# Effect of genotypes and planting geometry on vegetative growth, flower yield and quality of gladiolus (*Gladiolus* x *hybridus* Hort)

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## ABSTRACT

A field experiment was conducted during winter season of 2014-15 having 12 treatment combinations of two genotypes viz $V_1$ (American Beauty) and $V_2$ (*Psittacinus* Hybrid-1) and six spacing viz $S_1$ (15 x 15 cm), $S_2$ (20 x 20 cm), $S_3$ (30 x 15 cm), $S_4$ (30 x 20 cm), $S_5$ (30 x 30 cm) and $S_6$ (40 x 30 cm) laid out in factorial randomized block design with three replications at College of Horticulture and Forestry, Jhalawar, Rajasthan. The highest estimated spike yield per hectare (564583) and maximum estimated corm yield per hectare (612500) was noted in treatment $V_2S_1$ while minimum was recorded in $V_1S_6$. The economic feasibility in the treatment $V_1S_6$ was found higher with estimated gross income of Rs 3758333 per hectare from sale of spikes (458333 numbers) and corms (481250 numbers) with highest B:C ratio of 3.54 while the lowest B-C ratio was obtained in $V_2S_1$ (1.39). Thus the treatment combination cv American Beauty with 40 x 30 cm spacing could be suggested for better economic returns from gladiolus.

**Keywords:** Genotype; planting geometry; gladiolus; spike; corm

## INTRODUCTION

Gladiolus (*Gladiolus* x *hybridus* Hort) is an important cut flower crop grown commercially in many parts of the world. It has gained popularity owing to its incomparable beauty, attractive colours, various sizes and shapes of florets, variable spike length and long vase life. Gladiolus produces beautiful spikes from December to March in the plains and from June to September in the hills of India. The genus *Gladiolus* belongs to family Iridaceae and comprises about 250 species with more than 10000 cultivars out of which about 20 species are grown commercially for cut flower purpose. Gladiolus is widely distributed in central Europe, the Mediterranean region and central and south Africa. It requires well drained soil for achieving healthy plants. Proper plant spacing is an important practice for providing good open position for sunlight, availability of moisture and nutrients vital for successful crop production and quality (Dogra et al 2012). Out of various plant spacing wider spaces produced higher number of corms and cormels (Gupta et al 2014). Earlier studies showed that planting density has very close relationship with the quality of gladiolus. Because of small holdings of the growers people are trying to produce large number of plants per unit area for getting more spikes and corm yield. This practice badly affects the quality of spikes. For proper utilization of space and production of quality spikes there is still need for identification of proper planting distance/density for southeastern Rajasthan. Although work has been done on other aspects of gladiolus but little or no work has been done on planting density by considering the soil and climatic conditions of this area (Sudhakar and Kumar 2012).

There are many excellent varieties of gladiolus with magnificent inflorescence in exhaustive range of colours, shades, florets, size of the florets, arrangement of the florets, spike length, post-harvest life and adaptability to different seasons. The performance of any crop or variety largely depends on genotypic and environmental interaction. As a result cultivars which perform well in one region may not perform same in

other regions of varying climatic conditions. Hence it is very much necessary to collect and evaluate the available varieties to find out the suitable varieties for the specific region. Thus the testing of varieties was carried out to study the performance of two genotypes with plant geometry of gladiolus under southeastern Rajasthan conditions (Pragya et al 2010).

## MATERIAL and METHODS

The field experiment was conducted during winter season of 2014-15 at Department of Floriculture and Landscaping, College of Horticulture and Forestry, Jhalawar, Rajasthan. The experiment consisted of 12 treatment combinations ($V_1S_1$, $V_1S_2$, $V_1S_3$, $V_1S_4$, $V_1S_5$, $V_1S_6$, $V_2S_1$, $V_2S_2$, $V_2S_3$, $V_2S_4$, $V_2S_5$, $V_2S_6$) comprising of two genotypes viz $V_1$ (American Beauty) and $V_2$ (*Psittacinus* Hybrid-1) and six spacing viz $S_1$ (15 x 15 cm), $S_2$ (20 x 20 cm), $S_3$ (30 x 15 cm), $S_4$ (30 x 20 cm), $S_5$ (30 x 30 cm) and $S_6$ (40 x 30 cm) laid out in factorial randomized block design with three replications. The observations were recorded in order to evaluate the economics of the varieties (in rupees) taking into consideration spike and corm yield and general market prices. In calculating the economics only the spike and corm yields have been considered as the economic produce. First the total cost of cultivation and gross income were estimated on the basis of the average spike and corm yield (both in number) per hectare for each treatment combination. The cost of cultivation included money spent on preparatory tillage, planting material cost, manures and fertilizers, irrigation, weeding, earthing-up, plant protection, harvesting and various labour charges. The net income was calculated by deducting the total cost of cultivation from gross income. The B-C ratio was calculated by the following formula:

B-C ratio= Net income (Rs)/Total cost of cultivation (Rs)

## RESULTS and DISCUSSION

Benefit-cost ratio is an important factor which decides the optimum level of inputs to be used for maximizing the production and returns in any crop. In the present study the benefit-cost ratio was worked out for different cultivars and different spacing of gladiolus. The details of cost of cultivation of gladiolus using different treatments are given in Table 1 and yield of spikes and corms, gross and net returns and B-C ratio in Table 2.

Total cost of cultivation was maximum in $V_2S_1$ (Rs 1475033) followed by $V_1S_1$ (Rs 1461733) and minimum in $V_1S_6$ (Rs 326699).

The interaction effects of genotypes and planting geometries on estimated spike yield per hectare were found highly significant. The maximum spike yield per hectare was noted in treatment $V_2S_1$ (564583) whereas the minimum in $V_1S_6$ (131250). The estimated number of spikes produced per hectare increased gradually with the increasing planting density and the number of spikes produced per plant.

The maximum corm yield per hectare was noted in treatment $V_2S_1$ (612500) and the minimum in $V_1S_6$ (191667). The estimated number of corms produced per hectare increased gradually with the increasing planting density and the number of corms produced per plant. Similar results have also been reported by Anwar and Maurya (2005) and Pragya et al (2010) in gladiolus.

The treatment $V_1S_1$ was found superior with estimated gross income of Rs 3758333 per hectare from sale of spikes (458333) and corms (481250). However highest B-C ratio of 3.54 was obtained in $V_1S_6$ while the lowest in $V_2S_1$ (1.39). Similar observstions were made by Meena et al (2016).

Based on the economics of cost of cultivation the major portion of cost of cultivation was consumed by planting material itself. In gladiolus the final income is decided based on the outturn of first grade quality of spikes and corms. Similar variations were also observed by Chengappa et al (1998) in gladiolus, Mysore et al (2005) in carnation and Singh et al (2011) in gladiolus.

On the basis of these findings it can be concluded that out of the 12 treatments the treatment combination American Beauty and spacing of 40 x 30 cm was the ideal combination for the better gladiolus crop.

## REFERENCES

Anwar S and Maurya KR 2005. Effect of spacing and corm size on growth, flowering and corm production in gladiolus. Indian Journal of Horticulture **62(4):** 419-421.

Chengappa DG, Reddy DMG and Nethra NN 1998. Cut flower industry in Karnataka: analysis of trade constraints.

Table 1. Cost of cultivation of gladiolus with different treatments

| Parameter | Cost involved under different treatment combinations (Rs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $V_1S_1$ | $V_1S_2$ | $V_1S_3$ | $V_1S_4$ | $V_1S_5$ | $V_1S_6$ | $V_2S_1$ | $V_2S_2$ | $V_2S_3$ | $V_2S_4$ | $V_2S_5$ | $V_2S_6$ |
| Primary land preparation | 3600 | 3600 | 3600 | 3600 | 3600 | 3600 | 3600 | 3600 | 3600 | 3600 | 3600 | 3600 |
| Secondary land preparation | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 |
| Cost of corm | 1333333 | 750000 | 666666 | 499998 | 333333 | 249999 | 1333333 | 750000 | 666666 | 499998 | 333333 | 249999 |
| Bed formation | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 | 1800 |
| Corm planting | 16000 | 10000 | 8000 | 6000 | 4000 | 3000 | 16000 | 10000 | 8000 | 6000 | 4000 | 3000 |
| Cost of manures @ 10 tonnes/ha | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 |
| Fertilizer NPK (30:20:20 g/$m^2$) | 16900 | 16900 | 16900 | 16900 | 16900 | 16900 | 16900 | 16900 | 16900 | 16900 | 16900 | 16900 |
| Weeding (2) | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 |
| Earthing | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 |
| Plant protection | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 |
| Irrigation (8) | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 |
| Spike harvesting | 9000 | 6800 | 5800 | 4800 | 3200 | 2600 | 11200 | 7200 | 7000 | 6200 | 5000 | 4200 |
| Corm harvesting | 20000 | 14000 | 13600 | 11200 | 8800 | 7600 | 24400 | 18000 | 16800 | 15600 | 10400 | 8800 |
| Packing charges | 9000 | 6800 | 5800 | 4800 | 3200 | 2600 | 11200 | 7200 | 7000 | 6200 | 5000 | 4200 |
| Transports and marketing charges | 19500 | 15000 | 12000 | 10500 | 7500 | 6000 | 24000 | 16500 | 15000 | 13500 | 10500 | 9000 |
| Total | 1461733 | 857500 | 766766 | 592198 | 414933 | 326699 | 1475033 | 863800 | 775366 | 602398 | 423133 | 334099 |

Cost of corms= Rs 3/corm, FYM cost= Rs 1000/tonne, Transportation charges/truck (350 boxes)= Rs 1500, Labour cost= Rs 200/man day, Cost of DAP= Rs 25/kg,
Cost of urea= Rs 7/kg, cost of MoP= Rs 16/kg, Irrigation cost= Rs 1000/irrigation

Table 2. Economics of cultivation per hectare and benefit-cost ratio

| Treatment | Total cost of cultivation (Rs) | Spike yield/ha (number) | Corm yield/ha (number) | Gross returns (Rs/ha) | Net returns (Rs/ha) | B-C ratio |
|---|---|---|---|---|---|---|
| $V_1S_1$ | 1461733 | 458333 | 481250 | 3758333 | 2296600 | 1.57 |
| $V_1S_2$ | 857500 | 345833 | 354167 | 2800000 | 1942500 | 2.27 |
| $V_1S_3$ | 766766 | 297917 | 339583 | 3187500 | 2420734 | 3.16 |
| $V_1S_4$ | 592198 | 239583 | 285417 | 2625000 | 2032802 | 3.43 |
| $V_1S_5$ | 414933 | 166667 | 220833 | 1770833 | 1355900 | 3.27 |
| $V_1S_6$ | 326699 | 131250 | 191667 | 1483333 | 1156634 | 3.54 |
| $V_2S_1$ | 1475033 | 564583 | 612500 | 3531250 | 2056217 | 1.39 |
| $V_2S_2$ | 863800 | 364583 | 452083 | 2450000 | 1586200 | 1.84 |
| $V_2S_3$ | 775366 | 354167 | 427083 | 2770833 | 1995467 | 2.57 |
| $V_2S_4$ | 602398 | 312500 | 391667 | 2504167 | 1901769 | 3.16 |
| $V_2S_5$ | 423133 | 252083 | 266667 | 1822917 | 1399784 | 3.31 |
| $V_2S_6$ | 334099 | 210417 | 220833 | 1514583 | 1180484 | 3.53 |

Rate per spike= Special grade @ Rs 5, standard grade @ Rs 4 and utility grade @ Rs 3
Rate per corm= 2.5-4 cm size @ Rs 3, 4-6 cm @ Rs 4 and 6-8 cm @ Rs 5

Research Report, University of Agricultural Sciences, Bangalore, Karnataka, India.

Dogra S, Pandey RK and Bhat DJ 2012. Influence of gibberellic acid and plant geometry on growth, flowering and corm production in gladiolus (*Gladiolus grandiflorus*) under Jammu agroclimate. International Journal of Pharma and Bio Sciences **3(4):** 1083-1090.

Gupta YC, Parmar RS, Dhiman SR and Thakur P 2014. Growth and flowering behavior of newly evolved hybrid of gladiolus (*Gladiolus* x *hybridus* Hort) under different plant spacing and corm size in mid-hill areas of Himachal Pradesh. Progressive Horticulture **46(2):** 42-44.

Meena B, Moond SK, Meena RR, Singh P and Singh D 2016. Effect of genotype and planting geometry on flower quality and vase life of gladiolus (*Gladiolus* x *hybridus* Hort). The Bioscan **11(4):** 2711-2714.

Mysore S, Gajanana TM and Dakshinamoorthy V 2005. Economic feasibility and profitability of carnation cultivation. Journal of Ornamental Horticulture **8(4):** 254-259.

Pragya, Ranjan JK, Attri BL, Das B, Krishna H and Ahmed N 2010. Performance of gladiolus genotypes for cut flower and corm production under high altitude of Uttarakhand. Indian Journal of Horticulture **67(Special Issue):** 386-390.

Singh KP, Gajanana TM and Subramanayam KV 2011. Effect of planting densities on yield and economics of gladiolus cultivation. Annals of Horticulture **4(1):** 104-105.

Sudhakar M and Kumar R 2012. Effect of corm size and spacing on growth and flowering of gladiolus cv White Friendship. International Journal of Agricultural Sciences **2(6):** 9-12.