



INFLUENCE OF SEAWEED EXTRACT OF *ASCOPHYLLUM NODOSUM* ON THE GROWTH, FLORAL AND CORMS YIELD OF TWO *GLADIOLUS* CULTIVARS (*GLADIOLUS HYBRIDA*)

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Abstract

The research was carried out in the Lath house of the Agricultural Research Station/College of Agriculture/Kirkuk University/Al-Sayadah region, south of Kirkuk for the period from 20/3/2019 to 28/8/2019, the experiment was laid out in two factors, included the study the effects of adding of Seaweed Extract of *Ascophyllum nodosum*, which named Acadian, to the soil, by three levels (0.1.2)g. on the growth, floral and corms yield of two *Gladiolus* cultivars Sapporo and Bimbo, corms were planted on 20 March 20019, in a 24 cm diameter contented with a mixture of medium (2 soil:1 Peat moss) and weight (6.5) kg, analyzed the data of the experiment was laid out in Randomized Complete Block Design (R.C.B.D.). The results showed that the level of addition of Acadian organic fertilizer (2)g to the soil was significantly influenced of all parameters, that improving the qualities of vegetative growth, floral and corms yield. The outcome of the two *Gladiolus* cultivars different in their response, as the Sapporo cultivar was excelled in its qualities and gave the best results compared with Bimbo cultivar, as well as its overlap with the levels of Acadian organic fertilizer, which showed the best results when increasing the level to 2g.

Key words: *Gladiolus*, Acadian, Seaweed Extract, *Ascophyllum nodosum*, cultivars

Introduction

Gladiolus is one of the most important flowers in the world, and it is known to be the king of monochromatic flowering bulbs. It is the largest genus in the Iridaceae family. The genus *gladiolus* includes about 250 species. The original habitat of *Gladiolus* is South Africa. To the Latin word *Gladius*, the small sword means a reference to the shape of the leaves of the sword (Abu Dahab, 1992 and Hussain and Lee, 2008). As for the name of the species (*hybrida*), it is due to the fact that the cultivated *gladiolus* species are all crossbred and there are no pure varieties, and the importance of the *gladiolus* plant is due to The short period of growth, which averages three months, from Corms cultivation to obtaining flowers, the possibility of cultivating it and producing beautiful flowers suitable for commercial harvest throughout the year and according to the environmental conditions of the country in which it is grown, and cultivated in Iraq in two loaves (spring and autumn), as well as its multiple forms And the colors of its florets (Al-Batal, 2004 Al-Jalabi and Al-Khayyat, 2013). The Netherlands is the first country to export *gladiolus* Corms in the world and *Gladiolus*

production ranks second after It is located in the European countries, and it is ranked fourth in the world in terms of the trade of cut flowers, so that the production of *gladiolus* flowers occupies about 5.8% of Global production of flowering bulbs. The country of India produces approximately 127 million inflorescences annually, with an estimated area of 1270 hectares of cultivated land in *gladiolus* (Anonymous, 2000). The research addressed many important and influencing factors in improving the productivity of this plant, that Seaweed extracts are found to contain plant growth substance such as cytokinins, auxin, and plant nutrients, its including the direction of recent research Using plant and marine extracts or Acadian as a safe alternative to growth regulators and chemicals, as they have no effect on humans and the environment, as well as increasing plant resistance to disease and insects, and the fact that organic fertilizer is an important and influencing factors in plant growth, and Acadian organic fertilizer is a natural extract of marine algae. Pure *Ascophyllum nodesum*, the most widely used in the agricultural and horticulture for its many beneficial effects on soil properties, plant growth and crop yield, is rich in natural ingredients, especially hormones such as

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cytokinins, auxins and gibberellin, among others, that work together to stimulate and stimulate biological processes in the plant and increase plant growth and yield, as well as organic compounds such as amino acids, vitamins and carbohydrates that work to preserve the vitality of the plant, And it contains many of the elements The major and minor nutritional needs for plant growth, and being helpful in forming a strong and diffuse root system that enhances the plant's ability to absorb nutrients, resist soil diseases, and increase the plant's natural resistance to withstand stress resulting from environmental conditions by increasing its ability to produce antioxidants, and plant resistance to pests and diseases As a result of the increased systemic acquired resistance to the plant (SAR), and the production of strong and healthy plants with a high ability to flower and improve the quality of the crop (Jan *et al.*, 2014), as it leads to improved vegetative growth and increased yield, as it supplies the plant with nutrients, enters into building organic compounds, and improves the course of activities Within the plant, which is reflected in the growth in the plant (Haynes and Goh, 2013). Studies on the application of *Ascophyllum nodosum* extract on few ornamental crops reported enhanced root length ,development of shoots , fresh and dry weight of inflorescence (Abdel Aziz *et al.*, 2011), Hamid *et al.*, (2014) concluded that the Acadian spray was 2g. Liter⁻¹ had a significant effect in flowering period and the highest period took 13.7 days when spraying with 2g, liter⁻¹ compared to the comparison treatment that recorded the lowest characteristics of the saffron plant *Crocus sativus* L., Yuqi and Neil (2015) were suggested that substrate drench at 5-10 ml.l⁻¹ of rockweed (*Ascophyllum nodosum*) extract significantly increased flower number of Petunia and its appropriate for the improvement of postharvest life of petunia and tomato transplants and Yaseen and Kadim (2017) achieved the highest percentages of traits studied at concentration 1g liter⁻¹ of Acadian organic fertilizer in *Moringa opeifera*, Saleh and Shekhly (2018). The leaf spray of gladiolus plants with seaweed extracts and at two levels (5.0) g. Liters⁻¹ has led to significant differences in the description of the time required to open the base flower. The first is 120.003 days, the length of syphilis is 84.407 cm, and the wet weight of syphilis is 56.331g. Mazrou (2019) confirmed, in a study conducted on the nodule, in which the Acadian seaweed extract was used in two concentrations (1.0) g.L⁻¹, as it resulted in treatment with Acadians. To improve all the characteristics of vegetative and flower growth and the production of Corms.

And many studies confirm the influential and large role of the genetic factor represented by the variety in

the response of the cultivar to the different factors studied. Al-saad (2010) indicated that white Prosperity cultivar was significantly in its qualities on the pastoral cultivar despite the latter's superiority in the average number of Corms and this was confirmed by Padmalatha *et al.*, (2013) in the variation of the Darshan and Dhiraj cultivars of gladiolus as the Darshan cultivar showed a significant difference in its attributes, including plant height and foliar area as well as early flowering compared to the Dhiraj cultivar. It has the highest percentage of flowering plants and outperformed the number of florets in Spike compared to the first variety, which significantly outperformed and gave the longest floral Spike , similar results were obtained by Iftilhar *et al.*, (2013) who reported that the five exotic cultivars of Gladiolus were different in all characteristics, which was Fado cultivar responded well to treatments as compared with others cultivars, Ali (2019), who reported in the different of two gladiolus cultivars : Rosie bee red and Cartago in their response and differed significantly in their studied characteristics, Abdur Rahman *et al.*, (2019) mentioned that the two Gladiolus cultivars : White Prosperity and Red Advance, a significant difference in their characteristics, As the Red Advance cultivar excelled in its response to the studied factors and produced the best traits for growth, flowering and yield of Corms compared to the first cultivar, similar results indicated by Al-zubaidi (2019) in the different cultivar of saffron in their traits due to the genetic difference represented by the variety and two cultivars of Tulip Apeldoorn and Golden Oxford by Gani *et al.*, (2019) , who observed that cultivar Apeldoorn performed better in all parameters in comparison to Golden Oxford cultivar.

Materials and Methods

The research was carried out in the Lath house of the Agricultural Research Station/College of Agriculture/ University of Kirkuk/University site in the Sayyada region, south of Kirkuk Governorate for the period from 3/3/2019 to 28/8/2019 and included a study of the effect of adding Acadian organic fertilizer to the soil, at three levels (0,1,2) g.Pot⁻¹ in growth, flowering and com yield of two cultivars of the Gladiolus plant, Sapporo and Bimbo, in which the cultivars of the two cultivars were planted on 3/20/20019, in pots with a diameter of 24 cm, filled with a medium mixture consisting of (2 soil: 1 peat moss) and a weight of (6.5)Kg, the research was designed according to the design of the complete Randomized Block Design (RCBD), the data were analyzed statistically and the Dunkin polynomial test was used to compare the averages and a weekly preventive program was developed after planting to prevent fungal diseases and

insect injuries, as the fungicide Finish which contains the active substance was used (Metalaxyl 35%) and the ta-toxic fungicide that contains the active substance (Thiophanate-Methyl 70%). Xenon was also used as its active ingredient (Diazinon 60%) to prevent insect infections, while continuing to perform all necessary service operations from regular irrigation and clearance of bushes. Fertilization with compound fertilizer NPK at 2 g.Pot⁻¹ for the entire duration of the research and whenever the need arises. And all the vegetative and floral traits were taken, and it was recorded when the first color appeared in the first basal flower, and the last vine was extracted on 28/8/2019 after two weeks of complete dryness Of the vegetative group, and the characteristics of the corms quotient were recorded.

Results

Influence of Seaweed Extract of *Ascophyllum nodosum* on the vegetative characteristics of two cultivars of Gladiolus

Plant height (cm): The results in Fig. 1 indicate that compost was significantly superior in giving the highest plant height rate of 107.57 cm when added to the soil at a level of 2 g. A pot superior to that on the rest of the levels, as the lowest height of the comparison treatment plants reached 84.1 cm, and the two varieties differed in their mean height significantly, as the Bimbo variety outperformed the plant height of 99.41 cm, while 89.81 cm at the Sapporo cultivar and the interaction between the workers indicates the response of the variety Bimbo significantly when increasing the level of Acadian organic fertilizer addition to 2 g.

leaf area : cm²

Fig. 2 shows that the Acadian organic fertilizer had a positive moral effect in increasing the leafy area of the plant by increasing the level to 2 gm and reaching 143.74 cm², outperforming the comparison treatment plants in which the lowest rate of the leafy area reached 80.47 cm², and that the two cultivars differed significantly in the leafy area Sapporo then outperformed the highest leaf area of 113.12 cm² on the Bimbo cultivar, which reached 98.51 cm², and thus achieved the highest response to increasing the level of additives to fertilizer to 2 g, as it gave the highest paper area of 167.88 cm², significantly outperforming the Bimbo variety.

The number of leaves Plant. (leaf.Plant⁻¹)

Fig. 3 shows that the number of leaves increased significantly when the fertilizer level increased and reached the maximum number of 9.9 leaves at the level of 2g, significantly outperforming the rest of the levels and the

lowest number of leaves reached 6.77 leaves when compared treatment plants and the variety Sapporo differed significantly and the highest number of leaves

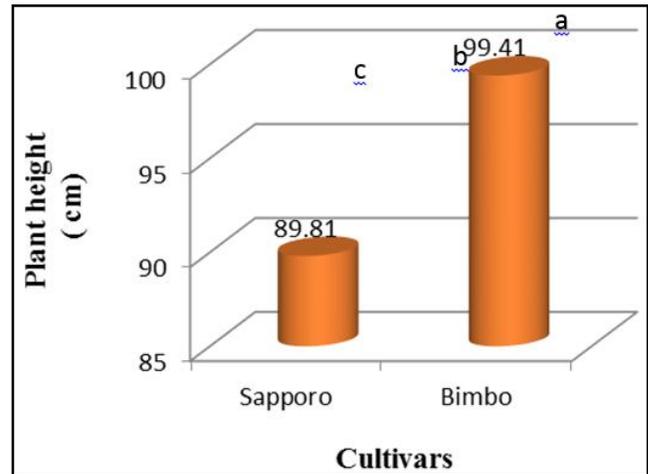


Fig. 1-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on the plant height of the gladiolus.

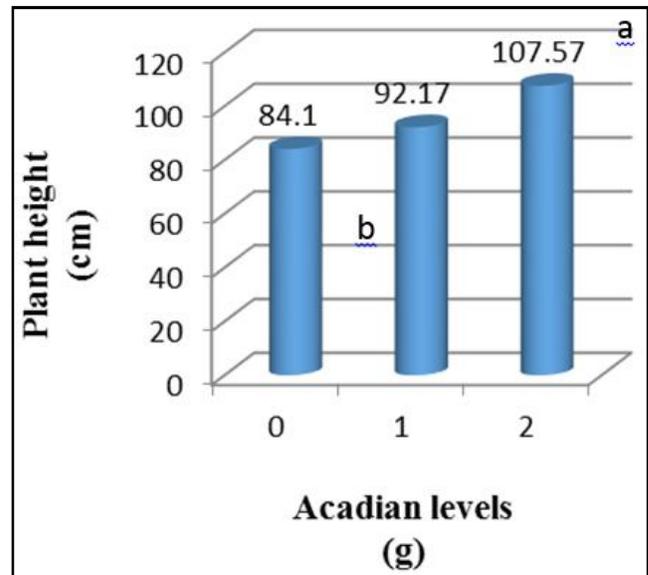


Fig. 1-b: Influence of cultivars on the plant height of the gladiolus.

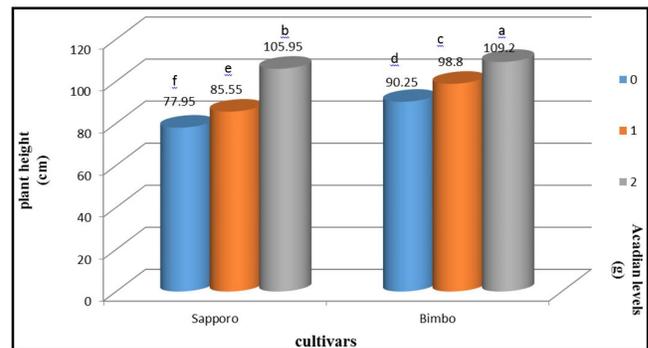


Fig. 1-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the plant height of the gladiolus.

reached 8.71 leaves outperformed the Bimbo cultivar, which had a minimum number of 7.68 leaves and the interaction between the workers had a positive effect, as the Sapporo cultivar was the best response to the increase

in the level of Acadian organic fertilizer addition and the highest number of leaves reached 10.45 leaves. Plant⁻¹ significantly outperformed the rest of the transactions.

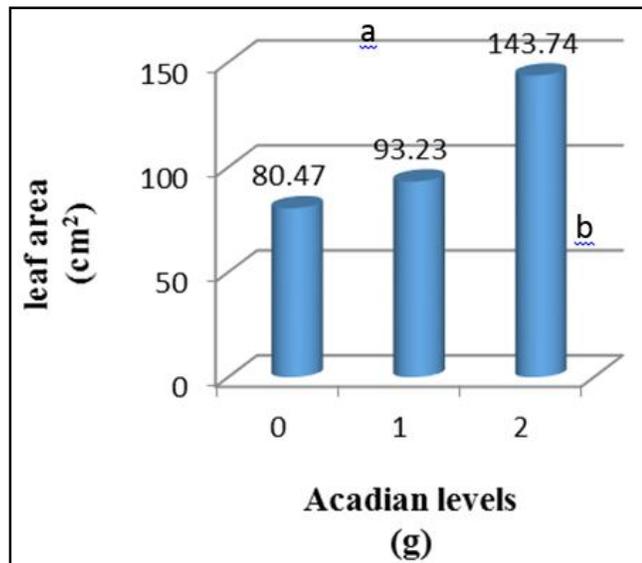


Fig. 2-b: Influence of cultivars on the leaf area of the gladiolus.

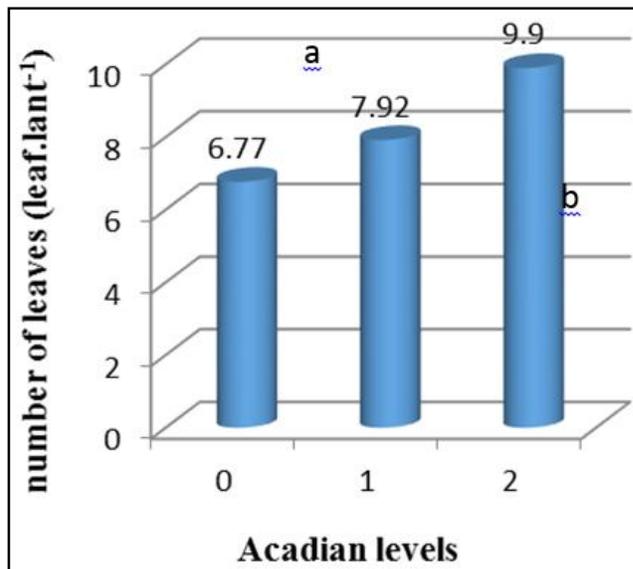


Fig. 3-b: Influence of cultivars on the number of leaves of the gladiolus.

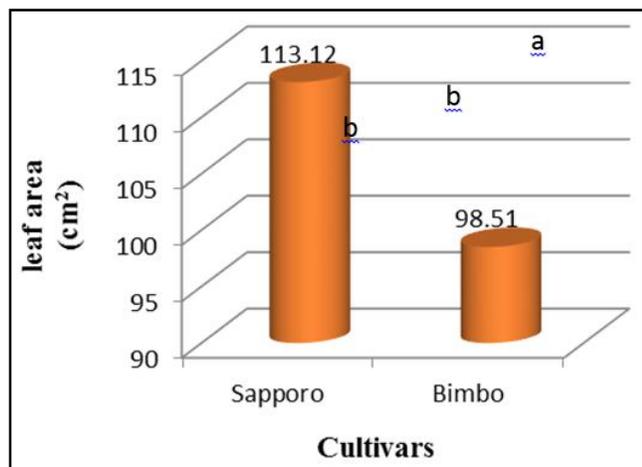


Fig. 2-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on the leaf area of the gladiolus.

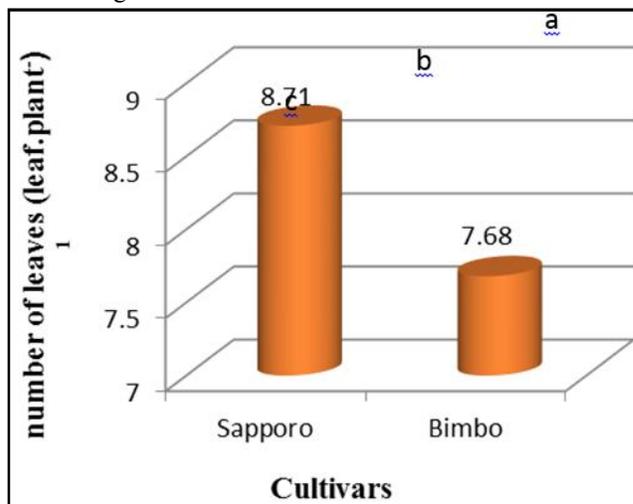


Fig. 3-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on the number of leaves of the gladiolus.

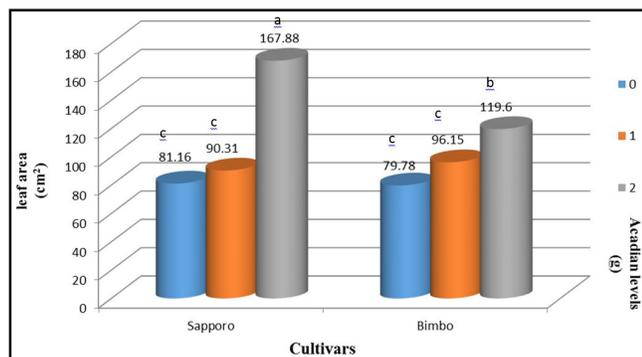


Fig. 2-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the leaf area of the gladiolus.

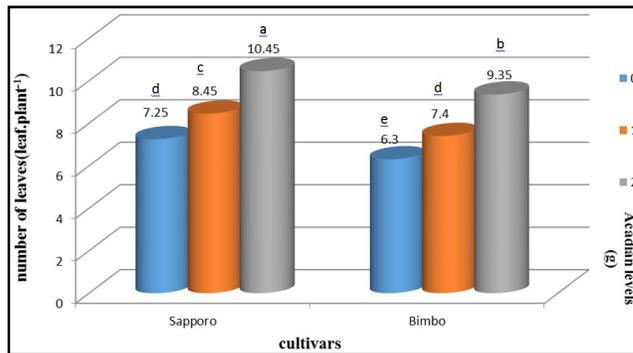


Fig. 3-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the number of leaves of the gladiolus.

Effect of Acadian organic fertilizer on the floral characteristics of two cultivars of Gladiolus

Number of florets per Spike (florets.Spike⁻¹)

Fig. 1 shows that the number of florets increased significantly by increasing the level of organic fertilizer to 2 g and amounting to 10.37 florets.Spike⁻¹, while the lowest number was 7.15 for comparison treatment plants, and the Sapporo cultivar significantly increased and the highest rate of flowers reached the highest number of flowers, outperforming the cultivar. Bimbo with the lowest number of 7.40 florets.Spike⁻¹, the interference had a positive effect in increasing the number of florets significantly, when increasing the level of addition to the organic fertilizer, interfering with the response of the Sapporo cultivar, where the highest rate of florets reached 12.20 florets.Spike⁻¹.

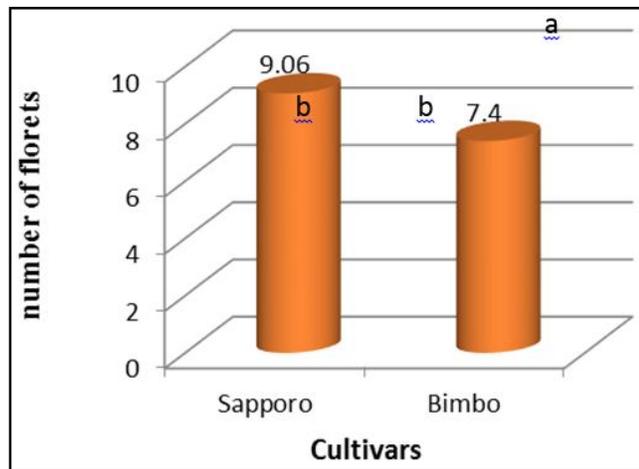


Fig. 1-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on the number of florets of the gladiolus.

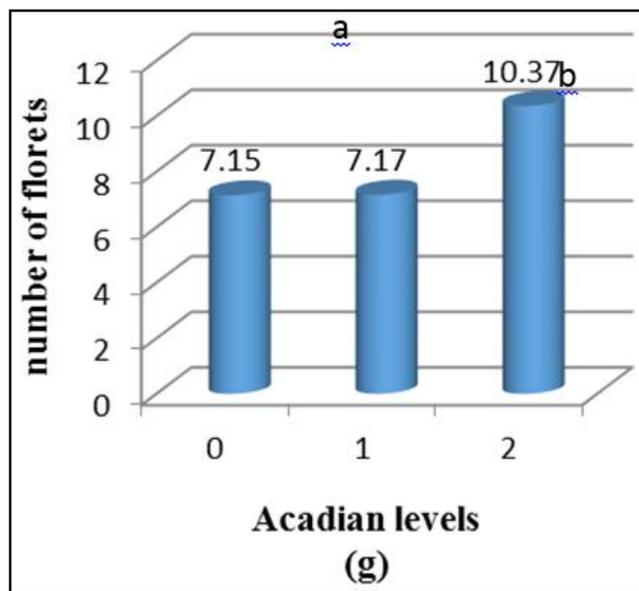


Fig. 1-b: Influence of cultivars on the number of florets of the gladiolus.

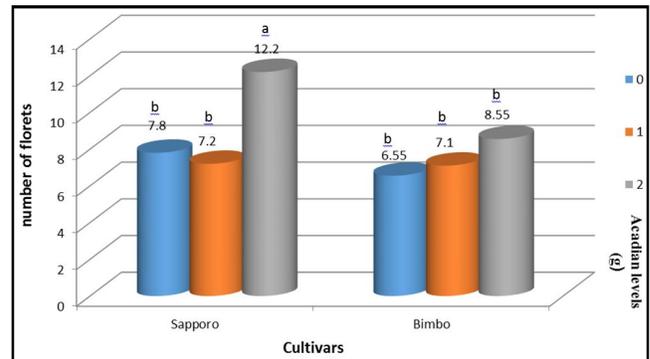


Fig. 1-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the number of florets of the gladiolus.

The diameter of the first basal florets (cm)

Fig. 2 shows that the increase in the average diameter

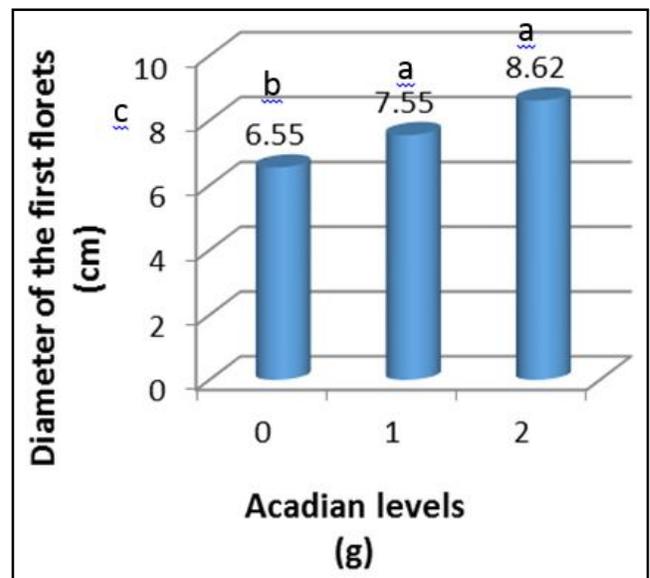


Fig. 2-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on the diameter of the first florets of the gladiolus.

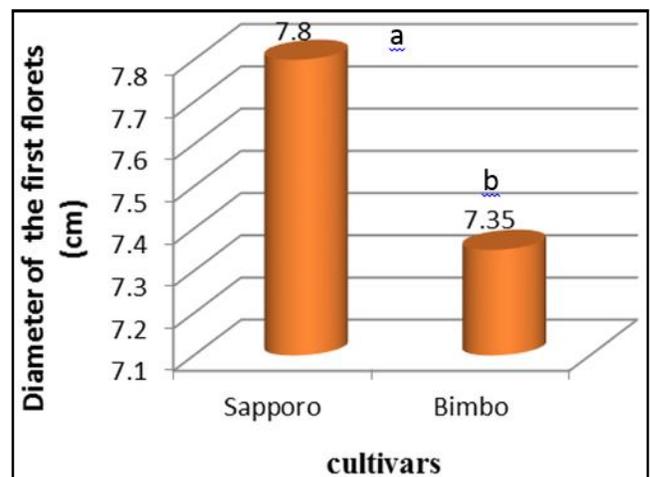


Fig. 2-b: Influence of cultivars on the diameter of the first florets of the gladiolus.

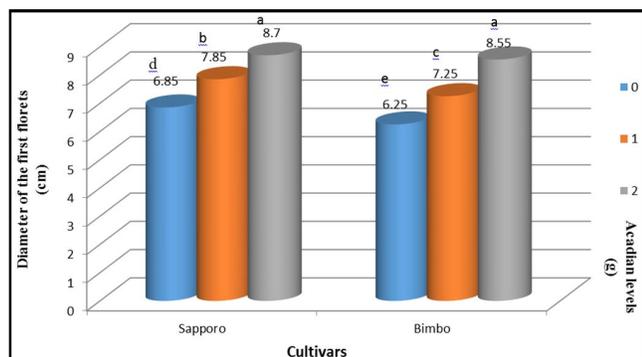


Fig. 2-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the diameter of the first florets of the gladiolus.

of the first basal florets was significant and increased with the addition of the level of Acadian organic fertilizer, and the highest diameter of the first florets to 8.62 cm and the two varieties varied in the average diameter of the first flowering and reached a maximum of Sapporo of 7.80 cm, and the lowest diameter was 7.35 cm and showed Interference that the Sapporo cultivar was better in response to the increase in the level of the addition of Acadian organic fertilizer to 2 g, in which the highest rate for the first basal flower diameter was 7.80 cm and it differed significantly from the rest of the treatments.

Effect of Acadian organic fertilizer on the corms yield characteristics of two cultivars of Gladiolus

Number of a new Corms

The data in Fig. 1 shows that the Acadian organic fertilizer affected significantly when increasing the level of its addition to 2g and gave the highest number of corms amounting to 2.2 germs, an increase that differed significantly from the rest of the transactions and the Bimbo cultivar outperformed and gave the highest number

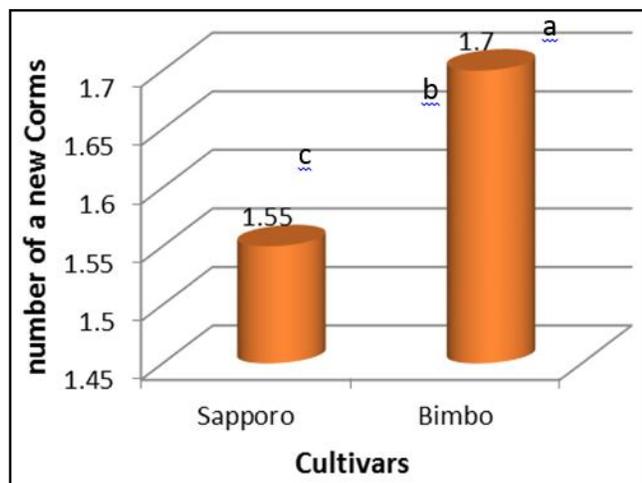


Fig. 1-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on the number of a new Corms of the gladiolus.

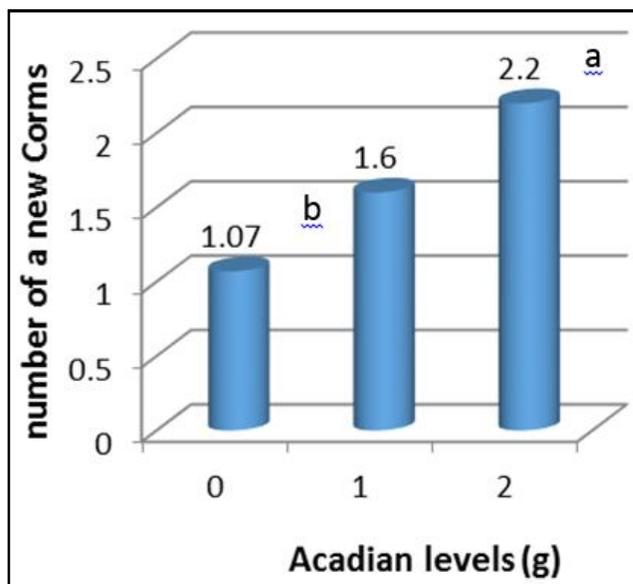


Fig. 1-b: Influence of cultivars on the number of a new Corms of the gladiolus.

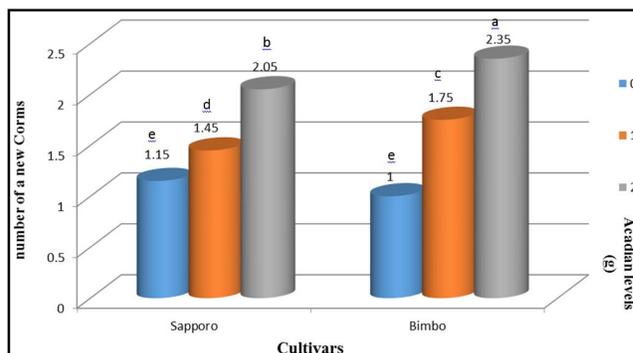


Fig. 1-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the number of a new Corms of the gladiolus.

of germs reaching 1.7 corm, while the lowest number It reached 1.5 corm for the Sapporo cultivar, and interference between the employees had a positive moral effect in increasing the number of corms when increasing the level of addition to 2 g and the moral response of the class to Bimbo, which showed the best response and gave the highest number of 2.35 corms, outperforming the rest of the transactions.

The diameter of a new corms (cm)

Fig. 2 shows that the diameter of the corms has increased significantly with the increase of the level of the Acadian organic fertilizer to 2 g compared to the comparison treatment plants, and that the two cultivars differed significantly between them and the Sapporo cultivar outperformed the new diameter of the corms over the Bimbo variety, which gave the lowest rate of new corms diameter, The overlap between the levels of organic fertilizer and the response of the two cultivars

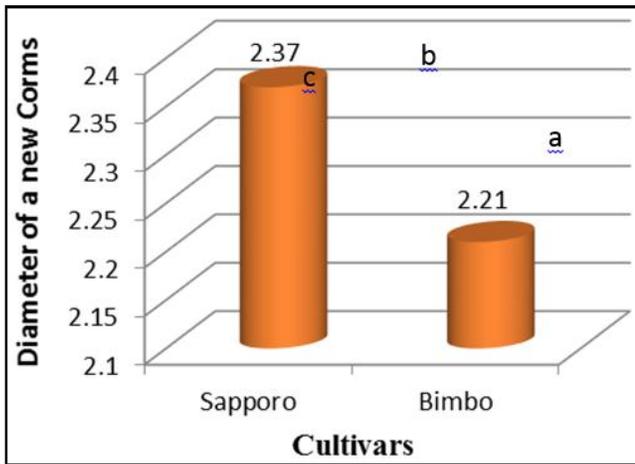


Fig. 2-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on the diameter of a new Corms of the gladiolus.

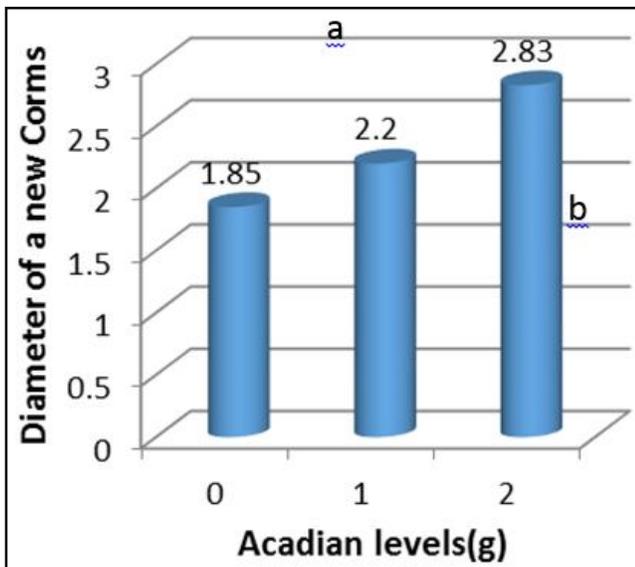


Fig. 2-b: Influence of cultivars on the diameter of a new Corms of the gladiolus.

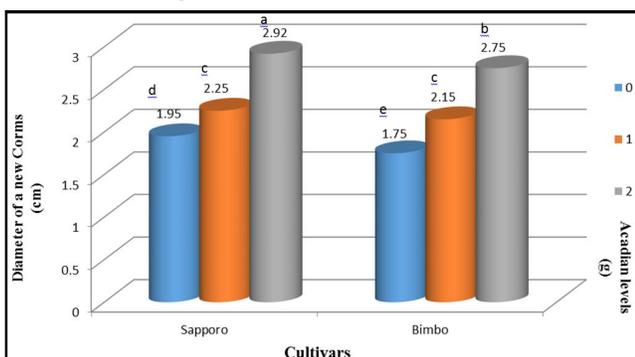


Fig. 2-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the diameter of a new Corms of the gladiolus.

had a significant effect on the increase in the diameter of the new corms, as the Sapporo cultivar gave an increase in the level of the Acadian organic fertilizer, the highest

diameter of the corms, outperforming the rest of the treatments.

Total carbohydrates content of leaf (%)

Fig. 3 shows that the organic fertilizer significantly affected the leaf content of total carbohydrates when

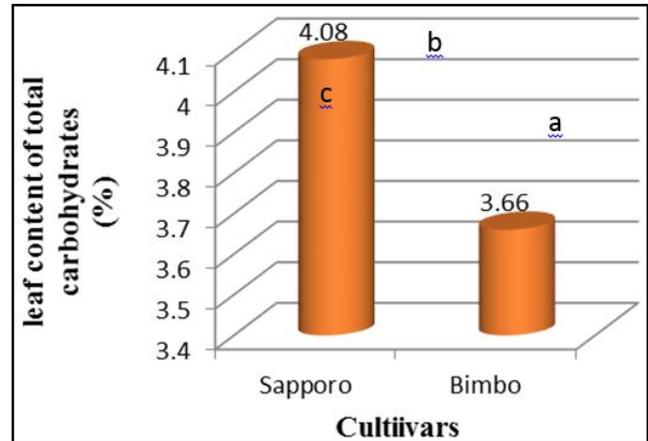


Fig. 3-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on the leaf content of total carbohydrates of the gladiolus.

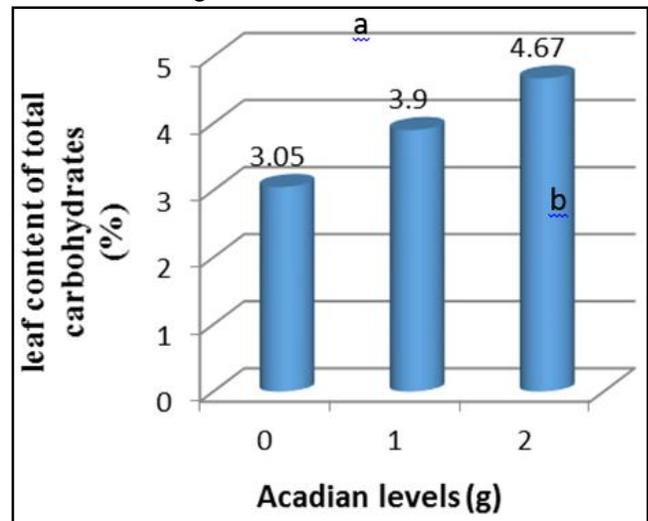


Fig. 3-b: Influence of cultivars on the leaf content of total carbohydrates of the gladiolus.

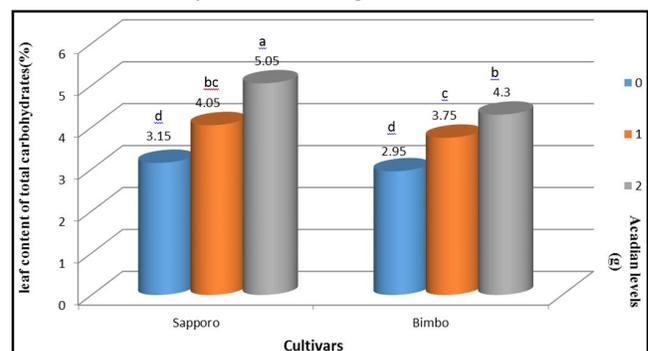


Fig. 3-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the leaf content of total carbohydrates of the gladiolus.

increasing the level to 2 g and differed significantly from the rest of the levels and reached 4.67%, and the lowest content reached 3.05% in the comparison plants, and the Sapporo cultivar significantly increased its carbohydrate content and reached There was 4.08%, and it was better in responding to the level of Acadian organic fertilizer and it had the highest carbohydrate content in the leaves, compared to the Bimbo cultivar.

The wet weight of corms (g)

The data in Fig. 4 indicate that the wet weight of the corms increased with an increase in the level of organic fertilizer at the level of 2 g and in which it reached 5.73 g and the minimum weight of 2.99 g in the comparison treatment plants, and the Sapporo cultivar outperformed in giving the highest wet weight of the corms of 4.28 g and less weight It reached 4.26 g for the Bimbo variety, but it was not a significant increase, and the first category

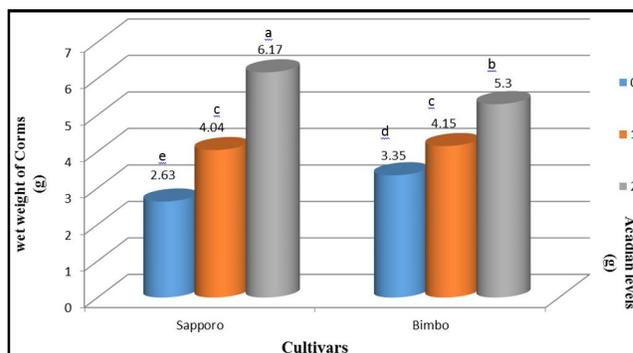


Fig. 4-c: Influence of overlap between Seaweed Extract of *Ascophyllum nodosum* and cultivars on the wet weight of corms of the gladiolus.

was the best response to increase the level of organic fertilizer to 2 g and reached a higher weight of 6.17 g significantly superior to the rest of the transactions.

Discussion

Statistical analysis data indicate that the Seaweed Extract of *Ascophyllum nodosum* (Acadian) had a significant effect in improving the characteristics of growth, flowering and the yield of corms positively as a result of its effective role being rich in seaweed extracts that have antimicrobial and fungi activity and that increased plant growth is due to the effect of these extracts in cellular metabolism and stimulating The synthesis of antioxidant molecules that improve plant growth and resistance to stress (Ibrahim, 2013), as well as containing key nutrients (N, P and K) that play an important role in physiological processes such as photosynthesis in many plants (Jan *et al.*, 2014), And that the positive effect of the organic fertilizer Acadian may be due to a change in the levels of enzymatic activities of the reactions leading to the production and increase of ascorbic acid because Acadians contain the nutrients that help in the vegetative growth of the plant and the chlorophyll content that leads to an increase in the activity of photosynthesis and building carbohydrates (Al-janabi and others, 2016), which are results confirmed by many researchers and pointed out to the role of Acadian organic fertilizer in improving the class Growth and flowering of many plants, consistent with the results of Yuqi and Neil (2015), Yassin and Kazem (2017) and similar results obtained by Mohammad *et al.*, (2019), which they addressed the effect of bio-fertilizer, 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 of hormones as auxins, cytokinins, gibberellin, organic acids and amino acids, thus increasing growth rates and improve the qualities of flowers and the yield of Freesia and other plants1, it may

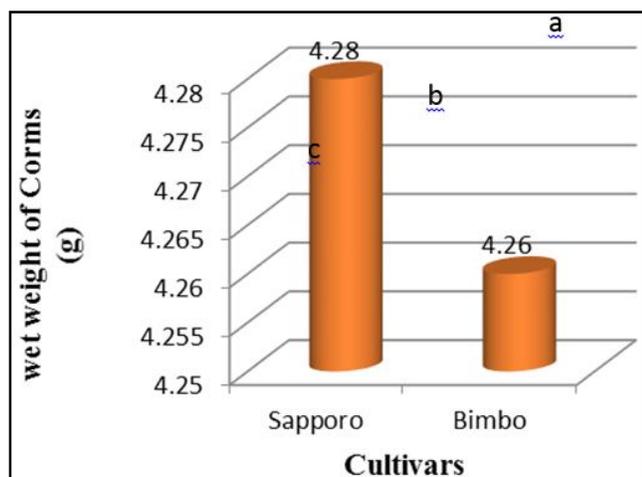


Fig. 4-a: Influence of Seaweed Extract of *Ascophyllum nodosum* on wet weight of corms of the gladiolus.

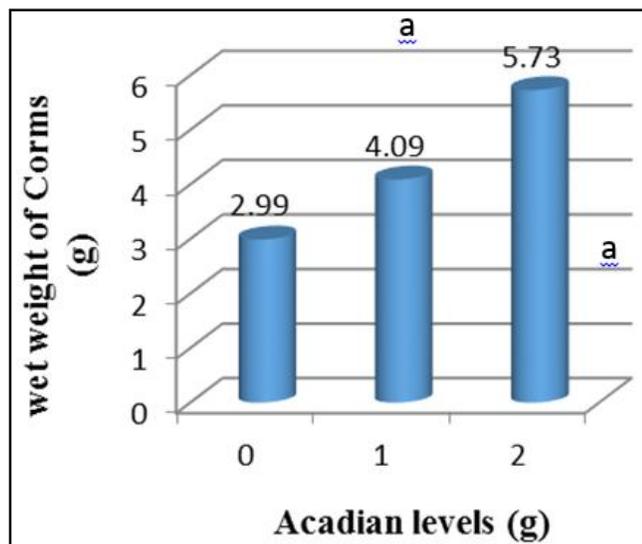


Fig. 4-b: Influence of cultivars on wet weight of corms of the gladiolus.

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 (Fadhl, 2010). And that the variation of cultivars in the response indicated by many researchers, who reported that different between cultivars may be due to differential genetic make-up of the cultivars, overall, the growth and yield comparison of the tested cultivars was similar to that of reported by Saleem *et al.*, (2013), Iftilhar *et al.*, (2013), Ali (2019), Gani *et al.*, (2019), Al-zubaidi (2019) and others Authors.

Conclusions

1- The results of the research show that the level of the addition of Seaweed Extract of *Ascophyllum nodosum* (Acadian) at 2 g to the soil was significantly superior in improving the characteristics of growth, flowering and yield of corms, which showed the best results when increasing the level to 2 g.

2- Sapporo cultivar was excelled in its qualities and gave the best results compared with Bimbo cultivar.

Sapporo cultivar was responded well to levels of Seaweed Extract of *Ascophyllum nodosum* (Acadian) as compared with Bimbo cultivar, which showed the best results when increasing the level to 2g.

References

- Abu Dahab and M. Abu Dahab (1992). Production of ornamental plants. Kingdom of Saudi Arabia, college of Agriculture, Cairo University.
- Abdur Rahman, G., W.K. Nabi, N.K. Muhammad, H. Majid, I. Muhammad, B.A. and A. Yasir (2019). Influence of gibberellic acid on vegetative, floral and corms yield of gladiolus cultivars under the agro-climatic condition of Peshawar-Pakistan. *Pure Appl. Biol.*, **8(1)**: 559-571.
- Abdel Aziz, N.G., M.H. Mahgoub and H.S. Siam (2011). Growth, flowering and chemical constituents performance of *Amaranthus tricolor* plants as influenced by seaweed (*Ascophyllum nodosum*) extract application under salt stress conditions. *J. Appl. Sci. Res.*, **7**: 1472-1484.
- Al-Batal, N. (2005). Producing Protected Ornamental Plants. Publications of the University of Damascus. Syrian Arab Republic.
- Al-Jalabi, S.K. and Nisreen K. Al-Khayyat (2013). Ornamental plants in Iraq. Ministry of Higher Education and Scientific Research. College of Agriculture - University of Baghdad.
- Al-Saad, K.G. (2010). Effect of planting dates, gibberellic acid and Licorice root extract on growth and yield of *Gladiolus hybrida*. Ph.D. Thesis - College of Agriculture - University of Mosul - Iraq.
- Ali, J.S.O. (2019). Effect of salicylic acid and Alar on growth and yield of two *Gladiolus* cultivars (*Gladiolus hybrida*). Master Thesis. Department of Horticulture and Landscape design - College of Agriculture - University of Kirkuk - Iraq.
- Al-zubaidi, M.M.O. (2019). Effect of Benzyladenine and Gibberellic Acid on Growth and productivity of some saffron cultivars (*Crocus sativus* L.). Master Thesis. Department of Horticulture and Landscape design - College of Agriculture - University of Kirkuk - Iraq.
- Anonymous (2000). Inventarisatie wereldboolenareaal. *Bloembollen cultare*, **21**: 4 (C.F.De).
- Hertogh, A.A. and Le Nard (1993). The physiology of flower bulb. Elsevier scientific publisher. Amsterdam. The Netherland.
- Fadhl, A. (2010). The effects of biofertilizer with different drying system and storage period on growth and production of Tomato and Potato in the field, (Bogor Agri. Graduate School, Ed.), Indonesia.
- Hamid, R.B., B. Mona, M.M. Maral and A. Ebrahim (2014). Saffron (*Crocus sativus*) flowering duration changes under different management strategies Astaneh Ashrafiyeh. *Advances in Environmental Biology*, **8(5)**: p.1267-1272.
- Haynes, R.J. and K.M. Goh (2013). Evaluation of potting media for commercial nursery production of container grown plant. *New Zealand Journal of Agricultural Research*, **20(3)**: 371-381.
- Hussain, S. and S. Lee (2008). Gladiolus production a successful example in the climate of khanaspur. Ayobia District Hazar, NWF (Province) Pakistan. *The Geographical Journal of Korea*, **48(2)**: 177-181.
- Gani G., A. Raiz, Z. Rather, T. Imtiaz and A.W. Muneeb (2019). Effect of nutrient sprays and planting depths on growth and bulb production of Tulips, *J. of Experimental A. International*, **30(2)**: 1- 8.
- Mohammad J., K.K. Zaid and M.H. Rabab (2019). Effect of algae extract and bio-fertilizer on vegetative growth and flowering of *Freesia hybrida* L., *Journal of Kerbala for Agricultural Sciences*, **6**:
- Ibrahim, Z. (2013). Effect of folic acid, Zn, sealiar spray of seaweed extracts (Sea) force and biofertilizers (EM-1) on vegetative growth and root in sunflower (*Helianthus annuus* L.) to investigate desirable hybrids in sunflower plants subjected to salt stress? *Journal of Applied Botany and Food Quality*, **84**: 169-177.
- Iftilhar, A., U.S. Rana, Q. Muhammad, S. Muhammad, S.K. Ahmad and Y. Muhammad (2013). Humic acid and cultivar effects on growth, yield, vase life and corm characteristics of *Gladiolus*. *Chilean Journal of Agri. Rese.*, **37(4)**: 339-344.

- Jan, K. Rather, A.M. Boswal, M.V. and A.H. Gaine (2014). Effect of biofertilizer and organic fertilizer on morpho-physiological parameters associated with grain yield with emphasis for further improvement in wheat yield production (Bread wheat = *Triticum aestivum* L.). *International Journal of Agriculture and Crop Sciences*, **7(4)**: 178-184.
- Mazrou, Ragia, M. (2019). Application of Biostimulants and Gibberellic Acid Improves the Growth, Flowering and Corm Production in *Gladiolus grandiflorus* L. *Journal of Plant Production*, **10(8)**: 689-695.
- Padmalatha, T., G. Satyanarayana Reddy, R. Chandrasekhar, A. Shankar and Anurag Chaturvedi (2013). Effect of foliar sprays of bio regulators on growth and flowering in *Gladiolus*. *Indian J. Agri. Res.*, **47(3)**: 1192-1199.
- Saleh, M.A. and Abdel Rahman A. El Sheikhly (2018). The effect of soaking with gibberellic acid, sprinkling with humic acid and seaweed extracts on some characteristics of flower growth of *Gladiolus* cultivar chinon, *Journal of Agricultural, Environmental and Veterinary Sciences*, **2(2)**.
- Saleem, M., I. Ahmad and M.A. Khan (2013). Cultivar Effect on Growth, Yield and cormel production of *Gladiolus* (*Gladiolus grandiflorus* L.). *J. Ornam. and Hort. Plants*, **3(1)**: 39-48.
- Yaseen, A.A. and A.M. Kadim (2017). *Moringa oleifera* L. response of *Moringa oleifera* for nano concentrations of nano- chelated iron, GA3 and organic fertilizer (Acadian) and its effect in the content of leaves fatty acids and Ascorbic acid. *Al Furat Journal of Agricultural Sciences*, **9(4)**: 381-400.
- Yuqi Li and Neil S. Mattson (2015). Effects of Seaweed Extract application rate and method on post- production life of *Petunia* and tomato transplants. *Hort. Technology*, August. **25(4)**.