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Retraction

Retracted: Synthesis and Use of Environmentally Friendly Superabsorbent Smart Polymer to Improve the Properties of the Gypsum Soil

Adsorption Science and Technology

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] F. N. Abed, M. M. Abdulridha, A. A. H. Mohamad, Z. Meraf, and M. Abdelhedi, "Synthesis and Use of Environmentally Friendly Superabsorbent Smart Polymer to Improve the Properties of the Gypsum Soil," *Adsorption Science & Technology*, vol. 2022, Article ID 3320135, 7 pages, 2022.

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SAGE Publishing

Research Article

Synthesis and Use of Environmentally Friendly Superabsorbent Smart Polymer to Improve the Properties of the Gypsum Soil

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A smart, environmentally friendly superabsorbent polymer was prepared using solvents. It was polymerization on the microwave rays at a medium capacity and for 25 minutes, where the yellow gel was obtained. The polymer was cut and washed with absolute ethanol and methanol and was dried at a temperature of 60°C. Then, the polymer was extracted and milled with ceramic fat until obtaining a very soft powder, and the tests were taken as a formula for a scanning electron microscope and infrared spectrum. The results showed that the absorption value of polymer is at the equivalent acid function, where the absorption capacity was 467.32 grams. At room temperature, the water retention rate was 71%, and at 50°C, it was 52%, and the gel content was 90%. The results showed an improvement in the properties of the gypsum soil in terms of virtual density, porous, and acidic function, reaching 7.3%. The proportion of significant elements (P, N, Ca, K, Na) and moisture content in the soil was 64%, the cumulative tip amount and the consistency of soil granules through wet and dry palm, penetration resistance, electrical conductivity 4 ms, and organic material content were as follows, and the results were very high.

1. Introduction

Gel polymers are 3D polymers that contain water-loving aggregates where they can retain water and other liquids for long periods [1]. These polymers can retain water even if they are subject to a particular pressure effect [2, 3]. The U.S. Department of Agriculture has several polymer gels of promising materials in applications [4, 5]. The sodium alginate was used in the preparation of super absorptive hydrogel, a cross-section of a natural polysaccharide polymer and a nonbranched line consisting of two different types of monosaccharides, see Figure 1.

Polymerization reactions to polymeric chains that make up the synthesis of gel polymers are caused by coherence or hydrogen, R. Dabhi, he explane introduces interferences or physical associations. In recent years, water-absorbent gel polymers have been used in agriculture due to water shortages, improving soil properties and reducing water drainage by reducing fumigation and increasing growth rates. In pots, ultra-absorbent gel polymers were prepared for microrays, characterized by many qualities, including a high heating rate in time, noncontact between the materials to be heated, and the source and the magnetic heating cleanliness [6].

1.1. Gypsum Soil. Soils containing aquatic calcium sulfate ($CaSO_4.2H_2O_2$) or amniotic calcium sulfate ($CaSO_4$) are characterized by weak electrical receipt gypsum soil and acid function close to alkali [7].

1.2. Experiment Part. Dissolve 1 g of sodium genes in 50 ml distilled water under severe mechanical stirring. Then, heat

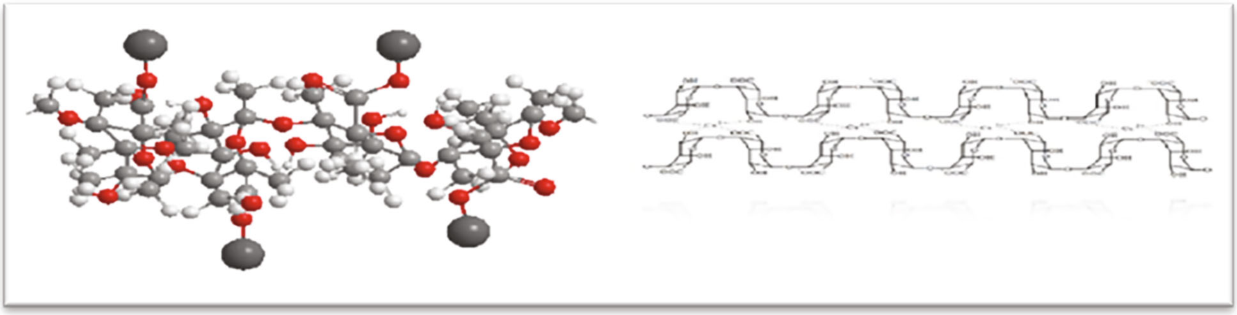

Figure 1: Structure chemical of sodium alginate.

the solution to a temperature of 60°C. Dissolve 1 g of sodium laurel sulfate in 50 ml distilled water. Add sodium lauryl sulfate solution to the sodium gene solution under constant mechanical investigation to obtain the homogenous solution for ten minutes while maintaining a temperature of 60°C. Prepare two locals from dissolving 0.02 g KPS and 1.25 ml tri-like dai min in 5 ml of distilled water. Then, we drip them into the solution above with intense stirring for 15 minutes and under 60°C. We drip the solution of 5 grams of acrylic, 5 grams of acrylic amazed, and 0.1 grams of two acrylates, e.g., acrylate amid the sodium gene solution with laurel ether sodium sulfate under constant stirring at 1040 rpm for 15 minutes. Then, process the final mixture using the microwave; the two rounds occur after 20 minutes. We cut the gel into small pieces. Wash it several times with methanol to dissolve nonreactive substances. Then, wash it once with absolute ethanol. Dry for several hours at 70°C until crisp. Grind and place in a dryer at 60°C for 24 hours [8] through Figure 2 below which shows how the interaction between the monomer and the initiator occurs and the occurrence of the polymerization process.

2. Results and Discussion

2.1. Infrared Spectrum Measurements. The polymer infrared radiation prepared to prove any interaction between the polymers was measured, and the results that emerged showed that the interaction had occurred entirely and successfully. The following was the explanation of the results obtained that were two packs appeared at frequency 343 3 cm^{1} and 3408, which belong to the hydroxyl group found in the sodium genes before the reaction occurred, while the 3408 cm^{1}-frequency rain pack disappeared in the interaction of sodium genes with other polymers, and this is chemical evidence reaction to sodium genes and the appearance of a package at frequency 3209 cm^{1}-which belongs to the leading group of accruals as well as the emergence of a new package in polymer reaction at 2929 cm^{1}-which belongs to the group of two examples that indicates the successful interaction of polymerization. The infrared spectrum also showed a displacement of carboxyl group packs in the sodium genes before the reaction occurred, which falls within 1614 cm^{1}-1415 cm^{1} to 1450 cm^{1}-1530 cm^{1}-after the polymerization reaction. The packages of carboxyl and carbonyl gene and acrylate fall within the frequency of 887 cm^{1} and 813 cm^{1}, which disappear when polymerization occurs and appears at frequencies within the range of 1165 cm^{1} and 1672 cm^{1}, which are due to the mixing of the carboxyl group of an acrylic group and the potatoes of the carbonyl group. This is evidence of a polymerization reaction on the surface of the sodium gene. We note through the red infrared spectrum that no packages appear for the group of selfies that belong to the surface-effective material that appears at 1180 cm^{1} and 1376 cm^{1}. This frequency has disappeared into the polymerization reaction spectrum, indicating the disposal of this substance by washing [9]. Through Figure 3 below, we note that the interaction process is occurring significantly.

2.2. Scanning Electron Microscope. We note from the measurements above that the porous structure of polymer increased significantly when the active substance is added superficially due to the self-assembly of the active substance in the reaction of polymerization that gathers in the form of a mold to generate large pores which is very important in the absorption of water and other syllables, where pores are generated after washing polymer to get rid of the active substance superficially that leaves large pores after disposal during washing. Pore generation is actually linked to the concentration of the active substance superficially, where the increase in the concentration of the active substance superficially leads to interference in polymeric reactions, which negatively affects the generation of pores and through the infrared spectrum, we note that no packages of the active substance appear superficially, meaning that the appropriate concentration of the active substance has been used superficially [10]. Figure 4 below shows the size of the pores in the polymer.

2.3. Effect of the Acid Function in Absorption Capacity. 0.1 grams of super absorption material was taken and flooded in various acid function water solutions for 24 hours to reach a complete balance in the bloating process and then measured the absorption capacity graphically below in Table 1 and Figure 5.

We notice that the actual middle is the highest absorption peak because carboxyl totals are very careful, and the dissonance between polymer chains increases, leading to more water entry [11].

2.4. Measuring the Content of the Gel. This measurement aims to find out how much polymer chains are intertwined with each other and transformed from dissolved sol to undulated

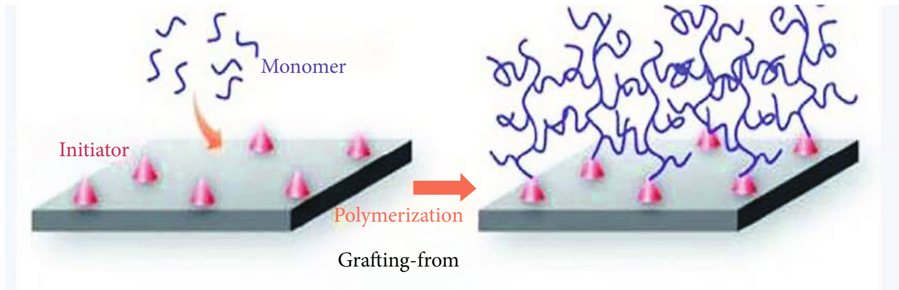

Figure 2: Reaction to prepare polymer.

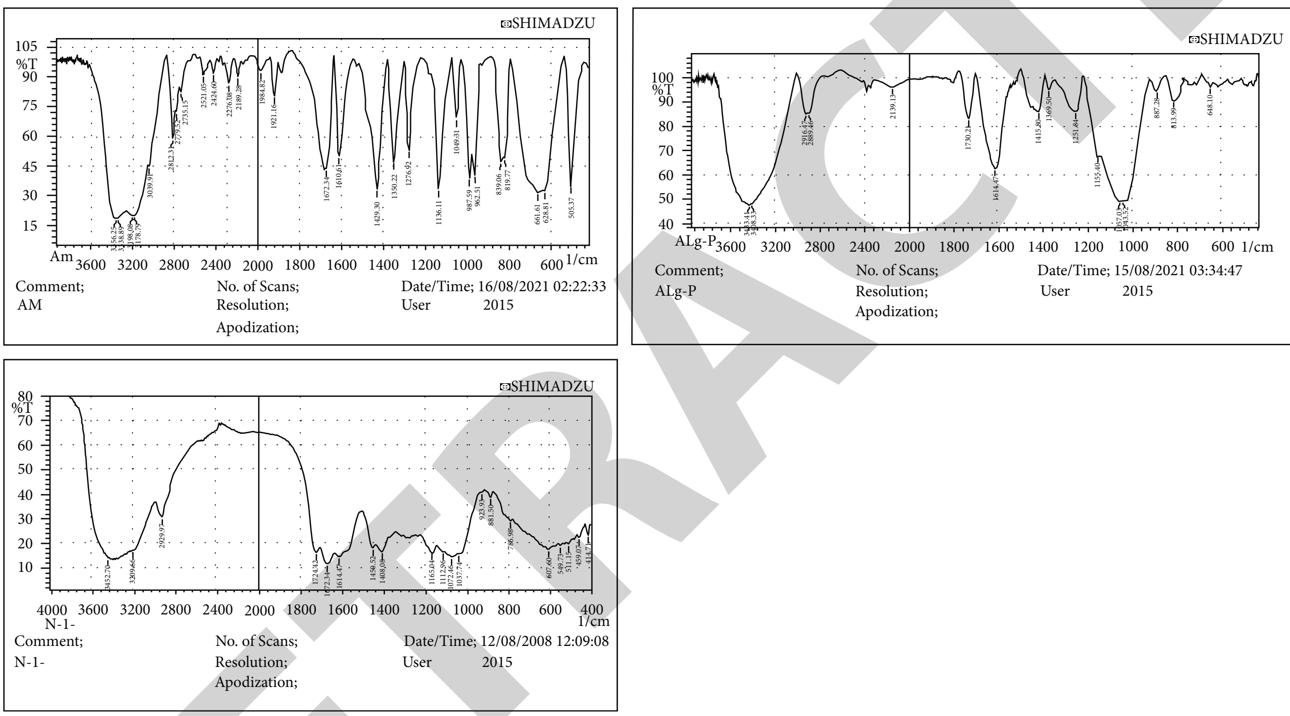

Figure 3: Polymer infrared spectrum.

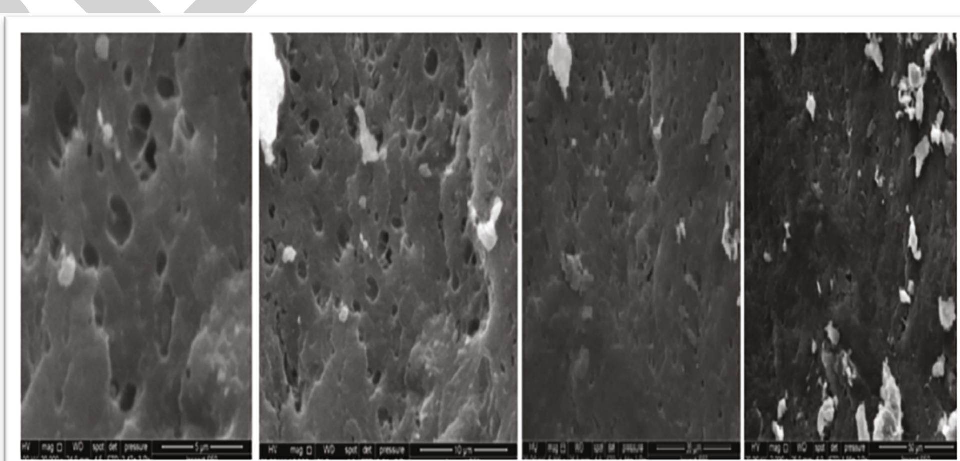

Figure 4: Electron microscope scanner scans for polymers.

Table 1: The table below shows the relationship between the acid function and the absorption capacity.

12	10	9	8	6	7	8	9	10	pH
45.7	106.48	110.76	203.	381.19	467.32	203.89	110.76	106.48	Absorption capacity

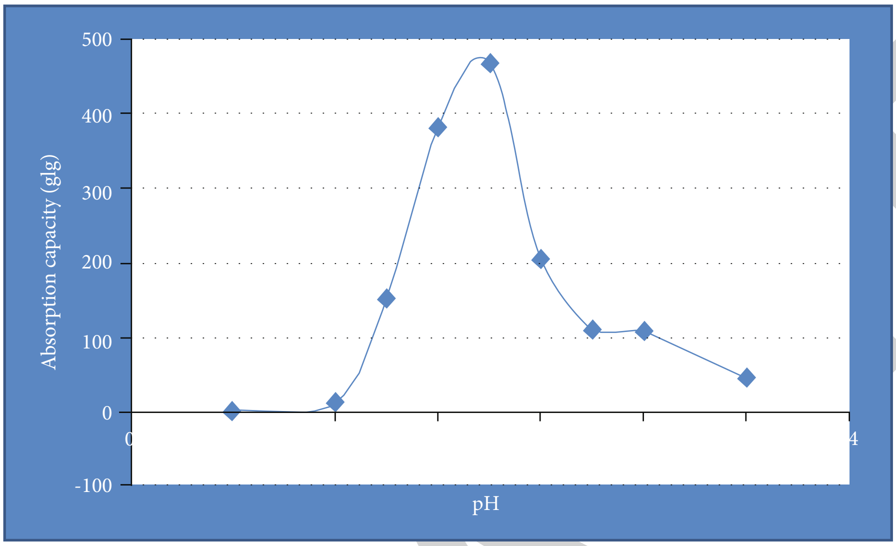

Figure 5: The drawing below shows the relationship between the acid function and the absorption capacity.

Table 2: The relationship between the size of the sieve and the amount of soil remaining.

Sieve size								Soil	No.
0.150	0.3	0.500	2.00	2.36	4.00	4.75	9.53		
Soil quantity								Treatment	1
0.150	2.57	0.81	0.047	0.23	—	0.098	162.5		
14.96	8.45	3.26	0.24	1.12	0.61	2.47	119	No treatment	2

Table 3: The relationship between the size of the sieve and the amount of soil remaining.

Sieve size								Soil	Sequence
0.150	0.3	0.500	2.00	2.36	4.00	4.75	9.53		
Amount of soil remaining								Treatment	1
0.19	0.4	2.25	0	0	3.18	0	0		
0.22	2.3	0	0.18	3.18	0	0	0	No treatment	2

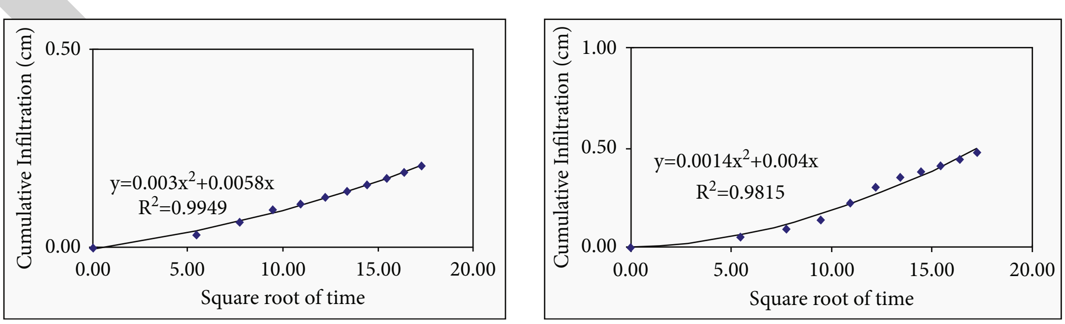

Figure 6: Polymer's ability to retain water at different pressure.

Table 4: Amount of elements in soil treated with polymer and untreated soil.

Nitrogen	Phosphor	ppm Potassium	Calcium	Sodium	Soil type	Sequence
158.355	3.62	41.18355	153.7919	206.09	Treatment	1
58.8	3.439	51.97248	307.5839	527.526	No treatment	2

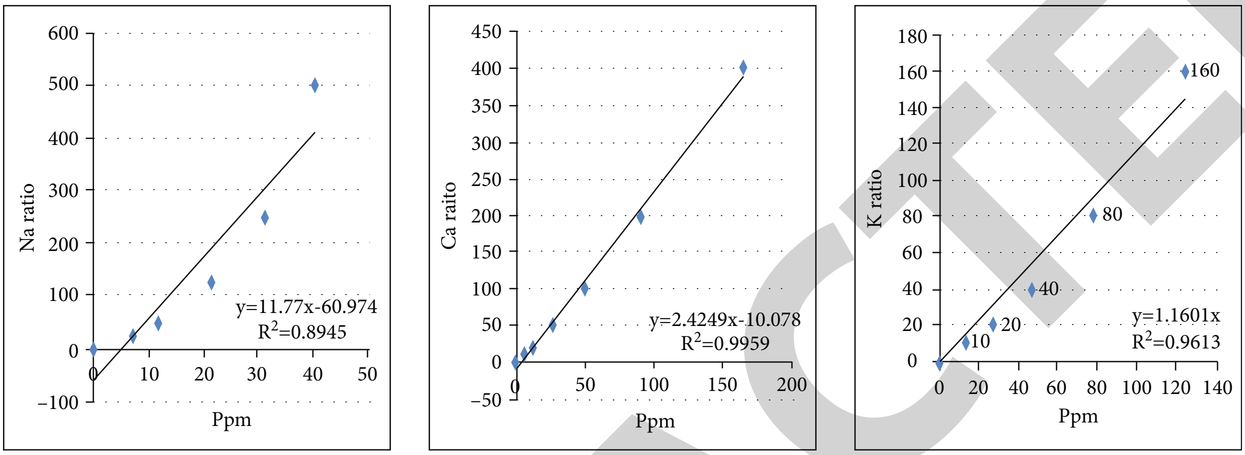

Figure 7: The relationship between concentration and the proportion of the element in the soil.

gel. Then, it was washed with distilled water and flooded with absolute ethanol for 48 hours. Then, it was put in the drying oven until the weight is firm, depending on the content of the gel as in the following relationship [12]:

$$\begin{aligned}\text{Gel\%} &= \frac{\text{wd}}{\text{wf}} * 100,\\ \% &= \frac{0.180}{0.2} * 100,\\ \% &= 90\%.\end{aligned} \quad (1)$$

2.5. Measuring the Retention of Water in the Polymer at Room Temperature. This measurement reflects the ability of the polymer to hold water inside at specific temperatures, as this test is critical in applications that require the regular release of water at specific temperatures. Readings were taken at 25°C and 50°C. The following equation calculated the percentage of water trapped inside the gel [13].

$$\begin{aligned}\text{Water retention\%} &= \frac{\text{W2}}{\text{W1}} * 100\left(25\text{c}^0\right),\\ \text{Water retention\%} &= \frac{12.25}{17.229} * 100 = 71\%,\\ \text{Water retention\%} &= \frac{\text{W2}}{\text{W1}} * 100\left(50\text{c}^0\right) = \frac{8.98}{17.229} * 100 = 52\%.\end{aligned} \quad (2)$$

2.6. Laboratory Applications on Gypsum Soil. The use of superabsorbent polymer in improving the chemical and physical properties of gypsum soil is as follows, a soil with many problems, and the results were as follows:

2.6.1. Measuring Moisture Content. The moisture content was measured in the oven manner at 70°C, and it was found after the tests that the soil treated with hydrogel had a humid content of 64.17%. In contrast, the untreated soil was low at 17.7%. Advanced results found that polymer absorbed large amounts of water and significantly detained within the soil's pores, leading to an increase in soil porousness and ventilation, which is necessary for soil ventilation where the soil water is balanced with air [14].

2.6.2. Measuring the Virtual Density of Soil. The density measurement in the Paraffin wax method and the results for polymer-containing soil were 1,532, while the original soil had a density of 1,725, where there is an inverse relationship between virtual density and pores, i.e., the higher the density, the fewer pores and the smaller the pores, and the greater the pores where the density is affected by the moisture content, and the higher the density, the lower the density, the greater the pores, and vice versa, where there is a significant difference in density between the polymer-treated and nontreated soils, which indicates an increase in soil porosity [15].

2.6.3. Measuring the Acid Function. Most physical properties change the acid function, which plays a vital role in preserving carbon dioxide in the soil, where the apparent density was low, the air pores are good, and the soil content is good, this reduces the acid function number due to the critical role in the gas exchange process, and the increased spread and flow of carbon dioxide gas deep into the soil reduce the number of acid function due to increased ground airflow, which is loaded with carbon dioxide gas, which occupies the pores in the soil, which leads to the melting of part of this gas in the groundwater and the carbonic acid that reduces the number of acid function in the leveled or close to the equalizer, which is why the pH in the soil under study decreased where the value of the acid function was 7.3 while the value of the acid function before polymer was 7.8 [16].

2.6.4. Electrical Conductivity. The low electrical conductivity of the soil treated with polymer 4.00sims/m is the formation of water-grained gel, which leads to the cohesion of soil granules very high. This polymer absorbs and retains minerals to put in the soil when needed [17].

2.6.5. The Cohesion of Sand Granules in the Way of Dry Palm. The measurement was made using a vibrator and sieves starting from 9 mm to 0.2 microns, where the samples were sifted for half an hour, and the results were as follows Table 2.

By reading the 0.150-micron whole sieve, we note the amount of soil crossed through the sieve is minimal compared to the soil that is not treated with a prominent parting, which indicates that the soil is stable towards climatic erosion due to the polymer's ability to collect soil granules and hold them together [18].

2.6.6. The Cohesion of the Sand Grains by Wet Palm Road. The measurement was made using a standard water-immersed vibrator device where a sieve was used, starting from 9 mm and ending at 0.2 microns. The product was as follows in Table 3.

After placing the soil in the palm device for half an hour, we noted that the sieve with four microopenings was held soil by 3.18 grams of treated soil. In contrast, the unspoiled soil was not caught, which indicates that the jelly polymer has firmly held the granules of the soil, making it resistant to the losses that occur to the agricultural field during watering rain and others, which is very important and necessary to improve the properties of the cohesion of the gypsum soil, which suffers from significant losses.

2.6.7. Tip in the Soil. From the drawings below, the absorption measured for polymer treatment soil was 41.46, and the water delivery factors were 114.28%, unlike the untreated soil, because the hydrogel used increased water absorption and retention within soil pores [19]. The figure below shows that the soil containing polymer has the ability to retain large water unlike the untreated soil, see Figure 6.

2.6.8. Measuring the Significant Elements of Soil. The spectral flame device measured the sodium, potassium, and calcium element, and the UV device measured the phosphorus and nitrogen element, where the results, as shown in the table, were consistent with the natural proportions found in the soil, improving soil readiness with essential nutrients [20, 21]. Through Table 4, it was found that polymer-containing soils had a very high proportion of elements compared to untreated soils, as shown on the Figure 7.

2.6.9. Measuring Penetration Resistance. The penetration resistance to the soil not treated with polymer 2 kg was 2 kg. In comparison, the treated soil was over 0.5 kg, which means that the amount of stacking in the soil was very high due to the presence of polymer, which leads to increased soil porousness and thus reduces stacking in the soil [21].

2.6.10. Measuring the Organic Content of the Soil. The soil's organic matter containing hydrogel was 2.23%, while the unprocessed soil was 1.58% organic matter.

3. Conclusion

The ability to prepare nontoxic environmental polymers, use of polymers prepared in the treatment of gypsum triathlon, and the use of polymers have improved most of the physical and chemical properties of the soil, and we were able to reduce the consumption of water used in agriculture.

Data Availability

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

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