



Effect of Algae extract and Bio-fertilizer on vegetative growth and flowering of *Freesia hybrida* L.

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Abstract :

The present investigation aimed to find out the effect of foliar application of algae extract and Bio-fertilizer on growth and flowering yield of freesia plant. This study was carried out in winter 2018 at experimental site of the Horticulture Department, Faculty of Agriculture, Al-Qasim Green University . The experiment was laid out in Randomized Complete Block Design (R.C.B.D) with three replications and two factors. The first factor consisted of two levels of Algae extract foliar spray (0 and 3) ml/L, coded as A0 and A1 which were applied three times (15, 30 and 45) days after germination. The second factor involved two levels of Bio-fertilizer (0 and 10) g/L, coded as B0 and B1 which were applied after 10 days of germination. The results revealed the significant effect of Algae extract and Bio-fertilizer on vegetative growth and flowering yield. The treatment with A1B1 recorded higher average of plant height. The treatment with A1B0 gave higher average of the leaves number per plant, chlorophyll content, length flowering stem, number of inflorescences, number of florets per inflorescence, but there were no significant differences when the plants were treated with A1B1.

Key words: algae extract, Bio-fertilizer, *Freesia hybrid* L,.



تأثير مستخلص الطحالب البحرية و التسميد الحيوي في النمو الخضري والزهري لنبات الفريزيا

Freesia hybrida L.

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المستخلص :

نفذت التجربة خلال الموسم الشتوي 2018 في الظلة الخشبية التابعة - لقسم البستنة وهندسة الحدائق كلية الزراعة، جامعة القاسم الخضراء . لمعرفة تأثير السماد الحيوي ومستخلص الطحالب البحرية في النمو والحاصل الزهري لنبات الفريزيا ، اجريت التجربة وفق تصميم القطاعات العشوائية الكاملة (R.C.B.D) بثلاث مكررات و عاملين. شمل العامل الاول مستخلص الطحالب البحرية (0، 3) مل/ لتر ورمز له A0 ، A1 ، تمت المعاملة بعد 15 ، 30 ، 45 يوم من الانبات رش على المجموع الخضري. والعامل الثاني السماد الحيوي (0، 10) غم/لتر رمز له B0 ، B1 تم معاملة النباتات بعد عشرة ايام من اكتمال الانبات . اظهرت النتائج ان المعاملة بمستخلص الطحالب والسماد الحيوي اثر معنوياً في بعض صفات النمو والحاصل الزهري لنبات الفريزيا ، اذ اعطت المعاملة A1B1 اعلى معدل في ارتفاع النبات، بينما سجلت المعاملة A1B0 اعلى معدل في معدل عدد الاوراق و محتوى الكلوروفيل في الاوراق. ومعدل طول الحامل الزهري ومعدل عدد النورات الزهرية ومعدل عدد الزهيرات في النورة، لكنها لم تختلف معنوياً مع المعاملة A1B1 .

كلمات مفتاحية : التسميد الحيوي ، مستخلص الطحالب، الفريزيا .

Introduction:

Freesia plant is one of the important picking flowers in the world belonging to the Iridaceae family. The importance of freesia corms from its fragrant aromatic flowers in its flowers as well as grown mainly for the production of potted plants or cut flowers (Salunkhe, Bhat, & Desai, 2012). In view of the side effects of the chemical compounds used in the agricultural field and their negative effects on public health and the environment, specialists have tended to use natural alternatives to reduce the used quantities for these compounds, as these natural alternatives contain metabolic substances when added in small quantities to improve growth of plant (Sharma, Fleming, Selby, Rao, & Martin, 2014) and (Zhang & Schmidt, 1999). Bio-fertilizers and organic fertilizers are among the alternatives that affect many physiological processes in the plant including photosynthesis, nucleic acid synthesis, respiration, increasing absorption of elements, and plant chlorophyll content. Bio-fertilizers are



used to reduce the addition of chemical fertilizers by at least 25% as well as their role in reducing environmental pollution problems (Lucy, Reed, & Glick, 2004).

One of the most important types of bacteria used in the field of bio-fertilization is the bacteria that fix the atmospheric nitrogen, which requires a specialized host such as the various types of rhizobia and free living that needs to plant roots, but not specialized. Azotobacter and Azospirillum are among the free-living organisms that increase growth as a result of biological nitrogen fixation or secretion of growth regulators (Mashoor, El-Borollosy, & Abdel-Azeem, 2002). Foliar fertilization is an important factor in increasing the rate of growth, completeness and quality of flowers. Fertilization improves vegetative growth and flowering and increases the production of corms in plants. Studies confirmed the poor response of freesia plants to ground fertilization (Al-Saad, 2000). Therefore, foliar fertilization was carried out in this experiment for easy absorption and metabolism in plant tissues (Al-Sahaf, 1989).

Due to the importance of such studies on the indicators of vegetative growth and flowering of freesia plant in Iraq, this study aimed to use some advanced agricultural techniques to improve vegetative growth and flowering by using bio-fertilizer and foliar fertilization (Algae extract).

Materials and Methods :

The experiment was carried out in lath house during winter season 2018 to study the effect of algae extract and Bio-fertilizer on growth and flowering of freesia plant. The experimental site was located at the Department of Horticulture, Faculty of Agriculture. This experiment was designed according to (R.C.B.D) with three replicates and two factors (El-Sahooki, 1990). The first factor included two levels of algae extract foliar spray (0 and 3) ml/L and coded as A0 and A1 which were applied three times (15, 30 and 45) after germination. The second factor was the Bio-fertilizer (Bacteria mix) which is a bacterial mixture containing (*Pseudomonas striata*, *Bacillus megaterium* and *Azospirillum lipoferum*) the percentage of active substance 12% and used in two levels (0 and 10) g/L, coded as B0 and B1. Bacteria mix was prepared by mixing 10 gm bacteria in distilled water and filled the volume to 1000 ml). The treatments of Bacteria mix were applied after 10 days of germination. The bulbs were planted in 30 cm diameter plastic pots which were filled with 5kg of river sediment and peat moss and each pot contained one bulb then covered with a layer of soil. The data of vegetative growth were recorded after 10 days of the last treatment, whereas, flowering parameters observations were taken after flowering. In order to study the effects of the factors, plant height, leaves number per plant, chlorophyll content in leaves (SPAD 502), length flowering stem, number of inflorescences per plant, number of florets per inflorescence were measured.

Result and Discussion:

1- Plant height (cm)

Figure (1) shows the significant effect of spraying algae extract on the plant height where the treatment of A1 gave the highest rate (33.53 cm) compared with the control treatment, which gave the lowest rate (27.88 cm). Bio-fertilizer application showed a significant effect on the plant height where the treatment of B gave the highest rate



(31.93 cm) compared with the control treatment, which gave the lowest rate (29.48 cm). The interaction of algae extract and Bio-fertilizer showed a significant effect on plant height where the treatment of A1B1 gave the highest average (34.50 cm) compared with the control treatment, which gave lowest average (26.40 cm). There was no significant differences when the treatment of A1B0 was applied.

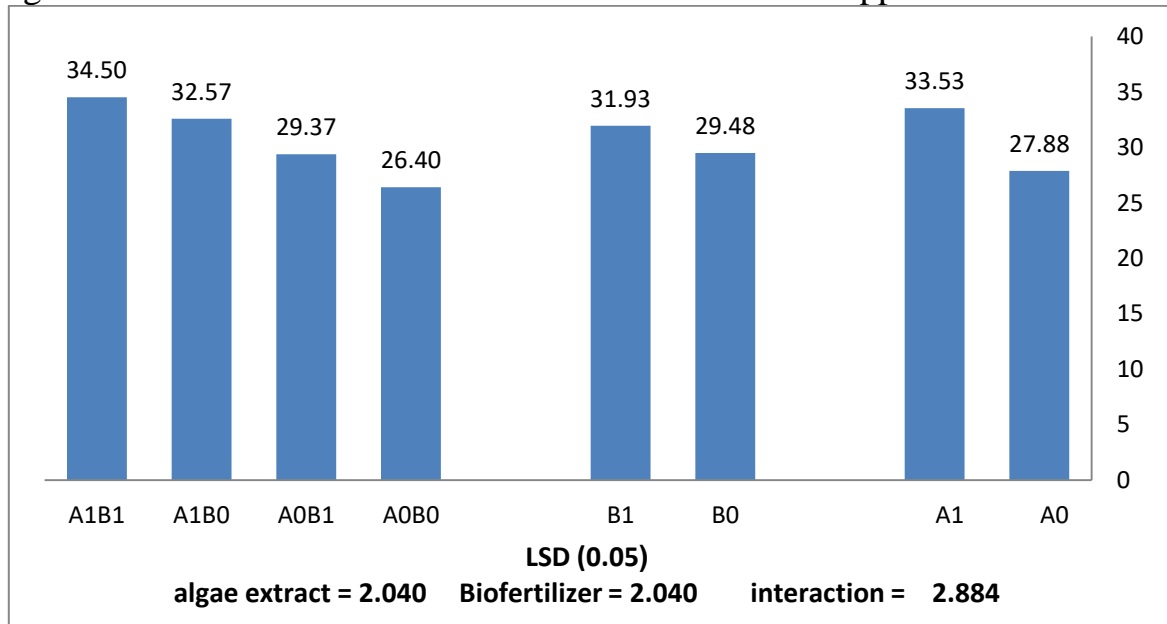


Fig. 1 Effect of algae extract and Bio-fertilizer in Plant height (cm)

2-Number of leaves

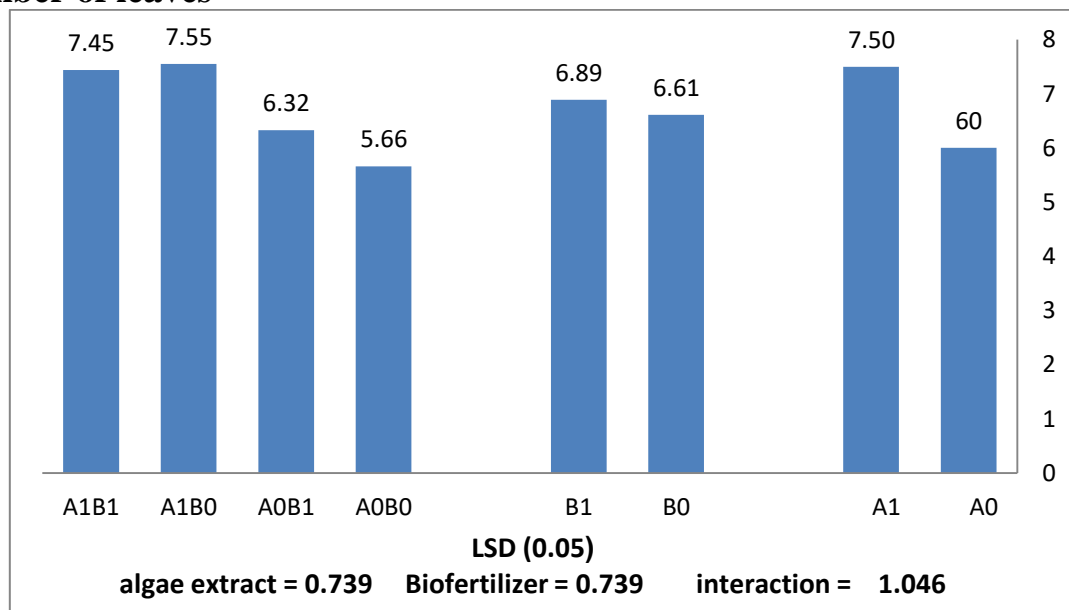


Fig. 2 Effect of algae extract and Bio-fertilizer on number of leaves

Using the algae extract caused a significant effect on the number of leaves, the A1 treatment gave the highest rate (7.50) compared with control treatment, which gave the lowest rate (6.00). The results recorded showed no significant differences leaves number when Bio-fertilizers was applied. The interactions between the two factors resulted in a significant increase in leaves number where the A1B0 treatment gave the



highest rate (7.55) compared with control treatment (A0B0) that gave the lowest rate (5.66). There was no significant difference with using A1B1 treatment (Figure 2).

3- chlorophyll content in leaves (SPAD)

Figure (3) indicated that using algae extract had a significant effect on leaves content of chlorophyll where A1 treatment gave the highest rate (73.60) compared with control treatment which gave the lowest rate (63.10). Bio-fertilizer did not have a significant effect on chlorophyll content, while the interactions between the two factors showed a significant increase in leaves content of chlorophyll where A1B0 treatment recorded the highest rate (73.70) compared with control treatment (A0B0) that gave the lowest rate (56.60). There was no significant effect of using A1B1 treatment.

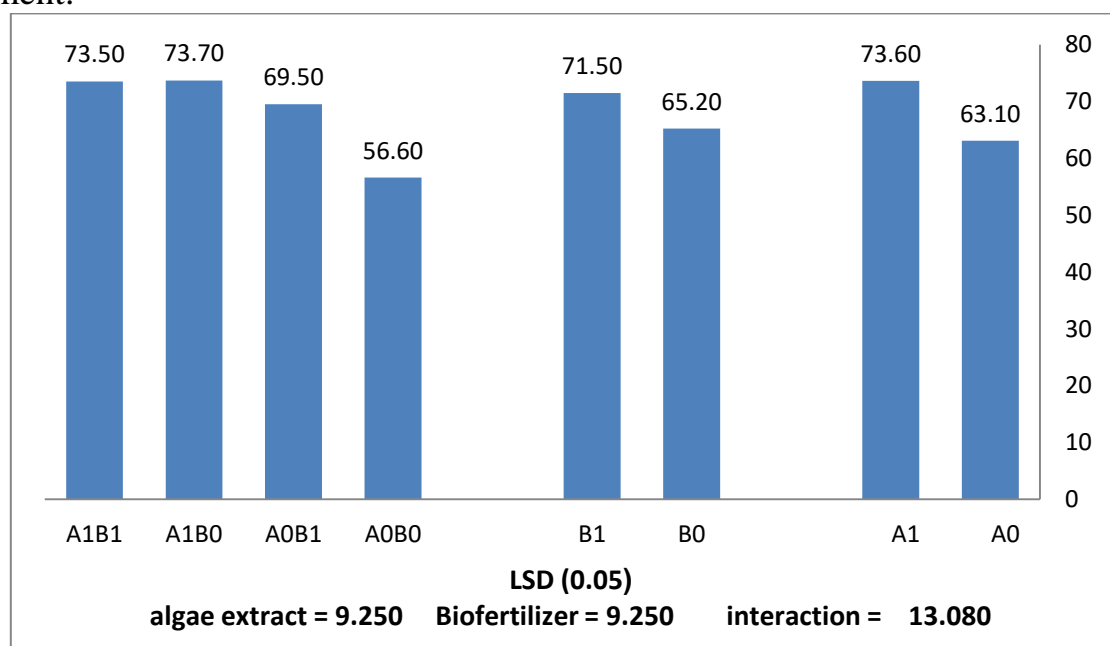


Fig. 3 Effect of algae extract and Bio-fertilizer in chlorophyll content

4- length flowering stem (cm):

Figure (4) shows a significant effect of spraying algae extract on the length of flower stem where A1 treatment gave the highest rate (36.80 cm) compared with control treatment, which gave the lowest rate (31.32 cm). The result presented in Figure (4) shows a significant difference in the length flower stem caused by Bio-fertilizer where B1 treatment gave the highest rate (34.79 cm) compared with control treatment which gave the lowest rate (33.34 cm). The interactions between algae extract and Bio-fertilizer resulted a significant increase in length flower stem where A1B0 treatment gave the highest rate (37.06 cm) compared with control treatment (A0B0) that gave the lowest rate (29.61cm). There was no significant difference with applying A1B1 treatment.

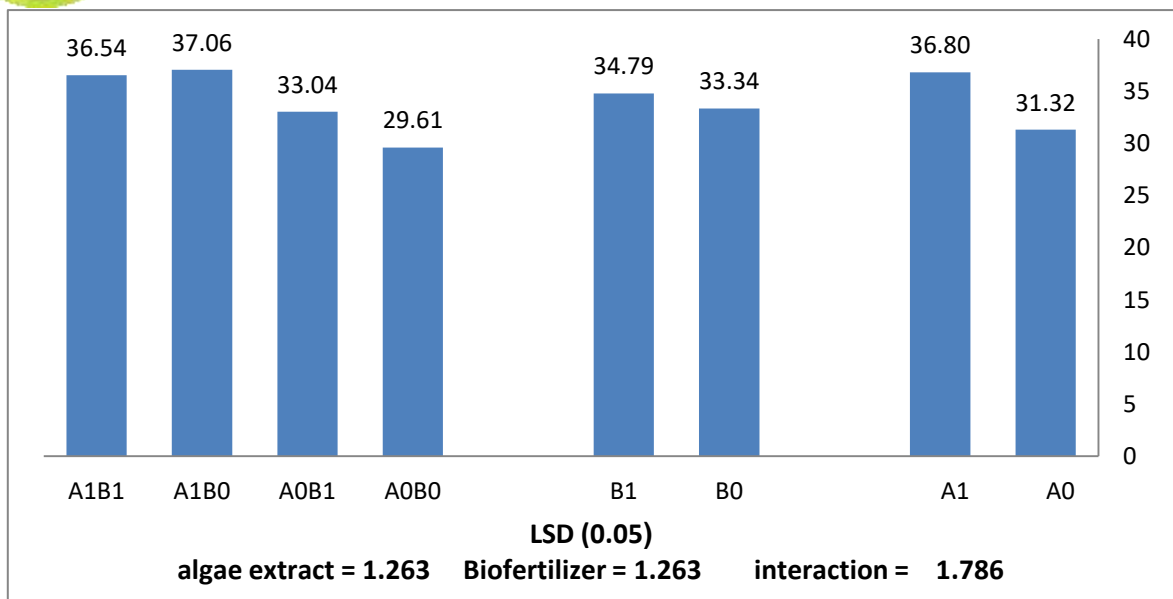


Fig. 4. Effect of algae extract and Bio-fertilizer length flowering stem

5- Number of inflorescences per plant:

The results in Figure (5) revealed that using algae extract caused a significant effect on number of inflorescences per plant where A1 treatment gave the highest average (3.94) compared with control treatment, that gave the lowest rate (2.98). The data presented in Figure (5), indicate that Bio-fertilizer treatments did not result significant effects on number of inflorescences per plant. The interaction treatments gave a significant increase in number of inflorescences per plant where A1B0 treatment gave the highest rate (4.00) compared with control treatment, which gave the lowest average (2.66). There was no significant differences with using A1B1 treatment.

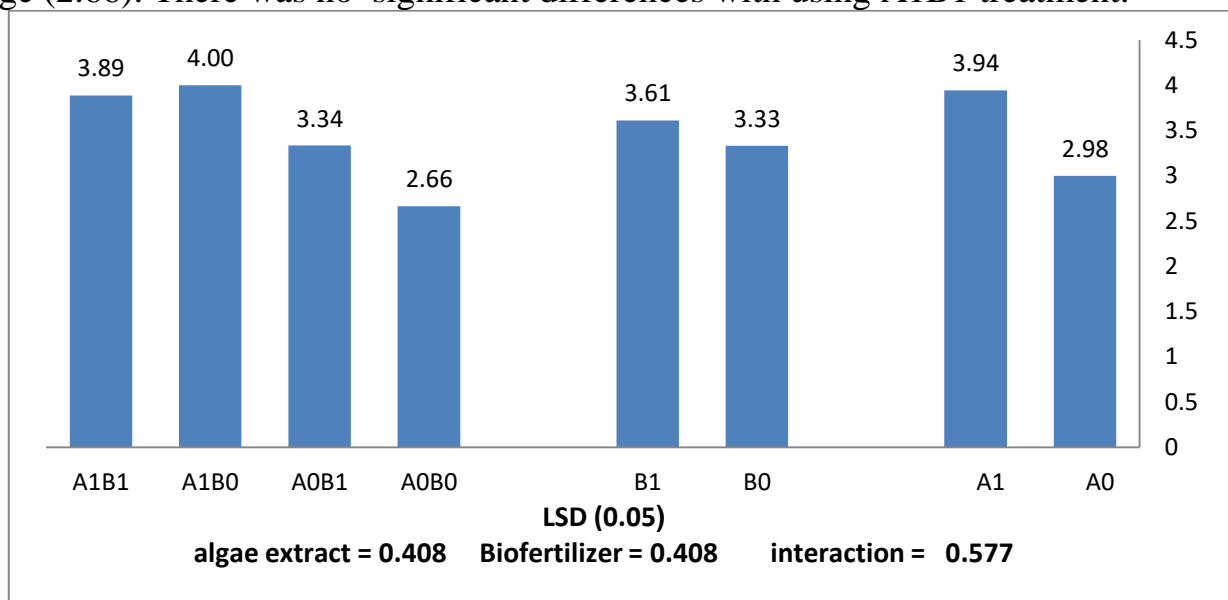


Fig. 5 Effect of algae extract and Bio-fertilizer in number of inflorescences plan

6- Number of florets inflorescence:

Figure (6) shows the significant effect of spraying algae extract on number of florets per inflorescence where A1 treatment gave the highest rate (8.05) compared with control treatment, which gave the lowest rate (6.00). Using Bio-fertilizer showed no



any significant effect on the number of florets per inflorescence. Overlapping algae extract and Bio-fertilizer showed a significant effect on the number of florets per inflorescence where A1B0 treatment gave the highest average (8.33) compared with control treatment which gave the lowest average (5.45). There was no any significant difference with using A1B1 treatment.

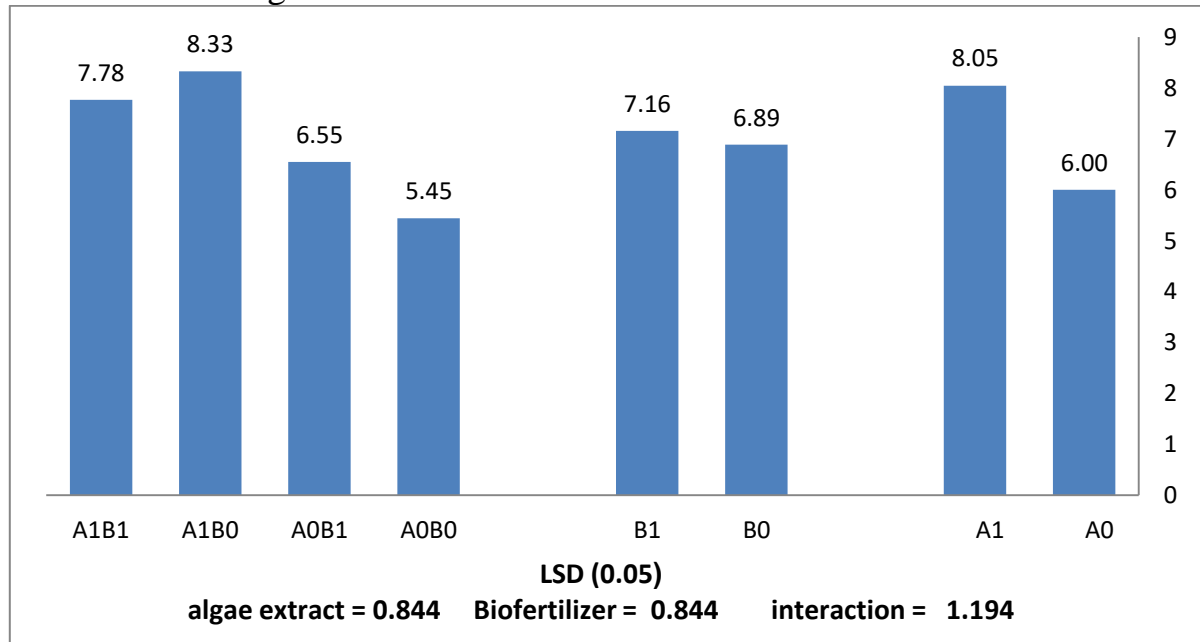


Fig. 6 Effect of algae extract and Bio-fertilizer in number of florets inflorescence

As a result of the above, the treatment of algae extract and Bio-fertilizer are superior in some studied Characteristics. This may be due to the positive effect of the algae extract, which contains the necessary nutrients of the plant such as macro-nutrients (N, P and K) and micro-nutrients (Fe, B, Mg, Zn, Mo and Cu) and also contains organic acids, auxins, cytokines, gibberellin and amino acids. These additions, when added to the soil or sprayed on plants, stimulate root growth, increase stem thickness and increase vegetative growth because it affects photosynthesis, respiration, cell metabolism, and nucleic acid synthesis, thereby increasing cell division, protein synthesis, enzymes, and hormones, thus increasing growth properties of plants (Charlie, 2003).

The increase in growth and flowering indicators as a result of treatment with Bio-fertilizers may be due to the pollination process leading to increased nitrogen stabilization, which increases the supply of necessary amino acids for the growth and continuity of its vital activities. The improvements in vegetative growth traits may be due to the role of bacteria in increasing the nutrient concentration in the soil, which has an important role in the functioning of plant processes, which ultimately leads to increase growth and yield indicators (Fadhil, 2010) and (Zhang & Schmidt, 1999). These results are consistent with the findings of (Badawy, El-Dsouky, Sadiq, & Abou-Baker, 2003), (Hussein, 2017) and (Mostafa, 2002).

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