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EFFECT OF GROUND AND NATURAL ZEOLITE ON GROWTH AND YIELD OF WHEAT

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Abstract

This study was conducted in the area of Basatin Mohamed Ali, located in the Muthana Governorate for the winter season 2017-2018 to study the effect of zeolite metal on the physical properties of the soil of the experiment. The study investigated the effect of 4 levels of natural zeolite metal: 0%, 1%, 2%, 3%, 4% and 4 levels of ground zeolite 0%, 1%, 2%, 3%, 4%. The experiment was carried out by designing the whole randomized sections with three replicates.The use of zeolite metal in both its natural form and the mill resulted in increasing the properties of the plant height, the area of the flag leaf, the number of stools and the chlorophyll content significantly. The effect on the traits of the crop if the number of spikes, number of grains, number of spikes and spike length increased with zeolite and the positive effect of 1000 Beans and bio-yield and grain.

Key words: Zeolite, yield of wheat, Silty Loam Soils.

Introduction

Triticm aestivum L. is one of the strategic crops in Iraq and the world. The crop production conditions in Iraq suffer from the low productivity of the unit area due to the methods of soil and water management and the weak use of modern agriculture techniques in production. Natural zeolite is optimized for physical and fertility soil properties and water use efficiency in crop irrigation. Global production of natural zeolite is estimated at 3.2 million metric tons. China produces more than 70% of it (Vitra, 2013). There are about 40% species and 100 industrial species (Szerement *et al*.., 2014).The zeolite is characterized by a high ion exchange capacity and high moisture and nutrient retention capacity. It has been used as a water efficiency enhancer, ready to collect nutrients in the soil and plays a slow editor role for nutrients from fertilizer (Gairley *et al*.., 2015). Zeolite is a four-walled aluminum alloy with hollow cavities in the form of 3-dimensional solid crystal channels and a large surface area with low production costs (Moattar and Hayeripour, 2004). Molecular sieves and molecular sieves with molecular size pores (0.3-2.0 nm) exhibit selective adsorption (Kwakye-Awah, 2008). And low density of the cavities (Cabanilla *et al*., 2016). Zeolite affects the properties of physical soils. It has been used to increase soil capacity to store water (Khalaf, 2010) and to control soil erosion (Al-Busaidi *et al*., 2007) and (Mortani *et al*., 2010). (Geiba and gilani, 2001). Zeolite was used to improve the solubility of solid soils to increase the molecular pores 50% (Ramesh, 2015). In addition to the high quality surface area (Wolf *et al*., 2004). The zeolite has a high cation exchange capacity of up to 400 Cm^{-1} and is used for adsorption of micro and large elements and treatment. The use of minerals for agricultural purposes has become widespread and zeolite metal has a special place in this field. Zeolite minerals are known as aluminosilicate water formed from alkaline or alkaline metals, with a four-surface structure, each composed of 4 atoms of oxygen (SiO_4) surrounded by cations (sodium, calcium, potassium and barium) forming an open structure containing open cavities Body channels and wide cages. These cavities are filled with water molecules and additional cations are interchangeable. The channels are large enough to allow the passage of hosted ions. The Zeolite Metallic Group contains a number of hydro silicate minerals, which are similar to their chemical composition and presence in nature. They are known as aluminum silicate, sodium and calcium in particular and contain a large proportion of water. (Polat *et al*., 2004). Zeolite has gained great importance due to the many benefits of its application in the recent past. The pioneer in starting agricultural work is Japan. In 1960, Japanese farmers used it over the years to control moisture content, increase acidity of acidic volcanic soils, reduce ammonia losses by volatilization and increase the efficiency of nitrogen use (Ramesh *et al.*, 2015).

Materials and Methods

A field experiment was carried out during the agricultural season (2017-2018) in the area of Basatin Mohamed Ali, located in the Muthana Governorate on 45.278777 longitude east and 31.327489 in the north to study the effect of addition of natural zeolite metal on the properties of physical soil and the growth and yield of soft wheat *Triticum aestivum* L. (Z) with five levels of zeolite (0%, 1%, 2%, 3% and 4%) and three replicates for both natural and flat forms. Soil samples from the depth of 0-30 cm were collected from different locations of the field, mixed well for homogenization, pneumatic and softened using a polyethylene hammer and passed from a 2 mm diameter sieve, from which a compound sample was taken for the purpose of estimating some According to the design, each panel consisted of 12 lines with a length of 2 m and a width of 1 m. It was left between the experimental units with a distance of half a meter and between the repeaters for a distance of 3 m. In addition to the sowaki, zeolite was added to the slabs designated for agriculture For the above levels, mixed with soil at a depth of 20 cm before one week of planting, the plates were planted with seeds of the class used on 15 November at a rate of 120 kg. Hectar1, phosphate fertilizer was added at once in agriculture with 30 kg per hectare. (P_2O_5). Nitrogen fertilizers were added to the quantity of 200 kg per hectare, with two payments at the end of the planting phase and before the expulsion of the spice and in the form of urea fertilizer (46% N) (1993). Potassium fertilizer was added to 80% kg per hectare and addition of iron and zinc by 50% ppm organic fertilizer was added to all experimental units by 2%. The crop service operations were carried out from preparing the land for agriculture till harvest. Each experimental unit was irrigated from the date of planting till the date of maturity and according to the need in the water balance method. The control was carried out using the Refugil herb. The bushes were planted as needed and harvested on 21/4/2018. The experiment was carried out by designing two-way randomized whole sectors for both natural and ground metal using RCC and three replicates.

The number of grains, the number of grains, the weight of 100 grains, the yield of grains (tons of ha), the tonnage (tons of ha), the harvest index (%). The grain yield of the group of plants harvested from the intermediate lines (40×100 cm) was determined after the manual study of the plants from each experimental unit. After the straw was isolated from the grains, the weight of the grain was weighed. From the following equation:

Harvest guide = (grain yield / biomarker) × 100, Donald, 1962. The data were statistically analyzed using the Genestat program and the averages were compared according to the least significant difference (L.S.D) (Steel *et al.*, 1997).

Results and Discussion

The results of the statistical analysis showed significant differences in the height of the plant table 4. The height of the plant increased by increasing the level of the addition of the metal in both the natural and the flammable zeolites. The highest mean height of the plant in the treated zeolite was 107.70 cm at the addition of 4% and 98.85 cm in the zeolite treatment the comparison of these values with the comparison treatment of 0% Zeolite 70.30 cm, shows the role of the metal in the increase of this character by (53.20%) for treatment of ground zeolite and (40.61%) for the treatment of natural zeolite. The ratio of the added metal has increased from 70.30 Cm to 98.85, 91.08, 82.32,74.42 cm when upgrading the metal from 0 to 4.3, 21% natural zeolite respectively and 107.70, 97.45, 87.38, 77.18 cm Zeolite crushed to the same levels respectively, may be attributed to the strength of root growth When increasing the level of zeolite in the soil, which increases the absorption of water and nutrients that contribute to the growth and elongation of cells and may also be due to the entry of nitrogen in the composition of protein and nucleic acids such as DNA and RNA and in the molecule (NADPH) necessary for the conversion of Acetyl coA to Gibberellins and in the composition Tryptophan, which is the basic compound in the formation of Indole acetic acid and the latter is a catalyst for elongation of cells and the addition of nitro Gene stimulates the plant to produce oxins that stimulate cell division and expansion and perhaps the increase

Table 1: Some physical and chemical properties of pre-planting soil.

Adjective		the value	Unit
Chemical properties	Soil reaction (PH)	7.22	-
	Electrical conductivity (ECE)	4.90	dsm^{-1}
	Nitrogen ready	11.2	mg kg^{-1}
	Phosphorus Ready	14.1	mg kg^{-1}
	Potassium ready	165.4	mg kg^{-1}
	Cation Exchange Capacity (CEC)	8.98	C .Mol kg-1
Physical properties	Sand	14	gm kg^{-1} soil
	Green	60	gm kg^{-1} soil
	Clay	26	gm kg^{-1} soil
	Soil tissue	Silty Loam	

Table 2: Some physical and chemical properties of zeolite metal.

Adjective	Value	Unit
PH reaction rate	7.3	-
Electrical conductivity EC	0.01	dsm^{-1}
Bulk density	0.09	$Mg\ m^{-3}$
Partial density	1.0	$Mg\ m^{-3}$
Porosity%	91	%
Cation exchange capacity CEC	Natural 75.43, Grounded 83.79	C .Mol kg-1

in plant height is associated with the increase in the number of leaves. Zeolite also contributes to the availability of nutrients necessary to allow the plant to benefit from high efficiency, especially nitrogen, which helps to grow through its impact on the number of cells and the speed of division and that the food component, which gives high growth and productivity in the poor land. The vegetative growth increases the length of the amphibians, which in turn increases the length of the plant. Zeolite works to improve soil water conditions and provide the necessary moisture for the development of vegetative growth.

The results of the statistical analysis (Table 4) showed the significant effect of zeolite in the area of the paper area. The table shows that the highest average area of the flag paper was in the natural zeolite treatment at 4% normal zeolite and reached 64.02 cm 2. The comparison of 0% Zeolite, which corresponds to the results of (Abdel-Hassan, 2018) as it indicated that the reason for increasing the area of the paper science is due to the addition of the metal affected the development of the paper area for its role in water retention and nutrients and metabolism, which positively affected the increase of this attribute.

While the level of 1% gave a normal zeolite of 37.02 cm 2 and gave the levels 3%, 2% natural zeolite averaged 44.64, 47.11 cm^2 and gave the levels 1, 2, 3, 4% (35.43, 46.58, 51.85) cm^2. This significant difference in the values of the area of the science paper for natural zeolite and milliners may be due mainly to the increase of nutrients such as nitrogen and phosphorus as well as potassium. These elements have the role of being involved in or stimulating many biological and phylogenetic processes related to the manufacture of food within the plant or Stimulation of cell division and elongation and the formation of cellular membranes that lead to increased vegetative growth and paper surface (Jefferies and Mackerron, 1993). The results of the statistical analysis (Table 4) showed a significant effect of zeolite in the number of branches with increase in the mineral level. The number of branches increased significantly by increasing the level of addition of the metal in both the natural and flour zeolites. The highest average number of branches in the treatment of ground zeolite (9.80) Tillers. $plant^{-1}$, at the level of addition of 4% Zeolite was recorded while the natural zeolite recorded the same average level (7.40) $Tillers.plant^{-1}$ and the comparison of the values with the comparison treatment 0% zeolite (3.60) Tillers. $plant^{-1}$. The table indicates that the increase in the number of branches with the increase of the percentage of ground zeolite added to the soil increased from (6.60) Tillers. $plant^{-1}$ to (6.93) (8.40) (9.80) Tillers. $plant^{-1}$ when raising the level of metal added from (1) to (2), (3), (4) respectively. In the natural zeolite treatment, (4.80 Tillers. $plant^{-1}$ (5.00) (6.20) (7.40) $Tillers.plant^{-1}$ and vegetarians increased at the same levels of addition. The reason is that the zeolite effect In the increase of total production by increasing the total vegetative as the increase in the number of steppe, which in turn is affected by the abundance of nitrogen in the soil, which works to increase the vegetative growth and this is consistent with (Ahmed and others, 2006) Which indicates that the addition of zeolite reduces the nitrogen washing and increases the content of nitrates in the soil, which makes it easier to absorb, as well as what it has created (Abdel- Hassan, 2018) It helps to absorb the nutrients and yields a higher grain content recorded by the Cation Exchange Capacity (CEC) with the highest value of the natural mill. This resulted in a superior treatment of the naturalized zeolite treatment, as well as improvement of water management and reduction of the density of the soil. Edde provide nutrient soil of nitrogen, phosphorus and potassium. The results of the statistical analysis (Table 4) showed a significant effect on the addition of zeolite in its natural form and on the chlorophyll content of the plant, if the chlorophyll content increases with the addition of the metal and the highest average chlorophyll content in the natural zeolite treatment is 41.50 and

Table 3: Shows the volumetric distribution of the natural zeolite and millimeter minutes used in the experiment.

Percentage of natural mineral %	Diameter (micron)	Percentage of mined metal %	Diameter (micron)
14.44	4750 Bigger than	16.11	600 Bigger than
39.11	4750-2360	30.55	300-600
25.11	2360-1000	50.55	150-300
16.13	1000-600	2.22	125-150
0.65	600-300	0.38	75-125
3.23	300-125	0.19	Less than 75
1.12	125-75		
0.21	75 less than		

Table 4: Effect of zeolite in plant height (cm), leaf area of science (cm ^{2}), number of seedlings (Tillers.plant^{-1}) and chlorophyll content (mg .cm^{-2}).

Attributes studied				Added levels %	Type of zeolite
Chlorophyll content	Number of participants	The space of the flag sheet	Plant height		
27.98	3.600	21.93	70.30	0	Control
33.95	4.80	37.02	74.42	1	Natural Zeolite
35.24	5.00	44.64	82.32	2	
36.79	6.20	47.11	91.08	3	
41.50	7.40	64.02	98.85	4	
30.52	6.60	30.65	77.18	1	Ground zeolite
32.47	6.93	35.43	87.38	2	
33.86	8.40	46.58	97.45	3	
37.11	9.80	51.85	107.70	4	
1.534	0.6603	6.998	4.383	$L.S.D_{0.05}$	

36.79 mg.cm^{-2}. The level of addition of 4% and 3% Zeolite and 35.24 and 33.95 mg.cm^{-2} at the level of addition of 2% and 1% Zeolite and to compare these values with the comparison treatment 0% Zeolite 27.98 mg.cm^{-2} (1, 2, 3, 4)%. The chlorophyll content of the plant increased to 37.11, 33.86, 32.47, 30.52 mg.cm^{-2} Chlorophyll contains both plants. The table shows that the treatment of natural zeolite is higher in their average than the zeolite treatment. This may be due to the increases in the chlorophyll content of the leaves resulting from the plant's nutritional needs, soil fertility and the availability of the main nutrients represented by nitrogen, which is a key component of the construction of chlorophyll, phosphorus and potassium. The latter has a large role in the activation of a large number of enzymes, including responsible for the construction of chlorophyll, the lack of which leads to the destruction of plastids This is consistent with(Jun *et al.*, 2010) who found that the increase in potassium levels significantly increased the chlorophyll content of plant leaves. The results (Table 5) showed that there was a significant effect of zeolite in the number of spikes per plant. The number of spikes increased by increasing the levels of addition of the metal in both the natural and grated zeolite treatments. The highest average number of fertile ears in the zeolite treatment was 588.3 mb2 at level 4, (526.3) Spike.m^{-2} for the treatment of natural zeolite for the same level. The comparison of these values with the comparison treatment of 0% zeolite, which gave an average of (261.3) Spike.m^2, showing the effectiveness of the metal in increasing this quality in both treatments, The high exchange capacity of the crushed cellulite compared with the natural form Its cation exchange capacity is lower, increasing soil susceptibility to nutrient retention and plant readiness, which reflects plant nutrient reserve in the soil. The table also indicates that the number of fertile ears increased with the increase in the percentage of mineral added to the soil. It increased from (261.3) Spike.m^2 to (302.0) (364.0) (463.3) (526.3) Spike.m^2 for the treatment of natural zeolite when raising the level of the mineral added to the soil From 0 to 4, 3, 2 and 1 respectively and from 261.3 Spike.m^2 to (364.7) (430.7) (542.3) (588.3) Spike.m^2 for the treatment of ground zeolite for the same levels, respectively. These differences may be attributed to the fact that zeolite provides nutrient at the critical stages of the development and development of branches and saplings. It performs several roles, including the provision of continuous food supply and these nutrients to improve growth opportunities and increase the content of the leaves of chlorophyll and its role in raising the efficiency of representation and thus increase the representative products, thereby reducing the competition within one plant, which increases the number of ears.

The results of the statistical analysis showed a significant effect of zeolite on the number of grains per spike. Table 5 showed an increase in the number of grains per spike, with an increase in the level of metal addition in both treatment plants. (52.24) (37.10) Grain.spike^{-1}, respectively and the same table showed the positive effect of the metal on the treatment of ground zeolite. The metal levels have led to an increase in the number of grains with one spike and in proportion to the increase in these levels compared with In comparison, Zeolite (4%) recorded the highest average of zeolite fermentation treatment (55.97) Grain.spike^{-1} at all levels for the treatment of ground zeolite. The levels (3), (2), (1) zeolite averaged (49.98) (44.12) (34.59) Grain.spike^{-1}. Comparison of these values with the comparison treatment of 0% Zeolite (28.63) Grain.spike^{-1} seed shows the role of the metal in increasing this characteristic. The natural zeolite averages were higher than those of zeolite. These differences are due to the role of natural zeolite in providing nutrients necessary for the growth and development of plants, especially nitrogen, phosphorus and potassium, which have a higher average than in zeolite and increase vegetative growth. And increase the proportion of carbohydrates manufactured in the leaves, which in turn transmitted seeds, which led to the improvement of qualities or may be due to the increase in the amount of materials manufactured within the leaves because of increased nutrients ready to absorb the cycle of Increase the effect of enzymes that stimulate the transfer of carbohydrates manufactured and stored in the leaves to the fruits and reflected positively on the

Table 5: Effect of zeolite in the number of spike (Spike.m^2), number of grains per spike (Grain.$spike^{-1}$), number of spikes and length of spike (cm).

Attributes studied				Added levels %	Type of zeolite
Length of spike	Number of stables	Number of grains per spike	Number of fertile ears		
5.967	12.867	28.63	261.3	0	Control
10.733	17.467	37.10	302.0	1	Natural Zeolite
12.067	16.933	52.24	364.0	2	
13.300	18.467	57.99	463.3	3	
12.900	19.133	69.22	526.3	4	
12.967	18.000	34.59	364.7	1	Ground zeolite
14.333	18.533	44.12	430.7	2	
15.433	19.067	49.98	542.3	3	
15.900	20.733	55.97	588.3	4	
0.7367	0.8532	7.672	37.25	$L.S.D_{0.05}$	

qualities of the crop. The results of the statistical analysis (Table 5) showed the significant effect of zeolite when treated with soil. The table shows that the highest mean number of saplings was in the treated zeolite at 4% (1), zeolite (20.733) and (19.067) at 3% 33.56), (30.51) for crushed cellulite of the same levels, respectively. This significant difference in the values of the number of saplings of natural zeolite and millonite compared to the non-treated cellulite soil (12.867) may be due mainly to the fact that zeolite served to provide continuous food supply on the one hand and the role of these nutrients in enhancing photosynthesis on the other, Clear to increase their number. In general, the number of saplings showed a marked increase in their value when adding natural zeolite (17.467 to 16.933, 18.467 and 19.133) at the rate of zeolite (1 to 4.3.2% respectively) and 18,000 to 18.533 and 19. 067 and 20.733) for the same levels of crushed cellulite. The results of the statistical analysis (Table 5) indicate a significant effect of zeolite in the length of the spike, with the addition of the mineral additive levels. The length of the spike increases significantly in both the natural and milliliter zeolite and the mean length of the spike in the treated zeolite (15.900) cm at the level of addition of 4% Zeolite while the natural zeolite record for the same level of average (12.900) cm and the comparison of values with the treatment of comparison 0% Zeolite (5.967) cm shows the role of the metal in the increase of this attribute. The table shows that the increase in the length of the spike and the increase in the percentage of ground zeolite added to the soil increased from (5.967) cm to (12.967) (14.333) (15.433) (15.900) cm when raising the level of the added metal from (0) to (1) (3) (4) respectively and in the treatment of natural zeolite rose from (5.967) cm to (10.733) (12.067) (13.300) (12.900) cm at the same additive levels. This increases photosynthesis and thus increases the amount of carbohydrates, which increases the length of the spike.

The results of the statistical analysis (Table 5) showed a significant effect of zeolite in the weight of 1000 grains. The highest mean weight of the grains in the natural zeolite treatment was 42.69 g at the addition of (4)% zeolite, while the comparison treatment gave a mean average of 28.87 g. This was due to the increase in paper area by increasing the levels of nitrogen. This resulted in an increase in the efficiency of photosynthesis by the increase of the processed materials that positively affected the grain filling and weight increase, followed by the levels (2) and (3)% average zeolite (34.76 gm and 38.08 gm), While the levels (1) and (0)% Zeolite average (32.70) gm and (28.87) gm. In the treatment of ground zeolite, it exceeded the level of (4)% zeolite with an average of 37.97 gm at other levels, followed by the level of (3)% zeolite with an average of 35.42 gm. The reason for the weight gain of the first treatment may be due to the fact that zeolite provides better nutrients to the plant, especially the nitrogen element, when it needs (Milla'n *et al.*, 2008). The nitrogen provided by zeolite plays a key role in increasing the weight of the seeds by entering the formation of the enzymes responsible for the biological processes in the plant such as photosynthesis (Barker and Pilbeam, 2007), increasing the efficiency of starch production, which turns into sugars, Which move to grain and which depend on the paper area and therefore reflected on the weight increase of grain (Faraj and Jadouh, 2015).Table 6 shows a significant effect of zeolite in raising the values of grain yield in both treatments. The fermented zeolite treatment significantly affected the natural zeolite treatment in its grain content. The addition of natural zeolite and flour increased the values of grain yield. This increase in natural zeolite treatment increased from 2.420 tons .Ha^{-1} at the level of adding 0% zeolite to 5.053, 4,760, 3.973, 3.177 tons.Ha^{-1} at levels 4, 3, 2, 1% natural zeolite respectively and in the treatment of ground zeolite was increased to 4.157, 3,547, 2.987, 2,850 tons.Ha^{-1} for the same levels respectively. This is in line with the results of (Zheng *et al.*, 2018), which showed that the increase in grain yield may be attributed to the decrease in nitrogen filtration and the increase in the ability of the soil to retain water with the presence of zeolite metal, which improved the availability of nitrogen and water for rice growth. Increasing the availability and absorption of nitrogen leads to increased biological processes, the components of enzymes, proteins and chlorophyll. It is included in all

Table 6: Effect of zeolite in the weight of 1000 grains (gm), grain yield (tons. Ha-[1]), biomass (tons.Ha^{-1}) and harvest index.

Attributes studied				Added levels %	Type of zeolite
Harvest Guide	The Vital Score	Grain holder	Weight 1000 tablets		
27.13	8.913	2.420	28.87	0	Control
33.61	9.463	3.177	32.70	1	Natural Zeolite
38.38	10.353	3.973	34.76	2	
43.41	10.963	4.760	38.08	3	
43.73	11.557	5.053	42.69	4	
28.99	9.833	2.850	33.81	1	Ground zeolite
27.73	10.767	2.987	32.73	2	
30.51	11.613	3.547	35.42	3	
33.56	12.383	4.157	37.97	4	
3.407	0.2168	0.3077	3.494	$L.S.D_{0.05}$	

enzymatic processes, reactions, photosynthesis and increased fertilization of the bearing branches as well as an increase in the number of grains with spike and 1000 tablets(Faraj and Jadouh, 2015). It seems that the increase in grain yield is a natural result of the strong and positive correlation between total productivity and soil content of zeolite. As these substances are a natural store of nutrients for plant life, nitrogen, which causes an increase in vegetative growth of the plant, (Barzegar *et al.*, 2002). The added zeolite is rich in phosphorus, which also has a significant effect on the composition of vegetative and root populations of the plant as well as the importance of its availability in the grain-filled phase. The results of the statistical analysis (Table 6) showed the significant effect of zeolite when treated with soil. The table showed that the highest mean of the biomass was in the treatment of ground zeolite at the level of 4% zeolite and 12,383 tons.Ha^{-1} and 11,613 tons.Ha^{-1}, at the level of 3% of the metal and (11.557) tons.Ha^{-1} and (10.963) tons.Ha^{-1} for natural zeolite for the same levels, respectively. This significant difference in the biomass values of natural and flat zeolite compared to non-treated cellulite soil (8.913) tons.Ha^{-1} may be due mainly to the fact that zeolite has been adapted to suitable conditions for plant growth, water absorption and nutrients and its role in improving physical, chemical and biological soil properties and increasing retention Soil with water. In general, the biomarker showed a significant increase in its value when adding natural zeolite, ranging from 9.833 to 10.767, 11.613 and 12.383 tons.Ha^{-1} at the rate of zeolite (1 to 4.3.2% respectively) and 9.463 to 10.353 and 10.963 and 11.557 tons.Ha^{-1} for the same levels of natural zeolite. This increase was due to increased levels of addition of zeolite, which is the main source of many nutrients, especially the major elements such as nitrogen, phosphorus and potassium. The recorded zeolite recorded higher values of (12.383) tons.Ha^{-1} compared to the recorded zeolite which recorded lower values of the harvest guide (11.557) tons.Ha^{-1}. This may be due to the increase of soil fertility by increasing the element of nitrogen, potassium and phosphorus, as well as the role of zeolite in improving soil properties, increasing water retention, increasing the positive exchange capacity (CEC) of the soil and increasing the soil content of the nutrients, which increases the susceptibility of the plant to absorb nutrients. (Ghazavi, 2015). Zeolite can retain nutrients in the root zone for use by plants when needed, leading to higher nutrient efficiency and therefore higher yield. The results of the statistical analysis (Table 6) showed the significant effect of zeolite when treated with soil. The table shows that the highest mean density of the harvest guide was in the natural zeolite treatment at 4% normal zeolite (43.73) and (43.41) at 3% and (33.56), (30.51) for the crushed cellulite of the same levels, respectively. In general, the harvest index showed a significant increase in its value when adding natural zeolite (33.61 to 43.73, 43.41 and 38.38) at the zeolite rate (1 to 4.3.2% respectively) and 28.99 to 27.73 (33.56 and 30.51) For the same levels of crushed cellulite. The natural zeolite recorded higher values of (43.73) than the recorded zeolite, which recorded a lower value of the harvest index (33.56). This may be due to the increase in the quantity of grains and the quantity of the biomass. The physical soil due to the zeolite effect resulted in improved growth properties. This reflected an increase in the area of the science paper, which contributed to the increase in photosynthesis and plant retention.

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