

EVALUATION OF GLADIOLUS (*Gladiolus grandiflorus* L.) GENOTYPES UNDER WEST GARO HILLS DISTRICT, MEGHALAYA

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ABSTRACT : Evaluation of gladiolus cultivars to identify the suitable variety for successful cultivation, flower and corm production under agro-climatic condition of Tura, West Garo Hills district was performed. Twenty two varieties namely, The Queen, Red Majesty, Applause, Charm Glow, Candyman, Interpid, Eight Wonder, Pacifica, Tiger Flame, Souvenir, American Beauty, Oscar, White Prosperity, Wedding Bouquet, Poppy Tears, Morocco Beauty, Summer Sunshine, Wing Wang Sang, Her Majesty, Green Bay, Priscilla and Red Ginger were selected for their evaluation. Uniform size of gladiolus corms (3.00-4.00 cm diameter) were planted on raised bed following randomized block design with three replications. Uniform package of practices were followed throughout the experiment to grow a healthy crop. Significant response in vegetative, flowering and corm characters was observed in cultivar Candyman followed by Interpid, Eight Wonder, Priscilla, Charm Glow and Wedding Bouquet. Sprouting of corms was advanced in cultivar Interpid (6.67 days) and delayed in cultivar Wedding Bouquet (29.00 days). Highest plant height (97.13cm), number of leaves per plant (9.80) and length of leaf (65.47cm) in cultivar Candyman, while, breadth of leaf (5.27cm) in Wing Wang Sang was recorded. However, earliness in spike emergence (68.58 days) and days to first floret opening (77.53 days) in Eight Wonder, maximum spike length (109.77cm) and rachis length (65.50cm) in Candyman, florets per spike (15.13) in Wedding Bouquet and spike girth (0.90cm) in Priscilla were observed. Enhanced Field life (14.10 days) and vase-life of cut gladiolus flowers under tap water (11.73 days) was observed in cultivar Charm Glow. Whereas, maximum corm weight (93.00g) was noticed with cultivar Candyman followed by American Beauty (75.43g) and Interpid (69.73g).

Keywords : *Gladiolus*, evaluation, field life, vase-life, corm size.

Gladiolus (*Gladiolus grandiflorus* L.) is one of the most popular cut flowers in international and domestic markets. It prefers cool and dry conditions and temperature plays a major role in its growth and flowering. This crop is grown commercially under open field conditions all over the country. There are excellent varieties of gladiolus with magnificent inflorescence in exhaustive range of colours, different shades, varying number of florets, arrangement of florets, spike length, post-harvest life and adaptability to different seasons. Gladiolus cultivation has gained popularity among farmers due to ease in cultivation and good profit. However, its production is just confined to winter season (November- February).

Hence, it is very much necessary to evaluate the varieties suitable for the specific region. There are few reports about the suitable gladiolus varieties being grown in North-Eastern region, but scientific information is not available on gladiolus for commercial cultivation in West Garo Hills district. Therefore, present study was carried out to evaluate various gladiolus cultivars best suited to this region.

MATERIALS AND METHODS

An experiment was conducted at experimental farm, KVK, Sangsanggre, Tura West Garo Hills District, Meghalaya during October 2014 to May 2015. The district is situated approximately between the latitudes 90° 30' and 89° 40' E and the longitudes of 26° and 25° 20' N. The prevalent climate of the region is sub-tropical, experiences a relatively high temperature in summer and cool winters. Average rainfall is 4203.8 mm which occurs mostly during the monsoon season. The experiment was laid out in randomized block design with 22 treatments and three replications. Twenty two varieties namely, The Queen, Red Majesty, Applause, Charm Glow, Candyman, Interpid, Eight Wonder, Pacifica, Tiger Flame, Souvenir, American Beauty, Oscar, White Prosperity, Wedding Bouquet, Poppy Tears, Morocco Beauty, Summer Sunshine, Wing Wang Sang, Her Majesty, Green Bay, Priscilla and Red Ginger were selected for their evaluation. Uniform sized gladiolus corms (3.00-4.00 cm diameter) were planted on raised beds at a spacing of 25cm × 25cm under irrigated condition on the 20th of October 2014. Uniform package of practices were followed throughout the experiment to

grow a healthy crop. Plant height was measured at the time of spike emergence. Spikes were harvested at bud stage when the first bud was about to open by retaining four leaves on the plant to study the vase-life of different gladiolus varieties. Observations were made on various vegetative growth, flowering and corm characters as well as vase-life under tap water. The data collected were pooled and analysed using statistical methods as suggested by Panse and Sukhatme (11).

RESULTS AND DISCUSSION

Performance of gladiolus cultivars for growth parameters

Significant differences were observed in vegetative, flowering quality and corm and cormel characters among the gladiolus cultivars. There were significant differences among varieties in respect to vegetative parameters (Table 1). Sprouting of corms

was advanced in cultivar Interpid (6.67days) which was on par with Candyman (7.67days) and The Queen (8.33days), while, it was delayed in cultivar Wedding Bouquet (29.00days) which was at par with Morocco Beauty (28.00days) and Green Bay (27.00days). The variation in days to sprouting of corms amongst gladiolus cultivars might be due to the genotypic differences that could have contributed to different hormonal levels, especially of gibberellins and abscisic acid in the corms, controlling the extent of dormancy and ultimately time required for sprouting (Chourasia *et al.*, 2). Cultivar Candyman showed highest plant height (97.13cm), while, it was minimum in cultivar Tiger Flame (52.83cm). Pandey *et al.* (10) assessed the performance of twelve gladiolus cultivars in Jammu region and observed significant response among cultivars in respect of their morphological characters which corroborates with the present findings. The number of leaves per plant was significantly higher in cultivar Candyman (9.80) followed by Red Ginger

Table1 : Performance of gladiolus cultivars for growth parameters under West Garo Hills District, Meghalaya.

Cultivars	Days taken for sprouting	Plant height (cm)	Number of leaves/plant	Leaf length (cm)	Leaf breadth (cm)	Number of tillers/ plant
T ₁ – The Queen	8.33	82.33	8.47	54.47	4.27	1.18
T ₂ – Red Majesty	19.00	77.87	7.80	56.67	4.15	1.00
T ₃ – Applause	10.00	81.26	7.47	62.13	4.50	1.07
T ₄ – Charm Glow	24.67	76.60	7.27	54.87	3.75	1.00
T ₅ – Candyman	7.67	97.13	9.80	65.47	4.30	1.44
T ₆ – Interpid	6.67	71.67	7.53	46.73	3.73	1.11
T ₇ – Eight Wonder	11.00	79.27	9.47	54.93	3.95	1.67
T ₈ – Pacifica	22.33	61.47	6.40	52.36	3.91	1.07
T ₉ – Tiger Flame	20.33	52.83	6.13	38.87	2.87	1.18
T ₁₀ – Souvenir	12.33	71.13	6.33	53.22	3.37	1.00
T ₁₁ – American Beauty	27.33	82.40	8.47	58.40	3.20	1.00
T ₁₂ – Oscar	15.33	75.53	6.07	54.17	3.52	1.11
T ₁₃ – Prosperity	20.67	82.37	8.08	54.34	4.22	1.11
T ₁₄ – Wedding Bouquet	29.00	87.62	7.33	61.33	4.17	1.00
T ₁₅ – Poppy Tears	19.67	59.98	7.18	47.40	3.23	1.00
T ₁₆ – Morocco Beauty	28.00	63.47	6.47	43.38	2.73	1.22
T ₁₇ – Summer Sunshine	19.33	86.53	8.87	63.00	5.04	1.56
T ₁₈ – Wing Wang Sang	20.33	69.67	6.87	59.07	5.27	1.67
T ₁₉ – Her Majesty	25.67	69.11	7.33	56.00	4.21	1.56
T ₂₀ – Green Bay	27.00	78.44	8.27	54.79	3.57	1.44
T ₂₁ – Priscilla	23.00	90.23	8.00	64.50	4.33	1.78
T ₂₂ – Red Ginger	17.67	88.60	8.93	62.80	4.07	1.44
CD (P=0.05)	3.24	2.18	0.53	1.69	0.19	0.08
CV	10.38	1.72	4.20	1.85	2.88	9.24

(8.93), whereas, cultivar Oscar showed lowest number of leaves per plant (6.07). Difference in vegetative characters of different cultivars of gladiolus may be due to varied growth rates and their genetic capability resulted in variation in phenotypic expression. Similar results for vegetative characters in gladiolus were observed by Lepcha *et al.* (6). Increased length of leaf (65.47cm) was shown by cultivar Candyman followed by cultivar Summer Sunshine (63.00cm), whereas, cultivar Tiger Flame had minimum length of leaf (38.87cm). Breadth of leaf (5.27cm) was significantly higher in cultivar Wing Wang Sang, while, minimum breadth of leaf (2.73cm) was associated with cultivar Morocco Beauty. Cultivars Eight Wonder and Wing Wang Sang recorded maximum number of tillers (1.67 each). whereas, minimum number of tillers per plant (1.00) was noticed in cultivar Red Majesty, Charm Glow, Souvenir, American Beauty, Wedding Bouquet and Poppy Tears which was on par with cultivar Appaluse and Pacifica (1.07). Different cultivars showed variable responses for vegetative characteristics. Cultivars under study were given same soil and climatic conditions but variations occurred. This might be due to their genetic composition which interacts differently to the soil and climatic condition of the prevailing area. Reports of Safiullah and Ahmed (14) also confirmed these results regarding variation in vegetative and floral characteristics for gladiolus cultivars.

Performance of gladiolus cultivars for flowering characters

Gladiolus cultivars varied significantly for quality and flowering parameters (Table 2). One can observe variations among floral characteristics for different cultivars. These variations among floral characteristics of gladiolus cultivars have also been observed by Lal *et al.* (5). Mahanta and Paswan (7) compared various gladiolus cultivars and observed similar differences among cultivars for floral characteristics. Days taken for spike emergence (68.58days) and floret opening (77.53 days) were advanced in cultivar Eight Wonder whereas, it was delayed in Green Bay (110.17days). While, cultivar Green Bay took maximum days for floret opening (119.47 days) which was on par with cultivar Pacifica (119.13 days). Time required for spike emergence is an important varietal character in gladiolus that might be primarily governed by the genetic makeup of the varieties. Spike emergence might have been primarily dependent on food reserves that could be related to growth rate of plants regulating accumulation of the requisite level of carbohydrates for slipping. These results are in accordance with the

findings of Kumar (3), Swaroop (17), Cantor *et al.* (1), Shaukat *et al.* (15) and Negi *et al.* (9) who reported different time durations for first spike initiation, showing of first floret colour and floret opening in different cultivars under prevailing agro-climatic conditions. Advanced spike initiation and delay in floret opening in several cultivars of gladiolus signifies the good quality of spike which may regulate the market based on prevailing climatic conditions of West Garo Hills. Spike length, which is synonymous with quality in current commercial grading system, was highly variable among the cultivars. Data recorded for spike length of different gladiolus cultivars presented in Table 2 showed that significant increase in spike length was associated with cultivar Candyman (109.77cm) followed by cultivar Pacifica (98.33cm) and The Queen (95.93cm). The lowest spike length was recorded with cultivar Her Majesty (55.07cm). No significant differences were observed among cultivars Poppy Tears (66.83cm), Wedding Bouquet (66.80cm), Morocco Beauty (66.63cm) and Wing Wang Sang (65.43cm), respectively. A similar trend was noted for rachis length where cultivar Candyman had the maximum rachis length (65.50 cm), while it was minimum in cultivar Her Majesty (29.87 cm), whereas, cultivars, Interpid (44.40cm), Eight Wonder (45.63cm), Oscar (43.97cm) Wedding Bouquet (45.17cm), Poppy Tears (44.40cm), Morocco Beauty (45.37cm) and Wing Wang Sang (44.60cm) were on par with each other. Cultivar Wedding Bouquet exhibited the maximum number of florets per spike (15.13) being on par with cultivar The Queen (15.07) and Green Bay (14.33). Minimum number of florets per spike (8.40) was observed in cultivar Her Majesty. Number of florets per spike obtained in all varieties was markedly superior due to vegetative growth. Uppal and Arora (18) also noticed significant differences in number of florets per spike in different gladiolus cultivars. Significant response in diameter of second floret and flower stalk was observed among the gladiolus varieties under study. The maximum diameter of second floret (10.23cm) was noticed in cultivar Priscilla. However, Her Majesty showed lowest diameter of second floret (4.70cm). Spike girth is a crucial character, since it determines the sturdiness of the cut flowers. Mahanta and Paswan (7) recognized sturdiness of the cut flower as one of the important characters in gladiolus. Spike girth should be more to have sturdy cut flowers. There were significant differences amongst the gladiolus cultivars with respect to spike girth. Cultivar Priscilla had also recorded the maximum spike girth (0.90cm) followed by Pacifica (0.83cm) and Candyman (0.77cm). Minimum spike girth (0.34cm) was noted

Table 2: Performance of gladiolus cultivars for flowering characters under West Garo Hills District, Meghalaya.

Cultivars	Days taken for spike emergence	Days taken for floret opening	Spike length (cm)	Rachis length (cm)	No.of florets/spike	Diameter of 2 nd floret (cm)	Spike girth (cm)	Field life (days)	Vase life (days)
T ₁ – The Queen	73.60	83.30	95.93	51.70	15.07	9.07	0.83	13.72	10.09
T ₂ – Red Majesty	76.73	90.27	78.06	41.37	13.47	8.12	0.73	12.09	8.34
T ₃ – Applause	79.27	91.53	86.69	51.37	12.51	7.70	0.75	11.80	7.30
T ₄ – Charm Glow	93.73	106.27	64.83	37.47	13.28	6.10	0.65	14.10	11.73
T ₅ – Candy Man	72.13	83.20	109.77	65.50	12.63	8.13	0.77	11.82	8.33
T ₆ – Interpid	74.00	84.32	73.07	44.40	12.32	9.47	0.87	11.76	9.60
T ₇ – Eight Wonder	68.58	77.53	81.07	45.63	11.03	8.79	0.79	10.67	9.60
T ₈ – Pacifica	107.00	119.13	98.33	56.33	9.53	9.24	0.83	9.33	8.07
T ₉ – Tiger Flame	81.20	93.57	84.93	42.31	11.52	8.70	0.68	10.47	8.47
T ₁₀ – Souvenir	77.60	89.47	71.70	36.83	9.00	8.47	0.78	8.40	7.03
T ₁₁ – American Beauty	80.20	93.73	98.20	60.40	13.32	7.93	0.76	12.87	11.33
T ₁₂ – Oscar	83.00	93.31	92.27	43.97	10.27	8.40	0.65	9.87	8.33
T ₁₃ – Prosperity	93.07	106.24	78.00	42.33	9.80	9.03	0.88	9.00	7.73
T ₁₄ – Wedding Bouquet	102.53	113.13	66.80	45.17	15.13	8.40	0.81	14.00	10.81
T ₁₅ – Poppy Tears	99.45	108.00	66.83	44.40	11.40	5.87	0.34	11.00	8.47
T ₁₆ – Morocco Beauty	99.80	111.73	66.63	45.37	10.60	7.40	0.58	10.15	8.03
T ₁₇ – Summer Sunshine	84.20	94.60	67.23	39.63	9.80	6.73	0.54	9.24	7.63
T ₁₈ – Wing Wang Sang	89.40	99.93	65.43	44.60	11.33	7.37	0.69	10.77	8.83
T ₁₉ – Her Majesty	88.43	103.27	55.07	29.87	8.40	4.70	0.36	7.67	6.47
T ₂₀ – Green Bay	110.17	119.47	82.53	55.13	14.33	9.17	0.82	13.27	10.60
T ₂₁ – Priscilla	80.87	89.60	94.25	51.20	12.93	10.23	0.90	12.13	9.40
T ₂₂ – Red Ginger	79.63	91.15	81.45	49.00	12.24	8.57	0.77	11.87	8.73
CD(P=0.05)	1.91	3.25	1.83	2.08	1.56	0.42	0.06	1.11	1.14
CV	1.35	2.02	1.38	2.71	4.77	3.14	5.57	3.56	4.05

from cultivar Poppy Tears. Cultivar Charm Glow showed maximum field life of the flowers (14.10 days) followed by cultivar American Beauty (12.87days) and Candyman (11.82days), while, minimum field life (7.67days) was noted in cultivar Her Majesty. However, prolonged vase life of the cut gladiolus flowers was observed in cultivar Charm Glow (11.73 days) which was on par with American Beauty (11.33 days), whereas, the minimum vase life was recorded in cultivar Her Majesty (6.47 days). Variation in vase-life may be attributed to differential accumulation of carbohydrates from varied leaf production, sensitivity of cultivars to ethylene and genetical framework of the plant. Kumar and Yadav (4) and Mishra (8) had also

reported similar results in variation of vase-life of cut gladiolus spikes. Maximum vase-life period may be attributed to its longer spike length and more number of florets per spike which helps the spike to retain attractiveness for a longer period. These results are in accordance with the findings of Pasannavar (12) and Sidhu and Arora (16), where they reported a vase-life of 7.6-11.6 days, respectively.

Performance of gladiolus cultivars for corm characters

Close observation of the corm and cormel characteristics showed variable responses for the cultivars under study. Different cultivars responded or

Table 3: Performance of gladiolus cultivars for corm characters under West Garo Hills District, Meghalaya.

Cultivars	No. of corms/ plant	No. of corm- els/ plant	Polar diameter of the corm (cm)	Equatorial diameter of the corm (cm)	Weight of the corms (g)	Weight of the cormels (g)
T ₁ – The Queen	1.87	38.93	2.20	4.98	44.33	38.51
T ₂ – Red Majesty	2.13	27.67	3.13	5.85	42.40	23.37
T ₃ – Applause	1.87	43.33	2.00	4.33	39.43	36.49
T ₄ – Charm Glow	1.80	30.97	2.00	4.80	29.90	25.68
T ₅ – Candy Man	2.40	29.20	3.37	7.13	93.00	23.46
T ₆ – Interpid	2.00	63.00	3.00	7.47	69.73	48.34
T ₇ – Eight Wonder	2.13	27.23	2.50	6.27	37.47	21.15
T ₈ – Pacifica	2.33	59.23	2.70	5.57	44.73	44.20
T ₉ – Tiger Flame	1.40	19.43	1.50	3.20	9.60	14.11
T ₁₀ – Souvenir	1.53	18.47	1.77	3.80	13.97	13.51
T ₁₁ – American Beauty	1.97	31.07	2.00	6.70	75.43	22.49
T ₁₂ – Oscar	2.13	22.03	1.97	4.87	31.40	15.58
T ₁₃ – Prosperity	2.27	47.53	2.10	4.83	26.43	33.72
T ₁₄ – Wedding Bouquet	1.47	41.53	2.53	4.53	30.07	30.86
T ₁₅ – Poppy Tears	2.20	29.73	1.93	3.97	41.10	21.78
T ₁₆ – Morocco Beauty	2.07	33.83	1.67	4.20	45.47	24.02
T ₁₇ – Summer Sunshine	2.13	38.07	1.53	4.57	28.23	25.11
T ₁₈ – Wing Wang Sang	2.23	58.23	2.87	5.83	42.83	44.57
T ₁₉ – Her Majesty	1.63	36.70	2.33	6.30	50.83	27.52
T ₂₀ – Green Bay	1.60	30.40	2.00	3.80	40.77	23.99
T ₂₁ – Priscilla	1.67	43.03	1.20	2.73	11.63	34.71
T ₂₂ – Red Ginger	2.07	38.70	1.97	3.87	40.33	26.82
CD (P=0.05)	0.41	2.47	0.35	0.46	3.27	2.99
CV	12.82	4.08	9.63	5.58	4.88	6.42

interact with prevailing soil and climatic conditions depending upon their genetic composition. Mahanta and Paswan (7) compared different cultivars of gladiolus and observed highly significant differences among the cultivars for corm and cormel characteristics. The maximum number of corms per plant (2.40) was observed in cultivar Candyman being on par with Pacifica (2.33), White Prosperity (2.27), Wing Wang Sang (2.23), Poppy Tears (2.20), Red Majesty (2.13), Eight Wonder (2.13), Oscar (2.13), Summer Sunshine (2.13), Morocco Beauty (2.07), Red Ginger (2.07) and Interpid (2.00). Minimum number of corms (1.40) was recorded from cultivar Tiger Flame. However, cultivars Interpid showed maximum number of cormels per plant (63.00) and minimum number of

cormels per plant (18.47) was observed in cultivar Souvenir. Analysis of data (Table 3) revealed that cultivar Candyman had the maximum weight of the corms (93.00 g) and there was minimum (9.60g) weight in Tiger Flame. However, cultivar Interpid noted the maximum weight of the cormels (48.34g), while, minimum weight of cormels (13.51g) was observed in cultivar Souvenir. A significant difference in polar and equatorial diameter of corm was also noticed among the gladiolus cultivars. Cultivar Candyman showed maximum polar diameter (3.37cm) which was on par with Red Majesty (3.13cm). Minimum polar diameter of the corm (1.20cm) was noted from cultivar Priscilla. However, maximum equatorial diameter of the corm (7.47cm) was exhibited by cultivar Interpid (7.47 cm)

which was on par with Candyman (7.13 cm). While, cultivar Priscilla showed minimum equatorial diameter of the corm (2.73 cm). Pragma *et al.* (13) also noticed significant differences in corm and cormel characters among the cultivars.

Therefore, the present investigation concluded that among twenty two cultivars, Candyman performed best for most of the vegetative, flowering and corm production parameters, followed by Interpid, Eight Wonder, Priscilla, Charm Glow and Wedding Bouquet. These cultivars may be recommended for the commercial cultivation under the prevailing climatic conditions of West Garo Hills district, Meghalaya.

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Citation : Momin B.C., Kumar S., Momin K.C. and Dewan N. (2015). Evaluation of *gladiolus* (*Gladiolus grandiflorus* L.) genotypes under West Garo Hills district, Meghalaya. *HortFlora Res. Spectrum*, **4**(3) : 224-229