



Assessment of the Effects of NPK on Flowering Characters of Gladiolus (*Gladiolus grandiflorus* L.) cv. Big Time Supreme

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: Gladiolus the most important cut flower crop and as it has great demand in national and international flower market it is worthwhile to apply the experimental trial on it, in respect to estimate the flowering characters of Gladiolus.

Place and duration of Study: The field experiment was conducted at Horticultural Research Farm-I, Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow, (U.P), India. During the 2018-2019 and 2019-2020 rabi seasons.

Results: Replicated thrice having twenty three treatments in each replication. The minimum days taken to emergence of spike (102.21 and 101.04 days), The maximum number of spikes per plant (1.29 and 1.30), The minimum days to first floret opening (109.25 and 110.25 days), The maximum duration of flowering (15.55 and 15.85 days), The highest length of spike (87.35 and 88.05 cm), The highest number of florets per spike (15.12 and 16.13), The maximum diameter of floret (9.25 and 9.42 cm) and The maximum length of floret (9.85 and 9.92 cm) with the application of N 20g + P 15g + K 15g (T₁₆). Moreover, the treatment T₁₆ showed the best results on flowering characters of gladiolus. Appeared as the best practice for better flowering and therefore it may be recommended to boost up flower production and quality of gladiolus.

Keywords: *Gladiolus*; flowering characters; nitrogen; phosphorus; potassium.

1. INTRODUCTION

Floriculture is a focused branch of horticulture which pacts not only with the cultivation of flowers, trees, foliage, shrubs, climbers, cacti and succulents etc., but also with their marketing and production of value-added products from them. India has a long tradition of floriculture. and a number of flowering crops are grown. It is an ancient creative skill with mind and an advanced science that played a very important role during human civilization and its social development. In most part of the country, flower growing is carried out on small holdings and commercial floriculture has importance only in the recent past. Traditionally, flowers have been grown in India in the open fields, where they have been exposed to both biotic and abiotic stresses. Hence, the quality is not up to the standards. However, in the era of globalization, the produce should be of International quality and globally competitive, as there is demand for different floricultural products in the export market. The modern floriculture will meet the above demand of the present day's consumers. Cut flowers are precious products of horticulture. Maintaining good quality of cut flowers and extending the vase life, is considered important and practical for having acceptable products for the markets. In general, many studies have been under taken for this purpose- Mohammadi et al., [1]. *Gladiolus* (*Gladiolus grandiflorus* L.) is perennial bulbous flowering plant belongs to the family Iridaceae. Pliny and Elder coined the term *gladiolus* (AD 23-79). Mediterranean Europe, South Africa, Tropical Africa, Asia and are all native to it. The centre of diversity of the genus is located in the Cape Floristic Region. *Gladiolus* also known as sword lily or corn flag, gets its name from the Latin word *Gladius*, which refers to its sword-shaped leaves. It is one among the most popular cut flower ornamentals in India and across the world. *Gladiolus* is the fourth most popular cut flower in the global market after rose, carnation and chrysanthemum. Adopting integrated nutrition management techniques improved the production and quality of flowers and corms- Singh et al., 2006 [2]. *Gladiolus* is widely used as artistic garlands, floral ornaments, bouquets etc. The long flower spikes are excellent as cut flower for table decoration when arranged in vases. *Gladioli* contribute the most important item for aesthetic, economic and social appeal. Florets open sequentially from the base of the rachis and extension of longevity of these florets helps in

maintaining the economic value of these flowers for a longer time. The number of days a flower remains fresh in acceptable condition is the criterion for describing the keeping quality of flowers. Flower crops are very much responsive to fertilizer. It is highly capable of exhausting huge nutrients from native soil. So, it require higher amount of chemical fertilizer in balance proportion for ensuring maximum flower production. Fertilizer requirements of *gladiolus* like other crops, has vital role in growth, quality, corm and cormels production. There are some reports on the requirement of Nitrogen (N), phosphorus (P), potassium (K) and other fertilization in many countries. Major nutrients like nitrogen, phosphorus, potassium along with zinc noticeably increase the number of flowers, florets/spike, length of spike and flowering stem of *gladiolus*- Afify, 1989 [3]. Hence, present experiments were laid out to see the response of *gladiolus* to different doses of nitrogen, phosphorus and potassium under Lucknow reason.

2. MATERIALS AND METHODS

2.1 Description of the Study Site

The field experiment was conducted at Horticultural Research Farm-I in front of Gautam Buddha Central Library, Department of Horticulture, School of Agricultural Sciences and Technology (SAST), Babasaheb Bhimrao Ambedkar University (A central university), Vidya-vihar, Rae Bareli Road, Lucknow-226 025 (UP), India.-was undertaken during the month of October - April in 2018-2019 and 2019-2020 respectively. Geographically, Lucknow is situated at 26°76' N latitude, 80°92' E longitude and an altitude of (123) meter above mean sea level (MSL). The climate of the experimental site is subtropical with maximum temperature ranging from 19°C to 40°C in summer and 5.5°C to 19°C in winter and relative humidity ranging from 60-90% in different seasons of the year. Lucknow has a sub-tropical climate with hot, dry summers and cold winters, with an average annual rainfall of 800 to 1000 mm and 85 percent of rain fall during the monsoon season.

2.2 Experimental Design and Treatments

The layout of experimental field was laid down in Randomized Block Design and replicated thrice having twenty three treatments in each replication. The planting of corm took place on October 25th, 2018 and October 25th, 2019, in

the first and second years, respectively. Planting of corms were done in the evening at a spacing 25x25 cm (plant to plant and row to row) consisting of 16 plants per plot after 10 days light irrigation was applied in the field. The treatments were T₁ (Control), T₂ (N 20g), T₃ (N 40g), T₄ (P 15g), T₅ (P 30g), T₆ (K 15g), T₇ (K 30g), T₈ (N 20g+P 15g), T₉ (N 20g+P 30g), T₁₀ (N 20g+K 15g), T₁₁ (N 20g+K 30g), T₁₂ (N 40g+P 15g), T₁₃ (N 40g+P 30g), T₁₄ (N 40g+K 15g), T₁₅ (N 40g+K 30g), T₁₆ (N 20g+P 15g+K 15g), T₁₇ (N 20g+P 15g+K 30g), T₁₈ (N 40g+P 15g+K 15g), T₁₉ (N 40g+P 15g+K 30g), T₂₀ (N 20g+P 30g+K 15g), T₂₁ (N 20g+P 30g+k 30g), T₂₂ (N 40g+P 30g+K 15g) and T₂₃ (N 40g+P 30g+K 30g). Appropriate management practices were adopted.

2.3 Data Collection on Flowering Parameters

Randomly five plants were selected and tagged each plot to recorded the data on the following characters viz.- days to emergence of spike, number of spikes per plant, days to first floret opening, duration of flowering, length of spike (cm), number of florets per spike, diameter of floret (cm) and length of floret (cm). At the appropriate stage.

2.4 Harvesting of Spikes and Corms

Harvesting of spikes was done in morning hours with the help of secateurs when 1-2 florets showed colour. After 6-8 weeks of harvesting of spikes, corms were matured and ready for lifting. Lifting the corms was carried out manually with garden forks or "khourpas".

2.5 Statistical Analysis

Observations on flowering characters were recorded and statistically analyzed Gomez and Gomez, 1984 [4]. Data were subjected to one way ANOVA and means were separated at 5% level of Critical difference were obtained. All Flowering parameters were analyzed form OPSTAT.

3. RESULTS AND DISCUSSION

The result depicted in Tables 1 & 2 showed that the effect of NPK and their combinations of gladiolus cv. Big Time Supreme on days taken to emergence of spike was significantly influenced during the both years of experimentation (2018-19 and 2019-20) respectively. The minimum days taken to emergence of spike (102.21 and 101.04 days) was observed with the application of N 20g + P 15 g + K 15 g, which was noted at

par with N 20 g + P 15 g + K 30 g (102.98 and 101.41 days) and the maximum days taken to emergence of spike (107.12 and 106.21 days) was recorded in Control, the maximum number of spikes per plant (1.29 and 1.30) was recorded under treatment of N 20 g + P 15 g + K 15 g, which was obtained at par with N 20 g + P 15 g + K 30 g (1.26 and 1.27), while the minimum number of spikes per plant (1.05 and 1.06) was noted in control, the minimum days taken to first floret opening (109.25 and 110.25 days) was recorded with the application of N 20g + P 15 g + K 15 g, which was found at par with N 20 g + P 15 g + K 30g (109.95 and 110.83 days). However, the maximum days taken to first floret opening (114.12 and 115.05 days) was recorded in Control, the maximum duration of flowering (15.55 and 15.85 days) was recorded with the application of N 20 g + P 15 g + K 15 g followed by N 20g + P 15g + K 30g (14.88 and 14.98 days), while the minimum duration of flowering (11.35 and 11.55 days) was recorded in control, the maximum spike length (87.35 and 88.05 cm) was recorded with the application of N 20g + P 15g + K 15g followed by N 20g + P 15g + K 30g (86.80 and 87.54 cm). However, the minimum spike length (81.25 and 82.12 cm) was recorded in Control, The maximum number of florets per spike (15.12 and 16.13) was recorded with the application of N 20g + P 15g + K 15g followed by (14.95 and 15.85) under the treatment of N 20g + P 15g + K 30 g. However, the minimum number of florets per spike (12.05 and 13.15) was recorded in Control, the maximum diameter of floret (9.25 and 9.42 cm) was recorded with the application of N 20g + P 15g + K 15 g followed by N 20 g + P 15 g + K 30 g (8.95 and 8.99 cm). However, the minimum diameter of floret (7.05 and 7.35 cm) was recorded in Control and the maximum floret length (9.85 and 9.92 cm) was recorded with the application of N 20g + P 15g + K 15 g, which was noted at par with N 20g + P 15 g + K 30 g (9.55 and 9.66 cm). However, the minimum floret length (7.85 and 7.89 cm) was recorded in Control. This outcome has got the support of Singh et al., 2014 [5] also reported that the effect of INM was investigated on days taken for Earliest initiation of spike, opening of first floret, number longest duration of flowering, the maximum number of spikes per plant, maximum length of spike, maximum diameter of florets, maximum length of florets, maximum number of florets per spike and size of spike were observed with (Azospirillum + 75% N + 200 kg P₂O₅ + 200 kg K₂O), respectively. The NPK on growth and flowering of Alstroemeria cv. Capri. the maximum cut stems per plot, early

Table 1. Effect of NPK on flowering characters in Gladiolus cv. Big Time Supreme

Treatments	Days to emergence of spike		Number of spikes per plant		Days to first floret opening		Duration of flowering	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T ₁ - (Control)	107.12	106.21	1.05	1.06	114.12	115.05	11.35	11.55
T ₂ - (N 20g)	106.15	105.21	1.07	1.08	113.14	114.24	11.85	11.88
T ₃ - (N 40g)	106.54	105.41	1.09	1.10	113.54	114.35	11.89	11.99
T ₄ - (P 15g)	105.14	104.21	1.06	1.07	112.42	113.25	12.65	12.87
T ₅ - (P 30g)	105.45	104.25	1.08	1.09	112.55	113.54	13.25	13.35
T ₆ - (K 15g)	104.15	104.05	1.10	1.11	111.25	112.35	13.54	13.67
T ₇ - (K 30g)	104.15	103.25	1.12	1.13	111.32	112.40	12.26	13.25
T ₈ - (N 20g+P 15g)	104.13	103.26	1.11	1.12	111.21	112.41	13.25	12.88
T ₉ - (N 20g+P 30g)	103.01	103.26	1.14	1.15	110.05	111.25	13.54	13.87
T ₁₀ - (N 20g+K 15g)	103.25	102.45	1.16	1.17	110.25	111.30	13.87	13.95
T ₁₁ - (N 20g+K 30g)	104.25	103.26	1.13	1.14	111.25	112.35	13.64	13.88
T ₁₂ - (N 40g+P 15g)	104.54	103.25	1.15	1.16	111.35	112.25	13.25	13.75
T ₁₃ - (N 40g+P 30g)	103.25	102.24	1.18	1.19	110.25	111.24	12.54	12.95
T ₁₄ - (N 40g+K 15g)	103.54	102.14	1.16	1.17	110.35	111.35	12.85	13.05
T ₁₅ - (N 40g+K 30g)	104.05	103.25	1.19	1.20	111.15	112.32	13.25	13.85
T ₁₆ - (N 20g+P 15g+K 15g)	102.21	101.04	1.29	1.30	109.25	110.25	15.55	15.85
T ₁₇ - (N 20g+P 15g+K 30g)	102.98	101.41	1.26	1.27	109.95	110.83	14.88	14.98
T ₁₈ - (N 40g+P 15g+K 15g)	103.25	102.35	1.25	1.26	110.54	111.25	14.25	14.35
T ₁₉ - (N 40g+P 15g+K 30g)	103.54	102.32	1.20	1.20	110.45	111.25	14.54	14.85
T ₂₀ - (N 20g+P 30g+K 15g)	103.25	103.25	1.24	1.25	110.25	111.35	13.25	14.75
T ₂₁ - (N 20g+P 30g+K 30g)	104.21	102.54	1.21	1.22	111.26	112.35	13.64	13.95
T ₂₂ - (N 40g+P 30g+K 15g)	104.25	103.31	1.23	1.24	111.43	112.54	14.08	14.15
T ₂₃ - (N 40g+P 30g+K 30g)	104.26	103.26	1.22	1.23	111.45	112.45	14.15	14.25
SE(m)±	0.805	0.937	0.009	0.019	0.790	1.001	0.581	0.592
CD (P=0.05)	2.303	2.680	0.026	0.033	2.260	2.863	1.661	1.692

Table 2. Effect of NPK on flowering characters in Gladiolus cv. Big Time Supreme

Treatments	Length of spike (cm)		Number of florets per spike		Diameter of floret (cm)		Length of floret (cm)	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T ₁ - (Control)	81.25	82.12	12.05	13.15	7.05	7.35	7.85	7.89
T ₂ - (N 20g)	82.54	83.24	12.54	13.34	7.15	7.56	7.98	7.92
T ₃ - (N 40g)	82.65	83.35	12.67	13.85	7.20	7.88	7.93	7.95
T ₄ - (P 15g)	83.05	84.15	12.98	13.64	7.25	7.85	7.94	7.98
T ₅ - (P 30g)	83.15	84.56	13.25	14.25	7.22	7.75	8.15	8.19
T ₆ - (K 15g)	82.35	83.42	13.54	14.65	8.05	7.94	8.23	8.15
T ₇ - (K 30g)	82.45	83.54	13.54	14.26	8.33	8.57	8.25	8.35
T ₈ - (N 20g+P 15g)	83.25	84.15	13.57	14.35	8.16	8.67	8.35	8.42
T ₉ - (N 20g+P 30g)	83.45	84.24	14.05	15.25	8.24	8.78	7.99	8.12
T ₁₀ - (N 20g+K 15g)	83.48	84.65	14.24	15.30	7.85	8.15	7.96	7.99
T ₁₁ - (N 20g+K 30g)	84.56	85.42	13.54	14.52	7.75	8.05	7.97	8.05
T ₁₂ - (N 40g+P 15g)	84.58	85.45	12.95	13.85	8.65	8.98	8.32	8.54
T ₁₃ - (N 40g+P 30g)	84.25	85.30	13.25	14.25	8.55	8.68	8.55	8.65
T ₁₄ - (N 40g+K 15g)	85.24	85.55	13.47	14.45	7.52	7.84	8.59	8.85
T ₁₅ - (N 40g+K 30g)	85.65	86.54	13.88	14.85	7.98	7.93	8.54	8.67
T ₁₆ - (N 20g+P 15g+K 15g)	87.35	88.05	15.12	16.13	9.25	9.42	9.85	9.92
T ₁₇ - (N 20g+P 15g+K 30g)	86.80	87.54	14.95	15.85	8.95	8.99	9.55	9.66
T ₁₈ - (N 40g+P 15g+K 15g)	86.65	87.12	14.55	15.56	8.88	8.87	8.84	8.92
T ₁₉ - (N 40g+P 15g+K 30g)	85.25	87.14	14.26	15.45	8.54	8.65	8.45	8.55
T ₂₀ - (N 20g+P 30g+K 15g)	86.25	87.14	14.15	15.24	7.98	8.15	8.46	8.65
T ₂₁ - (N 20g+P 30g+K 30g)	85.64	86.24	13.98	14.65	7.95	8.24	9.15	9.25
T ₂₂ - (N 40g+P 30g+K 15g)	86.05	87.25	13.88	14.35	8.74	8.85	9.13	9.34
T ₂₃ - (N 40g+P 30g+K 30g)	85.45	86.45	14.05	15.24	8.85	8.92	8.95	9.06
SE(m)±	1.046	1.034	0.526	0.620	0.351	0.363	0.376	0.380
CD (P=0.05)	2.991	2.658	1.505	1.773	1.004	1.039	1.075	1.087

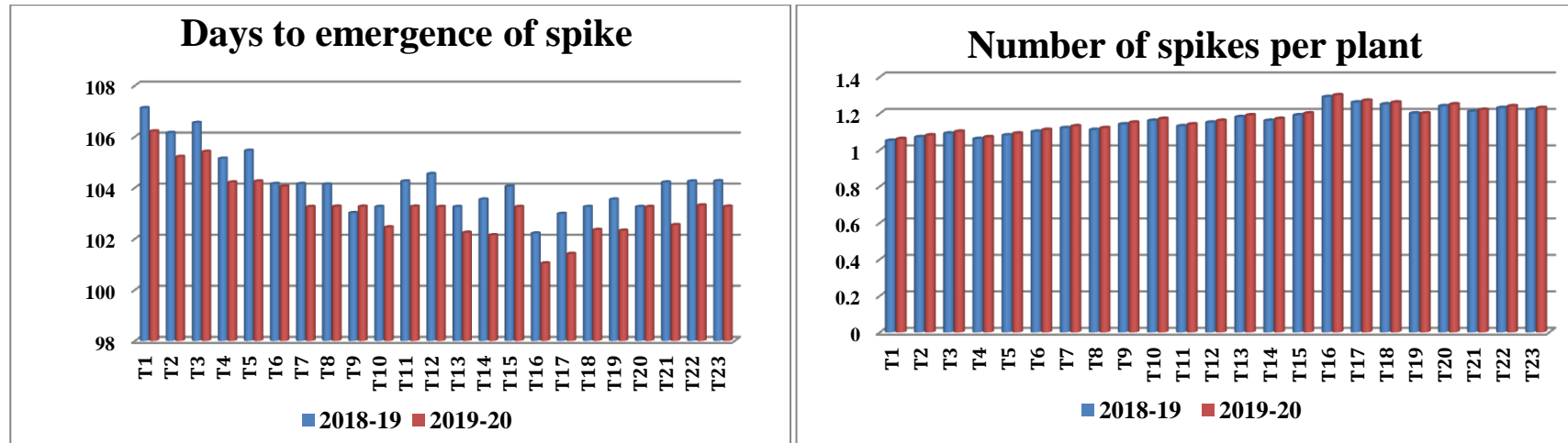


Fig. 1. Effect of NPK on days to emergence of spike and number of spikes per plant

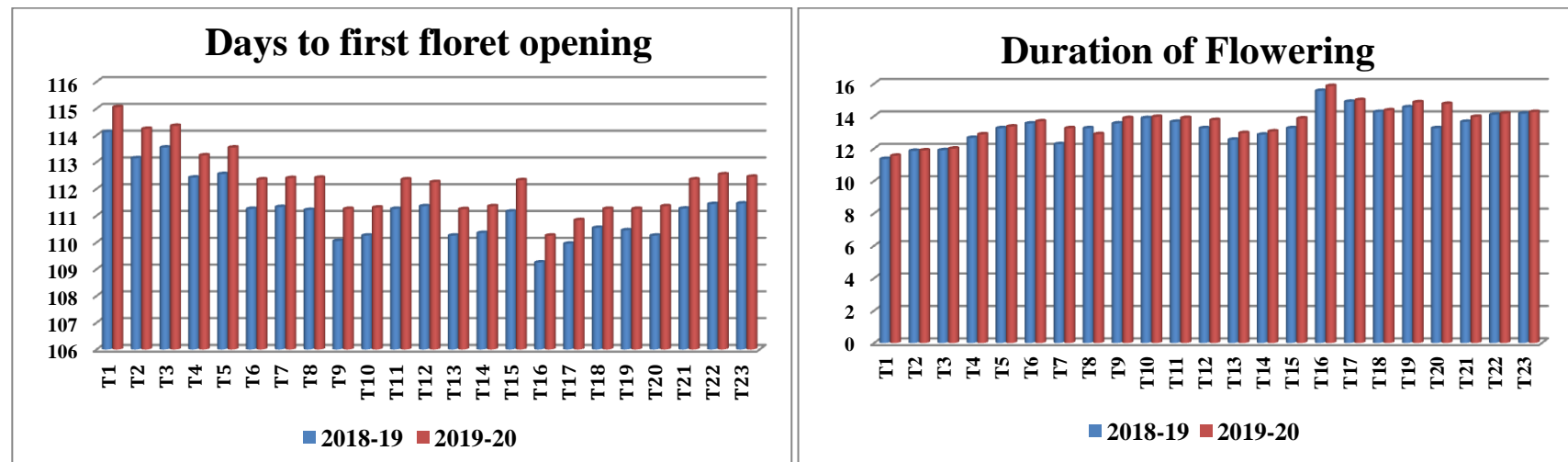


Fig. 2. Effect of NPK on days to first floret opening and duration of flowering

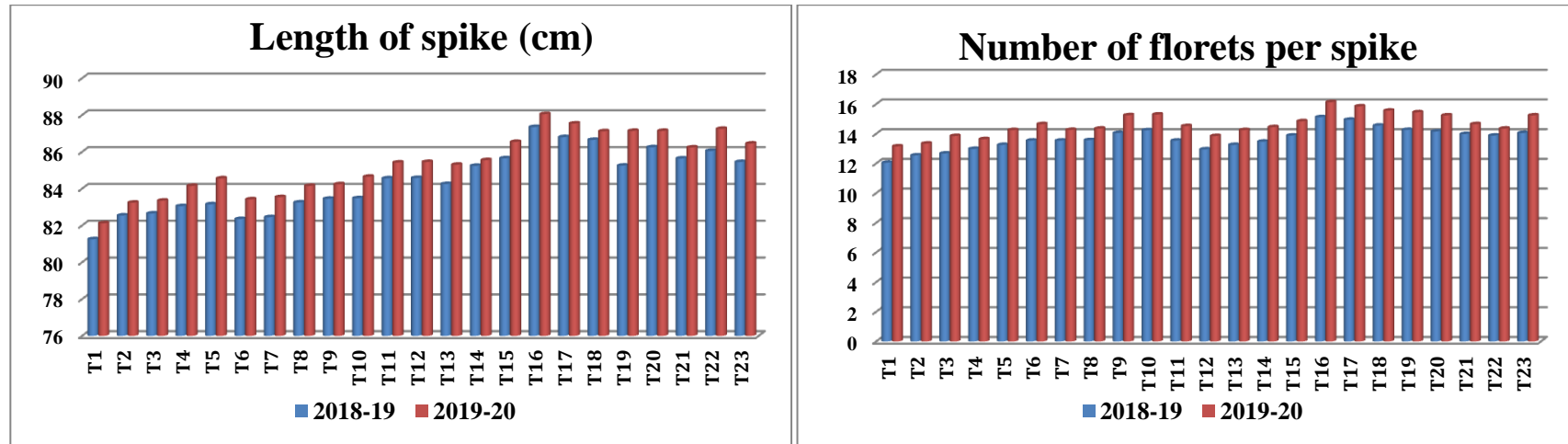


Fig. 3. Effect of NPK on length of spike (cm) and number of florets per spike

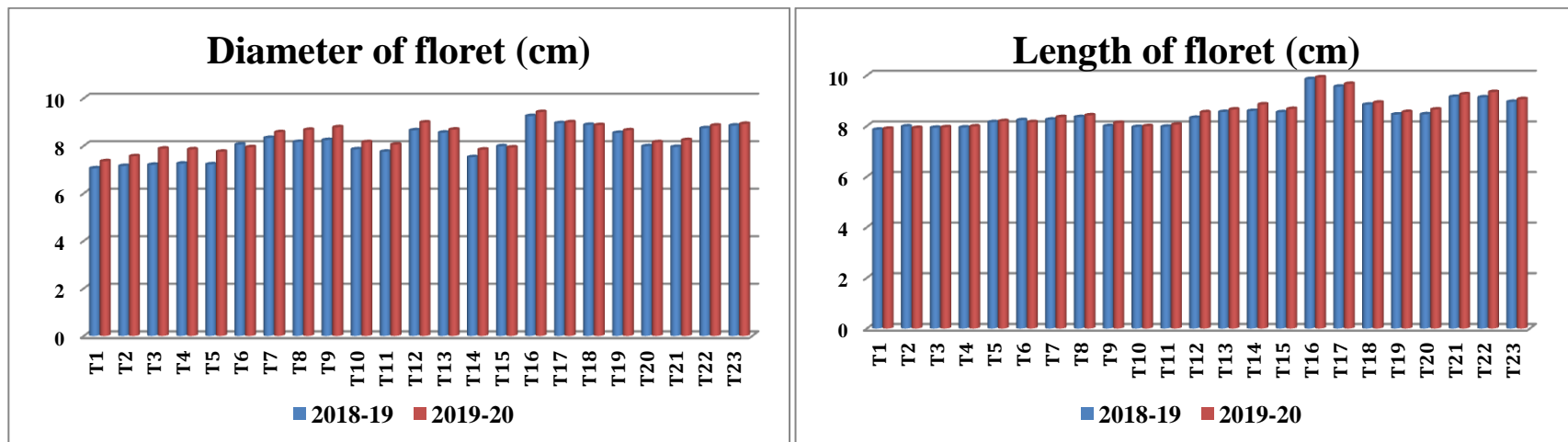


Fig. 4. Effect of NPK on diameter of floret (cm) and length of floret (cm)

flowering, maximum number of flowers per cyme and maximum stem length was recorded with the application of NPK @150:100:150 ppm twice a week through fertigation reported by Singh et al., [6] and Fayaz et al., [7] in gerbera. Similar results were also reported by Chouhan et al., [8], Tirkey et al., [9], Khan et al., [10], Singh et al., [5], Rajesh et al., [11], Keisam et al., [12] and Dubey et al., [13] in gladiolus.

4. CONCLUSION

On the basis of results obtained from the present investigation, it can be concluded that the application of N 20g + P 15g + K 15g was applied full doses of phosphorus, potassium and half dose of nitrogen at the time of field preparation and remaining the half dose of nitrogen was applied one month after planting, to be found most effective with respect to flowering characters in Gladiolus (*Gladiolus grandiflorus* L.) cv. Big Time Supreme and can be recommended to farmers for commercial cultivation of Gladiolus under Lucknow conditions.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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