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Effect of various potassium levels on growth and development of different gladiolus cultivars

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Abstract

An experiment was conducted to determine the effect of various potassium levels on growth and development of different gladiolus cultivars at the University of Agriculture Peshawar, Pakistan during 2012. Three cultivars of gladiolus namely Balance, White Prosperity and FlevoBreezer and different levels of potassium (0, 100, 150 and 200 kg ha^{-1}) were used to investigate suitable cultivar, optimum level of potassium and its interaction in gladiolus. Cultivars were significantly different regarding days to spike emergence, spike length, number of florets $spike^{-1}$, days to first floret opening and size of corms. Cultivar Balance proved to be superior regarding spike length (71.84 cm), florets $spike^{-1}$ (12.13) and size of corms (4.87 cm). Cultivar FlevoBreezer showed significant earliness in spike emergence (67.27 days) and first floret opening (81.10 days). Potassium levels significantly affected days to spike emergence, spike length, number of florets $spike^{-1}$, days to first floret openingand size of corms. Potassium at the rate of 150 kg ha^{-1} significantly increased spike length (71.67 cm), florets $spike^{-1}$ (11.53) and size of corms (4.83 cm) which was not significantly different from that of 200 kg ha^{-1} K.Cultivar Balance supplied with 150 kg ha^{-1} K significantly increased spike length (76.87cm), florets $spike^{-1}$ (13.47) and size of corms (5.21 cm). Cultivar Balance and White Prosperity supplied with 150 kg ha^{-1} K are recommended for production of gladiolus in Peshawar.

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Introduction

Gladiolus (*Gladiolus grandiflorus*) belongs to family irridaceae and is usually called as the queen of bulbous flowers (Randhawa and Mukhopadhyay, 1985). It is native to South Africa and has been cultivated globally. Gladiolus flowers come in a wide array of shapes and colors. Gladiolus can be found in a variety of colors except clear blue. Its cultivation is increasing in the developing countries and in Pakistan; it is now among the highest priced cut flowers (Anonymous, 2003). Corms and cormels are the propagating materials for gladiolus. Cormels grow in between mother and daughter corms (Larson, 1992). It is a popular cut flower and is also used for exhibition and landscape. Gladiolus for landscape purpose may have low nutritional requirements but sufficient fertilizer should be applied when grown for commercial purpose like flowering spikes and corm yield. Balanced fertilizer is necessary for enhancing the flower and corms production in gladiolus. Potassium is one of the most important elements required for plant growth, affecting the vegetative/reproductive balance in many plants. Optimum potassium results in increased number of florets, lengthening of the spikes and speed up flowering in gladiolus (Wilfret, 1980).Proper potassium application also improves cormel growth and corm production (Bhattacharjee, 1981).As Gladiolus is gaining commercial importance in Peshawar so fertilizer application and cultivars should be standardized to meet the demand of the market. Keeping the importance of potassium for the better growth and flowering of Gladiolus the current research project was carried out with the following objectives.

1. To determine the best level of potash fertilizer for better growth and flowering of Gladiolus
2. To find out suitable cultivar for the agro climatic condition of Peshawar region.

Materials and methods

An experiment “effect of various levels of potassium on growth and development of different gladiolus cultivars” was carried out at Newly Developed Farm (NDF), Department of Horticulture, The University of Agriculture, Peshawar during 2012. Corms were planted in the month of April 2012. Different cultural operations like weeding, hoeing and irrigation were carried out regularly.

Nitrogen and phosphorus was applied at 100 kg ha^{-1} rate. Potassium and phosphorus was applied during the preparation of the land whereas nitrogen was given in split installments. Initially, nitrogen was given after plant emergence while second dose was applied at three leaves stage. Urea, Di ammonium phosphate (DAP) and Potassium sulfate were used as a source of nitrogen, phosphorus and potassium respectively. Corms were planted at a plant to plant distance of 20cm and row to row distance of 60cm (Zubair *et al.*, 2006). The experiment were laid out in Randomized complete block design (RCBD) with two factors split plot arrangement having main plot factor potassium and subplot factor gladiolus cultivars. Three levels of Potassium *viz.* control, 100 kg ha^{-1}, 150 kg ha^{-1} and200 kg $ha^{-1}$and three Gladiolus cultivars *viz.*Balance, White Prosperity and Flevo Breezer were used as treatments in the experiment.

Statistical analysis

The collected data was subjected to analysis of variance (ANOVA) according to Steel and Torrie (1980). After getting the significant variation, the mean was further assessed for differences through least significant difference (LSD) test. Data was recorded on Days to spike emergence, Days to first floret opening, Length of the spike (cm),and number of florets $spike^{-1}$,

Results and discussion

Days to spike emergence

Analysis of variance showed that various levels of potassium significantly affected days to spike emergence. Cultivars were significantly different from one another regarding days to spike emergence while their interaction was not significant. Mean values of different potassium levels showed that the spikes in plots fertilized with potassium at the rate of 200 kg ha^{-1} emerged lately (75.51) followed by the days to

spike emergence (73.52) in plots with 150 kg ha^{-1} potassium treatment whereas earlier spike emergence (66.22) was observed in plots supplied with no potassium (Table1). Similarly spikes of cultivar Balance emerged lately (75.44) followed by the days to spike emergence(70.45) in cultivar White Prosperity while earlier spike emergence (67.27)was noted in case of cultivar FlevoBreezer(Table1).These findings are in accordance with those of Zubair*et al.* (2006) who stated that earliness in spike emergence was observed with 100 kg ha^{-1} potassium fertilization while delayed spike emergence was recorded with potassium at the rate of 200 kg ha^{-1}. These results also support the findings of Wilfret (1980) who concluded that flowering is delayed in gladiolus with enhancement in potassium level.

Table 1. Effect of various potassium levels on days to spike emergence of different gladiolus cultivars.

	Potassium levels (kg ha^{-1})				
Cultivar	Control	100	150	200	Means
Balance	70.92	72.82	77.81	80.22	75.44 a
White Prosperity	65.03	68.73	73.23	74.81	70.45 b
FlevoBreezer	62.71	65.37	69.51	71.50	67.27 c
Means	66.22 d	68.97 c	73.52 b	75.51 a	

LSD values at 5% for potassium levels=1.561107

LSD values at 5% for cultivars =1.859732.

Table 2. Effect of various potassium levels on days to first floret opening of different gladiolus cultivars**.**

	Potassium levels (kg ha^{-1})				
Cultivar	Control	100	150	200	Means
Balance	81.95	86.35	91.77	92.51	88.14 a
White Prosperity	78.61	81.57	86.94	91.57	84.67 b
FlevoBreezer	71.56	79.78	84.47	88.59	81.10 c
Means	77.37 c	82.57 b	87.73 a	90.89 a	

LSD values at 5% for potassium levels=5.133

LSD values at 5% for cultivars =1.463

LSD values at 5% for interaction=2.926.

Days to first floret opening

Analysis of variance showed that there is a significant effect of potassium levels, cultivars and their interaction on number of days to first floret opening. Means of various potassium levels showed that delayed first floret opening (90.89) was observed for plants with 200 kg ha^{-1} potassium application while earliness of first floret opening (77.37) was recorded for control level (Table2). In case of cultivars, late first floret opening (88.14) was noted for cultivar Balance while first floret opening (81.10) resulted earlier in cultivar FlevoBreezer. Cultivar White Prosperity took an average of 84.67 days in opening its first floret.

Table 3. Effect of various potassium levels on spike length (cm) of different gladiolus cultivars.

	Potassium levels (kg ha^{-1})				
Cultivar	Control	100	150	200	Means
Balance	63.19	69.65	76.87	77.65	71.84 a
White Prosperity	59.66	62.16	72.60	75.58	67.50 b
FlevoBreezer	59.39	63.33	65.54	67.95	64.05 c
Means	60.75 c	65.05 b	71.67 a	73.73 a	

LSD values at 5% for potassium levels=4.907

LSD values at 5% for cultivars =2.098

LSD values at 5% for interaction=4.197.

Interaction showed that cultivar Balance with 200 kg ha^{-1} potassium treatment resulted in delayed first floret opening (92.51) while an average of 71.56 days to first floret opening was observed in cultivar FlevoBreezer fertilized with no potassium (Table2). An increase in potassium level, delayed first floret opening in all the cultivars. These results also support the findings of Zubair*et al.* (2006) who reported that delayed first floret opening occurred with the enhancement in potassium from zero to 200 kg ha^{-1}.

Table 4. Effect of various potassium levels on number of florets spike^{-1} of different gladiolus cultivars.

	Potassium levels (kg ha^{-1})				
Cultivar	Control	100	150	200	Means
Balance	10.32	12.24	13.47	12.49	12.13 a
White Prosperity	9.93	10.45	11.31	11.36	10.76 b
FlevoBreezer	8.45	8.06	9.82	9.19	8.88 c
Means	9.57 c	10.25 b	11.53 a	11.01 a	

LSD values at 5% for potassium levels=1.0385

LSD values at 5% for cultivars =0.43086

LSD values at 5% for interaction=0.8617.

Length of the spike (cm)

Analysis of variance revealed that various levels of potassium significantly affected spike length. All cultivars were significantly different regarding length of the spikes whereas their interaction was not significant. Increased spike length (73.73 cm) was observed in plants treated with 200 kg ha^{-1} potassium dose which was not significantly different from the plants fertilized with 150 kg ha^{-1} potassium (71.67 cm), while minimum spike length (60.75 cm) was recorded for control level (Table-3).

Mean data concerning different cultivars shows that lengthiest spikes (71.84 cm) were observed in cultivar Balance followed by White Prosperity (67.50 cm) while the shortest spikes of 64.05 cm lengths were recorded in cultivar FlevoBreezer. Cultivar Balance fertilized with 200 kg ha^{-1} potassium resulted in lengthiest spikes of 77.65cm lengths while the shortest spikes of 59.39 cm lengths were noted in cultivar FlevoBreezer fertilized with no potassium (Table3). These results are in agreement with Anil *et al.* (2000) who stated that potassium at the rate of 200 kg ha^{-1} resulted in highest spike length. These results are in conformity with the results of Arora and Khanna (1985) and Basavaraddy(2004) who reported that lengthiest spikes may be due to the genetic makeup of certain cultivars.

Number of florets spike^{-1}

Analysis of variance revealed that various levels of potassium and the interaction between potassium and cultivars significantly affected number of florets spike^{-1}. Cultivars were also significantly different regarding number of florets spike^{-1}. Upon the observation of means of potassium levels, maximum number of florets spike^{-1} (11.53) resulted in plots treated with 150 kg ha^{-1} which was statistically not different from that of 200 kg ha^{-1}. However minimum number of florets spike^{-1} (9.57) were noted in plots treated with no potassium which was not significantly different from the florets spike^{-1} (10.25) with application of 100 kg ha^{-1} potassium (Table4).

Highest number of florets spike^{-1} (12.13) was recorded for cultivar Balance while lowest number of florets spike^{-1} (8.88) was observed in case of cultivar FlevoBreezer. Number of florets spike^{-1} in case of cultivar White Prosperity was 10.76 which were intermediate between those of Cultivar Balance and FlevoBreezer. In case of interaction, highest number of florets spike^{-1} (13.47) was observed in cultivar Balance treated with 150 kg ha^{-1} potassium. However, minimum of 8.06 florets spike^{-1} were noted in cultivar FlevoBreezer supplied with 100 kg ha^{-1} potassium(Table4).The number of florets also decides the shelf life of the spikes. Fading process starts from

the lowest floret of the spike and proceeds towards the top most floret. Hence more number of florets will increase the shelf life of the spikes. The present findings support the results of Mukherjee *et al.* (1994) who stated that 200 kg ha^{-1} potassium dose resulted in highest number of florets.

Conclusion

It is concluded from the experiment that days to spike emergence, spike length, Florets $spike^{-1}$, days to first floret opening and size of corms were significantly affected by potassium levels. Cultivar Balance was superior in all the three cultivars tested. White Prosperity was ranked second on the basis of performance and results. Based on these conclusions Cultivar Balance and White Prosperity supplied with 150 kg ha^{-1} K are recommended for commercial production of gladiolus in Peshawar.

References

Anil S, Ahlawat VP, Gupta AK, Sehrawat A. 2000. Influence of nitrogen, phosphorus and potassium application on growth, flowering and corm production in gladiolus. Haryana Journal of Horticulture Sciences. **29,** 1-2, 71-72.

Anonymous. 2003. Directorate of Floriculture. Government of the Punjab, Lahore, Pakistan.

Arora JS, Khanna K. 1985. Evaluation of gladiolus cultivars. Journal of Research, Punjab Agricultural University **22,** 655-662.

Basavaraddy M. 2004, Evaluation of elite hybrids of gladiolus for cut flower production under transition tract of Karnataka.M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad.

Bhattacharjee SK. 1981. Flowering and corm production of gladiolus as influenced by corm size, planting depth and spacing. Singapore Journal of Primary industry **9(1),** 18-22.

Larson. 1992. Introduction to floriculture seconded. Academic press, London. 147 P.

Mukherjee S, Jana SC, Chatterjee TK. 1994. Effect of nitrogen and phosphorus doses on production of flowers and corms of gladiolus. Indian Agric. **38(3),** 211-213.

Randhawa S, Mukhopadhyay SP. 2000. Promising varieties of gladiolus for commercial floriculture. Haryana Journal of Horticulture Science. **24(3-4),** 197-203.

Steel RGD, Torrie JH. 1980. Principles and procedures of statistics, a biological approach. 2nd ed. McGraw Hill, Inc. New Yark, Toronto, London.

Wilfret GJ. 1980. Introduction to Floriculture, Academic press Inc., pp. 166-181.

Zubair M. Ayub G, Wazir FK, Khan M, Mahmood Z. 2006. Effect of potassium onprefloweringgrowthof gladiolus cultivars. Pakistan Journal Biological Science **1(3),** 36-46.