

Growth and Flowering of *Gladiolus hortulanus* L. cv. Wind Song as Influenced by Various Levels of NPK

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ABSTRACT

Effects of various levels of NPK applied after 30 and 45 days of planting on plant growth and flowering characteristics of *Gladiolus hortulanus* L. cv. Wind Song, were studied as a mean of achieving better management, production and ascertaining NPK utilization by plants. Plant height (cm), number of leaves, leaf length (cm) and spike length (cm) was maximum with 10:10:5 g pot⁻¹ NPK whereas emergence of spike, opening of first and last floret, corm diameter and corm weight was maximum with 5:5:5 g pot⁻¹ NPK. Number of florets per spike was maximum with 10:5:5 g pot⁻¹ NPK. High nitrogen application rate alongwith moderate phosphorus and potassium enhanced vegetative growth characteristics while moderate doses of NPK exhibited more pronounced effect on floral characteristics and corm development of gladiolus.

Key Words: *Gladiolus hortulanus*; Nutrition; Growth; Flowering

INTRODUCTION

Gladiolus respond well to well balanced nutrition for maximum flower production and better growth. Inadequate plant nutrition causes serious disorders and may eventually lead to decline of plant vigor and yield. Increasing level of N advanced the time of flowering and greatly increased flower spike length, corm weight and size and number of cormels per plant in gladiolus (Bhattacharjee, 1981) while Shah *et al.* (1984) stated that increasing N rates delayed flowering but augmented plant growth, number of leaves, spike length and number of florets per spike. Foliar nutrition with NPK in addition to soil application significantly affects vegetative growth and floral characters (Roy *et al.*, 1995); whereas, Amarjeet *et al.* (1996) attributed that application of higher rate of fertilizer delayed spike emergence and considerably prolonged the flowering period and shelf life of florets. Fertilizer application also affects flower colour of gladiolus but not in a systematic manner (Devecchi & Barni, 1997). It was observed by Barman *et al.* (1998) that effect of N and K were much more pronounced than those of P on number, size and weight of corms and cormels. Application of N in two equal splits applied at 30 and 60 days after planting promoted sprouting, spike appearance and flowering in gladiolus as compared to a single dose at planting time which only enhanced length of spike and rachis (Singh, 2000), whereas, Mukesh *et al.* (2001) reported that application of NPK @ 50:10:20 g/m² in *Gladiolus grandiflorus* resulted in maximum spike weight, number of flowers per spike, flower diameter and size, number and weight of corms.

This experiment was designed to optimize NPK requirement for enhancing growth and flower yield of

Gladiolus hortulanus L. cv. Wind Song and to obtain more number of large sized cormels.

MATERIALS AND METHODS

Present study was conducted in floriculture research area, Institute of Horticultural Sciences, University of Agriculture, Faisalabad, during 2002. Healthy corms were planted in 30 cm earthen pots after filling them with soil, sand and farm yard manure in the ratio of 1:1:1. Completely randomized design was employed having nine treatments replicated five times.

Sources of nitrogen, phosphorus and potassium were urea (46%), single super phosphate (18%) and muriate of potash (50%), respectively. Both nitrogen and phosphorus were applied @ 0, 5 and 10 g pot⁻¹ alone as well as in all possible combinations while potassium was applied at a constant rate of 5 g pot⁻¹ to all the treatments. Fertilizer was applied twice according to the treatments with first application after 30 days of planting and second one applied after 15 days of first application. Fertilizer was applied according to the treatments whereas other management practices like irrigation, weeding, hoeing, staking etc. were same for all treatments during entire period of study.

Plants were allowed to grow and data on various vegetative and floral characteristics were collected. Plant height (cm), leaf length (cm), and length of spike (cm) was measured with the help of measuring tape. Number of leaves per plant, number of days for spike emergence, first and last floret opening, and number of florets per spike were calculated by counting. Corm weight (g) was calculated by weighing each corm on the eclectic balance and corm diameter (cm) was measured with the help of vernier caliper.

Data were analysed statistically by performing analysis of variance (Steel & Torrie, 1980) and means were separated using Duncan's multiple range test at 5% level of significance.

RESULTS AND DISCUSSION

Present research project was envisaged with the aim of studying the response of gladiolus to different levels of NPK application. Data regarding plant height indicated that 10:10:5 g pot⁻¹ NPK produced plants with maximum height (86.3 cm) but statistically similar with 10:5:5 and 10:0:5 g pot⁻¹ NPK which produced 81.9 and 81.8cm tall plants, respectively. On the other hand, 0:0:5, 0:5:5 and 0:10:5 g pot⁻¹ NPK were statistically at par and produced dwarf plants as reported by Haitbura and Misra (1999) who stated that 30 g N m⁻² is best for enhancing vegetative growth of gladiolus.

As for as number of leaves per plant was concerned, 10:10:5 g pot⁻¹ NPK expressed its significant supremacy over rest of the treatments except 10:0:5 g pot⁻¹ NPK which behaved statistically at par. Number of leaves produced by 10:10:5 g pot⁻¹ NPK was 12.6 while 0:0:5 g pot⁻¹ NPK (control) produced only 7.0 leaves per plant as shown in Fig. 2. High dose of N and P resulted in maximum number of leaves which is in confirmed by the findings of Pandey *et al.* (2000) who observed that 20 g N and 40 g P m⁻² produced maximum number of leaves of gladiolus.

Information procured on length of leaf exhibited significant superiority of 10:10:5 g pot⁻¹ NPK over other treatments by producing 63.7 cm long leaves as shown in Fig. 1 While 10:5:5 and 10:0:5 g pot⁻¹ NPK stood at par with 10:10:5 g pot⁻¹ NPK by producing 60.9 and 60.3 cm long leaves, respectively. Control (0:0:5 g pot⁻¹ NPK) produced minimum leaf length while remaining treatments expressed intermingling behavior among one another.

Results obtained on number of days taken for spike emergence depicted that 5:5:5 g pot⁻¹ NPK took minimum number of days (71.2) for spike emergence by decreasing growing period and maintenance cost. Whereas, 10:10:5 g pot⁻¹ NPK took maximum days (87.4) for spike emergence (Fig. 3) It was observed that treatments with high nitrogen rate took more days for spike emergence as compared to the treatments in which less or no nitrogen was applied. High level of nitrogen increased vegetative growth thereby delaying reproductive phase of the plant. These results are inline with the findings of Bhattacharjee (1981) who stated that increasing the level of N advanced the time of flowering.

Data regarding number of days to open first and last floret revealed that 5:5:5 g pot⁻¹ NPK excelled rest of the treatments by taking minimum number of days to open first floret (81.6 days) and 97 days to open last floret; while 10:10:5 g pot⁻¹ NPK took maximum number of days (102.4) for opening first floret and 116 days for opening last floret as shown in Fig. 4. Remaining treatments exhibited

intermingling results so dominance of one over the other could not be ascertained.

As for as length of spike was concerned, 10:5:5 g pot⁻¹ NPK revealed significantly better results than other treatments. This treatment (10:5:5 g pot⁻¹ NPK) exhibited non-significant results with 10:10:5 and 10:0:5 g pot⁻¹ NPK. While 0:0:5, 0:5:5 and 0:10:5 g pot⁻¹ NPK stood at par statistically at bottom of the ranked order. These results are supported by the findings of Bhattacharjee (1981) who observed that increasing the level of N greatly increased

Fig. 1. Mean efficacy of various levels of NPK on plant height (cm) and leaf length (cm) of Gladiolus hortulanus L. cv. Wind Song

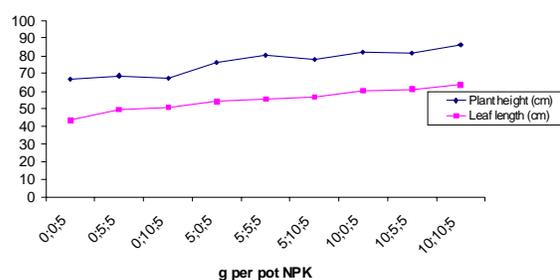


Fig. 2. Mean efficacy of various levels of NPK on Number of leaves per plant and length of spike (cm) of Gladiolus hortulanus L. cv. Wind Song

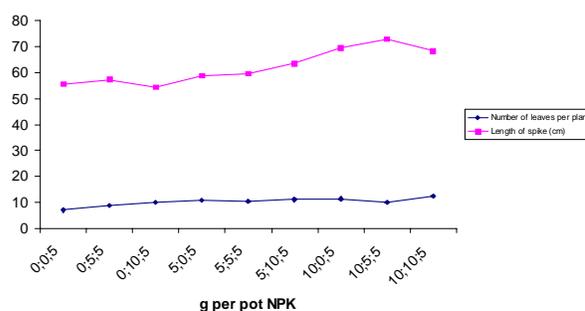
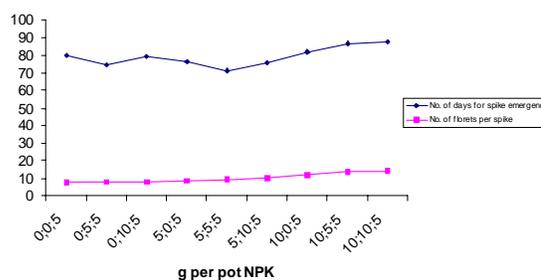


Fig. 3. Mean efficacy of various NPK levels on No. of days for spike emergence and number of florets per spike of Gladiolus hortulanus L. cv. Wind song



flower spike length.

Results obtained on number of florets per spike depicted that 10:10:5 g pot⁻¹ NPK proved best treatment as compared to rest of the treatments. Number of florets produced by 10:10:5 and 10:5:5 g pot⁻¹ NPK was 14 and 13.6, respectively which are statistically at par; whereas, 0:0:5 g pot⁻¹ NPK produced minimum florets per spike (8.4) as presented in Fig. 3. These findings are in accordance with the findings of Haitbura and Misra (1999) who reported that increasing level of nitrogen resulted in maximum number of florets per spike of *Gladiolus*.

Maximum corm weight was observed in 5:5:5 g pot⁻¹ NPK with 70.06g weight, whereas, 10:5:5 and 10:0:5 g pot⁻¹ NPK stood at par with 5:5:5 g pot⁻¹ NPK. On the other hand, 0:0:5, 0:5:5 and 0:10:5 g pot⁻¹ NPK behaved statistically alike at the bottom of ranked order by producing 52.8, 53.4 and 54.0 g weight, respectively. Remaining treatments presented an intermingling situation so dominance of one over the other could not be sorted out. Our results also confirmed the findings of Singh (1996) and Bhattacharjee (1981) who argued that increasing the level of N increased corm weight alongwith size and number of cormels plant⁻¹.

As for as corm diameter was concerned, 5:5:5 and 10:5:5 g pot⁻¹ NPK resulted in larger corms of maximum diameter (3.14 and 3.02 cm, respectively) as presented in Fig. 5. Control (0:0:5 g pot⁻¹ NPK) produced corms of minimum diameter (1.26 cm) while other treatments occupied intermediate positions. Corm diameter and weight are important indices which greatly influence plant growth and flowering, so equal dose of NPK resulted in maximum corm diameter and weight.

CONCLUSION

NPK application enhanced various growth indices and increased flower yield of *Gladiolus hortulanus* L. cv. Wind Song vigorously. High rate of nitrogen and phosphorus (10:10:5 g pot⁻¹ NPK) performed better regarding spike length, plant height, number of leaves and length of leaf while moderate rate of NPK (5:5:5 g pot⁻¹ NPK) enhanced reproductive growth by early emergence of spike, opening of florets and increasing corm diameter and weight. Therefore, optimum use of compound fertilizer would help better towards vigorous growth and maximum flower production in *gladiolus*.

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Fig. 4. Mean efficacy of various NPK levels on No. of days to open first and last floret of *Gladiolus hortulanus* L. cv. Wind song

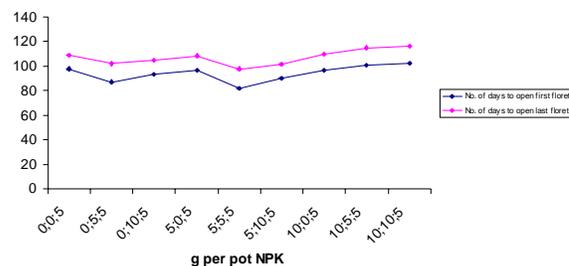
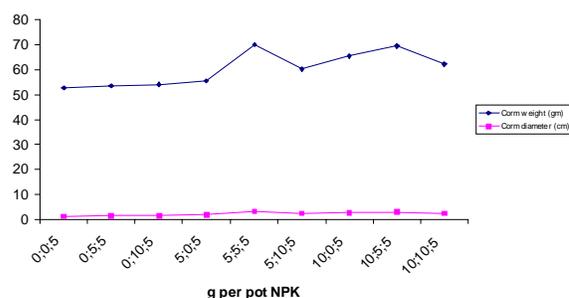


Fig. 5. Mean efficacy of various NPK levels on corm characteristics of *Gladiolus hortulanus* L. cv. Wind song



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(Received 10 June 2004; Accepted 27 August 2004)