Plant Archives Volume 20 No. 2, 2020 pp. 5807-5812 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF HUMIC ACID AND CPPU ON GROWTH AND YIELD OF *GLADIOLUS HYBRIDA*

Adnan Ahmed Abd Khudair Al-Gubouri and Kefaia Ghazi Saeed Al-Saad*

Department of Horticulture and Landscape, College of Agriculture, Kirkuk University, Iraq

Abstract

This study was conducted in the Lath house of Agriculture college of University of Kirkuk from April 2019 to August 2019 to show the effect of spraying humic acid and CPPU on the growth and flowering and corms of *Gladiolus* cultivars of Blue Isle, Humic acid was three levels (2, 1, 0) $g.L^{-1}$ and two levels of CPPU (0, 10) $mg.L^{-1}$. Factorial experiment in designing RCBD by split -plots and three replicates, the results showed that spraying humic acid significantly increased and the superiority of spraying at a concentration of 2 $g.L^{-1}$ gave highest height Plant, number of leaves, Vase Life, total carbohydrates in the flowers and cormels (81.46 cm, 7.12 leave.plant^{-1}, 10.48 day, 6.26% 1.33 cormels.Plant^{-1}) respectively, Spraying CPPU with a concentration of 10 $mg.L^{-1}$ was a significant increase in the majority of studied growth characteristics and gave the lowest plant height, most leaf, Vase Life and total carbohydrates in flowers (74.44 cm, 6.88 leaves. Plant $^{-1}$, 10.09 days, 6.01%), Respectively, interaction between humic acid with a concentration of 2 $g.L^{-1}$ and spraying with CPPU of 10 $mg.L^{-1}$ has a significant effect on most of the studied traits.7.75) leave.plant^{-1}, 11.5 days, 7.78%, 1.66 cormels.Plant^{-1}), respectively.

Key words: CPPU, humic acid, *Gladiolus hybrida.*

Introduction

Gladiolus hybrida of the Irisaceae family, which is corms and contains 300 species (Javiad and Riza, 2008), cultivated in Iraq with spring and autumn and can be produced round the year under controlled conditions (Al-Chalabi and Al-Khayyat, 2013) that intensive use of chemical fertilizers has side effects in the plant and its negative effects on organisms Micro flora in the soil, humic acid is widely used for its many benefits in improving the properties of the soil and its effect on production. Humic acid is an organic compound of a polymeric nature and a natural resource that can be used to increase plant growth and nutrition (Sharif *et al*., 2002) and has a positive effect in improving physical and chemical soil properties, which positively affects plant growth and increases vegetative and flower growth (Canellas and Olivares, 2014). Ali *et al.,* (2017) show effect of humic acid in concentrations (250, 350, 500) $mg.L^{-1}$ in four varieties of Cladiolus, concentration was 500 $mg.L^{-1}$ improved vegetative growth. syphilis, including plant height and number of flowering dates. The CPPU plant growth regulator is also called (KT-30) or For chlorfenuron or 4PU-30 and it is one of the industrial cytokines, including (N– (2– Chloro - 4 - pyridinyl) N– phenyl urea), highly effective and exceeds Benzyl adenine (BA) is 10-100 times (Mok and Mok, 2001. Abdel-Aziz *et al.,* (2015) explained that spraying Narcissus with a concentration of 9 $mg.L^{-1}$ from KT-30 resulted in an increase in the percentage of chlorophyll, number of leaves and leafy area, an increase in plant height, number of side branches, flowering siphon diameter, flower diameter and flower number as well.

Importance of this plant and its global rank among the cut flowers and the active role of the factors studied This study to know the effect of spraying with different levels of humic acid and the CPPU growth regulator in improving growth and flowering and possibility of successful cultivation of Gladiolus in the spring under the conditions of the province of Kirkuk and encourage its cultivation as an economic crop and the development of research and development programs in this field.

Material and Methods

The study was carried out in the Lath house of the Department of Horticulture and Landscape / College of Agriculture - University of Kirkuk in Alsayadda research station for the period from April 2019 to August 2019 for Blue Isle variety. Planting in pots 24 cm and weight of

***Author for correspondence :** E-mail: dr.kefaiaalsaad@gmail.com

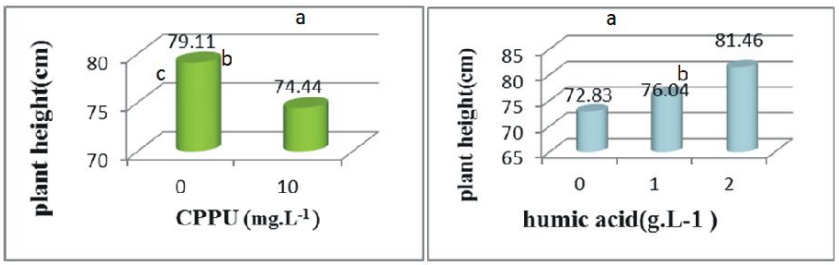

Fig. 1-a: Effect of humic acid plant Height (cm)

Fig. 1-b: Effect of CPPU plant Height (cm)

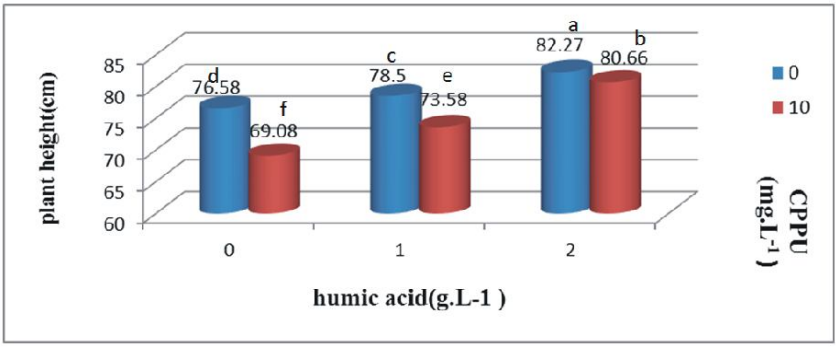

Fig. 1-c: The effect of between humic acid and CPPU on plant height (cm).

Fig. 1: Effect of Humic Acid and CPPU on Plant Height (cm) for *Gladiolus hybrid.*

7.5 kg filled with mixture soil added NPK (20.20.20) 2 gm.Pot^{-1}, spraying the fungicide (Zantara) and the insecticide (AYCOD). With a concentration of 1 ml.L^{-1} as a weekly protect program to. Experiment design with (RCBD) and three replicates and four plants per experimental unit to study two factors spraying plants with three Levels of humic acid (0, 1, 2) g.L^{-1} and two levels of the growth regulator CPPU (0, 10) mg.L^{-1}. The following traits were studied and the following when color appeared in the first flower, plant height (cm), number of leaves (leaf. Plant^{-1}), Vase Life (day), floral content of total carbohydrates, number of corms (corm.plant^{-1}), number of cormels (cormel.plant^{-1}). The statistical program (SAS, 2001) was used to analyze data and adopt the Duncan's Multiple Range Test to compare averages at a probability level of 0.05.

Results and Discussion

Plant Height

The results in fig. 1 significant differences on plant height (81.46) cm at spraying 2 g.L^{-1} humic acid and the effect of spraying with the CPPU growth regulator on the height of the plant and its minimum height reached 74.44 cm at a concentration of 10 mg.L^{-1}. This may be due to the fact that cytokinesis not affect the height of the plant (Abdul, 1987). The duo between the growth regulator CPPU and humic acid, its results were significant and reached a peak at the first level (comparison) of the CPPU with 2 g.L^{-1} humic acid and gave the highest height of the plant (82.27) cm, This may be due to the fact that the CPPU growth regulator is a cause of orientation of the nutrients and plant hormones for the growth and formation of lateral shoots at the expense of plant height (Abu Zaid, 2000) and to the vital role played by humic in reducing tension and the associated stresses and increasing cell divisions (Phelepstak). This is consistent with the results of Elzbieta, Patrycja, (2008); Abdulaziz *et al*., (2009) and Saleh, (2018).

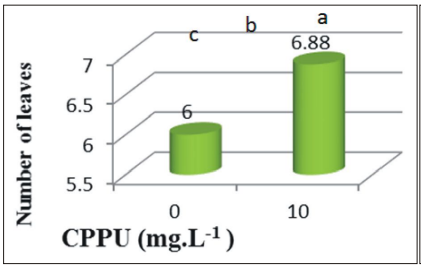

Fig. 2-a: Effect of humic acid In the number of leaves of galadiolus (leaf. Plant^{-1})

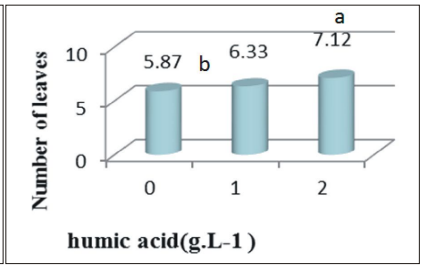

Fig. 2-b: The effect of the CPPU In the number of leaves for gladiolus (leaf.plant^{-1})

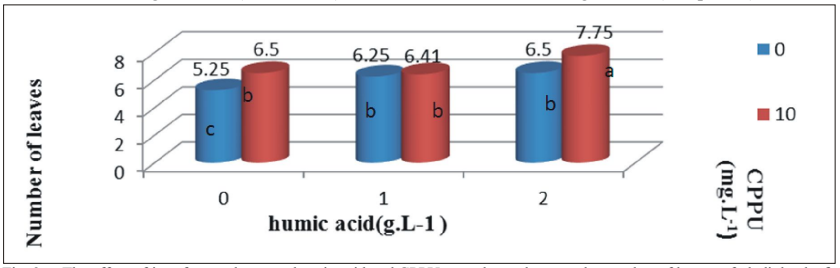

Fig. 2-c: The effect of interference between humic acid and CPPU growth regulator on the number of leaves of gladiolus leaf).

Fig. 2: Effect of Humic Acid and CPPU Regulator on Number of Leaves (leaf.Plant^{-1}) *Gladiolus hybrid.*

Number of leaves

The results showed in fig. 2 that the levels of humic acid significantly affected the average number of leaves by 7.12 leaves.Plant^{-1} at a concentration of 2 gm/ liter^{-1}, and this may be due to the role of humic acid in processing nutrients that increase growth with their activities Vitality (Abdel-Mawgoud *et al*., 2007), as well as the CPPU which increased the average number of leaves to 6.88 leaves.plant^{-1} and this may be due to the fact that the CPPU caused the increase in the number of apical states and cambiums and thus affected the increase in the total number of leaves (Mazher *et al.,* 2011) And the overlap of the employees was significant and the largest number of leaves was recorded at the

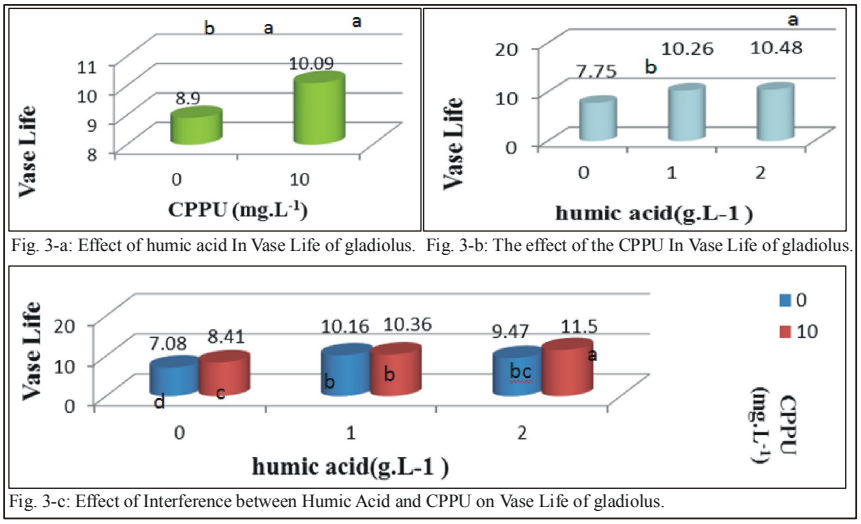

Fig. 3-a: Effect of humic acid In Vase Life of gladiolus. Fig. 3-b: The effect of the CPPU In Vase Life of gladiolus.

Fig. 3-c: Effect of Interference between Humic Acid and CPPU on Vase Life of gladiolus.

Fig. 3: Effect of humic acid and CPPU on Vase Life for gladiolus.

concentration of 2 g.L^{-1} from humic with 10 mg.L^{-1} from CPPU and this may be explained by the fact that humic acid works to increase the activity of microorganisms that encourage the absorption of nutrients and increase vegetative growth. The number of sheets (Nardi *et al*., 2002) It agrees with Al-Bayati and Al-Khalifa, (2019) and because CPPU works to divide, differentiate and develop cells and reveal them and its role in the formation of leaf prefixes leading to an increase in the number of leaves (Abdul, 1991) and this is consistent with the results of Ahmed and Saad, (2016) on the plant of the girl of the consul, Zubaidi and Saad, (2019) on the saffron plant.

Vase Life

Fig. 3 indicates the significant difference between the averages of the effect of spraying humic acid from plants that did not spray in the average flowering age and the plants that sprayed with 2 gm.L^{-1} of humic longer flowering life was 10.48 days and the reason for this may be due to the fact that acids Humicity works to increase the efficiency of processing with microelements, as it works to reduce the soil pH, the zinc component that contributes to the formation of the amino acid tryptophan that hinders the aging of flowers after their conversion to oxine (Adediram which, 2004 and Boras *et al*., 2011), as well as spraying with CPPU which it takes the most number of days (10.09) days at a concentration of 10 mg.Liters^{-1} because CPPU has provided the carbohydrates saved from photosynthesis and the abundance of food stocks that enabled them to remain as long as possible (Reid *et al*., 2002). The same figure indicates the significance of the interference for the flowering life expectancy and achieved the highest duration of flowering life (11.50) days at 2 g.L^{-1} of humic acid and 10 mg.L^{-1} of CPPU, due to the increased efficiency and readiness of the micronutrients as a result of lowering the pH by Humic acid, especially Zn, which contributes to the formation of the amino acid (tryptophan), which in turn turns into a natural oxine that inhibits the formation of ethylene in flowers, impedes the aging of flowers and prolongs their flowering period and keeps them as long as possible (Adediram *et al*., 2004; Barker and Pilbean, 2006; Boras *et al*., 2011) and the ability of cytokinein to inhibit aging (Sakakibara, 2006), which is consistent with the findings of the Al-Khalifa, (2015); Chalabi and Khafaji, (2016).

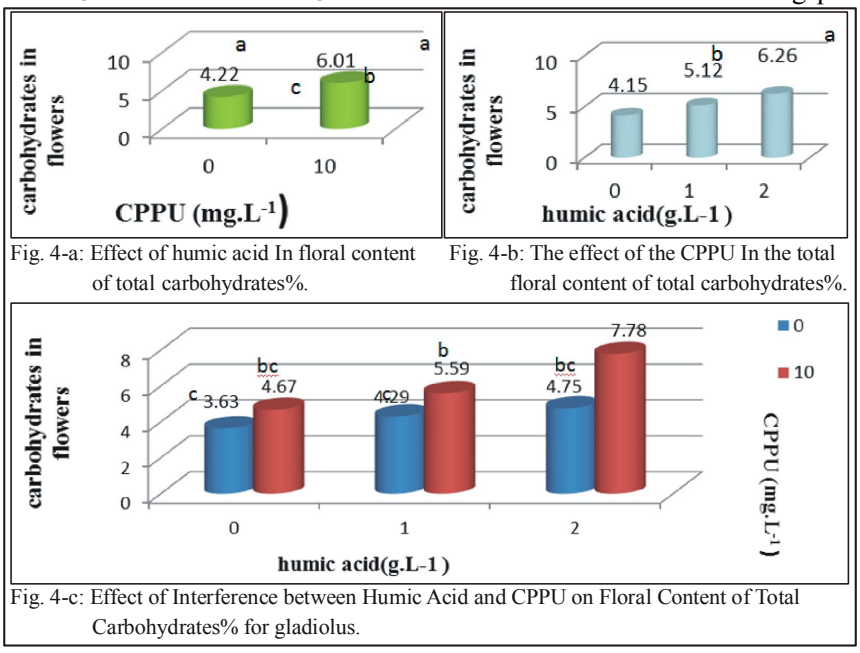

Fig. 4-a: Effect of humic acid In floral content of total carbohydrates%. Fig. 4-b: The effect of the CPPU In the total floral content of total carbohydrates%.

Fig. 4-c: Effect of Interference between Humic Acid and CPPU on Floral Content of Total Carbohydrates% for gladiolus.

Fig. 4: Effect of Humic Acid and CPPU on flower content of total carbohydrates% for gladiolus.

Carbohydrates in Flower %

Fig. 4 showed a significant difference in the average total carbohydrate content in flowers as a result of spraying humic acid from untreated counterparts and recorded the largest percentage of carbohydrates amounting to 6.26% for a concentration of 2 g.L^{-1} and the reason for this is that the increase in the efficiency of photosynthesis by humic acid increased the stock. The higher diet of carbohydrates in flowers (Abdel-Latif, 2006). The treatment of plants with the

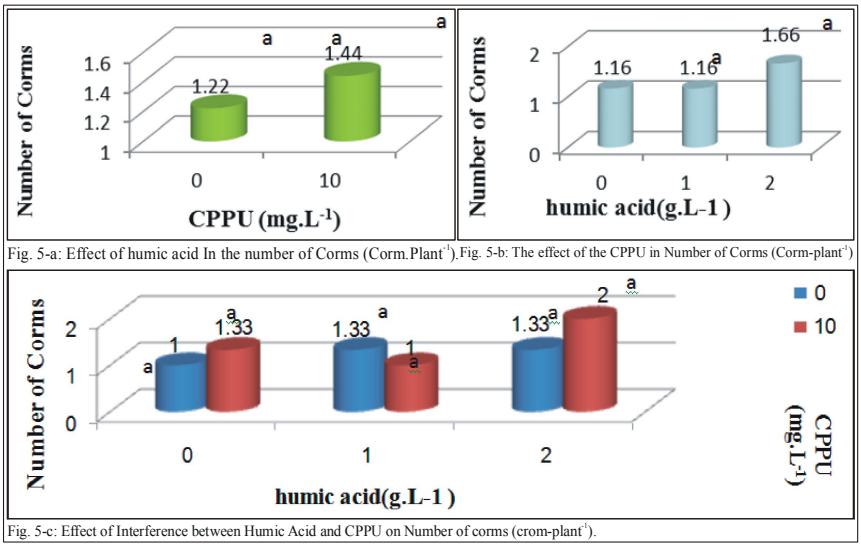

Fig. 5-a: Effect of humic acid In the number of Corms (Corm.Plant^{-1}).Fig. 5-b: The effect of the CPPU in Number of Corms (Corm-plant^{-1})

Fig. 5-c: Effect of Interference between Humic Acid and CPPU on Number of corms (crom-plant^{-1}).

Fig. 5: Effect of Humic Acid and CPPU on Number of corms (corm.plant^{-1}) for *Gladiolus hybrida*.

growth regulator CPPU achieved significant differences and the highest was 6.01% at a concentration of 10mg.L^{-1} due to the effects of CPPU and its catalytic capabilities to form carbohydrates in the leaves and increase the efficiency and indicators Vegetative growth produced more carbohydrates in flowers (Salisbury and Ross, 1992), consistent with the results of Subbaraj *et al.,* (2010) and the interaction between humic acid and CPPU achieved significant values and the spraying record was 2 g.L^{-1} of humic acid and the concentration was 10 mg.L^{-1} of CPPU the largest percentage of carbohydrates in flowers by 7.78% and this may be due to the effect of humic acid in making the elements Small and large foods are ready and absorbed, nutrient production increases and carbohydrate accumulation increases (Asli and Neumann, 2010; Calov *et al*., 2014) and the abundance of photosynthesis and their increased by CPPU has led to more carbohydrate formation (Salisbury and Roos, 1992). This is consistent with the findings of Padmalatha and Chandrasekhar, (2015).

Corms and cormels:

• Number of Corms: The results of fig. 5 showed that both humic acid spray and CPPU spraying were insignificant and their differences in the number of Corms average.

• Number of Cormels: fig. 6 indicates a significant increase in the number of cormels when spraying with humic acid at a concentration of 2 g.L^{-1} and amounted to 1.33 cormel.Plant^{-1} and this may be due to the fact that humic acid works to provide the availability and readiness of essential and essential nutrients, especially phosphorous and nitrogen, which are A result indicated by Ahmad and others, (2013) and Baldotto *et al.,* (2013), as well as the significant significance of spraying with CPPU growth regulator, while the two interactions were significant at concentration 2 g.L^{-1} liters of humic acid and concentration 10 mg of CPPU growth regulator and reached in it 1.66 cormels.Plant^{-1}, which may be attributed to the fact that humic acid works to provide phosphorous, which is one of the basic elements for forming cormels (Baldotto *et al*., 2013). As well as the positive role of the CPPU growth regulator in improving the characteristics of vegetative and syphilic growth, which is reflected positively by the quotient of cormels (Baskaran *et al*., 2014) and (Chopde *et al*., 2015), a result indicated by Nassour and Hedaya, (2016) and Saleh, (2018), which confirms, the positive role and act of the factors studied and the interactions among them, which resulted in improving the characteristics of growth, flowers and the yield of corms and cormels.

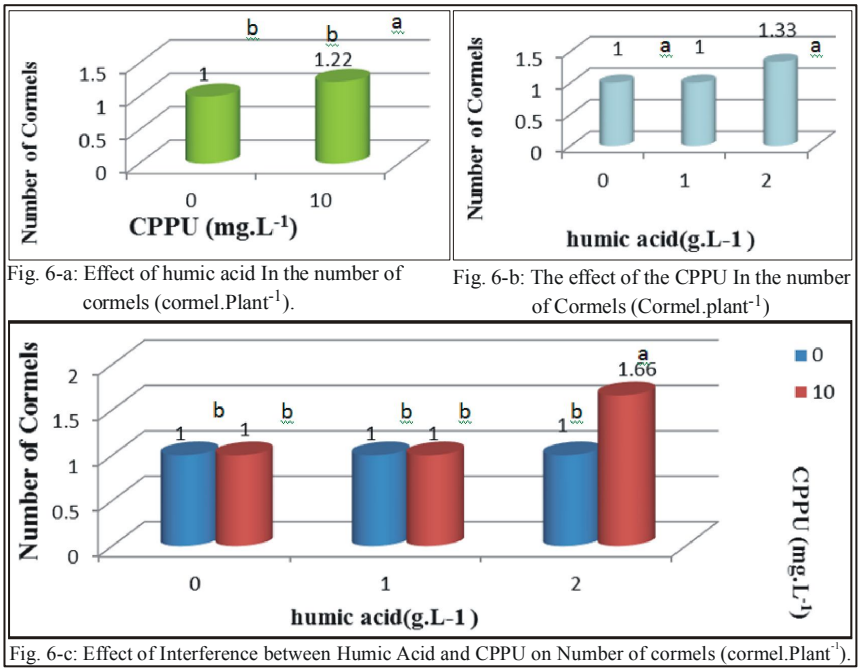

Fig. 6-a: Effect of humic acid In the number of cormels (cormel.Plant^{-1}).

Fig. 6-b: The effect of the CPPU In the number of Cormels (Cormel.plant^{-1})

Fig. 6-c: Effect of Interference between Humic Acid and CPPU on Number of cormels (cormel.Plant^{-1}).

Fig. 6: Effect of Humic Acid and CPPU on the number of cormels (cormel plant^{-1}) for *Gladiolus hybrid.*

References

Abdoul, Karim Saleh (1991). Plant Physiology (Advanced), Part 1. Directorate of the House of Books for

Printing and Publishing. Salah al-Din University. Ministry of Higher Education and Scientific Research. Iraq.

Abdoul, Karim Saleh (1987). Plant growth regulators. The second part. The first edition, Dar Al-Kotub Directorate for Printing and Publishing. University of Al-Mosul. The Republic of Iraq.

Abdul Aziz, Nisreen Khalil, Abdul Karim Abdul Jabbar Muhammad Saeed, Karima Abdul Idan and Sami Karim Muhammad Amin (2015). *Narcissus poeticus* response to spraying with regulators of vegetable growth salicylic acid and KT-30, *Diyala Journal of Agricultural Sciences*, **7(1):** (111-120).

Abdul Aziz, Nisreen Khalil, Jaffani Korkis Aziz, and Sami Kareem Muhammad Amin (2009). The effect of spraying magnesium and benzene adenine on the growth and flowering of the Lisianthus plant (*Eustoma russellianum*) cultivar Super magic, *Diyala Journal of Agricultural Sciences*. **37:** Iraq.

Abdul Latif, Sawsan Abdullah (2006). A physiological study in the production and storage of Lisianthus flowers. PhD thesis. Department of Horticulture. College of Agriculture. University of Baghdad.

Abu Zaid, Al-Shahat Nasr (2000). Plant hormones and agricultural applications, The Arab Publishing House Publishing, Second Edition, National Research Center, Cairo. Egypt.

Adediram, A.J., B.L. Taimo, O.M. Akande, A.R. Sobule and J.O. Jdown (2004). Application of organic and Inorganic fertilizer for sustainable maize and cowpea yields in Nigeria. *J. Plant Nut*., **27:** 1163-1181.

Ahmad, I., R.U. Saquib, M. Qasim, M. Saleem, A.S. Khan and M. Yaseen (2013). Humic acid and cultivar effects on growth, yield, vase life, and corm characteristics of gladiolus. *Chilean J. of agri. Res.,* **73(4):** 339-405.

Ahmad, Iman Burhan and Kifaya Ghazi Al-Saad (2016). The effect of daylight and spraying with benzene adenyl and cycocel on the growth and flowering of the plant of the consul girl *Euphorbia pulcherrima*. *Kirkuk University Journal of Agricultural Sciences*, **9(3):** 38-44.

Al-Khalifa, Ahmed Kamal Al-Din Abdul Samad (2015). The effect of earring and spraying with regulators of benzene adenine and allar growth on the growth and flowering of geranium hortorum Pelargonium, MA thesis. University of Kirkuk. Iraq.

Al-Dabaa, Rafiah Saad Al-Din, Hamdi Muhammad Ali Al-Bagouri, Atef Muhammad Zakaria Sarhan, Muhammad Abdul-Khaleq Al-Khatib and Salwa Salem Al-Saqr (2004). Ornamental Plants. Cairo University. The Egyptian Arabic Republic.

Ali, B., J. Ali, S.W.A. Bacha, M. Ilyas, W. Khan and M.B.A. Shah (2017). Effect nitrogen and humic acid levels on plant height and number of florets per spike of gladiolus cultivars. *Int. J. Environ. Sci. Nat. Res.*, **7:** 1.

Al-Khafaji, Makki Alwan (2014). Plant growth organizations and their gardening applications. Ministry of Higher Education and Scientific Research. University of Baghdad. faculty of Agriculture.

Al-Zubaidi, Marwa Mohamed and Kefaya Ghazi Al-Saad (2019). Effect of benzene adenine and gibberelic acid on the growth and productivity of some varieties of saffron plant *Crocus sativus* L., Proceedings of the third international agricultural conference. *Kirkuk University Journal of Agricultural Sciences. Iraq*, 376-386.

Asli, S. and P.M. Neumann (2010). Rhizosphere humic acid interacts with root cell walls to reduce hydraulic conductivity and plant development. *Plant Soil*., **336:** 313-322.

Baldotto, M.A. and L.E.B. Baldotto (2013). Gladiolus development in response to bulb treatment with different concentrations of humic acids. *Revista Ceres,* **60:** 138-142.

Barker, A.V. and D.J. Pilbeam (2006). Handbook of plant Nutrition. CRC. press, Boca Raton, Florida, 613.

Baskaran, V., K. Abirami and S.D. Roy (2014). Effect of plant growth regulators on yield and quality in gladiolus under Bay Island conditions. *Journal of Horticultural Science*, **9(2):** 213-216.

Bouras, Metadi, Abu Turabi, Bassam and Al-Basit, Ibrahim (2011). Vegetable crops production theoretical part. Publications of the University of Damascus. faculty of Agriculture. 466.

Calvo, P.L. Nelson and J.W. Kloepper (2014). Agricultural uses of plant biostimulants. *Plant Soil*, **383:** 3-41.

Canellas, L.P. and F.L. Olivares (2014). Physiological responses to humic substances as plant growth promoter. *Chemical and Biological Technologies in Agriculture*, **1(3):** 1-13.

Chalabi, Sami Karim and Nisreen Khalil Al-Khayyat (2013). Ornamental plants in Iraq, Ministry of Higher Education and Scientific Research, University of Baghdad. University Orbit for Printing, Publishing and Translation. The Republic of Iraq.

Chalabi, Sami Karim Muhammad Amin and Safaa Muhammad Salih Ali Al-Khafaji (2016). Effects of GA3 and CPPU spray on Freesia sp GOLDEN MELODY. *Al Furat Journal of Agricultural Sciences,* **8(2):** 23-30.

Chopde, N., A. Patil and M.H. Bhande (2015). Growth, yield and quality of gladiolus as influenced by growth regulators and methods of application. *Plant Archives*, **15(2):** 691-694.

Elzbieta, P. and S. Patrycja (2008) effect of benzyladenine on flowering of *campanula persicifolia* L. ALBA Cultivated in an unheated plastic tunnel and in the field. University of life sciences in Lublin. *Acta Sci. Pol. Hortorum Cultus,* **7(3):** 57-63.

Javaid, A. and T. Riaz (2008). Mycorrhizal colonization in different varieties of gladiolus and its relation with plant vegetative and reproductive growth. *Int. J. Agri. Biol.,* **10:** 278-82.

Jawad, Rana Moussa and Bayan Hamza Majeed (2017). Response of vegetative growth to treatment with organic nutrient and calcium chloride for *Gerbera jamesonii* Iraqi *Journal of Agricultural Sciences* **48(1):** 266-273.

Ji-gang, B., X. Pei-lei, Z. Cheng-shun and W. Cai-yun (2009). Effects of exogenous calcium on some postharvest characteristics of cut gladiolus *Agricultural Sciences in China*, **8(3):** 293-303.

Khaled, H. and H.A. Fawy (2011). Effect of different levels of humic acids on the nutrient content, plant growth and soil properties under conditions of salinity. *Soil & Water Res*., **6(1):** 21-29.

Mok, D.W.S. and M.C. Mok (2001). Cytokinins metabolism and action. *Annual Review of Plant Physiology and Plant Molecular Biology*, **52:** 89-118.

Nassour, Mazen and Hossam Hediwa (2016). The effect of using humic acid on the growth, flowering, and reproductive factors of gladiolus (*Gladiolus hybrid* cv. queen, s. blush). Tishreen University *Journal for Research and Scientific Studies - Biological Sciences Series*. **38(6)**.

Padmalatha, T., G.S. Reddy and R. Chandrasekhar (2015). Effect of plant growth regulators on corm production and vase life in gladiolus. *Journal of Horticultural Sciences,* **10(2):** 220-225.

Phelepstek (2008). Htt:*II*www.com*I* clients *I*huimc acid. Html. Stracture properties and soil Aplplicant, 30.

Reid, J.B., N.A. Botwright, J.J. Smith, D.P. O,Neill and L.H.J. Kerckhoffs (2002). Control of Gibberellin levels and gene expression during de-etiolation in Pea. *Plant Physiol*., **128:** 734-741.

Sakakibara, H. (2006). Cytokinins: activity, biosynthesis, and translocation. *Annu. Rev. Plant Biol.*, **57:** 431-449.

Saleh, Mostafa Abdel Samad (2018). Effect of maceration with gibberellic acid, sprinkling with humic acid and seaweed extracts in some characteristics of flower growth of Cladiolus cultivar, Chinon. M.Sc., Faculty of Agriculture. Diyala University. Iraq.

Salisbury, F.B. and C.W. Ross (1992). Plant development. 357-408. In: Plant Physiology. 4th Ed.Wadsworth, Belmont, CA.

SAS (2001). SAS ISTAT, User's guide for personal computers. Release 6.12. SAS Institute Inc., Cary, NC. USA.

Sharif, M., R.A. Khattak, and M.S. Sarir (2002). Effect of different levels of lignitic coal derived humic acid on growth of maize plants. *Communication in Soil Science and Plant Analysis,* **33:** 3567-3580.

Sinha, P. and S.K. Roy (2002). Plant regeneration through *in vitro* cormel formation from callus of culture of Gladiolus. *Plant Tiss. Cult*., **12(2):** 139-145.

Stoskov, Neil (1989). Understand crop production. Translated by Hatem Jabbar Attia and Karima Muhammad Waheeb. University of Baghdad- Ministry of Higher Education and Scientific Research - Republic of Iraq.

Subbaraj, A.K., K.A. Frunnell and D.J. Wolley (2010). Dormancy and flowering are regulated by the reciprocal in correction between cytokinin and gibberellin in *Zantedeschia. time for a change Trends Genet*., **(11):** 263-268.

The Narrator, Khashi Mahmoud and Khalaf alah Abd Al-Aziz Muhammad (2000). Design and analysis of agricultural experiments. House of Books for Printing and Publishing, Faculty of Agriculture and Forestry, University of Mosul.

Tomoko, T., T. Yasumasa, K. Masakazu and M. Wataru (2008). Anthocyanins of Gladiolus Cultivars and their contribution to flower colors. *J. Japan. Soc. Hort. Sci*., **77(1):** 80-87.