lee, et al., 2003), also the piscidins are stocked in the granules of the phagocytes of the organism's body (Powers and Hancock, 2003).Liet al.(2000) mention the brush border structure of the gastrointestinal tract of animals is linked to the peptide and the disaccharidase enzymes that lead to the total digestion of the diet components and allow their absorption by the columnar absorptive cells. Pompilio et al. (2011) thought that the sulphomucins might be able to form a complex with pepsin, stabilizing and buffering the enzyme. Because of their known anti-peptic activity, acid mucin has been suggested as contributing to the rising resistance of the mucus to bacterial degradation (Lee, et al., 2007), and may protect the delicate microvilli of the intestine from mechanical damage and make it easier for food to be absorbed (Gazit, et al., 1995).

The antimicrobial peptide is ubiquitous and is created by organisms meandering from bacteria to superior mammals (Linde et al., 2001). Ribosomal synthesized antimicrobial peptides from prokaryotes are called bactericides (Lai, et al., 2009They have been proven to be powerful weapons to protect or grab an ecological cavity (Li et al., 2000). In eukaryotes, antimicrobial peptides such as thionins have been illustrated in the different organs of plants (Peng, et al., 2016). The antimicrobial peptides are energetic against viruses, bacteria, fungi, and parasitic cells. There is, however, a significant disparity in the spectrum of antimicrobial peptides' activities (Peng, et al., 2016). Antimicrobial peptides can be effective against both prokaryotic and eukaryotic cells (Podda et al., 2006; Lee et al., 2001), or they can be shown to be effective against only a few types of bacteria (Lee et al., 1989). The plasma membrane is the main target of these peptides. They act on sensitive cells by breaking up the plasmatic membrane (Linde, et al., 2001).

Antimicrobial peptides act by binding to the surface of bacteria, changing the shape of the peptide, causing peptide monomers to stick together, and causing the bacterial cell wall to split (Vunnam et al., 1997). In most cases, antimicrobial peptides possess a net positive charge (Zasloff, 2002), which allows them to connect with negatively charged molecules on the surface of bacteria or cancer cells (Li et al., 2000). These negatively charged molecules are phospholipids, sialylated gangliosides, O-glycosylated mucins, and heparin sulfates (Lee and Eckert, 2007).

These proteins is most varied but can be classified into two types; the membranolytic and the non-membranolytic antimicrobial peptides (Penny and Li, 2018). Linde, et al.(2001)

said the antimicrobial peptides bind to the lipopolysaccharides in the negatively-charged (Powers and Hancock, 2003), the gram-negative bacterial external cell wall, or too acidic polysaccharides of the gram-positive bacterial external cell wall (Peng, et al., 2016). After the binding, the permeabilization of the bilayer membrane happens through the transient pore creation (Zaoloff, 2002). Scacchi, et al. (1999) mentioned that Permeabilization oversees the leakage of the cell parts and cell death. There are several samples of permeabilization, although, of the exact mechanism, three permeabilization samples are named barrel stave, choroidal, and carpet (Qu, et al., 1996). The antimicrobial peptides are perfect candidates for the clinical antimicrobial used sinuses. They are started against the antibiotic-resistant insulated (Lee, *etal*., 2003), do not choose for the resistant mutants (Lee, *etal*., 2001), and have determinated natural bacterial resistance (Lee, *etal*., 1989), they are synergistic with the conventional antibiotics (Penny and Li, 2018), specifically against the resistant mutants (Lee, *etal*., 2003), they kill rapidly and proven to kill bacteria in the animal models (Podda, *et al*., 2006), the supplementary activities, as sepsis inhibition and provide beneficially (Vunnam, *etal*., 1997).

The bacteriocins are nonpathogenic antimicrobial peptides or proteins perspired by gram-positive and gram-negative bacteria. (Qu, et al., 1996), and prevent the growth of similar bacterial strains (Gaynes, 1997) while avoiding the damage of host bacteria by selectively killing posttranscriptional modifications and the specific immunity mechanism (Lai and Gallo, 2009). Not similar to the broad movement spectrum of traditional antibiotics, bacteriocin has a thin activity spectrum (Lee, et al., 2003). Additionally its plays role in regulation of the signaling, sporulation and virulence (Peng, *et al*., 2016). The cationic antimicrobial peptides were very familiar in pets and changed significantly in structure, composition, and distribution among the species (Podda, *et al*., 2006). They occur in three categories, the linear, helical, and linearPeptides (Gaynes, 1997), which are ich in proline and cysteine stabilizedpeptides (Lee, *et al*., 1989). Inside each of thesethe groups were cathelicidins (Lee, *et al*., 2001), which differ in their structures, sequence and sizes (Gazit, et al., 1995). Everybody of the organismcontains a high percentage of the amino acid arginineand lysine (Ramanathan, *et al*., 2005). They have a common N terminalprefab area of about one hindered monolithic block for cysteine protease inhibitor Kathleen (Ramanathan, *et al*., 2004). This is amazing because of avid area also acts as a target for searches inthe new cathelicidins (Qu, *et al*., 1996). The extremely variable C terminus is

cleaved and includes the antimicrobial positive domainafter synthesisor matureAntimicrobial peptide (Penney and Li, 2018). The disruption of the membranes by the membranolytic antimicrobial peptides can be represented by several samples, which are the toroidal sample, carpet sample, the disordered toroidal pore model, and the barrel stave sample (Podda, *et al*., 2006).

Gaynes (1997) said that the details of each mechanism are different, but they all involve peptides causing membranes to break, which lets cytoplasm leak out and kill the cell. Nonmembranolytic antimicrobial peptides could work as metabolic inhibitors (Gazit et al., 1995), dealing directly with RNA, DNA, and protein synthesis (Lee et al., 2003), and inhibitors of cell wall synthesis or septum formation (Linde et al., 2001). They also cause ribosomal aggregation and membrane protein delocalization (Li et al., 2000). Lee et al. (2007) say that some natural antimicrobial peptides kill bacteria and viruses in a weak way (Peng, et al., 2016). Instead of killing or stopping the growth of bacteria directly (Lee et al., 2001), they work with the host's immune system through things like histamine release, chemokine induction, and angiogenesis modulation (Lee, etal., 1989). Only recently have people started to pay attention to how these drugs affect the immune system (Penny and Li, 2018). Antimicrobial peptides from amphibians are a big part of staying safe from pathogens like bacteria that have caused the global population of amphibians to drop (Lee, etal., 2001). Most insects make fat and blood cells where they are made (Podda et al., 2006). Antimicrobial peptides are made from microorganisms such as bacteria and fungi. Some well-known peptides, such as nisin and gramicidin from Bacillus subtilis, Lactococcus lactis, and Bacillus brevis (Lee et al., 2007), are different in size, composition, mechanism of movement, and range of specificity against microorganisms (Qu et al., 1996). Furthermore, they are found in many tissues, including polymorphonuclear leukocytes, macrophages, and mucosal epithelial cells (Peng et al., 2016).

Conclusion:

Antimicrobial peptides have been found in humans and other vertebrates. The cells play an essential role in maintaining the body from most pathogens. They are made in the body's fat bodies and blood cells, but bacteria and fungi can also produce them.

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THEORETICAL STUDY OF THE PHYSICAL PROPERTIES AND THERMODYNAMIC FUNCTIONS OF ASPIRIN USING QUANTUM MECHANICS CALCULATION (PARAMETRIC METHOD 3)

Nidaa A. JASIM

THEORETICAL STUDY OF THE PHYSICAL PROPERTIES AND THERMODYNAMIC FUNCTIONS OF ASPIRIN USING QUANTUM MECHANICS CALCULATION (PARAMETRIC METHOD 3)

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Abstract:

In this study, the theoretical quantum programs were relied upon to study some of the physical and radiodynamic properties, in addition to the spectral study of the aspirin compound. PM3 quantum chemistry methods and Gaussian 09 W program were applied to the calculation of the balanced dimentions (bond lengths, length angles in Angstrom) , The thermodynamic functions (E^0 , H^0 ,A^0 ,S^0 ,C_V) was calculated of compounds studied and also some physical properties (E_{HOMO} , E_{LUMO} , ΔE , IP) was also calculated. This study is important to reach additional theoretical information about acetylsalicylic acid (aspirin) using theoretical chemistry programs and compare it in the future with salicylic acid derivatives classified as analgesics to reach the best drugs on the other hand biological on the body.

Key words: Theoretical Study, Aspirin.

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Introduction:

Aspirin is one of the acetyl derivatives of salicylic acid, and it is classified as a weak acid, pka value is 3.5 at 25C^0 and it is a white crystalline substance, its boiling point is 140 C^0, Melting point 135 °C. Aspirin or salicylic acid is one of the most famous and most popular medicines used to treat fever and reduce pain, fever, or inflammation. Specific inflammatory during the last century, and it is still a distinct treatment over its alternatives. It is also used to avoid the formation of clots that cause heart attacks [(1)].Aspirin inhibits the activity of the enzyme Cox (cyclooxygenase), which leads to the formation of prostaglandins (PGs), which play a role in inflammation and pain. The sensation of pain results when your nerves send an electrical signal to your brain or when you suffer an injury. The damaged tissue releases chemicals called prostaglandins, which are similar to hormones and cause the surrounding tissues to swell. It also increases the intensity of the electrical signal coming from the nerves, which leads to an increase in the pain that a person feels . Aspirin is part of a class of drugs called nonsteroidal anti-inflammatory drugs (NSAIDs). Aspirin and other NSAIDs are widely used to chemically manipulate these nerve signals by blocking the effects of certain enzymes that secrete prostaglandins. This means less pain and less swelling [(2)]. Aspirin reduces this pain and swelling because it is analgesic (pain reliever), antipyretic (antipyretic) and anti-inflammatory (fights swelling and inflammation **)** [(3)] ·Research has shown that aspirin protects against first angina pectoris and stroke, prevents migraines, reduces colon cancer recurrence, and reduces high blood pressure. Realtime the most widely used salicylate derivative is the acetylsalicylic acid, a universal substance commercially known as aspirin[(4)].

After nearly 100 years of aspirin use, aspirin is still the most widely used drug in the world without a prescription and is still recognized as an analgesic, antipyretic and anti-inflammatory agent [(5)]. Research is still ongoing on salicylic acid derivatives. In the fields of medicinal chemistry, there is a great lack of data and information about the biological effects of aspirin[(6)]. The aim of the research is to provide more theoretical information about aspirin, which is difficult to reach practically through the use of advanced quantum programs in the world of chemistry to ensure the safety of this drug and to compare these results with other studies of methyl salicylic acid derivatives used in relieving muscular and joint pain and choline salicylate used to relieve mouth ulcers [(7)].

Computational chemistry:

Computational chemistry The term computational chemistry is generally used when a mathematical method is sufficiently well developed that it can be used automatically on a computer[8]. Quantum mechanics gives a mathematical description of the behavior of electrons that has never been found to be wrong. However, the quantum mechanical equations have never been solved exactly for any chemical system other than the hydrogen atom [9]. Thus, the entire field of computational chemistry is built around approximate solutions. Some of these solutions are very crude but are still more accurate than any experiment that has yet been conducted Molecular modeling is an aspect of computational chemistry and a particular molecular system can be modeled with the hope that it could be synthesized in the laboratory[10], especially for species that are too difficult , dangerous, impossible or too expensive to carry out experimentally [11]. Molecular modeling is a quite accurate method in accounting for properties like geometric and electronic structures, frequencies, chemical shifts, bond distances, bond angles. It is an aspect of chemistry that is fast spreading and has become a useful tool in studying molecular system prior synthesizing the system in the laboratory. It has also aided in our understanding of biochemical processes such as enzymatic reactions, photosynthesis, it assisted in the design of new drugs and chemical compounds in general with specific properties and led to the discovery of structure-property reactivity relationships[12].

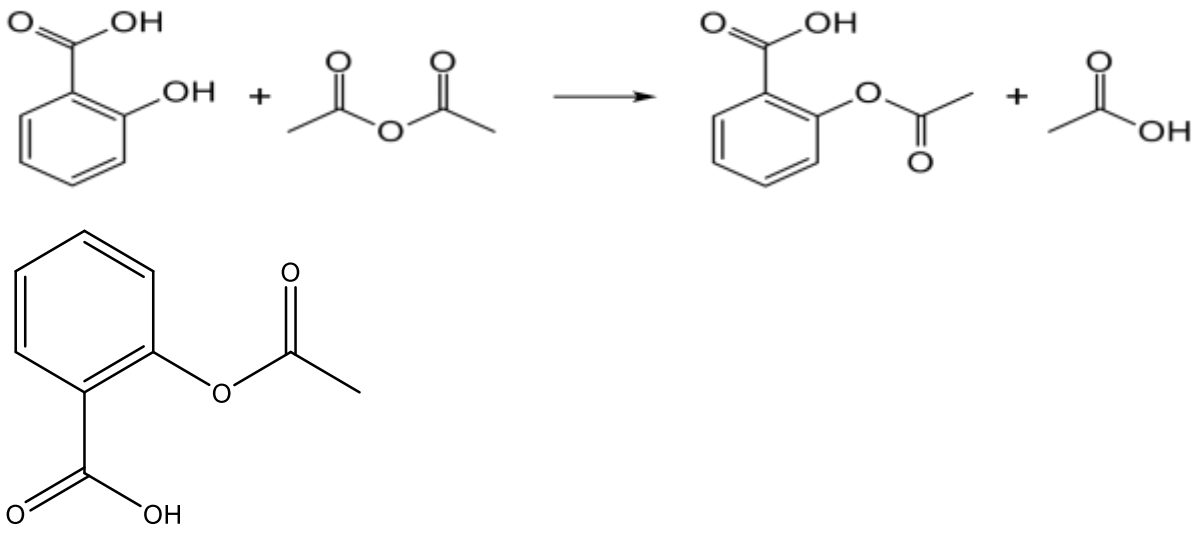
Semi Empirical PM3 Calculations:

Semiempirical (SE) methods can be derived from either Hartree–Fock or density functional theory by applying systematic approximations, leading to efficient computational schemes that are several orders of magnitude faster than ab initio calculations [13]. Such numerical efficiency in combination with modern computational facilities and linear scaling algorithms, allows application of SE methods to very large molecular systems with extensive conformational sampling. To reliably model the structure, dynamics, and reactivity of biological and other soft matter systems, however, good accuracy for the description of noncovalent interactions is required. In this review [14], we analyze popular SE approaches in terms of their ability to model noncovalent interactions, especially in the context of describing biomolecules, water solution, and organic materials. We discuss the most significant errors and proposed correction schemes, and we review their performance using

standard test sets of molecular systems for quantum chemical methods and several recent applications. PM3 is a semi-empirical method for the quantum calculation of molecular electronic structure in computational chemistry. It is based on the Neglect of Differential Diatomic Overlap integral approximation[15]. PM3 method uses the same formalism and equations as the AM1 method. The only differences are: 1) PM3 uses two Gaussian functions for the core repulsion function, instead of the variable number used by AM1 (which uses between one and four Gaussians per element); 2) the numerical values of the parameters are different[16]. The other differences lie in the philosophy and methodology used during the parameterization: whereas AM1 takes some of the parameter values from spectroscopical measurements, PM3 treats them as optimizable values. Semi empirical PM3 calculations have been the best in predicting the geometric properties and vibrational frequencies of transition and organometallic metal complexes .This was further confirmed with this study which also shows that PM3 calculations worked perfectly as it predicts closely the calculated properties with experimental results [17].

Synthesis of aspirin:

The synthesis of aspirin was classified as an esterification. Salicylic acid reacts to an ester group (R-OH → R-OCOCH$_3$). This process aspirin and acetic acid, which is a byproduct of this reaction [18]. Small amounts of sulfuric acid (and sometimes phosphoric acid) are used as a catalyst. This method is commonly used in university graduate laboratories.



2-acetoxybenzoic acid

Molecular quantum mechanics, is a branch of physical chemistry that focuses on the application of quantum mechanics to chemical compounds to calculate the electronic contributions of molecules and solutions at the atomic level Physicists[19].

Calculations:

Result And Discussion

Geometric Parameders : In this paper, the geometric shape were calculated(bond lengths and bond angels) of aspirin using PM3 According to the results calculated and recorded in the **(table 1)**

Molecular formula $C_9H_8O_4$

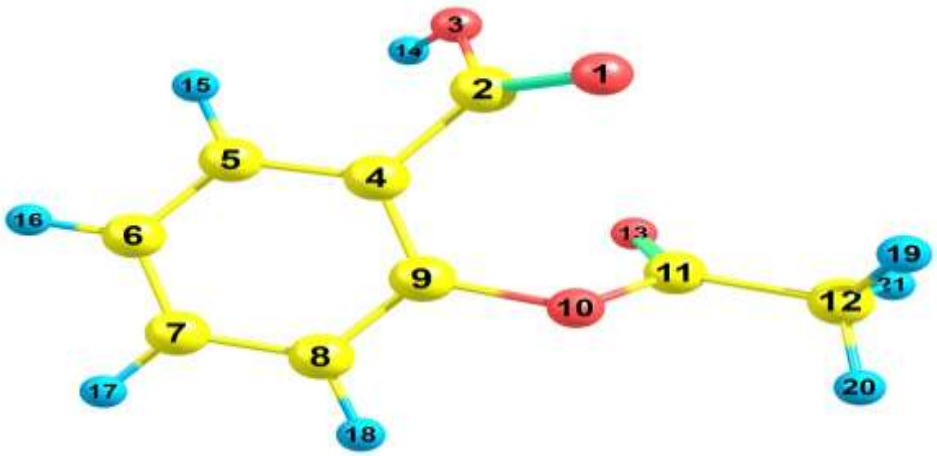


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Table 1 : Calculated geometric parameters (bond lengths and angles in Angstrom for aspirin

(bond lengths		*angles*	
R(1-2)	1.206	A(1-2-3)	119.7
R(2-3)	1.356	A(1-2-4)	124.4
R(2-4)	1.488	A(3-2-4)	115.8
R(3-14)	0.951	A(2-3-14)	116.4
R(4-5)	1.393	A(2-4-5)	119.7
R(4-9)	1.391	A(2-4-9)	122.0
R(5-6)	1.384	A(5-4-9)	118.3
R(5-15)	1.073	A(4-5-6)	121.1
R(6-7)	1.387	A(4-5-15)	119.4
R(6-16)	1.072	A(4-9-8)	121.1
R(7-8)	1.386	A(4-9-10)	122.3
R(7-17)	1.072	A(6-5-15)	119.5
R(8-9)	1.381	A(5-6-7)	119.6
R(8-18)	1.071	A(5-6-16)	120.0
R(9-10)	1.389	A(7-6-16)	120.4
R(10-11)	1.371	A(6-7-8)	120.1
R(11-12)	1.485	A(6-7-17)	120.2
R(11-13)	1.207	A(8-7-17)	119.7
R(12-19)	1.083	A(7-8-9)	119.8
R(12-20)	1.081	A(7-8-18)	121.5
R(12-21)	1.078	A(9-8-18)	118.7
A(1-2-3)	1.179	A(8-9-10)	116.6
		A(9-10-11)	123.6
		A(10-11-12)	111.1
		A(10-11-13)	121.7
		A(12-11-13)	127.3
		A(11-12-19)	108.3
		A(11-12-20)	110.5
		A(11-12-21)	109.8

		A(19-12-20)	108.1
		A(19-12-21)	109.7
		A(20-12-21)	110.5

Charges and Electronic Densities

The Calculated for all charges and electronic density of aspirin studied according to the method (PM3, Parametric Method 3) The results showed change in the values of the charges and the electronic density of the atom C8 , O10 has great charge and electronic Density compared with the other carbon (***Table 2***)

Table 2 :Calculated charge and electronic density for aspirin

Atom	Charge	Electronic Density	Atom	Charge	Electronic Density
O_1	**-0.525**	**6.525**	**C_2**	**0.824**	**3.176**
O_3	**- 0.726**	**6.726**	**C_4**	**-0.148**	**4.148**
C_5	**- 0.187**	**4.187**	**C_6**	**- 0.198**	**4.198**
C_7	**- 0.175**	**4.175**	**C_8**	**-0.203**	**4.203**
C_9	**0.423**	**3.577**	**O_{10}**	**-0.783**	**6.783**
C_{11}	**0.767**	**3.233**	**C_{12}**	**-0.520**	**4.520**
O_{13}	**-0.554**	**6.554**	**H_{14}**	**0.439**	**0.561**
H_{15}	**0.237**	**0.763**	**H_{16}**	**0.220**	**0.780**
H_{17}	**0.223**	**0.777**	**H_{18}**	**0.239**	**0.761**
H_{19}	**0.238**	**0.762**	**H_{20}**	**0.202**	**0.798**
H_{21}	**0.206**	**0.794**			

Physical Properties:

Depending on the Parametric Method 3 some of Physical Properties of the molecule studied in this paper. The higher HOMO energy values show the molecule is a good electron donor while the lower value of LUMO energy indicates a weak ability to electron donor and a good electron receiving The negative E_{HOMO} is equal to the ionization potential (IP). HOMO – LUMO gap always refers to higher Kinetic stability and lower chemical

reactivity, so the aspirin is more stable compare to other pervious salicylic acid derivatives**(table 3).**

Table 3: **Calculated Standard energy gap and IP at 298.15K of the Aspirine in ev unite**

Comp.	E_{HOMO} (ev)	E_{LUMO} (ev)	(homo- lumo) ΔE (ev)	IP (ev)
Aspirin	-9.816	2.145	-11.962	0.364

Thermodynamics functions :

The results shown in (**Table 4**) showed that the thermodynamic functions of aspirin

Table 4: Calculated Standard Thermodynamic Function at 298.15K of the aspirin in Kjmol

A^0 KJ/mol	S^0 KJ/mol.K	E^0 KJ/mol	H^0 KJ/mol	G^0 KJ/mol	A^0 KJ/mol
Aspirin	0.439	0.473	2.951	2.512	0.035

Aim of Research

Aspirin, also known as acetylsalicylic acid (ASA), is a medication used to reduce pain, fever, or inflammation So the aim of this paper

1- To recognize the theoretical results prior to clinical and laboratory studies.

2- To know the thermodynamic and physical properties of aspirin and its derivatives to reach a balanced geometric shape that is more stable and less sensitive while using it as a medicine.

Conclusions

Salicylic acid is in the category of antipyretic and analgesic agent Aspirin is a derivative of salicylic acid, but its side effects such as stomach bleeding or allergic reactions make it necessary to provide additional information about aspirin.Theoretical results obtained. In this study are the lowest energy and most stable geometry and some physical and thermodynamic properties.In order to provide additional information in medicinal chemistry to reach drugs that have less biological effects on the human body.

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GROWTH POWDER AND SEED LAYERS ZNO ON FOIL ALUMINUM USING HYDROTHERMAL METHOD

Amel D. HUSSEIN
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GROWTH POWDER AND SEED LAYERS ZnO ON FOIL ALUMINUM USING HYDROTHERMAL METHOD

Amel D. HUSSEIN [1]
Ali Muhsen ALI [2]

Abstract:

Nanopowder and thick seed layers of Zinc Oxide (ZnO) are grown on foil aluminum in size (2x3 cm) by a simple hydrothermal process that is structured as nanotubes. Where the thick seed layer ZnO covers the substrate in a dense and homogeneous texture arranged in vertically aligned nanostructures that differ from powder ZnO via in non-uniformly distributed in addition to randomly oriented. The complete were prepared at 95°C, for 4:30 hours, with a concentration of 0.05 M. Field scanning electron microscope (FE-SEM) and Scanning electron microscope (SEM) were used to characterize their morphologies of growth nanostructure powder and thick seed layers ZnO, which their benefits applications in many fields such as piezoelectric device, biomedical, and in nano-food applications, etc.

Key words: Hydrothermal Method, Foil Aluminum, Powder, and Layers Zno.

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Introduction:

ZnO is a unique semiconductor with thermal stability, characteristic chemical, great exciting binding energy (60 mV), and a huge direct band gap (3.37 eV). As well as multi-performing owing to its wide-ranging applications as optical waveguides, conductive gas sensors, dye-sensitized photovoltaic cells, light-emitting diodes, transparent electrodes, and in several additions in the medical field that are safe for human use, etc. Currently, several approaches have been advanced for the synthesis of nonstructural oriented arrays ZnO (nanowires, nanorods, and nanotubes) containing vapor–liquid-solid, sol-gel, hydrothermal, pulse laser, etc. These are shapes as non-toxic structures which confirmed the practical benefit in biomedical applications and are environmentally friendly, biocompatible, and low cost [1-3].

Recently, many researchers interested in the enhancement of the way of fabricating a flexible substrate that can be used in sensor devices, human motion analysis, and flexible pressure sensors used in the request of wearable electronics, biomedical devices, sports, and human-machine interaction [4, 5].

Nanostructures and semiconductor materials can be beneficial to fabricate wearable biomedical sensors. So, have optical moreover unique electrical properties. Wherever when coating a nano-biosensor causes these to fluoresce in numerous colors on interaction including various pathogens of food fabrics. As well, ZnO nanoparticles NPs beneficial in "clinical antimicrobial wound-healing bandages" [6-8].

Since ZnO is a non-centrosymmetric crystal structure and semiconducting, therefore, the researcher is very interested in the synthesis of ZnO in a variety of methods and procedures with different conditions which can benefit many applications.

Experimental:

Materials and Methods:

ZnO was structured by a hydrothermal process with a concentration of 50 mM, the solution is grown by adding zinc nitrate hexahydrate [Zn $(NO_3)_2.6H_2O$] (ZNH) then, adding placing it upon an equal molar ratio (1:1) of Hexamethylenetetramine [(CH_2). $6N_4$] (HMT). Consequently, the solution is dissolved in deionized water as well as continual stirring.

Combined reactants in addition to foil aluminum (2x3 cm) were deposited inside an autoclave sealed within Teflon, which complicated heating until thermal degradation of HMT is structured on behalf of synthesis through a hydrothermal process in (4:30 h) with heated treatment (95°C) see Fig 1.

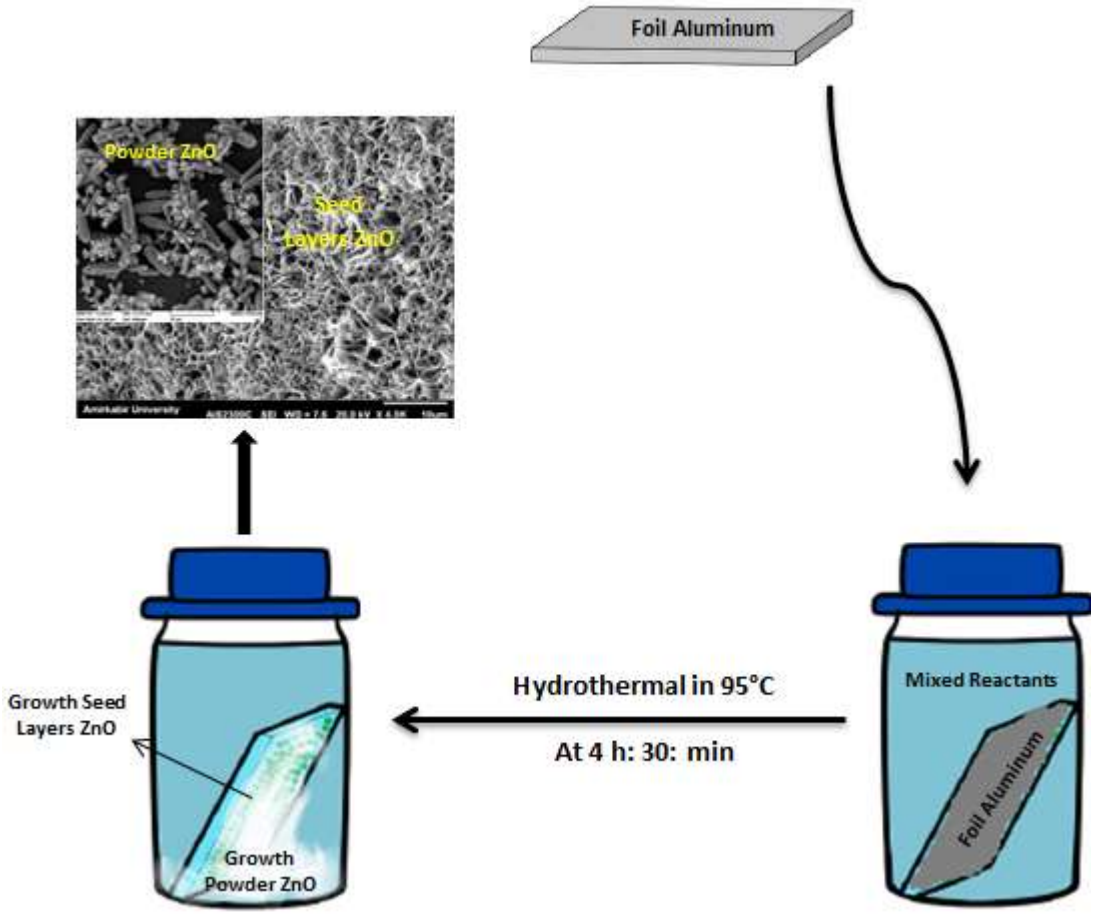

Fig. (1): Expression steps of prepared nanostructure's ZnO nanotubes.

Result and Desiccation:

Characterization ZnO Nanotube Using XRD:

Fig. 2 Illustration result of ZnO NP with (0.05M) ZNH: HMT synthesis in (4:30 h), and heated treatment (95°C). By matching spectral lines with JCPDS card file No (03-065-3411), diffraction lines peaks were constricted at [2θ= 56.755° (110), 47.686° (102), 36.422° (101), 34.565° (002), and 31.897° (100)]. We instructed that intensely small shafting happened to owe to the preparation procedure as indicated [2].

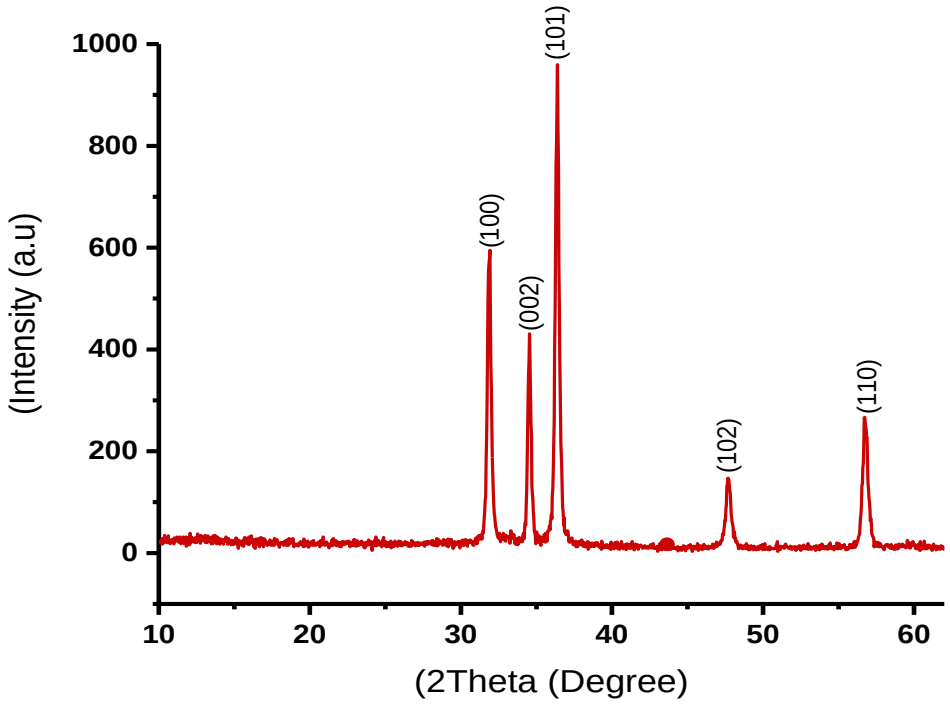

Fig. 2: XRD of ZnO structured using a hydrothermal method with 0.05M

SEM and FE-SEM of preparation ZnO powder and Seed Layers:

Fig. 3 shows FE-SEM of growth nanostructures ZnO NP with different magnifications are randomly oriented in non-uniform arrays of vertically and construction aligned. The nanostructures nanotubes powder ZnO without a seed layer is characterized as disordered; do not form a homogeneous surfacing, where the distribution is irregular and they have different edges, because the growth occurs only on the external defects which were harvested a small number of nucleation centers [9, 10].

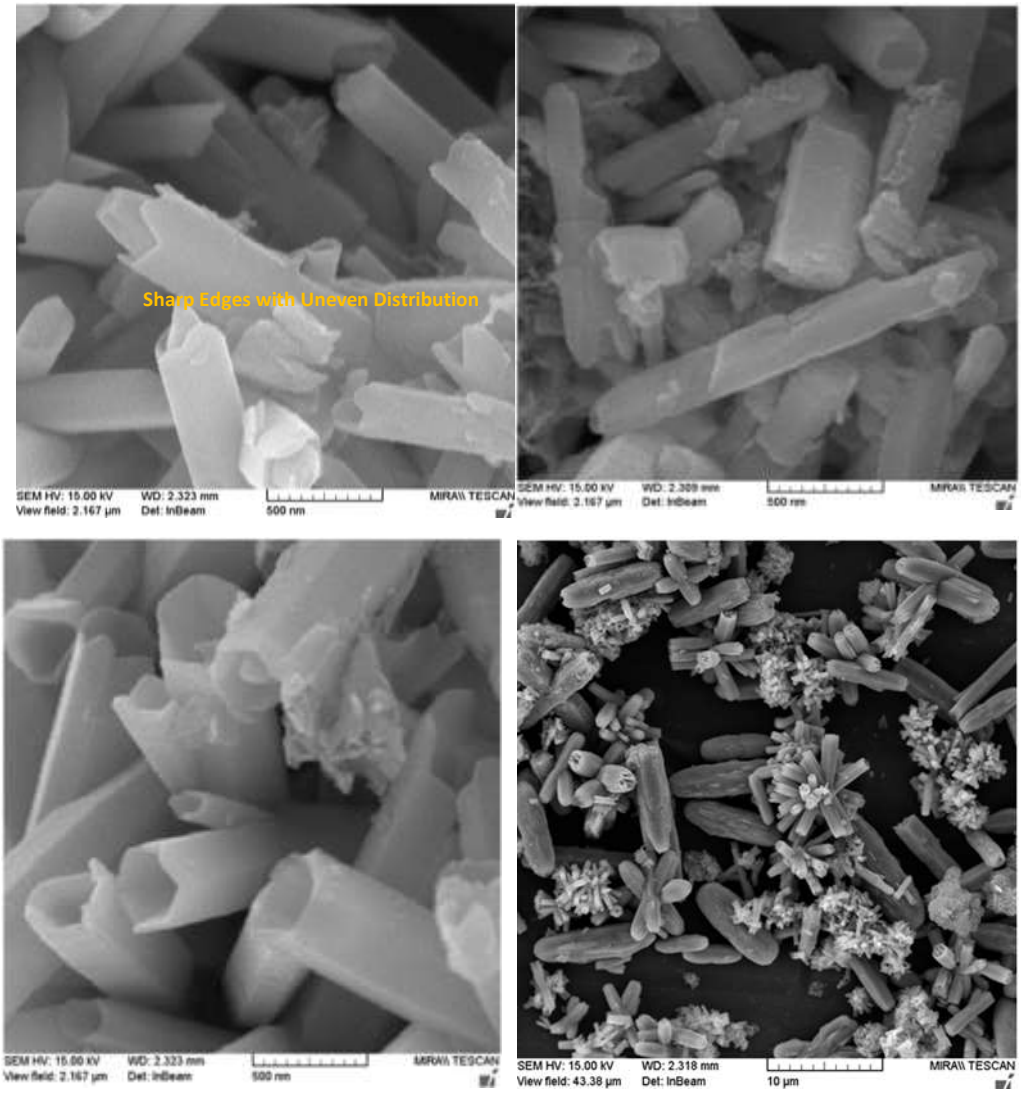

Fig.3: FE-SEM powder ZnO with different magnifications

While in Fig. 4 ZnO nanopowder was prepared at the same temperature, 95°C but for a shorter time, 3:30 h, the surface images were of the composition of stars with the presence of clusters.

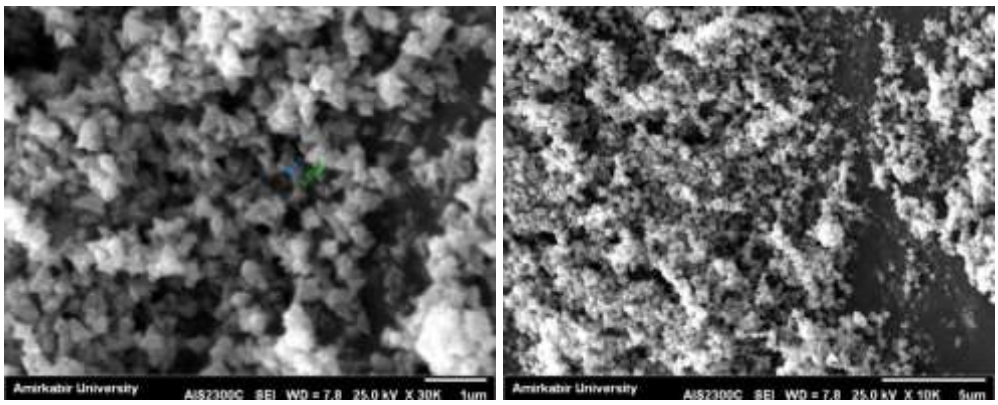

Fig. 4: SEM morphology of ZnO nanopowder in the form of stars

I want to explain the reason for changing the direction of the growing powder ZnO in Fig. 5 which coated the surface of a substrate in a dense and homogeneous texture at a thickness of 110 Mm seeing with a more vertical arrangement than the powder prepared in the same conditions at the same autoclave that the substrate retains heat more than the liquid forming the ZnO, meaning that the period longer growing times of conductive substrate affects the direction of the aligned, denser, and with homogeneous distributions since the heat treatment is one the most parameter which effected on the nanostructure growth process that agreement with [11-13].

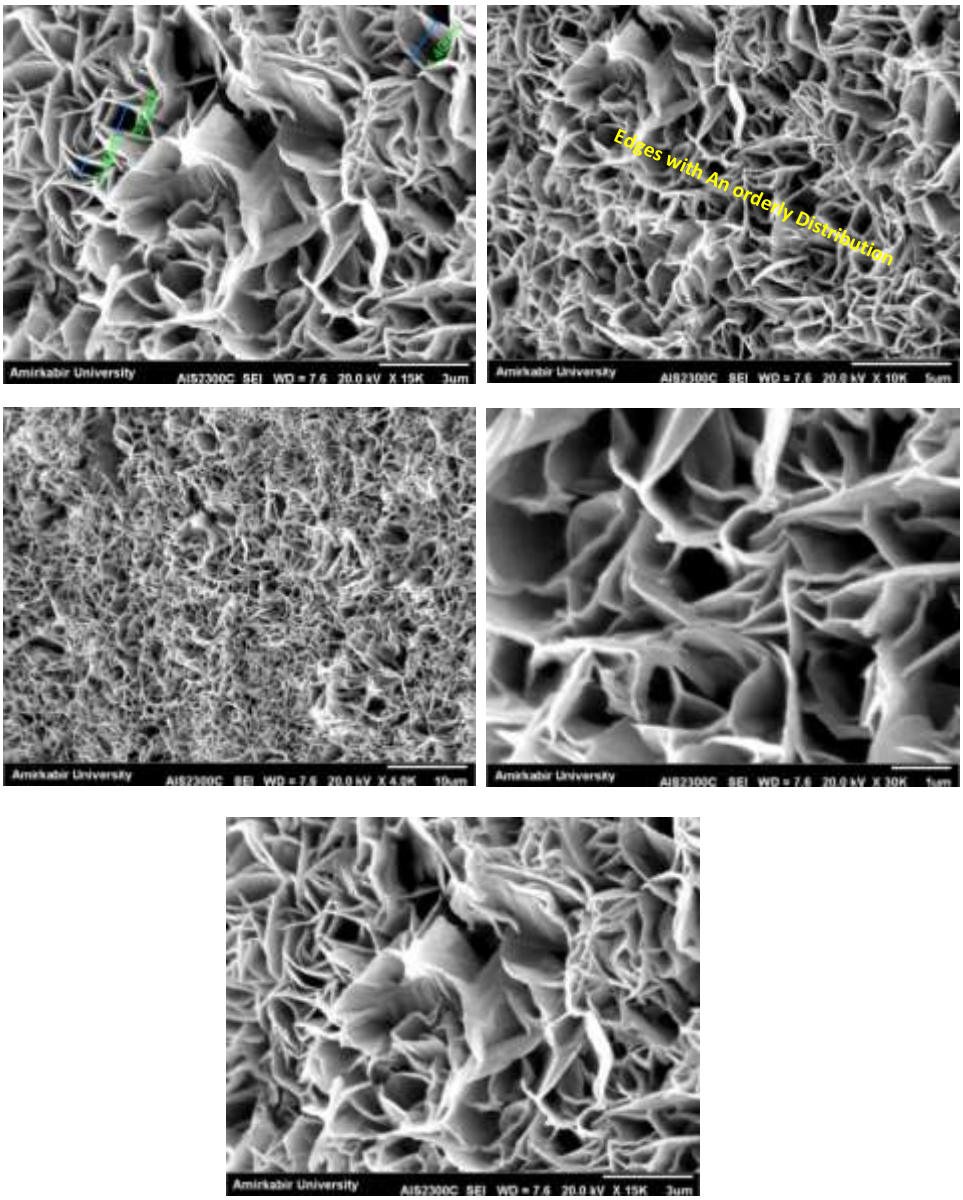

Fig. 5: Seed layers SEM of ZnO nanostructures nanotubes

Conclusion:

In this study growth, ZnO powder, and seed layers nanotubes on foil aluminum substrate were prepared by hydrothermal method. Surface morphology is characterized by SEM and FE-SEM approach where nucleation centers, of seed layers ZnO consenting was growing more oriented that form a well vertically aligned which covering all the surface of a substrate with high density distributed remaining to save heat treatment of substrate since the substrate made from a conductive material.

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ESTIMATING THE EFFECT OF INTERACTIONS OF ENVIRONMENTAL FACTORS ON GRAIN QUALITY BASED ON FACTORIAL EXPERIMENTAL DESIGN

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ESTIMATING THE EFFECT OF INTERACTIONS OF ENVIRONMENTAL FACTORS ON GRAIN QUALITY BASED ON FACTORIAL EXPERIMENTAL DESIGN

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Abstract:

Problem Statement: to study the effect of Carbon dioxide [CO_2], water [W], and nitrogen [N] and their interactions, a factorial experimental design has been proposed in this paper.

Methods: in this research, randomized trials were carried out based on the conditions of the factorial experiments to show the effect of elevated carbon dioxide [e[CO_2]], W, N, and their interactions on protein, zinc [Zn] and iron [Fe] of wheat crop. To determine the effects of interactions of CO_2, W and N on protein, Zn and Fe, the designed experiments are implemented in Matlab to investigate all possible possibilities for primary, binary and triple interactions. Emphasis was placed on binary and triple interactions. We developed the algorithm based on factorial design to study all possible interactions for three factors (e[CO_2], W and N) on protein, Zn and Fe of the wheat crop.

Results: these results suggested that high [CO_2] concentrations under various levels of environmental conditions affect protein, Zn and Fe concentrations in wheat crop negatively, with protein, Zn and Fe were decreased by 4.5%, 3.5%, 4.1%, respectively, during the three-year experimental period.

Conclusion: the analysis revealed that all three factors in the three models harmed protein, Zn and Fe values in the wheat crop.

Key words: Elevated Co_2 (E[Co_2]), Factorial Experimental Design, Protein, Zinc, Iron, Nitrogen, Water.

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Introduction:

In the recent decade, the concentration of Carbon dioxide CO_2 in the atmosphere of the earth has climbed over the years, according to the world health organisation (WHO, https://www.who.int/bulletin/volumes/94/10/15-167031/en/). This raised CO_2 in the atmospheric has fulfilled a boost in crop productivity (Ward, 2007) while diminishing grain quality of cereals and legumes. This raising has consequently harmed human health (Myers et al., 2014). Much research has shed light on the impacts of CO_2 on crops (Buchner et al., 2015; L. H. Dietterich et al., 2015; Fitzgerald et al., 2016).

However, little attention is driven to critical environmental factors, such as the level of both N and water in soil. For example, an abundance of studies have recorded the affair of water use competence, under e[CO_2] levels. Another substantial factor that defines the quality production by N (Njoroge et al., 2014). There is significant usefulness from N in most crops. However, over-fertilisation with N is also a problem (Njoroge et al., 2014). There is strong evidence that elevated CO_2 level can interact with N and water, which influence the quality of crops by detracting protein, Zn and Fe concentrations in the cereal. Thus, modelling the impact of the interaction of high CO_2, water and N on protein, Zn and Fe of crops will provide vital information on how these crops will be influenced in future climate conditions to take convenient measures to cope with this challenge. One of the best methods to offer reasonable solutions for biologists to this phenomenon is the experimental design.

The experimental design is an accurate balancing of various features including “power”, generalizability, different forms of “validity” and practicality. A robust balancing of these features in anticipation will result in an experiment with the best opportunity of providing beneficial evidence to modify the current case of knowledge in a particular scientific area. On the other hand, it is regrettable that many experiments were designed with preventable blemishes. It is only scarcely in these situations that statistical analysis can be the deliverance of the experimenter (Hicks, 1964). The aim is always to actively design an experiment that has the most significant occasion to produce meaningful and justifiable evidence, rather than expecting that proper statistical analysis might be able to correct flaws after the effect. Decently planning an experiment is essential to ensure that the right species of data and appropriate sample size and power are obtainable to answer the research

questions of interest as obviously and expeditiously as potential (Hinkelmann & Kempthorne, 1994).

The experimenter is often concerned about the main influences and the interaction effects of various factors (Skillings, 2018). A factorial design is frequently utilized by scientists to comprehend the effects of two or more independent variables upon one dependent variable. The factorial experimental design provided the best information for the influences of independent variables and their interactions on an experimental model (Dehghan et al., 2010); (de Camargo Forte et al., 2003). The most important utilities of this method are that the effects of single parameters as well as their relative significance are determined and that the interactions of two or more factors could be confirmed (Hunt et al., 2013; Mtaallah et al., 2017); (Salerno et al., 2018); (Carmona et al., 2005); (Fernandez et al., 2002). Current studies in food technology, biological, environmental, medical, psychological and pharmaceutical analysis and industrial-related processes are investigated using experimental design (Hanrahan & Lu, 2006); (Fangueiro et al., 2012); (Al-Asheh et al., 2003); (Abdel-Ghani et al., 2009); (Can & Yildiz, 2006); (Lee et al., 2006); (Shuttleworth, 2009); (Feldman et al., 1997); (Sonebi, 2004); (Cestari et al., 2008); (Meshkini et al., 2010); (Wang & Wan, 2009); (Abdulra'uf & Tan, 2013) (Abdulra'uf & Tan, 2013) (Rathinam et al., 2011); (Vicente et al., 1998); (Amadori et al., 2013).

Agricultural science, with a need for field-testing, often uses factorial designs to test the effect of variables on crops. In such large-scale studies, it is difficult and impractical to isolate and test each variable individually (Lüscher et al., 2000); (Aranjuelo et al., 2005) (Gavito et al., 2001; Pazzagli et al., 2016); (KIM et al., 2003) (Fangmeier et al., 1999). Several groups of researchers performed a factorial design to examine the effect of e[CO_2] on crop nutrients ((Myers et al., 2014); (Fangmeier et al., 1999); (Erbs et al., 2010); (Pleijel & Danielsson, 2009); (Borrill et al., 2014); (D.-X. Wu et al., 2004); (Högy et al., 2009). They discovered that some nutrient compositions reduced in crop under high [CO_2]. Recently, many studies were reported to analyse the impacts of CO_2, water and N on crops employing diverse methods. Of those, statistical techniques were found to be a significant approach to study the effects of environmental factors on crops, and to examine essential issues in connection with nutrients (Asseng et al., 2015; Cai et al., 2016; Erbs et al., 2015; Fernando et al., 2015; Fernando et al., 2014; García et al., 2015; Liu et al., 2014; Lobell et al., 2012; Lv et

al., 2013; Panozzo et al., 2014; Rodrigues et al., 2016; Sánchez et al., 2014; Tack et al., 2015; Valizadeh et al., 2014; G. Wu et al., 2016; Zhang et al., 2016).

However, there is a very limited understanding on how the interactions of e[CO_2], water and N influenced grain quality traits, such as protein, Fe and Zn within a range of functional groups. In addition, neither of those researches concentrated exclusively on the influences of interactions of e[CO_2] with essential factors, such as water and N fertilization on crop' nutrient composition. Also, there are not many kinds of research on how the interactions of e[CO_2], water and N influence on grain protein, Zn and Fe concentrations. Also, the impacts of the interactions of e[CO_2], N supplies and water on nutrients in crops are still not clear (Al-Hadeethi et al., 2017), (Al-Hadeethi et al., 2019).

There are significant knowledge gaps on how crops respond to the interactions of e[CO_2], water and N. When there is more than one factor influencing the production of a particular crop, and each factor has more than one level, there is a need to conduct randomized trials of a particular kind called factorial experiments. Due to it offers the possibility of indicating the significance of each factor as well as the importance of the interactions among them. In this research, different random trials of the wheat crop were taken. The effects were measured on protein, Zn and Fe by considering several factors of e[CO_2], water and N. This research is also involved in studying the impacts of the interactions of the three factors on nutrient compositions in wheat. The proposed method based on factorial design is implemented to accommodate all potential possibilities for primary, binary and triple interactions. Emphasis was placed on binary and triple interactions. This algorithm produced 49 trials for each experiment conducted for over three years. To the best of our knowledge, there have been no studies that discussed these combinations for each experiment.

Materials and Methods

This project proposes an efficient method for analysing the effects of the interactions of CO_2, water and N on grain protein, Zn and Fe concentrations. It consists of five phases. The first phase is the information about the datasets we used. The second phase deals with the classification and organization of the data to efficiently representing the data sets, while the third phase includes building a statistical model to describe the influence of the interactions of CO_2, water and N on grain protein, Zn and Fe of wheat crop. The

methodology was implemented in Matlab to investigate all possible interactions for the three factors of e[CO_2], water, and N on protein, Zn and Fe in wheat crop. The fourth phase presents the results through tables, graphs and discussions. The final stage summarises the levels of interactions of the three factors and discussions of the results. Figure 1 illustrates the methodology of this study.

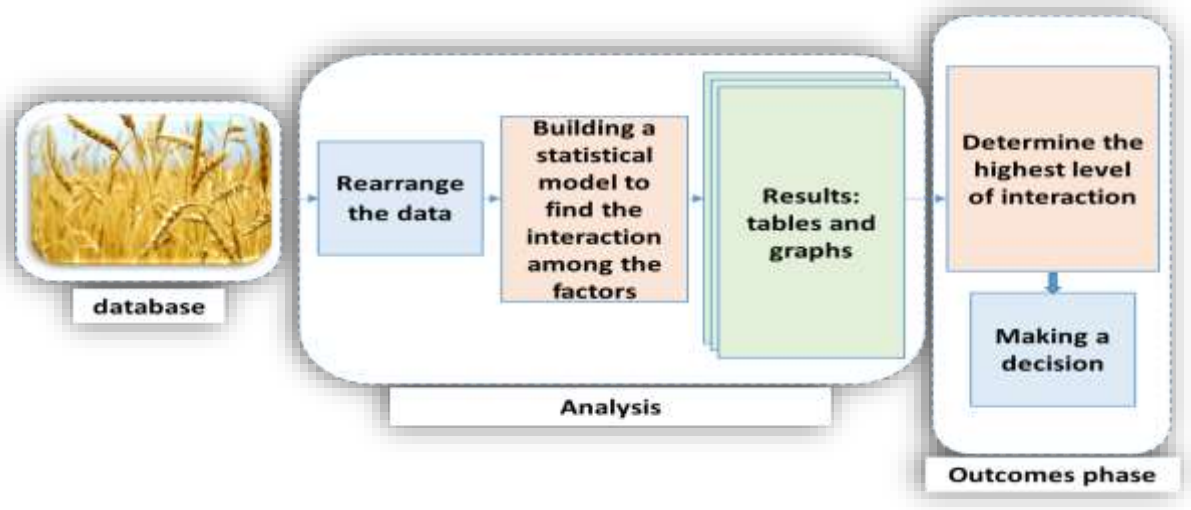


Fig. 1 Illustration of the methodology.

Data selection

The data used in this study was obtained from the website of *Nature (T. G. Dietterich & Horvitz, 2015)* through its URL: http://www.nature.com/articles/sdata201536#data-records. This database contains two parts. One of them is the study results that have been used in our previous research (Al-Hadeethi et al., 2019). The second part is the primary data, the raw data that were used in this research. An extensive reprocessing to the data to make it appropriate to the method implemented in Matlab was performed. The data were sorted by the levels of the studies that we need to analyze. We rearranged the data based on individual experiments. Each experiment datasets contains *replication, year, crop, city, level of CO_2, level of water and level of N*. This study focused on examining the interactions of two different levels of [CO_2] (ambient and elevated), two levels of N (low, medium) and two levels of water (wet and dry) on grain protein, Zn and Fe for wheat in Australia for 2007, 2008 and 2009.

Method: Factorial experimental design

In a factorial model, the influences of all experimental variables, factors, and interaction effects on the response or responses are investigated. If the combinations of *k* factors are investigated at two levels, a factorial design will consist of 2^k experiments (Lundstedt et al., 1998). The choice of sampling or experimental design is fundamental to any statistical study. Factors and levels must be carefully selected by an individual or team who understands both the mathematical models and the issues that the study will address (Coy et al., 2001). Analysis of variance ANOVA was used to analyse the data to obtain the amount of effects of the interactions among the factors.

To investigate the effects of the interactions of e[CO_2], W and N on protein, Zn and Fe in crops, the factorial experimental design was carried out for choosing three factors' practical responses. These three factors of CO_2, W, N were represented by *a*, *b* and *c*, respectively, in the experiments. *ab, bc* and *ac* represent binary interactions of the three factors, and *abc* indicates their triple interaction. Table 1 explains all the possible combinations of the three factors.

Table 1.	
Trial Number	Factor (individual factor)
1	*a*
2	*b*
3	*c*

Table 2.	
Trial Number	Factor (Binary interaction)
4	*ab1*
5	*ab2*
6	*ab3*
7	*ab4*
8	*ab5*
9	*ab6*
10	*ac1*
11	*ac2*
12	*ac3*
13	*ac4*
14	*ac5*
15	*ac6*
16	*bc1*
17	*bc2*
18	*bc3*
19	*bc4*
20	*bc5*
21	*bc6*

Table 3.	
Trial Number	Factor (Triple interaction)
22	*abc1*
23	*abc2*
24	*abc3*
25	*abc4*
26	*abc5*
27	*abc6*
28	*abc7*
29	*abc8*
30	*abc9*
31	*abc10*
32	*abc11*
33	*abc12*
34	*abc13*
35	*abc14*
36	*abc15*
37	*abc16*
38	*abc17*
39	*abc18*
40	*abc19*
41	*abc20*
42	*abc21*
43	*abc22*
44	*abc23*
45	*abc24*
46	*abc25*
47	*abc26*
48	*abc27*

where

Factors: *a* = CO_2, *b* =W (water), *c* = N (nitrogen); *ab, bc* and *ac* represent binary interactions among the three factors, and *abc* indicates their triple interaction.

Binary interaction: interaction between two factors

Triple interaction: interaction among three factors

Each of the factors of CO_2, W and N have two different levels of conditions coded as (-1 and +1) as shown in Table 4.

Table 4. Factor and their levels

Factor	Level	
CO_2	Ambient	Elevate
W	Wet	Dry
N	Low	Medium

A 2^3 full factorial design was carried out to set the mathematical relationships and to represent how protein, Zn and Fe depend on CO_2, W and N. The running order for each run was randomized to minimize possible systematic errors. All the factors and their interaction terms were taken into account. A model can be presented as follows:

$$Y = \beta_o + \beta_{1a} + \beta_{2b} + \beta_{3c} + \beta_{12ab} + \beta_{13ac} + \beta_{23bc} + \beta_{123abc} \quad (1)$$

where Y is either protein, Zn or Fe. β_o is the constant; β_1, β_2 and β_3 were coefficients for the coded variables *a*, *b* and *c*, respectively; and β_{12}, β_{13}, β_{23} and β_{123} were the interaction effects among variables. All the design and analyses of the experiments were implemented in Matlab (version R17). The proposed method was implemented in Matlab to investigate all the possible interactions for the three factors (CO_2, W, and N) on protein, Zn and Fe of the wheat crop. The main effects and interactions of the factors on crop' nutrients were determined. As well as the standard error of the estimates, the sum of squares of the errors, *F* statistics, *p*-value and *t*-test.

From the *p*-values at the smallest level of significance to the rejection of the null hypothesis, it shows that the significant effect of each factor and the interaction impacts are statistically significant when *p*-values are less than 0.05. Since a 95% confidence level and 56 factorial tests, $F_{0,05,1,56,}$ is equal to 4.40, all the effect with *F*-values higher than 4.49 are significant. Student's *t*-test was also carried out to define whether the calculated main interaction impacts were significantly different from zero. With a 95% confidence level (0.05, 63) degrees of freedom, the *t*-value was equal to 2.571.

The hypotheses that we will test are as follows:

H_0: Interaction of CO_2, W and N have no main effect on protein (2)

H_1: Interaction of CO_2, W and N have a main effect on protein

H_0: Interaction of CO_2, W and N have no main effect on Zn (3)

H_1: Interaction of CO_2, W and N have a main effect on Zn

H_0: Interaction of CO_2, W and N have no main effect on Fe (4)

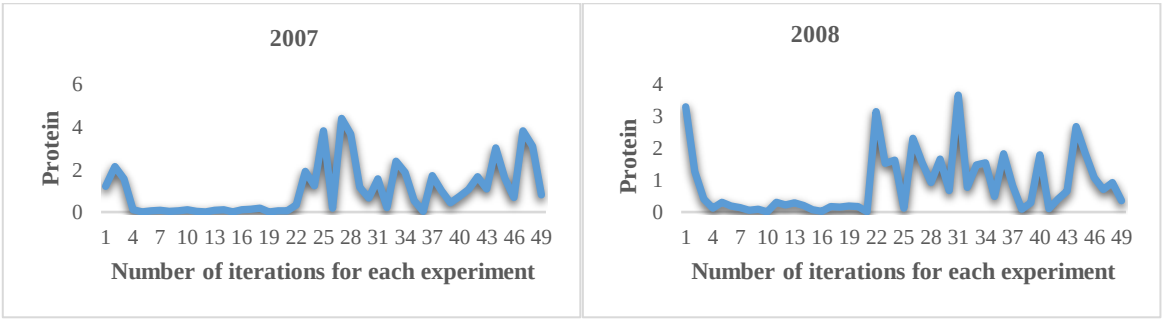
H_1: Interaction of CO_2, W and N have a main effect on Fe

Results

An experimental factorial design is a cost-effective method with a minimum number of trials (Yann et al., 2005). By using an experimental factorial design, a mathematical model was set to analyse the effects of interactions of e[CO_2], W and N on protein, Zn and Fe in the wheat crop. The factors of CO_2, W and N were represented as *a*, *b* and *c* in the model. The results of ANOVA for protein, Zn and Fe for the three-year period were given in Tables 3-11. ANOVA results indicated that three models were significant with the *F*-values. The results showed that all of the three factors in the three models were found to be statistically significant at $p<0.05$ in a 95% confidence interval. This result indicated that the model conditions of *a*, *b*, *c*, *ab*, *ac*, *bc* and *abc* in the three models were all statistically significant. The results in Tables 5-13 showed that all the three factors CO_2, W and N in the three models had a significant effect on protein, Zn and Fe values in wheat crop. The highest impact of the three factors on the protein at an average value of 31 is 4.5% (Fig. 2.), under conditions of elevated CO_2, well-W and low N.

For Zn, the high effect of e[CO_2], W, and N was at an average value of 32 is 3.5% (Fig 3.), under conditions of elevated CO_2, low W and medium N.

While the strong influence of three factors on Fe was at an average value of 25 is 4.1% under elevated CO_2 conditions, wet and low N. (Fig 4.)



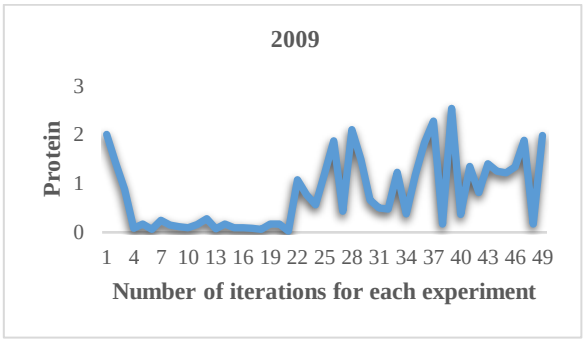
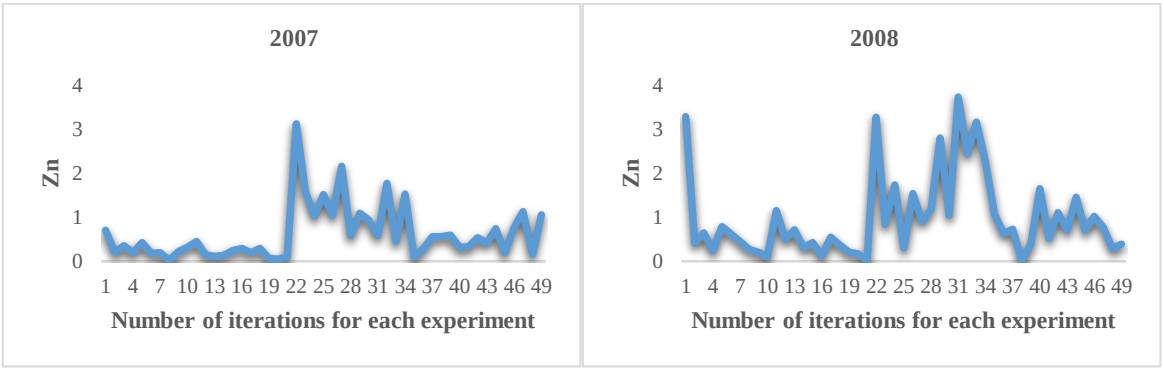


Fig. 2 Effects of elevated [CO_2], W and N on crop protein



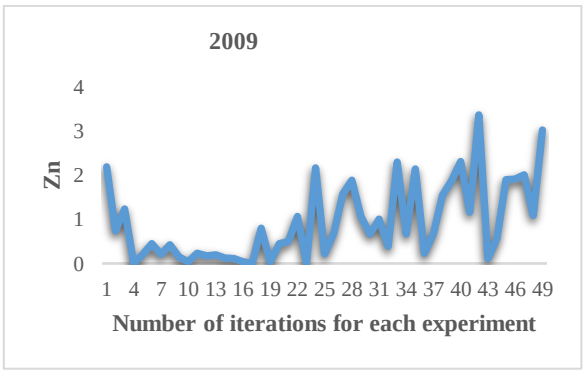


Fig. 3 Effects of elevated [CO_2], W and N on crop Zn

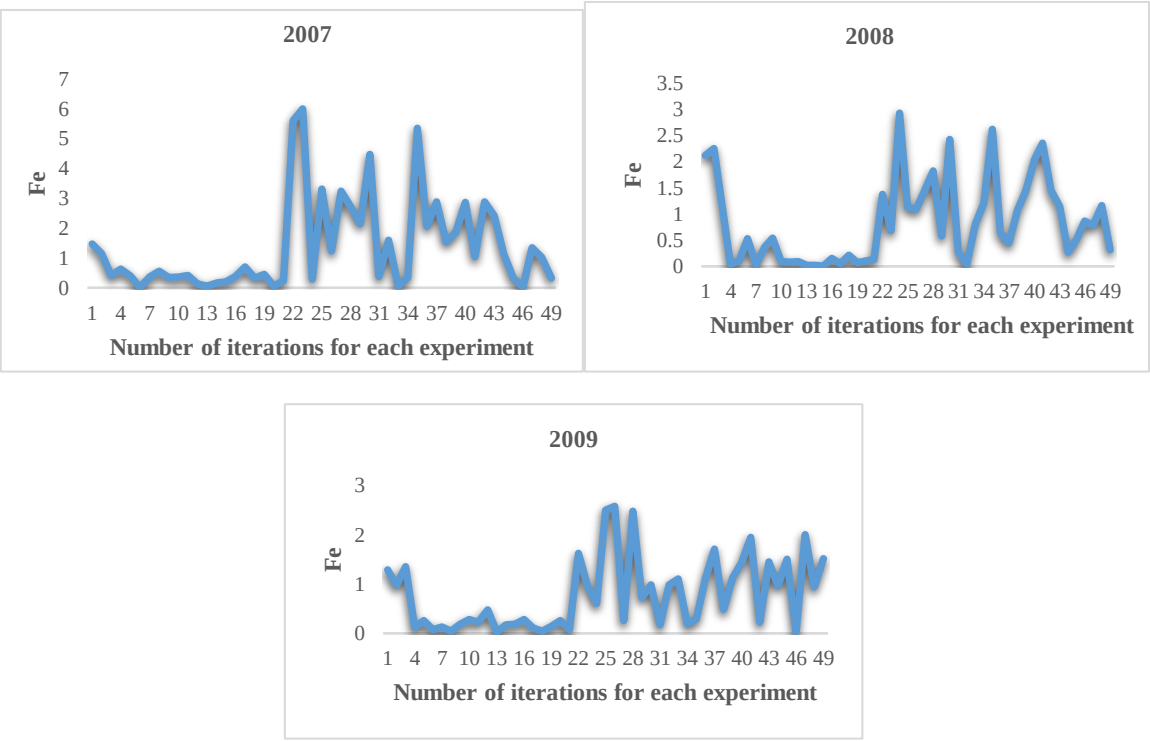


Fig. 4 Effects of elevated [CO_2], W and N on crop Fe

Table 5. Analyses of variance for the factorial model (Protein 2007)

Treatments	*df*	*S.S*	*MS*	*F*	*p-values*
a	1	0.669811	0.669811	20.31639	**
b	1	3.143946	3.143946	95.36063	***
c	1	1.33568	1.33568	40.5132	**
ab	1	3.81575	3.81575	115.7375	***
ac	1	2.386557	2.386557	72.38788	**
bc	1	4.505701	4.505701	136.6647	***
abc	1	5.982861	5.982861	181.4692	***
Error	56	1.846265	0.032969		
Total	63				

*** Non-significance**

**** Medium significance**

***** High significance**

***df* is a degree of freedom**

***S.S* is a sum of error squares**

***MS* is mean squares error**

The results approved the hypothesis of the interaction of CO_2, W and N having the main effect on the protein. A *p*-value less or equal to 0.05 that was accepted, while those with a value exceeding 0.05 were rejected. The reduction in protein concentration was highly significant at binary interactions of (e[CO_2] with W, and W with N) and triple interactions of (e[CO_2], W and N). At the same time, the decrease in protein was medium significant at e[CO_2], N and binary interactions of (e[CO_2] and N).

Table 6. Analyses of variance for the factorial model (Protein 2008)

Treatments	*df*	*S.S*	*MS*	*F*	*p*-values
a	1	11.5113	11.5113	12.55297	**
b	1	0.53374	0.53374	0.582038	*
c	1	1.087325	1.087325	1.185718	*
ab	1	21.96574	21.96574	23.95343	**
ac	1	13.63625	13.63625	14.8702	**
bc	1	1.622914	1.622914	1.769772	*
abc	1	24.17823	24.17823	26.36614	**
Error	56	51.35304	0.917019		
Total	63				

The hypothesis was true. The protein concentration showed a medium decrease at e[CO_2] and binary interactions of (e[CO_2] with W and e[CO_2] with N) and at triple interactions of (e[CO_2], W and N)

Table 7. Analyses of variance for the factorial model (Protein 2009)					
Treatments	*df*	*S.S*	*MS*	*F*	*p-values*
a	1	19.88103	19.88103	18.90737	**
b	1	4.530512	4.530512	4.308634	*
c	1	5.045504	5.045504	4.798404	**
ab	1	24.67493	24.67493	23.4665	**
ac	1	25.69616	25.69616	24.43771	**
bc	1	9.582308	9.582308	9.113021	**
abc	1	31.30538	31.30538	29.77222	**
Error	56	58.88379	1.051496		
Total	63				

The results approved the hypothesis. The lowering in protein concentration had a medium significant, approximately at all individuals, binary interactions and triple interactions of factors.

Table 8. Analyses of variance for the factorial model (Zn 2007)					
Treatments	*df*	*S.S*	*MS*	*F*	*p*-values
a	1	0.020306	0.020306	0.000723	*
b	1	0.286225	0.286225	0.010186	*
c	1	0.041006	0.041006	0.001459	*
ab	1	50.71653	50.71653	5.804835	**
ac	1	115.8927	115.8927	4.824242	**
bc	1	0.373456	0.373456	10.01329	**
abc	1	191.7854	191.7854	6.825013	**
Error	56	1573.621	28.10037		
Total	63				

The results approved the hypothesis of the interaction of CO_2, W and N having the main effect on Zn. A *p*-value less or equal to 0.05 that was accepted, while those with a value exceeding 0.05 were rejected.

The reduction in Zn concentration was a medium significant at binary interactions of (e[CO_2] with W, e[CO_2] with N, and W with N) and triple interactions of (e[CO_2], W and N).

Table 9. Analyses of variance for the factorial model (Zn 2008)

Treatments	*f*	*S.S*	*MS*	*F*	*p*-value
a		462.6263	462.6263	23.7065	**
b		2.398627	2.398627	0.122914	*
c		46.56356	46.56356	2.386071	*
ab		568.7846	568.7846	29.14641	**
ac		599.7013	599.7013	30.73068	**
bc		50.60379	50.60379	22.593106	**
abc		720.2908	720.2908	36.91008	**
Error	6	1092.826	19.51474		
Total	3				

The hypothesis was approved. The reduction in Zn concentration was a medium significant at binary interactions and triple interactions of factors.

Table 10. Analyses of variance for the factorial model (Zn 2009)

Treatments	*df*	*S.S*	*MS*	*F*	*p*-values
a	1	405.5189	405.5189	55.0772	**
b	1	0.039006	0.039006	0.005298	*
c	1	27.58876	27.58876	3.747079	*
ab	1	521.0129	521.0129	70.76349	***
ac	1	443.8989	443.8989	60.28993	***
bc	1	40.91379	40.91379	5.556872	**
abc	1	618.953	618.953	84.06561	***
Error	56	412.3133	7.362737		
Total	63				

The results confirmed the hypothesis. The reduction in Zn concentration was highly significant at binary interactions of (e[CO_2] with W, and e[CO_2] with N) and triple interactions of (e[CO_2] with W and N) while the lowering in Zn concentration was a medium significant at binary interactions of (W with N).

Table 11. Analyses of variance for the factorial model (Fe 2007)

Treatments	*df*	*S.S*	*MS*	*F*	*p*-values
a	1	37.34738	37.34738	6.570862	**
b	1	43.05	43.05	7.574177	**
c	1	8.143889	8.143889	1.432828	*
ab	1	216.7322	216.7322	38.13166	**
ac	1	45.51974	45.51974	8.008701	**
bc	1	51.40664	51.40664	9.044437	**
abc	1	453.1651	453.1651	79.72944	***
Error	56	318.292	5.683786		
Total	63				

*** Non-significance**

**** Medium significance**

***** High significance**

The results approved the hypothesis of the interaction of CO_2, W and N having the main effect on Fe. A *p*-value less or equal to 0.05 that were accepted, while those with values exceeding 0.05 were rejected.

The decrease in Fe concentration was a medium significant at e[CO_2] and W and binary interactions of (e[CO_2] with W, e[CO_2] with N, and W with N) while the reduction in Fe concentration was highly significant at triple interactions of (e[CO_2] with W and N).

Table 12. Analyses of variance for the factorial model (Fe 2008)					
Treatments	*df*	*S.S*	*MS*	*F*	*p*-values
a	1	87.28231	87.28231	11.9626	**
b	1	137.007	137.007	18.77769	**
c	1	0.154056	0.154056	0.021114	*
ab	1	278.3486	278.3486	38.14945	**
ac	1	159.008	159.008	21.79306	**
bc	1	149.0119	149.0119	20.42303	**
abc	1	381.6387	381.6387	52.30602	**
Error	56	408.5909	7.296267		
Total	63				

The results approved the hypothesis. Approximately the reduction in Fe concentration was a medium significant at individuals, binary and triple interactions of factors.

Table 13. Analyses of variance for the factorial model (Fe 2009)					
Treatments	*df*	*S.S*	*MS*	*F*	*p*-values
a	1	90.01266	90.01266	7.77056	**
b	1	50.33903	50.33903	4.345638	*
c	1	85.0084	85.0084	7.338556	**
ab	1	152.6718	152.6718	13.17976	**
ac	1	186.5132	186.5132	16.1012	**
bc	1	165.9007	165.9007	14.32178	**
abc	1	308.0013	308.0013	26.58896	**
Error	56	648.6931	11.58381		
Total	63				

Again, the results demonstrated the hypothesis was true. The concentration of Fe decreased had a medium significant at all levels of interactions of factors (individually, binary and triple).

Discussions

In statistics, the factorial experiments allow a researcher to study how the response variable affected based on each factor, and the effects of interactions among different levels of elements on the response variable. This work suggested that designing factorial experiments to measure the impact of e[CO_2], W and N on the essential nutrients in wheat crop. The experimental models are designed to be able to accommodate many factors with different levels. The experiments were designed to investigate the three essential nutrition elements of protein, Zn and Fe under the influence of three factors e[CO_2], W and N, and each factor has two levels of conditions (for example, wet and dry). This paper focuses on studying binary interactions and triple interactions among factors (CO_2, W or N), to explore the levels of impact on the nutrition elements of protein, Zn and Fe concentrations. For the triple interaction, it was designed to find out the effect of three factors on each individual nutrition element. Fig. 5 shows the diagram of the influences of interactions of CO_2, W and N on protein, Zn and Fe in wheat crop.

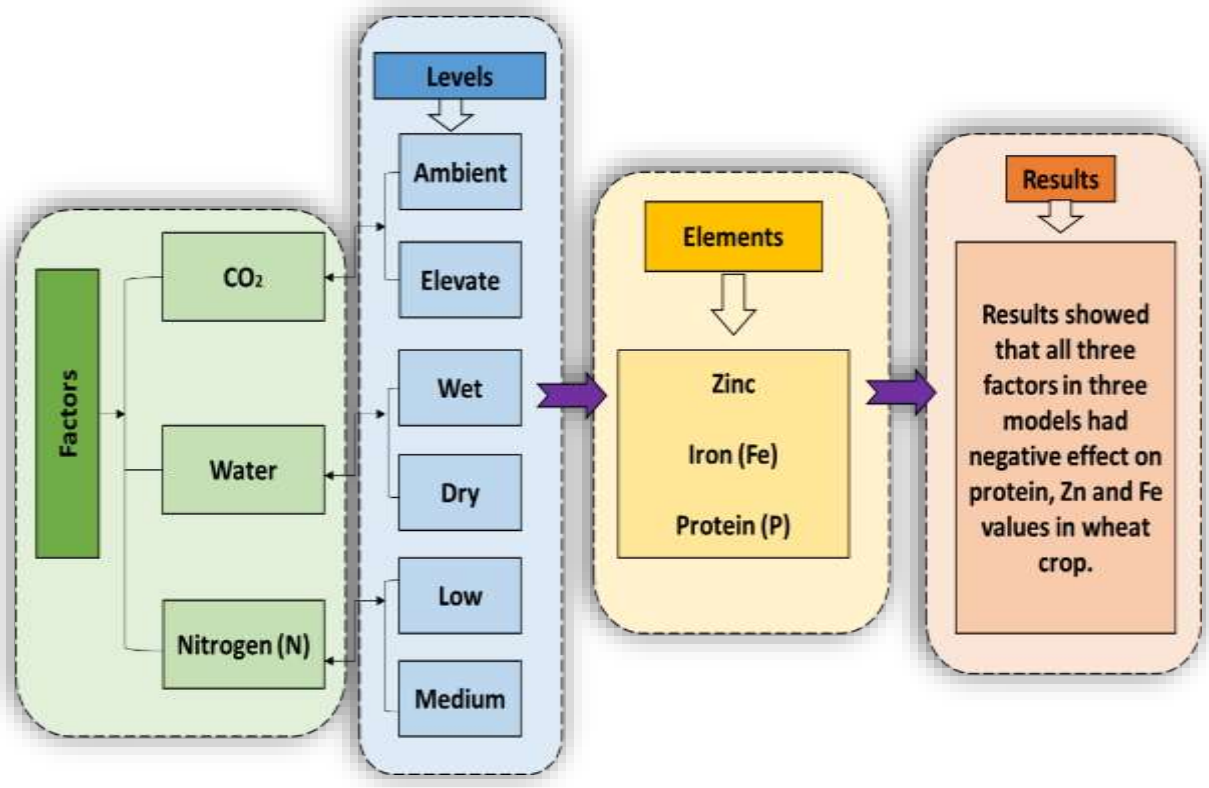


Fig. 5. The diagram of interactions of CO_2, W and N on protein, Zn and Fe in wheat crop.

Conclusions

The 2^3 factorial design was used to investigate the effects of the interactions of e[CO_2], W and N on protein, Zn and Fe in wheat crop. The experimental models indicated that the nutrients in the crop are susceptible to e[CO_2] under W and N conditions. The research results in this study showed that the interactions of e[CO_2], W and N can affect the protein, Zn and Fe concentrations in wheat crop negatively. Where protein, Zn and Fe were reduced by 4.5%, 3.5%, 4.1%, respectively, during the three-year experimental period. The results also indicated that with a careful selection of the W and N conditions under e[CO_2], crop quality can be improved. The proposed method was implemented in Matlab to investigate all possible interactions for three factors (CO_2, W, and N) on protein, Zn and Fe in wheat crop.

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MOLECULAR IDENTIFICATION OF SOME ORNAMENTAL PLANT ROOT ROTTING FUNGI

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MOLECULAR IDENTIFICATION OF SOME ORNAMENTAL PLANT ROOT ROTTING FUNGI

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Abstract:

Plants produced for their beauty rather than their practical utility are known as ornamental plants. There are several sorts of attractive plants such as Rubber, Gladiolus, Iris, and others.

Fungi impacting these plants were isolated and identified using morphological and molecular approaches, including PCR and sequencing the ITS region for the most prominent isolates.

The isolation results showed the presence of *Fusarium ptoliferatum* from Rubber, *Paecilomyces tenuis* from Gladiolus and *Rhizoctonia solani* from Iris.

Sequencing revealed new *Fusarium ptoliferatum*, *Paecilomyces tenuis* and *Rhizoctonia solani* isolates that have been registered at the GeneBank database and registered under the accession number **MT935588, MT936328**, and **MT946901** respectively.

Key words: *Fusarium Ptoliferatum*, Rubber, *Paecilomyces Tenuis,* Gladiolus, Iris, And *Rhizoctonia Solani*.

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Introduction:

Plants produced for their beauty rather than their practical utility are known as ornamental plants. Ornamental plants come in a variety of varieties, including Rubber, *Gladiolus Iris*, and others. Over 10 million hectares of rubber tree (Hevea brasiliensis (Willd.) Muell.Arg.) are planted for latex production in all tropical zones (1). Asia accounts for 97% of the world's natural rubber supply (2). Gladiolus (*Gladiolus grandiflorus*) is a natural ornamental bulbous plant that belongs to the monocot family Iridadceae and has over 150 identified species. Its native habitat is in the Mediterranean and South Africa (3). The Iridaceae family has over 85 genera, the biggest of which being Iris L. (4, 5). There are bearded, crested, and beardless species in the genus. The genus' subsurface sections are generally rhizomatic, bulb and tuber shaped. *Iris* taxa are commercially significant geophytes that produce a variety of secondary metabolites. For a long time, the *Iris* L. species has been used to treat a variety of ailments as an anti-inflammatory, diuretic, analgesic, wound-healing agent, anti-bacterial, anti-viral, and anti-cancer agent (6, 7). This valuable ornamental plant is being plagued by a variety of diseases, including root rot. *Fusarium proliferatum* (Matsush.) Nirenberg, previously Gerlach & Nirenberg 1982, is a fungus with a global distribution that has been linked to a number of illnesses in economically significant plants (8). *Paecilomyces* is a saprobic filamentous fungus that is widely isolated from soil, plants, decaying vegetation, insects, nematodes, and laboratory air (as a contaminant), and it is a source of infection in humans and other animals. This genus contains certain plant pathogens. Despite being widely described as a component of the soil mycobiota, it is also utilized as a biological control against plant infections (9). *Rhizoctonia solani* Khün is a necrotrophic plant pathogen with a practically limitless host range (10). It is a soil-borne fungus that causes seedling damping-off, root, crown, and stem rots, as well as foliar and sheath blights (11). During poor environmental circumstances, this pathogen can persist in soil as sclerotia or mycelia within infected plant material for several years. In nature, it does not create asexual spores and very rarely develops sexual spores (12).

The internal transcribed spacer (*ITS*) region sequence of the fungal rRNA gene is commonly employed in fungal molecular taxonomy research because it gives better resolution for its high variability (12-14). Molecular biology has established an efficient way for fungal classifiers to quickly recognize diverse isolates and localize the illness. It may also be used to distinguish between closely related species that have some morphological

differences, to give information on the connections between several fungal species, and to identify strains of a single species (15-17).

The goal of this study was to isolate the fungi associated with the roots of several ornamental plants and identify the most common fungus using PCR and sequencing to corroborate the morphological diagnosis.

MATERIALS AND METHODS

Isolation of fungi

The roots of diseased ornamental plants were sampled (9). Beneficial Microbes in Agro-Ecology: Bacteria and Fungi is a comprehensive resource on agriculturally essential beneficial microflora that are employed in agricultural production methods. All rights reserved by Elsevier Inc. sanitized for two minutes with 1% sodium hypochlorite solution (NaOCl), dried between two filter papers, and cultured in Petri plates with Potato Dextrose Agar (PDA) at 5 pieces per dish. After five days of incubation at 25 2°C, the fungal growth was purified for identification and utilized in further investigations. Each isolated fungus' frequency was determined.

$$\text{The percentage of frequency} = \frac{\text{The number of times fungi appear}}{\text{The number of total colonies}} \times 100$$

Morphological identification

After cultivating them on PDA and using the following taxonomic keys, the fungal isolates were identified based on the phenotypic features of the colonies and microscopic inspection (11). The purified fungal isolates were stored at 4°C in the refrigerator until use.

Molecular identification

A PCR examination was performed to affirm the phenotypic finding at the species level for the most dominant fungi.

DNA extraction and purification

The process of extracting and purifying DNA from pure fungal culture was carried out using the commercial DNeasy Plant Kits (QIAGEN, Germany). The extraction technique was carried out in accordance with the manufacturer's instructions. The isolated DNA was stored in aliquots at -20oC.

Polymerase chain reaction (PCR)

ITS gene detection was carried out utilizing primers for amplification. To amplify an ITS fragment of 650bp given by IDT, a forward primer (ITS1 F: 5'- TCCGTAGGTGAACCTGCGG-3') and a reverse primer (ITS4 R: 5' TCCTCCGCTTATTGATATGC-3') (12) were used (Integrated DNA Technologies company, Canada.). The PCR was performed in a total volume of 25l, which included 1.5l of DNA, 5l of Taq PCR PreMix (Intron, Korea), and 1l of each primer (10 pmol). The remaining 25µl of the tube contained distilled water. The following procedures were used for the thermal cycling: Denaturation at 94°C for three minutes, then 35 cycles of 94°C for 45 seconds, 52°C for one minute, and 72°C for one minute, followed by a seven-minute incubation at 72°C utilizing a thermal Cycler (Gene Amp, PCR system 9700; Applied Biosystem). After red staining, the PCR products were separated by 1.5% agarose gel electrophoresis and detected by UV (Intron Korea).

Table 1: Primers used in this study (12)

Primer name Sequence	Tm (ºC)	Product size (bp)
ITS1 5` TCCGTAGGTGAACCTGCGG 3`	**60.3**	**650**
ITS4 5` TCCTCCGCTTATTGATATGC 3`	**57.8**	

Nitrogenous Base sequence determination and Bioinformatics analysis

For each sample, about 20l of PCR product containing the forward primer (17pmol) was sent for sequencing (Macrogen, Korea). The Bellerophon tool was used to search for chimeras in the sequencing findings (13). Sequence similarity was achieved by aligning the sequence to existing relevant sequences in the National Center for Biotechnology Information (NCBI) database using the BLAST (Basic Local Alignment Search Tool) program: BLASTN 2.2.27+ (14) Biotechnology Information internet gene database (www.ncbi.nlm.nih.gov) to identify taxonomy categorization. MEGA version 5 program generated a phylogenetic neighbor-joining tree (15) utilizing the Saitou and Nei technique (16).

RESULT AND DISCUSSION

Isolation and identification

Laboratory isolation revealed the presence of many fungal infections on roots. The most prominent isolates were chosen for further study (table 2). The morphological properties of the pure single fungal colony cultivated on PDA proved *Fusarium proliferatum*. The colony seemed white cotton with a faint pink tint that became to dark red in older colonies. After eight days of incubation at 25 2°C, the colony reached 8.5 cm in diameter. Microscopic inspection revealed the appearance of the fungus's three spore types, which were identical to the morphological descriptions of *F. proliferatum* provided by (17, 18), While *Rhizoctonia solani* was confirmed present in the samples isolated from the root area.

Isolated fungus were cultivated, purified, and morphologically diagnosed using dissecting and compound microscopes. Fusarium proliferatum inspection using a compound microscope revealed the existence of microconidia, macroconidia, and chlamydospores generated by this fungus. Microconidia were the most common, with one or two cells measuring 5.7-13.7x2.3-3.4 m. Macroconidia were 27.4-32.3x3.0-3.1 m in size, with 3-5 cells and distinct foot and apical cells, and were barded on short conidiophores. Chlamydospores, on the other hand, were either individuals or short series with diameters of 10.4-12.1x11.0-11.1m. According to, these fungal features were typical of *Fusarium proliferatum* (17, 18).

The front side of *Paecilomyces tenuis* mycelium was milky white while the back side was yellowish brown. Sporulation was dense, conidia were in mass, Irregular form, and smooth surface. The color was initially white then became light yellow.

Microscopy indicated that the *R. solani* colonies were light brown in color and varied in development and the generation of dark-colored conidia. *R. solani* hyphae were long tubes with septa or divisions within. The hyphae branches were tapered and had perpendicular angles. There was a septum and a curve/slightly narrowed at the point of the branch. Young *R. solani* hyphae had branches that formed roughly 45º angles; adult branches will be perpendicular and the same size (19). Because of their thicker cell walls, adult hyphae become rigid (20).

Table 2: The most frequent isolated fungi

Plant	Fungus	Percentage (%)
Rubber (*Hevea brasiliensis* (Willd.) Muell.Arg.)	*Fusarium proliferatum*	35
Gladiolus grandiflorus	*Paecilomyces tenuis*	30
Iris sp.	*Rhizoctonia solani*	32

Molecular Identification

Fusarium. proliferatum, P. tenuis, and *R. solani* Because they were the most prevalent isolated fungus among all analyzed materials, isolates were further identified using molecular techniques. The sequencing of the 650bp PCR amplicon (Figure 3) was performed. The high-quality sequences were aligned to find the closest relative with the greatest similarity, and a NJ tree was constructed (Figures 4, 5, and 6). Sequences with less than 100% similarity were submitted to the GenBank database and assigned the accession numbers **MT935588, MT936328, and MT946901**. The isolates were recognized as *F. proliferatum, P. tenuis* and *R. solani* with 99% similarity to the nearest neighbor (Table 3), and the isolates emerged in their own clade in the NJ tree, indicating that they are unique strains (first registration).

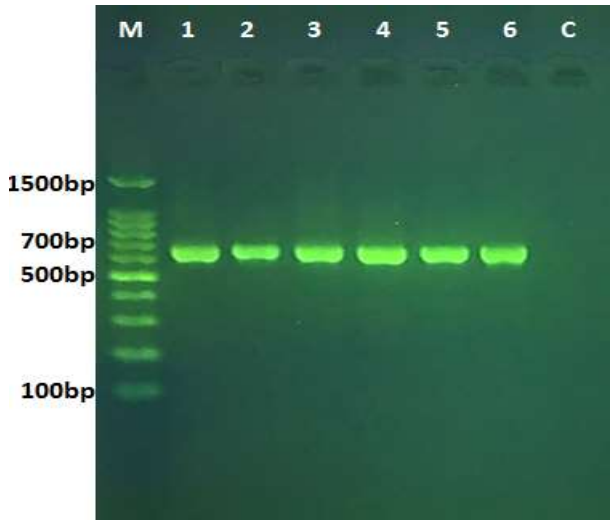

Figure 3: Electrophoretically separated PCR product on an agarose gel (650bp). Lane M is a DNA marker (100pb), lanes 1-6 are ITS region amplified bands, and lane C is a control.

Table 3. New strains sequencing results

Species	Nearest relative Accession	Country	Compatibility	Accession
F. proliferatum	MT560212.1	China	99%	MT935588
P. tenuis	MH027198.1	USA: Michigan	98%	MT936328
R.solani	**ON745560.1**	Iraq: Erbil	99%	MT946901

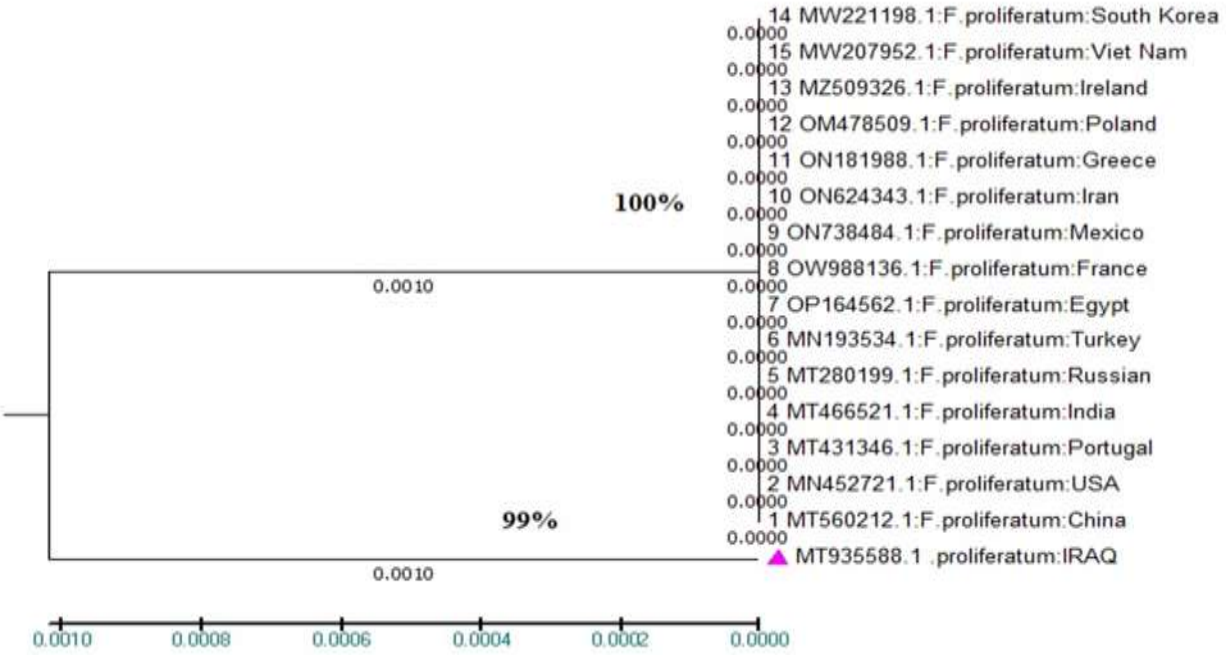

Figure 4: Neighbor-joining tree of the *F. proliferatum* isolate

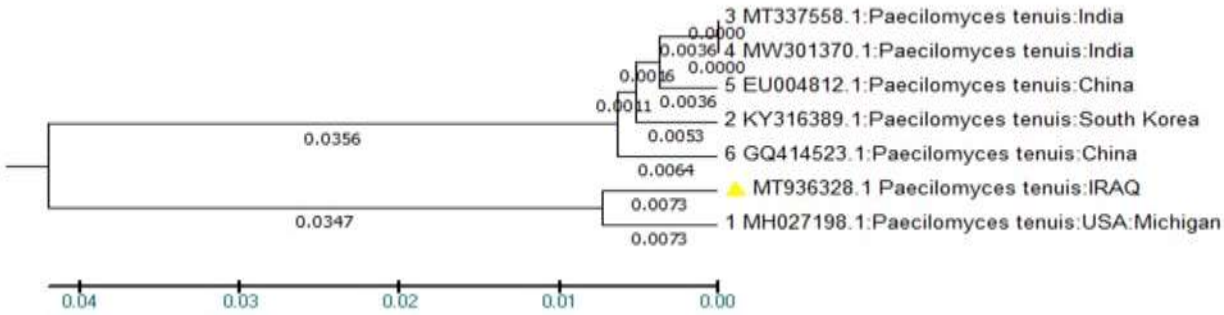

Figure 5: Neighbor-joining tree of the *P. tenuis* isolate

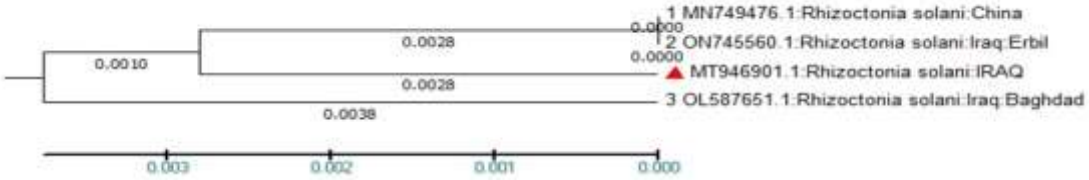

Figure 6: Neighbor-joining tree of the *R.solani* isolate

CONCLUSION

F. proliferatum , *P. tenuis,* and *R. solani* associated with some ornamental plant roots that showed leaves yellowing, and reddish-brown lesions because of rotting, were isolated and described morphologically and identified by sequencing where three new isolates were registered that need more antifungal treatment investigation.

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SIMULTANEOUS SPECTROPHOTOMETRIC DETERMINATION OF LINAGLIPITIN AND METFORMIN USING H-POINT STANDARD ADDITION AND VIERODT'S METHODS

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Abstract:

For the simultaneous determination of linagliptin and metformin in pharmaceutical formulations, two spectrophotometric procedures were described that were direct, accurate, and precise. The first was based on the H-point standard addition method (HPSAM) in which a standard solution of linagliptin was added to a mixture of linagliptin and metformin to monitor the absorbance at the wavelength pair of 231.7 nm and 243.4 nm. Linearity, accuracy, and precision were accepted over the concentration range of 0-3.2 µg/mL and 0.8 - 2.8 µg/ mL for linagliptin and metformin, respectively. In the second method, the simultaneous equation method (Vierodt's method) was developed and validated, where two wavelengths 226 and 238 nm of linagliptin and metformin, respectively, were chosen to form the simultaneous equation. The results of applying Vierodt's method showed that linagliptin and metformin could be quantified simultaneously in the concentration range of 0 - 25 µg/mL and 0 -20 µg/mL, respectively. These methods have been successfully applied to the simultaneous determination of linagliptin and metformin in various synthetic mixtures, and pharmaceutical products.

Key words: Linagliptin ; Metformin ; H-Point Standard Addition Method ; Vierodt'S Method; Simultaneous Determination.

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Introduction:

High blood glucose levels (hyperglycemia) are a symptom of a group of metabolic disorders known as diabetes mellitus (DM) (1). This widespread endocrinological condition, which is linked to morbidity, mortality, decreased quality of life, and higher healthcare costs, is already very prevalent and growing at an alarming rate throughout the world(2). In the presence of chronic insulin resistance, progressive cell dysfunction occurs, resulting in a progressive loss of plasma glucose homeostasis. As a result, glucagon secretion increases, gluconeogenesis increases, renal glucose reabsorption decreases, and the incretin response decreases. (3) DM is classified into type 1 and type 2, T2DM, the most common type, is a progressive disorder caused by -cell dysfunction and insulin resistance, accounting for approximately 90-95% of diabetes cases (1). Glucose accumulates in the absence of insulin, resulting in hyperglycemia. A monotherapy approach and lifestyle modification could result in normalizing glucose levels or slowing disease progression. These methods may not always be enough to maintain glycemic control and reduce diabetic complications (4). As a result, an additional antihyperglycemic pharmacotherapy drug should be included.Metformin HCl it is an oral anti-diabetic agent in type – II diabetes. Is chemically identified as N, N-Dimethylimidodicarbonimidicdiamide. By reducing the amount of glucose absorbed in the intestine and the amount of glucose produced by the liver, it helps to regulate blood sugar. This is done by inhibiting hepatic gluconeogenesis and stimulating glucose uptake in muscle (Figure 1) (5, 6). Drugs used in combination therapy have complementary mechanisms that act on various targets, making it crucial. These complementary effects have brought attention to the use of metformin in combination with a more recent class of anti-diabetic medications, namely dipeptidyl peptidase (DPP)-4 inhibitors (7). Compared to metformin alone, results from clinical trials of linagliptin and metformin given as a single pill combination (LPCs) demonstrate a significant improvement in glycated hemoglobin (HbA1c) and fasting plasma glucose (FPG) (8). Linagliptin belongs to a class of (DPP- 4) inhibitors that delays incretins' rapid cleavage, resulting in higher endogenous incretin levels and an increase in glucose-induced insulin secretion. The overall result is a reduction in post-meal and fasting blood glucose levels. In addition to diet and exercise, linagliptin lowers blood sugar (glucose) levels in patients with T2DM when used alone or in combination with other medications. Chemically known as 1H-Purine-2,6-dione, 8-((3R)-3 aminopiperidin-1-yl)-7-(2-butyn-1-yl)-3,7-dihydro-3-methyl-1-((4-methylquinazolin-2-yl) methyl) Figure 2. (1, 2).

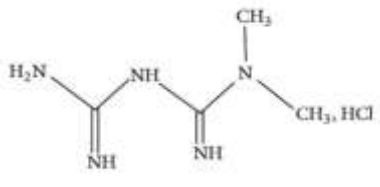

Figure (1): Metformin hydrochloride

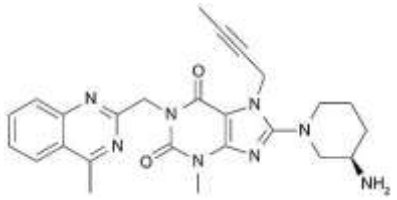

Figure (2): Linagliptin

According to the literature review, several RP-HPLC methods (6, 10–16), a few HPTLC methods, and stability indicating studies have all been reported for the simultaneous estimation of metformin hydrochloride and linagliptin (5, 17–19). Chromatographic and spectrophotometric techniques were also developed (20–26). Several methods, including spectrophotometric, HPLC, stability indicating, and plasma extraction, have been used to determined the drugs metformin, lintagliptin, and empagliflozin, either separately or in combination (2, 3, 27, 28). HPSAM has not been used for the delemination of linagliptin and metformin, according to a letreture review. Therefore, in the current study, two chemometric techniques were developed to simultaneous detrmination of linagliptin and metformin. The first method was based on his HPSAM when both the analyte and the interference are present in the sample. In the current study, two chemometric techniques were developed for the simultaneous determination of linagliptin and metformin. When both analyte and interferent are present in a sample, the first method, was based on HPSAM, allows the determination of an unbiased analyte concentration. The ability of HPSAM to eliminate the presence of an interference and reagent blank is one of its greatest benefit. Additionally, the two components in the sample can be found simultaneously with extensive or even coincident overlapping spectra (29) . It is important to adhere to the method's principles. The analyte signal should be linear with its concentration at the two chosen wavelengths, whereas the interferent signals should remain constant even if the analytical concentrations are altered(30). The procedure makes use of analytical signal data at two chosen wavelengths, providing two straight lines that have a common point with coordinates H (-C_H and A_H), where -C_H is the unknown analyte concentration and A_H the analytical signal due to an interferent. The second approach (Vierodt's method) was based on simultaneous equations techniques. This procedure was used on a sample of two medications, linagliptin (X) and metformin (Y), each of which absorbs light at the maximum wavelength of the other. The absorbance of the mixture at any wavelength is equal to the sum of the absorbance of each component at that wavelength.The two methods are simple,

cheap, accurate, sensitive, and selective for simultaneous determination of linagliptin and metformin in pure and tablets.

2. Materials and Methods

2.1 Equipment used

The spectrophotometer used was a Perkin Elmer Lambda 25 UV/Vis. double-beam spectrophotometer with quartz cells 1 cm in width. The samples were weighed using a sensitive balance (GR-200).

2.2. Materials and reagents

The Awa Medica pharmaceutical company in Hawler, Iraq, supplied pure drugs, and all chemicals used were of a very high degree of purity.

2.3 Stock standard solution (100µg/ml)

A standared solution of linagliptin and metformin were prepared by dissolving 0.01 g of the pure material in 100 mL of HPLC reagent grade methanol (MeOH).

2.4 Spectrophotometric determination of linagliptin and metformin in mixture using the HPSAM.

2.4.1 Preliminary Study

Several preliminary tests were carried out using each 10µg/mL linagliptin, and metformin in various solvents (MeOH) to assess theimpact of the solvents on the spectra of these drugs. The absorption spectra in the range of 200 to 350 nm were measured.

2.4.2 Absorption spectra in methanol

The absorption spectra were measured in the 200-350 nm regions for each 5µg/mL of linagliptin, and metformin, as well as the laboratory-prepared mixture, using MeOH as a blank.

2.4.3 Wavelengthselection

In a series of 10 mL volumetric flasks 0.1 mL of 100 µg/mL of each Linagliptin (Analyte) and metformin (Interference) were added, followed by increasing volumes of Linagliptin (0,0.04,0.08,0.12,0.16,0.2,0.24,0.28,0.32,0.36,and 0.4 mL). Each flask was then filled with MeOH to the mark. Then, measurements were made at different wavelengths.

2.4.4 The accuracy of the selected wavelengths

In a series of 10 mL volumetric flasks 1.0 µg/mL of each Linagliptin and Metformin were added, followed by increasing volumes of Linagliptin (0,0.04,0.08,0.12,0.16,0.2,0.24,0.28,0.32,0.36,and 0.4 mL). Each flask was then filled with MeOH to the mark. Then, measurements were made at the selected wavelengths (231.7 and 243.4 nm).

2.4.5 AH measurement

In a series of 10 mL volumetric flasks, specific linagliptin concentrations (0-4µg/mL) were added to different mixtures of constant linagliptin concentration (1 µg/mL) and variable metformin concentrations (0.8–2.8 µg/mL),and the volume was completed to mark using MeOH. Absorption was recorded at wavelengths of 231.7 and 243.4 nm.

2.4.6 CH measurement

In a series of 10 mL volumetric flasks, specific linagliptin concentrations (0-4 µg/mL) were added to different mixtures of constant metformin concentration (1 µg/mL) and variable linagliptin concentrations (0–3.2 µg/mL),and the volume was completed to mark using MeOH. Absorption was recorded at wavelengths of 231.7 and 243.4 nm.

2.4.7 Determination of linagliptin and metformin in the mixture

Several synthetic mixtures containing different concentration ratios of linagliptin and metformin (ranging between 4:1 and 1:3)were prepared in 10 mL-volumetric flasks; standard additions of linagliptin were made (0– 4 µg/mL) and then,

the flasks were filled to the mark with MeOH , and the absorbance was measured at 231.7 and 243.4 nm .

2.5 Spectrophotometric determination of linagliptin and metformin in mixture using the simultaneous equation method (Vierodt's Method)

2.5.1 Absorption spectra

The absorption spectra were measured in the 200-400 nm regions for each 5µg/mL of linagliptin, and metformin, as well as the laboratory-prepared mixture, using MeOH as a blank. From the overlain spectra two wave-lengths were selected for the formation of simultaneous equation

2.5.2 Construction of calibration curves

Different aliquots of (0-25) µg g/mL linagliptin, and (0-20) µg g/mL metformin were accurately transferred to two separate sets of 10ml volumetric flasks and filled to volume with MeOH. The absorbance was measured at λ 238nm and λ 226 nm for each set, and the absorptivity was calculated.

2.6 Preparation of drug sample

Five tablets of Trajenta Duo were accurately weighed and finely powdered. An accurately weighed amount of the powder equivalent to 500 mg was transferred to a 100-mL volumetric flask, mixed, and complete to the mark with MeOH, to obtain a concentration of 5000 µg/mL metformin, and 25 µg/mL of linagliptin, from which a solution of 100 µg / mL was prepared,and different volumes were diluted to obtain concentrations of 2.5 and 1.5 µg / mL of metformin, corresponding to 0.0125 and 0.0075 µg / mL of linacliptin. since the concentrations of linagliptin are very low, its absorption in the mixture will be very weak , known concentrations of pure linagliptin have been added to obtain concentrations of 2.5 and 1.5 µg/mL, which fall within the standard curve (28)

3. Results and discussion

3.1 HPSAM

3.1.1 Preliminary Study

Several preliminary tests were carried out using 10µg/mL of each linagliptin, and metformin in different solvents) MeOH, methanol , ethanol, sodium hydroxide, water) in the wavelength range from 200 nm to 350 nm to investigate the effect of the solvents on the spectra of these drugs (Table 1, Figures 3 and 4). MeOH, and ethanol are the best solvents for achieving the highest levels of absorption and sensitivity, although the latter was excluded due to measurement instability. As a result, MeOH was used as the solvent for the subsequent tests.

Table (1) Effect of solvents on the absorption of linagliptin and metformin

Solvent and dilution	*Linagliptin (10 µg/mL)*		*Metaformin (10 µg/mL)*	
	λmax (nm)	*Absorbance*	*λmax (nm)*	*Absorbance*
Water	*227.2*	*0.5421*	*232.87*	*0.83340*
	294.8	*0.1805*		
Ethanol	*226.06*	*1.1992*	*238.16*	*1.2163*
	296.35	*0.3911*		
Methanol	*226.07*	*1.1718*	*237.03*	*0.93006*
	295.97	*0.3363*		
Methanol HPLC	*226.07*	*1.236*	*237.87*	*1.0812*
	295.97	*0.3454*		
NaOH	*227.96*	*1.1718*	*232.87*	*0.62241*
	302.02	*0.3908*		

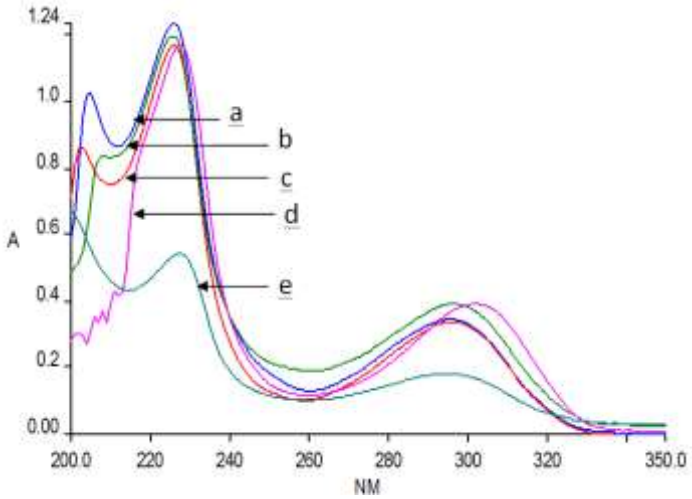

Figure (3) The absorption spectrum of linagliptin (10 µg/mL) dissolved in each of a- MeOH, b- methanol, c- ethanol, d- sodium hydroxide, e- water

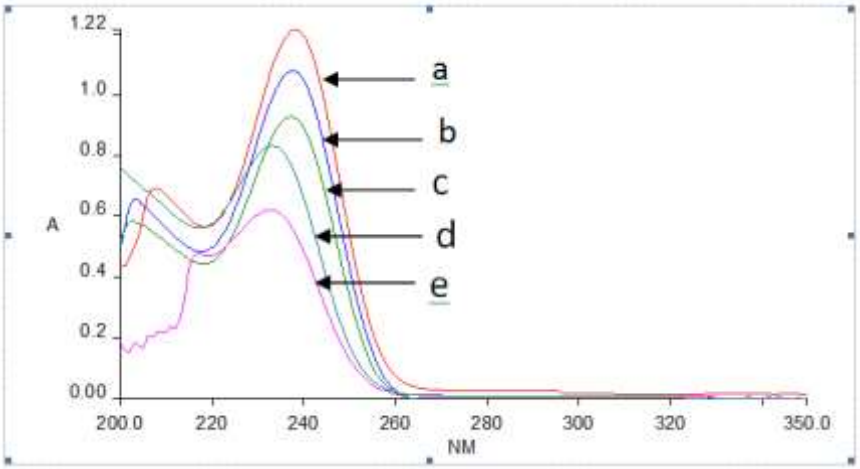

Figure (4) The absorption spectrum of metformin (10 µg/mL) dissolved in a-ethanol, b- MeOH ,c-methanol d- sodium hydroxide ,e- water

3.1.2 Absorption spectra in MeOH

The absorption spectra of 5 µg/mL linagliptin, metformin, and a binary combination of the two were plotted against MeOH as a blank in the 200-400 nm region (Figure 5). Linagliptin's maximum wavelengths are 230 and 299 nm, while metformin's are 215 and 237 nm. The high linagliptin / metfrmin ratio in the pharmaceutical preparations may make conventional spectrophotometry difficult to resolve the mixture. As a result, The HPSAM methodology was chosen since it began with two wavelengths that offer good sensitivity and also has the advantage of standard additional measurements.

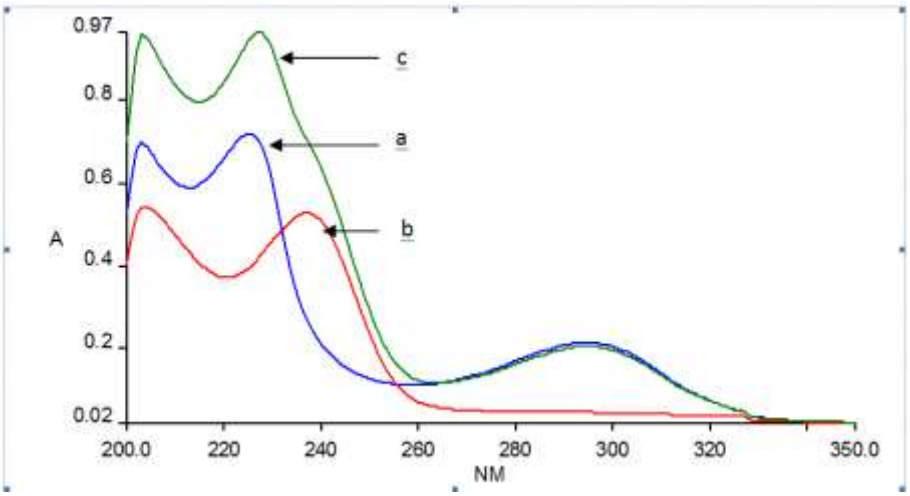

Figure (5) Absorption spectra of a-linagliptin (5 µg/mL), b-metformin(5 µg/mL), and c- mixture in MeOH

3.1.3 Wavelength selection

Linagliptin was utilized as analyte and metformin as interference in these experiments. Different wavelength pairs were tested, as seen in Table 2. In order to test the mixture's absorbance at the two chosen wavelengths, known analyte amounts were added to the mixture of interference and analyte. The result shows that the ideal pair of wavelengths for obtaining the maximum linagliptin recovered was 243.4-231.7 nm.

Table (2) Choosing the appropriate wavelengths for drug analysis

Wavelength (nm)	*A-C Equation*	*R2*	*Amount taken (µg/mL)*		*Amount found (µg/mL)*	*Absorbance (AH)*
			Linagliptin	*Metformin*	*Linagliptin*	*Metformin*
234.3-241.2	*Y234.3=0.0611x+0.0812* *Y241.2=0.0196x+0.0421*	*0.9981* *0.9918*	*1.0*	*1.0*	*0.942*	*0.0236*
232.8-242.7	*Y232.8=0.0614x+0.0825* *Y242.7=0.0208x+0.0408*	*0.9947* *0.9910*	*1.0*	*1.0*	*1.02*	*0.0193*
231.7-243.4	*Y231.7=0.059x+0.0882* *Y243.4=0.0176x+0.0479*	*0.9973* *0.9932*	*1.0*	*1.0*	*0.973*	*0.0307*

3.1.4 The accuracy of the selected wavelengths

To ensure the accuracy of the chosen wavelengths (231.7 and 243.4 nm), the HPSAM curves of linagliptin as analyte and metformin as interference were plotted (Figure 6). The H-point (-CH, AH) is the intersection of the two straight lines obtained, with CH representing the analyte concentration and AH representing the analytical signal due to interference. The CH concentration of linagliptin was determined directly at the x-axis intersection. The results showed that the wavelengths chosen provided good accuracy, with linagliptin recovered at 97.3%.

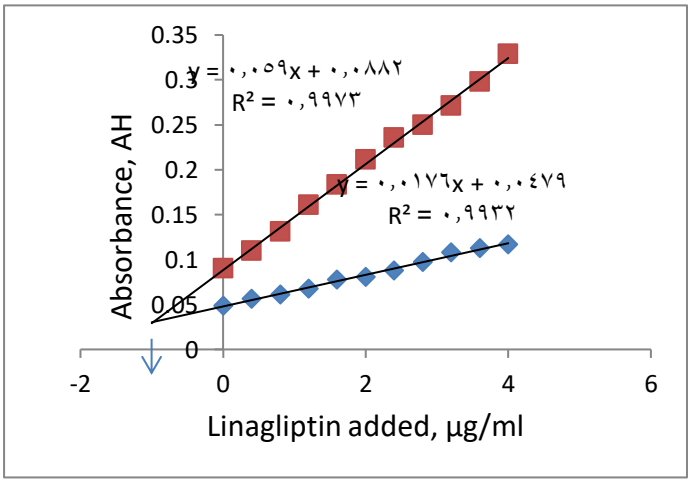

Figure (6) HPSAM curve at the selected wavelengths, λ = 231.7 and 243.4 nm for linagliptin

3.1. 5 Calibration curve of metformin interference (AH)

To obtain the ordinate values of the H-point (AH), certain linagliptin concentrations were added to several mixes of constant linagliptin concentration (1 g/mL) and different metformin concentrations (0.8 to 2.8 g/mL). The absorbance was measured at 231.7 and 243.4 nm. To create a calibration curve for calculating metformin concentration, the obtained AH values (from figure 7) are plotted against the metformin concentration (0.8-2.8 g/mL), as shown in figure 8. Calibration was found to be linear in the concentration range of 0.8-2.8 g/mL, with a positive deviation above 2.8 g/mL, and the recovery of linagliptin and metformin in the mixture shown in table 3.

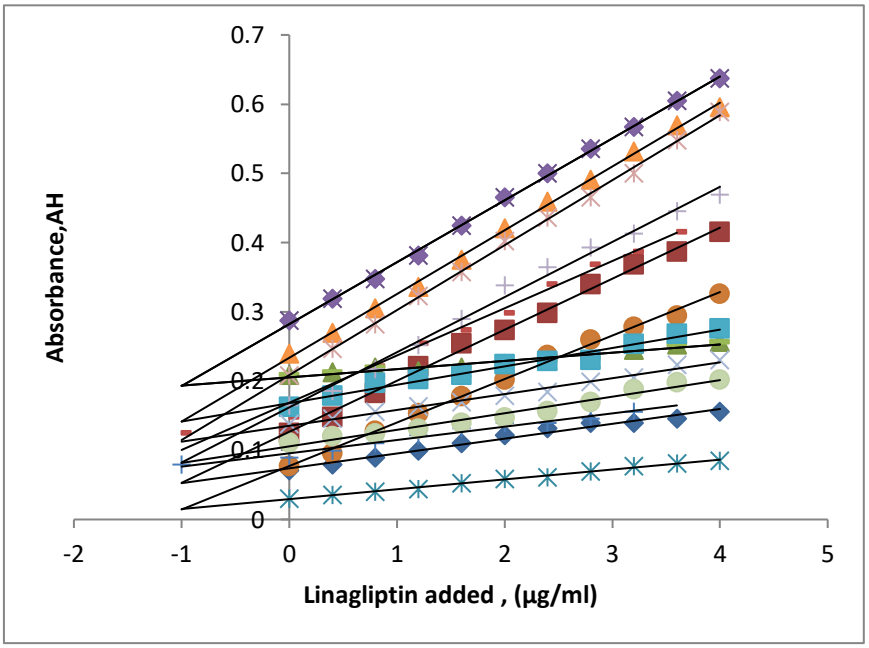

Figure7. HPSAM curves for a fixed linagliptin concentration (1µg/mL) and different metformin concentrations at λ 231.7 and 243.4 nm .

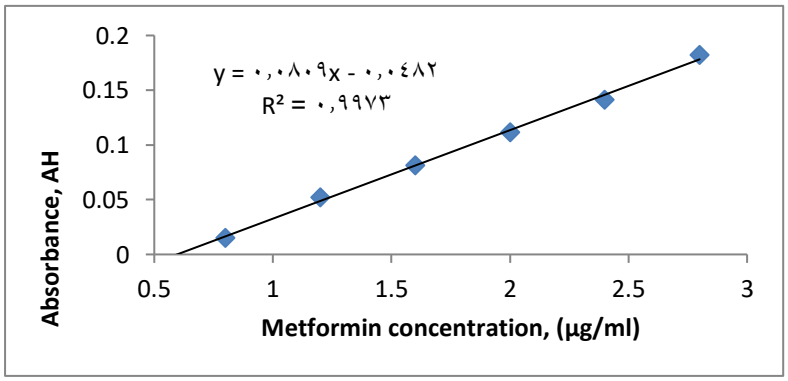

Figure (8) Standard curve for (AH) Metformin with 1.0 µg/mL of Linagliptinin the mixture .

Table (3) equations of the straight line at λ231.7 and λ234.4 and the recovered quantity and percentage of each of linagliptin (-CH) and metformin (AH) in mixture.

A-C Equation	*R2*	*Amount taken (µg /ml)*		*Linagliptin*		*Metformin*	
		Linagliptin	*Metformin*	*Amount found (µg/ml)*	*Recovery (%)*	*Amount found (µg/ml)*	*Recovery (%)*
Y231.7 =0.0628x+0.0772 *Y243.4=0.0142+0.0294*	*0.9961* *0.9935*	*1.0*	*0.8*	*0.9835*	*98.35*	*0.7861*	*98.26*
Y231.7=0.0737x+0.1267 *Y234.4=0.0214x+0.0739*	*0.9960* *0.9783*	*1.0*	*1.2*	*1.0095*	*100.95*	*1.241*	*103.41*
Y231.7=0.0797x+0.162 *Y243.4=0.0239x+0.1056*	*0.9928* *0.9765*	*1.0*	*1.6*	*1.01*	*101*	*1.6024*	*100.15*
Y231.7=0.0938x+0.2086 *Y243.4=0.0229x+0.1354*	*0.9989* *0.9879*	*1.0*	*2.0*	*1.032*	*103.2*	*1.976*	*104*
Y231.7=0.0921x+0.2336 *Y243.4=0.0281x+0.1067*	*0.9984* *0.9061*	*1.0*	*2.4*	*0.9847*	*98.47*	*2.3498*	*97.90*

3.1.6 Standard curve of the analyte linagliptin (CH) in the presence of a fixed amount of the interfering substance (metformin) (AH)

for the determination of the linagliptin, specific linagliptin concentrations (0-4 µg/ml) were added to different mixtures of constant metformin concentration (1 µg/ml) and variable linagliptin concentrations (0–3.2 µg/ml). Absorbance was recorded at wavelengths of 231.7 and 243.4 nm, and the H-point (-CH, AH) was determined figure 9. A calibration curve was plotted between the obtained CH and the linagliptin concentrations (0-4.0 µg/mL) (Figure 10). The calibration curve that obtained was linear in the concentration range of 0-3.2 µg/mL. A good recovery of 96.04–104.70 percent was achieved for linagliptin and metformin in the mixture, Table 4.

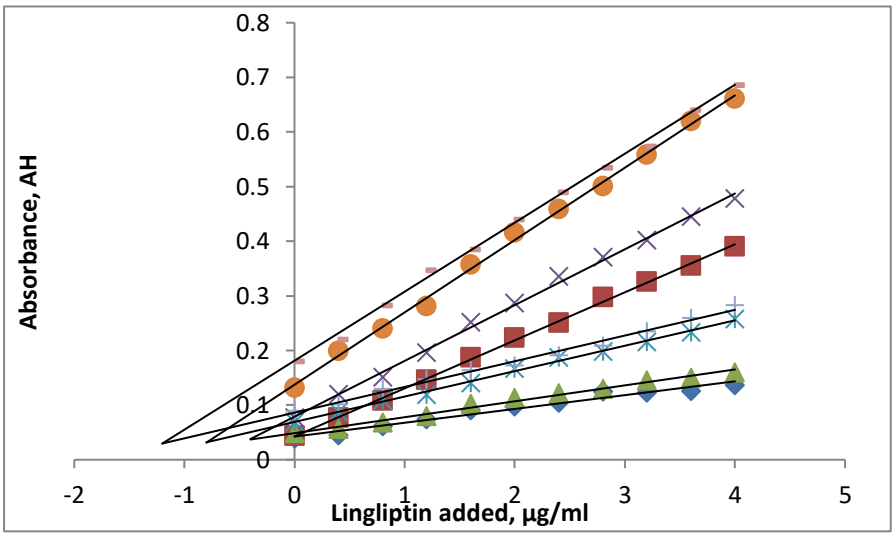

Figure (9) HPSAM curves for a fixed metformin concentration (1 µg/mL) and different linagliptin concentrations at λ 231.7 and 243.4 nm

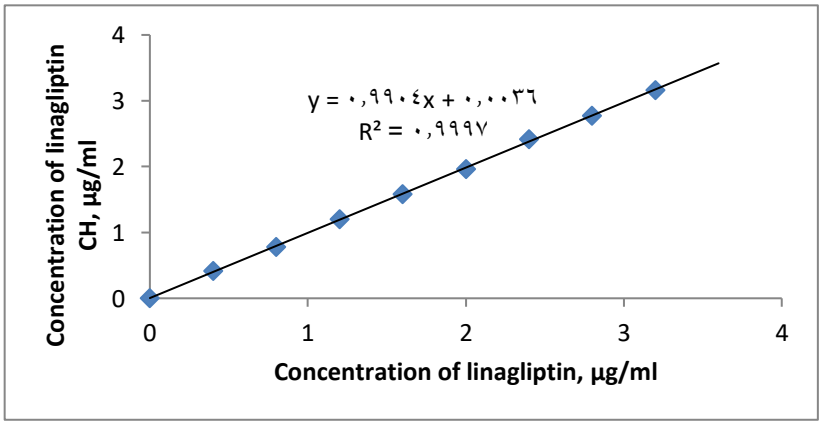

Figure (10) Standard curve for Linagliptin (CH) with 1.0 µg/mL of interfering Metformin(AH).

Table (4) equations of the straight line at λ231.7 and λ243.4 and the recoverable amount of linagliptin (-CH) and metformin (AH) for the mixture

	A-C Equation	R^2	Amount taken (µg /mL)		Linagliptin		Metformin	
			Linagliptin	Metformin	Amount found (µg/ml)	Recovery (%)	Amount found (µg/ml)	Recovery (%)
	$Y_{231.7}$ =0.0879x+0.0427 $Y_{243.4}$=0.0253x+0.0424	0.9986 0.9662	0.0	1.0	0.0	0	1.011	101.1
	$Y_{231.7}$ =0.102x+0.0788 $Y_{243.4}$=0.0291x+0.0487	0.9973 0.9867	0.4	1.0	0.412	103.00	1.04	104
	$Y_{231.7}$=0.1339x+0.136 $Y_{243.4}$=0.0465x+0.0692	0.9971 0.9942	0.8	1.0	0.764	95.5	0.986	98.60
	$Y_{231.7}$ =0.1263x+0.1813 $Y_{243.4}$=0.0471x+0.0862	0.9980 0.9900	1.2	1.0	1.2007	100.05	0.9621	96.21
	$Y_{231.7}$ =0.118x+0.2168 $Y_{243.4}$=0.0452x+0.1016	0.9989 0.9868	1.6	1.0	1.582	98.875	0.9674	96.74
	$Y_{231.7}$ =0.1109x+0.249 $Y_{243.4}$=0.0431x+0.1157	0.9966 0.9888	2.0	1.0	1.966	98.3	0.978	97.8
	$Y_{231.7}$ =0.104x+0.2814 $Y_{243.4}$=0.0419+0.1307	0.9970 0.9875	2.4	1.0	2.42	100.83	0.9542	95.42
	$Y_{231.7}$=0.0983x+0.309 $Y_{243.4}$=0.0393x+0.1452	0.9978 0.990	2.8	1.0	2.776	99.25	1.04	104
	$Y_{231.7}$=0.0954x+0.3348 $Y_{243.4}$=0.0378x+0.1513	0.9962 0.9939	3.2	1.0	3.185	99.53	0.9765	97.65

3.1.7 HPSAM for the determination of linagliptin and met metformin in the mixture

In order to simultaneously determine linagliptin and metformin in a sample, a number of synthetic mixtures with different linagliptin and metformin concentration ratios were assessed using HPSAM. Results of the study are shown in Table 5.

Table (5) results of the analysis of mixtures prepared from linagliptin (-CH) and metformin (AH) in different proportions by the HPSAM method

A-C Equation	R^2	Amount taken (µg /ml)		Linagliptin		Metformin	
		Linagliptin	Metformin	Amount found (µg/ml)	Recovery (%)	Amount found (µg/ml)	Recovery (%)
$Y_{231.7}$ =1.058x+0.1664 $Y_{243.4}$=0.0618x+0.1306	0.9986 0.9990	0.8	1.6	0.813	101.62	1.588	99.25
$Y_{231.7}$ =0.0906x+0.233 $Y_{243.4}$=0.0160x+0.1419	0.9991 0.9271	1.2	2.0	1.22	101.66	2.1	105
$Y_{231.7}$ =0.1065x+0.2212 $Y_{243.4}$=0.0294x+0.0708	0.9967 0.9757	2.0	0.8	1.95	97.50	0.761	95.12
$Y_{231.7}$ =0.0875x+0.3042 $Y_{243.4}$=0.037x+0.1486	0.9953 0.9664	3.0	1.0	3.08	102.66	1.023	102.30
$Y_{231.7}$ =0.081x+0.3813 $Y_{243.4}$=0.0301x+0.2354	0.9941 0.9870	2.8	2.4	2.86	102.14	2.43	101.25

3.1.8 Accuracy and precision of the method

Three replication tests for the study of three different ratios of linagliptin to metformin mixtures were conducted to test the method's accuracy and precision, and it was found that the relative recovery ranges for linagliptin and metformin using the current method were 96.12% and 102.75%, and 97–104%, respectively. In addition, the relative standard deviation range (RSD %) for linagliptin , and metformin were 0.37–1.83 % and 0.55–3.23%, respectively. The method's accuracy and precision met acceptability requirements table 6 .

Table (6) Accuracy and precision of the HPSAM method

A-C Equation	*R2*	*Amount taken (µg/ml)*		*Amount found (µg/ml)*		*Recovery (%)*		*RSD* (%)*	
		Linagliptin		*Linagliptin*	*Metformin*	*Linagliptin*	*Metformin*	*Linagliptin*	*Metformin*
$Y_{231.7}$ =0.0886x+0.301 $Y_{243.4}$=0.0375x+0.1474	0.9942 0.9669	3.0	1.0	3.005	1.023	100.16	102.3	0.37	3.23
$Y_{231.7}$ =0.089x+0.2995 $Y_{243.4}$=0.0291x+0.0487	0.9957 0.9834	3.0	1.0	3.023	0.97	100.76	97		
$Y_{231.7}$ =0.0878x+0.3027 $Y_{243.4}$=0.0371x+0.1491	0.9967 0.9804	3.0	1.0	3.029	1.04	100.96	104		
$Y_{231.7}$ =0.0829x+0.3771 $Y_{243.4}$=0.0313x+0.2313	0.9956 0.9507	2.8	2.4	2.825	2.436	100.89	101.50	0.87	0.55
$Y_{231.7}$ =0.0812x+0.3803 $Y_{243.4}$=0.0304x+0.2341	0.9959 0.9535	2.8	2.4	2.877	2.407	102.75	100.29		
$Y_{231.7}$ =0.0814x+0.379 $Y_{243.4}$=0.0305x+0.2347	0.9968 0.9614	2.8	2.4	2.834	2.428	101.21	101.16		
$Y_{231.7}$=0.1061x+0.1657 $Y_{243.4}$=0.0614+0.1313	0.9988 0.9986	0.8	1.6	0.769	1.63	96.12	101.87	1.83	1.06
$Y_{231.7}$ =0.1057x+0.1674 $Y_{243.4}$=0.0612x+0.132	0.9987 0.9991	0.8	1.6	0.8009	1.6205	100.11	101.28		
$Y_{231.7}$ =0.102x+0.0788 $Y_{243.4}$=0.0291x+0.0487	0.9992 0.9996	0.8	1.6	0.782	1.593	97.75	99.56		

3.2 Simultaneous equations method (Virodet Method)

3.2.1 Absorption spectra

The absorption spectra were measured in the 200-400 nm regions for each 5µg/ml of linagliptin, and metformin, as well as the laboratory-prepared mixture, using MeOH as a blank figure 5 . From the overlain spectra two wave-lengths 226nm, and 238nm were chosen for the estimation of simultaneous equation.

3.2.2. Construction of calibration curves

Two calibration graphs were created by plotting absorbance values as a function of concentrations (µg/mL) atλ 226nm (figure 11) and λ238nm for various liquots of linagliptin (0-25 µg/mL).Another two calibration graphs were created by plotting absorbance values as a function of concentrations (µg/ml) at λ226nm and λ238nm(figure 12) for metformin at

various concentrations (0.2 - 20µg/ml).Linagliptin has molar absorptivity values of $5.5335x10^4$ L mol-1 cm-1 (λ 226nm),and $1.69174*10^4$ L mol-1 cm-1 (λ 238nm), while metformin has molar absorptivity values of 1.17283*104 L mol-1 cm-1 (238nm) and 0.86154*104 L mol-1 cm-1 (226nm). Other statistical and optical parameters are mentioned in Table 7.

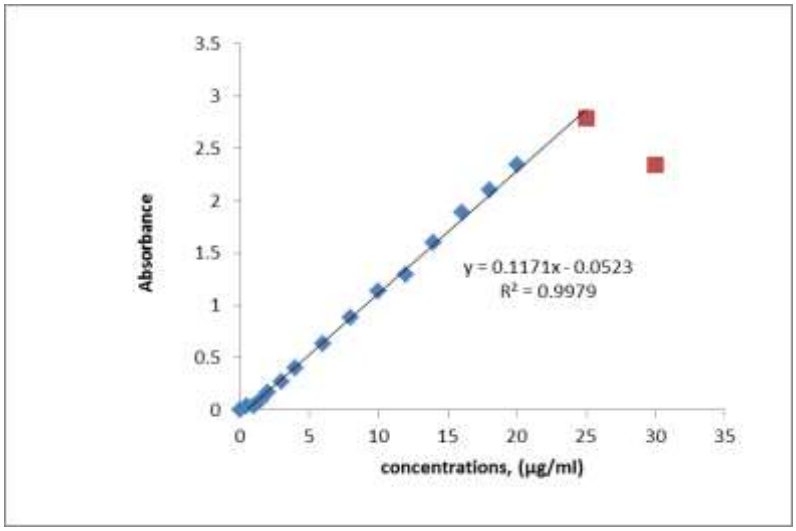

Figure (11) calibration curve of linagliptin at λ226 nm

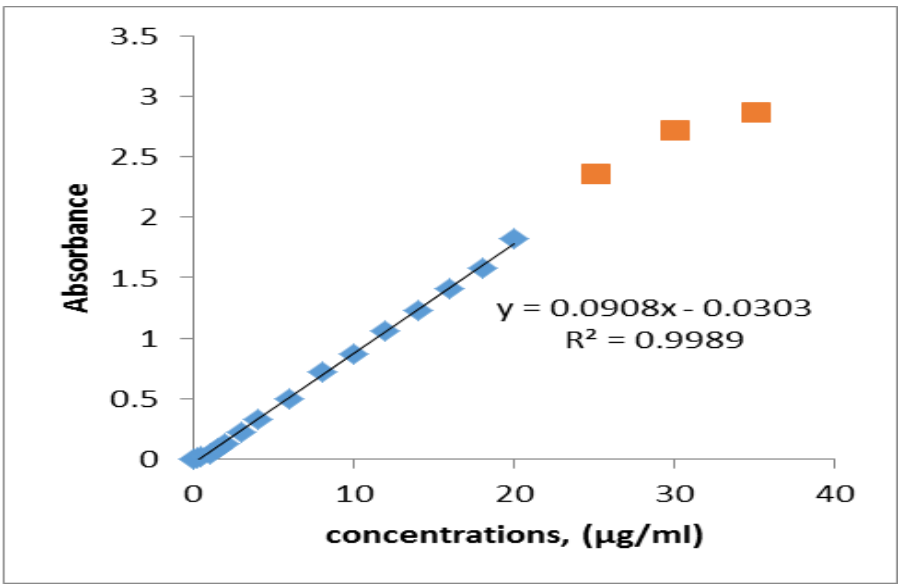

Figure (12) calibration curve of metformin at λ238 nm

Table (7) Statistical parameters of regression equation for the simultaneous determination of linagliptin and metformin by Vierodt's method

Parameters	Linagliptin		Metformin	
λmax(nm)	266	238	266	238
Regression equation	y = 0.1171x - 0.0523	y = 0.0347x - 0.0137	y = 0.0908x - 0.0303	y=0.0358x-0.1463
Correlation coefficient (R^2)	0.9979	0.9987	0.9989	0.9993
linear range (µg/ml)	0-25		0.2-20	
LOD(µg/ml)	0.47		0.28	
Molar absorptivity,a($L.mol^{-1}.cm^{-1}$)	$5.5335x10^4$	$1.69174x10^4$	$0.86154x10^4$	$1.17283x10^4$

3.2.3. Simultaneous equation

This method relies on the construction of two equations based on the idea that the absorbance of a mixture of linagliptin and metformin at 226 nm and 238 nm is the sum of the absorbance at each respective wavelength.

$A_{226}= ax_{226}bCx + ay_{226}bCy$ … (1)

$A_{238}= ax_{238}bCx + ay_{23}bCy$ …. (2)

Where:

A_{226} & A_{238} are the absorbance of the mixture at 226 nm & 238 nm, respectively

ax_{226} molar absorptivity of linagliptin at 226 nm

ay_{226} molar absorptivity of metformin at 226 nm

ax_{238} molar absorptivity of linagliptin at 238 nm

ay_{238} molar absorptivity of metformin at 238 nm

Cx and Cy are concentration of linagliptin and metformin in the sample solution.

By substituting in equations (1) and (2), the concentration of each drug in the mixture can be calculated as follows:

$0.2782= 5.5335x10^4$ Cx + $0.8615x10^4$ Cy

$0.2279 = 1.69174x10^4$ Cx + $1.17283x10^4$ Cy

Cx = 0.2582×10^{-5} Mole/L = 1.2201µg/ml Linagliptin

Cy = 0.15706×10^{-4} Mole/L = 2.028 µg/ml Metaformin

Based on this, the various concentrations of linagliptin and metformin in the binary mixtures can be calculated, as shown in Table (8).The method is consistent with the HPSAM method presented in Tables (4), and can be concluded to be selective for the determination of linagliptin and metformin in the mixture.

Table (8) Determination of linagliptin and metformin in the mixture by Vierodt's method

Amount added (µg/mL)		Amount fount(µg/mL)		Recovery* (%)		RSD* (%)	
Linagliptin	Metformin	Linagliptin	Metformin	Linagliptin	Metformin	Linagliptin	Metformin
1.2	2.0	1.2201	2.028	101.675	101.400	0.92	1.37
2.8	2.4	2.776	2.33	99.142	97.083	1.06	1.90
2.0	0.8	1.963	0.8144	98.15	101.8	2.03	1.02
3.0	1.0	2.97	0.95	99.00	95.00	1.79	3.11
0.8	1.6	0.803	1.56	102.56	100.375	1.14	1.59

***Average of three determinations**

3.3 Application of the HPSAM and simultaneous equations method for the determination of linagliptin and metformin in pharmaceutical preparations

For the purpose of determining the two drugs linagliptin and metformin in their pharmaceutical dosage form, Trajenta Duo tablets, the HPSAM and simultaneous equations methods were used. As can be seen in Table 9, the results obtained by both methods demonstrate the validity of the proposed methods for the selective quantification of the two drugs within the tablet matrix**.**

Table (9) Application of the HPSAM, and Vierodt's method for simultaneous determination of linagliptin ,and metformin in Trajenta Duo tablet

Types of drugs	A-C Equation	R^2	Amount taken (µg/ml)		Linagliptin		Metformin	
			Linagliptin	Metformin	Amount found (µg/ml)	Recovery* (%)	Amount found (µg/ml)	Recovery* (%)
HPSAM								
a Trajenta Duo	$Y_{231.7}$=0.0947x+0.2083 $Y_{243.4}$=0.0381x+0.1248	0.9974 0.9971	1.5	1.5	1.475	98.33	1.443	96.20
	$Y_{231.7}$=0.0861x+0.3707 $Y_{243.4}$=0.0378x+0.2511	0.9973 0.9840	2.5	2.5	2.476	99.04	2.542	101.68
Vierodt's method								
a Trajenta Duo	$A_{\lambda 226}$= 5.5335x10^4 Cx + 0.8615x10^4 Cy A_{238}= 1.69174x10^4 Cx + 1.17283x10^4 Cy		1.5	1.5	1.49	96.66	1.45	99.33
			2.5	2.5	2.52	98.80	2.47	100.80

a-Boehringer Ingelheim , Germany

***Average of three determinations**

4. Conclusion

The direct spectroscopic determination of linagliptin and metformin in mixtures has been successfully carried out using HPSAM, a modification of the standard addition method that enables both proportional and constant errors produced by the sample matrix to be corrected directly. Linagliptin (analyte) and metformin (interferences) were detected in a mixture of 1:2 and 3:1 with recoveries of 96.12 and 102.75%, respectively, and an RSD better than 3.23% at a wavelength of 231.7, and 243.4 nm. Vierodt's method also used different ratios of linagliptin to metformin in a binary mixture of 1:2 and 3:1 with recoveries ranging from 98.15 to 102.56% and RSD 3.11% at wavelengths of 226 and 238 nm. The proposed methods have been successfully used to determine linagliptin and metformin in pharmaceutical preparations with a recovery between 96.20 – 101.68% (HPSAM) and 96.66 – 100.80% (Vierodt method).

The two developed approaches, which were utilized for the simultaneous determination of linagliptin and metformin, are simple, fast, precise, accurate and inexpensive.

List of Abbreviation

Diabetes mellitus…… DM

Type 2 diabetes mellitus……T2DM

dipeptidyl peptidase ……. DPP

Reverse phase-high performance liquid Chromatography…….RP-HPLC

High-performance thin-layer chromatography …….. HPTLC

H-point standard addition method…….. (HPSAM)

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SYNTHESIS AND CHARACTERIZATION OF SOME MULTI DENTATE LIGAND WITH TRANSITION METALS

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SYNTHESIS AND CHARACTERIZATION OF SOME MULTI DENTATE LIGAND WITH TRANSITION METALS

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Abstract:

In this study we synthesized and characterized new complexes containing ((isophthalohyrazide) N,N (1,3-dithioformylphthalamide)) ligand which prepared from reaction between phathalic acid with thiosemicarbazied in the rate of (2:2) presence of the hydraulic acid with some transition metal (Cr(III),Mn(II),Fe(II), Co(II),Ni(II), Cu(II), Zn(II)). Elemental analyses, FTIR (Fourier transform infrared) and UV-vis spectral investigations, magnetic measurement, conductivity measurement, and ^{1}HNMR for the ligand (L) and some of the complexes have all been used to characterize the complexes. The complexes' stoichiometry has been determined from analytical data to be (1:2) (metal: ligand), and conductance results show that they are (1:2) electrolyte.The electronic spectra and magnetic measurements indicate that the type of complexes $[M(L)]Cl_2$ and $[M(L)]Cl_3$ have a tetrahedral environment around the metal ions.

Key words: Thiosemicarbazied, Phathalic Acid, Transition Metal, Tetrahedral, Metal Complexes.

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Introduction:

Many researchers find inspiration in the coordination chemistry of metallo-nitrogen or sulfur compounds because these molecules have unusual stereochemical, magnetic, and spectroscopic features. Yuan and Huynh studied ligand-containing metal complexes that use nitrogen and sulfur as donor atoms. [1-3].

Thiosemicarbazones (Fig.1) represent a versatile class of Schiff based ligands having sulfur and nitrogen as donor atoms. They are typically made through a condensation reaction involving thiosemicarbazide and aldehydes or ketones[4]. Thiosemicarbazones have been used medically to treat leprosy and tuberculosis since the 1950s[5–6].

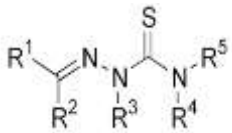


Fig 1: General structure of Thiosemicarbazones,R^1,R^2,R^3,R^4,R^5=H, or any organic substituent

The effectiveness of many bis (5-substituted -l, 3, 4-oxadiazole) sulfides and sulphones against two fungi has been studied. [7]. Another benefit of these compounds is that they provide effective ligands for coordination with metals .Triazoles[8], oxadiazole[9], thiadiazole[10], and transition metal ions were used to create a broad range of coordination compounds.

Superoxide dismutase-like radical scavengers and anticancer chemotherapy have both been studied using the Cu(II) complex of bis(thiosemicarbazone) [11]. However, what has drawn a lot of interest is their application as radioactive copper delivery agents in novel copper-based radiopharmaceuticals and the hypoxia selectivity of a few copper bis (thiosemicarbazone) complexes[12].

Rakesh Tada, Naimish Chavda, and Manish K. Shah condense 3-bromo-4-hydroxy -5-methoxybenzaldehyde with 4- (4bromo- phenyl) thiosemicarbazide to produce new thiosemicarbazides., such as 1-(3-bromo-4-hydroxy-5-methoxybenzylidene)-4-(4-bromo-pheny and their metal complexes were produced by combining 1-(3-bromo-4-hydroxy -5-methoxybenzylidene)-4-(4-bromophenyl) thiosemicarbazide with different transition metal chloride salts of Cu(II), Co(II), and Ni(II). various analytical techniques, They are characterized using techniques like elemental analysis, ^{1}H NMR, FT-IR, GC-MS, and ESI mass spectroscopy.. [13].

Nickel (II) complexes with N,N'-disalicylidene-3,4-diamino-toluene (H_2L_1), N,N'-bis (3,5-di-t-butylsalicylidene) -1,3 diamino propane (H2L2), tetrathiaflavalene-N,N'-phenylene bis (salicylideneimine) These investigations demonstrate the tetrahedral and octahedral geometries of the complexes. [14].

4-hydroxy-4-methyl-2-pentanone-1H-benzimidazole-2yl-hydrazone is a tridentate ligand (H-HpBH), transition metal complexes of Cr(III), Fe(III),Mn(II),Co(II),Ni(II),Cu(II), and Zn were made using this compound, which is created by condensation of 2-hydrazino benzaimidazole and diacetone alcohol (II). Conductance, thermal magnetic, infrared, and analytical, ^{1}HNMR, electronic, mass, and ESR spectrum data have all been used in the characterisation process. Neelama[15] explored the divalent complexes with the general formula $[M(HpBH)Cl(H_2O)_2]$, [M(HpBH)Cl] in square and tetrahedral planar stereo-chemistries, and $[M(HpBH)Cl_2(H_2O)]$ in an octahedral disposition.

Complexes of the new ligand 4[N-(Salicylaldehyde) imino] antipyrinyl semicar- bazide ligand (L_1) with the metal ions Cr(III), Fe(II), Fe(III), Mn(II), and Hg(II) have been synthesized and characterized on the basis of physiochemical investigations, including infrared and electronic spectroscopy and elemental analysis. Based on the aforemen- tioned physicochemical information, an octahedral and four coordinated geometries were found for the complexes. [16].

Experimental

Material and Methods

All of the first supplies were of the highest grade, came from Fluka and BDH, and were used exactly as they were delivered. Using a C.H.N.S elemental analyzer model 2400 Perkin Elmer, the ligands and their complexes were analyzed. Using a Shimadzu AA670 spectrophotometer, the metal content was calculated spectrophotometrically. FT-IR Brucker Tensor 27Co spectrophotometer was used to capture infrared spectra in the 200–4000 cm^{-1} range. At room temperature, the electrical spectrum collected using a Shimadza UV-Vis photography UV1600 spectro- photometer. These measurements were made at a concentration of the complexes in DMSO of 10-3M. Using the Farady method and a Bruker BM6 equipment, the magnetic measurements were performed on the solid state at 25°C.

Utilizing a conductivity meter model PCM3 Jenway, conductivities were measured. These measurements have been made

Preparation of the ligand(L).

A clear solution of (fathalic acid) (0.3g, 0.002 mole) in methanol (10 ml) was added slowly and drop wise to a solution of thiosemicarbazide (0.18g, 0.002mole) in methanol (10 ml),add a few drops of HCl conc., about 30 minutes were spent stirring the mixture. A yellow precipitate was developed after cooling the resultant solution for 7 hours, and it was filtered off., The solid thus obtained after cooling at room temperature ,was washed with petroleum ether (60-80°C) and dried for several hours under suction.

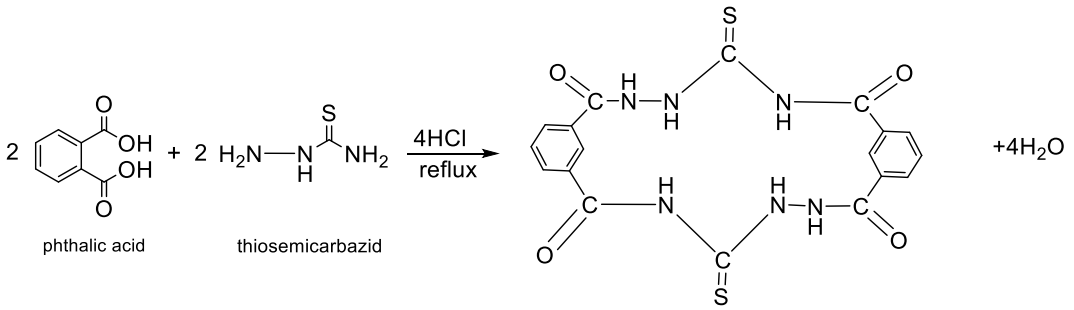
Preparation of $[M(L)]Cl_n$ complexes (M= Cr(III),Mn(II), Fe(II),Co(II), Ni(II), Cu(II), Zn (II) n=2,3)

A stirred solution of the ligand (L) (0.44 g, 0.001 mol) in (10 ml) ethanol was combined with a solution of a metal chloride (0.001 mol) in (10 ml) ethanol. For three hours, the reaction mixture was refluxed. The mixture was periodically rinsed with ethanol and diethylether after being allowed to precipitate for 24 hours at room temperature. It was then dried under vacuum for several hours.

Results and discussion

Ligand:

According to Scheme 1, the ligand is created by substituting phthalic acid with thiosemicarbazid in a (2:2) molar ratio



Scheme 1: Preparation of the ligand

The ligand's infrared spectra exhibits distinctive stretching absorption bands at 3182, 1679, and 761 cm-1, respectively, which are attributed to the (N-H), (O=CNH), and (C=S) groups[17]. The ligand's and their complexes' electronic spectral bands are listed in (Table 2).

Complexes:

The complexes were determined to have the composition shown in Table 1 based on (N&M) analysis. Complexes in DMSO with molar conductance data that indicated they were of an electrolyte nature [18].

The [v(N-H)] band and the amides II and III bands shift toward the lower side during complex formation, indicating that the coordination of the -NH group [N4] through nitrogen. Additionally supporting this is the emergence of a medium intensity band in the 456-529 cm-1 range that is attributed to [(M-N)][19].

The percentage of chlorine was determined by precipitation method (Volhard) [20]. The practically obtained percentages were in agreement with what is expected in theory, which indicates the correctness of the chemical formulas expected for them, While determination of the metal Co^{+2}, Ni^{+2}, Cu^{+2}, Zn^{+2} in the complexes were used standard solution of EDTA and suitable indicator[21] (table 1), while the C.H.N.S. elements for the ligand and the prepared complexes were analyzed at laboratories of Ordu University, Ordu,Turkey.

Chromium (III) :

The Cr(III) complex(1) magnetic moment value was(4.04)B.M compared to, it is greater twisting torque due to the orbital contribution[22]. A band at (26739 cm-1) was visible in the electronic spectra and was linked to the $^4T_1(F)$ $^4A_2(F)$ ν_3 transition ,as for the two bands that belong ~~to ν_2~~,ν_2 they are not clearly visible because they are located in the near IR region and this corresponds to tetrahedral structure[23]

In the IR spectra the complex (1) show a positive shift of υ(S=CNH) by (3160 cm^{-1}) and υ(C=S) by (750) cm^{-1} ,positive shift of υ(O=CNH) by (1698 cm^{-1}) ,the (M-N) also appeared at (529) cm^{-1} [24]

Manages (II) :

The Mn(II) complex (2) exhibits a high spin state and magnetic moments (5.83 B.M) are significantly close to the calculated spin-only value for five unpaired electrons.. Tetrahedral shape is consistent with the absence of any noticeable d-d transition-related absorption in the electronic spectra of Mn(II) complexes [22].

Absorption of this complex was observed in the rang (34246-36675) cm^{-1} This results from the charge transfer bond between the metal and the ligand.(M-L) [25]

In the IR spectra the complex (2) show a positive shift of υ(S=CN-H) by (3204 cm^{-1}) and υ(C=S) by (765) cm^{-1} ,positive shift of υ(O=CNH) by (1723 cm^{-1}) ,the (M-N) also appeared at (456) cm^{-1} ,_These values prove the occurrence of the bonding of the ligand with the metal [26,27].

Iron(III) :

The Fe(II) complex's magnatic moment value (4.71)B.M) was in good agreement with deformed tetrahedral structures [28]. Electronic spectra revealed a band at (14970, 16129, and 18585 cm-1 that was attributed to the $^6A(s) \longrightarrow {}^4T_1(G)\nu_1$, $^6A(s) \longrightarrow {}^4T_1(G)\nu_2$ and $^6A(s) \longrightarrow {}^4T_1(G)\nu_3$ respectively. This transition could be attributed to a tetrahedral structure, and measurements of molar conductance were consistent with their speculative structure[29].

In the IR spectra the complex (3) show a positive shift of υ(N-H) of (S=C-NH) by (3316 cm^{-1}) and υ(C=S) by (798) cm^{-1} ,positive shift of υ(O=CNH) by (1681 cm^{-1}) [30].

Cobalt (II) :

The Co(II) complex (4)'s magnetic moment value was (4.50 B.M), indicating a tetrahedral geometry. Their electronic spectra show one transition, $^2A_2(F) \longrightarrow {}^4T_1(p)$, consisting of two humps at (14925 cm^{-1}) and (15479 cm^{-1}); the splitting of this band is anticipated due to Jahn-Teller type distortion of the tetrahedral structure in the excited state[31], while the Return to the permitted movement in rama while displaying another band at (10245 cm^{-1}) (dxy dyz)[32].

In the IR spectra the complex (6) show a positive shift of υ(N-H) of (S=C-NH) by (3144 cm^{-1}) and υ(C=S) by (763) cm^{-1}) ,positive shift of υ(O=CNH) by (1797 cm^{-1}).Based on these results , the tetrahedral structure of the complex was proposed[33].

Nickel (II) :

A band 3 is visible in the Ni(II) complex's electronic spectra at 16722 cm^{-1} due to the $^3T_1(F) \rightarrow {}^3T_1(p)$ transition in tetrahedral geometry[34]. Bands 1 and 2 are present in the bottom field of the spectra, below the spectrophotometer limits of operation. The Ni(II) complex exhibits a magnetic moments (4.60)B.M. ,while in the IR spectra the complex (7) show a negative shift υ (N-H) of (S=C-NH) by (3076 cm^{-1}) and positive shift of υ(O=CNH) by (1695 cm^{-1}), through these results, it was proved that the association occurs and the formation of a tetrahedral complex[35].

Cupper (II) :

The complex (6) has a (2.4)B.M magnetic moment at ambient temperature, and its electronic spectra revealed a broad band at (16129 cm^{-1}) attributed to a $^2T_2 \rightarrow {}^2E$ transition, which is comparable to complexes with tetrahedral structure[36]

In the IR spectra the complex show a positive shift of υ (N-H) of (S=C-NH) by (3148 cm^{-1}) and υ(C=S) by (797cm^{-1}) and positive shift of υ(O=CNH) by (1699 cm^{-1})[37]

All metal chelates have non-ligand bands in the range of 290 to 340 cm^{-1} in their far IR spectra, and these bands are attributed to (M-Cl). All complexes' spectra exhibit non-ligand bands in the range of 400–500 cm^{-1}, which was identified as the (M–N) band [38].

A tetrahedral structure was proposed[39] since all complexes spectra show non-ligand bands between 400 and 500 cm^{-1}.This band was identified as the (M–N) band.

Zinc (II):

The prepared zinc complex is diamagnetic because it has a full d orbital. The electronic spectrum of the zinc (II) complexes was measured and it gave absorption bands (32990cm^{-1}) and this absorption most likely represent the charge transfer spectra and in a few cases they may be attributed to the ligand bundles, as the ligand transitions may shift to lower or lower

wavelengths. Higher spectra of complexes indicate formation of complexes. From this it can be concluded that the prepared zinc (II) complex (7) have a tetrahedral structure [28,40]

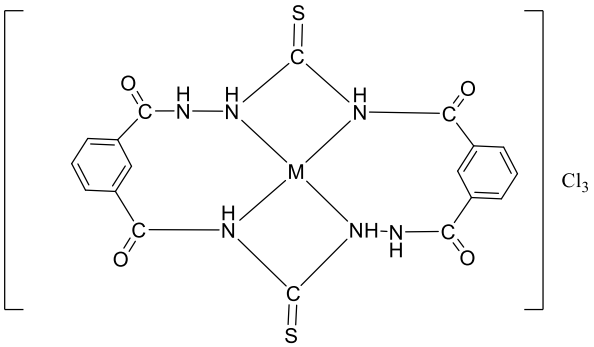
In the IR spectra the complex (7) show a positive shift of υ(N-H) of (S=C-NH) by (3299 cm^{-1}) and υ(C=S) by (797) cm^{-1}) ,positive shift of υ(O=CNH) by (1699 cm^{-1}). This confirms the connection of the metal to the ligand and the form of a tetrahedral structure [33].

^{1}H-NMR Spectra

The ^{1}H-NMR proton nuclear magnetic resonance spectrum of the ligand was measured using DMSO-d6 solvent, the spectrum of the ligand showed band at δ = (10.42ppm) back to the protons of the two imine groups (-NH) and another band at δ = (7.68ppm) back to the protons of the two aromatic rings.[41]

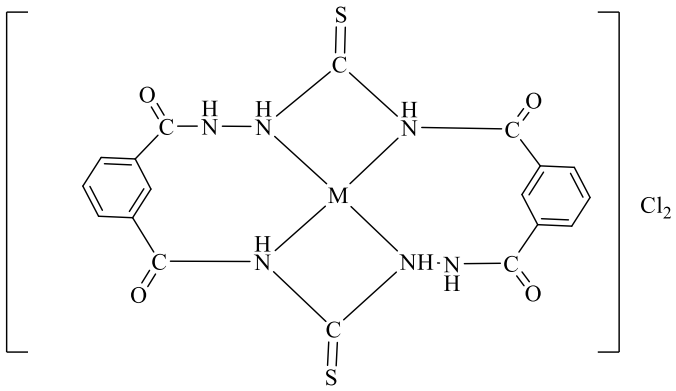
Conclusion

In conclusion, we provide the first report of the synthesis and characterisation of the ligand and its metal complex with (Cr^{+3},,Mn^{+2},Fe^{+3}, Co^{+2},Ni^{+2}, Cu^{+2} and Zn^{+2}). The result of the spectrophotometric analysis , (C.H.N.S), I.R. U.V. Conductivity measurements, determination of the percentage of chlorine and metal were in agreement with the proposed formulation which have a tetrahedral (Fig. 1 and 2).



M= Cr(III), Fe(III)

Fig 1: The suggest structure for the complexes



M= Mn^{+2},Co^{+2},Ni^{+2}, Cu^{+2} and Zn^{+2}

Fig 2: The structure of complexesTable 1: Physical properties of organic salts and their ionic salts

Comp. No.	Structure	m.p (°c)	Yield %	color	Analysis found (calc.) %						*Molar Conductivity* Ω^{-1} .cm².mol^{-1}	μ_{eff}
					C	H	N	S	Cl	M		
L	$[C_{18}H_{16}N_6O_4S_2]$	128-130	82	Yellow	48.87 (46.89)	3.17 (2.98)	19.00 (17.99)	---	---	---	---	Di
1	$[Cr(L)]Cl_3$	280^d	69	Dark Green	35.98 (33.82)	2.33 (3.02)	13.99 (14.13)	15.99 (16.11)	17.71 (18.33)	---	110	2.9
2	$[Mn(L)]Cl_2$	108-109	68	Grey	38.04 (39.21)	2.47 (1.92)	14.79 (13.88)	11.27 (12.11)	12.50 (11.95)	---	68	5.83
3	$[Fe(L)]Cl_3$	92^d	74	Green Black	35.75 (33.65)	2.32 (2.01)	13.90 (12.94)	15.88 (14.94)	17.60 (18.79)	---	90	4.71
4	$[Co(L)]Cl_2$	159^d	70	Dark Green	37.77 (35.42)	2.45 (2.33)	14.69 (13.50)	11.90 (12.29)	12.41 (13.54)	10.30 (11.56)	73	4.50
5	$[Ni(L)]Cl_2$	170^d	77	Pale green	37.79 (36.74)	2.45 (2.02)	14.70 (13.45)	11.19 (13.08)	12.42 (12.98)	10.27 (11.21)	66	4.60
6	$[Cu(L)]Cl_2$	154^d	78	Dark Green	37.47 (36.76)	2.43 (1.98)	14.57 (13.73)	11.10 (12.78)	12.31 (13.58)	11.02 (12.04)	67	2.4
7	$[Zn(L)]Cl_2$	55^d	83	White Yellowish	37.35 (36.53)	2.42 (1.98)	14.53 (13.78)	11.06 (12.30)	12.27 (13.210	11.30 (12.32)	---	Di

Table 2: Electronic spectral data and IR spectra of the ligand and their complexes

Comp. No.	υ(C=S)	υ(O=C-NH)	υ(M-N)	υ(S=CNH)	UV.vis. absorbance bands (cm^{-1})
L	761_S	1679_S	---	3182_w	---
1	750_S	1698_m	529_w	3160_S	26739
2	765_S	1732_m	456_m	3204_m	34246-36675
3	798_S	1681_m	486_S	3316_m	14970,16129,18585
4	798_S	1700_S	523_S	3144_w	14925,15479
5	797_S	1637_m	523_w	3076_w	16722
6	797_S	1699_S	523_m	3148_w	16129
7	797_S	1699_S	523_m	3299_w	---

S= strong ,m= medium, w=weak

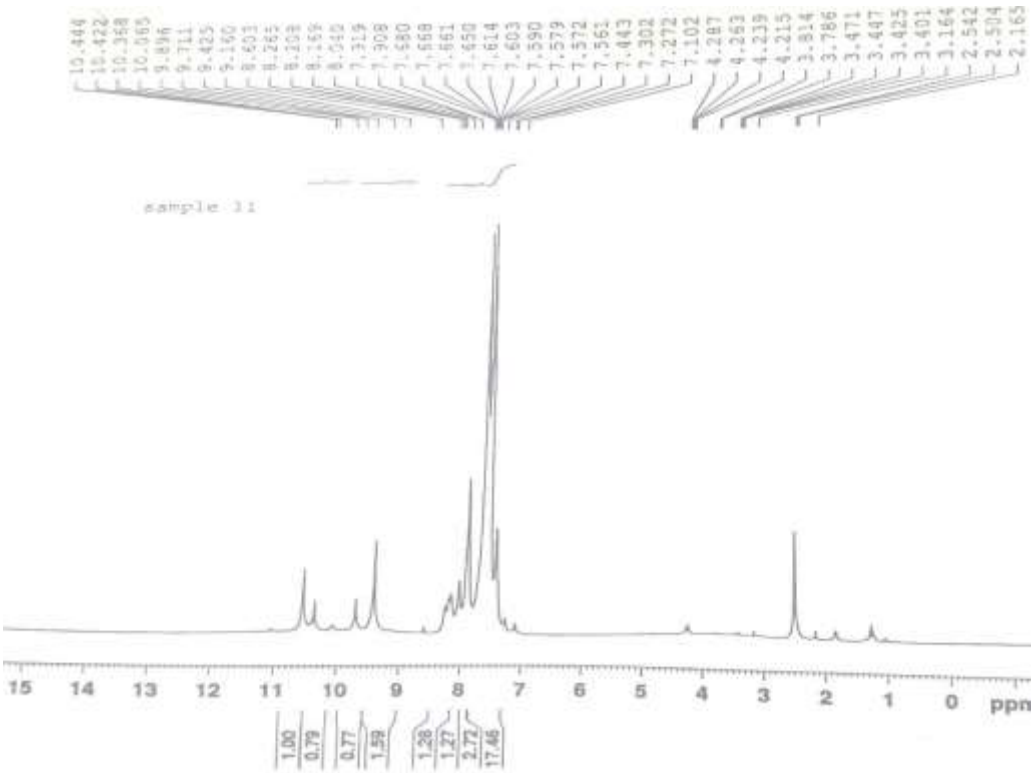


Fig 3: ^{1}HNMR for the ligan

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SESTIMATE THE SOLAR RADIATION ENERGY FOR BABYLON CITY IN (15-7-2021) USING DIGITAL ELEVATION MODEL(DEM) AND GIS TECHNIQUES

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Lina HATTAB
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ESTIMATE THE SOLAR RADIATION ENERGY FOR BABYLON CITY IN (15-7-2021) USING DIGITAL ELEVATION MODEL(DEM) AND GIS TECHNIQUES

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Abstract:

Calculating the amount of solar radiation arriving on horizontal, inclined and elevated surfaces is very important in several applications, including sustainable development, climate and the cultivation of solar cell farms.Many methodologies available for this aim directly (with radiometer) or indirectly as will be presented so, in this research where was used the digital elevation model (DEM) and spatial analysis in software Arc-GIS ,to prepared maps for distribution solar radiation energy for Babylon city in (15-7-2021). A method was used to calculate the solar radiation for the city of Babylon on this day, the total radiation from sunrise to sunset, and it was embodied in a scrawl showing the distribution of the different radiation energies over the different areas of the city. After that, maps of solar radiation energy were prepared for every four hours of time, and thus we got four different maps for different times of the day.

Key words: Solar Radiation, Digital Elevation Model, GIS, and Babylon City.

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1- Introduction:

Study area Babylon city which is one of the most well-known in the world. It was in southern Mesopotamia that the ancient civilization of Babylonia about 60 miles south of Baghdad, Iraq, today. Records from roughly 4000 years ago indicate that Babylon was likely used as a major administrative center, while nothing else about its early history is known for certain.

Figure (1-A): the map of Babylon city

Solar Radiation in Iraq well knowledge that Iraq receives a lot of sunlight Research shows that Baghdad, Iraq receives more than 3,000 hours of sun radiation annually. With a potential sun irradiation about 2,000 kWh/m2 per year, Iraq is a promising location for solar energy development [1]. Monthly worldwide sun irradiation (including diffuse and direct) averages 2766 Wh/m2 in December and rises to 6842 Wh/m2 in June over Iraq. Horizontal solar irradiance in Iraq ranges from 4.5 kWh/m2 per day in the north to 5.7 kWh/m2 per day in the south. [2], In accordance with what is depicted in Figure1. Power from the sun (PV) solar technology is suitable for energy generation in Iraq due to the very consistent distribution of solar radiation. The annual-daily average worldwide sun irradiation in Iraq varies from (4266) to (4700) Wh/m2 in the north, (4750) to (5000) Wh/m2 in the central and southern (flat plains) regions, and (5378) to (5596) Wh/m2 in the western plateau and desert region. The average annual solar radiation received by Baghdad is greater than 3000 hours [3].

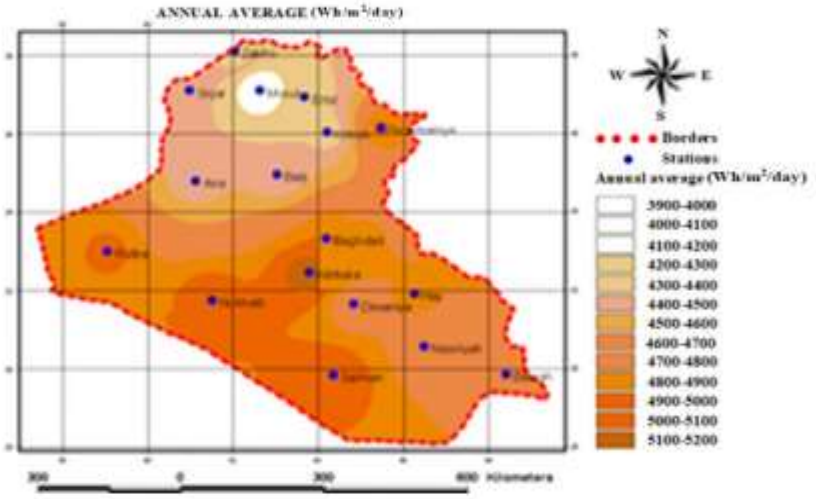

Figure (1-B): The annual spatial variability of total solar radiation falling on the horizontal surface of Iraq [2].

2. Solar Radiation

Clean technologies are becoming increasingly relevant across the world to maintain the future sustainability and to counter the influence of the change in climate as well as the global warming[1,2,3]. Economically feasible renewable options for wide-ranging energy output are wind and solar energy [4,5]. The sun is a continuous energy source [6,7] and the main two types of solar energy, light and heat, are constantly being transformed into other sources of renewable energy [8,9]. Solar power, amongst totality of the sources of renewable power, is an essential source of renewable energy to eliminate emissions of greenhouse gas and assists in reducing universal warming. [10]. In fact the solar energy amount that reaching the ground surface is more than 6000 times the actual universal energy consumption[11] and much of it remains unutilized for human prosperity. So to ensure power stability while resolving environmental issues in developing countries, solar energy plays a significant role[2].

In Iraq, solar energy has enormous potential. With 8.5 hours of radiance duration, most areas in Iraq earn around 300 sunny days per year. The average daily incident in Iraq involving solar power range varies from (4.6 to 6.6) kWh /m^2 per day.

Unavailability of regulation, infrastructure in addition to solar data (including mapping of appropriate solar land areas with possible local estimates) are major obstacles to the

introduction of solar energy technologies)]. The purpose of this paper is to deal with several of these obstacles through the use of a GIS to mapping the locations of solar potential, taking into account the suitable areas and the intensity of solar radiation as minimum as possible.

The importance of estimating the potential of the solar energy is multidimensional. Several researches have measured the potential of solar energy in a global [6] and national [4, 7, 13] scale. Research has been conducted around the world to develop low cost and highly effective solar energy technologies [8]. However, in order for these technologies to be used effectively, it is essential to define the real capacity of solar energy on the ground at first [14]. In addition, maximum potential assessment for the resource of energy will assist defining and effectively installing suitable technologies while reducing the cost of implementation and operating [15]. It is possible to use remote sensing and GIS to determine the feasibility of different alternatives to renewable energy, including location[16] and the technologies used to exploit renewable energy [17,18]

3. MATERIAL AND METHODS

Quantity of total solar radiation on horizontal and inclined surface is very important in different applications, there in this paper by using the integrated between remote sensing and GIS techniques , Arc-GIS 10.3, ENVI software and digital elevation model for Babylon city, which was downloaded from (https://search.asf.alaska.edu/) at spatial resolution 12.5 m has been calculated the solar radiation energy for each pixel with in clip image Babylon city.

4. RESULTS AND DISCUSSIONS

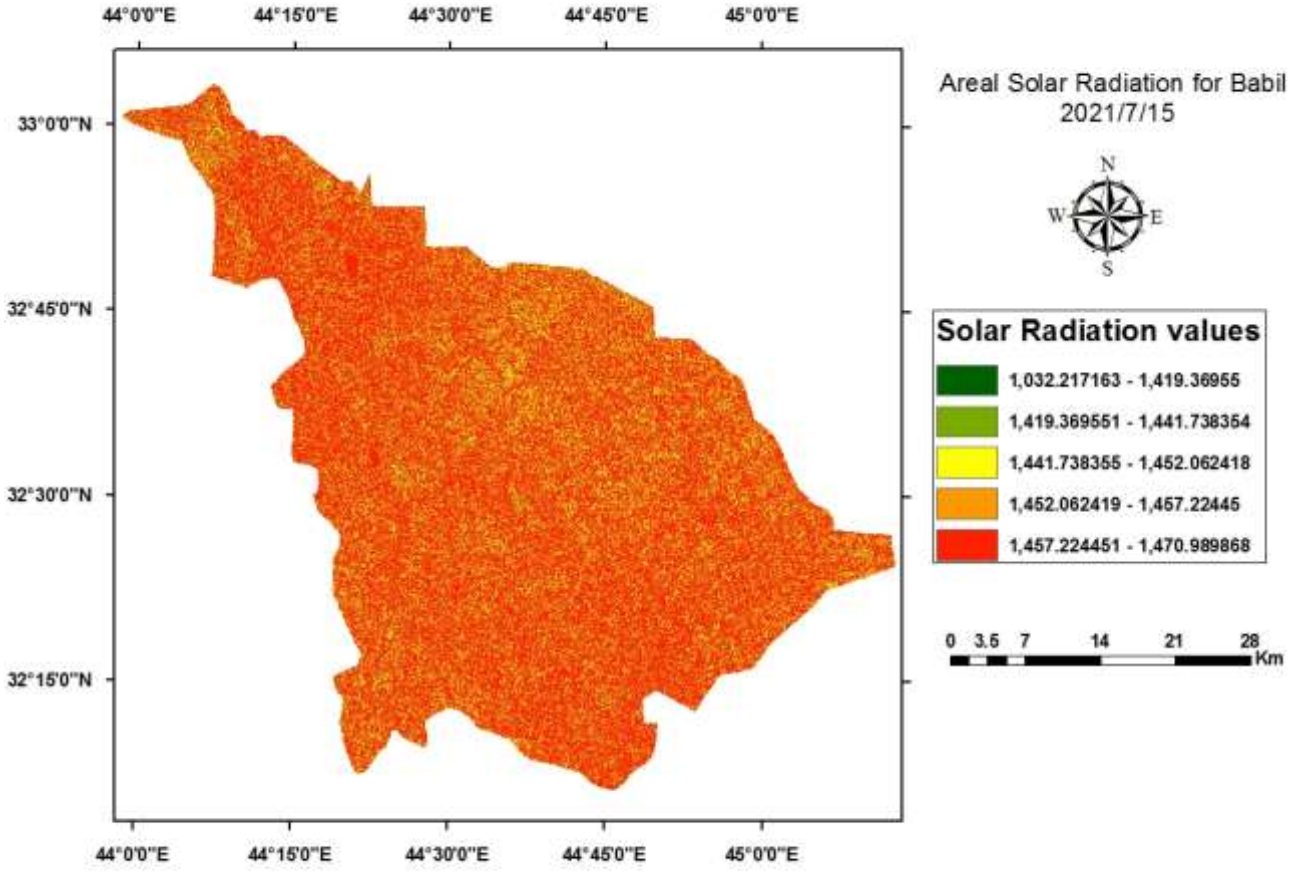

Figure.2: The solar radiation energy for Babylon city (15-7-2021)

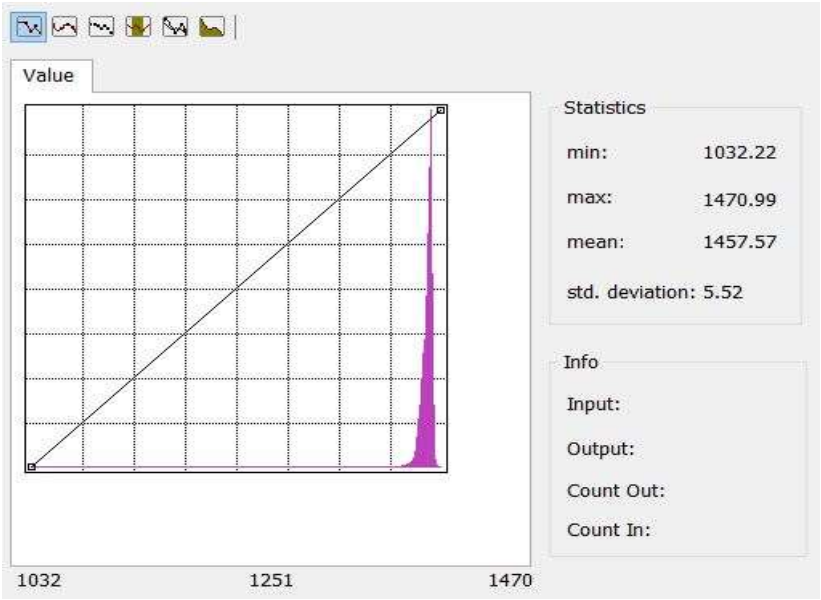

Figure 3 : Histogram of solar radiation for Babylon city at 15-7-2021

From figures 2 and 3 the following has been noted , Most of the values of solar radiation for the city of Babylon are equal or close to each other, except for some points that say less or more, because the value of solar radiation depends largely on the location of the city in relation to the globe, meaning (longitude and latitude) and almost the city and its locations are very close to each other and there is no difference In addition, the value of solar radiation depends on its height above the surface of the earth, and the city of Babylon is all flat land and differs by a small amount in heights, so the results appeared close to each other . this is evident from the figure (2) histogram of solar radiation of Babylon city

Benefits of this work

i) The ministry of Environment

ii) The ministry of Electricity to create the solar radiation cell farm

iii) Meteorology stations

6. CONCLUSIONS

This paper shows that It is clear from the map and graph that the greatest radiation energy for Babylon city was 1493 (W.H\M^2) and the lowest energy was 1000.92 (W.H\M^2). Because the amount of solar radiation depend on the location of study area (longitude ,latitude) and digital elevation model ,thus almost solar radiation of Babylon city are converge Values.

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IMPACT OF BISMUTH OXIDE NANOPARTICLES ON GAMMA RAY BUILDUP FACTOR MEASUREMENTS

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IMPACT OF BISMUTH OXIDE NANOPARTICLES ON GAMMA RAY BUILDUP FACTOR MEASUREMENTS

Amjed Mohammed SHAREEF [1]

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Abstract:

This research includes the practical results obtained for the gamma ray Buildup factor in addition to the mean free path, the effective atomic number and the density of the composite material for the radiation protection. Shields fabricated from a base material of unsaturated polyester in addition to nano bismuth oxide (Bi_2O_3) as a reinforced material with different concentrations (15%, 25%, 35 %, 45%) with a certain thickness to evaluate these shields' efficiency to protect against ionizing radiation. Use of the scintillation detector (NaI (Tl)) with an ionizing radiation source (^{60}Co). The results showed that the best concentration used represents the lowest value of the Buildup factor which is the best measure and also the mean free path decreases with increasing concentration of the reinforced material in the prepared shield, whereas the effective atomic number and density of the prepared shield increase with increasing concentration of the reinforced material in the prepared shield.

Key words: Bi2O3, Gamma Ray Buildup Factor, Mean Free Path, Zeff.

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Introduction:

Gamma radiation may penetrate the human body and ionize cells in patients, destroy proteins, DNA, and other genetic material in human cells, and causing sickness and even fatality. There are three main preventive strategies for external radiation hazards: minimizing contact time with radioactive sources, increasing distance from radiation sources, and utilizing protective materials. [1-5] Protective materials are used to reduce the dose of exposure to individuals who operate in the field of radiation and the significance of the buildup factor in various applications such as shield design, nuclear reactor design, health physics, and education. buildup factor of correcting estimations for the proper thickness of shielding gamma ray sources [6-8]

Many factors directly affect the design of radiation shielding materials or their evaluation and have a significant impact on the scattering of repeated radiation as it passes through the nuclear shield material. The previously scattered gamma rays return to the detector as if they had not been scattered and are consequently calculated as non-collision rays. Any subtraction from the calculations, and to avoid this large difference between the practical and theoretical results, a specific and important factor is introduced into the theoretical calculations to bring their results closer to the practical results, and this factor is the so-called buildup factor [9,10]. The most successful research strategy is to create effective and practical protective materials in order to avoid typical shielding materials such as concrete and steel. Because of its excellent shielding performance, lead has historically been the most preferred radiation protection material, but the toxic hazards and environmental pollutants associated with lead are increasing. Most typical shielding materials have a low shielding efficacy and must have a particular thickness to provide sufficient protection. As a result, it is vital to replace non-toxic materials for lead. At the present, research is focusing on the development of non-toxic, lightweight, efficient, and low-cost materials [11-13]. As a result, in this work, we employed bismuth oxide (Bi_2O_3) materials, which perform better in terms of nuclear radiation protection. In this study, we discuss shielding parameters such as the buildup factor, mean free path, effective atomic number, and composite density of the prepared shield.

2. Experimental Work

Shields were manufactured in this study using a base material (unsaturated polyester) reinforced with volume fractions of bismuth oxide. At the nanoscale, several proportions of reinforcing material (15%, 25%, 35%, 45%) of (Bi_2O_3) were used. The fabrication included taking a quantity of reinforcing materials that achieve the required volume fraction, as well as weighing its unsaturated polyester, where the reinforcing materials are added to unsaturated polyester and mixed together until we get a homogeneous mixture, then the product is put into the mold homogeneously and left for 24 hours to dry, and then the required nuclear tests are performed.

3. Results and Discussion

The influence of increasing the concentration of reinforced materials in the prepared composite was investigated in this study, as the relationship between each buildup factor was illustrated as a function of the concentration of reinforced materials as illustrated in the figure (1). We see that at concentration (0%), which represents an unsaturated polyester sample without addition. The buildup factor takes the largest possible value and then declines with the initial addition of the metal concentration (15%). Following then, the reduction will be slow and irregular with increasing concentration until it reaches the concentration (45%). The high value of the buildup factor of unsaturated polyester alone represents the polyester's transparency towards gamma rays, rendering it unsuitable for use as a shield, whereas the decrease in the buildup factor at the first concentration of the substance The reinforced material can be attributed to an improvement in the behaviour of the unsaturated polyester, proving the composite material suitable for use as a shield against gamma rays. In general, the values of the buildup factor decrease as the concentration of the mineral powder increases because the characteristics of the composite material tend to be comparable to the qualities of the reinforced material.

Figure 2 illustrates the mean free path (MFP) of samples prepared at various concentrations, demonstrating that the MFP values of unsaturated polyester without any reinforcing materials have the maximum value, while those with nano-Bi_2O_3 MFP have a lower value. This sharp decline is reinforced by increasing concentrations, which indicate that Bi_2O_3 nanoparticles are more efficient at absorbing radiation for the amounts investigated.

The measurements show that the bluildup factor increases with the increase in the mean free path due to the arrival of additional scattered photons to the detector, especially at lower concentrations, as illustrated in the figure (3), which depicts the relationship between the bluildup factor and the free path rate of the prepared shield.

The variation of the effective atomic numbers of prepared shields (Zeff) with reinforced material concentration plays an important role in the testing of manufactured shields, with the increase of this bi2o3 concentrations due to an increase in the mole fraction of the high Z element (bi2o3) at the expense of other low Z elements. Furthermore, it is obvious that when photon energy increases, the effective atomic numbers decrease, because high energy photons may penetrate deeply into the absorber of matter without performing any reaction. As a result, the largest value of Z_{eff} occurs at high energy, when the concentration of Bi_2O_3 is highest as illustrated in the figure (4).

The influence of varying the density of the prepared shield material on the buildup factor was investigated, and it was revealed that the buildup factor decreased as the density of the shield material increased due to the possibility of gamma ray photons interacting with the prepared composite material. The increased density of the reinforced material improves the wide material's characteristics, making it efficient in shielding against less dense materials. The relationship between the density of the prepared shielding material and the buildup factor is seen in Figure (5).

The density values of the prepared shield material increase in ratio to the concentration of the reinforced material, as shown in Figure (6), especially because the nano-bismuth oxide has a high effective atomic number and a small atomic radius, which means that many atoms can be filled in a specific structure. Because bismuth oxide has a high electron density, it is highly suited for scattering gamma ray photons. Radiation passing through the shield material loses energy by interacting with the electrons of the shield material's atoms, and so these photons can stop or continue to lose energy. The reaction process is determined by the atomic number and density of bismuth oxide, as well as the kind and energy of the incident radiation, thus photons are better absorbed when the shield density is increased.

Table (1):The buildup factor, mean free path, effective atomic number, and composite density of the prepared shield.

Concentrations of Bi_2O_3	B.F	M.F.P	Z_{eff}	ρ_{comp}
0 %	1.31000	14.61988	**4.2720**	**1.16000**
15%	1.19852	9.861933	**32.1312**	**1.333376**
25%	1.17964	7.173601	**50.7040**	**1.481984**
35%	1.16748	5.144033	**69.2768**	**1.66697**
45%	1.14890	3.885004	**87.8496**	**1.905362**

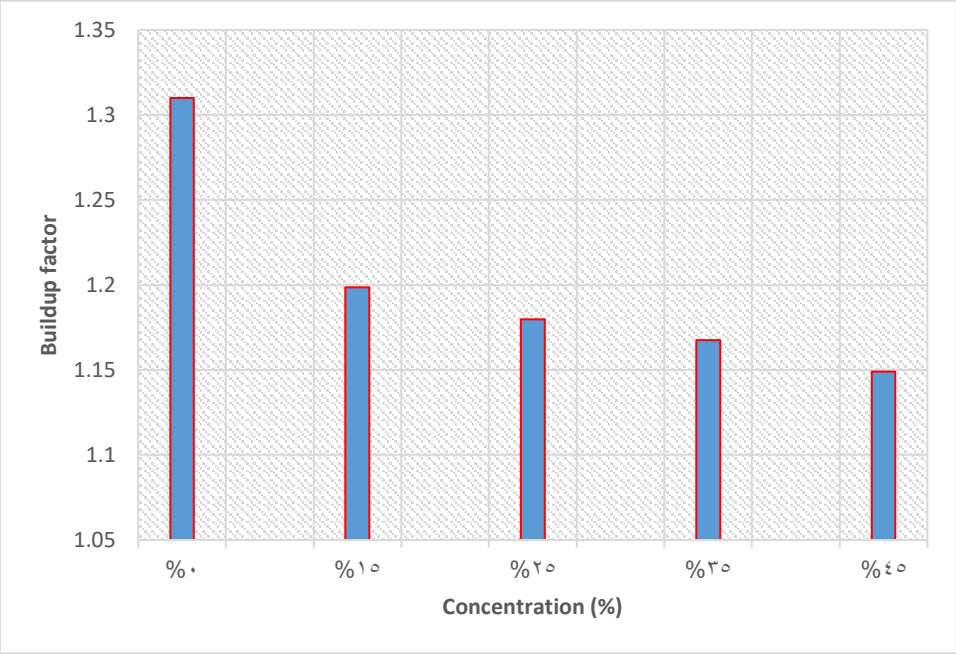

Figure -1: The Buildup factor of prepared shields as a function of concentration of Concentrations of Bi_2O_3 in (%)

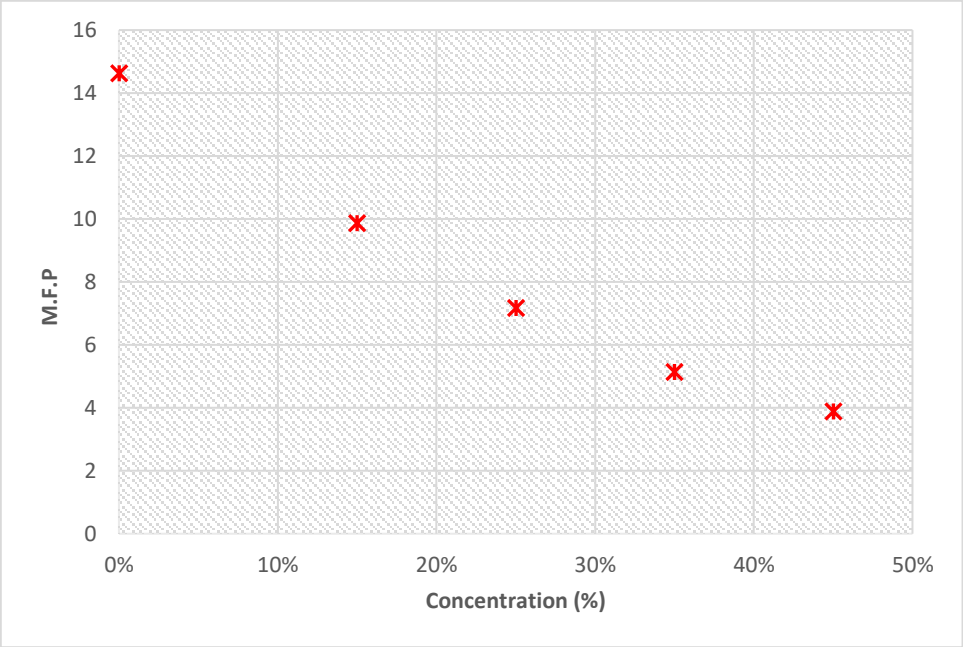

Figure -2: The mean free path of prepared shields as a function of Concentrations of Bi_2O_3 in (%)

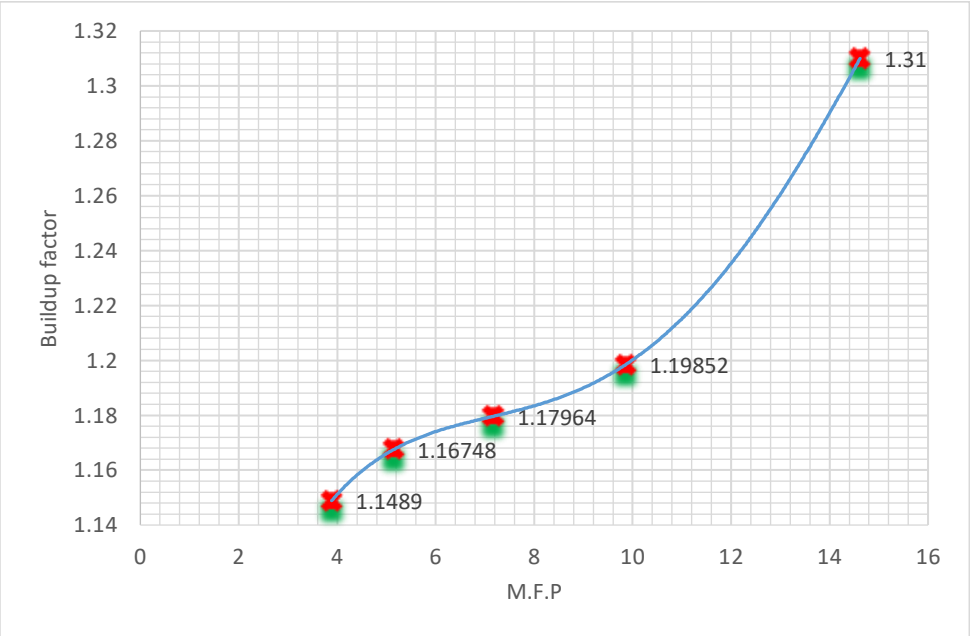

Figure -3: The Buildup factor of prepared shields as a function mean free path

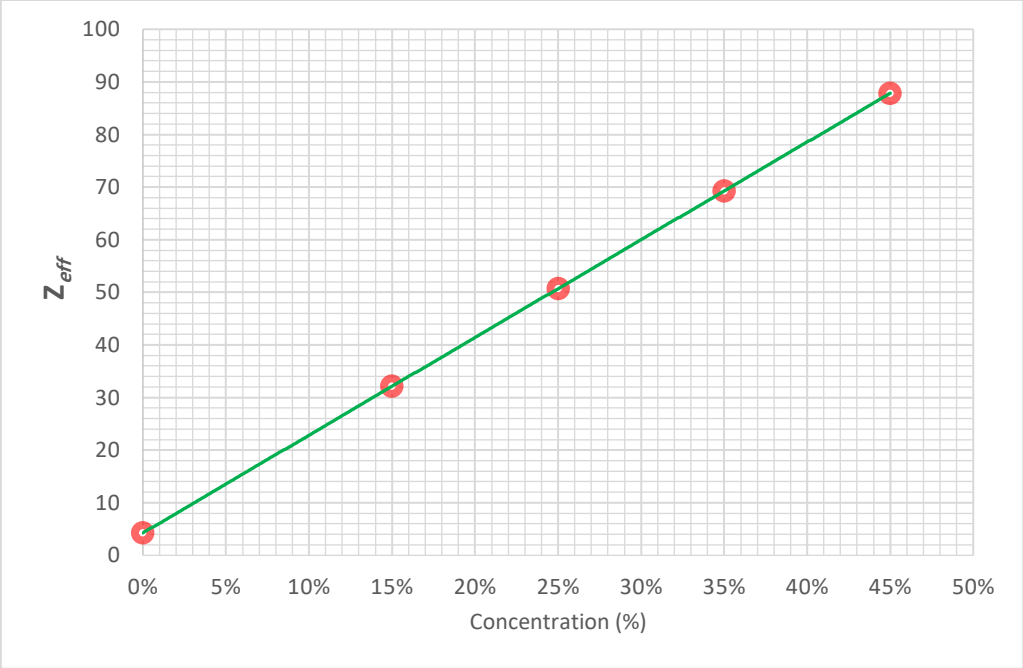

Figure -4: The Z_{eff} of prepared shields as a function of Concentrations of Bi_2O_3 in (%)

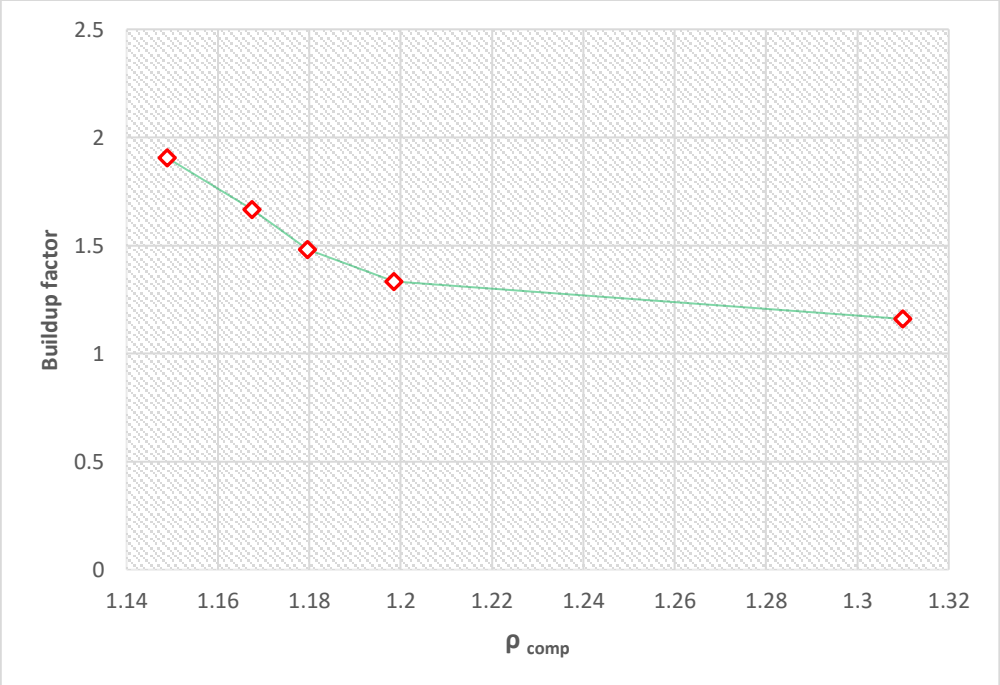

Figure -5: The Buildup factor of prepared shields as a function of the composite density

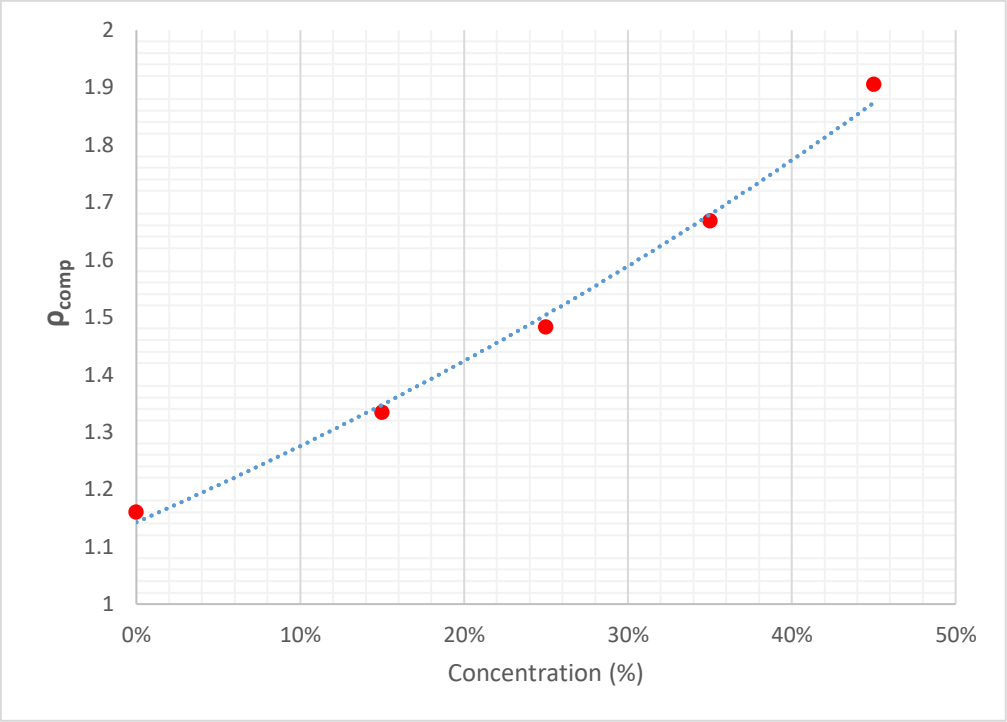

Figure -6: the composite density of prepared shields as a function of Concentrations of Bi_2O_3 in (%)

4. Conclusions

1. Increasing the concentration of Bi_2O3 in γ-ray composite materials can significantly improve shielding efficiency; the greater the Bi2O3 concentration (45%), the better the shielding performance.

2. The prepared composite (Bi2O3/UP) in this study exhibits excellent qualities in terms of ease of preparation, low cost, and mass production. It is also a reasonably environmentally friendly, economical, and light nuclear protective material that may be used in X-ray rooms, CT rooms, digital radiography (DR) rooms, and other applications.

3. The results of this research revealed a preference for the usage of nanomaterials in the field of radiation protection. When a result, as the concentration of bismuth oxide nanoparticles increases, the nanoparticle yields a low value for both the buildup factor and the free path rate. With increasing concentration of the reinforced material in the prepared shield, the effective atomic number and density of the prepared shield increase.

4. This experimental investigation provides essential information about the shielding properties of bismuth oxide nanomaterial when it interacts with gamma radiation, indicating a development in the attenuation capacity of the prepared samples due to the effect of Bi2O3 nanoparticles that could be applicable for radiation protection.

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SURVEY AND CHECKLIST FOR ECOLOGICAL AND GEOGRAPHICAL DISTRIBUTION OF RESEDACEAE FAMILY IN IRAQ

R. K.H.AL-MASOUDI

SURVEY AND CHECKLIST FOR ECOLOGICAL AND GEOGRAPHICAL DISTRIBUTION OF RESEDACEAE FAMILY IN IRAQ

R. K.H.AL-MASOUDI [1]

Abstract:

The study aims to identify the species grown in Iraq belong to the Resedaceae family and determine their environment and geographical distrbution of species by reviewing the different references and samples preserved in Iraqi herbariums. The study indicated possession of the genera *Cayluse* (St. Hilaire) and *Oligomeris* (Cambess.) on a single species for each of them. *Reseda* (L.) is considered one of the largest genera of the family as it is represented by eight species. The study of the environment of family species indicated its spread among different environments from desert lands, mountains, depressions, sandy lands and others with a note of the spread of all species within different lands and soils. A study of the geographical distribution of the species showed that the *Caylusea hexagyna* (Forssk) species was confined to the desert plateau region and the presence of the *Oligomeris linifolia (*Vahl.) in the lower Mesopotamia and the desert plateau regions. The species of the genus Reseda L. belong to the family were distinguished by their grown spread in different environments and different district, and the species *R.luteola* (L.) is rare in Iraq, as it was found in one province within the mountainous region, and the species *R. odorata* (L.)was distinguished as one of the cultivated species in Iraq.

Key words: Ecological Distribution, Desert Plateau Region, Geographical Distribution, Cultivated.

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Introduction:

Resedaceae family is one of the flowering families belong to the group of wild dicotyledonous plants distributed in the various environments of Iraq, and the Resedaceae family belongs to the tribe of Resedales(1,3). The Resedaceae family is called the Balaeha family as it was reported from (5). The family includes 6 genera and 70 species, most of which spread in Mediterranean regions of the world, yet a few species arise in northwest Europe. (2,10,11). In Iraq, the family included 3 genera and 10 species distributed in different regions in Iraq [4,14]. The genus *Reseda* (L.) is the biggest genera from the Resedaceae family, it consists of 8 species (23,25).The family Resedaceae was reviewed by previously (7,15).Current molecular studies proposed that *Oligomeris*, *Randonia* ,and *Ochradenus* all emerge in the ranks of *Reseda* that will reveal that only three genera must be identified, though as so far no nomenclatural changes have been made (17).Resedaceae are located beneath the Cronquist system in the order Capparales. The APG II a system putted the family in the order Brassicales (18). In APG IV it was developed to contain the genera *Borthwickia* (formerly Borthwickiaceae), *Neothorelia*, *Stixis*, and *Tirania* (formerly Stixidaceae) and *Forchhammeria* (formerly in Capparaceae)(16). Resedaceae is a family Herbs or shrubs annual, biennial, or perennial. Stems erect or ascending; Leaves alternate, simple ,Inflorescences spikes, Flowers bisexual and hypogynous, Fruits capsule or star-shaped ,membranous capsules(8, 9). Ecological Factors and geographical Variations are among the important factors and characteristics affecting the morphological composition of living organisms, therefore, it is necessary to determine the different environmental factors such as soil quality, light intensity, humidity, location of plant species distribution, and determine the extent to which these factors relate to the morphological characteristics of different taxa ranks , and the importance of geographical distribution was evident in some taxa with limited species spread on a specific geographical area, which made it one of the methods used in the process of isolation and classification of species (22). On the other hand, the geographical evidence explains the origin, spread, migration and evolution of species, given that the similarities and differences in the morphological and anatomical features of taxonomic ranks and at various levels are related to the extent of spread, whether wide or narrow (19). For the lack of Iraqi references of information on the Resedaceae family and the absence of a detailed modern study of the environment and the

prevalence of the species belonging to the family and its geographical locations in Iraq, this study was prepared.

Materials and methods

This study has relied on the information proven in the dry preserved sample labels in the Iraqi herbarium, as it worked for the identity card for each sample that includes all the information installed in the sample card; The information published by the researchers, such as (24;6;20;12; and 21) was also used, and Guest was reviewed. To illustrate the areas of the spread of the species under study on the maps, The map showing the species distributed locations has been drawn on the geographical provinces listed below.

Table 1. Regions and phytodistricts of Iraq according to (13)

M	**Mountain Region**
MAM	Amadiya District
MRO	Rowanduz District
MSU	Sulaimaniya District
MJS	Jabal Sinjar District
F	**Upper Plains and Foothills Regions**
FUJ	Upper Jazira District
FNI	Nineveh District
FAR	Arbil District
FKI	Kirkuk District
FPF	Persian Foothills District
D	**Desert Plateau Region**
DLJ	Lower Jazira District
DGA	Ghurfa-Adhaim District
DWD	Western Desert District
DSD	Southern Desert Distinct
L	**Lower Mesopotamian Region**
LEA	Eastern Alluvial Plain District
LCA	Central Alluvial Plain District
LSM	Southern Marsh District
LBA	Basra Estuarine District

Results and Discussion:

The genus *Cayluse* (St. Hilaire) in Iraq is represented by only one species, which is *Caylusea hexagyna* (Forssk). The species was found in the east of Ramadi in stone lands and on Al-Rutba Road, 5 km north of Al-Rutba city and south of Al-Rutba city 15 km and away 210 km west of Ramadi and 15 km southeast of the Houran Valley within the (DWD) District in the cultivated depressions, and was found in Kufa and Shabicha and the Khader al-Mayi region and 8 km north-west of the city of Aidaha within the province of (DSD) in the loamy mud hills. As this species can withstand the climate of western and southern Iraq, where humidity is moderate in a to the west and droughts in the south, as it tends to relatively high temperatures and droughts and lacks in northern Iraq due to its inability to withstand the northern climate with high humidity and moderate temperatures. The genus *Oligomeris* (Cambess) is represented by Iraq with only one species, the species *Oligomeris linifolia* (Vahl). The species was found west of the city of Samawa 35 km, and west 65 km north of Busaiya, in Khidr al-Mai, Wadi Al-Batin and Shabicha, and 10 km west of the city of Al-Zubair and on Jabal Sanam ,and 1 km east of the city of Um Qasr and near Salman Castle, 110 km southwest of Samawah within the (DSD) province , and also the species registered the lower Mesopotamia region in the(LBA) as the species was registered near Hafr Al-Batin and the western city of Basra, and in the Nasiriyah Governorate within the province (LSM), and to the north of Sheikh Mahmoud in the Baghdad governorate within the (LCA) province in sandy hills, an indication of the adaptation of this species only to the living conditions in southern Iraq and some central regions of it .The genus *Reseda* L. is one of the largest genera of the family and includes nine species, as the first species *R.alba* (L.) spread in the Sulaymaniyah city within the province of(MSU) and in the city of Shargat and the city of Hadhr , Tal Julaimid ,and in the Makhlat and in the Qaiyara and between Sharqat and Tikrit and on 25 km north of the city of Baiji within the (FUJ) province and in the city of Mosul and Nineveh within the (FNI) province and in the city of Kirkuk and 25 km north of the city of Toz within the province of (FKI) and in the city of Jalaula and between the city of Jalaula and Muqdadiya and 10 km north of Khanaqin city and 38 km southwest Mandali, 16 km southeast of Badra, near police post inspection in Wadi Tib within the (FPF) province, 70 km north of Rawa city ,120 km southeast of the Hadhr city ,and between the Balad and Samarra within(DLJ) province ,and in Rutba city and 13 km to the north of them in Wadi al

Battikha, and about 80 km north of the city of Nokhaib, 15 km south of the city of Rutba, 5 km south of the city of Ana, 65 km west of the city of Ramadi and between Rutba and Fallujah and 16 km west of the city of Fallujah and 120 km west of Karbala Governorate within the (DWD) district and in the region Shabicha, in Al-Salman, 16 km northwest of Busaiya, in Al-Batin, 65 km southwest of Basra Governorate, near Zubair, within the (DSD)district, in the Fallujah desert, to the west of Fallujah, and 20 km west of Abu Ghraib, near Fallujah, and in Baghdad Within the district of (LCA) ,and in Amara governorate within(LSM). This species is very prevalent in southern and central Iraq compared to its spread in northern Iraq, where its spread is relatively fewer, which indicates that it adapts better to the south and center climate than the rest of Iraq, but he has the decency to live in the climate of northern Iraq. The second species is *R. arabica* (Boiss.) It is found in Jabal Muwailih, 70 km north of Amara within the (FPF) province and the Wadi al- Ajramiya , 60 km north of the city of Rutba, and 2 km west of Rutba, 260 kmwest of the city of Ramadi, and in Nukhaib within the province of (DWD), and in Wadi al-Khirr , and 120 km northeast of Shabicha, on the road to Najaf, between Salman and Busaiya, in Al-Batin, 65 km southwest of Basra, to the east of the city of Al-Zubair 60 km, and Jabal Sanam within the (DSD) district, and grown also in Baghdad within the province (LCA), and this be indicated that the species is adapted to its growth in southern Iraq in terms of high temperatures and droughts. The third species is *R. aucheri* (Boiss.) The species distributed in the city of Mosul within the (FUJ / FNI) and to the north of Mosul and below Rabban Hormuz and near Alqosh within the (FNI / MAM) and all the way from Mosul to Erbil within the (FNI / FAR) and in Hawi Sumara within the province of (FAR)and in Kirkuk and Baba Gurgur and Kifri and the mid-way between Sulaiman Beg and Jalaula, in Jabal Hamrin, within the (FKI) district, in Mandali, 10 km west of the city of Mandali, in Koma Sang, between Mandali and Naft khana, in Hashimat al-Brahim, in Baskaya, in Jabal Muwailih, in the north of Amara within the (FPF) district, and the species was found in North of Tikrit, 35 km northwest of Fallujah, and 65 km north northwest of Fallujah and between Fallujah And the wadi Thirthar, to the south of Lake Thirthar within the (DLJ) district, was found 15 km west of the city of Ramadi and all the way to the city of Hit and the north of the Habbaniyah lake near Ramadi within the province of (DWD) and the species spread to 120km northeast of Shabicha and all the way to Najaf and Zubair within the (DSD) district and the Amara governorate within the (LSM) district in sandy clay soils, which indicates the good fitness that enables to live in central, northern and southern Iraq, where

the difference in climate and due to the presence of depressions, sandy plateaus, and muddy gravel valleys are necessary for the growth species. The fourth species *R. haussknechtii*(Muell.) is spread in Jabal Sinjar at an altitude of 450 meters within the province of (MJS) and in Jabal Golat and between Balad Sinjar and Ain Tilawi within(MJS / FUJ) and 26 km east Balad Sinjar and 35 km from Sinjar, 20 km north of Badra, Jabal Muwailih, and 70 km north of Amara, within the (FPF) district. The species has spread to mountainous regions, which indicates its influence of elevations and moderation in temperatures and climate appropriate to its growth condition. As for the fifth species *R. lutea* (L.), its spread was recorded in Dohuk governorate on the hillside side within the province of (MAM) and to the east of a chair in the mud-rich soil in the province of Mosul and Jabal Sinjar and near the Balad Sinjar and between Sinjar and Tal Afar, 15 km south The city of Mosul and near Hamam Alil in the province of (FUJ) ,it was found in Haji Omran within the governorate of Arbil in the rocky limestone soil and the Alqosh and on the side of the road to Darband in the province of (FAR) and in Kirkuk and Tuz within the province (FKI) in the sandy gravel hills Dirt slopes and mud-rich soils, in Jabal Maqloub and Ain Kabrit within a district (FNI) and that the presence of the species in the areas of mountain plains and mountain slopes near water sources indicates the necessity of water as requirements for its growth as well as high humidity as it has relatively little fitness. The sixth species *R. luteola* (L.) was very rare in Iraq, and it was found in Sarsnak and Jabal Sinjar at an altitude of 550 meters within the province of (MAM) where the mountains and the abundance of water and moderate temperatures, as the fitness species is very few to limit its growth to this province only.The seventh species *R. muricata*(Presl.) its spread was recorded in the desert regions of Iraq, it was found in Wadi Um Agroon in Shabicha, 6 km west of Shabicha, along the Najaf road, in Salman, 30 km east of Salman, and 21 km southwest of Busaiya and in Haddaniya and between Salman and Busaiya are on the side of the road to Salman within the (DSD) district and 55 kmwest of the city of Ramadi and near Ukhaidhir within the province of (DWD), as the species tends to relatively high temperatures and droughts in desert regions and is lacking in northern Iraq because it is not able to withstand the northern climate with moisture high and temperature low. As for the eight species *R. odorata*(L.) it is one of the species cultivated in Iraq, it was found in the Rustamiya area near Baghdad within the (LCA) province and in the Kut al-Imara region within the (LEA)province and in Jabal Sanam within the (DSD) province. This species distributed in distinct regions the central and southern

provinces of Iraq indicate that they have a proportion of fitness to live in these environments.

Conclusions

It was found from the current study that the genera of this family are distributed all over Iraq, but they are more prevalent in the southern and central regions of Iraq, as they spread less in northern Iraq, which indicates that they are not adapted to the climate of northern Iraq, where low temperatures and frequent rains, but it was noted that the genus *Reseda* is the most prevalent species in southern Iraq due to its multiple species, as specific species are spread in southern Iraq, which indicates its adaptation and climate suitability.

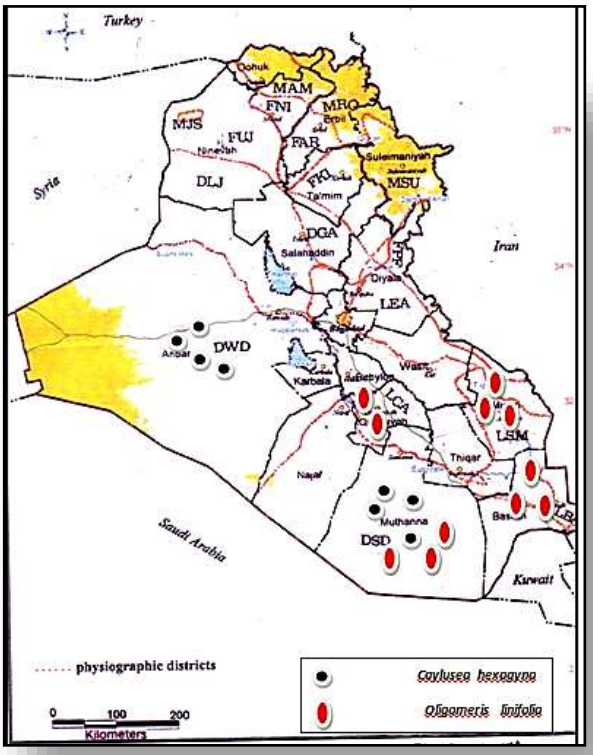

Figure 1: Geographical distribution of species *Caylusea hexagyna* , *Oligomeris linifolia*

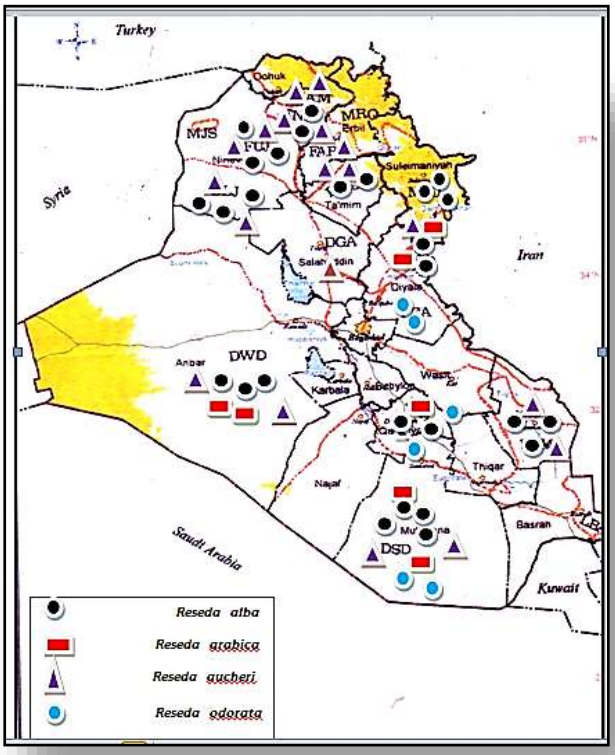

Figure 2: Geographical distribution of species Reseda alba ,R.eseda arabica, Reseda aucheri , Reseda odorata

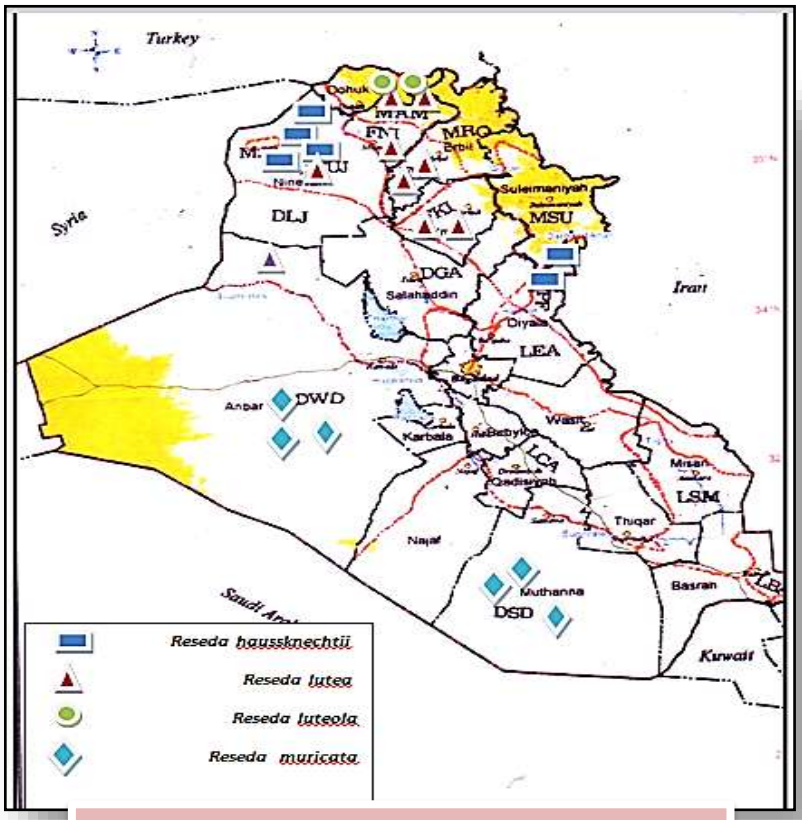

Figure 3: Geographical distribution of species *Reseda haussknechtii, Reseda lutea, Reseda luteola, Reseda muricata*

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CORRELATION BETWEEN TOXOPLASMA GONDII (T. GONDII) AND VITAMIN D3 LEVELS IN IRAQI PREGNANT WOMEN

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CORRELATION BETWEEN TOXOPLASMA GONDII (T. GONDII) AND VITAMIN D3 LEVELS IN IRAQI PREGNANT WOMEN

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Abstract:

Background: Toxoplasmosis played a significant influence in causing abortions and congenital malformations in pregnant women . Vitamin D insufficiency contributed to bone fragility and osteoporosis, putting women at risk for fractures and abnormalities in their babies. nObjective: To evaluate the correlation in the middle of toxoplasmosis seropositivity and vitamin D defects in Iraqi pregnant women. nMethodology: A cross-sectional.study.was directed by examining.the.sera of 60 women, versus to 30 women negative toxoplasmosis (age ranged from 15 - 50 years). Results: the result showed that there is high significant changes between patient and control groups toxoplasmosis IGG P value (0.0001) and significant alterations between patient and control groups toxoplasmosis IGM p value (0.016)and (0.003) vitamin D and negative correlation between vitamin D with age, toxo IGM.

Conclusions: there is high significant association between toxoplasmosis and vitamin D deficiency.

Key words: Pregnant Women, Toxoplasmosis, Vitamin D.

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Introduction:

The protozoan infection toxoplasmosis is brought on by Toxoplasma gondii (T. gondii), and it can be acquired either congenitally or by eating food contaminated with tissue cysts or infected oocysts from cat feces. It's a cosmopolitan disease that affects women in various Arab countries. In Iraq, for example, a toxoplasmosis infection rate of 34.7 percent has been reported among pregnant women in Baghdad. (1)

Vitamin D is a hormone which required for calcium homeostasis, it keeps bone healthy and conserves calcium. Recently, substantial research has revealed the importance of vitamin D in maintaining bones strong and robust, as well as the link between vitamin D levels and cancer [2]. Sunlight, food, or supplements are the main sources of vitamin D in humans (as either vitamin D2 [ergocalciferol] or vitamin D3 [cholecalciferol]). Its action following entry into circulation is dependent upon liver hydroxylation to 25-hydroxyvitamin D [25(OH)D] before converting to the hormone's active form, 1,25-dihydroxyvitamin D [1,25(OH)2D]. The later hydroxylation primarily takes place in the kidney [3].

Vitamin D has two key possible benefits: immunological modularity plus fetal immunologic response.[4]. The link between 25(OH) vitamin D and miscarriages is strong in the first trimester, but only mild in the second. In contrast to the third trimester, this link gets weaker, implying that vitamin D may be a modifiable risk factor for insufficiency [5].

The effects of parasitic infections are linked to a variety of factors, including nutrition, immunological condition, the amount of parasite consumed, parasite virulence, and parasite placement within the host. Tissue parasites wreaked havoc on their hosts, especially humans; one example is the coccidian protozoan parasite "Toxoplasma gondii." This parasite is cosmopolitan in that it infects a cat as its final host, but most mammals are infected in nature by various stages of this parasite [6]. The phases are characterized by two types of trophozoites: tachyzoites (actively motile) and bradyzoites (slowly motile), tissue cysts (primarily in the intermediary host), and oocysts (Immature when discharges and mature after 3 to 7 days in the environment) [7]. Water, raw milk, undercooked meat, unwashed vegetables, blood donations, medical instruments, and, most notably, Oocysts, which contain two sporocysts, each containing four sporozoites, are all means of transmission [8] .

Clinically, acquired toxoplasmosis is a self-limiting disease in immunocompetent people, however in major infections, the disease can have acute, sub-acute, and chronic stages [9]. Fever, malaise, tiredness, and lymphadenopathy are the most common symptoms. Individuals with immune-compromised or depleting disorders face a more serious and life-threatening situation [10]. The capacity of trophozoites to contact the fetus through the placenta, allowing them to reach the fetus and causing the second picture of "congenital toxoplasmosis" in women during pregnancy [11].

Material and method : the data was collected from private laboratory between September 2021 and December 2021. During this period, (30) cases pregnant women with

toxoplasmosis (30) healthy pregnant women . Ethical agreement was attained from all the participant.

Result:

Table: comparison of toxoplasmosis IGG and IGM , VITAMIN D in serum between pregnant women and control groups according to mean+ standard error

Parameter	Mean + SE CONTROL	Mean + SE PATIEINT	P VAL
Age (year)	33.2+2.52	28.7+2.1	0.180
Toxo IGG (In/ml)	0.45+0.093	3.68+0.81	0.0001*
Toxo IGM (In/ml)	0.294+0.03	0.661+0.133	0.016*
VIT D (ng/ml)	19.64+1.76	13.73+0.92	0.003*

*significant value

Table: correlation of toxoplasmosis IGG and IGM , VITAMIN D in serum between pregnant women and control groups according to mean+ standard error

VIT D r	age	IGG	IGM
	-0.201	0.040	-0.504
p	0.44	0.879	0.039

Discussion

bToxoplasmosis is a disease that have emotional impact most nbirds and nwarm-bloodednmammals, including humans, all over the world. Toxoplasmosis is a nparasitic infection that causes no symptoms in the majority of patients. This is because a strong immune system can usually defend the body against parasites and keep them from causing sickness.

Toxoplasmosis is a parasiticoinfection caused by Toxoplasma gondii (T. gondii), one of the most common parasites on the planet. T. gondii can be found in the following foods: raw or undercooked meat, Raw cured meats like parma ham or salami, unpasteurized goat's milk, cat feces, and soil or cat litter contaminated with diseased cat feces are all dangerous. (12)

mBecause the prevalence of vitamin D in Iraqi people is significant, vitamin insufficiency is a mystery today. Less exposure to sunshine, which allows for excellent penetration and the manufacture of sufficient amounts of vitamin D, could be one of the reasons for this insufficiency; climate change could also be a factor (13).

The influence of T. gondii on the mbone, on the other hand, is unknown since bone is a stiff tissue, and the form of osteocytes is not conducive to the parasite's development within it. Furthermore, tubules, and small intestinal tissue, causing a decrease in calcium reabsorption and bone trials to compensate for the calcium shortage, leading to

mosteoporosis or bone fragility, which increases the risk of fractures and other arthritis symptoms (14).

The link between a in elevation level of mToxo-IgM (18.43%) and vitamin insufficiency means that women are more likely to experience the negative symptoms of toxoplasmosis. In addition, vitamin D deficiency could be caused by a diet lacking in some minerals, particularly S. magnesium. As a result, oral vitamin D, Ca2+, and mineral supplements for women may play an important role in avoiding vitamin D deficiency. Instead of using spiramycin, which is commonly utilized in Iraqi clinics, this aircraft should be go along with by the discovery of the most efficient usage for ntoxoplasmosis in women. (15)

Several variables influence Vitamin D serum levels, including the fact that deficiency causes a variety of diseases and difficulties, particularly in women, which can disrupt fertility and may be linked to a variety of pregnancy complications. As a result, VDD is a serious health issue that should be addressed as one of the top objectives in health programs, particularly for women's health (16)

Cryptosporidiosis and toxoplasmosis Without passing the placental barrier, it produces a high tissue concentration in the placenta. As a result, it is the preferred treatment for T.gondii infection during pregnancy. However, the advent of parasite resistant strains could potentially limit the drug's therapeutic efficiency (17)

In pregnant women in Baghdad City, this study found high levels of IgG and IgM antibodies against T. gondii. Congenital toxoplasmosis in the fetus and baby can cause a wide range of symptoms, including spontaneous miscarriage and stillbirth, as well as hydrocephalus or microcephalus, brain calcifications, and retinochorioditis. (18)

and several studies were conducted to assess T. gondii infection in pregnant women or women of childbearing age in various countries, with various seroprevalences estimated. In Saudi Arabia (19), 51.4 percent of people had T. gondii infection, compared to 59 percent in Argentina (20). In Zair, Nigeria, anti-IgG and anti-IgM antibodies were found in 29.1 percent and 0.8 percent of pregnant women, respectively (21).

This study show highly significant between vitamin D and toxoplasmosis this agreement study Zohre fakhrieh (22) According to the study's findings, vitamin D insufficiency was linked to toxoplasma infection, and there was a noteworthy difference in the prevalence of T. gondii infection between the two groups of individuals with sufficient and inadequate vitamin D. For the in vivo and in vitro interpretation of vitamin D and parasite illnesses, more research is advised. and demonstrate the inverse relationship between vitamin D levels with age and toxo IGMs.

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22- Zohre FAKHRIEH KASHAN 1, *Saeede SHOJAEE, Hossein KESHAVARZ , Mohsen ARBABI , Mahdi DELAVARI , Mahbobeh SALIMI Vitamin D Deficiency and Toxoplasma Infection **(09 Jan 2018; accepted 24 Jan 2018)**

EFFECT OF DEPAKINE ON SOME PHYSIOLOGICAL CHANGES OF PREGNANT MICE AND THEIR EMBRYOS USING FOLIC ACID

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EFFECT OF DEPAKINE ON SOME PHYSIOLOGICAL CHANGES OF PREGNANT MICE AND THEIR EMBRYOS USING FOLIC ACID

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Abstract:

The present workconducted to evaluate the preventive role of folic acid in decreasing harmful effect on some phisiological changes & malformation in pregnant mice and their embryos.

In this research we used Depakine (anti convulsant) at concentration of (300,500,600).

In the present work, administration of Depakine (anti-convolsant) at the concentration of (300,500,600) mg/kg and folic acid 5 mg/kg to pregnant mice from the 1st till the 18th day of gestation. 30 pregnant mice were used and 2 experiments were performed.each experimental have 3 groups with 5 pregnant mice in each group.

In the first experiment.the first group involved 5 pregnant mice were administered oral doses of distilled water and served as control, second group involved 5 pregnant mice treated with 500 mg/Kg Depakine,third group involved these mice treated with 300mg/Kg of body .The 2nd experiment involved 3 groups: The first was administered oral doses of folic acid at 5 mg from the 1 st to the 18th day of gestation. The other two groups were treated by the same vitamine and being left for an one hour (to be obsorbed) and then administered by oral doses of Depakine equivalent to (300 and 500) mg/kg respectively from 1st to the 18th day of gestation ,(600mg group were repeated 2 times and there was death among pregnant mice).

The statistical analysis revealed a significant decrease in the average of length, weight and number of embryos if compared to control, pregnant mice organs (liver,heart,kidney,lung,brain,spleen,reproductive system&placenta),all showed significant decrease when compared to control.

The dosage by Depakine leads to multiple physiologic malformations mostly: head caP atrophy,tissues invaginations,different sites haemorrhage especially bloody spot at the mid – dorsum,hooked tailes. We concluded from what previously mentioned that the admission of Depakine leaded to multiple organs malformations, whereas, folic acid has a preventive but not treating role in decreasing such effects.

Also, some malformations were noted at the groups dosed by Depakine + vitamin together.

Key words: Folic Acid,Depakine, Conolusant,Pregnant Mice,Absence Of Head Cap.

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Introduction:

Depakine is an anti epileptic drug used clinically as an anti-convolsant, anti-manic (bipolar mania) but not to be used as an anti-convolsant during pregnancy(Saeed et al ,2020).It is simple compound similar to the internally formed fatty acid. It is formed by (8) carbon atoms,2-propolypentanoic acid,2-propolyvaleric acid from valeric acid whose naturally extracted from the valeriana officinalis (Chateauvieux et al,2010).

Investigation by (Tung &Winn,2011) revealed that the admission of depakine at dose of 0.6mM to the cultured embryos leads to a significant decreasein the embryos growth and increase in the embryonic malformations percentage which belonged to the active oxygenic forms and the programmed death of cells.also, usage of depakine during pregnancy leads to delaying of intrauterine growth by decreasing length and weight of embryo and malformations within the skeleton (Mohamed et al,2021).(Chang et al,1998) noted congenital malformationswithin the embryos, as the Depakine passes through placenta, causing a fetal valproate syndrome which caused skeletal and extremities malformations and growth delay (Clayton-Smith & Dannai,1995) and also stimulate cleft palate and cardiac malformations (Lacaz,2012),

Data revealed that all malformations within embryos was due to the direct effect of VPA on the retinoic acid (a compound founds everywhere and has a role in the natural development). So, and due to the VPA toxicity, there will be a reduction within the alimentary elements passed through placenta (Nikoloussi et al,2004). Depakine is considered as malformation agent to studies animals, due to it stimulates disturbances within neural tube closer when admitted on day 12 of pregnancy(Kim et al,2011).

In mice,it is resulting in death and adsorption of embryos, delay of growth, neural tube malformations, skeletal and cardiac malformations (Aldeeb et al,2000).

Depakine effects are related to its stimulatory role in reducing methionine and inhibiting folate metabolism, which in turns, inhibiting the additions of methyl groups to DNA (Alonso-Aperte et al,1999) & increasing the level of the amino acids contain sulfer & prevent the GSH system (Hishida &Nau,1998), also, it stimulate the oxidative stress, the pregnant are more toxically sensitive to VPA if as compared to pregnant rat (Ornoy,2009).

Depakine leads to another disturbances like autism,excessive motion and lack of attention, And these influences resulted from the negative role of valproate which In turn inhibiting the histon deacetylase enzyme, and also, due to the oxidative stress of the valproate which leads to the multiple neural tube malformations. The admission of depakine to parents causes multiple disturbances in neural growth even when, dietary supplements (like folic acid are used). So, Depakine is contraindicated during pregnancy(Blaszczyk et al,2022).

Depakine also effect on the expression of genes that controlling cell cycle and differentiation. It is considered as the most anticonvulsant drugs causing malformations (Blaszczyk et al,2022)

Material and Methods:

This study is done on some tissues of pregnant mice to show the effect of the Depakin 500 mg (tablet), made in France , decreasing this effect by using anti-oxidative vitamin Folic acid (B9).julphar company.United arabic emirates.

This study started at 10l2l2021 , ended at 24l7l2022.

Experimental animals :

Adult male and female albino mice were used in this experiment, with average weight 20-30 gm. They were taken from the animal house of College of Veterinary Medicine female to male ratio was 3:1(3female,1 male)in each box,the ground of that box was wood mulch (free of anti-insects)(Abdulfatah,2004).which was replaced (2-3)times /week,this box was supplied by water and food (specific food) along the week.the mating was ensured by monitoring the vaginal plug on the next day morning (Meirow etal,2001) and Date was written on the box container,the mating day is considered as day zero and the next day is the 1st day of pregnancy (Correia pinto etal,2001).

Experimental Design:

Thirty female pregnant mice were divided into 2 divisions

A_1st division:

1st group Pregnant mice were administered oral doses of distilled water for 18 day and served as the control group.-

-2nd group: included (5) pregnant mice were dosed at rate 500mg/kg Depakin ,day for 18 days.

-3rd group: included (5) pregnant mice were dosed at rate 500 mg/Kg +5 mg Folic acid ,/day for 18 day.

B-2nd divisions:.

-1st group: included (5) pregnant mice dosed by + vitamin folic acid 5mg/kg +300 mg/Kg of Depakine for 18 day.

-2nd groups : each group included (5) pregnant mice dosed by vitamin folic acid (5mg)/kg and were left for 1hr then dosed by 300 mg /Kg Depakin.

Animal dissection:

The animals were dissected after being anaesthetized by Ether at the day (18),then, abdomen was incised upward, the embryos and the targeted organs of the pregnant mice were excised and washed by the physiologic solution Nacl 0.95%,then,The organs and embryos are weighted and the dimensions are taken ,They were put in (formalin10%)which was changed on the next day depending on the way of (hamid et al,2021;Taha,2021).

Results:

D: Depakine

folic acid (F) a structural or functional malformation at time of birth which leads to a mental or physical handicap and some time death, chemical and medical materials are classified as teratogens based on its capacity to make malformations.The teratogenecity depends on the drug dose ,administration and period of pregnancy .VPA is an anticonvolsant,as well as a significant teratogen, when it is used during pregnancy, it increases the chance of malformation and comprehensive disturbances of new born after birth.

The study of malformative factor is an important to evaluate drugs toxicity, as well as to decrease chances of the malformative new born (Saeed et al,2020).

Morphological changes in pregnant mice:

Depakine(500 mg)groups:

Lung,liver &kidneys showed surface vesicle, body vesiclas with hair loss (disappeared in other treatments).

in embryos:embryonic adsorptions(as in picture 1) ,exophthal mous, hemorrhage in different regions especially in head with dorsal petechiae (as in picture 2,3), while the (500 mg depakine+folic acid) group showed slightly enlarged sized of embryos with no obvious improvement and loss of the skull cap (as in picture 4,5) .

300 Depakine groupe: showed loss of the carnium cap, brain extrusion, wrinkling of the skin, tail torsion(in few sample) and hemorrhage in multiple site of body(as in pictures 6,7,8,9) whereas, (300 depakine +folic acid) group : showed slight minor improvement with body congestion and tail torsion in some embryos (as in picture 10,11).and these result agree to (Saeed et al,2020) according to the brain tumor, dorsal hemorrhage extremities malformation and delay of growth

Picture(1)explain adsorption in embryos at 500 mg Depakine

Picture (2) showed bleeding in other region at at 500 mg Depakine

Picture (3)showed bleeding in dorsal at 500 mg Depakine

Picture(4) showed abscense of head cap at 500 D+F

Pictur (5)showed bleeding in head &wrinkling in the skine at 500mg D+F

Picture (6) showed absence of head cap at 300mg Depakine

Picture (7) showed adsorption of the embryo at 300 mg Depakine s

Picture (8) showed invagination in abdominal region & release organ to the outside at300 mg Depakine

Picture (9) showed bleeding in other regions especially in dorsal at 300 mg Depakine

Picture (10) showed decrease in size of embryos at 300 mg Depakine+F

Picture (11) showed absence of head cap 300 mg Depakine +F

(Saeed et al,2020) corresponding with the present study showed there is a growth retard, abdominal invagination and organs protrusion out of the body, mid dorsal haemorrhage, brain and body atrophy.(Mohamed et al,2021) ther is a reduction in the size and length of the embryos, embryonic adsorption as well as growth retardation, loss of some particular sites, abnormal ribs and skeletal malformation ,this is corresponding with this study.Brain,circum orbital and extra cranial haemorrhage are evidences excephalety, brain loss may leads to a disturbances in neural tube closure which inturn leads to a puncture in a base of a skull and then brain protrusion outside (Alchalabi et al,2017).The wrinkled skin and loss of extremities are evidences on skeletal system malformation which might be due to differences in calcification and formation of particular part of skeletal system(Siddiqi& Alnazwani,2019).

Statistical analysis: SPSS system is used to analysis data, completely randomized design is used to analyze the contrast in the adjectives of proportional average to each of weigt (brain,reproductive system,heart,liver,kidney,spleen).Chi square is used to analyse of pregnant mice showed adsorbed embryos and their percentage,number of adsorbed embryos and their percentage.

Brain:

Brain weight in (500D,300D)groups revealed significant decrease when compared with control and folic acid group, while (Depakine+folic acid) groups showed slight improvement if compared with control groups(as in table 1) this effect caused an increased in the free radical which in turn effect on the brain (Shona et al,2018), and assured the preventive role of the folic acid against the neurotoxicity effect of VPA(Shona et al,2018).

Reproductive system:

(300D,500D,500DF,300DF)showed significant decreased when compared with control group,while,(300DF,500DF)groups revealed significant increased when compared with

(300D,500D) only (as in table 1).and this is related to the direct effect of VPA which passes through placenta effecting the weight with embryos &finally the weight of reproductive system(Aljuboury,2021).

Heart:

All groups showed significant decreased in which of heart weight if compared to control group and folic acid groups (as in table 1) and this is because of the effect of VPA on the blood stream and the alimentary elements by decreasing there entrance to the heart and then decreasing the weight of the heart (Aljuboury,2021).

Liver:

Depakine groups showed significant decreased if compared to control group while D+F) groups showed significant increased if compared to (D)groups, but there was no significant change between(500DF,300D) groups,300Df group showed no significant changed when compared to control (as in table 1) and this is because of the lack of alimentary materials arriving to the liver which in turn lead to lack of the proliferation and finally decreasing the liver size (Aljuboury,2021).

Kidney:

All groups showed significant decreased if compared to control group, (D+F)groups showed significant improvement if compared to others, There was no significant change between (F,500DF,300DF)group , and was no significant change between(300 D,500DF) groups (as in table 1).and this is might be due to their need for a move time to get rid of the drug and vitamin or due to loss in the average of fluids and mineral (Aljuboury,2021).

Lung :All groups showed significant decreased if compared to control group, there was no significant change a mong (300DF,F) groups and control, also, there was significant change a mong ,there was no significant (300D,300DF,500DF,F)groups. ,there was no significant change among(300,500D,500DF)(as in table 1).

Spleen:

All grouped showed significant decreased if compared to control group, (D+F) groups showed an increased if compared to (D) groups whereas , (500D,500DF) groups showed significant decreased if compared to (300D,300DF). there was no significant change among (300D,300DF,F) groups, as well as, no change among (300D,300DF,500DF)groups(as in table 1).this might due to the lack in the cell reproduction by proliferationwhich might be due to the lack blood supply to the organs (Aljuboury,2021)

Table(1) : weight of the organs in pregnant mice treated with Depakin, folic acid and Depakine +folic acid).

Spleen	lung	kidney	liver	heart	Reproductive system	Brain	organs / samples
0.3 a	0.32 a	0.29 a	2.00 a	0.30 a	13.86 a	0.42 a	Control
0.28 ab	0.3 ab	0.24 b	2.07 a	0.21 b	13.64 a	0.38 ab	Folic Acid
0.13 d	0.21bc	0.14 d	0.97 c	0.15 c	3.90 e	0.31 b	500 D
0.18 cd	0.18 cd	0.20 bc	1.59 ab	0.16 c	6.28 d	0.34 ab	500 DF
0.23 bc	0.21 bc	0.17 cd	1.39 bc	0.14 c	8.52 c	0.32 b	300 D
0.23 bc	0.29 ab	0.23 b	2.01 a	0.15 c	10.60 b	0.36 ab	300 DF

Table(2) :Explain weight of placenta and weight ,lenghth ,number of the embryo

Embryos number	Embryos length	Embryos weight	Placenta weight	Samples
7.40 ab	23.82 a	1.25 a	0.16 a	Control
9.00 a	16.17 d	0.95 b	0.11 bc	500 D
5.40 b	19.67 c	0.84 b	0.13 b	500 Df
8.80 a	22.41 b	1.28 a	0.13 bc	300 D
5.00 b	19.46 c	0.91 b	0.11 c	Folic aciad
6.60 ab	23.27 ab	1.32 a	0.12 bc	300 Df

Placenta:

All grouped showed significant decreased if compared to control group , there was no significant change among (500D,500DF,300D,300DF) groups, (F) group showed significant decreased when compared to control but with no change if compared to others (as in table 2) and this is correspond to (Omrany,2013), this is because the VPA pass through placenta and concentrate in the blood at the embryo more than mothers (Wenger et al,1992), affecting the supplements diet to the embryonic cycle (Aljuboury,2021).

Embryos weight:

All groups except (300D,300DF)showed significant decreased if compared to control group,(300D,300DF)groups showed no significant change if compared to control group,(500D,500DF,F)groups showed no significant among them(as in table 2).which correspond to (Omrany,2013).

Embryos length:

All groups showed significant decreased if compared to control .(300D,300DF)groups showed no significant if compared to control,(F,500DF) groups showed no significant between them (as in table 2).The decrease in the average of embryos length might be attributed to the disturbances and decrease of blood flow within placenta and uterus which intern effect the function of placenta.the decrease in the length and weight of the embryos is corresponding with this study, whereas decrease of the intrauterine growth leads to retard the growth(Kacirova et al,2015).

Embryos number:

All (D) groups showed significant decreased if compared to control group.wherease,no significant change between (D+F),F& control groups (as in table 2).

Average of absorbed embryos:showed significant increase $p<0.05$ in the average of absorbed embryos of pregnant mice treated by Depakine,as the percentage of the pregnant mice with absorbed embryos reached 60% and the percentage of absorbed embryos 38.8%.wherease(500D+F)group,percentage of pregnant mice reached 20%,absorbed embryos reached 18.5% if compared to control.

The percentage of pregnant mice showing in 300D group reached 20%,and the absorbed of embryos 10%,in 300D+F group the percentage reached zerro when compared to control.(as in table 3).

The decrease in the average of embryos is attributed to the increase in the number of absorbed embryos as there is reversible relation between the average of the embryos & the number absorbed embryos,this is responding with(Dillasamolla et al,2016).

Table (3): the number of absorbed embryos & their percentage & the number pregnant mice showed absorbed embryos & their percentage

Percentage of Number of absorbed embryos	Number of absorbed embryos	Percentage of Pregnant mice showed absorbed embryos	Pregnant mice showed absorbed embryos	Samples
0	0	0	0	Control
38.8%	7	60%	3	500D
18.5%	7	20%	1	500DF
0	0	0	0	Folic acid
10%		20%	1	300D
0	0	0	0	300DF

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FACE SMILE DETECTION USING DEEP LEARNING INTEGRATION APPROACH OF CONVOLUTIONAL NEURAL NETWORK

Sahar WAHABKHADIM

FACE SMILE DETECTION USING DEEP LEARNING INTEGRATION APPROACH OF CONVOLUTIONAL NEURAL NETWORK

Sahar WAHABKHADIM [1]

Abstract:

Recognizing facial expressions has been a hot focus of research in recent years. Smile recognition can help with research into human facial expression recognition because it is one of the most essential facial expressions. In this paper, we provide an automated approach for identifying distinct forms of grins. The photos are first processed to isolate the faces. Furthermore, the Convolutional Neural Network (CNN) is trained using different optimizers based on face extraction. Convolutional Neural Networks, a type of neural network, excel at processing visual input. An image is convolved (passed over) with a kernel to create an output. A deep learning network is created by stacking these convolutional layers, which allows it to learn extremely sophisticated visual information. The work integrates the face smile detection using deep learning based approach of Convolutional Neural Network (CNN) with the effectual outcomes and higher degree of accuracy and minimum error factor so that the overall performance will be elevated. The usage patterns of CNN are associated for effectual face smile detection with higher performance and effectiveness. The outcomes are quite effective and near to more than 90% accuracy levels to indicate the cumulative performance.

Key words: Deep Learning And Biometrics, Face Smile Detection, Face Smile Detection Using Deep Learning.

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Introduction:

One of the primary areas of study in real-time video processing as well as digital image processing is face detection. Various areas of the face must be examined during a face analysis in order to determine the subject's emotions and moods. Lips, Eyes, Cheeks, Ears, Eyebrows, Nose, and several more body parts are among these segments. Lips Detection is a technique used to identify a person's emotions, including happiness, happiness, frustration, and many more [1].

It is suggested in some study papers to investigate the Lips-based Smile Detection on Faces and examine the Smile Detection using a metaheuristic technique that uses global optimization of outcomes. Artificial neural networks or support vector machines may be employed in this field to categorize the smile on a human face [2]. A commonly utilized technology, face recognition or detection is always being developed to produce better results. It is utilized in a variety of settings, including forensic science, health, and security or surveillance systems. Additionally, it has a robust mobile application. Face detection technology comes in a wide variety of forms, and the algorithms powering these technologies are also diverse. Many academics and researchers have been working to put the optimal face detection algorithm into implementation. While several strategies were employed to do this, not all restrictions were taken into account when creating this programme [3].

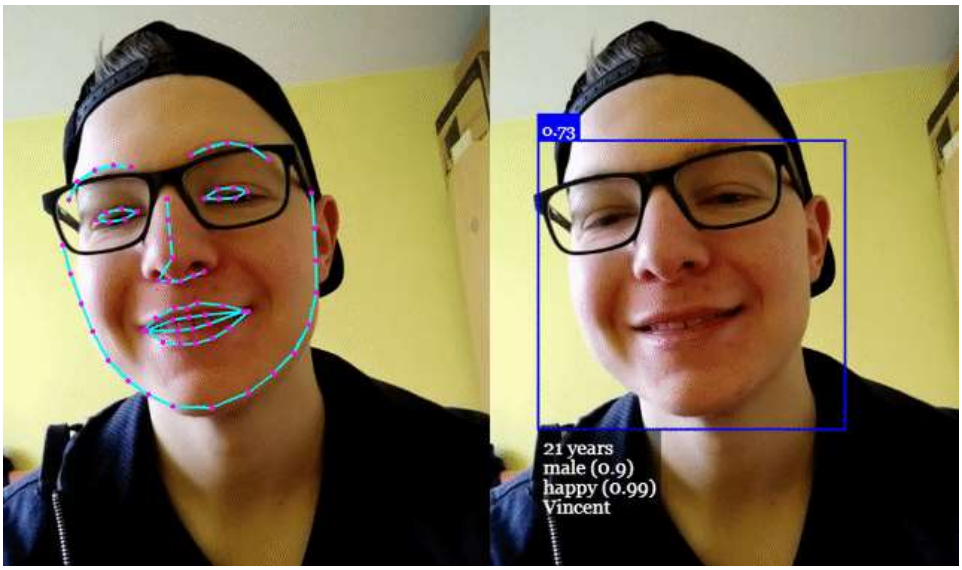

Figure 1 : Face Smile Aspects.

In everyday life, a smile is one of the most common ways to show happiness, contentment, beauty, and enthusiasm. In recent decades, researchers have paid a lot of effort to developing methods for detecting smiles. Mehrabian claims that in an effective communication, 55% is conveyed through the use of specific facial muscle movement; 38% is conveyed through paralinguistic means, such as the way in which words are pronounced (normally or sarcastically); and 7% is conveyed through the inherent meaning of the words that are spoken at that time [4].

Existing Work:

In recent years, several scientists have presented new methods. Choosing a feature extraction approach that executes robustly in unknown settings like age, sex, illumination, and skin color is the most difficult challenge in grin recognition, along with classification.

Enormous existing feature extraction methods may be broken down into two broad categories: appearance feature methods and geometric feature methods [1]. Geometric-based methods require accurate and robust facial feature detection and tracking methods such as Histogram of Oriented Gradients (HOG), K-Nearest Neighbor (KNN), Gabor Energy Filters, Self-Similarity of Gradients (GSS), Deep convolutional neural networks (CNN), and local binary pattern (LBP) etc., while appearance-based methods use manually designed feature extraction. Various classifiers [2, 3], such as AdaBoost, Haar Classifier, Support vector machine (SVM), Hidden Markov Model (HMM), Haar-cascade classifier, Edge Orientation Histograms (EOH), Extreme Learning Machine (ELM), and SoftMax classifier, are used to categorize facial expressions.

Specifically, CNN is a Deep Learning method that has shown excellent performance when inputs have several dimensions. To put it plainly, this neural network learns to recognize unique patterns that may change and distort in unexpected ways. The mathematical operations of convolution and pooling are responsible for this remarkable result.

In order to execute convolution, the multidimensional input is taken into the convolution layer, and the multidimensional output, known as the convolved feature or feature map, is then passed on to the successive layers [4, 5].

Specifically for CNNs, convolution is executed with weight matrices known as filters/kernel. Filters can be compared to virtual sieves, allowing only certain types of data to flow through. The dimensions, gait, and number of channels of these filters define them. The filter's "size" denotes its overall form, its "stride" the number of units by which it shifts, and its "channels" the total number of convolved features produced by stacking the filters. Back propagation is used to fine-tune the filter weights and make it possible to extract robust features. To generate the convolved feature/feature map shown below, the filter (blue matrix) travels from top to bottom, left to right, with a stride of one, multiplying the input image pixels by the weights of associated cells.

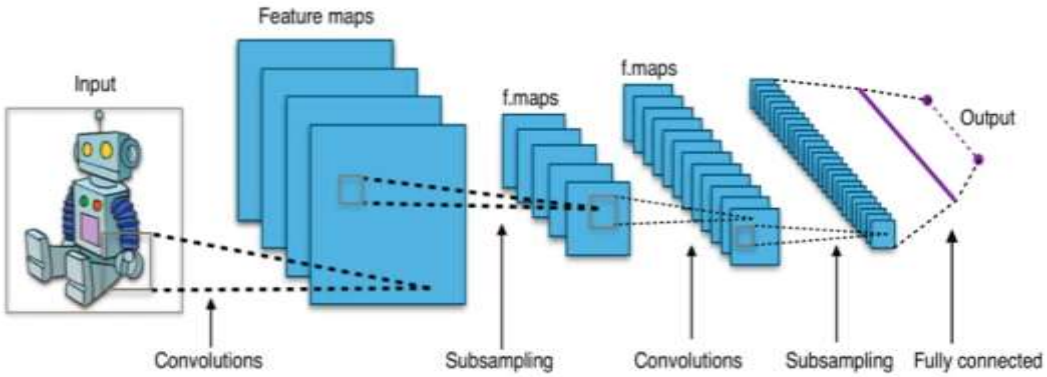

Figure 2: Patterns in Convolutional Neural Network

To accomplish this goal, feature maps can be "pooled," or aggregated, by grouping together contiguous cells according to a predetermined aggregation criteria. The size and pace of the Pooling layer are indicative of Pooling [6, 7, 8]. The size controls how many cells are taken into account for the aggregation, while the stride specifies how many units are used to switch to the next group of cells.

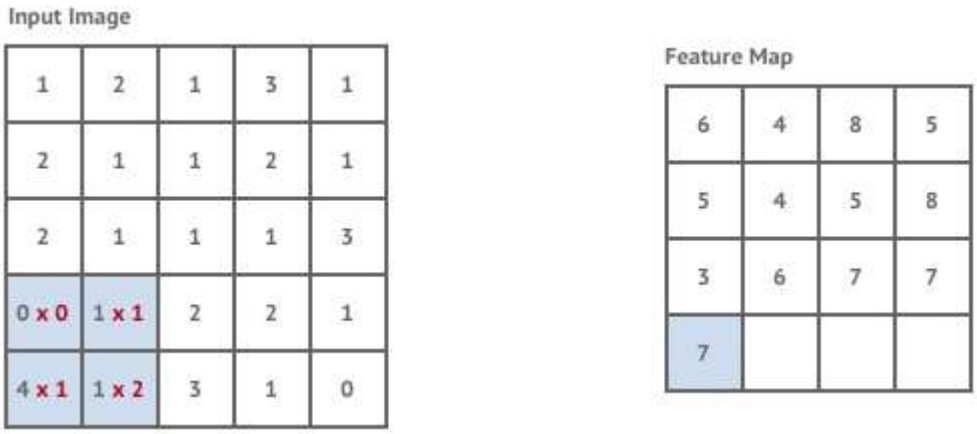

Figure 3: Pooling in Convolutional Neural Network

When compared to filters, Pooling layers are distinct because they employ aggregation techniques such as Maximum and Average of cells without relying on weights.

So, this layer is immune to the effects of back propagation. Below is an illustration of Max Pooling, wherein the maximum of four cells are examined, with a stride of two, travelling from top to bottom and left to right to produce a reduced feature map [9, 10].

Research Problem:

A facial smile or grin is a very basic muscle motion used to express delight. A grin indicates pleasure and delight. The technology underpinning smile detection has been implemented into a broad range of practical applications, including product evaluation, patient monitoring, photographing, holding video conferencing, and developing interactive systems. Unconstrained grin detection has seen a multitude of proposed approaches since its debut. Most major feature descriptors, on the other hand, have extraordinarily large dimensions, making them challenging to utilize in real-time applications. Moreover, there has to be a more robust characteristic for telling the difference between a smiling and a neutral face [11, 12]. The work needs the robust approach with higher degree of performance and accuracy for the effectual outcomes on the face smile detection and addressed in this work.

Objectives:

With the use of the person's live characteristics, behavior and qualities, forensic applications have made face recognition and object identification one of the primary topics of research. In forensic contexts, it is useful to be able to recognize a person by analysing and learning from many different parts of their face. The human grin is comprised of several different parts, including the lips, forehead, cheeks, chin, and others, and may be detected by studying these features. Work on hairstyles is possible in other fields of study, but as they are subject to manipulation, work on facial grin recognition has taken centre stage. In this study, we describe a deep learning-based method for facial grin recognition by combining the capabilities of a Convolutional Neural Network (CNN) with fuzzy logic.

Contribution and CNN Model:

When first trained, most CNN models generate a limited number of highly convolved features; as the network progresses to the fully connected output layer, the number and size of these features gradually increase. Over fitting is prevented by inserting a pooling layer or a dropout layer between the convolution layers.

Normalization in Batches:

After being normalized, a dataset will have a mean of zero and a standard deviation of one. Normalizing the input helps stabilize this undesirable volatility, which reduces the performance of Neural networks when there is variance in the distribution of data. Considering that each layer in a neural network serves as an input layer for the layers that follow, wouldn't it be great if the data were normalized before being passed on to the next layer [13-16]. The output will vary depending on the weights of the individual nodes. Consequently, due to back propagation, the distribution of the data given as input for successive layers is dynamic. This causes delays in the training process and might lead to the network being stuck.Batch Normalization's primary benefits are greater accuracy, faster convergence (about 14 times faster), the elimination of dropout layers, and the tolerance of higher learning rates.

Data Pre-Processing and Analytics Patterns

Data and Evaluation Patterns:

The source for the smiley face database. It's made up of pictures of happy and sad faces (64x64 pixels in size). It's the perfect starting point for the machine learning algorithm to learn about feelings.

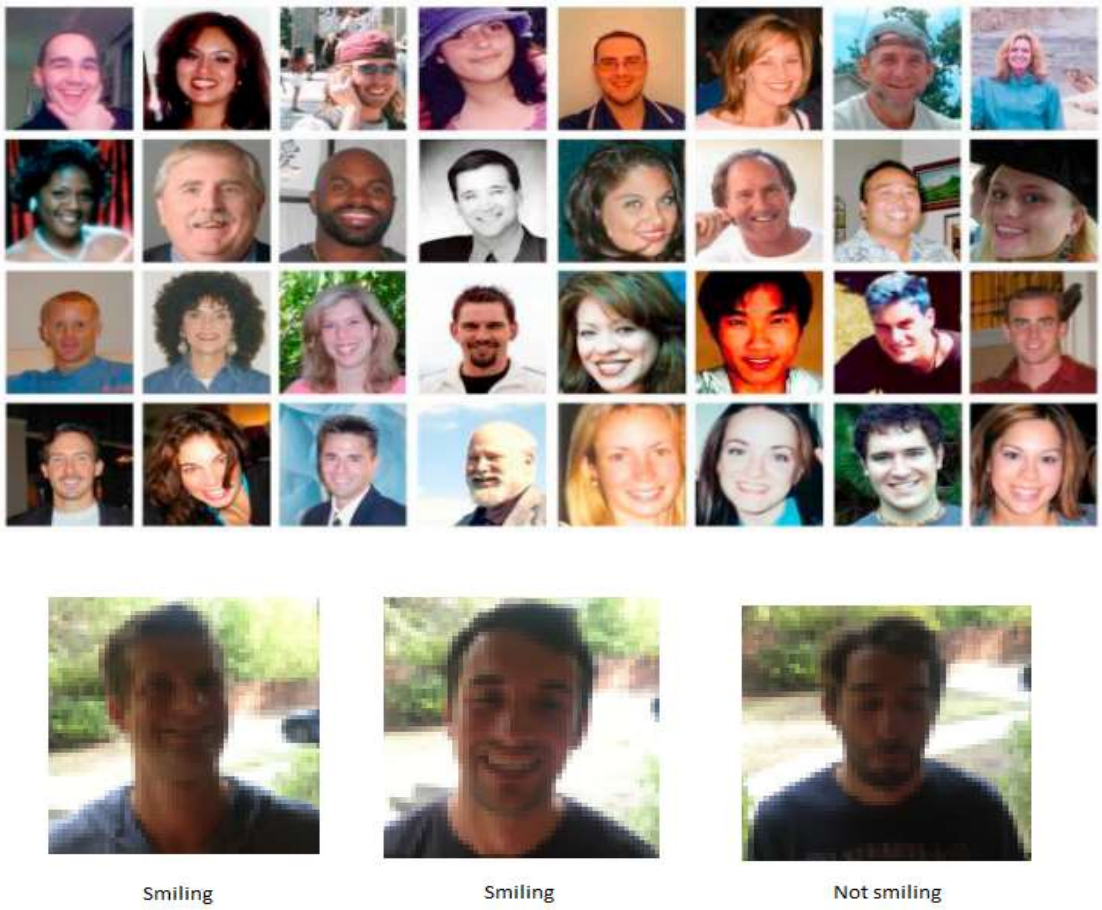

Figure 4: Dataset in Analytics.

In all, there are 600 instances in the training set. There are a total of 150 instances in the test set [23].

Activation Functions:

The activation functions enclose the neural network node outputs. Without an activation function, the network's behavior would be unpredictable, with the output wildly swinging back and forth with each new round of training data.

Rectified Linear Unit (ReLU) will be used as the activation function for the hidden layers, while the Sigmoid function will be used for the output layer.

Integration with Relevant Subsystems:

When using Python for scientific computation, the NumPy library is essential. It works well for efficiently storing and processing data with a large number of dimensions.

Pandas is a free and open-source library for Python that provides high-performance, user-friendly data structures and data analysis tools under the BSD license.

In order to operate on top of Tensorflow, Keras is a deep learning library. It's like taking a piece of cake and turning it into Tensorflow[14].

Figure 5:Dataset with Convolutional Neural Network.

The HDF5 binary data format may be accessed using the H5py Python interface. It's a convenient way to store and work with large volumes of numerical data, and it's compatible with numpy.

Sklearn is a machine learning module for Python that provides access to a wide variety of helpful features and models.

Key Methodology and Process:

Step 1. The dataset is loaded from the repository so that the pre-processing and initial implementations can be done for further analytics with CNN
Step 2. Integration of Deep Neural Networks based CNN approach with Assorted Layers
a. Dense Layers
b. Max Pooling Layers
Step 3. 2D Convolutional Based Layers in integration of ReLU is implemented
Step 4. Batch Normalization Process for each convolutional layer
Step 5. Max Pooling Layer
Step 6. Flattering for conversion to 1D from 2D with fully connected network
Step 7. Dense layers implementation and training

Deep Neural Network:

In the implementation of a Neural network, we use a straightforward sequential model consisting of Convolution, Batch Normalization, Max Pooling, and Dense layers.

We use a 2D convolution layer with 32 filters, a 5x5 matrix, and ReLU activation. It is standard practice to incorporate padding in the first layers of a network in order to minimize information loss due to the dimensions of the resultant convolved features reducing.

After each convolution layer, the features are normalized using a Batch Normalization layer. In order to convert and feed normalized information to the succeeding CNN, the work incorporated batch normalization as the input layer.

The size of the resulting convoluted features can be reduced thanks to the Max Pooling layer, which collects cells in them.

When passing data to a fully connected layer, a flattening layer reduces the 2D convolved features to a 1D sorted tuple.

Full connectivity indicates a dense layer. They only work with one-dimensional inputs. Inner layers are activated by ReLU. In contrast, the model's outer layers employ a Sigmoid function for binary classification (smiling or frowning).

Input shape = (64, 64, 3) is a valid parameter for the input layer. As a result of the image's 64x64 pixel dimensions and 3-channel color palette, this is the case (RGB).

It's important to note that the output layer is a dense layer with only a single node. This node just needs to use the Sigmoid activation function to generate values between 1 (Smiling) and 0 (Not smiling)[15][16].

Systematic Model Construction:

To set up the learning procedure, the compilation function is implementation with CNN before you begin training a model. You can pass in an optimizer, a loss function, and some metrics to it. With the use of optimizers, the overall process is fit so that the outcomes and results will be accuracy aware with minimum loss[17].

$$H_p(q) = -\frac{1}{N}\sum_{i=1}^{N} y_i \cdot log(p(y_i)) + (1 - y_i) \cdot log(1 - p(y_i))$$

Binary Cross-Entropy / Log Loss

H : Key Factor for Analysis

q : Evaluation Pattern

p : Probability Factor

N : Number of Points

y : Label for the output class

The formulation underlines that to log (p(y)) the loss is added that is the log probability

An optimization algorithm is accepted by the optimizer. Most commonly, they are generated from the standard gradient descent. We make use of an optimizer named ADAM that can change its learning rate depending on any of its inputs.

Iterations over epochs are based on the loss function, which is used as a measure to evaluate the model's performance and drives back propagation. They offer a numeric representation of the discrepancy between predicted and actual results. Since this is a binary classification problem, we employ Binary Cross entropy for this project[18].

Forming a Model:

Certain training parameters are populated based on a number of factors.

How many times the model will be iterated over the training data is measured in "epochs." Through each epoch, metrics are utilized to monitor how well the model is performing. Accuracy (Correct rate) is typically the parameter used to assess a neural network's performance during training.

$$CR = \frac{C}{A}$$

CR – The correct rate;
C – The number of sample recognized correctly;
A – The number of all sample;

With the correct rate analytics, the overall accuracy and performance can be evaluated with the correctly recognized outcomes or test data with the sample analytics. The sample or testing dataset can be evaluated on the trained model and then the overall performance with the correct rate can be evaluated[19].

The validation split method randomly divides the training dataset in half; one half is utilized for training, while the other half is used to calculate the validation measures following each epoch. Twenty percent of the data is utilized for checks and balances here[20].

The validation loss can be tracked via a callback parameter for early termination (loss measured using the validation set). Having set patience to 5, training will terminate if the validation loss hasn't decreased after that amount of time.

```
Train on 480 samples, validate on 120 samples
Epoch 1/32
480/480 [==============================] - 9s 19ms/step - loss: 1.2512 - acc: 0.7146 - val_loss: 3.0769
- val_acc: 0.5250
```

```
Epoch 26/32
480/480 [==============================] - 8s 16ms/step - loss: 0.1068 - acc: 0.9604 - val_loss: 0.1094
- val_acc: 0.9667
Epoch 00026: early stopping
```

Figure 6: Analytics of Accuracy.

Metrics for the model for Visualization

Let's take a moment to picture the rigorous training we gave the model. The discrepancy between training accuracy and validation accuracy is fascinating. Have you observed the fluctuations in the validity of the checks? The traditional behavior of back propagation (peaks and troughs)[21].

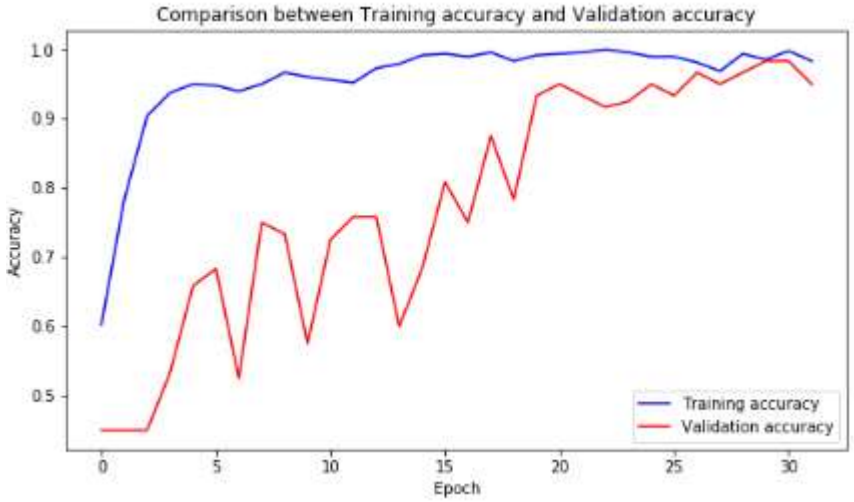

Figure 7:Analytics with Training and Validation Accuracy

However, the accuracy achieved during validation typically falls short of that achieved during training. Let's see how validation loss stacks up against Training loss. Once again, the swaying won't quit. As training continues, however, both the Training loss and the validation loss drop dramatically[18][22].

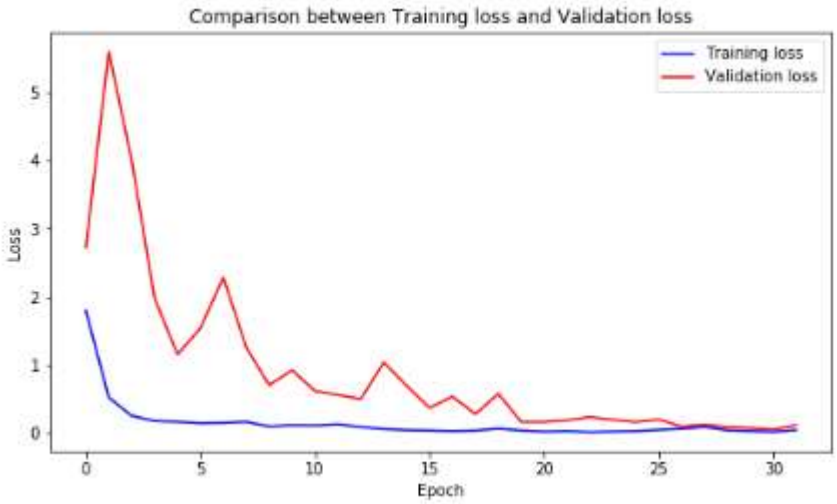

Figure 8: Epoch and Validation Analytics.

In most cases, the Training loss is lower and the Validation loss is larger.

```
model.evaluate(x=test_x, y=test_y, verbose=1)
```

```
150/150 [==============================] - 1s 4ms/step

[0.10699425359567007, 0.9533333309491475]
```

```
confusion_matrix(test_y, np.round(model.predict(test_x).flatten()))
```

```
array([[66,  0],
       [ 7, 77]])
```

Figure 9: Results and Analytics.

Table 1: Evaluation Pattern of Accuracy.

Simulation Attempt	Accuracy - Classical Approach	Accuracy - Projected Novel Approach
1	92	96
2	92	98
3	90	95
4	90	96
5	91	98
6	90	99
7	90	97
8	91	97

With the integration of CNN with deep ensemble learning, the accuracy is quite higher in the proposed approach. The proposed outcomes are giving better results and performance as compared to the classical approach.

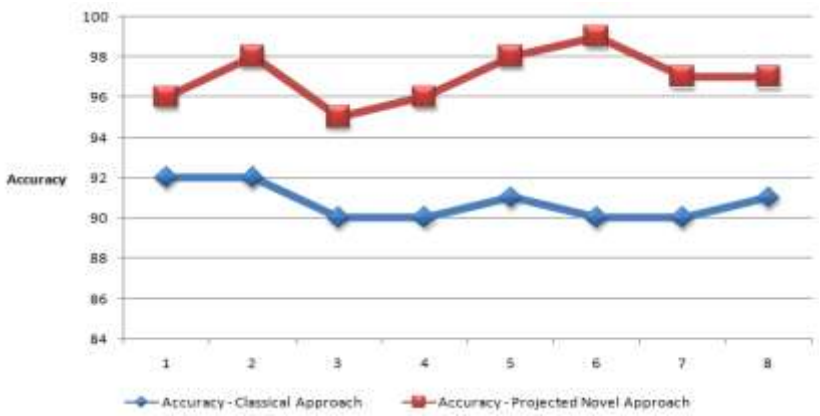

Figure 10: Accuracy Evaluation.

With a validation accuracy of higher values, the model is powerful and effective.However, accuracy tracking alone won't cut it for this endeavor. Since this is a classification activity, we need to generate a Confusion Matrix to check that the right categories were used. The outcomes present that the model has done really well thus far, with very less false positives and indicating the higher degree of performance and effectiveness.

Conclusion:

Humans use their smiles more than any other facial emotion. Speculation about other people's feelings is a strong social signal. The fields of psychology and pediatrics, such as ASD (Autism Spectrum Disorder), have paid a lot of attention to the study of how to decode the smiles of newborns (ASD). Experts have focused on developing an automatic grin identification system as a replacement for the laborious but necessary task of manually recording the emotions present in newborn face photos. However, research progress in this subject is hampered by the unavailability of a substantial volume of labeled data. The proposed approach is effective and giving better results as compared to the classical approach. The accuracy measure in the classical approach is very less as compared to the proposed approach that is generating outcomes with more accuracy.

Future Recommendations and Scope:

Research on slanted faces and micro-expressions may be a promising avenue for the development of grin recognition technology in the future. Only a few methods exist now for handling micro-expressions and slanted faces. For those who have lost the ability to express themselves naturally due to illness, catching a genuine grin might be an additional hurdle. Twelve medical conditions—Asperger syndrome, autism, Bell's palsy, depression, depressive disorders, drooping or paralyzed facial muscles, facial weakness, hepatolenticular degeneration, major depressive disorder, Parkinson's disease, scleroderma, and Wilson's disease—have been linked to patients losing their ability to express themselves naturally. The projected model has done really well for such a basic CNN and the key models like LeNet, ResNet, VGG, and GoogLeNet are incredibly adept and considerably strong with soaring accuracy; they are the models you should use for the complex jobs.

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SEROPREVALENCE OF TOXOPLASMA GONDII IN PREGNANT AND ABORTION WOMEN IN TIKRIT CITY

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SEROPREVALENCE OF TOXOPLASMA GONDII IN PREGNANT AND ABORTION WOMEN IN TIKRIT CITY

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Abstract:

The hazardous endemic disease toxoplasmosis is mostly brought on by the intracellular parasite Toxoplasma gondii. Sero epidemiological surveys indicate that 15–85% of people are infected by this parasite. Toxoplasmosis seroprevalence in pregnant and postabortive women will be assessed,210 pregnant women with single or multiple losses were tested. Of these, 32 (15.2 %) were found to have toxoplasmosis. All women had an enzyme-linked immunosorbent assay to test for the presence of IgG and IgM antibodies specific for toxoplasma. IgM antibodies indicates recent or acute infection in 7 (3.3 %) of patients, whereas anti toxoplasma IgG indicates old or chronic infection in 25 (11.9%) of infections. As long as toxoplasmosis is still one of the risk factors for miscarriage, serodiagnosis must be suggested in order to distinguish between acute and chronic infection by performing a regular test to measure IgM and IgG antibody levels in both pregnant and non-pregnant women.

Key words: Seroprevalence, Toxoplasma Gondii, Abortions Women, Normal Pregnant Women, Tikrit City.

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Introduction:

The parasite that causes toxoplasmosis is Toxoplasma gondii, an intracellular protozoan. The first time T. gondii was found in the tissues of the gundi (Ctenodoactylus gundi), it was discovered by Nicolle and Manceaux in Tunisia and Splendore in Brazil in 1908. (1908). Warm-blooded animal T. gondii is a typical parasite that can lead to encephalitis, chorioretinitis, congenital infections, and newborn mortality [1]. The infection will spread if you consume tissues from definitive or intermediate hosts that have tissue cysts in them, or if you drink water that has been polluted with them[2]. From 1 to 100 per 10,000 live infants, congenital toxoplasmosis frequency varies widely between nations and even within one nation between various areas or populations[3]. T. gondii infection affects between 30 and 50 percent of the world's population, according to estimates[4].

Infections can cause serious and even life-threatening issues, such as encephalitis and serious ocular consequences, when an immune system is compromised. Infected individuals frequently experience mild flu symptoms. Serological techniques have been known for a while, but because to their high cost, lack of trained employees, low test demand, and problems with sensitivity, specificity, and interpretation, most clinical labs do not consistently use them. Complement fixation, indirect hemagglutination, indirect fluorescent antibodies, soluble antigen fluorescent antibodies, latex agglutination, counter electrophoresis, enzyme-linked immunofluorescence assays, radioimmunoassays, and intradermal testing are examples of common techniques that have been used [5].

Aim of the study:

In this study, Toxoplasma gondii seroprevalence in pregnant and postabortive women in Tikrit city was investigated.

STATISTICAL ANALYSIS:

Chi-square test (Minitab version 17) was used to statistically examine the data, with a probability threshold of ($p>0.05$) and ($p>0.01$), and no significant differences were found.

MATERIALS AND METHODS:

This poll was carried out during the Salah AL-din administration between November 2021 and March 2022. This study included 210 pregnant individuals with an average age of 15 to 45 years. These patients filled out a standard questionnaire with personal information and registered. The registration contains the following information: name, residence, age, and the total number of abortions. Five venous blood samples from each patient were taken in order to analyze the serum. The amount of IgG and IGM antibodies was measured using the enzyme-linked immunosorbent assay (bioactiva, Germeny).

RESULTS:

Between November 2021 to march 2022, this study was conducted. It covers 210 pregnant patients at Salah al-Din Hospital who have had abortion or have a history of recurrent abortion. 32 patients (15.2 %) out of 210 were confirmed to have toxoplasmosis. as in table (1).

TABLE 1.

Test ELISA	IgM		IgG		Total positive (IGM+IgG)	Total %	Total sample
Toxoplasma	n=7	3.3%	n=25	11.9%	32	15.2	210

TABLE 2. displays the age-specific prevalence of toxoplasmosis. The majority of patients were between the ages of 15 and 25 and were 14 (6.7%) and 4 (1.9%), respectively.

No.of IgG and IGM seropositivity to toxoplasma

Age group year	TOXG IgG		TOXG IgM	
	No.	%	No.	%
15-25	14	6.7	4	1.9
26-35	7	3.3	2	0.95
36-45	4	1.9	1	0.47
Total	25	11.9	7	3.3
P Value	0.818		0.884	

TABLE 3. showed the pregnant women with Toxoplasmosis was most common in rural area (11.9%) of cases, while (3.3%) of the cases in urban area.

No of IGM and IgG Of toxoplasma				
	TOXG IgG		TOXG IGM	
	No.	%	No.	%
Rural	15	7.14	5	2.38
Urban	10	4.7	2	0.95
Total	25	11.9	7	3.3
P Value	0.125		0.157	

TABLE 4. showed the distribution number of abortion women with Toxoplasmosis was most common in single abortion (8.57%) (1.9%) for IgG and IGM respectively.

No. of IgG and IGM positively to Toxoplasma with abortion				
	TOXG IgG		TOXG IgM	
No of abortion	No.	%	No.	%
1	18	8.57	4	1.9
2	5	2.38	2	0.95
0	2	0.95	1	0.47
Total	25	11.9	7	3.3
P Value	0.421		0.644	

DISCUSSION:

The current study's findings indicated anti-IgG/IgM seropositivity to T. gondii. Our findings were at odds with those of a Beijing study that examined a substantial number of newborns involving mothers who had BOH. (11.9%)/(3.3%) Anti-toxoplasma IgM antibodies were found in 183 of the 4692 female subjects who underwent ELISA-based serological testing for IgM and IgG antibodies for toxoplasma (3.9%). Of the patients, 89 (1.9%) showed anti-Toxoplasma IgG antibodies[6]. In terms of residence, rural women had a higher risk of T. gondii infection than urban women, which may be related to the study's small sample size of rural women or to their dietary choices. These results ran counter to those of [7]. at Iran. Every woman in this study either had an abortion once or twice, or they did not. the number of women who had abortions was high (8.57%), which was inconsistent with the findings of several previous studies, including [8[from Iraq], which found that 42.2% of abortions were double abortions. According to the study's findings, toxoplasmosis prevalence varies dramatically depending on where you reside, with rural areas having a far greater incidence than metropolitan ones. This finding was at odds with earlier research on rural-dwelling Iraqi women. Though our findings are similar with other studies conducted in Iraq, which indicated a high prevalence rate in rural regions, [9] in AL-Anbar,[10] in Diyala, [11] in Salah AL-din Government and [12] in Kirkuk.

Since most rural women had low socioeconomic position, low educational attainment, and poor cleanliness standards, they may have had a higher risk of toxoplasmosis infection than urban women. Additionally, because there are so many cats that serve as permanent hosts, the majority of them frequently came into touch with household animals, raw meat, raw vegetable consumption, and soil that may be highly polluted with oocysts. Preparing and consuming meat, drinking untreated water, not pasteurizing milk, and eating unwashed fruits are all practices that are more prevalent in rural areas[13][14].

The present study revealed no correlation between the proportion of infection and the number of abortions, despite the fact that women who had abortions previously had high infection rates. The findings of the current study were in agreement with those of [15], who noted that there were fewer abortions today than there were two decades ago.

Miscarriage can result from a variety of situations, and because there are so many possible causes, it can be difficult to pinpoint the root causes. Up to two-thirds of early pregnancy losses may be accounted for by chromosomal abnormalities. [16]. Normal persons do not need therapy for toxoplasmosis unless their symptoms are especially severe or a key organ, such the eye, is affected. If an acute infection reactivation is confirmed, pregnant women should be treated. To detect recent or acute toxoplasmosis, etological screening, particularly IgM-Ab, should be heavily considered. We advise gynecologists to treat and concentrate on women if an ELISA test for identifying IgM and IgG Ab is positive, as well as to do additional examinations on a regular basis in both married and single women and also pregnant or aborted women.

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STUDY THE BIOCHEMICAL AND HISTOPATHOLOGICAL CHANGES INDUCE BY CHRONIC METHIMAZOLE EXPOSURE AND PROTECTIVE ROLE OF ARTEMESIA IN FEMALE RATS

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STUDY THE BIOCHEMICAL AND HISTOPATHOLOGICAL CHANGES INDUCE BY CHRONIC METHIMAZOLE EXPOSURE AND PROTECTIVE ROLE OF ARTEMESIA IN FEMALE RATS

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Abstract:

Sixty white female rats were divided evenly into four target groups to study the effects of methimazole (ME) on biochemical and histological alterations in the rats. The first group received 0.04 mg/kg B.W. of actual (ME) orally every day for 90 days. Also, (ME) with Artemisia(Ar) (2nd) team used to be handled as in first team and at the identical time administered orally for 10% of Artemisia for 90 days. Third (3rd) group was once administrated by way of solely (Art) in the 2nd group. Whereas, fourth set group was once attended and drenched (0.25ml) as manage control. Results examination published that the (ME.) caused expanded in all liver enzymes and bilirubin, whilst the find out about regarded diminished in complete protein as evaluating with manipulate group animals. The pathological examination made that the (G1.) liver revealed introduced of marked proliferation of kupffer cells. But, the (G2.) group exhibit moderate infiltration of lymphocytes in sinusoids. Finally, (G3) group liver confirmed moderate cloudy swelling in hepatocytes in contrast with confirmed ordinary texture in hepatocytes in fourth group . Study conclude, (Ar.) can reduced liver harm precipitated by way of oxidative consequences brought on by using (ME.) and linked to their antioxidant effects.

Key words: Methimazole, Artemisia, biochemical, histopathological changes.

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Introduction:

Actually, Methimazole (Me.) was an anti-thyroid drugs goes to drug type thionamides. major instrument of motion of Methimazole drug is to mass thyroid hormone industrial from the thyroid gland. It interferes with the step that reasons the iodination of tyrosine deposits in thyroglobulin, mediated via the enzyme thyroid peroxidase, accordingly stopping the synthesis of thyroxine (T4.) and triiodothyronine(T3.) (Abraham and Acharya .,2010). Methimazole effects the manufacturing of thyroid hormone then is helpful in treating fundamentals related to thyroid hormone, in particular thyrotoxicosis. Therefore, it is watched a thyroid delaying off agent (*Akin et a*l.,2008). It most often takes place in the chief three months of jump remedy however can take house even next or spare of publicity or at certain point of frequent exposures after treating a decline (Takata et al.,2009). hepatic deadliness of methimazole stands extra of a cholestatic method than allergic hepatitis watched in propylthiouracil and mends slowly after ceasing the medicine (Ross *et al .,*2016). Otherwise, the organic efficacy of Artemisia regularly is subtle for the duration of the world as a really helpful vegetable aside from its wide-ranging utilization as a herbal, extraordinary components of this plant have been used in famous medication is used to deal with a extensive vary of ailments (including kidney dysfunction, asthma, worm infection, inflammation, and leprosy). The reason of this investigation used to be experimentally to measure the proportional extraordinary between artemisia and methimazole on the female rat liver via calculation of viable adjustments in biochemical and histopathological factors.

Materials and Methods.

Animals and treatments: sixty person Wister female rats ancient eight weeks, allowance (250 ± 10 gms), had been accumulated by way of (Animal Case Cluster of the Veterinary Institution of Almuthanna Academy). Animals have been saved in temperature monitored rooms (24 ±3oC°) and humidity (40-70%) and a 12h/12h mild / darkish duration prior to being used in experimental approaches. To accommodate the workshop conditions, rats have been allowed to take part in the experiment for one week. Rats have been divided into 4 separate agencies (methimazole group) (G1),

however methimazole and 10% Artemisia (G2) and the different Artemisia solely in team (G3) and the manage group rats in G4 acted as a manage team and have been regularly given orally distilled water. House-trained animals in group G1 obtained oral methimazole at a dosage of 0.04 mg / kg b.w./day (Essa et al., 2015). In addition to methimazole, animals in team G2 are given a 10% Artemisia extract in addition to methimazole, G3 rats are given a 10% Artemisia as a supplement. Continued for ninety days thru the belly drain. The doses that used for continual cure of Methimazole (Palmer.,2019) had been organized via dissolving 1 pill of captopril (5 mgs) in (100 ml) distilled water regularly to put together awareness (0.04 mg/ml) and to be given at dose extent 0.2 ml/ a hundred g. of physique weight of animal (Palmer.,2019). The doses that used for chronic therapy of Methimazole had been equipped by means of dissolving 1 capsule of captopril (5 mgs) in (100 ml) distilled water oftentimes to put collectively cognizance (0.04 mg/ml) and to be given at dose extent 0.2 ml/ a hundred g. of physique weight of animal 11, Whitman No.1 and quickly 3000 rpm for ten minutes, then the filtrate and put in sterile bottles and the refrigerator for use while this has been organized applications (10%) of this Artemisia extract by Hot Aqueous Extract: Put 50 gm of the plant powder and add 300 ml of boiled distilled water to it in a 600 ml container. It is placed in the shaking incubator for 48 hours, then filtered using sterile gauze, then the filtrate is placed in a centrifuge at a rate of 2500 rpm/min for 10 minutes, then the filtrate is subjected to evaporation using a Rotary Vacuum Evaporator at a temperature of 45 °C to obtain dry powder, which is kept in the refrigerator at a temperature of 45 °C. 4 pm and so to take the becoming quantity of the stays it in a given extent of sterile disinfected water (Van & Wink.,2018.).

Biochemical tests

Alkaline Phosphatase (ALP)

ALK is an enzyme originated mainly in the bone, liver, and placenta, with some activity in the kidney and intestines It is called alkaline because it functions best at a PH of 9 (Frances Fischbach, 1999) By a colorimetric method (King and Armstrong) serum alkaline phosphatase was measured by using ALK kit, which is based on hydrolyzation of disodium phenyl phosphotase with liberation of phenol and formation of sodium phosphate The amount of liberated phenol is read on absorbance at 510 Nm, and by using of the following equation

- Serum Transamination

Colorimetric method for detection of ALT and AST in serum is done by using of AST and ALT kits (Reitman, 1957) depending on the following reactions

- The pyrovate or oxaloacetate formed is measured by a reaction with 2,4 Dinitrophenlyhydrazin in alkaline solution at wavelengthof 510 Nm

- Total protein analytical methods Total protein in serum can be measured by a variety of methods, including chemical methods, turbidimetry and nephelometry The most widely used is a method based on the biuret reaction, in which an alkaline copper (II) solution reacts with peptide linkages to form a complex that absorbs light at wavelength 540 nm The sensitivity of the reaction can be increased by the addition of phosphotungstomolybdic acid (Folin- Ciocalteu reagent, phenol reagent) (Lowry method), which, together with other modifications, results in increased absorption for a given amount of protein The reactivity of the various plasma proteins to the biuret reagent is not significantly different, since it is dependent on the number of peptide linkages, not on amino acid composition The response is linear from [total protein] 15 g/L to at least 120 g/L

- Total bilirubin, in the existence of an appropriate solubilizing agent, is combined with diazonium ion in a highly acidic form of media Acid bilirubin + diazonium ion azobilirubin The color strength of the red azo dye produced is directly proportional to the amount bilirubin and can be photometrically determined (Bortolussi et al.,2014).

- The animals' blood was once accrued after 90 days. Blood series cast-off to be finished on every expermintal rat then used for a serological investigation.
- Histopathological study:

Liver was once taken and constant in 10% of formaline, for haematoxylin and eosin (H & E) (Cikmaz et al., 2010). As nicely as being examined with a mild microscope (Leica, Germania).

- Data analysis:

statistical evaluation was once persistently administered the usage of ANOVA and the learn about used to be carried out to examine the records from the manipulate group with the experimental groups. The findings had been described as suggest ± S.E. (standard imply error). A P-valueof much less than 0.05 used to be viewed to be vital and is described in brackets. (Tlou, 2010).

Results.

Alkaline phosphatase (ALP, mg/dL) merchandise are proven in (table 1). A tremendous enlarge ($p < 0.05$) was once recorded in the methimazole group (G1) (218.5± 1.9) in contrast to the manage team (G4) (136.7± 1.8). Furthermore, there was once a less-significant shift in the methimazole team with 10% Artemisia (G2) (139.1± 5.6) in contrast to G1 , in addition to the Grd was once (96.4 ± 8.6). Surprisingly, the limit (p 0.05). Alanine Aminotransferase Tests (ALT) (IU / dL) confirmed a big expand ($p < 0.05$) in (G1) and (G2) businesses (106.8±92.8; 50.1±5.7) relative to controls (35.0± 0.7). Nevertheless, there are no major improvements in both 10% Artemisia and methimazole (G2) (42.4±2.3) with regulation. (Table 1).

The assessments of serum .glutamic-oxaloacetic. transaminase (SGOT.) or aspartate aminotransferase enzyme (AST.) values increased extensively ($P < 0.05$) in the methimazole group (G1) (95.2±4.8) in relation to the manipulate team (G2) (42.4±2.3), however there was once no observe capable distinction in the 10% Artemisia (G3) values (20.5±0.7) in relation to the manipulate group (G4) (19.6±0.7).

The bilirubin check values elevated notably ($P < 0.05$) in the methimazole group (G1) (1.6±o.58) in relation to the manipulate group (G4) (0.6±0.01), and there was

once additionally a sizable distinction in the methimazole and 10% Artemisia (G2) values (0.63±0.14) in contrast to the (G3) group (0.55±0.48.

The whole protein findings are proven in (Table 1). Indeed, there used to be a tremendous minimize ($p < 0.05$) in the methimazole group (G1) (5.4±0.09) in contrast to the manipulate team (G4) (7.6±0.1). Also, there is a extensive distinction in the methimazole and Artemesia (G2) group (6.6±0.09) relative to the manage group. Finally, there is a giant minimize ($p < 0.05$) in the methimazole and 10% Artemisia organizations (G3) (7.66±0.08) in contrast to the control group.

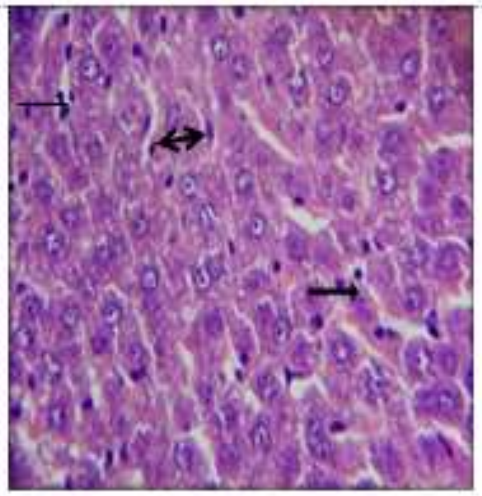
Table (1) Evolution serum levels with different parameters in relation with Methimazole drug and 10% Artemisia:

No. Toxin groups		Alp IU/L	ALT IU/L	AST IU/L	Bilirubin mg/dL	Protein g/dL
G1	Methimazole	218.5± 1.9 a	106.8±92.8 a	95.2±4.8 a	1.6±o.58 a	5.4±0.09
G2	Methimazole + 10% Artemesia	139.1± 5.6 b	50.1±5.7 b	42.4±2.3 b	0.63±0.14 b	6.6±0.09
G3	10% Artemesia	96.4 ± 8.6 c	34.1± 2.9 c	20.5±0.7 c	0.55±0.48 b	7.66±0.08
G4	Control	136.7± 1.8 c	35.0± 0.7 c	19.6±0.7 c	0.6±0.01 b	7.6±0.1

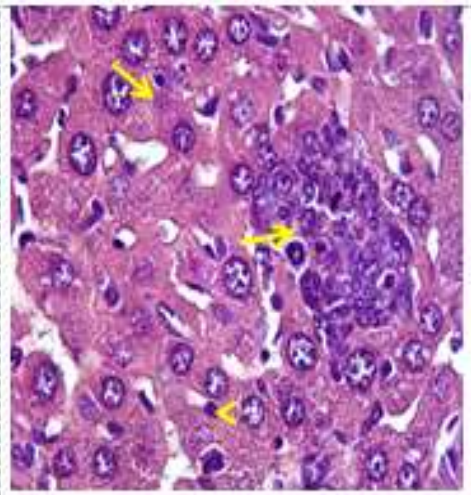
Different small letters means significant ($p<0.05$) results between groups.

Histopathological:

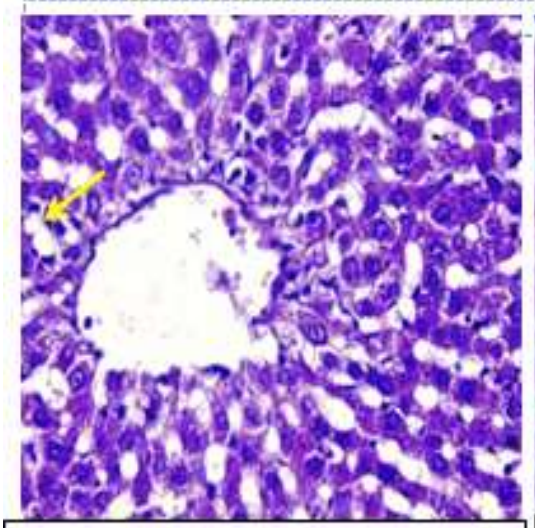
The outcomes of this find out about printed extraordinary histopathological adjustments regarded in liver. The liver's histopathological area printed that it used to be printed pathological adjustments in rats at 60 days publish handled with the aid of (Methimazole) confirmed marked proliferation of kupffer cells with pyknotic and necrosis in hepatocytes and aggregation of mononuclear cells (figure1). While the histopathological examination of the liver in 2d group (G2) printed a significant proliferation of kupffer cells (figure2) with a minor infiltration of lymphocytes in the sinosoids mild cloudy swelling in hepatocytes in (G3) (Fig3). Using Artemisia extract a shielding agent with methimazole in (liver almost every day (Fig4).



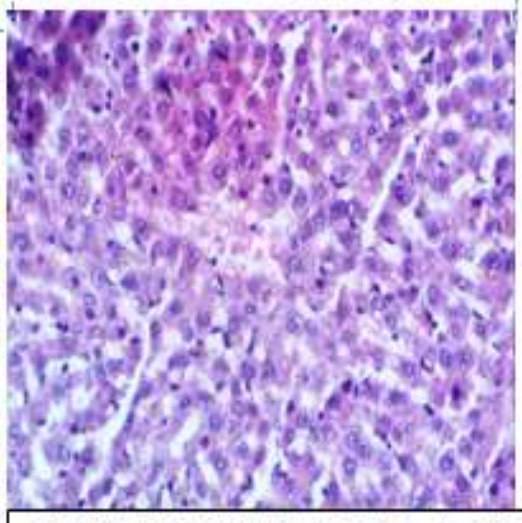
(Figure1) Histopathological section of liver of rat(G1)for 90 days shown marked proliferation of kupffer cells (double arrow) with slight infiltration of focal mononuclear cells (arrow) (H & E stains X 200).



(Figure2) Histopathological section of liver of rat(G2)for 90 days shown marked proliferation of kupffer cells (arrow) with pyknotic and necrosis in hepatocytes (head arrow) (H & E stains X 200).



(Figure3) Histopathological section of liver of rat(G3)for 90 days shown slight cloudy swelling in hepatocytes (arrow) (H & E stains X 100).



(Figure4) Histopathological section of liver of rat(G4)for 90 days showing normal hepatic architectures : (arrow) (H & E stains X 100).

Discussions:

The find out about discovered that there used to be a big increase in liver enzymes and bilirubin degrees (P 0.05). But, there is a reduce in whole protein in G1 as in contrast to G4. Because the liver enzymes and bilirubin have escaped from hepatocytes, indicating impaired liver function due to the (methimazole) impact. This consequences agreed with (Kasper et al .,2014). Adverse effects hepatocytes

described as cellular damage designated via outflow of enzymes since injured hepatocytes besides pure proof of hepatobiliary block or cholestasis intrahepatic. The effects exhibit a huge reduce ($p < 0.05$) in whole protein in G1 as in contrast to G2, G3 and G4 groups. The serum complete protein depend may additionally originate from the liver, bone, and intestine. diminished complete protein would possibly be due to methimazole-effects by using attenuating oxidative stress triggered by way of this drug and stopping the negative consequences of methimazole and/or its metabolite on subcellular factors such as mitochondria., ensuing in disturbances in the transport features of the hepatocytes (Heidari et al .,2013). (methimazole) publicity is properly recognized to control thyrotoxicosis and average to extreme ophthalmopathy by Graves with suspected optic nerve injury cutting-edge sufferers by extended liver enzymes ranks. (Silvijus et al .,2017). Because artemesias have a protecting impact on the liver, G2 confirmed a great reduce (P 0.05) in liver enzymes and bilirubin in contrast to G1. In addition to, G2 confirmed a sizeable extend (P 0.05) in whole protein in contrast to G1 due to the fact artemesia elicit antioxidant motion with the aid of scavenging reactive oxygen species (ROS), bettering the cell antioxidant enzymes and the activation of the biotransformation for artemisinin accumulation. ROS and NO, as properly as their interactions, should modulate now not solely the oxidation in the course of the bioconversion of artemisinic acid, however additionally some enzymes and genes in the artemisinin biosynthetic pathway. Furthermore, produces antioxidants, “free radical scavengers”, that inhibit or prolong telephone damage. Reinforcing the antioxidant defence device and/or counteracting the deleterious repercussions of excessive reactive oxygen and nitrogen species (RONS) is essential and might also curb the development of getting old and persistent degenerative syndromes. Various therapeutic strategies for ROS and oxidative stress discount have been developed. However, scientific investigations are required to check their efficacy. (Li Ping et al.,2010). The Histopathological learn about confirmed extreme harm in the liver of G1 due to the fact the free radicals are immediately cytotoxic. Prolonged oxidative stress can end result in oxidative harm to tissues. These findings are regular with (Kaynar et al .,2005), who determined that (methimazole) multiplied the quantity of apoptotic through reveal that Schwann cells categorical practical thyroid-stimulating hormone (TSHR) and that diabetes with subclinical

hypothyroidism (SCH) exacerbates diabetic peripheral neuropathy(DPN), perhaps thru a mechanism whereby TSH will increase oxidative stress and proapoptotic consequences in Schwann cells. Cells can accumulate in the liver and motive oxidative harm to hepatic mobile membranes, inflicting transaminase to launch it into the bloodstream (Xiao et al.,2015).Similar hepatotoxicity lesions have been additionally suggested by using Banu and Sharma, (Yamate et al., 2016) and Shalan, (Azmi et al .,2002). While the G2 demonstrates solely minor histopathological modifications in the liver, The hepatoprotective residences of artemisia can also be attributed to the current of (flavonol -3-glycosides) need stood remoted since grasses of artemisia, which have antioxidant and detoxifying properties. This detoxifying impact is defined through the induction of isorhamnetin, patuletin and spinacetin derivates (Amat et al .,2010). Moreover, liver seems toward stay, due to its special metabolic role, the maximum frequent goal structure of deadliness. A vast range of diseases, pills then poisonous chemical substances container reason organs such liver harm through potential of their direct injuriousness then/otherwise endogenous noxious metabolic merchandise (Huang et al .,2013).

In conclusion, Artemisia can minimize the harm of liver Cells from oxidative outcomes prompted by way of ethimazole, and that is associated to its antioxidant results.

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DETERMINATION THE IMMUNE RESPONSE PARAMETERS IN DOMESTIC IRAQ RABBIT TO VACCINATION BY MIXTURE OF BACTERIAL ISOLATES

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DETERMINATION THE IMMUNE RESPONSE PARAMETERS IN DOMESTIC IRAQ RABBIT TO VACCINATION BY MIXTURE OF BACTERIAL ISOLATES

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Abstract:

The aim of this study was to investigate the effect of Low Level diode laser on the pathogenic bacterial isolates from mixed infection of gram negative bacteria in humans (*Proteus mirabilis, Enterobacter cloacae, Klebsiella pneumonia, Esherichia coli and Pseudomonas aeruginosa)* which used in preparation of vaccine (Live attenuated and killed vaccines) and to determine the immune responses using the RID kit. The antibacterial agent's sensitivity before irradiation was performed by using twelve antibiotics, these strains showed high resistance for these antibiotics before irradiation except amikacin. But after irradiation the sensitivity was increased. Some features were studied such as bacterial count which decreased and loss of blood hemolysis and bio cyanine stain from *P.aeruginosa* according to increasing the time and power of irradiation. Bacterial growth was killed and attenuated to prepare vaccine using diode laser (915) nm of wavelength having (50 and 250) mw of power and the frequency (1-10) kHz. The experiment was conducted on 60 adult white New Zealand male rabbits with (1.5-2) Kg body weight each, they were divided into three groups with 20 rabbits to each and inoculated with killed and attenuated vaccine and one group was used as control. After (35day) of immunization, determination was done for (IgM, IgG, IgA in addition to C3 and C4). The Ig and Co. of immunized animals were higher (P>0.05) compared with control animals, also the live attenuated vaccine induced highly immune response as compared with killed vaccine. The control group died after challenge dose while the immunized animals not.

Key words: Bacteria, Vaccine, Diode Laser, RID, İmmune Responses.

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Introduction:

Since the invention of laser in 1960, lasers have been developed and approved in many fields. Lasers can now be regarded as practical tools with unique properties that have been utilized effectively in several applications in fields of medical and biological sciences. Many studies have been presented since fourty years to explain the effect of different lasers on biological cells at the levels of biology and microbiology with little mention to the effect of laser on the immunological cells or using of laser to attenuate pathogens and evoke the immune response (1).

The energy level is the quantum state of an atom or molecule, which ranges from a base or ground level to a high level in which this species driven to a state of excitation, (2). Susceptibility of bacteria to laser light varied from one Genus to another ranging from highly effect on their metabolic mechanisms reaching killing by laser treatment, (3). He-Ne laser (632.8 nm) used to cure DNA plasmid of E.coli, and it was done by this wavelength. In the current study, chopped 915 nm Diode laser used to investigate its effect on bacterial growth, which used in preparation of vaccine in this study. There are several types of mixed infection which occur by different kinds of gram negative bacteria such as *K.pneumonia* is well known to most clinicians as a cause of community-acquired bacterial pneumonia, occurring particularly in chronic alcoholics and showing characteristic radiographic abnormalities due to a severe pyogenic infection, which has a high fatality rate if untreated, (4).

According to the CDC, *E.cloacae* is responsible for bacteremia, endocarditis, osteomyelitis, septic arthritis as well as infections in the skin, respiratory tract and urinary tract. Many of these infections are nosocomial, (5). *P. aeruginosa* is an opportunistic pathogen does not infect healthy individuals, but does cause a wide variety of severe infections in immunocompromised patients. For that reason, *P.aeruginosa* categorized as an opportunistic pathogen, (6). *E.coli* defined as the one of several types of bacteria that normally inhabits the intestine of humans and animals. Their pathogenicity is due to their ability to produce many virulence factors including many enzymes and toxins which help bacteria to avoid immune response and resist antibiotics treatment, (7).

Vaccine adjuvants are traditionally defined as chemical compounds or macromolecules that augment immune responses of co-administered antigen (Ag) with minimal toxicity or long lasting immunity on their own (8). Vaccine is a biological preparation that improves immunity to a particular disease. Vaccine typically contains an agent that resembles a disease-causing

microorganism, and often made from weakened or killed forms of the microbe or its toxins. The agent stimulates the body's immune system to recognize the agent as foreign, destroy it, and "remember" it, so that the immune system can more easily recognize and destroy any of the microorganisms that it later encounters (9). There are several types of vaccines in use such as Killed, Attenuated, Toxoid, Subunit and Conjugate vaccine. These represent different strategies used to try to reduce risk of illness, while retaining the ability to induce a beneficial immune response, (10). Significant advances in biotechnology and biochemistry have led to the discovery of a large number of bioactive molecules and vaccines based on peptides and proteins (11). The Aims of the Current Study represented by Detection of antibiotics sensitivity before and after application of diode laser, Evaluating the role of diode laser in attenuation of pathogenic bacteria, Selecting of the power densities, frequencies and exposure times that attenuate and kill these bacteria, Preparing of vaccines (live attenuated and killed) by irradiation of the bacteria by the low level diode laser and detection of immune response by measuring IgG , IgA , IgM, C3 and C4 level in response to the vaccine, and after admitting live bacteria to vaccinated animals.

2- Materials and Methods:-

The materials used in the study, which includes laboratory apparatuses, culture media, chemical reagents and the laser system. The methods represented by isolation and identification of bacteria, and the effect of laser irradiation on bacterial survival, in addition to the effect of Antibiotics on bacteria before and after irradiation, finally vaccine preparation method and Determination of some systemic immune response parameters.

2-1-Bacterial isolates:

Five isolates of gram negative bacteria were obtained from mixed infection in human. The samples identified according to Berge's manual. The identification tests including cultural, morphological characteristics, microscopic examination by using Gram stain, Hemolysin Detection and biochemical characteristics was done for each isolate, in adding to Antibiotics Sensitivity Test and Identification by using API system (12).

2-2-Laser Device and Irradiation Setup:

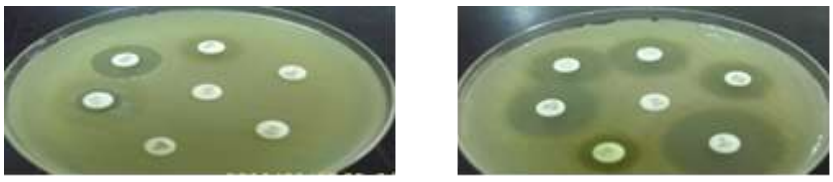
Omega diode laser was used in this study, the device emits the wavelengths (915 nm), the output power (50 and 250) mw with different frequencies (1-10) kHz, and exposure time adjusted to (5-30) min.

2-3-Irradiation of Samples and Preparation of vaccine:

One isolate of each bacterium was chosen to study laser effect on bacterial growth. Five isolates of bacteria cultured on blood agar at 37˚C for 24hr. harvesting the surface of the plates with normal saline using glass rods. And using cold centrifugation at 6000 rpm for 10 min, Cell pellets were washed twice with physiological saline then mixed by vortex and re suspended in 5 ml of normal saline (pH=7.2) and compared with McFarland solution. The bacterial suspension irradiated with laser to obtain live attenuated and killed vaccines. The bacterial suspension was examined by culturing on blood agar to confirm the sterility of the antigen, (13). The experiment was conducted on 60 healthy adult white New Zealand male rabbits randomly with (1.5-2) Kg body weight each, they were divided into three groups with 20 rabbits each and inoculated with killed and attenuated vaccine and one group was used as control.

3-Result and discussion:

In this study we obtained five isolates of bacteria from mixed infection of gram negative bacteria in Samawa city of Iraq, and we found that the laser effect on bacterial count and hemolysin production which is decreased until lost by increasing the dose of irradiation. Also The susceptibility of isolates to antibiotics which were resistant before irradiation but they render sensitive after irradiation, as figure (1), which shows the inhibition zone diameters of bacteria before and after irradiation at, (50mw, 10kHz, 15min).



Before irradiation After irradiation

Figure (1): The susceptibility of bacteria using Diode laser.

The effect of laser on the bacterial chromosome may lead to loss their hemolysin production and virulence of bacteria, (14). The results showed that hemolysin production was

lost or decrease at wavelength 915 nm with different times and power of the irradiation. The results of irradiation showed a significant decrease in the bacterial viability as the dose increase. Bacterial irradiation with laser may induce cell wall, protein synthesis, membrane function, nucleic acid and metabolic processes inhibition. The results of the current study showed high resistance of Oxacillin, Erythromycin and Cefoxitin, these results were agreed with those got by, (15). The rapidly increasing emergence of antibiotic resistance amongst many species of pathogenic bacteria may be bringing to an end of a period extending over the past 50 years.

The therapeutic agent activities against the bacterial isolates were variable depending on the bacterial species and the mode of action of each agent. The results showed that the bacterial isolates were resistant against much of the antibiotics which used in the study before irradiation, as seen in table (1).

Table (1): the results of antibacterial susceptibility test before irradiation.

Antibiotics	Results				
	P. mirabilis	*E. cloacae*	*K. pneumonia*	*E. coli*	*P. aeruginosa*
Chloramphenicol(C)	I	I	I	S	R
Rifampin (RA)	R	I	R	R	R
Amikacin (AK)	S	S	S	S	S
Gentamicin (GN)	R	R	S	S	R
Ciprofloxacin (CIP)	S	S	S	S	S
Vancomycin (VA)	S	I	R	I	R
Oxacillin (OX)	R	R	R	R	R
Erythromycin (E)	R	R	R	R	R
Cefoxitin (FOX)	R	R	R	R	R

Key : (R): resistance , (S): sensitive , (I): Intermediat

Laser irradiation may effect in one of these ways, it may affect the pumping system, which mainly responsible for multidrug resistance including beta lactams and aminoglycoside group (amikacin), or alter the target site of these antibiotic. These results have a good

agreement research, (16). One of the most important ways of laser efficiency is the irreversible inhibition of plasmid DNA activity after laser irradiation which may destroy them and unable the plasmid to produce beta–lactamase enzyme, Increasing outer membrane permeability which is also associated with other antimicrobial agents such as the beta–lactams. Increase bacterial sensitivity to amniglycosides group may be due to increase the penetration of antibiotic by reducing the lipopolysaccaride layer (LPS) which plays a role in resistance processes (17). The resistance can be both chromosomal or plasmid mediated. Laser irradiation can break strand DNA plasmid thus the bacteria may lose their ability to resist such type of antibiotic, (18). Resistance due to changes in DNA sequence would be extremely stable. Reversion to antibiotic sensitivity would generally require back mutation of the precise base originally altered, a very infrequent event, (19). Acquired staphylococcal resistance to antibiotics is largely mediated by ribosomal methylases encoded several genes. These enzymes methylate the bacterial ribosome at the binding site for antibiotics, thus inhibiting antibiotic activity. Such resistance may be occurs in the presence of erythromycin, (20).

After irradiation of the bacterial suspensions with the diode laser for different exposure times and different frequencies, and using the wavelength 915 nm, the results showed a noticeable change in the sensitivity of all the bacterial isolates to most of the used antibiotics, table (2).

Table (2): the results of antibacterial susceptibility test after irradiation.

Antibiotics	Results				
	P. mirabilis	*E. cloacae*	*K. pneumonia*	*E. coli*	*P. aeruginosa*
Chloramphenicol(C)	S	S	I	S	S
Rifampin (RA)	S	I	R	S	I
Amikacin (AK)	S	S	S	S	S
Gentamicin (GN)	S	R	S	S	I
Ciprofloxacin (CIP)	S	S	S	S	S
Vancomycin (VA)	S	I	S	I	R
Oxacillin (OX)	S	S	S	S	S
Erythromycin (E)	S	I	S	S	I

Cefoxitin (FOX)	I	S	I	S	S

Key : (R): resistance , (S): sensitive , (I): Intermediat

The results of irradiation showed a significant decrease in the viability of the bacteria of all species when the dose was increased. It is clear to see that the survival rates decreased as the laser exposure time increased. the isolates were very sensitive to Amikacin and Chloramphenicol but still resistant against Cefoxitin and Erythromycin, as shown in table (2), these results agreed to (21). And also these results approach the results obtained by, (22) ,who found that the inhibition zones to bacterial isolates were increased after irradiation with laser light reaching the maximum values using 7.96 W/cm2 at 3 minutes exposure time. when using 915 nm, 10 kH, at (20) minutes, observed high increase in sensitivity to antibiotics as shows in table (3), these results agreed with those got by, (23). The more and more frequent use of antibiotics in the treatment of infections has resulted in an increasing number of bacterial strains resistant to a large number of these antibiotics. This result has inspired a search for new antibiotics able to inactivate new resistant microorganisms to the existent antibiotics.

The growth of *E. coli, Klebsiella pneumonia, Proteus mirabilis* and *Enterobacter cloacae* were normal at exposure time 10 min. at the Wavelength (915). Killing of *E. coli* occurred using 10 kHz and 30 min. while *Klebsiella pneumoniae* and *Proteus mirabilis* were killed using 915 nm, 10 kHz, at 20 min. Irradiation of *Pseudomonas aeruginosa* showed that the bacteria remained survive until 30 min. for the Wavelength (915), but killing occurred at exposure time 40 min. and 10 kHz , as shown in table (3).

Many factors may interfere in the effectiveness of laser irradiation, including the capacity for light absorption by the photosensitized microorganism, wavelength of the laser, physiological state of the bacteria, emission from the laser, time of laser exposure, pH of the medium, water content, thermal conductivity, and the organic matrix, (24).

Table (3): the results of irradiation at (915) nm of all Bacterial isolates.

Bacterial isolates	**Frequency (kHz)**	**Time (min)**	**Results**
P. mirabilis	5 kHz	10 min	**+**
		20 min	**+**
		30 min	**–**

	10 kHz	10 min 20 min 30 min	+ - -
E. cloacae	5 kHz	10 min 20 min 30 min	+++ ++ +
	10 kHz	10 min 20 min 30 min	+ – –
K. pneumonia	5 kHz	10 min 20 min 30 min	+++ ++ –
	10 kHz	10 min 20 min 30 min	+ – –
E. coli	5 kHz	10 min 20 min 30 min	++ + –
	10 kHz	10 min 20 min 30 min	+ – –
P. aeruginosa	5 kHz	10 min 20 min 30 min	++ + +
	10 kHz	10 min 20 min 30 min 40 min	++ + – –

Key : (+++): growth , (++): weak growth , (+): very weak growth , (-): no growth (killed).

Radial Immunodiffusion (RID) method used for determination immunoglobulins concentration IgG, IgA, IgM, C3, and C4. Which present in the serum of the rabbits which were inoculated with live attenuated and killed vaccine, there were an increasing in the level of IgG for all the animals groups. The variations between the live attenuated vaccine group and the control group were very high significant $P < 0.001$, but were high significant $P < 0.01$ between the killed vaccine group and the control one, and not significant between the attenuated vaccine group and the killed vaccine one, as observed in table (4).

Table (4): mean of Immunoglobulins concentration rate on the live attenuated vaccine, killed vaccine and control groups.

Immunoglobulins	Control	Attenuated	Killed
IgG	1656	2641 ***	2315 **
IgA	541	913 **	802.9 *
IgM	202.2	342.0 *	218.8 *
C3	200.5	310.0 *	229.9 *
C4	71.4	110.44 *	94.00 *

Key: (***) Very high significant, $P < 0.001$; (**) Highly significant, $P < 0.01$; (*) Significant, $P < 0.05$

The results of IgA concentrations for the three groups were highly significant $P < 0.01$, when comparing the attenuated with control group, while were significant $P < 0.05$ between the killed vaccine and control groups , and not significant variations between the attenuated and killed groups , The results of IgM concentrations for the three groups showed significant variations $P < 0.05$, for the both groups , attenuated and killed when compared with the control group , but not significant between the attenuated and killed groups , The same results were obtained for the (C3) and (C4) concentrations which showed significant variations $P < 0.05$, for the both groups , attenuated and killed when compared with the control group , but not significant between the attenuated and killed groups, as shown in table (4).

After (one month) from the vaccination period , the three groups of animals Inoculated with live dose of bacteria , and the immunoglobulins concentration(IgG, IgA , IgM , C3, and C4) were also estimated, where giving the serum sample form the rabbits after 8 days of injection the live dose of bacteria. The results of IgG for the animals groups showed that the variations between the attenuated and control groups were very high significant $P < 0.001$, but were high significant $P < 0.01$ between the killed and control groups, and not significant

between the attenuated group and the killed vaccine group , The results of IgA concentrations for the three groups after injecting of the live dose of the bacteria , were highly significant, P < 0.01 , between the attenuated and the control groups , while were significant , P < 0.05 between the killed and control groups , and not significant between the attenuated and killed groups , The results of IgM concentrations for the three groups after injecting the live dose of bacteria , were significant P < 0.05, for both the comparisons , attenuated and killed vaccines with the control group , but were not significant between the attenuated and killed groups, the Concentrations of C3 and C4 for the three groups after injecting the live dose of bacteria ,were decreased comparative with concentrations after vaccination , and the results were significant P < 0.05, for both the comparisons , attenuated and killed vaccines with the control group , but were not significant between the attenuated and killed groups , all these concentration of immunoglobulins and complement after challenge dose showed in table (5).

Table (5): Immunoglobulins concentration rate of the(live attenuated , killed) vaccine and control groups , after 30 day of injection the live dose of bacteria.

Immunoglobulins	Control	Attenuated	Killed
IgG	2354	2880.1 ***	2686 **
IgA	620	984 **	910.1 *
IgM	351.0	451.8 *	441.9 *
C3	158.0	208.7 *	205.3 *
C4	51.1	70.28 *	67.78 *

Key: (***) Very high significant, P < 0.001; (**) highly significant, P < 0.01; (*) Significant, P < 0.05

After (one month) from the vaccination period , the three groups of animals injected with live dose of bacterial isolates , and the results of immunoglobulins concentration showed that the variations between the attenuated and control groups were high significant, P < 0.01 and significant, P < 0.05 between the killed and control groups, and not significant between the attenuated group and the killed vaccine group , as shown in table (5).

Vaccines prevent from catching a disease because they contain an element of the disease (the weakened or dead organisms). This element triggers the body to create an army of antibodies that are trained to stamp out the disease if contract it in the future (25). The purpose of vaccination is to provide protection from disease via induction and recall of

immunological memory responses. Antigen-specific antibodies in the serum are mainly produced by effector B cells (antibody-secreting cells) that are differentiated from memory B cells upon stimulation by their specific antigen, (26).

Conclusions:-

The sensitivity of bacterial isolates to antibiotics increased with increment of powers of the laser output with respect to the frequencies of diode laser while bacterial growth was completely stopped in line with the increase of power output, frequencies and exposure time. The bacterial count decreased with increasing of powers the laser output until lost. Live attenuated and killed vaccines inoculated intra peritonial induced high immunity against the infection, live attenuated vaccine was better than the killed one in immunity response. IgG gives higher rate of immunoglobulin concentration.

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SPRAWL OF RESIDENTIAL SLUMS ON AGRICULTURAL LAND IN CITY OF BAGHDAD

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SPRAWL OF RESIDENTIAL SLUMS ON AGRICULTURAL LAND IN CITY OF BAGHDAD

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Abstract:

More property, particularly those around city of Baghdad or lands on its edges that constantly devour thousands of agricultural lands with their endless expansion is becoming a problem of urban sprawl, and problem of urban development that continually expands and becomes as a trend where rural fields are converted into urban areas. This study was focused on hypothesis that rapid population growth in city of Baghdad greatly contributed to unplanned urbanization trend. The urbanization trend has influenced explicitly Baghdad's Master Plan. The study was focused on hypothesis that rapid population growth in city of Baghdad greatly contributed to unplanned urbanization trend. The urbanization trend has influenced explicitly Baghdad's basic design. The work is of interest in tracking factors contributing to an increase in urban sprawl. The research is focused on use of modern scientific tools, such as IT, to examine urban planning studies and their effects on rural property.

Key words: Urban Expansion, Land Use, Housing Factor, State Policy.

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Introduction:

Studies of agricultural land uses in the city of Baghdad and knowledge of urban expansion is a basic and important requirement to preserve it and formulate appropriate policies to benefit from most of its resources at a time when society is working to increase production to meet the rapid population growth. This is what decision-makers seek to prepare appropriate development plans and programs to meet the needs of its residents and develop natural resources to reduce differences between parts of the city, as the increasing need for new lands for housing purposes is a major problem in overtaking agricultural lands produced by changing the use of agricultural land as residential, and areas will be lost. Large ones account for human settlements.

One of the indicators of the changes in land uses in the city is the increase in the areas designated for construction within the organizational structure, which has emerged in a large and influential manner as a result of the absence of the authority of law and legislation that regulates the construction process, which most countries of the world suffer from, especially those characterized by high rates of population growth or immigration from Countryside to city. The importance of this study is that the vicinity of Baghdad is an agricultural area known for its economic value.

Therefore, study will address problems faced by land uses in city and try to present most important appropriate directions to solve these problems.

Research Aim:

Analyzing the issue of urbanization in rural areas, understanding its causes, and determining its causes.

Study Methodology:

The study followed the descriptive approach to clarify the factors affecting urban sprawl at the expense of agricultural lands, using simple linear regression to predict the phenomenon of urban expansion and its impact on agricultural lands, with mapping. To the city because of the lack of job opportunities and the search for decent housing led to a significant increase in the process of housing expansion at the expense of agricultural land.

1. Urban expansion:

The process of change in land uses comes largely and essential as a result of reflection of population increase and in response to its main requirements, whether by its natural source resulting from difference between births and deaths or abnormal source that is no less important than its predecessor and represented by positive migration towards city of Baghdad those requirements which population will be in urgent need It is represented in housing, transportation, commercial centers, factories, and recreational centers, knowing that their availability varies according to need for each of them (Kassab, 2001, p. 26). Also, urban expansion is defined as a general multi-faceted concept that refers to expansion of a city and suburbs. It comes at expense of agricultural lands and surrounding areas, and this phenomenon leads to development of rural areas adjacent to big cities gradually and increasing its population density gradually (Qabaha, 2014, p. 8), and urban expansion is defined as continuous increase in population numbers, whether this is in regular housing or not On a regular basis, this leads to an increase in demand for agricultural lands, thus creating an imbalance in environment (Al-Azzawi, 2005, p. 7).

2. Urban land uses:

The uses of land inside city are one of foundations of its existence and continuity of its permanence in life, because city does not exist primarily without job and it is not possible to imagine a city without a job. (2010, p. 305). (Use of land) represents change in a person's relationship with land, creating a balance between them, and human dependency on earth increases with time due to population growth, as it is spatial dimension that settles on it, and occupies its wealth and resources for sake of its needs, achieving Luxury th T aims to reach it (Mesrob, 2008).

Factors affecting land use:

a) Natural factors, as factors that site draws in city are among important factors in distribution of urban uses, as its impact is highlighted in some important sites, according to surface requirements, building composition, soil, climate, and others (Al-Sammak, 1985, p. 54).

b) Economic factors The price of land may have greatest effect in determining type of use of that land (Al-Hiti, 1986, p. 74).

c) behavior of individuals and their decisions, as use of land inside city is constantly changing, and decisions of individuals in this city can be said, and it can be said that changing uses of land is result of social processes: (Medhat, 2003, p. 79).

d) The changes taking place in prevailing investment pattern, where expansion is in form of far-flung waves abroad, and residential use is one of most rapid urban uses to change its position due to effect of its lack of competitiveness (Hussein, 2017, p. 139).

3. Housing variable

Finally, Baghdad witnessed a steady horizontal expansion, and new neighborhoods appeared that had a great impact on urbanization, especially in the areas surrounding the city. This expansion occurred in a way that lacked accurate scientific planning, so the residents of the new neighborhoods suffered from a lack of basic services as the residents of the regions, and the main pressure on the services provided was the result of the emergence of these new neighborhoods (Al-Ashaab 1976). , p. 66). The increasing need for new lands for housing purposes is a big problem in front of shortage of agricultural lands by converting them into new lands for housing and recreation

Availability of safe and affordable housing It is one of essential necessities for every family. Without proper housing, a person cannot be a productive element in his society. In this context, housing is generally defined as a study of housing units in which people live and it is a study of housing production market as well as a study of people's desires and requirements for their housing and problems to which people are exposed to obtain adequate housing and then effect of housing on people psychologically, socially and culturally (Jabara, Awad, 2003, p. 14),and cultural production, which was built within limits of possibility and has an enjoyable residence that has three functions: productivity, field of work, and field of life (Dulaimi, 2009, pp. 40-41), that housing It is place where individual lives in. It is considered vital for formation of his personality and a factor affecting his psychological, physical and social health.

The city’s architectural prestige (Kamouna, 2000, p. 101), also known as the set of design principles and principles that reconcile human requirements with material needs (Al-Nabulsi, 1999, p. 54), basic plan includes a set of long-term planning goals and sets out policy necessary to achieve those Quietness and includes a presentation of urban structure of city and measurement of development trends, specifically for short and long-term goals of growth and for expected future changes in this direction with development of specific

recommendations that appear in form of plans, maps and shapes and work to establish necessary standards for different uses (Hassan, 1988, p. 65).

4. Reasons for urbanization in Baghdad:

There are a group of reasons that have clearly contributed to process of growth of city of Baghdad and its encroachment into surrounding agricultural lands. These include:

1-Population growth of cities, where rapid population growth is one of most important challenges facing world, especially in developing countries, whose population is increasing at great rates. Agricultural lands (Al-Azzawi, 2012).

2-State policy and laws: It represents one of factors that helps in urban expansion and encroachment through development of new residential neighborhoods near agricultural lands (Al-Tamimi, 2014).

5. The practical framework:

In this research, we will deal with city of Baghdad as a case study and indicate urban expansion that has a green belt and surrounding agricultural lands during successive periods of time.

Reasons for choosing study area: The study area includes spatial boundaries of city of Baghdad and surrounding agricultural lands that are part of green belt surrounding city, i.e. outskirts of main municipal boundaries of city of Baghdad, whose use has been changed from agricultural to residential or to any other use and there is a set of reasons Which led to selection of study area from:

A- The state promulgates laws in successive periods of time by distributing lands of agricultural use, dividing them as residential use, and giving building approvals within these lands without paying attention to basic design and nature of land uses.

B- The construction area of Baghdad is expanding enormously, at expense of surrounding agricultural lands.

C- Entering irregular abuses on outskirts of Baghdad on agricultural lands surrounding city of Baghdad, which are part of green belt as a result of increased migration due to security conditions that Iraq has gone through in general, which allowed for transgression on lands surrounding it.

D- The bulldozing of thousands of orchards surrounding Baghdad, which contain many palm trees and citrus fruits (Al Hassoun, 2013, p. 29).

6. Reasons for urban sprawl in Baghdad:

1-Population growth: Baghdad witnessed a rapid population and urban growth due to its dominance in all of Iraq's cities due to its administrative, economic and political position, which plays an essential role in process of attracting activities, events and residents to it. This rapid urban phenomenon has coincided with a period of unrest It was preceded by year 2003, which led to an acute housing crisis in city of Baghdad and emergence of a widespread deficit in basic services provided, represented by a lack of drinking water and a lack of energy, services, and communications.

Table 1 : Senses of Baghdad city 1970-2017

Year	Population /person/milion	%
1970	2.26	4.8%
1977	3.18	1.88%
1987	3.8	4.42%
1997	4.42	1.36%
2007	7.14	2%
2017	8.7	2.2%

Source : researcher depend on Baghdad municipal

It is noted from above table that population of Baghdad increased to 3.8 million in 1987, with a growth rate of 3.02%, and population of city in 1997 reached a growth rate of 4.4 million and a growth rate of 1.36 The reason is due to low rate of growth due to abnormal conditions that country went through and entered A war with neighboring countries. Population growth is observed again in 2007, with a growth rate of 2.2% as a result of unstable security conditions in that period while population growth is rising after improvement of security conditions. The city of Baghdad witnesses an abnormal displacement wave in search of job opportunities, bringing population growth rate to city of Baghdad in 2017. To 8.7 million, at a growth rate of 2.2%. .

2-The weak laws and legislations: The acceleration of division of land and its distribution by state under pain of housing crisis is result of weak urban laws and weak implementation. This, in turn, has affected future and size of urban plan for city of Baghdad and city's enormous expansion at expense of area of agricultural land and green belt.

Some of treatments that would solve problem of urbanization in city of Baghdad

1 -Laying down laws and legislations that would regulate process of dividing land use within cities and surrounding areas, Makhen considering extension and growth of residential communities.

2- Work to establish institutions specialized in urban planning within city, which will be responsible for urban expansion within city.

3- Directing future urban expansion towards areas classified as non-agriculturally produced or of poor productivity, encouraging farmers to work on agricultural lands, providing all forms of material support, and working to encourage policy of satellite cities.

4- Stopping laws responsible for changing gender of land classified in basic designs as agricultural lands and converting them into a residential cloak.

5-Adopting vertical residential extension to limit horizontal extension and prevent excesses on agricultural lands.

Conclusions:

1- The most important cause of urban expansion on agricultural land is due to desire of population to build a family home as a result of lack of housing.

2- The study concluded that as a result of events that Iraq experienced after 2003 led to a significant increase in housing expansion at expense of agricultural lands due to absence of rule of law and weak legislation and laws as well as large migration from countryside to city because of lack of work opportunities on one hand and search for housing with Low costs on other hand.

3-There have become large lands with residential use outside city’s master plan.

4- The emergence of phenomenon of urban expansion of city has greatly affected general landscape of city.

5- There is a great shortage in municipal departments and lack of an information system for process of studying phenomenon due to poor planning and necessary studies.

6- Governmental decisions issued and their effect on converting gender of agricultural land into housing, which in turn led to destruction of large areas of agricultural land for benefit of housing expansion.

8- Recommendations:

1-Finding final solutions to problem of encroaching on agricultural lands by paying attention to building new and low-cost housing units with full facilities and services, which allows attracting largest possible number of residents to it.

2- Working to simplify building licensing procedures and reduce fees.

3- Shedding light on authorities concerned with abuses, taking firm and strict measures and setting timetables to limit encroachment on agricultural lands.

4- Encouraging reverse migration by finding serious development projects in rural areas, by creating job opportunities, particularly supporting agricultural sector and farmers to stabilize them on their lands and not migrate to cities.

5-Working on necessity of implementing special legal projects to protect agricultural lands by enabling administrative agencies in study area to directly interfere to deter violations.

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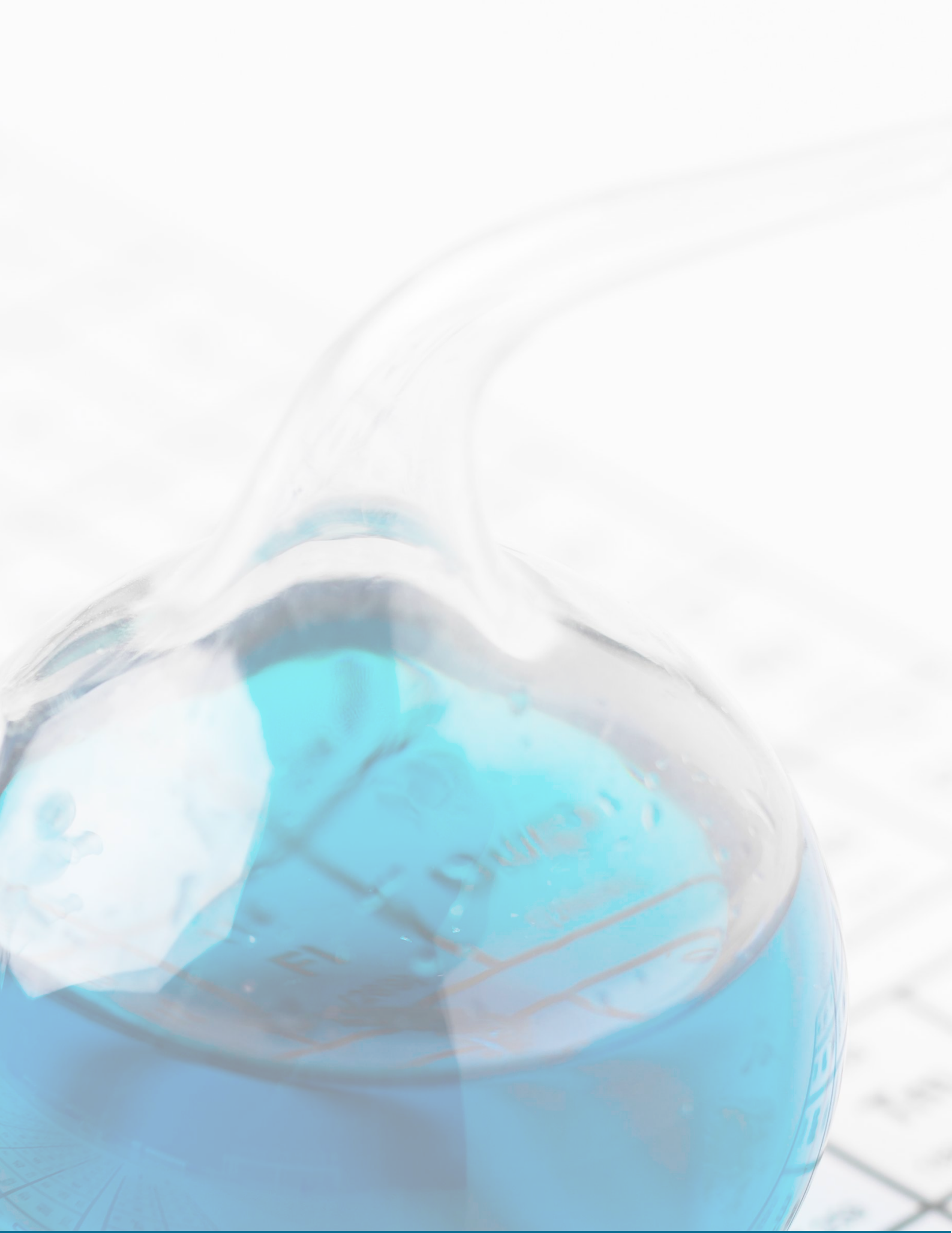

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