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Estimation of chlorophyll content of leaf, growth and yield of gladiolus (*Gladiolus grandiflorus* Hort.) genotypes under hill zone of Karnataka

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Abstract: *An experiment was conducted at Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere to evaluate ten gladiolus cultivars for chlorophyll content of leafs, vegetative growth and spike yield. Chlorophyll 'a' and total chlorophyll content was maximum in cultivar Charms Flow whereas Chlorophyll 'b' content was maximum in cultivar Green Boy. Cultivars Red Majesty, Summer Sunshine and Candy Man were early to sprout (5.67, 7.00,7.00 days respectively), while Cv. Jester was late (11.00 days). Per cent sprouting was maximum in Cv. Summer Sunshine (95.00%) and minimum in Cv.Her Majesty (51.67 %). The cultivars Summer Sunshine, Red Ginger, Red Majesty and Green Bay were fairly good with respect to growth attributes such as plant height, number of leaves per plant, leaf length and leaf width, while poor vegetative growth was recorded in cultivars Jester and Her Majesty. Among the ten cultivars studied, Cv. Summer Sunshine recorded maximum spike yield (116666.33 spikes per hectare) followed by Red Ginger (105555.33 spikes per hectare) and Red Majesty (101851.67 spikes per hectare), whereas, it was minimum in Cv. Jester (59259.00 spikes per hectare).*

Key words: *Evaluation, Gladiolus, Chlorophyll content Cultivars, growth and Spike yield.*

INTRODUCTION

Gladiolus (*Gladiolus grandiflorus* Hort.) is one of the most popular bulbous flowers grown throughout the world for its beautiful flower spike and said to be the **"Queen of bulbous flower crops".** It is commonly known as sword lily or corn flag, which belongs to the family Iridaceae and it is native to South Africa. The crop is grown for its attractive colored spikes, which are used as cut flowers and flower arrangement purpose. Today the gladiolus has earned tremendous popularity in floriculture industry due to its wide range of color spikes and their excellent keeping quality.The performance of any crop or cultivars largely depends upon its genetical makeup. Further the performance of these crops depends upon climatic condition of the region under which they are grown. As a result cultivars, which perform better in one region, may not do so in other regions of varying climatic conditions. Hence it is very much necessary to collect and evaluate gladiolus cultivars. Keeping above points in consideration, this experiment was carried out to study the performance of ten cultivars of gladiolus for vegetative growth and spike yield under hill condition of Karnataka.

MATERIALS AND METHODS

The present investigation was conducted at Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere during the period from October to April 2012- 13 with ten gladiolus cultivars. The corms were planted on 28 th October, in a randamized complete block design with three replications.

Before planting, corms were dipped into Carbendazium (0.2%) solution for fifteen minutes and dried under shade and then planted. Planting was taken up in plot size of 1.5 x1.2 mt at a spacing of 30 x20 cm and at 5-6 cm depth. All the recommended agronomic practices were followed to raise a good crop. Five plants were selected at random in each replication for recording the observations.

Chlorophyll content of leaf was analyzed by collecting the healthy and fully matured second leaf from the centre of the plant at peak vegetative stage. Chlorophyll-a, Chlorophyll-b and total chlorophyll

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contents of leaf tissue were determined by using Dimethyl sulfoxide (DMSO) as suggested by Shaof and Lium (1976).

Chlorophyll procedure

Fresh and fully matured leaves from the plant were brought to laboratory in polyethylene bag from the research field and leaves were cut into pieces. Known weight of sample (100 mg) was incubated in 7.0 ml of Dimethyl sulfoxide at 65^0C for 120 minutes. After the incubation, supernatant was collected by decanting and leaf tissue was discarded. Than the volume of the supernatant was made up to 10 ml using DMSO.

The absorbance of the extract was measured at 645 nm and 663 nm using Dimethyl sulfoxide as blank in spectrophotometer.

The total chlorophyll, Chlorophyll-a and Chlorophyll-b contents were calculated by using formulae given below

$$Total\ chlorophyll = \{20.0(A_{645}) + 8.02(A_{663})\}\frac{V}{1000xWxa}$$

$$Chlorophyll - a = \{12.7(A_{663}) - 2.69(A_{645})\}\frac{V}{1000xWxa}$$

$$Chlorophyll - b = \{22.9(A_{645}) - 4.68(A_{663})\}\frac{V}{1000xWxa}$$

Where,

A = Absorbance at specific wave length (645 nm and 663 nm)

V = Volume of the extract (10 ml)

W = Fresh weight of the sample (100 mg)

A = Path length of light in cuvette (1 cm)

Various vegetative parameters were recorded at 60 days after planting. The number of spikes produced per hectare was worked out with a help of following formula and used for analysis.

$$Spikes\ yield\ per\ ha = \frac{Number\ of\ spikes / plot\ x\ 10,000}{Plot\ size\ (1.8\ sq.m)}$$

RESULTS AND DISCUSSION

Gladiolus cultivars showed significant differences in Chlorophyll content of leaf. The data pertaining to chlorophyll content are presented in table 1.

Chlorophyll 'a'content

Different cultivars of gladiolus varied significantly with respect to chlorophyll "a"content. Cultivar Charms Flow recorded maximum chlorophyll content (17.98 mg/g). However, it was on par with cultivar Green Boy (16.82 mg/g). Chlorophyll "a" content was found minimum in cultivar Her Majesty (10.30 mg/g).

Chlorophyll 'b' content

Chlorophyll 'b' content of leaves varied significantly among the cultivars. Cultivar Green Boy recorded maximum chlorophyll 'b' content (8.45 mg/g) and it was on par with cultivar Red Majesty (6.77 mg/g). Chlorophyll 'b' content was found minimum in Cultivar Candy Man (4.91 mg/g).

Total chlorophyll

Different cultivars of gladiolus showed significant variation with respect to total chlorophyll content. Cultivar Charms Flow recorded maximum total chlorophyll content (26.98 mg/g) and it was on par with cultivar Red Majesty (23.19 mg/g). Whereas cultivar Her Majesty was recorded minimum total chlorophyll content (14.53 mg/g).

Gladiolus cultivars showed significant differences in vegetative growth and spike yield. The data pertaining to vegetative growth and spike yield are presented in table 2.

Among the different cultivars studied, Cv. Red Majesty was early to sprout (5.67 days) followed by Cultivars Summer Sunshine and Candy Man (7.00 days) whereas, cultivar Jester was late (11.00 days) Similar variations for days taken for sprouting were previously reported by Kamble *et al.*(2004), Manoj Nazir and Dwivedi (2006). The variation in number of days taken for sprouting is known to be influenced by the genetic makeup of the cultivar.

The per cent sprouting of corms varied significantly among the cultivars and it was ranged

Table 1
Chlorophyll content of different cultivars of gladiolus

Sl. No.	*Cultivars*	*Chlorophyll "a" (mg/g)*	*Chlorophyll " b" (mg/g)*	*Total Chlorophyll (mg/g)*
1	Jester	14.30	6.28	22.15
2	Charms Flow	17.98	6.55	26.98
3	Red Ginger	12.25	6.05	17.76
4	White Prosperity	14.61	5.77	15.50
5	American Beauty	13.67	6.00	20.83
6	Her Majesty	10.30	5.27	14.53
7	Green Bay	16.82	8.45	21.59
8	Red Majesty	16.54	6.77	23.19
9	Summer Sunshine	12.19	5.45	17.00
10	Candy Man	11.57	4.91	16.55
	S. Em ±	0.69	0.58	1.41
	CD @ 5%	2.06	1.72	4.17

Table 2
Vegetative growth and flower yield of different cultivars of gladiolus under hill zone of Karnataka.

Sl.No	Cultivars	Days taken for initial sprouting	Per cent sprouting	Plant height (cm)	Number of suckers per plant	Number of leaves per plant	Leaf length (cm)	Leaf width (cm)	Number of spikes per hectare
1	Jester	11.00	53.33	51.60	0.13	6.60	40.81	3.17	59259.00
2	Charms Flow	8.00	83.33	60.98	0.00	5.93	43.27	3.65	92592.33
3	Red Ginger	7.33	93.33	67.95	0.13	7.07	47.53	4.00	105555.33
4	White Prosperity	9.33	70.00	59.33	0.00	6.03	46.53	3.61	77777.33
5	American Beauty	7.33	65.00	55.59	0.13	8.13	43.93	3.85	85185.12
6	Her Majesty	9.67	51.67	56.04	0.27	7.73	42.57	3.45	61110.67
7	Green Bay	7.67	86.67	59.23	0.33	8.93	47.90	4.71	99999.67
8	Red Majesty	5.67	88.33	76.31	0.07	7.73	53.13	4.00	101851.67
9	Summer Sunshine	7.00	95.00	60.37	0.47	8.27	47.27	4.80	116666.33
10	Candy Man	7.00	86.67	64.73	0.13	7.87	48.67	4.33	96296.14
	S. Em ±	0.66	4.99	2.08	0.05	0.54	2.09	0.16	6602.32
	CD @ 5%	1.95	14.83	6.19	0.15	1.60	6.21	0.48	19616.5

from 95.00 to 51.67. Cultivar Summer Sunshine recorded maximum per cent of sprouting (95.00), however it was on par with cultivars Red Ginger and Red Majesty (93.33 and 88.33 per cent, respectively). The cultivar Her Majesty recorded minimum per cent of sprouting (51.67).Variation in per cent sprouting of corms was expected to occur as it was controlled by the genetic composition of the cultivar. Similar variations in percent sprouting of corms was previously observed by Kamble *et al.* (2004) and Manoj Nazir and Dwivedi (2006) in gladiouls.

Cultivar Red Majesty produced the tallest plant height (76.31 cm) followed by cultivar Red Ginger (67.95 cm) and Candy Man (64.73 cm) whereas, shortest plants in cultivar jester (51.60cm).Variations in plant height was mainly due to genetic factor. Similar trend of variation in plant height was observed by Kamble *et al.* (2004) and Manjunath Rao and Jankiram (2006) in gladiouls.

The sucker production per plant was maximum in cultivar Summer Sunshine (0.47) and it was followed by cultivars Green Boy and Her Majesty (0.33 and 0.27, respectively), whereas cultivars Charms Flow (0.00) and White Prosperity (0.00) did not produce any suckers in the experiment. Similar trend of variation in sucker production was reported by Kamble *et al.*(2004) and Mandal *et al.*(2004) in gladiolus.

The leaf production per plant showed significant differences among the cultivars. Cultivar Green Boy recorded maximum number of leaves per plant (8.93) and it was on par with cultivars Summer Sunshine (8.27) and America Beauty (8.13) whereas, minimum number of leaves were observed in cultivar Charms Flow (5.93). This variation was due to increase in number of leaves, which helps in better synthesis of carbohydrates and their utilization for building up of new cells. Such variation in leaf production among cultivars was reported by Kamble *et al.* (2004) and Kishan Swaroop and Singh (2007) in gladiolus.

Leaf length was maximum in cultivar Red Majesty (53.13 cm) and it was on par with cultivars Candy Man (48.67 cm) and Summer Sunshine (47.27 cm) whereas, minimum was recorded in cultivar Jester (40.81cm). With respect to leaf width, it was maximum in cultivar Summer Sunshine (4.80 cm) and it was on par with cultivar Green Boy (4.71 cm) whereas, minimum in cultivar Jester (3.17 cm). The difference in leaf length and width was governed by the genetic makeup of the cultivars. The size of the leaf plays an important role in photosynthetic activity, which greatly influence the growth and flower yield. Similar variations were also observed by Kamble *et al.* (2004) and Kishan Swaroop and Singh(2007) in gladiolus.

Spike yield recorded was maximum in cultivar Summer Sunshine (116666.33 spikes per ha) followed by cultivars Red Ginger and Red Majesty (105555.33 and 101851.33 spikes per ha, respectively) whereas, minimum was recorded in cultivar Jester (59259.00 spikes per ha).The variations of spike yield among the cultivars was mainly due to variations in per cent sprouting, number of suckers produced per plant and genetically controlled character. Similar trend of variation was observed earlier by Kamble *et al.* (2004) and Neha Chopde *et al.* (2012) in gladiolus.

From the results, it can be concluded that cultivar Charms Flow recorded maximum total chlorophyll content followed by Red Majesty. Cultivar Summer

Sunshine, Red Ginger, Red Majesty and Green Bay were fairly good with respect to growth attributes such as plant height, number of suckers per plant, number of leaves per plant and leaf size. The cultivars Summer Sunshine, Red Ginger and Red Majesty are promising ones for cut flower production under hill zone of Karnataka.

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