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Testing of Some Feeding Programs on The Criteria of Flowering Quality and Corms Marketability of Gladioli cv. "Advance Red"

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ABSTRACT

Gladiolus grandiflorus cv., "Advance Red" is an attractive flower to Egyptian and Arab tastes. It is a distinctive cut flower and is also grown in gardens and parks for the beauty of its flowers. Gladiolus may be exposed to alkaline soil stress in most Egyptian soils. To achieve environmentally friendly and safe feeding programs without resorting to chemical fertilization, which causes soil pollution with heavy metals with long-term residual effects. Therefore, the experiment aimed to use growth stimulants with both salicylic and ascorbic acids (Vitamin C) whether by spraying, soaking, adding to the soil through irrigation, or combining them, with the aim of improving vegetative growth and flower quality and achieving high corm production with high marketable qualities. Both ascorbic and salicylic acid are growth promoters that are naturally produced within plants in general. As their concentration increases as a result of adding them as growth stimulants, their biological effectiveness increases, as they act as antioxidants, stimulate the production of enzymes and proteins, aid in the absorption of nutrients from the soil, aid in cell division and elongation, and inhibit the production of free radicals. The treatment of soil drench with acetylsalicylic acid 96mg/l and ascorbic acid with 100 mg/l respectively, achieved the best results in all cases, followed by the treatment of 96 mg/L acetylsalicylic acid + 100 mg/L ascorbi acid as a foliar spray on the vegetative growth of the plant compared to the control or untreated plants, which gave the lowest values.

Keywords: Gladiolus -Ascorbic acid - Salicylic acid- bio-stimulants.

INTRODUCTION

Gladiolus grandiflorus, a member of the Iridaceae Family, ranks first among cut flowers in Egypt. The "Advance Red" variety is highly prized by Egyptian and Arab tastes due to its bright, shiny red flowers. It is grown in Egypt for corm production, as a cut flower for export or due to the high demand in the local market . It is also suitable for planting in public and private gardens and flower exhibitions. However, production has recently been exposed to several risks due to adverse weather conditions and climate change. Egyptian soil also suffers from high alkalinity and increased salinity due to increased concentrations of mineral and organic pollutants. To produce bulbs or cut flowers that meet international standards and competitive quality, this may require an appropriate fertilization program that stimulates growth and flowering and increases the plant's resilience to weather fluctuations and soil salinity. Recently, it has become necessary to fertilize with environmentally friendly and safe materials to avoid increasing the concentrations of salts and pollutants in the soil that appear in the long term (Gabra, 2017). Fertilizing plants with biological growth stimulants such as amino acids, organic acids, and vitamins has become remarkably active recently, in order to protect the soil form residual pollutants (Souri and Hatamian, 2019). These biostimulants have been shown to improve plant growth and flowering, particularly under conditions of biotic and abiotic environmental stresses (Aghaye Noroozlo et al., 2019 and Mohammadipor and Souri, 2019).

Vitamin C plays an important role in promoting plant growth, improving the quality of its characteristics, and increasing

its tolerance to biotic and abiotic stresses. It is a powerful antioxidant with a higher concentration in plants than other antioxidants such as carotenoids, tocopherols, and polyphenols. It helps protect plant cells from damage caused by free radicals and oxidative stress. It also stimulates plant growth by stimulating photosynthesis, increasing nutrient uptake, improving protein production, cell division and elongation (Horemans et al., 2000), and enhancing root formation. Ascorbic acid also helps plants withstand harsh environmental conditions such as drought, salinity, high temperatures, exposure to heavy metal pollution, irrigation water shortages, soil alkalinity, and exposure to intense light (photo stress). It then enhances signal transmission to guard cells and stomata closure to limit photosynthetic activity (Smirnoff and Wheeler, 2000), preventing cell membrane damage and cell death resulting from overproduction or toxicity by reactive oxygen species (ROS), such as singlet oxygen ($^1O1$), superoxide anion ($O2^{\cdot -}$) , hydroxyl radicals, and hydrogen peroxide(H_2O_2). It protects the photosynthetic apparatus and cellular components from oxidative damage resulting from excessive ozone production. This is because ascorbic acid is an important cofactor in oxidation and reduction processes (Asada and Takahashi, 1987). Ascorbic acid also serves as an enzyme cofactor in the synthesis of some plant hormones such as ethylene, gibberellins, abscisic acid, and anthocyanins. It can also be used as a foliar spray to increase nitrogen and chlorophyll concentrations. It is also used for soil irrigation to enhance nutrients absorption, especially in alkaline soil conditions that retain nutrients (Gallie, 2013). Abdel-Aziz et al. (2009) on *Gladiolus grandiflorus* L., indicated that application of Ascorbic Acid (AsA) significantly increased all growth traits and some chemical components. While, Abo Leila and Eid, 2011) stated that Gladiolus plants treated with 200ppm ascorbic acid +200ppm thiamin, gave the best growth, delayed flowering, vase life quality, cormels induction and increased macro nutrients status, whereas Gabra (2017) suggested that, all the highly significant values of vegetative growth, flowering characters, corm productivity and chemical constituents of *Gladiolus grandiflorus* L.,cv. " White Prosperity" resulted from the treatments of MATERNA® 1 tablet/l (Vitamins and Minerals) as a foliar spray + Microben 1g /pot + 3g Kristalon/plant and (MATERNA® 1 tablet/l as a foliar spray + Microben 1g /pot) in both seasons. Also, Ahmed and Saleh (2023) studied the response of two cultivars *Freesia hybrid* cv. "red" and "yellow" to spraying with gibberellic and ascorbic acid and they found that, all plants treated with any growth regulators caused a significantly increase in growth and flowering traits and chlorophyll content in comparison with unsprayed plants.

In 1928, John Buchner first extracted salicylic acid naturally from the willow plant (*Salix spp.*). Salicylic acid is a naturally occurring plant growth regulator. It is a phenolic derivative that has several physiological functions, such as plant growth and development, as well as several vital functions such as photosynthesis, metabolism, cellular and protein synthesis, stomatal closure, and gas exchange. It also strengthens the plant's immune system, protecting it from diseases and increasing the effectiveness of antioxidants and enzymes. It also stimulates flowering, increases flower quality, and helps the plant to absorb and transport elements within the plant (Al-Hashemi and Abdaljabar, 2024). Salicylic acid is important for plant tolerance to abiotic stresses, specially drought, and it also plays multiple roles in regulating plant metabolism (Muthulakshmi

and Lingakumar, 2017). Also, in protecting plants from frost, and salinity by resisting the formation of reactive free oxygen radicals (ROS), which destroy cell membranes by oxidizing unsaturated fatty acids and inhibiting the activity of antioxidant enzymes (Parashar et al., 2014) . The positive effect of salicylic acid on growth and productivity is also attributed to its direct effect on other plant hormones, as it affects auxin and cytokinin levels. It also plays a role in increasing the number of flower buds compared to vegetative buds (Kumar et al., 1999). It also accelerates the formation of chlorophyll, carotenoids and anthocyanins and photosynthesis by stimulating the formation of grana plates, developing the chlorophyllase enzyme, and inhibiting the action of chlorophyllase enzymes, which naturally have a positive effect on enzyme activity. It also plays a role in the process of thermoregulation in plants, in addition to increasing the plant 's resistance to microbial and insect diseases (Hayat and Ahmad, 2007). Al-Hashemi and Abdaljabar (2024) stated that, spraying and soaking certain types of bulbs in salicylic acid has yielded the best quality specifications for growth, flowering, and bulb production for many ornamental bulbs, such as gladiolus, lily, tulip, narcissus and tuberose. Saja and Ammar (2022) indicated that spraying of three cultivars of *Gladiolus hortulanus* L. with SA at 250 ppm had a significant effect producing the highest values for the corms productivity, vegetative growth and flowering characteristics, as well as total sugars accumulated in the corms, total chlorophyll content of leaves and the percentage of dry matter when sprayed with salicylic acid on the red variety comparison with the other two varieties (white and purple). While, Abdou et al. (2014) indicated that salicylic acid + ascorbic acid at 100 ppm for each, followed by ascorbic acid alone at 200 ppm were the moste effective in improving all vegetative growth and flowering parameters of *Gladiolus grandiflorus* cv. White Prosperity. On the same plant, Sajjad et al. (2014) found a relationship between salicylic acid and the growth and development in *Gladiolus grandiflorus* cv. White Prosperity.

Spraying with salicylic acid at 200 ppm led to a significant increase in the plant height, number of leaves /plant, leaf area, total chlorophyll as well as early appearance of blooming, early appearance of colour vision in bud and also increase the stalk length, early sprouting of *Liliumasiatic* hybrid Tresor (Pahare et al., 2022). Whereas, Amin et al. (2021) stated that *Narcissus tazetta* treated with NPK at 2 g/plant + salicylic acid at 200 ppm achieved the highest values of all morphological characteristics of plants, as well as chemical contents such as chlorophyll-a,b and the percentage of nitrogen, phosphorus and potassium compared to untreated plants, however, the treatment of salicylic acid at 100 ppm (with NPK at 2g/plant) had the highest stimulative effect on flowering characteristics and vase life of cut flowers.

MATERIALS AND METHODS

The plants of experiment were cultivated in Al-Harrery village in El-Montaza district at the East of Alexandria, Egypt, for two consecutive seasons 2021-2022 and 2022-2023. This study tested the effect of some non-conventional alternative feeding programs like ascorbic and salicylic acids by spraying, soaking and soil drench, on the criteria of flowering quality, cormels marketability, vase life and chemical components of *Gladiolus grandiflorus* cv. “Advance Red”.

The gladiolus corms cv. “Advance Red” were imported from Holland and planted on October 7th and 10th for both seasons, respectively. Corms were selected

with almost identical specifications, with corm circumferences ranging from 7.5 to 8.5 cm and a weight ranging from 5.5 to 6 g. Corms were then planted in plastic pots with a diameter of 20 cm filled with a mixture of clay and sand soil at a ratio of 1:1 at a depth of 5 cm (1 corm/pot). The weight of the potting mixture soil was 5 kg. The averages chemical and physical analysis of the soil during the two seasons are shown in **Table (1)** , according to (Jakson, 1967).

Feeding programs treatments were performed using: First, ascorbic acid, or vitamin C, in tablet form. This is a pharmaceutical product called " Vitacid C 1gm", produced in Egypt by the Chemical Industries Development Company (CID) Giza A.R.E.G.C.R. 19717, at a rate of 1 tablet/10 liters, equivalent to 100 mg/ liter of tap water. Second, acetylsalicylic acid, also in medical tablet form, under the name "Revo Micro" (Acetylsalicylic acid 320 mg), produced by the Arab Company for Pharmaceuticals and Chemical Industries, Al Amyria, Cairo- A.R.E., at a rate of 3 tablets per 10 liters, equivalent to 96 mg / liter.

As for the methods of applying feeding program doses, they were all as follows:

First, all foliage spraying treatments, whether with one acid or both acids together, were in done in three batches (stages): a- when the leaves reached a height of 20 cm, b- at the beginning of the appearance of the flower bud, and c- after picking the flowers. And the interval was a week between one spray treatment and the other with both acids .

Second, all soil drench treatments were also applied in three batches at the same growth stages as the previous ones, using the same spray concentration, but at a rate of 200 ml per pot until the potting soil was saturated. One week was the interval between soil drench treatments with both acids.

Third, the soaking treatments: involved soaking the corms for two hours in the same concentrations of acids. Treatments that required soaking in both acids involved soaking the corms in ascorbic acid for two hours, followed by soaking them in acetylsalicylic acid for another two hours.

The treatments were as follows:

1- Control.
2- Sal. A. F. spray (foliar spray with acetylsalicylic acid, 96mg/l).
3- V.C.F. spray (Vitacid C foliar spray, 100mg/l).
4- Sal. A. corm D. (corms soaking with acetylsalicylic acid, 96mg/l for 2 hours).
5- Sal. A. soil dr. (soil drench with acetylsalicylic acid, 96mg/l for 200ml/pot).
6- V.C. soil dr.(soil drench with Vitacid C, 100mg/l).
7- V.C. corm D. (corms soaking with Vitacid C, 100mg/l, for 2 hours).
8- Sal. A. + V.C.F. spray (foliar spray with acetylsalicylic acid and Vitacid C with96mg/l and 100mg/l respectively).
9- Sal. A. + V.C. soil dr. (soil drench with acetylsalicylic acid 100mg/l and Vitacid C with96mg/l respectively).
10- Sal. A. + V.C. corm D. (corms soaking with acetylsalicylic acid and Vitacid C with 96mg/l for 2 hours and 100mg/l for 2 hours respectively).

The Complete Randomized Design (CRD) was the experimental design including 10 treatments, 3 replicates and 4 pots/treatment. The difference between the mean values of treatments were tested by Duncan's Multiple Range Test according to Snedecor and Cochran (1974) in both seasons, except for the analysis of NPK in the plants, it was the average of the two seasons together.

Data recorded for vegetative growth traits were as follows, as in **Table (2):** Foliage length (cm), number of leaves/plant, fresh and dry weight/plant (g). While, for

the data recorded for the floral growth traits, they were as shown in **Tables (3 and 4):** Flowering date, diameter of floret (cm), number of florets/spike, length of spike (cm), fresh and dry weights of spike (g) and vase life (day). Also, data expressing the productivity traits of corms, as in **Table (5),** were: Number of corms/plant, number of cormels/plant, corm diameter (cm), fresh weight of corm (g) and fresh weight of cormels (g). As for the chemical analysis characteristics, they appear in **Table (6)** as follows: Total chlorophyll (mg/g F. wt. of leaves) according to (Moran,1982) were for each season separately. While, N% according (Evenhuis and Deward,1980), P % due to (Trough and Meyer,1939) and K % was determined according to (Brown and Lilliland, 1946), data of N %, P % and K % were the average of both seasons combined together.

Table (1). Physical and chemical analysis of the used experiment mixture soil (average of both seasons).

Soil particles	Value	Chemical analysis	Unit	Value
Clay	43.69 %	Total N	%	1.66
Silt	23.22 %	Total P	ppm	13.97
Sand	33.09 %	K^+		2.02
Texture	Clay loam soil	Ca^{++}		1.01
Ec. dS/m	1.083	Mg^{++}		1.18
		Na^+		1.62
pH	7.9	HCO_3^{--}	meq/l	1.78
		Cl^-		1.93
		$SO4^{--}$		2.12

RESULTS AND DISCUSSION

1. Characteristics of vegetative growth and development:

Data in **Table (2)** showed the characteristics of vegetative growth and development was progressively increased by the treatment of (Sal. A + V.C. soil dr.) in the two seasons. Meanwhile , V. c. f. spray and Sal. A. soil dr. gave the same value but the untreated plants gave the lowest values in both seasons. Data registered in **Table (2)** indicated that treating plant with Sal. A + V.C. soil dr. and Sal. A + V.C. F. spray recorded the significantly highest No. of leaves, but Sal. A. soil dr. and V.C. soil dr. gave nearly the same. The plants gave the lowest number in this value in both seasons. The treatments of Sal. A + V.C. soil dr. significantly increased the F.W and D.W. of leaves to the highest value compared to control. However, the treatments of Sal. A. F. spray and V.C. F. spray gave the same value better and it was significantly better than the control that gave the lowest number (d, f).

This is due to the vital and physiological function of both ascorbic and salicylic acids in cell division, development and elongation within plants, as they are vital growth stimulants, metabolism, cellular and protein synthesis. These results are in agreement with the findings of Kumar et al. (1999), Horemans et al. (2000), Parashar et al. (2014) on *Brassica juncea*, Aghaye Noroozlo et al. (2019) on sweet basil, Mohammadipor and Souri (2019) on *Coriandrum sativum* plants and Al-Hashemi and Abdaljabar (2024) on some ornamental bulbs.

Table (2). Effect of some feeding program applications on vegetative growth parameters of *Gladiolus grandiflorus* cv. "Advance Red" during two seasons 2021-2022 and 2022-2023.

Feeding programs	Foliage length (cm)		No. of leaves/plant		Fresh weight of leaves (g)		Dry weight of leaves (g)	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Control	61.92 e	6.54 f	7.23 e	7.67 e	18.61 d	16.85 d	2.11 f	2.03 f
Sal. A. F. spray	79.98 c	84.67cd	8.85 bc	9.35 cd	23.28 b	21.29 b	2.52 cd	2.54 cd
V.C. F. spray	82.28 c	86.66bc	9.05 bc	9.46 c	23.16 b	21.33 b	2.58 cd	2.35 d
Sal. A. corm D.	72.64 d	76.42 e	8.44 c	8.35 d	20.91 c	17.34 cd	2.25 e	2.17 e
Sal. A. soil dr.	82.18 c	87.25 ab	9.42 ab	9.87 b	24.12ab	22.41ab	2.65 bc	2.89 b
V.C. soil dr.	85.24 b	88.5 a	9.45 ab	9.82 b	24.04 ab	22.10ab	2.79 a-c	3.01 ab
V.C. corm D.	72.38 d	79.55de	8.32 c	8.39 d	20.68 c	18.14 c	2.36 de	2.23 de
Sal. A + V.C. F. spray	87.04 ab	87.69 ab	10.24 a	10.09ab	24.8 ab	21.34 b	2.99 ab	2.86 b
Sal. A + V.C. soil dr.	89.01 a	89.5a	10.54 a	11.03 a	25.66 a	23.96 a	3.12 a	3.24 a
Sal. A.+V.C. corm D.	73.88 d	81.33d	8.74 bc	9.66 bc	21.28 c	18.19 c	2.39 d	2.67 c

Means in the column having the same letters are not significantly different (Snedecor and Cochran, 1974)

2. Flowering and blooming parameters:

Data exhibited in **Table (3)** show that treating plants with Sal. A+ V.C. as soil drench induced emergence of flowers after 99.21 days in the first season and 98.68 days in the second one respectively. The treatments of Sal. A. and V.C. as soil drench recorded 110.08 and 110.64 days in the first season and 115.48 and 113.22 days respectively. Whereas the control plants emerged the flowers after 129.25 and 127.94 days in the first and second seasons, respectively. The diameter of floret in response to the bio- stimulants as presented in the same Table, clearly showed that adding Sal. A + V.C. as soil drench was the best treatment followed by treatment of Sal. A + V.C. as foliar spray. While, the control showed the smallest value (6.03 and 6.01 cm) in both seasons was the bad number at this character. Also, No. of florets/spike was increase reaching the master number by the combined treatment (Sal. A+ V.C. as soil drench) resulting 14.88 and 14.68 florets/spike in both seasons, respectively, with percent increases of 64.87% and 58.96%, followed by the treatment of Sal. A+ V.C. as foliar spray. While the treatments, Sal. A. soil dr. and V.C. soil dr. which showed the same significantly effect but lower than the treatment of Sal. A + V.C. soil drench, however the control gave the lowest value. Negligible differences were noticed for length of spike (cm) resulted from using (Sal. A. soil dr. and V.C. soil dr.) treatments in both seasons. Meanwhile, the significantly highest values resulted from the combined treatment of Sal. A+ V.C. soil drench.

Table (3). Effect of some feeding program applications on flowering parameters of *Gladiolus grandiflorus* cv. "Advance Red" during two seasons 2021-2022 and 2022-2023.

Feeding programs	Flowering date (days)		Diameter of floret (cm)		No. of florets/spike		Length of spike (cm)	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Control	129.25 a	127.94 a	6.03 e	6.01 e	9.03 e	9.21 e	86.0e	93.66 e
Sal.A. F. spray	118.33 c	119.58cd	6.93 bc	6.84 c	12.43 c	12.06 c	112.22c	114.39 c
V.C. F. spray	115.27 c	117.34 d	6.87 bc	6.76 c	12.9 bc	12.31 c	112.17c	115.94 bc
Sal. A. corm D.	121.22 b	122.67b	6.37 c	6.23 d	10.13 d	11.03 d	100.67d	108.61 d
Sal. A. soil dr.	110.08 e	115.48de	7.17 a-c	7.23 bc	13.51 a-c	13.67 b	112.4c	118.02 b
V.C. soil dr.	110.64 e	113.22e	7.63 ab	7.68abc	13.87 a-c	13.85 b	114.83b	118. 96 b
V.C. corm D.	120.35 b	124.11ab	6.33 c	6.27 d	9.91 d	11.09 d	101.2d	109.75 d
Sal.A+V.C. F.spray	112.46 d	110.72f	7.83 ab	7.92 ab	14.03 ab	13.98 b	115.33b	116.59 bc
Sal.A+ V.C. soil dr.	99.21 f	98.68 g	8.13 a	8.04 a	14.88 a	14.64 a	120.17a	121.35 a
Sal.A.+V.C. corm D.	120.01 b	121.19bc	6.27 c	6.69 c	10.47 d	13.79 b	102.17d	116.28 bc

Means in the column having the same letters are not significantly different (Snedecor and Cochran, 1974)

For fresh and dry weights of spike (g), there were significantly highest values resulted from plant treated with Sal. A + V.C. soil drench, followed by Sal. A + V.C. Foliar spray, as well as all treatments produced the highest values of fresh and dry weights of spike when compared to control in the two seasons, as exhibited in **Table (4).** For vase life, all treatment except the control significantly extended the vase total life of cut flowers by freshness and quality, which extend storage period and transportation, moreover the treatment of Sal. A + V.C. as soil drench had the longest average storage life in two seasons , giving 13.00 and 12.93 days, respectively. Both salicylic and ascorbic acids are effective bio-stimulates that have a significant effect on flowering, increases flower quality and plays a role in increasing the number of flower buds/ spike. These results are consistent with what was achieved by Horemans et al. (2000), Smirnoff and Wheeler (2000), Gallie (2013), Muthulakshmi and Lingakumar (2017), Pahare et al.(2022) on *Liliumasiatic* hybrid Tresor, Saja and Ammar (2022) on three cultivars of *Gladiolus X hortulanus* L. and Ahmed and Saleh (2023) on two cultivars of *Freesia hybrid*.

Table (4). Effect of some feeding program applications on flowering parameters of *Gladiolus grandiflorus* cv. "Advance Red" during two seasons 2021-2022 and 2022-2023.

Feeding programs	Fresh weight of spike (g)		Dry weight of spike (g)		Vase life (days)	
	First season	Second season	First season	Second season	First season	Second season
Control	28.64 e	27.94 e	4.68 f	4.59 e	9.05 f	8.94 f
Sal. A. F. spray	36.98 b	36.28 bc	5.62 d	5.34 c	11.02 d	11.52 d
V.C. F. spray	37.15 bc	36.45bc	5.72 d	5.93 bc	11.57 cd	11.67 d
Sal. A. corm D.	31.47 d	30.77 d	5.07 e	5.02 d	10.02 e	10.43 e
Sal. A. soil dr.	38.44 b	37.44 bc	6.42 bc	6.34 b	12.07 b	12.38 b
V.C. soil dr.	38.85 b	38.15 bc	6.54 bc	6.68 b	12.23 b	12.52 ab
V.C. corm D.	31.65 d	30.95 d	5.18 e	5.07 d	10.16 e	10.64 e
Sal. A +V.C. F. spray	42.07 ab	41.37 ab	7.04 b	7.38 a	12.79 ab	12.74 a
Sal. A + V.C. soil dr.	45.08 a	44.38 a	7.53 a	7.62 a	13.00 a	12.93 a
Sal. A. + V.C. corm D.	34.52c	33.82 c	6.10 c	6.19 b	11.83 c	12.17

Means in the column having the same letters are not significantly different (Snedecor and Cochran, 1974)

3. Corms productivity:

Data exhibited in **Table (5)** indicated that number of corms and cormels/plant was increased by treatments of Sal. A + V.C. soil drench and Sal. A + V.C. F. spray followed by V.C. soil drench then V.C. corm soaking recorded significantly higher values in both seasons. Also, Corms diameter (cm) in the two seasons was increased by all treatments specially Sal. A + V.C. soil drench which was the most effective after that of Sal. A + V. C. F. spray and the control showed the lowest values. While, reading the effect of different additions of growth stimulants on F. W. of corms and F. W. of cormels/plant, the data illustrated in **Table (5)** revealed that, there were highly significant effects of treatments ,recording the highest value with Sal. A + V.C. soil drench in both seasons. Whereas, the (control) gave achieved the lowest values in this connection. That is because the positive effect of salicylic and ascorbic acids on growth and productivity, it is also attributed to their direct effects on plant hormones, as it affects auxin and cytokinin levels, this lead to the initiation of a strong rooting system. These data confirms the findings of Abdel-Aziz et al., 2009 on gladiolus plants , Abo Leila and Eid, 2011 on the same plants , Abdou et al., 2014 on *Gladiolus grandiflorus* cv. White Prosperity, Sajjad et al., 2014 on *Gladiolus* "White Prosperity", Gabra 2017 on the same cultivar; Saja and Ammar 2022 on three cultivars of *Gladiolus X hortulanus* L., Ahmed and Saleh 2023 on *Freesia hybrid* and Al-Hashemi and Abdaljabar 2024 on some flowering bulbs.

Table (5). Effect of some feeding program applications on corms productivity of *Gladiolus grandiflorus*, cv. "Advance Red" during two seasons 2021-2022 and 2022-2023.

Feeding programs	No. of corms /plant		No. of cormels /plant		Corm diameter (cm)		Fresh weight of corm (g)		Fresh weight of cormels (g)	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Control	1.05 e	1.12 e	32.67 g	39.54 g	2.23 f	2.52 f	8.24 g	7.32 f	16.21 f	17.73 e
Sal. A. F. spray	2.09 c	2.07 cd	44.35e	48.66 d	2.73 de	3.54 d	9.87de	9.42 d	19.42 e	21.21 c
V.C. F. spray	2.29 bc	2.22 c	47.95 d	49.48 d	2.89 d	3.78 c	10.02d	9.59 d	22.67 c	22.12 c
Sal. A. corm D.	1.28 d	1.76 d	42.96 f	42.68 f	2.66 e	2.95 e	9.16f	8.97 e	20.38 d	19.09 d
Sal. A. soil dr.	2.38 bc	2.49 b	50.44 c	52.82 bc	3.49 c	4.12 b	10.84bc	10.72 c	22.96 c	24.75 b
V.C. soil dr.	2.59abc	2.54 b	52.75bc	53.94 b	3.97 b	4.24 b	10.92bc	10.84 c	23.43 b	25.67 ab
V.C. corm D.	1.18 d	1.78 d	42.88 f	45.22 e	2.69 e	3.04 e	9.58e	9.03 e	20.05 d	19.34 d
Sal. A +V.C. F. spray	2.78 ab	2.82 ab	53.37 b	54.76 ab	4.43 a	4.61 a	11.54 b	11.42 b	27.95 a	27.83 a
Sal. A + V.C. soil dr.	3.17 a	3.02 a	58.64 a	56.39 a	4.78 a	4.93 a	13.03 a	12.98 a	30.34 a	28.42 a
Sal. A .+ V.C. corm D.	1.46 d	2.04 cd	51.83bc	52.17 c	4.09 b	4.08 b	10.57c	11.06 bc	23.53 b	25.83 ab

Means in the column having the same letters are not significantly different (Snedecor and Cochran, 1974)

4. Chemical components:

Data illustrated in **Table (6)** demonstrated that all treatments improved total chlorophyll content in leaves compared with control in both seasons. Moreover, the superiority was using Sal. A+ V.C. soil drench, followed by Sal. A + V.C. F. spray. Also, all the treatments used led to increasing in the percentages of nitrogen, phosphorus and potassium, and the highest percentages resulted from treating gladiolus by Sal. A + V.C. soil drench, but the control recorded the lowest levels in the two seasons. So, these results are due to the activity of ascorbic and salicylic acids, which stimulates the absorption of mineral elements and to its role as a cofactor in enzymatic activity like chlorophylls enzyme, antioxidants and producing chlorophyll, carotene, anthocyanin's and photosynthesis. Similar results were reported by Smirnoff and Wheeler, (2000); Hayat and Ahmad, (2007) on many plants; Abo Leila and Eid, (2011) on gladiolus plants; Gallie, (2013); Sajjad et al., (2014) on Gladiolus cv. "White Prosperity"; Amin et al., (2021) on *Narcissus tazetta* plants; and Al-Hashemi and Abdaljabar, (2024) on some flowering bulbs.

Table (6). Effect of some feeding program applications on chemical components of *Gladiolus grandiflorus* cv. "Advance Red" during two seasons 2021-2022 and 2022-2023.

Feeding programs	Total chlorophyll (mg/g F. wt of leaves)		N (%DW)	P (%DW)	K (% DW)
	First season	Second season	Average of the two seasons		
Control	2.29 d	2.31 e	1.55 f	0.18 f	1.03 g
Sal. A. F. spray	2.72 bc	2.54 cd	2.07 e	0.29 d	1.79 e
V.C. F. spray	2.75 bc	2.62 c	2.14 d	0.31 cd	1.83 d
Sal. A. corm D.	2.64 c	2.42 d	1.89 ef	0.25 e	1.72 f
Sal. A. soil dr.	2.76 bc	2.84 b	2.21 cd	0.35 c	1.81 de
V.C. soil dr.	2.79 bc	2.96 ab	2.29 c	0.39 b	1.86 cd
V.C. corm D.	2.67 c	2.46 d	1.95 e	0.28 de	1.74 ef
Sal. A +V.C. F. spray	2.95 ab	3.02 a	2.52 b	0.40 ab	2.04 b
Sal. A + V.C. soil dr.	3.15 a	3.07 a	2.84 a	0.42 a	2.18 a
Sal. A. +V.C. corm D.	2.82 bc	2.77 bc	2.24 c	0.37 b	1.92 c

Means in the column having the same letters are not significantly different (Snedecor and Cochran, 1974).
Data of N%, P% and K% were the average of both seasons combined together.

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الملخص العربي

اختبار بعض برامج التغذية علي معايير جودة الإزهار و الصفات التسويقية لكرمات الجلاديولس صنف "الاحمر المتقدم".

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الجلاديولس صنف "الاحمر المتقدم" من الازهار الجذابة لدي الذوق المصري والعربي. وهو من ازهار القطف المميزة كما يزرع في الحدائق والمتنزهات لجمال ازهارة، وقد يتعرض الجلاديولس لاجهادات قلوية التربة في معظم الاراضي المصرية. وللحصول علي برامج تغذية صديقة وآمنة علي البيئة دون الحاجة للتسميد الكيماوي الذي يسبب تلوث التربة بالمعادن الثقيلة متبقية الاثر بعيدة المدي، لذا فقد هدفت التجربة لاستخدام بعض برامج التغذية بكل من احماض السالسيلك والاسكوربيك (فيتامين سي) سواء بالرش او النقع او الاضافة بغمر التربة او الدمج بينهم بهدف تحسين النمو الخضري وجودة الازهار وتحقيق انتاجية عالية من الكورمات ذات صفات تسويقية مرتفعة، وكل من الاسكوربيك والسالسيليك من محفزات النمو التي تنتج طبيعيا داخل النباتات بصفة عامة ومع زيادة تركيزها نتيجة الاضافة كمغذيات فتزداد فاعليتها الحيوية اذ تعمل كمضادات للاكسدة ومحفزة لانتاج الانزيمات والبروتينات وتساعد علي امتصاص العناصر الغذائية من التربة كما تساعد علي انقسام واستطالة الخلايا وتثبيط انتاج الشوارد الحرة، و حققت المعاملة (بحامض الاسكوربيك 100ملجم/لتر + حامض السالسيليك 96 ملجم/لتر كإضافة للتربة عن طريق الري) افضل النتائج في جميع الحالات متبوعة بالمعاملة (بحامض الاسكوربيك 100ملجم/لتر + حامض السالسيليك 96 ملجم/لتر كرش علي المجموع الخضري للنبات) مقارنة بالكنترول أو النباتات غير المعاملة والتي أعطت اقل قيم متحصل عليها.