

STIMULATIVE EFFECTS OF SEAWEED AND ACTIVE YEAST EXTRACTS AS FOLIAR TREATMENTS ON GROWTH AND PRODUCTIVITY OF *GLADIOLUS GRANDIFLORUS* ANDREWS ‘WHITE PROSPERITY’

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ABSTRACT: In view of the availability, safety and beneficial effects of both yeast at 0, 3, 5 and 7 g/l and seaweed extract at 0, 50, 100 and 150 ppm, the current experiment aimed at studying the ability of different concentrations of both substances to enhance growth, flowering and corm production of gladiolus ‘White Prosperity’ plants. The results showed that both dry yeast extract and seaweed extract are promising growth stimulants for gladiolus plants. It is obvious that the heaviest and longest spikes and rachis were obtained in gladiolus plants subjected to the foliar application of 5 g/l yeast alone. When yeast at 5 g/l was combined with seaweed extract at 100 or 150 ppm, the longest flowering duration was recorded. Increasing yeast concentration to 7 g/l in combination with seaweed extract at 100 ppm showed the best characteristics of the new corm including corm FW, DW and diameter. However, the combination of yeast at 5 g/l and seaweed extract at 50 ppm produced the highest number of cormels/corm. Accordingly, it could be recommended to spray gladiolus plants cultivated for the production of cut flowers with yeast extract at 5 g/l combined with seaweed extract at 100 ppm. Meanwhile, for the purpose of cormels production, it is recommended to use 7 g/l yeast with 100 ppm seaweed extract.

Key words: Yeast, algae, flower bulbs, sword lily, bio-stimulants

INTRODUCTION

Gladiolus is considered one of the most important cut flowers worldwide (Benschop *et al.*, 2010). It belongs to the family Iridaceae and is known as ‘Sword lily’ due to its sword-like leaves. To meet the production demand from gladiolus as a famous beloved cut flower all over the world, the availability of high-quality corms is a prerequisite matter. Local production of gladiolus corm in Egypt has deteriorated year after year, as it has been reported by several specialists and authors such as Khattab *et al.* (2016) and Bazaraa (2014). Accordingly, gladiolus cut flower production in Egypt has depended on

the annually imported corms from the Netherlands. This has been interrupted recently by the unprecedented global spread of COVID-19, which negatively affected the availability of the imported corms and high prices. To overcome these problems, much effort is needed to optimize the conditions of corm production locally.

Much effort has been done by several authors to improve the growth and productivity of gladiolus employing various technologies of agricultural practices along with growth substances. With the rise of environmental concerns about the use of agricultural chemicals, it has been a must to

look for safe and eco-friendly natural alternatives. Some natural substances such as yeast and seaweed had been used in the past for centuries in many life activities including agriculture. With the increased interest in the sustainability of modern agriculture, the application of yeast and seaweed extracts (SWE) has attained achievements in different aspects of agriculture including sexual and vegetative propagation, improving plant vegetative and flowering growth, acquired resistance against biotic and abiotic stresses in addition to the improvement of the soil (Ghaderiardakani *et al.*, 2019).

The simulative effects of SWE on plant growth and development have not yet been clearly comprehended. However, such effects may be attributed to direct or indirect impacts of the detected phytohormones and other growth-promoting components in SWE (Wally *et al.*, 2013). Several groups of phytohormones have been detected in SWE such as auxins and cytokinins, which are known for their direct promoting effect on plant growth and productivity. SWE components could indirectly provoke plant growth responses through triggering plant signaling pathways (Ghaderiardakani *et al.*, 2019). Several authors proved that SWE has a plant growth-promoting effect and it has shown favorable effects on vegetative growth, flowering and productivity of many plant species (Ibrahim, 2020). Gladiolus growth and flowering showed a positive response to the application of SWE (Abdou *et al.*, 2021; Al-Saad, 2020; Mazrou, 2019; Pansuriya *et al.*, 2018a and b). Many other bulbous plants exhibited also similar responses such as *Hippeastrum hybridum* cv. "Baby star" (Soffar, 2021), *Narcissus tazetta* (Rizk and Elngar, 2020), and *Dahlia pinnata* (El-Alsayed *et al.*, 2018).

Active yeast extract has the advantage of being cheap, readily available and easy to prepare and apply with non-specialists once its beneficial activity to plant growth is proved. It is characterized by its high cytokinins content which plays an important role in plant growth as natural plant

hormones, which are known for their abilities to promote cell division and induce the proliferation of axillary buds. Other yeast extract components such as vitamin B, proteins and nutrients may show synergetic effects with phytohormones and hence support better plant growth and productivity (Ahmed, 2002). On *Freesia* plants, Atowa (2012) reported a noticeable enhancement in vegetative growth, flowering and corm characteristics and ascribed this effect to the enhancement in photosynthesis and cell division because of the high leaf content of chlorophylls as well as N, P and K nutrients in yeast treated plants. Yeast treatment also affects the diameter of the parenchymal cells of the mesophyll tissue and vascular bundle of gladiolus plants, which contribute to the promotion of plant growth (Al-Shewailly, 2020).

In view of the availability, safety and beneficial effects of both yeast and seaweed extracts, the current study aimed at studying the ability of different concentrations of both substances to enhance growth, flowering and corm production of gladiolus 'White Prosperity'.

MATERIALS AND METHODS

The present study involved a field trial conducted at the nursery of Faculty of Agriculture, Al-Azhar University Assiut Branch, Assiut governorate, Egypt during the two successive seasons of 2018/2019 and 2019/2020 to study the effect of yeast and seaweed extracts foliar spray on the cultivar 'White Prosperity' of *Gladiolus grandiflorus* Andrews.

This experiment was arranged in a 4x4 two-way factorial experiment in a split-plot design with three replicates, each experimental unit comprised 10 plants with a total of 480 plants for the whole experiment. Two substances were employed including active dry yeast (yeast) and seaweed extract (SWE). Dry yeast was dissolved in warm water (32 °C) with sugar (20 g/l) and kept for two hours for activation before the application. Treatments of yeast, (0, 3, 5 and

7 g/l) were randomly assigned to the main plots, whereas the 4 treatments of SWE (0, 50, 100 and 150 ppm) were the sub-plots. Untreated plants (control) were sprayed with distilled water. The corms used in the two experimental seasons were pre-cooled uniform corms of gladiolus ‘White Prosperity’ (8-10 cm circumference), which were imported from the Netherlands by Misr Flower Co., Cairo, Egypt. The corms were planted under open field conditions on November 25th of both seasons. Physical and chemical properties of the used soil were done according to the methods described by (Black *et al.*, 1965) and (Jackson, 1973) and listed in Table (1). The soil was prepared and divided into 100 x 50 cm beds oriented from East to West, each bed contained one furrow and represented an experimental unit. The corms were planted on one side of the furrow at a depth of about 7-8 cm and spaced 10 cm apart. Thus, every experimental unit contained 10 corms and every treatment contained 30 corms divided into 3 replicates. Treatments of both yeast and SWE were applied as foliar spray three times starting from 45 days after planting the corms and then applied two more times at 15-day intervals. One day was allowed between the application of yeast and SWE to avoid any leaching effect.

The plants were irrigated every 14 days until the beginning of March and then at 10-day intervals until April, 25th. Thereafter, the plants were kept till the corm digging date without irrigation to allow drying of the leaves and maturity of new corms and cormels. Every plant was fertilized as

recommended with 8 g of ammonium sulfate (20.6% N), 8 g calcium superphosphate (15.5% P₂O₅) and 4 g potassium sulfate (48% K₂O) as dressing beside each plant in four equal doses. The first was applied when the plants reached about 10-20 cm height (3 leaves stage), the second at mid of vegetative growth period and the third at the beginning of the appearance of inflorescence, while the fourth was immediately applied after picking the spikes in order to encourage the growth of new corms and cormels.

At the end of each season, the data were recorded on plant height (cm), number of days to flowering (from planting to the first flower bud opening), flowering duration (days), spike length (cm), rachis length (cm), number of florets/spike, fresh and dry weights of cut spikes (g), spike diameter (measured in cm at the base of stem after picking spikes). The basal part bearing four leaves was left to permit the growth of new corms and cormels. The productivity of corms and cormels was evaluated by recording the fresh and dry weights of the produced corm (g), corm diameter (cm) and cormels yield (number of the produced cormels/plant).

Data obtained were statistically analyzed as ANOVA in split-plot design and the means of the different treatments were compared using LSD test (the least significant difference) based on (Gomez and Gomez, 1984) using Statistix 8.1 (Analytical Software, 2008). Pearson's correlation coefficient was performed using Analyse-it Software (v. 5.6 for excel).

Table 1. Some physical and chemical properties of the used soil (average of both seasons).

Particle size distribution (%)			Texture grade	pH (1:2.5) soil suspension	EC. dS/m (1:5) soil extract	Total CaCO ₃ (%)	Organic matter (%)	Soluble ions (meq/l, soil paste)							Total N (%)	Total P (%)	Total K (%)	
Sand	Silt	clay						Anions			Cations							
								Cl ⁻	CO ₃ ⁼	HCO ₃ ⁻	SO ₄ ⁼	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺			
22.3	26.2	51.5	Clay	8.71	1.03	1.97	0.97	3.32	-	4.94	3.05	5.40	0.52	1.30	3.89	0.70	0.21	0.41

RESULTS

Vegetative growth and flowering:

Gladiolus plants subjected to the foliar application of yeast at 0, 3, 5 and 7 g/l and/or SWE at 0, 50, 100 and 150 ppm showed positive responses regarding the vegetative growth and flowering parameters compared to the control (non-treated plants). The variation among treatments was proved significant in both seasons using the two-way ANOVA at $p < 0.05$ concerning spike length, rachis length, spike fresh weight and number of days to flowering (Table, 2). The exception was the number of days to flowering, which didn't show significant variation in most cases.

It is clear from the data presented in Table (2) that spike length was increased in response to the yeast treatments at the two concentrations of (3 and 5 g/l) compared to the control, then significantly declined with the highest concentration (7 g/l). On the other hand, the application of SWE at concentrations of 50 and 100 ppm didn't affect spike length, while the highest concentration (150 ppm) exhibited a significant decline. The sole treatment of yeast at 5 g/l was superior compared to the other combined treatments. Rachis length showed almost similar performance to that of spike length and accordingly both spike and rachis lengths showed a very high positive correlation ($r=0.723$) according to Pearson's product correlation illustrated in Fig (1) and Table (4). Having a strong correlation with rachis ($r=0.809$) and spike lengths ($r=0.756$), spike fresh weight was also increased by the application of yeast especially the lowest concentration (3 g/l). Meanwhile, increasing the concentration of SWE showed nonsignificant improvement with the lowest concentrations (50 and 100 ppm) and a significant decrease with the highest concentration (150 ppm). The heaviest spikes were obtained with the treatment of yeast at 5 g/l compared to the other combined treatments.

It is clear that the tested treatments didn't affect the earliness of flowering as no significant variations were detected among treatments regarding the number of days to flowering. However, the flowering duration was significantly extended due to increasing yeast or SWE doses attaining the longest flowering duration when yeast at 5 g/l was combined with SWE at 100 or 150 ppm. The longest flowering duration was almost 3-fold that exhibited by the control treatment. A similar trend was observed during both seasons.

Corm and cormels production:

Different concentrations of yeast and/or SWE induced significant variations concerning corm fresh and dry weights, corm diameter and number of cormels/corm during both seasons as proved by the two-way ANOVA at $p < 0.05$ (Table, 3). Since only one new corm was produced by all treatments, it was sufficient to discuss corm characteristics, while the data of corm number was not presented. All corm characteristics including FW, DW and diameter were improved as the concentration of yeast was increased revealing the best results with the highest concentrations (5 and 7 g/l, respectively). In the same manner, increasing the concentration of SWE led to a significant enhancement in all corm characteristics. Combining the highest concentration of yeast (7 g/l) and the medium concentration of SWE (100 ppm) exhibited the best characteristics of the newly produced corm; FW, DW and diameter, compared with all the other combined treatments. The three parameters exhibited a highly positive correlation with each other (ranging from 0.685 and 0.826) as shown in Fig. (1) and Table (4).

The number of cormels/corm showed a similar trend to that of corm characters during both growing seasons. The elevated concentrations of yeast and SWE led to a significant increase in the number of cormels/corm compared to the control. The combination between yeast at 5 g/l and SWE at 50 ppm gave the highest number of

Table 2. Effect of active dry yeast and seaweed extract (SWE) foliar application on growth of gladiolus plant during 2018 and 2019 seasons (1st and 2nd, respectively).

Treatments		Spike length (cm)		Rachis length (cm)		Number of days to flowering		Flowering duration (days)		Spike fresh weight (g)	
Yeast (g/l)	SWE (ppm)	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
0	0	88.00	90.11	52.83	52.33	127.44	128.48	3.00	2.67	82.67	82.57
	50	90.69	92.44	51.73	51.51	127.27	128.19	5.00	5.00	86.07	86.96
	100	90.17	90.67	51.72	51.59	127.33	128.74	4.67	5.00	82.89	83.28
	150	84.55	85.67	49.83	50.59	127.44	127.33	4.33	4.33	73.67	75.97
	Mean	88.35	89.72	51.53	51.51	127.37	128.19	4.25	4.25	81.32	82.20
3	0	92.34	92.39	53.00	53.56	127.31	127.67	5.00	5.33	88.56	88.72
	50	93.00	94.00	52.55	52.81	128.11	128.48	5.00	5.33	88.56	88.76
	100	93.00	93.11	52.56	52.11	127.00	127.70	4.67	5.33	86.89	85.70
	150	90.33	91.33	49.45	50.56	127.56	127.74	6.67	7.33	85.33	85.74
	Mean	92.17	92.71	51.89	52.26	127.49	127.90	5.33	5.83	87.33	87.23
5	0	96.65	97.55	56.88	57.22	127.57	128.63	5.33	5.67	91.85	91.62
	50	93.55	94.78	53.83	53.88	127.11	127.67	5.67	5.67	90.44	91.09
	100	90.67	92.11	53.00	53.44	126.11	125.85	7.67	7.67	88.34	87.87
	150	87.22	89.85	47.89	49.15	126.11	126.26	7.33	7.33	72.39	75.31
	Mean	92.02	93.57	52.90	53.43	126.72	127.10	6.50	6.58	85.76	86.47
7	0	87.40	88.22	50.60	51.37	127.68	127.52	4.67	4.67	78.77	77.30
	50	90.44	92.22	51.00	52.56	127.44	127.33	5.00	5.33	82.00	84.25
	100	91.00	91.41	50.22	50.82	126.44	125.93	5.67	5.33	86.67	86.97
	150	87.89	88.87	47.44	47.78	126.33	126.48	4.33	4.33	70.33	72.63
	Mean	89.18	90.18	49.82	50.63	126.98	126.82	4.92	4.92	79.44	80.29
Means of SWE	0	91.10	92.07	53.33	53.62	127.50	128.07	4.50	4.58	85.46	85.05
	50	91.92	93.36	52.28	52.69	127.48	127.92	5.17	5.33	86.77	87.77
	100	91.21	91.83	51.88	51.99	126.72	127.06	5.67	5.83	86.20	85.95
	150	87.50	88.93	48.65	49.52	126.86	126.96	5.67	5.83	75.43	77.41
	Yeast	2.55	1.30	1.52	0.84	NS	0.69	0.67	0.76	1.31	0.65
LSD (0.05)	SWE	1.48	0.60	1.24	0.92	NS	0.77	0.75	0.63	1.70	1.51
	Yeast x SWE	2.95	1.20	NS	1.84	NS	NS	1.49	1.26	3.40	3.02

NS denotes nonsignificant differences using ANOVA

Table 3. Effect of active dry yeast and seaweed extract (SWE) foliar application on growth of gladiolus plant during 2018 and 2019 seasons (1st and 2nd, respectively).

Treatments		Corm fresh weight (g)		Corm dry weight (g)		Corm diameter (cm)		Number of cormels/corm	
Yeast (g/l)	SWE (ppm)	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
0	0	9.30	9.09	2.96	2.80	3.50	3.43	85.17	94.55
	50	12.25	12.75	3.05	3.27	3.68	3.66	133.94	134.67
	100	13.06	13.43	3.19	3.55	3.88	3.90	142.11	147.33
	150	11.95	12.33	3.06	3.22	3.71	3.73	118.78	120.44
	Mean	11.64	11.90	3.06	3.21	3.69	3.68	120.00	124.25
3	0	12.41	12.27	3.02	3.08	3.70	3.68	134.55	139.67
	50	12.37	13.32	3.19	3.74	3.71	3.76	134.22	137.11
	100	14.15	14.16	3.39	3.82	3.94	3.98	133.33	133.67
	150	12.81	13.04	3.00	3.26	3.81	3.94	128.56	126.85
	Mean	12.93	13.20	3.15	3.48	3.79	3.84	132.67	134.32
5	0	13.77	14.48	3.74	3.83	3.89	3.91	113.06	116.09
	50	15.03	15.57	3.77	4.00	4.03	4.08	166.11	167.51
	100	14.17	14.81	3.41	3.90	3.92	4.01	132.22	131.89
	150	12.94	13.49	2.98	3.27	3.91	4.02	132.67	131.59
	Mean	13.98	14.59	3.47	3.75	3.94	4.01	136.02	136.77
7	0	11.19	12.10	2.64	2.93	3.56	3.61	110.33	108.33
	50	13.69	13.94	3.20	3.62	3.87	3.88	138.33	140.36
	100	15.55	15.68	4.43	4.68	4.02	4.05	132.33	131.22
	150	13.81	14.88	3.51	3.74	3.92	4.02	132.45	131.03
	Mean	13.56	14.15	3.44	3.74	3.84	3.89	128.36	127.74
Means of SWE	0	11.67	11.99	3.09	3.16	3.66	3.66	110.78	114.66
	50	13.34	13.90	3.30	3.66	3.82	3.85	143.15	144.91
	100	14.23	14.52	3.61	3.99	3.94	3.99	135.00	136.03
	150	12.88	13.43	3.14	3.37	3.84	3.93	128.11	127.48
LSD (0.05)	Yeast	0.93	0.44	0.15	0.16	NS	0.03	4.65	1.93
	SWE	0.76	0.51	0.18	0.11	0.20	0.03	3.89	2.02
	Yeast x SWE	1.51	1.01	0.36	0.22	NS	0.06	7.78	4.04

NS denotes nonsignificant differences using ANOVA

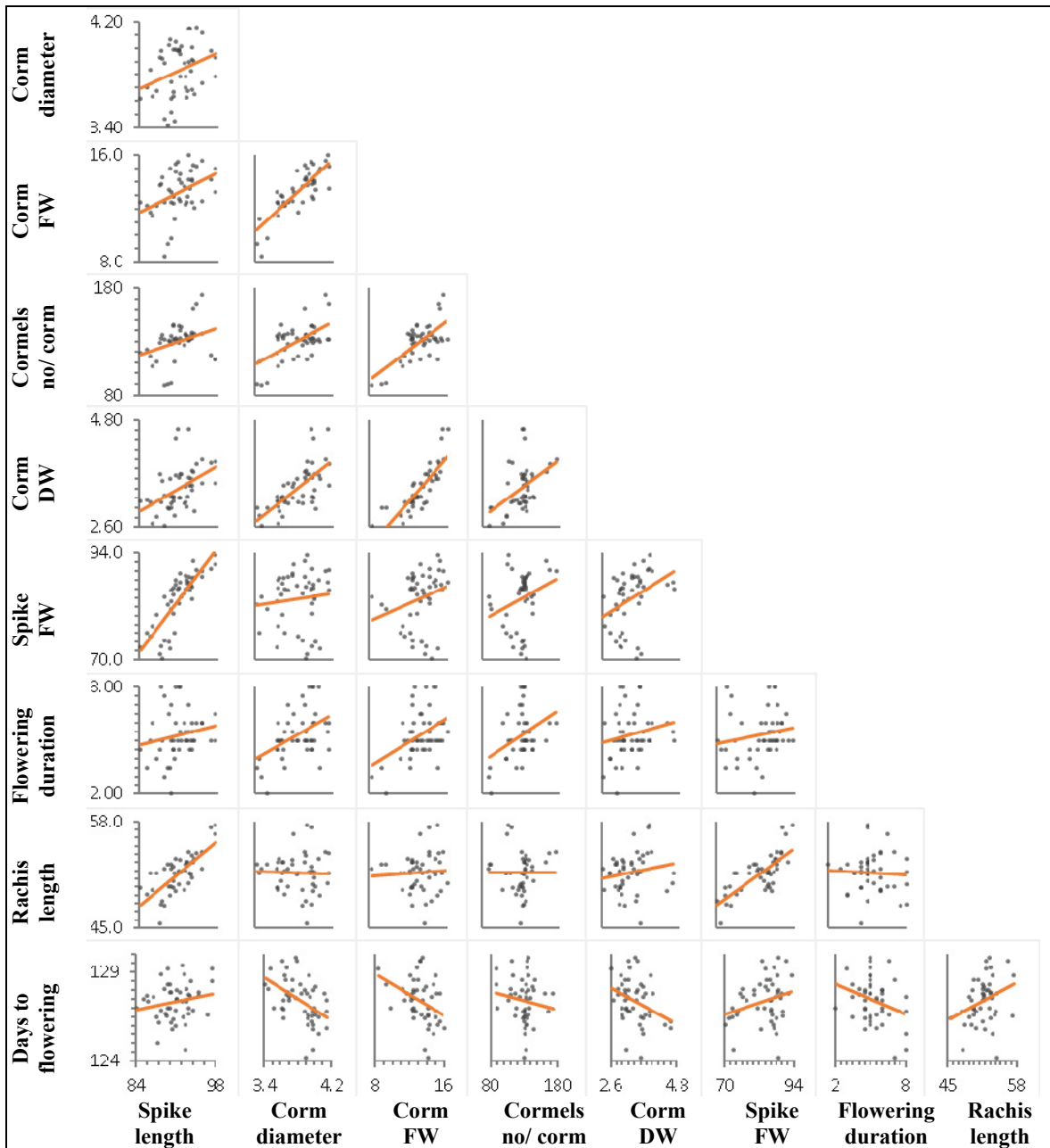


Fig. 1. Correlation scatter charts matrix including the trendline (orange-colored line) showing the trend of correlation among all growth traits of gladiolus plant across two growing seasons as affected by the application of active dry yeast and seaweed extract (SWE).

Table 4. Pearson's correlation coefficients among all growth traits of gladiolus plant across two growing seasons as affected by the application of active dry yeast and seaweed extract (SWE).

Characters	Spike length	Rachis length	days to flowering	Flowering duration	Spike FW	Corm FW	Corm DW	Corm diameter
Rachis length	0.723**	-						
Days to flowering	0.185	0.302*	-					
Flowering duration	0.184	-0.057	-0.295*	-				
Spike FW	0.809**	0.756**	0.270	0.175	-			
Corm FW	0.405**	0.062	-0.370**	0.421**	0.253	-		
Corm DW	0.443**	0.174	-0.335*	0.191	0.365**	0.825**	-	
Corm diameter	0.301*	-0.021	-0.465**	0.470**	0.105	0.826**	0.685**	-
Cormels no/ corm	0.329*	0.010	-0.142	0.371**	0.266	0.682**	0.436**	0.589*

*, ** Significant at the 0.05 and 0.01 probability levels, respectively

cormels which reached 166.11 and 167.51 in both seasons, respectively compared to 85.17 and 94.55 produced by the control (non-treated), which accounts for almost one-fold of the control results. The number of cormels was positively correlated with most of the assessed characters. The correlation was weak with spike length and flowering duration and was medium with the corm characteristics including corm FW ($r=0.682$), corm DW ($r=0.432$) and corm diameter ($r=0.589$).

DISCUSSION

To meet the production demand from gladiolus as a famous beloved cut flower all over the world, the availability of high-quality corms is a prerequisite. Local production of gladiolus corm in Egypt has deteriorated year after year as has been reported by several specialists and authors such as Khattab *et al.* (2016). Therefore, gladiolus cut flower production in Egypt has depended on the annually imported corms from the Netherlands. This has been interrupted recently by the unprecedented global spread of COVID-19, which negatively affected the availability of the imported corms or led to raising the prices. To overcome these problems, much effort is needed to optimize the conditions of corm production locally.

In the current study, two natural growth stimulants were evaluated for their capability to enhance flower and corm production of gladiolus plant. It is obvious from the obtained results that the heaviest and longest spikes and rachis were obtained in gladiolus plants subjected to the foliar application of 5 g/l yeast alone. The same concentration of yeast induced a longer flowering duration and a higher number of newly produced cormels/corm. However, better characteristics of the new corm were observed in gladiolus plants treated with the highest yeast concentration (7 g/l). In accordance with our results, Khattab *et al.* (2016) recommended treating gladiolus *Gladiolus grandiflorus* 'Rose Supreme' with yeast extract at 5 to 10 g/l for high-quality corms production. A similar stimulative trend for yeast extract at concentrations ranging from 4 to 6 g/l was also observed by Abdou *et al.* (2021) and Manoly and Nasr (2008) on vegetative growth parameters, flowering aspects, corm production and chemical constituents of gladiolus plants. Al-Shewailly (2020) recorded a significant effect of active yeast extract at 7 g/l on plant height, leaf area, the number of days required for the flowering and the duration of the flowering period. Similar results were reported for the effect of yeast extract on other bulbous plants such as *Hippeastrum*

hybridum cv. Baby star (Soffar, 2021). In another study conducted by (Atowa, 2012), *Freesia* plants treated with yeast extract at 5 g/l showed the highest leaf contents of chlorophylls, N, P and K nutrients. Meanwhile, the lower concentration (2.5 g/l) induced better growth and corms and cormels production.

This promotive effect of yeast extract could be attributed to its high cytokinins content, which plays an important role as natural plant promoting substances known for their ability to promote cell division and induce the proliferation of axillary buds. In addition, yeast extract was also reported to contain other important substances such as vitamin B, protein and nutrients, which help support better growth and corm production of gladiolus plant (Ahmed, 2002). This reflected in better photosynthesis and cell division, which in turn led to noticeable enhancement in vegetative growth, flowering and corm characteristics. A better understanding of the influence of active yeast extract on plant tissues was presented by Al-Shewailly (2020), who recorded a significant increase in the diameter of the parenchymal cells of the mesophyll tissue and vascular bundle of gladiolus plants treated with yeast extract at 7 g/l.

When yeast at 5 g/l was combined with SWE at 100 or 150 ppm, the longest flowering duration was obtained. Increasing yeast concentration to 7 g/l combined with SWE at 100 ppm showed the best characteristics of the new corm (FW, DW and diameter). However, the combination of yeast at 5 g/l and SWE at 50 ppm produced the highest number of cormels/corm. Several previous studies reported significant enhancement of vegetative growth parameters and flowering aspects of various cultivars of gladiolus in response to the foliar application of SWE at 300 ppm (Abdou *et al.*, 2021; Al-Saad, 2020; Mazrou, 2019; Pansuriya *et al.*, 2018a and b). Similar results were reported for the effect of SWE on other bulbous plants such as *Hippeastrum hybridum* cv. Baby star (Soffar, 2021),

Narcissus tazetta (Rizk and Elngar, 2020), and *Dahlia pinnata* (El-Asayed *et al.*, 2018). The mechanism through which seaweed extract improves plant growth and productivity has been elucidated by several previous studies. It has been stated that SWE is rich in macro and micronutrients as well as several growth substances including amino acids and vitamins. These substances together with the high content of plant growth regulators (cytokinin, and auxins) in SWE strongly affect plants' metabolism and hence enhance vegetative growth, flowering and productivity (Karim *et al.*, 2017).

CONCLUSION

The current study showed that both dry yeast extract and seaweed extract are promising growth stimulants for gladiolus plants. It is obvious from the obtained results that the heaviest and longest spikes and rachis were obtained in gladiolus plants subjected to the foliar application of 5 g/l yeast alone. When yeast at 5g/l was combined with SWE at 100 or 150 ppm, the longest flowering duration was obtained. Increasing yeast concentration to 7 g/l in combination with SWE at 100 ppm showed the best characteristics of the new corm including corm FW, DW and diameter. However, the combination of yeast at 5 g/l and SWE at 50 ppm produced the highest number of cormels/corm. Accordingly, it can be recommended to spray gladiolus plants, which are cultivated for the production of cut flowers with yeast extract at 5 g/l combined with SWE at 100 ppm. Meanwhile, for the purpose of cormels production, it is recommended to use 7 g/l yeast with 100 ppm SWE.

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التأثيرات التنشيطية لمعاملات الرش الورقي بمستخلصات الأعشاب البحرية والخميرة النشطة على نمو وإنتاجية الجلاديولس صنف 'White Prosperity'

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في ضوء ما تتميز به مستخلصات الخميرة النشطة والأعشاب البحرية من توافرها واستخدامها الآمن وتأثيراتها النافعة على النباتات، فإن البحث الحالي يهدف إلى دراسة تأثيرهما بتركيزات مختلفة على تحسين النمو والتزهير وإنتاج الكورمات في نبات الجلاديولس صنف White Prosperity. وقد أظهرت النتائج أن كلاً من مستخلصي الخميرة النشطة والأعشاب البحرية تعتبر مواد واعدة كمحفزات لنمو نباتات الجلاديولس. حيث ظهر بوضوح أن أطول وأكبر وزن للسيقان الزهرية والأجزاء المزهرة قد تم التحصل عليها من المعاملة المنفردة بالخميرة بتركيز ٥ جم/لتر. في حين أن أطول فترات التزهير سجلت مع المعاملة المشتركة بين تركيز الخميرة ٥ جم/لتر والأعشاب البحرية بتركيز ١٠٠ أو ١٥٠ جزء في المليون. وبزيادة تركيز مستخلص الخميرة إلى ٧ جم/لتر وإضافته مع مستخلص الأعشاب البحرية بتركيز ١٠٠ جزء في المليون أظهرت الكورمات الجديدة الناتجة أفضل المواصفات من حيث الوزن الطازج والجاف والقطر. بينما تم الحصول على أعلى عدد للكوريمات الجديدة لكل كورمة نتيجة المعاملة المشتركة بين الخميرة بتركيز ٥ جم/لتر والأعشاب البحرية بتركيز ٥٠ جزء في المليون. وبناء على ذلك يمكن التوصية بمعاملة نباتات الجلاديولس المنزرعة بهدف إنتاج الأزهار بالرش بمستخلص الخميرة بمعدل ٥ جم/لتر مع مستخلص الأعشاب البحرية بمعدل ١٠٠ جزء في المليون، ومعاملة تلك النباتات المنزرعة لإنتاج الكورمات بالرش بالخميرة بمعدل ٧ جم/لتر مع الأعشاب البحرية بمعدل ١٠٠ جزء في المليون.