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# Evaluate the quality of cut spikes of different varieties of gladiolus

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**Abstract**
The present investigation entitled "Evaluate the quality of cut spikes of different varieties of gladiolus" was conducted during the period of October 2016 to March 2017 at the Department of Floriculture and Landscape Architecture, K.N.K. College of Horticulture, Mandsaur, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.). The experiment was laid out in Completely Randomized Design with three replications. Nine gladiolus cultivars (African Star, Friendship, Hunting Song, Priscilla, Punjab Dawn, Regency, Sancerre, Sunayana, and Swapnil).The observations on different post harvest and biochemical parameters were recorded and the results obtained are summarized below. Swapnil recorded the best performance with respect of most of the post harvest parameters i.e. days to opening of 5th florets, days to withering of 5th florets, number of florets open at a time, percentage of open florets/spike, water uptake on 5th day (ml), total water uptake (ml), vase- life (days) and pigment content. Regency show the best performance with respect of days to opening of 3rd and 4th florets, days to withering of 3rd and 4th florets. The maximum diameter of 3rd, 4th 5th florets and reducing sugar was recorded with cv. Priscilla. The maximum Non- reducing sugar & total sugar was recorded with cv. Friendship while dry weight of cut spikes at senescence was recorded with cv. Punjab Dawn.

**Keywords:** Gladiolus, cultivars, post- harvest, evaluate and spikes

## Introduction
Flowers not only offer aesthetical beauties, but also have become commercial object. Flower production is a branch of horticultural cultivation today in several countries and can contribute to national economies providing millions of dollars (Bulut, 1994). Cut flower cultivation is a part of ornamental plant production having the largest part either in production or economic value. Gladiolus is an important commericial flower crop and is very popular as cut flower both in domestic and international market. The flower is popular for it majestic spikes, which contain attractive elegant, dazzling and delicate florets. Generally, flowers remain turgid condition when harvested at proper stage of development. Flowers cut at advanced stage have shortened longevity then younger ones. Optimum harvesting stage of gladiolus is at the stage when 2-5 buds showing colors. At present it has been come imperative to find out suitable varieties for post harvest life, post harvest senescence is an integral part of normal development cycle of plants and is highly regulated process that involves structural, biochemical and molecular changes in the plant tissue**.** Different flowers and varieties are reported to differ in their vase life due to genetic, physiological or anatomical characteristics. However the information on comparative performance of gladiolus cultivars for post harvest attributes is very meagre. Hence this experiment was carried out to get information on comparative performance of gladiolus cultivars for various post harvest attributes so that specific type of cultivars may be identified (Ahmed *et al*, 2014) [1].

## Materials and Methods
The present experiment was undertaken at Horticulture Research Farm and post harvest studies was carried out in the laboratory of the Department of Floriculture and Landscape Architecture, The study will be conducted in the PG Lab, K.N.K. College of Horticulture, Mandsaur (M.P.). In this experiment 09 cultivars namely African Star, Friendship, Hunting Song, Priscilla, Punjab Dawn, Regency, Sancere, Sunayana and Swapnil were used as experiment material. These varieties grow in the field, standard packages of cultural practices were followed during the field experiment.

For post harvest study the cut spikes were harvested in the morning when two lower florets of spike shows color are harvested with the help of sharp knife and placed in bucket containing water and immediate brought to the laboratory. Spikes were placed in 250 ml conical flasks which contain distilled water. During the experiment basel ends of spikes were re-cut 1.00 cm, with the help of sharp knife to proper uptake of distilled water solution. Different observations were recorded with the help of essential tools and equipments and these data statistically analyzed.

## Results and Discussion

### Parameters to be recorded

### Days to opening of 3rd, 4th and 5th floret

It is evident from the data present in Table that there was significant variation among the cultivars of gladiolus on days to opening of 3rd floret 4th floret and 5th floret. Days to opening of 3rd floret were ranges between 2.93 days (cv. Sunayana) to 4.05 days (cv. Regency).The maximum days to opening of 3rd floret was reported with cultivar Regency (4.05 days), while the minimum days taken by cultivar Sunayana (2.93 days).

The maximum days to opening of 4th floret were reported with cultivar Regency (4.60 days), while the minimum days taken by cultivar Hunting Song (3.40 days). Days to opening of 5th floret were ranges between 5.27 days (cv. Friendship) to 7.80 days (cv. Swapnil). The maximum days to opening of 5th floret were reported with cultivar Swapnil (7.80 days), while the minimum days taken by cultivar Friendship (5.27 days). It may be mentioned that opening of florets in a spike is largely due to interaction of higher water potential and reserve carbohydrate maintained in the floral spike in addition to the environmental factor like light and temperature in absence of use of any floral preservative as bud opening solution the variation observed in interaction effect of above factors influencing bud opening might to be due to the inherent character of varieties. (Patra and Mohanty 2015) [33]. There occurs a variation in days to opening of floret among different cultivars of gladiolus (Patil *et al.,* 2004) [31], Rao and Janakiram (2006) [35]. Similar variation in days to opening of florets was also noticed by several workers Kumar and Yadav (2005) [19], Rupa Rani and Singh (2005) [38] Singh and Singh (2009) [20], Kumar (2009) [42], Rajan *et al.* (2010) [36], Choudhary *et al.* (2011) [7], and Saleem *et al.* (2012) [50] in gladiolus.

### Days to withering of 3rd, 4th and 5th floret

Significant variation in days to withering of 3rd, 4th and 5th floret among various cultivars of gladiolus was observed. In different cultivars of gladiolus days to withering of 3rd floret varied from 6.27 days (cv. Friendship) to 7.40 days (cv. Regency). The maximum days to withering of 3rd floret was recorded with cultivar Regency (7.40 days), which was at par with cultivars Pricilla (7.33 days) and Sunayana (7.13 days). However, the minimum days to withering of 3rd floret was found with cultivar Friendship (6.27 days), which was at par with cultivars African Star (6.47 days) and Hunting Song (6.60 days). Highly significant difference showed during experiment with respect to days to withering of florets. The maximum days taken to withering of 4th floret was recorded with cultivar Regency (8.67 days), which was at par with cultivars Sunayana (8.60 days), Sancerre (8.53 days) and Hunting Song (8.20 days). However the minimum days taken to withering of 4th floret was found with cultivar African Star (7.60 days), which was at par with cultivars Pricilla (7.66 days), Swapnil (7.80 days) and Punjab Dawn (7.93 days).

The maximum days taken to withering of 5th floret was recorded with cultivar Swapnil (11.40 days), which was at par with cultivars Regency (11.00 days). However, the minimum days taken to withering of 5th floret was found with cultivar Hunting Song (10.13 days), which was at par with cultivars African Star (10.20 days), Friendship (10.33 days), Sancerre (10.40 days) and Pricilla (10.53 days). A loss of turgidity and carbohydrates in the flower tissue might lead to flower fading and ultimately withering (Ghidiyal *et al*., 2012). Result of Rupa Rani & Singh (2005) [38], and Kumar *et al.* (2007) [21], also showed similar variation among the cultivars for days to withering of floret in gladiolus.

### Diameter of 3rd, 4th and 5th floret (cm)

Significant variation in diameters of 3rd, 4th and 5th floret (cm) among various cultivars of gladiolus was observed. The maximum diameter of 3rd floret was found in cultivar Pricilla (9.26 cm), followed by Punjab Dawn (8.94 cm) and Swapnil (8.84 cm). However the minimum floret diameter was recorded in cultivar Hunting Song (7.55 cm), Regency (7.77 cm), Sunayana (8.06 cm) and African Star (8.37cm). The maximum diameter of 4th floret was found in cultivar Pricilla (9.26 cm), followed by Punjab Dawn (8.98 cm) and Swapnil (8.88 cm). However the minimum floret diameter was recorded in cultivar Hunting Song (7.66 cm), Regency (7.87 cm), Sunayana (8.09 cm) and African Star (8.39 cm).

The maximum diameter of 5th floret was found in cultivar Priscilla (9.26 cm). However the minimum floret diameter was recorded in cultivar Hunting Song (7.72 cm), Regency (7.93 cm), Friendship (8.29 cm) and African Star (8.46 cm) and Sancerre (8.85 cm). The variation in diameter of florets in different cultivars might be attributed due to the genetic differences of the cultivars and superiority of some of the genotypes over others in respect of floret diameter. The variation in diameter of florets might be due to hereditary traits of the varieties. Rani and Singh (2005) [40], Ram *et al*. (2005) [41]. There occurs a variation in floret diameter among different cultivars of gladiolus. Alka Sing *et al. (*2005), Kumar *et al.* (2007) [21], Singh and Singh (2009) [42], and Saleem *et al.* (2012) [50] in gladiolus.

### Number of florets open at a time

It is evident from the data in that there were significant differences among the different cultivars on number of florets open at a time. Florets open at a time was ranges from 5.36 to 7.31 florets. The maximum number of florets opened at a time was recorded with cultivar Swapnil (7.31 florets). However, the minimum number of florets open at a time was recorded with cultivars Regency (5.36 florets), Regency (5.36 florets), African Star (6.11 florets), Sunayana (6.44 florets) and Punjab Dawn (6.62 florets).It is a typical character of a particular variety, which depend on genetic constitution of cultivar and quality of stored food in spike after harvest. Hence, varieties are performing differently in this character. Similar variation among the cultivars with respect to number of florets open at a time were also observed by several workers Gupta *et al.* (2001), Nair and Shiva (2003), Kumar and Yadav (2005) [19], Rupa Rani and Singh (2005) [38] Bala *et al*. (2007) [3] and Rao and Janakiram (2006) [35], Grover *et al*. (2006) [12] Kumar *et al*. (2007) [21] in gladiolus.

**Percentage of open florets/spike**

Significant variation in percentage of open florets/spike among various cultivars of gladiolus was observed. In different cultivars of gladiolus percentages of open floret/spike were ranges from 62.59% to 74.3%. The maximum percentage of open floret/spike was found with cultivars Sancerre (73.47%), Friendship (72.53%), Punjab Dawn (68.36%) and Hunting Song (69.48%). However the minimum percentage of open floret/spike was recorded with cultivar Regency (64.5%), African Star (65.54%) and Sunayana (66.79%). It is a typical character of a particular variety, which depend on genetic constitution of cultivar and quality of stored food in spike after harvest. Hence varieties are performing differently in this character (Patil and Jankiram (2006) [32]. The cultivars different in their response to percentage of open floret/spike in gerbera (Javed *et al*., (2011) [15]. Similar variation in percentage of open florets/spike was noticed by Rupa Rani and Singh (2005) [38], Bala *et al.* (2007) [3] in gladiolus.

**Water uptake on 5th day of vase and total water uptake**

Significant variation among various cultivars of gladiolus was observed. In different cultivars of gladiolus water uptake on 5th day of vase by spikes ranges between 43.47 ml to 68.35 ml. Higher amount of water uptake on 5th day of vase recorded with cultivar Swapnil (68.35 ml). While the minimum water uptake on 5th day of vase was recorded with cultivar Sancere (43.47 ml), Sunayana (46.34 ml), regency (48.54 ml) and Priscilla (56.67 ml). In different cultivars of gladiolus total water uptake (ml) by spikes ranges between 67.91 ml to 91.81 ml. Higher amount of total water uptake by the spike recorded with cultivar Swapnil (91.81 ml). While the minimum total water uptake (ml) was recorded with cultivar Sancere (67.91 ml), Regency (72.97 ml), Sunayana (73.02 ml) and Friendship (74.01 ml). Higher uptake of water in these varieties might be due to well developed water conducting tissues particularly xylem vessels (Patra and Mohanty 2015) [33]. The result are in line with the findings Patra and Mohanty (2015) [33] in gladiolus. Similar variation on water uptake (ml) by spike of different cultivars was observed by Kumar *et al*. (2007) [21] in gladiolus and Kim *et al.* (2004) [23] in gerbera.

**Dry weight of cut spike at senescence (g)**

Significant variation among various cultivars of gladiolus was observed. In different cultivars of gladiolus dry weight of cut spikes at senescence was ranges between 4.42 g to 8.30 g. The maximum dry weight of cut spikes at senescence was recorded with cultivar Punjab Dawn (8.30 g). However, the minimum dry weight of cut spikes at senescence was recorded with cultivar African Star (4.42 g), Priscilla (4.66 g), Swapnil (4.87 g), Friendship (5.21 g) and Sunayana (5.34 g). In all the varieties studied the dry weight of cut spike at senescence reduced from harvest to senescence (Varun and Barad 2010) [51] in tuberose. Similar result were recorded by Horo *et al.* (2009) [14] and Choudhary *et al.* (2011) [7] in gladiolus.

**Table 1:** Performance of gladiolus cultivars for post harvest studies

| Treatment | Days to opening of 3rd 4th and 5th floret | | | Days to withering of 3rd 4th and 5th floret | | | Diameter of 3rd floret (cm) | Diameter of 4th floret (cm) | Diameter of 5th floret (cm) |
|---|---|---|---|---|---|---|---|---|---|
| | 3rd floret | 4th floret | 5th floret | 3rdfloret | 4th floret | 5th floret | | | |
| T1 – African Star | 3.60 | 4.17 | 5.33 | 6.47 | 7.60 | 10.20 | 8.37 | 8.39 | 8.46 |
| T2 - Friendship | 4.00 | 4.50 | 5.27 | 6.27 | 8.13 | 10.33 | 8.20 | 8.25 | 8.29 |
| T3 – Hunting Song | 3.27 | 3.40 | 5.67 | 6.60 | 8.20 | 10.13 | 7.55 | 7.66 | 7.72 |
| T4 - Priscilla | 3.17 | 4.47 | 6.13 | 7.33 | 7.66 | 10.53 | 9.26 | 9.31 | 9.36 |
| T5 – Punjab Dawn | 3.27 | 3.67 | 5.80 | 6.87 | 7.93 | 10.87 | 8.94 | 8.98 | 8.9 |
| T6 – Regency | 4.05 | 4.60 | 6.67 | 7.40 | 8.67 | 11.00 | 7.77 | 7.87 | 7.93 |
| T7 - Sancere | 3.13 | 4.33 | 6.87 | 6.93 | 8.53 | 10.40 | 8.72 | 8.81 | 8.85 |
| T8 - Sunayana | 2.93 | 4.13 | 6.53 | 7.13 | 8.60 | 10.73 | 8.06 | 8.09 | 8.16 |
| T9 – Regency | 3.20 | 3.93 | 7.80 | 6.73 | 7.80 | 11.40 | 8.84 | 8.88 | 9.02 |
| S.EM.± | 0.14 | 0.11 | 0.13 | 0.11 | 0.17 | 0.14 | 0.06 | 0.07 | 0.07 |
| C.D. at 5% | 0.41 | 0.32 | 0.38 | 0.34 | 0.51 | 0.43 | 0.18 | 0.20 | 0.22 |

**Table 2:** Post harvest studies of different varieties of gladiolus.

| Treatment | Number of florets open at a time | | | Total water uptake (ml) | | Vase – life of cut spike (days) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number of florets open at a time | Percentage of open florets/spike | Water uptake on 5th day of vase | | Dry weight of cut spikes at senescence (g) | Vase- life of cut spike (days) | Reducing sugars (mg/g) | Non-reducing sugars (mg/g) | Total Sugars (mg/g) | Pigment Content (mg/100g) |
| T1 – African Star | 6.11 | 65.54 | 60.65 | 83.26 | 4.42 | 15.75 | 0.67 | 0.25 | 0.92 | 0.27 |
| T2 -Friendship | 7.13 | 72.53 | 47.32 | 74.01 | 5.21 | 12.57 | 0.73 | 0.71 | 1.44 | 1.15 |
| T3 – Hunting Song | 6.70 | 69.49 | 62.47 | 80.55 | 6.31 | 13.30 | 0.88 | 0.44 | 1.32 | 1.06 |
| T4 - Priscilla | 4.19 | 62.59 | 56.67 | 82.15 | 4.66 | 13.40 | 0.99 | 0.27 | 1.26 | 1.65 |
| T5 – Punjab Dawn | 6.62 | 68.36 | 58.37 | 83.48 | 8.30 | 14.40 | 0.82 | 0.28 | 1.1 | 1.46 |
| T6 – Regency | 5.36 | 64.51 | 48.54 | 72.97 | 7.37 | 11.42 | 0.90 | 0.33 | 1.23 | 1.7 |
| T7 - Sancere | 7.18 | 73.47 | 43.47 | 67.91 | 6.41 | 10.44 | 0.89 | 0.16 | 1.05 | 1.77 |
| T8 - Sunayana | 6.44 | 66.79 | 46.34 | 73.02 | 5.34 | 12.78 | 0.86 | 0.28 | 1.14 | 1.28 |
| T9 – Regency | 7.31 | 74.30 | 68.35 | 91.81 | 4.87 | 16.47 | 0.88 | 0.18 | 1.16 | 1.83 |
| S.EM.± | 0.03 | 0.25 | 1.00 | 0.83 | 0.05 | 0.26 | 0.03 | 0.02 | 0.05 | 0.01 |
| C.D. at 5% | 0.09 | 0.73 | 2.97 | 2.46 | 0.14 | 0.77 | 0.08 | 0.05 | 0.13 | 0.04 |

**Conclusions**

Swapnil recorded the best performance with respect of most of the post-harvest parameters i.e. days to opening of 5th florets, days to withering of 5th florets, number of florets open at a time, percentage of open florets/spike, water uptake on 5th day (ml), total water uptake (ml), vase- life (days) and pigment content. Regency show the best performance with respect of days to opening of 3rd and 4th florets, days to

withering of 3rd and 4th florets. The maximum diameter of 3rd, 4th 5th florets and reducing sugar was recorded with cv. Priscilla. The maximum Non- reducing sugar & total sugar was recorded with cv. Friendship while dry weight of cut spikes at senescence was recorded with cv. Punjab Dawn.

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