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DISCOVERED A NEW TYPE OF ZEOLITE AND TESTED ON SOME CHEMICAL PROPERTIES OF SOIL AND PLANT YIELD

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Abstract

The research revolves around the discovery of a new material, one of the zeolite types that not discovered globally.

The mineral zeolite it's not discovered in Iraq previously, and in this research was discovered a new type of this metal, which contained of ions as follows (potassium 3.38%, iron 7.27%, calcium 8.84%, magnesium 3.43%, lithium 15.20%, silicate 45.25%) as this metal According to the analysis of the Iraqi geological survey laboratory and the diagnosis of specialists in rock science in the department of geology, College of Science, University of Kufa, as one of the new species previously undiscovered. The laboratory results of physical and chemical tests showed that it is characterized by high water absorption and retention rate of 75%, in addition to its, and low salinity level of 0.4 dS m^{-1}.

An experiment was carried out on the eggplant plant by adding zeolite in solid form at levels (0, 5, 10, 20, 30, 40 and 50 gm^{-1}). The results of the field experiment indicated an increase in soil processing of potassium, calcium and iron ions compared to the treatment, as well as increased production with an the levels of zeolite addition were highest in the treatment and 50 g $Cradle^{-1}$ as it reached 42.4 tons ha^{-1} compared to the comparison treatment, which was 22.6 tons.ha^{-1}.

The data of laboratory testing and the diagnosis of specialists in the American Zeolite Center (IZA), it is a high lithium zeolite with a good content of necessary nutrients for the plant as well as the physical properties of water retention and other properties that make it an important clay minerals in agricultural and industrial uses. The country imports quantities of it, an industrial zeolite.

Key words : Zeolite, chemical properties, plant yield.

Introduction

The zeolite is named by Swedish geologist Axel Frederick Kronsted in 1756 when observed when reheating a metallic material that emitted a large amount of water vapor was absorbed by it. The positively charged ions are adsorbed into the pores of the zeolite structure and natural zeolite arises when volcanic ash reacts with alkaline water. Zeolite crystallizes over a period of several thousand years. (Andrejkovièová, Slávka and *et. al.*2018; First¡ E.L. *et al.*, 2011 and Szerement J., *et al.,* 2014).

Zeolites are found naturally in basaltic stones and in sediments. They were formed in ancient times under the influence of hot mineral water. (GRACE.com. W. R. Grace & Co. 2006; Marakatti V.S. and Halgeri A.B.-2015; Marakatti VS, *et al.,* 2014).

The majority of which were named after their discoverer. The world's annual production of natural zeolite is 4 million tons, 3 million tons of which are shipped to Chinese markets, and the leading countries in the production of natural zeolites in Eastern Europe, Western Europe, Asia, Australia. Due to the scarcity of natural zeolites, (Marakatti V.S. *et al.,* 2014) scientists have attempted to make zeolites that have the same properties as natural zeolites. They are the most widely used in industry, some of which are analogous to natural zeolites, and there are some without a complete structure. (Andrejkovièová S., *et al.,* 2012; Ferraza E, Andrejkovièová S, Velosa AL, *et al.,* 2014; Rowe A.-2018).

Until 2008, scientists studied 175 types of zeolite, of which about 45 exist naturally.

High-porosity zeolite is able to retain positive ions such as sodium, potassium, calcium, magnesium and

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others. The positively charged ions are adsorbed into the pores of the zeolite structure, for example valentrolite, a zeolite compound with a chemical composition. Na2Al2Si3O10-2H2O Zeolite belongs to the family of tetrahedrons with three-dimensional structure. Forming identical sheets of zeolite. At the center of these quadrilateral objects are aluminum and selenium atoms. Each tetrahedron carries four oxygen atoms, like the other four-sided tetrahedrons, each with an additional negative charge. The arrangement of tetrahedrons in space form small and large cavities that are connected to each other by narrow channels called windows or pores through which the outer molecules are carried out. Each group has identical structural units (secondary structural units) (Nelson B.-2018). These units show the location of aluminum, silica and oxygen for each other without locating water and positive ions within channels and cavities, but they have a high degree of mobility, (Virta R.L.-2011). which explains ion exchange and water loss and recovery.

The research aims to discover a new type of zeolite previously unknown in the world and test this article on the eggplant plant to see its effect on some characteristics of chemical soil and plant yield.

Materials and Methods

1. The research was conducted in the area of Al-Rahimiya located in the western side of the Najaf city, which is 40 km away from it, a previously uninhabited area and did not conduct adequate research in the quality of available minerals.

2. As a result of drilling operations by drilling machines were discovered a layer under the depth of 3 meters and a thickness of 1.30 m and form an extended layer to an area of more than 8000 acres, according to the morphological analyzes conducted.

3. samples of this article were taken to the laboratories of soil science and water resources at the Faculty of Agriculture University of Kufa.

4. The results of laboratory analysis were taken and sent to specialists inside Iraq in the Department of Geology - College of Science.

5. Send the results for examination to the American Zeolite Center (IZA).

Laboratory tests and expert opinions were found to be a new type of zeolite

The new discovered zeolite was used by adding (0, 5, 10, 20, 30, 40 and 50) gm cradle^{-1} on eggplant cultivar (*Solanum melongena*). It was cultivated in the form of marz by adding cattle residues at the level of 16 tons ha^{-1} in sandy soil mixture. The crop was planted on 12/7/2017.

The Randomized Complete Block Design (RCBD) design used six levels and five replicates for each level. The mean was then compared with the lowest mean RLSD (Revised Least Significant Difference) and a probability level of 0.05.

Results and Discussion

As a result of drilling equipment in the area of Rahimiya in the Najaf Sea was found previously unknown material at a depth of 3 m and a thickness 1.30 m and after some exploratory investigations found that this material is formed in the form of a horizon with a thickness ranging from 0.6 to 1.5 m and at different depths ranging from 1.6 After taking the prototype to the laboratory, (IMA. Retrieved 2019.;EL, Gounaris CE, Wei J, *et al.,* 2011.; Baerlocher Ch. McCusker L.B., Olson D.H. 2007) it was found that the material has a soft clay texture and low salinity and has a high moisture retention so that it is not possible to get a leachate in the case of dilution 1: 1 as 100 g. of the material and add to it 100 ml distilled water well The leachate can be obtained in the case of dilution 1: 3 as 100 g of the substance to 300 ml of distilled water and found that this substance is a new undiscovered type of zeolite Fig. 1 and 2, and this article has characteristics that can enter in some industries in terms of content Good nutrients, mineral and physical qualities.

The results of laboratory tests for the detected zeolite

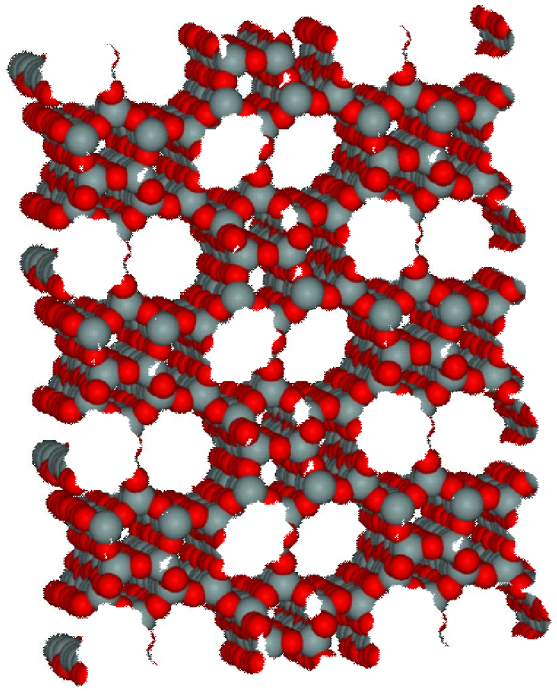

Fig. 1: Structural construction of zeolite.

Fig. 1: Shows the zeolite layer detected in the research area.

Fig. 2: Discovered zeolite material.

material showed a decrease in the salinity values of 0.4 dS m^{-1} and the increase of some important plant ions such as potassium, calcium and iron which reached (3.38, 8.84 and 7.27%) respectively as shown in (Table 1). The results of the analysis X-Ray table 1 that the material is a type of high-lithium zeolite, which reached (15.20%), respectively, Fig. (1). The results indicated that the solubility of zeolite is characterized by high solubility that transforms from solid to liquid 100% and returns to its initial solid state without changing its morphological and physical properties. (Barrer R.M. 1978; Chen Z.S., G.J. Lee, J.C. Liu 2000; Ghanbari M., Ariafar S. 2013)

(Table 2) indicated that the increase in the concentration of ready potassium in the soil at the level of addition 50 g j^{-1} compared to the rest of the levels and this is due naturally to the zeolite contain a good percentage of potassium, as well as the case of calcium ions and phosphorus if significantly exceeded treatment 50 g. j^{-1} compared to the rest of the levels and treatment comparison and this is due to the content of zeolite of these elements and referred to in table 1 as the zeolite acts as a source of nutrients as well as other role and this illustrates the importance of this article and that for its ability to release potassium from its compounds, 19. (Kowal D., 2009) and also helps On the nitro graphic editing In the soil of nitrogen compounds and enriched with nitrogen for the benefit of the plant due to its ability

Table 1: The results of the analysis of the material detected and diagnosed with x-Ray device in the Iraqi Geological Survey.

Unit	Value	Elements
%	45.25	SiO2
%	7.27	Fe2O3
%	14.39	Al2O3
%	0.97	TiO2
%	8.84	CaO
%	3.43	MgO
%	1.11	SO3
%	15.2	LOi
%	0.12	Na2O
%	3.38	K2O
%	0.02>	CL
%	0.03	P2O5

Table 2: Effect of zeolite addition levels on soil concentration of some elements.

Dissolved iron mg l	Dissolved calcium mg l	Ready Nitrogen mg kg^{-1}	Ready Phosphorus mg kg^{-1}	Ready Potassium mg kg^{-1}	Levels
2.7	156.8	7.9	3.7	24.5	0
5.6	215.3	15.9	9.1	37.8	5
9.7	224.3	8.9	10.8	38.1	10
10.4	245.6	22.4	22.3	45.8	20
11.2	253.1	28.6	36.7	48.1	30
11.9	247.9	30.9	45.9	66.9	40
13.82.7	278.114.9	41.55.1	60.46.8	86.412.3	50RLSD

to exchange ammonia.For iron, there was no moral superiority and this is due to the nature of the Iraqi soil, 29. Wei-yu Shia, Hong-bo Shaoa, (Hua Li, Ming-an Shao, Sheng D. 2009) which is calcareous soil, which gives calcium an active role in the stabilization of iron and be a difficult compound ready.

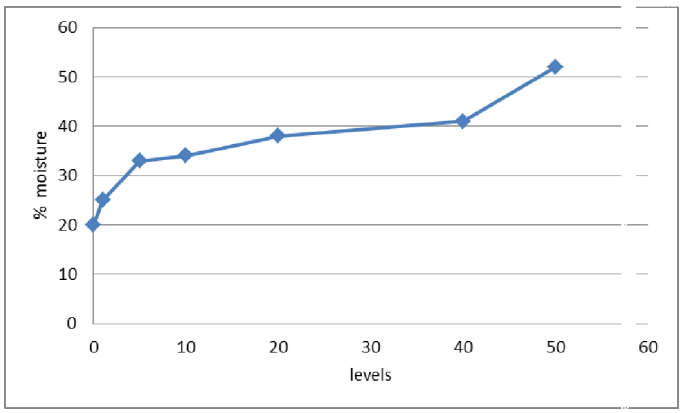

Fig. 3: Effect of zeolite levels added on soil moisture content.

Fig. (3) shows that the moisture content in the soil added to the zeolite increases with the increase of the level of addition that there is no significant moral superiority between levels, only in the treatment of 50 g. Cradle^{-1}, which significantly superior compared to the treatment of 40 g. This is due to the synthetic properties of zeolite, which contains too many eight-shaped interstitial spaces that allow water molecules to enter into it, thus making it difficult for the water molecules to be blurred in the normal position.

The results of the field experiment on eggplant yield showed that the irrigation rate decreased significantly with all levels of zeolite addition compared to the comparison treatment as the percentage of added irrigation water (92, 84, 78, 70, 65 and 42%) to the levels of addition (5, 10, 20, 30, 40 and 50)g. compared with treatment Comparison is 100%. The level of addition (50 g / g) is higher than other levels.

The results in Fig. (4) indicated that the volume of production increased significantly with increasing the level of zeolite addition and all the zeolite additives achieved an increase in the production quantity compared to the comparison treatment and the treatment exceeded 50 g. (Rehakova M. *et al.,* 2004).

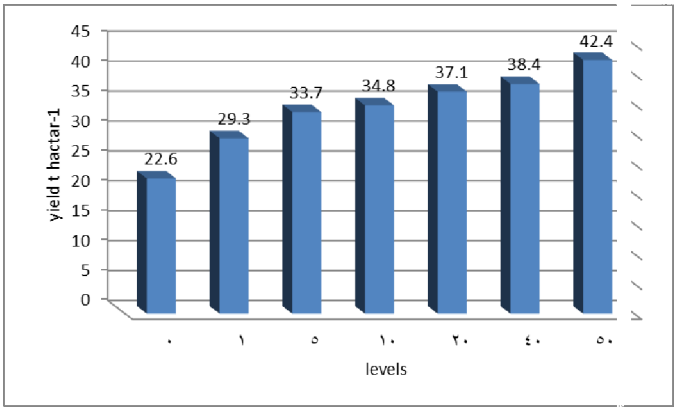

Fig. 4: Effect of zeolite addition levels on production volume.

The above results Fig. 4 indicate that the level of addition of 50 gm Cradle gave the best result in terms of increasing the soil content of some important nutrients necessary for the plant as well as increasing the levels of moisture and thus reduce irrigation, and the most important result is to increase the amount of production of this treatment, so we recommend conducting many Research on this new type of zeolite has been experimented with on different soil and plant types, as well as testing levels of addition of more than 50 g to see the best results on this discovered substance.

Conclusion

The results founding a high-lithium zeolite with a good content of nutrients necessary for the plant as well as the physical properties of water retention and other properties that make it an important clay minerals in agricultural and industrial uses. The country imports quantities of it, an industrial zeolite.

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