"Study On Genetic Variability Of Gladiolus (Gladiolus grandiflorus) Cultivar Under Prayagraj Agro-Climatic Conditions"

ABSTRACT

An experiment to Study on genetic variability of Gladiolus (*Gladiolus grandiflorus*) cultivars under prayagraj agro-climatic conditions was carried out at Departmental research field of Horticulture, Naini Agriculture Institute during the Rabi season of 2021-2022 with Eight Cultivars in randomized block design with three replications. The viz. White prosperity, Mohini, Hunting song, Creamy green, Suchitra, Samara, Nova, Peterpears. Evaluated were out of twenty-five cultivars means estimated Genetic variability, heritability, phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) and genotypic correlation. The characters, Plant height at (30, 60, 90 DAS), Number of leaves per plant at (30,60,90 DAS), No. of shoot per plant, Days taken for corm sprouting, Rachis length, Days taken to spike emergence, days taken colour break stage, No. of floret per spike, No. of spike per plant, No. of days taken for first floret open, No. of days taken for last floret open, spike length, floret diameter, vase life, Weight of daughter corm, Weight of mother corm, corm diameter, corm weight, No. of corm per hectare, No. of cormels per hectare and Corm yield/plant observed for all characters. Highest GCV and PCV were recorded for Weight of daughter corm (g) (33.6786 and 47.569), No. of cormels per hectare (37.743 and 37.97), No. of corm per hectare (27.961 and 32.13), No. of days taken for first floret open (30.0614 and 30.0889), Corm yield/plant (23.667 and 29.334), Weight of mother corm (25.6022 and 28.1499),Corm weight (21.75 and 25.49), Days taken for corm sprouting (23.7566 and 23.7566) and lowest GCV and PCV were recorded for No. of floret per spike (2.7578 and 3.3549). The genotypes Creamy green followed by White prosperity were identified as high corm yielding and no. of corm per hectare and produced higher spikes yield per plot which indicated that these genotypes may be sown for higher yield and indicated good response to selection owing to their high heritability, variability and genetic advance showing additive gene effect. These genotypes can be used for improvement of yield and component traits by selection.

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INTRODUCTION

The importance of Floriculture trading has been globally growing exponentially which results in enormous income providing pleasure and happiness. Apart from this bulbous ornamental covers 50,000 ha of the global land in which gladiolus covers 9500 ha. Moreover, in India bulbous ornamentals approximately covers 3500 ha in which gladiolus is cultivated more than 1200 ha with an annual production of 707 million spikes **(NHB, 2013)**, followed by tuberose (800 ha). Owing to the fact that gladiolus or sword lily *(Gladiolus grandiflorus L)* is the most popular ornamental bulbous plants which is commercially grown in our country for its excellent spikes with array of colours.

Comment [A1]: ? hectare

The word gladiolus means a sword because of its shape and foliage. This term was derived from latin word *gladiolus.* In Europe it is usually named as "corn flag" as *Gladiolus illyricus*is found wild as weed in corn fields. Additionally, it is also known as "water fall gladiolus" because it was found growing near the Victoria falls in the tropical forests of Africa. The cultivation of Gladiolus was initiated near the end of 16th century.

Gladiolus cut flowers are produced by different countries such as USA, Holland, Italy, France, Poland, Bulgaria, Brazil, Australia and also Israel. Apart from this in Europe, for over 100 years Gladiolus has been popular, whereas it has been introduced recently in India. Furthermore, gladiolus is being recognised as a modern cut flower and it has been ranked second in the field of area and production of cut flowers grown in India. The cultivation of gladiolus in India was exhibited in 19th century, as firminger's Manual of Gardening in India which was published in the year 1863 portrays that some Gladioli from corms and seeds were grown in Charles Grey's garden which is situated in coonoor. Moreover, cultivation of gladiolus is best suited in India which has suitable agro-climatic conditions. In addition to this, states which have shown to possess better conditions are Jammu & Kashmir, Uttar Pradesh, Himachal Pradesh, Haryana, Delhi, Karnataka, Punjab, West Bengal, Assam, Sikkim and Meghalaya **(NHB, 2015).** It is grown more than 14 ha area **(NHB, 2015).**The cultivation of gladiolus has the potential to change the economic scenario of farmers especially under Northern Indian plains (that includes whole U.P.), coastal areas of Tamil Nadu and Pondicherry.This contributes to employment and financial growth particularly in rural areas. Gladiolus is one of the best bulbous flowers in India which anticipates in establishing floriculture industry by progressive farmers and entrepreneurs.

Comment [A2]: Uttar Pradesh

The popularity of gladiolus has been immensely recognised both in domestic and international market. Likewise, it is also necessary to examine the efficiency of different varieties and hybrids available in the market. So, all these hybrids need to be tested for their performance, colours and colour combinations, floral characteristics like spike length, more number and better size of floret, increase vase life etc. Efficient breeding can be obtained by imparting knowledge of the nature and the extent of association of yield with yield contributing characters which are prime characteristics for breeding.

Materials and methods

The experiment was laid out in Randomized Block Design with Eight treatments, each replicated three times in the Experimental block of Department of Horticulture,Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj - 211007 (U.P.) India. The treatments were allocated randomly to a unit plot in each replication.Eight different varieties viz. White Prosperity,Mohini,HuntingSong,Creamygreen,Suchitra,Samara,Nova,Peterpears were used for the study. The entire experimental land was divided into subplots measuring 1.0m×1.0m and there were totally 24 plots. Five plants were selected at random (non —destruction sampling) and tagged in each treatment combination and replication for the purpose of recording observation on vegetative, flowering and corm characters were recorded from five randomly tagged plants in each treatment.

The Observations were recorded on ~~quantitatives~~quantitative characters selected for genetic variability studies such as Number of days taken for corm sprouting,Number of sprouting per corm,Plant height (cm),Number of leaves per plant, Day to spike emergence, Days taken for colour break stage, First floret opening (Days), Spike length (cm)Size of floret (cm), Vase life of spike (Size of floret (cm), Vase life of spike (at ambient room temperature) (days), Spike per plant at ambient room temperature) (days), Spike per plant Weight of mother corm,Weight of daughter corm(g) Corm diameter, No. of corm per hectare, No. of cormels per hectare, Corm yield/plant.

Estimation of component of variance

The mean square for error was subtracted from the mean square value to genotype and the difference was divided by replication for obtaining the genotype variance, which was calculated according to the method suggested by Burton (1952). The genotype variance was calculated following the procedure given by Burton and Devance (1953).

Genotypic and phenotypic variance for individual environments was obtained with the help of following formula:

Genotypic variance (σ2g) = Genotypic MSS — Error MSS

Number of replications

Phenotypic variance (σ2p) = (σ2g + σ2e)

Where,

σ2e = Error M.S.S.

σ2g = Genotypic variance

σ2p = Phenotypic variance

Results and Discussion

Analysis of variance showed significant differences among the genotypyes for all the twenty quantitative parameters, indicating the ~~sufficients~~sufficient genetic variability to be exploited in breeding programme (Table 1).

Genotypic Coefficient of Variation (GCV)

The genotypic coefficient variance value was categorized as low (0-10%), moderate (10-20%) and high (20% and above) given by Sivasubramanian and Madhavamenon (1973). Wide range of genotypic coefficient of variation (GCV) was observed for the characters ranging Weight of daughter corm (33.6786) to No. of floret per spike (2.7578). High magnitude of GCV were recorded for Weight of daughter corm (33.6786),No. of days taken for first floret open (30.0614), Weight of mother corm (25.6022), Days taken for corm sprouting (23.7566), Corm weight (21.757), number of corms per hectare (27.96), number of corm produced per mother corm (27.96), number of shoot/plant (24.904), corms yield/plant (g) (23.66)., While as moderate estimates were observed for No. of shoot per plant (13.0507), Plant height at (90 DAS) (12.0103), No. of leaves per plant at 30 DAS (11.6573), Days for spike emergence (11.5301), Spike length (11.2748), Days taken for color break stage (11.0456),Corm diameter (10.4691) Whereas low estimates were observed for Rachis length (9.7862), Plant height at 30 DAS (9.3666), Floret diameter (8.7413), Plant height at 60 DAS (7.9676), No. of spike per plant (7.6236), Vase life (7.0876), No. of leaves per plant at 90 DAS (6.8082), No. of days taken for last floret open (6.583), No. of leaves per plant at 60 DAS (6.0198), No. of floret per spike

(2.7578). Similar findings were also reported by Bhujbal et al., (2013), Kumar et al., (2011), Naresh et al., (2015), Pattanaik et al., (2013).

Phenotypic Coefficient of Variation (PCV)

The phenotypic coefficient variance value were categorized as low (0-10%), moderate (10-20%) and high (20% and above) given by Sivasubramanian and Madhavamenon (1973). Wide range of phenotypic coefficient of variation (PCV) was observed for the characters ranging from

Weight of daughter corm (47.569) to No. of floret per spike (3.3549). High magnitude of GCV were recorded for number of cormels/hectare (37.973), number of cormels/ plant (37.97), corms yield/plant (g) (29.33), Weight of daughter corm (47.569), No. of days taken for first floret open (30.0889), Weight of mother corm (28.1499), Corm weight (25.4938), Days taken for corm sprouting (23.7566), While as moderate estimates were observed for No. of shoot per plant (16.5765), No. of spike per plant (14.2576), No. of leaves per plant at 30 DAS (3.9563), Plant height at (90 DAS) (13.9332), Spike length (13.3344), , Rachis length (12.2749), Plant height at 30 DAS (12.2675), Days for spike emergence (11.685), Corm diameter (11.5979), Days taken for color break stage (11.057), Floret diameter (10.8422), Plant height at 60 DAS (10.07), Whereas low estimates were observed for Vase life (8.9914), No. of leaves per plant at 60 DAS (8.243), No. of leaves per plant at 90 DAS (7.5974), No. of days taken for last floret open (7.3535), No. of floret per spike (3.3549). Similar findings were also reported by Bhujbal et al., (2013), Kumar et al., (2011), Naresh et al., (2015), Pattanaik et al., (2013).

Heritability

In the present study the heritability estimates in broad sense were classified into 3 groups such as high (>75%), moderate (60% - 75%), low (<60%). The heritability estimates were found to be high (more than 75%). The high heritability in broad sense was observed for the characters viz. Days taken for corm sprouting (100), No. of days taken for first floret open (99.8176), Days taken for colour break stage (99.7937), number of cormels/hectare (98.80), Days taken for spike emergence (97.3652), Weight of mother corm (82.7181), Corm diameter (81.482), No. of leaves at 90 DAS (80.303), No. of days taken for last floret open (80.1418) , number of corms per hectare (75.70) While as moderate estimates were observed for Plant height at 90 DAS (74.3027), Corm weight (72.833), Spike length (71.4946), No. of leaves at 30 DAS (69.7674), No. of floret per spike (67.5702), Floret diameter (65.0009), Rachis length (63.5613), Plant height at 60 DAS (62.6044), Vase life (62.1359)No. of shoot per plant (61.9844). Whereas low estimates were observed Plant height at 30 DAS (58.2978), No. of leaves at 60 DAS (53.3333), Weight of daughter corm (50.1256), No. of spike per plant (28.5906).The present findings are in accordance with the findings of Bichoo et al., (2002)Balaram and Janakiram (2009), Bhujbal et al.,(2013)Naresh et al., (2015), Singh et al., (2017) and Vanlalruati et al.,(2013).

Genetic advance

In the present investigation, the genetic advance estimates were found to be high for Weight of mother corm (249.6294), Corm weight (234.9176), number of corms per hectare (98.200), number of cormels/hectare (97.500), corms yield/plant (g) (30.93) , Weight of daughter corm (47.6865), No. of days taken for first floret open (41.8654), While as moderate estimates were observed Plant height at 90 DAS (21.0558) showed low genetic advance estimate were found in Spike length (19.3327), Days taken for color break stage (18.4779), Days taken for spike emergence (17.6558), Rachis length (8.091), Plant height at 60 DAS (7.9491), Plant height at 30 DAS (5.3765), Days taken for corm sprouting (2.2022), Floret diameter (1.698), No. of days taken for last floret open (1.5125), No. of leaves per plant at 90 DAS (1.0369), Vase life (1.0022),Corm diameter (0.8644), No. of leaves at 30 DAS (0.7271), No. of leaves per plant at 60 DAS (0.6566), No. of floret per spike (0.5207), No. of shoot per plant (0.2548), No. of spike per plant (0.092). The results was also in accordance with the findings ofVanlalruati et al, (2013), Sing et al., (2017), Naresh et al., (2015), Bhujbal et al., (2013) and Kumar et al., (2011).

Table:1 Estimation of component of variance and genetic parameters for 25 character growth, flowering and corm yield of 8 genotypes in Gladiolus.

S.no.	Characters	Mean	Range		Vg	Vp	GCV	PCV	H^2 (%)	GA	GA as (% Mean)
			Max	Min							
1.	Plant height (cm) 30 DAS	36.49	43.18	31.81	11.68	2.04	9.37	12.27	58.30	5.38	14.80
2.	Plant height (cm) 60 DAS	61.205	67.69	54.04	23.78	37.99	7.96	10.07	62.60	7.94	12.98
3.	Plant height (cm) 90 DAS	98.72	116.57	76.18	140.60	189.234	2.01	13.93	74.30	21.05	21.32
4.	Number of leaves per plant at 30 DAS	3.62	4	3	0.17	0.25	11.65	13.95	69.76	0.72	20.05
5.	Number of leaves per plant at 60 DAS	7.24	8	6.66	0.19	0.35	6.01	8.24	53.33	0.65	9.05
6.	Number of leaves per plant at 90 DAS	8.25	10	8	0.31	0.39	6.80	7.59	80.30	1.03	12.56
7.	No. of shoot per plant	1.2	1.55	1.05	0.02	0.03	13.05	16.57	61.98	0.25	21.16
8.	Days taken for corm sprouting	4.41	6	3	1.27	1.32	23.75	23.75	100	2.20	48.93
9.	Rachis length	50.34	63.01	39.95	24.27	38.18	9.78	12.27	63.56	8.09	16.07
10.	Days for spike emergence	75.33	87	61	75.44	77.48	11.53	11.68	97.36	17.65	23.43

11.	**Days for colour break stage**	81.29	94	66	80.62	80.79	11.04	11.05	99.79	18.47	22.73
12.	**No. of floret per spike**	11.15	12	10.66	0.09	0.13	2.75	3.35	67.57	0.52	4.66
13.	**No. of spike per plant**	1.07	1.33	1	0.01	0.01	7.62	14.25	28.59	0.092	8.39

14.	**No. of days taken for first floret open**	67.66	97	45	413.77	414.53	30.06	30.08	99.81	41.86	61.87
15.	**No. of days taken for last floret open**	12.45	13	10	0.67	0.83	6.58	7.35	80.14	1.51	12.14
16.	**Floret diameter**	11.73	14.5	10.2	0.97	1.60	8.74	10.84	65.0009	1.69	14.51
17.	**Spike length(cm)**	98.44	117.76	71.73	123.16	172.27	11.27	13.33	71.49	19.33	19.63
18.	**Vase life**	8.70	10	7	0.38	0.61	7.08	8.99	62.13	1.002	11.50
19.	**Corm weight(g)**	614.29	813.33	350	19855.35	20515.47	21.75	25.49	72.83	234.91	38.24
20.	**Weight of mother corm(g)**	520.75	704	280	17752.38	2140.309	25.60	28.14	82.71	249.62	47.96
21.	**Weight of daughter corm(g)**	97.08	66	53.33	1069.04	2132.73	33.67	47.56	50.12	47.68	49.11
22.	**Corm diameter(cm)**	4.44	4.85	3.59	0.21	0.26	10.46	11.59	81.48	0.86	19.46

23.	**No. of corm per hectare**	251578.375	153300	153300	347913900	45852670000	27.961	32.13	75.70	98.2	50.11
24.	**No. of cormel per hectare**	4188514.00	714700	207410 0	49913300	52973900	37.743	37.97	98.20	97.50	77.27
25.	**Corm yield/ plant**	78.64	1033.37	47.41	346.38	532.13	23.667	29.334	65.10	30.93	39.33

Conclusion

Based on the present investigation it was concluded that the high magnitude of heritability (in broad sense) coupled with high genetic gain was observed for most of traits exhibiting additive genetic effect. It was observed that PCV was higher than GCV for all the traits studied highest GCV and PCV is recorded as Weight of daughter corm (g) (33.6786 and 47.569), High GCV and PCV is recorded in No. of days taken for first floret open (30.0614 and 30.0889), High GCV and PCV is recorded in Weight of mother corm (25.6022 and 28.1499), High GCV and PCV is recorded in Days taken for corm sprouting (23.7566 and 23.7566) respectively. Genotypic and phenotypic correlation coefficient analysis revealed that Corm weight/plant (g) showed positive significant association with No. of leaves per plant at 60 DAS, Weight of mother corm (g), Corm diameter (cm) while negative association with No. of leaves per plant at 30 DAS and Floret diameter. The genotypes Creamy green followed by White prosperity, Nova, Suchitra and Hunting song produced higher spike yield per plot which is indicated that these genotypes may be shown for higher yield and indicated good response to selection owing to their high heritability, variability and genetic advance showing additive gene effect. These genotypes can be used for improvement of yield and components traits by selection.

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