Evaluation of the effect of phenolic compounds and terpenes on harvesting the appearance and values of proteins and carbohydrates for some cultivars of wheat and barley \ Kirkuk – Iraq

Maryam Mahmoud Hussein and Rushdi Sabah Abdulqader

Kirkuk University, College of Education for Pure Sciences, Iraq

Emails: Marammahmod@uokirkuk.edu.iq , rushdisabah@uokirkuk.edu.iq

Abstract

To evaluate the effect of phenolic compounds and terpenes of eucalyptus precipitation plants on the phenotypic characteristics, protein and carbohydrate content of wheat and barley plants, in addition to some properties of the cultivated soil during the agricultural season2020-2021, eucalyptus leaves collected and it was detected that presence of phenolic compounds the following: ellagic acid, catechine , chlorogenic acid, quercetin, rutin and the presence of the following volatile oils: a-pinen, limonene , cineole, compherol, cymene, Terpinen. The concentrations %25% 50, %75 used For the of the aqueous extracts in the field experiment showed a significant effect p≤0.05 on the studied cultivars of wheat (Jahan, Al Sham, Abu Ghraib) and barley (Al Baraka) in terms of decline percentage of germination slow emergence of seeding, stunting, and inefficient stem absorption of nutrient ,which affected the leaves for lack of nutrient access So their numbers were reduced preparation, and its effect on the spikes was clear, so the lengths and numbers of the spikes were reduced , and the weights and numbers of the grains decreased, and its content was similar to flour in the treatment of grains On treatment 75% especially the Baraka cultivar , it was observed that there is an inhibitory effect of these extracts directly proportional to the increase in concentration . The extracts significantly affected the values of (carbohydrates and proteins) of leaves and grains of wheat and barley crops. Contrast effect of the concentrations of aqueous extracts of eucalyptus leaves on the physical and chemical properties of the soil between increase and decrease, such as hydrogen, phosphorous, electrical conductivity, potassium, organic matter, nitrogen, chloride and sulfate was significantly shown.

Keywords: phenolic compounds, terpenes, proteins, carbohydrates, wheat, barley

DOI Number: 10.14704/NQ.2022.20.15.NQ88127 **NeuroQuantology2022;20(15): 1400-1410**

Introduction

The process of obtaining food has become of paramount importance for the continuation of human life in many countries, especially in the second decade of the twenty-first century, in which the difficulty of providing it with good quality has increased (Narwal and Haouda, 2013), as plants are one of the most important living organisms that stabilize radiant energy within ecosystems. Produces energy and releases oxygen gas to continue the life of aerobic organisms living within a less polluted range because of their endurance (Krishnavenil et al., 2013). The phenomenon of allelopathy is one of the important phenomena in the environment that shows the relationship of microorganisms and plants among themselves or the influence of each other on each other in order to compete for available materials within the habitat and obtain nutrients to ensure the sustainability of life. (Basaran, 2020), and the phenomenon of allelopathy is a biological and chemical phenomenon Where opposing plants produce chemicals that affect the growth and productivity of neighboring plants (Noor Al-huda and Wasan, 2021). The wheat crop is one of the world's most important food crops for 36% of the world's population, as it is considered an energy source because it contains proteins, carbohydrates and calories, where protein is present by 7-22% and contains 55% of carbohydrates and contains 20% of the calories consumed Globally in developing countries (Fadoul et al., 2013), the barley crop is

eISSN 1303-5150

were: Take 100 grams of powdered leaves, put 100 grams in a liter of lukewarm water, the temperature of which is between 30-40 degrees Celsius for a whole day with shaking every hour. Two hours, we filter the mixture through a piece of gauze. The filtered solution is an aqueous extract of the eucalyptus plant, its concentration is 100 parts per million, we dilute by the following equation:

First focus * first volume = second focus * second volume

The extract should be prepared and watered fresh (Rashed and Butnariu, 2014) .

4-The plastic pots experiment

1-Soil was collected from the growth area of eucalyptus trees

2-Soil was collected from Al-Anadiyah village \ Al-Zab district \ Hawija district \ Kirkuk governorate.

3-The plastic pots were attended by a number of repetitions of them to grow wheat and barley varieties.

5-Determination of some physical and chemical properties of the experimental soil:

Soil texture was measured according to Cupta method (2000) and electrical conductivity, sulfur, nitrogen and pH according to method Ryan method et al . (1996) and the organic matter was estimated using Walkley and Black method described in Jackson (1958) and potassium as in Jackson's method (1958), Helmke & DLSparks (1996), Suares (1996) and phosphorous prepared according to Murphy method (1962) and chloride according to Richards method (1954).

Soil volatile oils: The examination was conducted using a gas chromatography device, Shimadzu 2010 model of Japanese origin, using the Flame Ionized Detector (FID) and using a capillary column type (DM-5Ms) with lengths (30m * 0.25 um * 0.25 mm) and the oil was extracted by taking 20 g of The fresh form was placed in a beaker, 100 ml of distilled water was added to it, and it was placed in the calfanger device for 5 hours. Collect the oil and add to it

considered one of the important crops in Iraq due to its multiplicity of use for different purposes. It is suitable for its growth in different environments and its shape is very close to the wheat plant (Farhan, 2012). The estimated production of wheat in Kirkuk governorate is 627324 tons for the year 2020, While the productivity of barley reached 3101 tons (Department of Statistics, 2020), the eucalyptus plant is one of the plants known for the phenomenon of antibiotics because its leaves contain secondary metabolic compounds that have a negative impact on grain crops, especially wheat.(Akram and et al., 2017).The aim of the current study is to determine the effect of aqueous extracts of eucalyptus leaves at percentages of (25%, 50%, 75%) and the soil containing the remnants of its leaves at different concentrations on the phenotypic characteristics, protein and carbohydrate content of wheat and barley plants, in addition to some soil properties.

Materials and methods

1-Field experiment

The experiment was coundected on 2020-11-21, where 30 plastic pots t were used and 7 kilos of soil was placed in each plastic pots, and 25 seeds were placed in each plastic pots. The end time of the experiment was on 2021-4-22. The plastic pots were placed in a place where rain could not reach, so that the watering was pure (pure) with the extract only rays The sun was irrigating control soil and eucalyptus soil with plain water for the two treatments.

2-The seed source

Three cultivars of wheat (Jihan, Abu Ghraib and Al Sham) and one cultivar of barley (Al Baraka) were selected and were obtained from the Seed Certification Division - Kirkuk Agriculture Directorate.

3-Preparing the aqueous extract

The aqueous extract was prepared with concentrations (25,50,75%) and the concentrations of eucalyptus leaves were prepared. The steps for preparing the extract

eISSN 1303-5150

Baraka cultivar, but the germination speed was not significantly affected, and the germination was delayed one day after the germination of the control treatment the reason for this delay can be attributed to the effect of the active compounds in the aqueous extracts with an allelopathic effect, which could have hindered the germination process as a result of their effect on the enzyme amylase or on the process of seed imbibition (Al-Juhaishi, 2017). As for the effect of the treatment on the primary metabolites, its effect on the percentage of protein in the grains of the Abu Ghraib and Al-Baraka cultivars was very high, significantly higher than the two cultivars of Al Sham and Jihan, which showed less sensitivity, and the effect of the treatment on the percentage of carbohydrates in The cultivars had a significant effect on the carbohydrate content of the grains of the Baraka cultivar, reaching the lowest value of 187.427 ppm, but they are near in the following cultivars (Jihan, Al Sham and Abu Ghraib).

The 25% treatment had an insignificant effect on the pH at the beginning of planting. It decreased but started to rise at the harvest season, which was similar to the effect of the control treatment. The pH value decreased as the concentration increased. As for the effect of the concentration on phosphorous, the phosphorous element began to rise and had a significant effect on the phosphorous element. It was within the range of (0.5- 37.3)ppm that the amount of phosphorous rises when a decrease in the pH value occurs, and these results are consistent with the results of Ryan et,.(2003) , while the effect of the treatment on nitrogen is not significant. At the beginning of cultivation, it started to rise but started to decline During the harvest season, the effect of concentration on potassium had a significant effect that led to an increase in potassium concentration in the soil and it was within the range of (72.5-304.8)ppm It turns out that the percentage of potassium increases with the

10 ml of hexane to separate the oil from the water droplets that accumulate with the oil. The oil was collected and kept in the refrigerator until the analysis process (K.Hcni, 2013).

6-Physiological characteristics of plants

Total protein content: The Lowry method (1951) modified by Ebru (2004) was adopted to determine the total protein value in plant leaves.

Total carbohydrate content: The total carbohydrate content of wheat and barley leaves was investigated using the method of Dubois et al,. (1956).

Phenols: According to the method presented by Cupta (2012), the examination was carried out using a high-performance liquid chromatography device, model sykamn - German origin, where the carrier phase was used: methanol: distilled water: formic acid in proportions (70: 25: 5) ODS: C18 (25 cm * 4.6 mm) To separate the phenols, ultraviolet detector: UV - 280 nm was used, where the velocity of the conveyor phase was: 1.0 ml / min.

7-**The studied flowering characteristics:** we measured the percentage of germination, the speed of germination, the height of the vegetative total (cm), the number of leaves in each plant, the length of the spikes in each plant, cm, the number of grains in the spikes, the weight of the grains before and after grinding in grams, and the number of spikes in each treatment.

Results and discussion

Treatment 25%

Treatment of 25% had a significant effect on the percentage of germination in the cultivar Baraka and Al Sham , while its effect on the height of the vegetative total, its effect was not significant on, but when compared with the treatment of 75%, a significant change was recorded between the two treatments , while its effect on the length of spikes, number of leaves, weight of grains, number of grains and number of spikes were significantly in the

eISSN 1303-5150

the extract, or this could be attributed to the fact that the aqueous extracts cause a decrease in seed saturation and delayed hydration, and thus a defect occurs in the The division of embryonic cells, a delay in their elongation, functional impairment of cells, and a weak response of degrading enzymes to nutrients, thus delaying the exit of the seed embryo (Khalaf and Al-Abadi, 2000, Qassem, 1993, Bhatt et al., 1997, Al-Zobaie, 2017). The effect of a concentration of 50% on the height of the vegetative total of wheat and barley, and there was a gradual difference in length from 25% to 50%, then 75%, because the decrease began to rise with an increase in concentration. The least sensitive varieties were Abu Ghraib and Al Sham Jihan, while The treatment recorded a "significant" difference in the cultivar Al-Baraka, where the height of the vegetative total of the cultivar Al-Baraka reached 17.41 cm. This decrease was directly proportional to the increase in the concentration. The reason can be attributed to the fact that the increase in allelopathic compounds works to impede the action of some hormones such as auxin (IAA), which is one of the hormones The task was in the elongation of plants, which resulted in a shortening in stem length (Queslati, 2003). The concentration of 50% had an effect on the length of the spikes, so the spike lengths were significantly reduced by 50% compared to that in the control treatment and in the 25% treatment. The treatment on the cultivars showed a non-significant difference between the wheat and barley crops. Also, the number of leaves was affected. It was noted that there was no significant difference in the effect of the treatment on the cultivars, but it was found that there was a slight significant difference between the 50% treatment and the eucalyptus soil treatment between the treatments by increasing the concentration. To treat a significant “effect” in terms of the increase in grain weights and numbers and the number of spikes in the Sham variety, in which these traits increase in the concentrations of the aqueous extracts of eucalyptus leaves. The dissolution of plant residues in the soil and its percentage increases and it is an adsorbing factor on the surfaces of the negatively charged colloids in which organic matter is formed (Minkel and Kirby, 1984), and the effect of Factoring on the value of electrical conductivity and organic matter, it had a non-significant effect, so the value of electrical conductivity increased, but there was no significant effect on the value of the organic matter. As for the effect of the treatment on sulfate and chloride in the soil, it had a significant effect on the elements chloride and sulfate in Soil, in terms of the high concentration of the two elements, with an increase in the irrigation period, the sulfates were within the range (125.11-220.71) ppm and chloride was within the range (51.31-4186.73) ppm.

Treatment50%

The effect of the 50% concentration on the flowering traits, the most important of which is the percentage of germination , there was a slight non-significant decrease between it and the concentration of 25% and a significant difference between the 50% treatment and the control treatment in the percentage of germination. The higher the concentration ,the grater the decrease . theless sensitive varieties were jihan and abu ghraib , while the morally sensitive varieties were the Alsham and Al Baraka, and the reason for this discrepancy may be due to the difference in the genetic structure of each of the wheat (Jihan, Abu Ghraib, Al Sham) and barley (Baraka) and this result corresponds to Khana et,.(2008) and Zaiaebrahimi et al.,(2007). And the speed of germination was no difference. Significantly significant between the germination of 25% concentration and 50% concentration, but the two concentrations started germination a day after the emergence of the control seeds and that the allelopathic substances impede the germination process at high concentrations of

eISSN 1303-5150

the plant residues of eucalyptus, or it may be due to the progression of the decomposition of these substances present in the soil, leading to the release of ions and an increase in the quantities of chloride in the soil, and this is consistent with the results of (Lahmoud and his group, 2014) as well as sulfates showed A slight significant increase by increasing watering when increasing the concentration was within the range of (126.94-247.99)ppm.

treatment75%

The treatment of 75% is considered the most significant growth inhibiting treatment in the cultivars that we studied, it affected the percentage of germination and inhibited growth The most emotionally affected items were Al-Baraka and Al-Sham, and the most affected items were Jihan and Abu Ghraib

These results match the results of Akram et al., (2017), and Jassim (2020) who concluded that the higher the concentration of the water extract of eucalyptus, the greater the decrease in the percentage of germination of wheat plant and that there were significant differences for germination according to the concentration of the extracts. Of the two treatments of control and eucalyptus soil. The effect of the treatment on the height of the vegetative total, a significant stunting occurred at the level of p≤0.05 in the cultivars, especially the cultivar Al-Baraka and Al-Sham at harvest because of its inhibitory role affecting the height of the vegetative total, which began to gradually decrease with an increase in the concentration of the extract. By increasing the concentration of eucalyptus leaves, the plants (wheat, sorghum, millet and maize) grow shorter and stunted in high concentration of the extract (Dafaallah and El-Twom, 2017). The 75% treatment had a significant and significant inhibitory effect on other characteristics such as the length of the spikes, their numbers, the number of leaves, the weight of the grsins and the number of grains, as the grains were similar increased significantly over the rest of the other varieties, more sensitive to the effect of the 50% treatment it may be due to the phenolic compounds contained in these leaves that increase the effectiveness of abscisic acid ABA is one of the protein-destroying acids by activating the enzymes protease, peptidase, which reduce the weight of the seeds in the spikes that contain it (Juma and Ibrahim, 2011). As for the effect of 50% concentration on proteins and carbohydrates, significant differences appeared, as the value of proteins increased and the value of carbohydrates decreased with an increase in allelopathic stress. The value of proteins in the month of March for the Baraka variety was 28,398 mg/g. The highest value of proteins and the value of carbohydrates in seeds for the month of May was 187.427 ppm, which is the lowest value of carbohydrates The more sensitive the plant is to the allelopathic effect, the higher the amount of proteins and the lower the amount of carbohydrates.

We note a small, insignificant decrease in the value of hydrogen, in contrast to phosphorus and potassium, which showed a significant effect and an increase in the value of phosphorus in the period of ripening of wheat and barley plants. The moral effect of phosphorus was within the range of (72.5_304.08)ppm ,Nitrogen in the cultivation stage began to rise, but it seemed to decrease insignificantly in the harvest stage, while the value of electrical conductivity was found to have a non-significant increase in salts than it is in the concentration of 25%, the organic matter at the beginning of the watering showed a non-significant increase in the percentage of organic matter, but at the stage of maturity the soil reached The saturation limit, and the effect of the treatment on chloride showed a significant difference at the level of significance p≤0.05 between (70.69-8600.46) ppm, the value of chloride increases, which may be due to the completion of the process of decomposition of

eISSN 1303-5150

the percentage of nitrogen, with an increase in concentration in January, the value of nitrogen amounted to 24.52 ppm, which is considered the highest value for the effect of treatments on the increase and decrease of nitrogen element, the increase in nitrogen ratios is due to the fact that it is released from the residues and plant residues. Which is a major source of nitrogen after the dissolution of internal cellular structures (carbohydrates, proteins, nucleic acids, enzymes), whose molecular structure contains nitrogen, as well as phenolic compounds such as phenolic acids that are produced from plant residues or that are filtered from cell It is a source of nitrogen and plant residues affect activity microorganisms such as root ganglia bacteria that fix atmospheric nitrogen in plants (Al-Saadawi and his group, 2007, Gomaa et al, (2010), and the effect of the treatment on the potassium element, the amount of potassium increased significantly at the time of harvest, so the percentage of nitrogen under the influence of 75% treatment was within the range (226-660.4) ppm. while the electrical conductivity increased by a small, non-significant percentage than it was at the beginning of cultivation The amount of organic matter increased significantly within the range (0.52-2.87)%, but the soil reached the limit of saturation with organic matter. The effect of the treatment on chloride and sulfate in the soil was also clear, so the amount of chloride increased significantly within the range (147.51-5363) ppm. As for the percentage of sulfates It increased in the middle of the planting season, but it began to decline at harvest, and there is a significant difference between the 50% treatment and the 75% treatment, so the 50% treatment was higher than the 75% treatment, and the significant effect of the 75% treatment on sulfates was within the range (99.76-192.21)ppm. to flour as a result of the toxic effect of phenolic and terpene compounds.

The effect of the treatment on the metabolic compounds Primary carbohydrates and proteins in leaves and grains, so the value of proteins increased and the value of carbohydrates decreased. In the treatment of 25% and the treatment of 50%, the cultivars were significantly affected by this treatment. The most valuable cultivars for proteins was Al Baraka, which amounted to 200 mg/gm in the leaves for the month of March, while the value of carbohydrates reached the lowest value of 23.307 ppm in the leaves of Al Baraka cultivar for the month of January, although The weight of the seeds before milling was crushed and after milling and the numbers of spikes in the Sham variety were the highest, but the percentage of protein in the grains decreased to 2.264 mg/gm and this is due to the inverse relationship between seed productivity and the percentage of protein. These results are consistent with Jassim (2020) and Dong and et al ,(2015) and Panozzo et al, (2014).

The treatment affected the soil properties, the pH decreased insignificantly, and the lowest treatments were in the pH value, which shows that the pH value gradually decreases, starting from the 25% treatment and ending with the 75% treatment. The decrease in the reaction degree is caused by the production of some of the organic acids present in the soil Such as humic acid, fulvic acid, or CO2 gas produced from the respiration of microorganisms in the soil that decomposes plant residues added to the soil and thus works with water and produces carbonic acid in the soil (Shaaban and Okasha, 2007). As for the effect of the treatment on the phosphorous element ,it had significant effect in terms of the increase in the percentage of phosphorous than it is in the treatment of 25% and 50%, so phosphorus fell under the influence of 75% treatment within the range (1.9-96.1) ppm and the treatment affected the amount of nitrogen in the soi. In

eISSN 1303-5150

Control treatment and eucalyptus soil treatment

There were clear and distinct differences between the two treatments, and the two treatments had stimulating effects, unlike the other treatments. Eucalyptus soil treatments significantly outperformed the control treatment in the percentage of germination with an average germination rate of 86%, but the emergence of seedlings in the two treatments appeared on the same day. As for the treatment of eucalyptus soil, it is Sham and Jihan, and a significant difference appeared in the height of the vegetative total, the length of the spikes, the number of leaves, the weight of the seeds, the number of seeds and the number of spikes between the two treatments. And differences appeared in the effect of the two treatments on the proteins and carbohydrates in the leaves and grains. The amount of proteins in the grains of the varieties varied, and it was the highest value in the Baraka variety, but in the treatment of eucalyptus soil, it was the highest in the Sham variety. Also, the amount of carbohydrates varied between the varieties, so the highest value in the grains of the control treatment was the Abu Ghraib variety. The highest value in the treatment of eucalyptus soil is the Baraka cultivar There were a number of changes that occurred on the soil properties during the cultivation period. The pH, electrical conductivity, and sulfate decreased in the eucalyptus soil treatment, a slight insignificant decrease compared to the control treatment as a result of the allelopathic substances present in it, in contrast to phosphorous, nitrogen, potassium, organic matter and chloride in the control treatment that The mean values were significantly superior to the Eucalyptus soil treatment.

We conclude that the leaves of eucalyptus contain secondary metabolites shown in tabel 2,3 that affected the phenotypic characteristics, protein and carbohydrate content of wheat and barley plants. The effect of treatment was 25%, 50% and 75% negative effect on all cultivars, and this negative effect increases with increasing concentration of treatment. As for the effect of treating eucalyptus soil, it was positive because it was empty of Weeds and improve productivity.

Table (1) the effect of treatments (control - eucalyptus soil -25%-50%-75%) on soil properties

Soil characteristics	Range	average treatment					recording significant or not heterogeneity
		control	eucalyptus soil	25%	50%	75%	
pH	(6.66-7.97)	7.36	7.26	7.34	7.25	7.07	No significant variation was recorded
Phosphorous ppm	(0.5-125.3)	44.82	31.8	20.6	20.74	40.96	Significant difference was recorded between treatment 75%, treatment 25% and treatment 50%
Potassium ppm	(30.48-660.4)	63.28	61.61	142.516	255.15	364.22	A significant difference was recorded between the control treatment and that of 25%, 50% and 75%
Nitrogen ppm	(7.15-24.52)	13.65	9.33	16.17	16.20	16.62	No significant difference was reported
Electrical conductivity	(0.21-1.99)	0.49	1.50	0.52	0.53	0.61	No significant variation reported

eISSN 1303-5150

mmoh.cm							
Organic matter %	(0.25-2.87)	1.33	0.92	1.54	1.92	2.04	Significant difference was recorded between the treatment of eucalyptus soil and the control treatment and treatment of 25%, 50% and 75%
Chloride ppm	(8.36-8600.461)	43.84	92.13	938.37	1810.33	1235.49	Significant difference was recorded between the control treatment and the treatment of 25%, 50% and 75%
Sulfate ppm	(89.5-266.96)	142.02	162.33	171.61	177.46	149.79	No significant variation reported

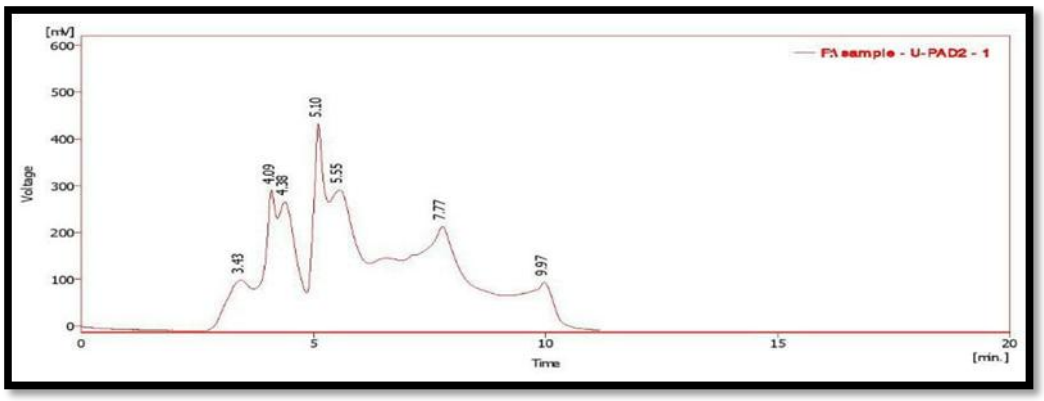
Table 2 standard curve for phenolic compounds with technology HPLC.

	Reten. Time [min]	**Area [mV.s]**	**Height [mV]**	**Area [%]**	**Height [%]**	**W05 [min]**	**C ompound Name**
1	**3.428**	**952.141**	**38.843**	**6.3**	**4.8**	**0.46**	
2	**4.092**	**1555.004**	**149.344**	**10.3**	**18.3**	**0.20**	Chlorogenic acid
3	**4.376**	**2844.146**	**143.461**	**18.8**	**17.6**	**0.33**	
4	**5.100**	**2742.877**	**249.622**	**18.2**	**30.6**	**0.19**	Rutin
5	**5.552**	**2742.877**	**65.110**	**9.9**	**8.0**	**0.41**	Ellagic acid
6	**7.772**	**3571.014**	**102.397**	**23.7**	**12.6**	**0.59**	Qurcetine
7	**9.968**	**1937.840**	**66.164**	**12.8**	**8.1**	**0.86**	Catechine
	Total	**15099.110**	**814.940**	**100.0**	**100.0**		

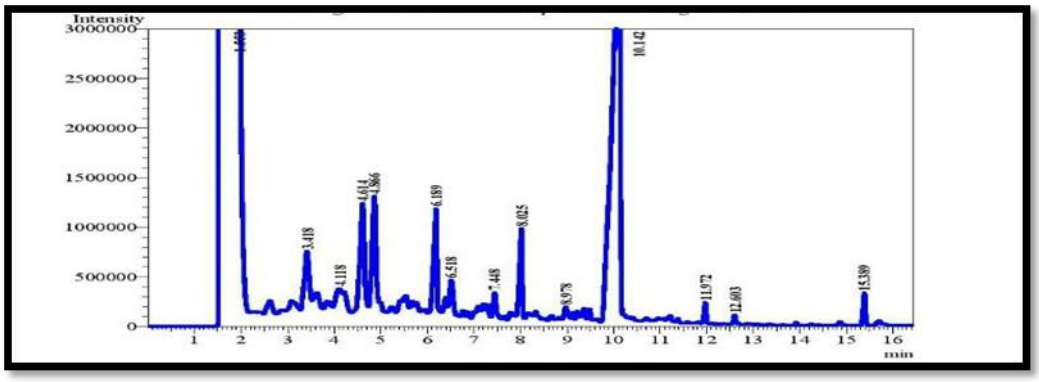
table 3 standard curve for volatile oils compounds with technology HPLC.

Peak#	Ret.Time	Area	Area%	Height	Name
1	1.553 50	5056484588	98.5312	0273290	Cineole
2	3.418	3618212	0.0705	540478	Cymene
3	4.118	2295808	0.0447	184314	
4	4.614	6578670	0.1282	1047675	A-Pinen
5	4.866	6082534	0.1185	1088948	Terpinen
6	6.189	4783357	0.0932	1019690	
7	6.518	1473484	0.0287	303169	

8	7.448	857212	0.0167	229457	
9	8.025	3562961	0.0694	893165	Limonene
10	8.978	527292	0.0103	114313	
11	10.142	43753377	0.8526	3165878	
12	11.972	540301	0.0105	189892	
13	12.603	268801	0.0052	88066	
14	15.389	1036917	0.0202	315737	Compherol
Total	51	513186351410	100.0000	9454072	



Fig(1) a shows the absorbance peas of the phenolic compounds



Fig(2) a shows the absorbance peas of the volatile oils compounds

anatomical characteristics, University of Mosul / College of Science.

Gomaa, Najm Abdullah; Ibrahim, Nagham Saadoun,(2011), The effect of aqueous and alcoholic extracts of eucalyptus on germination, growth and yield of wheat (Triticum aestivum L.) summer July-1, Diyala Journal of Agricultural Sciences, Volume (3), Issue (2), Part Three: 761-776.

Khalaf, Ahmed Saleh and Al-Abadi, Ahmed Abdullah Ahmed,(2000), the effect of seed

References

Jassim, Sorra Abdel Salam Khader (2020), Evaluation of the efficiency of some plant extracts, fungi and chemical pesticides in combating wheat bushes and their effect on wheat growth and production. College of Agriculture \ University of Basra.

Al-Juhaishi and Wasan Saleh Hussein,(2017), The use of plant residues in the biological control of some weeds and their allelopathic effects on growth, and some physiological and

germination and seedling growth of wheat *(Triticum aestivum* L). International Journal of Biosciences , Vol. 11, No. 5, p. 286-293.

Basaran, Fulya (2020),Plant Allelochemical Interference :Allelopathy.

Bhatt, B. P. ; Kumar , M. and Todaria, N. P. (1997) Studies on the allelopathic effects of Terminalia species of Garhwal Himalaya . J. Sustainable Agriculture. 11(1) :71-84.

Cupta Mardu , Sasmal Saymyakanti, Majumdar Sohini , Mukherjee Arup, (2012), HPLC Profiles of standard phenolic compound present in medicinal plants,International journal of pharmacognosy and phytochemical :4(3) ;162-167.

Dafaallah, A. B. & El-Twom, E. O. (2017). Alle lopathic Effect of Eucalyptus (Eucalyptus camaldulensis Dehnh) Leaf On Seed Germination and Seedling Growth of some Poaceous Crops, , *International Journal of Forest, Animal and Fisheries Research (IJFAF),ISSN: 2456-8791.*

Dong, C.; Shao, L.; Fu, Y.; Wang, M.; Xie, B.; Yu, J. & Liu, H. (2015) . Evaluation of wheat growth, morphological characteristics, biomass yield and quality in Lunar Palace-1, plant factory, green house and field systems. Acta Astronautica, 111:102-109.

Panozzo, J. F.; Walker, C. K.; Partington, D. L.; Neumann, N. C.; Tausz M.; Seneweera, S. & Fitzgerald, G. J. (2014). Elevated carbon dioxide changes grain protein concentration, composition, and compromises baking quality. A FACE study. Journal of Cereal Science, 60(3): 461-470.

Erbu Dulekgurgen (2004) , proteins protocol ,UIUC .

size and fogging with fungicides on the growth and yield of local chickpeas, Iraqi Journal of Agricultural Sciences, Volume (5), Issue (3): 55-53.

Ryan, John George Stephan and Abdul Rashid,(2003), Soil and Plant Analysis, Laboratory Manual, International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria .

Al-Zawba'i, Abdullah Muhammad (2019). Allelopathy effect of aqueous extracts of some parts of the sunflower plant Helianthus annuus on germination, growth characteristics and internal anatomy of maize plant Zea mays L. College of Science \ Tikrit University \ Iraq .

El Saadawi, Ibrahim Shaaban, Nadia Mahdi Saleh, and Faeq Tawfiq Chalabi. (2007). The allelopathic effect of maize residues on nitrogen fixation, growth and yield of beans. Iraqi Journal of Agriculture, Volume (12), Issue (1): 1-10 .

Farhan, Mohsen Awaid; Al-Amiri, Sarah Ali Hussein; Mahmoud, Zahra Hadi, (2012), an economic study of the supply response of barley crop in Iraq for the period 1980-2009. Department of Agricultural Economics, College of Agriculture, University of Baghdad, Al-Rafidain Agriculture Journal: Volume (40) Supplement 4.

.

Qassem, Gamal Ragheb, (1993), Inhibitory effects of some common weeds in grain fields on wheat and barley crops. Journal of Research and Applied Sciences Studies 20 (2): 28-7 .

Directorate of Agricultural Statistics, (2020), wheat and barley production 2020, the Central Bureau of Statistics / Iraq.

Minkell, K and J, A. Kirby, (1984), Principles of Plant Nutrition, translated by Saadallah Najm Abdullah Al-Nuaimi, University of Mosul / University Press / Iraq.

Akram,S; Safeer,M; Zaheer,M.S; Iqbal, R,(2017). Effect of aqueous extracts of eucalyptus (Eucalyptus camaldulensis L.) on

eISSN 1303-5150

Lowry, O.H; Rosen brough ,N.J ; farr ,A.L; Randall, R.J ., (1951) protin measurement with the Folin phenol Reagent , J Biol chem 193,pp.265-275.

Murphy, J. and J.P. Riley.(1962). A modified single solution method for the determination of phosphate in natural waters. Anal. Chim. Acta. 27: 31–36.

Narwal, S.S. & R. Haouala, (2013) Role of allelopathy in weed management for sustainable agriculture .Allelopathy :217-249 .

Noor Al-huda and Wasan (2021) , Evaluation Of Chikpea Extract Aqueous Allelopathic Effect On Division And Growth of some Wheat species(*Triticum aestivum)* of Soil Analysis, Part 3, Chemical Methods (Eds. D.L. Sparks *et al.*), SSSA Book Series.

Queslati , Q. (2003) Allelopathy in two durum wheat (*Triticum aestivum* L.) Varieties Agric. Eco. Env. 96:161-163.

Rashed, K. and M. Butnariu, 2014. Antimicrobial and antioxidant activities

Richards ,L .A. 1954. Diagnosis and improvement of saline and alkali soils Handbook 60. Washington, D.C.

Ryan, John; Garabet, Sonia; Harmsen, Karl and Abdul Rashid.(1996). A Soil and Plant analysis manual adapted for the West Asia and North Africa region. International Center For Agricultural Research in the Dry Areas(ICARDA), Aleppo, Syria.143pp.

Shaaban , S.M. and E.M Okasha . (2007) . Composts of wood Industry Wastes for Clay Conditioning : I . Growth Response and Water and fertilizer use efficiency by Two Successive Crops (Broad Bean and Corn) . Res. J . Agric. and Biol. Sci. , 3: 687-694.

Fadoul , H. E.; El Sidding ,M.A .& El Hussein , A.A.(2013) . Assessment of genetic diversity among Sudanese wheat cultivars using RAPD markers International Journal of Current Science , 6: 51 -57.

Gomaa,A.M. , M.H.M. Afifi,M.F. Mohamed and C.Y.El- dewiny. (2010).Nodulation , growth parameters and yield quality of faba bean cultivated in newly reclaimed sandy soil under Bio-organic Agriculture system .I.J.of Academic Research 2(5):134-13.

Gupta, P.K.(2000). Soil, plant, water and fertilizer analysis. Agrobios (India), Jodhpur, New Delhi, India. p.438.

Helmke, P.A. and D.L. Sparks.(1996). Lithium, sodium, potassium, rubidium, and cesium p. 551-574. In: Methods of Soil Analysis: Part 3, (eds. Sparks, D.L. *et al.*), SSSA and ASA, Madison, WI.

Jackson, M.L. (1958). Soil Chemical Analysis- advanced course, 2nd edn., Madison, WI, USA.

K.Hcni, J.A.Sotomayor ,M.J.Jordan and S.Boizid, (2013), Chemical compsition of the essential oil of Rosemary(*Rosmarinus officinalis* L.) of *Tunisian origin*.Asian journal of chemistry:2601-2603.

Khan a, M. A.; Iqtidar, H. & Khan, E. A. (2008). Allelopathic effects ofEucalyptus (Eucalyptus camaldulensis L.) on germination and seedling growth of wheat (Triticum aestivum L.). Pakistan Journal of Weed Science Research, 14(1/2): 9-18.

Krrishnaveni M. , Durairaj ., S.,Madhiyan P ., Amsavalli L ., Chandrasekaw R .(2013) .Impact of air pollution in plant near thermal power plant , Mettur , Salem , Tamilnadu ,India . Int . J . Pharm .Sci . Res ., 20(2) ; n 31, p. 173-177. ISSN 0976-044X.

eISSN 1303-5150

seed germination seedling growth and activities of peroxidase and polyphenol oxidase in three wheat cultivar seedlings (Triticum aestivum L.). Pakistan Journal of Biological Sciences, 10(19): 3415-3419.

Suarez, D.L. 1996. Beryllium, magnesium, calcium, strontium, and barium. In: Methods of Soil Analysis, Part 3, Chemical Methods (Eds. D.L. Sparks *et al.*), SSSA Book Series No. 5, SSSA and ASA, Madison, WI, pp. 575–602.

Ziaebrahimi , L .; Khavari –Nejad ,R.A.;Fahimi , H. & Nejadsatari , T.(2007) Effects of aqueous eucalyptus extracts on

eISSN 1303-5150