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Correlation Analysis in Gladiolus *(Gladiolus grandiflorus L.)*

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Abstract

Correlation coefficient analysis in twenty genotypes of gladiolus (*Gladiolus grandiflorus* L.) were studied at Department of Horticulture, Naini Agriculture Institute, SHUATS, Allahabad during the year 2013-2014 for eighteen quantitative characters. It was observed that there were significant correlations spike yield and its contributing characters at both genotypic and phenotypic levels. Shoots/plant exhibited a high significant correlation with corms/plant among spike parameters days to 50% heading, days to first floret colour showing, days to first floret opening and rachis length were found to be associated at high significance with spike yield. The results of investigation revealed that days to first floret colour showing, days to first floret opening, days to last floret opening, florets/spike, rachis length, plant height, shoot/plant and corms/plant are important spike quality characters. Hence, these characters may be considered as selection indices in gladiolus breeding programme.

Keywords: Gladiolus; Correlations; Yield attributes

Introduction

Gladiolus is an important bulbous ornamental prized for its beautiful spikes as well as longer vase-life and said to be the Queen of bulbous flower crops [1]. The current number of species in genus gladiolus is 300 [2]. Gladiolus is native to the sub African region, and is found mainly in Tropical Africa and South Africa. Gladiolus is being grown in an area of 11660 ha in the country with an estimated production of 106 crore cut flowers. Amongst the cut flowers, gladiolus occupied third position in terms of both area and production. The major gladiolus producing states in the country are Uttar Pradesh, West Bengal, Odisha, Chattishgarh, Haryana & Maharashtra. Gladiolus is also grown in states like Uttarakhand, Karnataka, Andhra Pradesh and Sikkim. Even though gladiolus is mainly a winter season flower crop, in areas having moderate climatic conditions, gladiolus can be grown throughout the year. Gladiolus cultivation under Northern Indian plains (that include whole of U.P), coastal areas of Tamilnadu and Pondicherry has a potential to change the economic scenario of farmers of these areas. Yield and quality of flower are quantitative characters and are highly influenced by environmental factors. Thus, yield and association of yield contributing traits is considered to be of great importance for planning and executing breeding programme. Correlation study provides beneficial information regarding the interrelationship of quantitative traits among each other and influence of these traits on yield, there by aid in selection [3].

Material and Methods

The present investigation entitled "Genetic variability and stability analysis for some quantitative characters in gladiolus (*Gladiolus grandiflorus* L.)" is undertaken to obtain information on genetic variability, heritability, correlation and stability under four environments. The experiment was conducted during 2013 to 2014 at Department of Horticulture, Naini Agriculture Institute, SHUATS, Allahabad. The experiment was laid out in RBD with three replication .the experiment consisted of twenty treatments namely (Redginger, American beauty, Charm flow, green bay, Jester, Red majestry, Candy man, Summer sunshine, Poppytears, Punjab dawn, Pusa srijana, Arti . Hunting song, Sabnam, Darsan, Arka amar, Legent, Summer rose , Wind song and Monini) statistical significance was tested by 'F' value at 5 per cent level of significance. It helps in working out the variance due to different source and also provides the basis for test of significance. Analysis of variance was carried out as per the procedure given by Panse and sukhatme1967 using the mean values of five randomly selected plants in each replication from all the treatments to find out the significance of treatment effect.

Results and Discussion

Table 1: Genotypic correlation coefficient between different characters of Gladiolus (*Gladiolus grandiflorus*) Allahabad 2013-2014.

S. No	Character	Weight of Corms	Diameter of Corms (in cm)	Day to Sprouting	Days to 50% Heading	Days to First Floret Color Showing	Days to First Floret Opening	Days to Last Floret Opening	Durability of Whole Spike	Diameter of First Floret	Florets / Spike	Florets Open At First	Florets Remain Open At A Time	Shoots/ Plant	Rachis Length (in cm)	Plant Height (in cm)	Leaves/ Shoots	Corms/ Plant	Cormels/ Plant
1	Weight of Corms	1	0.73	-0.32	0.15	0.11	0.13	-0.06	-0.26	0.17	0.07	0.31	-0.19	0.29	0.12	0.06	0.28	0.29	0.52
2	Diameter of Corms cm		1	-0.2	0.1	-0.03	-0.01	-0.09	-0.16	-0.1	0.29	0.04	-0.51	0.37	0.29	0.26	0.37	0.37	0.57
3	Day to Sprouting			1	-0.34	-0.27	-0.23	-0.24	-0.1	-0.53	-0.55	-0.27	-0.11	-0.06	-0.29	-0.42	-0.19	-0.06	-0.15
4	Days to 50% Heading				1	0.96	0.95	0.8	-0.16	0.15	0.12	0.07	-0.42	-0.45	0.36	0.54	0.46	-0.45	0.24
5	Days to First Floret Colour Showing					1	0.98	0.83	-0.13	0.18	0.01	0.01	-0.48	-0.6	0.34	0.52	0.36	-0.6	0.25
6	Days to First Floret Opening						1	0.86	-0.12	0.1	0.04	0.08	-0.52	-0.62	0.39	0.54	0.36	-0.62	0.26
7	Days to Last Floret Opening							1	0.38	0.11	0.28	0.05	-0.53	-0.57	0.52	0.52	0.32	-0.57	0.08
8	Durability of Whole Spike								1	-0.05	0.52	-0.15	-0.09	0.02	0.36	0.03	0.02	0.02	-0.33
9	Diameter of First Floret									1	0.17	0.23	-0.02	-0.13	0.23	0.36	0.37	-0.13	0.26
10	Florets/ Spike										1	0.09	-0.16	-0.13	0.62	0.48	0.24	-0.13	0.01
11	Florets Open At First											1	0.06	0.07	-0.04	0.03	0.28	0.07	0.31
12	Florets Remain Open At A Time												1	0.44	-0.44	-0.37	-0.19	0.44	-0.5
13	Shoots/ Plant													1	-0.4	-0.6	-0.13	1	-0.16
14	Rachis Length cm														1	0.85	0.43	-0.4	0.31
15	Plant Height cm															1	0.48	-0.6	0.39
16	Leaves/ Shoots																1	-0.13	0.33
17	Corms/ Plant																	1	-0.16
18	Cormels/ Plant																		1

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Table 1: Phenotypic correlation coefficient between different characters of Gladiolus (*Gladiolus grandiflorus*) Allahabad 2013-2014.

S. No	Character	Weight of Corms	Diameter of Corms (in cm)	Day to Sprouting	Days to 50% Heading	Days to First Floret Color Showing	Days to First Floret Opening	Days to Last Floret Opening	Durability of Whole Spike	Diameter of First Floret	Florets/ Spike	Florets Open At First	Florets Remain Open At A Time	Shoots/ Plant	Rachis Length (in cm)	Plant Height (in cm)	Leaves/ Shoots	Corms/ Plant	Cormels/ Plant
1	Weight of Corms	1	0.34	-0.31	0.12	0.1	0.12	-0.05	-0.23	0.16	0.07	0.28	-0.17	0.23	0.1	0.05	0.22	0.23	0.5
2	Diameter of Corms cm		1	-0.08	0.05	-0.04	-0.03	-0.07	-0.13	-0.08	0.13	0.09	-0.28	0.27	0.19	0.14	0.31	0.27	0.34
3	Day to Sprouting			1	-0.33	-0.26	-0.22	-0.24	-0.09	-0.52	-0.53	-0.26	-0.11	-0.05	-0.29	-0.42	-0.15	-0.05	-0.14
4	Days to 50% Heading				1	0.94	0.93	0.77	-0.17	0.13	0.1	0.06	-0.35	-0.41	0.35	0.53	0.35	-0.41	0.23
5	Days to First Floret Colour Showing					1	0.98	0.83	-0.13	0.17	0.02	0.01	-0.43	-0.56	0.33	0.51	0.27	-0.56	0.25
6	Days to First Floret Opening						1	0.85	-0.12	0.09	0.04	0.07	-0.46	-0.57	0.37	0.53	0.27	-0.57	0.26
7	Days to Last Floret Opening							1	0.37	0.11	0.28	0.04	-0.48	-0.52	0.5	0.51	0.24	-0.52	0.08
8	Durability of Whole Spike								1	-0.03	0.51	-0.16	-0.07	0.02	0.34	0.02	0.02	0.02	-0.32
9	Diameter of First Floret									1	0.17	0.21	-0.02	-0.14	0.22	0.34	0.29	-0.14	0.25
10	Florets/ Spike										1	0.07	-0.13	-0.13	0.6	0.47	0.17	-0.13	0.01
11	Florets Open At First											1	0.04	0.05	-0.03	0.01	0.25	0.05	0.29
12	Florets Remain Open At A Time												1	0.38	-0.38	-0.32	-0.11	0.38	-0.45
13	Shoots/ Plant													1	-0.36	-0.54	-0.12	1	-0.14
14	Rachis Length cm														1	0.83	0.34	-0.36	0.3
15	Plant Height cm															1	0.35	-0.54	0.38
16	Leaves/ Shoots																1	-0.12	0.26
17	Corms/ Plant																	1	-0.14
18	Cormels/ Plant																		1

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The genotypic and phenotypic correlation studies were carried out for eighteen quantitative characters to know the nature of association between number of cormeles/plant and its attributing characters (Table 1 & 2).

The weight of corm exhibited significant and positive correlation at both genotypic and phenotypic with diameter of corm (rg: 0.73; rp: 0.34), cormels/plant (rg: 0.52; rp: 0.50), florets open at first (rg: 0.31; rp: 0.28), diameter of first floret (rg: 0.17; rp: 0.16),days to 50% heading (rg: 0.15; rp: 0.12), days to first floret colour opening (rg: 0.13; rp: 0.12), rechis length (rg: 0.12; rp: 0.10), days to first floret colour showing (rg: 0.11; rp: 0.10), floret/spike (rg: 0.07; rp: 0.07), and plant height (rg: 0.06; rp: 0.05). significant and negative correlation was recorded by this parameter with days to sprouting (rg: -0.32; rp: -0.31), durability of whole spike (rg: -0.26; rp: -0.23), floret remain open at a time (rg: -0.19; rp: -0.17), and days to last floret opening (rg: -0.06; rp: -0.05).

Diameter of corms showed significant and positive correlation at both genotypic and phenotypic level with cormels/plant (rg: 0.57; rp: 0.34), leaves /shoots(rg: 0.37; rp: 0.34), corms/plant or shoot/plant (rg: 0.37; rp: 0.27), florets/pike (rg: 0.29; rp: 0.13), rechis length (rg: 0.29; rp: 0.19), plant height (rg: 0.26; rp: 0.14), and days to 50% heading (rg: 0.10; rp: 0.05). Significant and negative correlation was recorded by this parameter with florets remain open at a time (rg: -0.51; rp: -0.28), durability of whole spike (rg: -0.16; rp: -0.13), days to sprouting (rg: -0.20; rp: -0.08), diameter of first floret (rg: -0.10 ; rp: -0.08), days to last floret opening (rg: -0.09 ; rp: -0.07), days to first floret colour showing (rg: -0.03; rp: -0.04) and days to first floret opening (rg: -0.01; rp: -0.03).

Days to sprouting showed significant and negative correlation was recorded with floret/spike (rg: -0.55; rp: -0.53), diameter of first floret (rg: -0.53; rp: -0.52), plant height (rg: -0.42; rp: -0.42), days to 50% heading (rg: -0.34; rp: -0.33), rechis length (rg: -0.29; rp: -0.29), florets open at first or day to first floret colour showing (rg: -0.27; rp: -0.26), days to last floret opening (rg: -0.24; rp: -0.24), days to first floret opening (rg: -0.23; rp: -0.22), leaves/shoot (rg: -0.19; rp: -0.15), cormels/plant (rg: -0.15; rp: -0.14), floret remain open at a time (rg: -0.11; rp: -0.11), durability of whole spike (rg: -0.10; rp: -0.09), corms/plant (rg: -0.06 ; rp: -0.05), and shoot/plant (rg: -0.06; rp -0.05).

Days to heading had a significant and positive correlation at genotypic and phenotypic level with days to first floret colour showing (rg: -0.96; r: p 0.93), days to first floret opening (rg: 0.95; rp: 0.93), days to last floret opening (rg: 0.80; rp: 0.77), plant height (rg: 0.54; r: p -0.53), leaves/shoot (rg: 0.46; rp: 0.35), rechis length (rg: 0.36; rp: -0.35), cormels/plant (rg: 0.24; rp: 0.23), diameter of first floret (rg: 0.15; rp: -0.13), florets/pike (rg: 0.12; rp: -0.06), florets open at first (rg: 0.07; rp: 0.06), significant and negative correlation was recorded by this parameter corms/plant (rg: -0.45; rp: -0.41), shoots/plant(rg: -0.45; rp:-0.41), floret remain open at a time(rg: -0.42; rp: -0.35), and durability of whole spike(rg: -0.16; rp: -0.17).

Days to first floret colour showing had a significant and positive correlation at genotypic and phenotypic level with first floret opening (rg: 0.98; rp: -0.98), days to last floret opening (rg: 0.83; rp: 0.83), plant height (rg: 0.52; rp: 0.51), leaves/shoot (rg: 0.36; rp: 0.27), rechis length (rg: 0.34; rp: 0.33), floret per spike (rg: 0.01; rp: 0.02), floret open at first (rg: 0.01; rp: 0.01). Significant and negative correlation was recorded by this parameters corms/plant (rg: -0.60; rp: -0.56), shoot/plant (rg: -0.60; rp: -0.56), florets remain open at a time (rg: -0.48; rp: -0.43) and durability of whole spike (rg: -0.13; rp: -0.13).

Days to first floret opening showed significant and positive correlation at both genotypic and phenotypic level with days to last floret opening (rg: 0.86; rp: 0.85), plant height (rg: 0.54; rp: 0.53), rachis length (rg: 0.39; rp: 0.37), leaves/shoot (rg: 0.36; rp: 0.27), cormels/plant (rg: 0.26; rp : 0.26), diameter of first floret (rg: 0.10; rp: 0.09), floret open at first (rg: 0.08; rp: 0.07) and floret/spike (rg: 0.04; rp: 0.04) whereas significant and negative correlation was recorded at genotypic and phenotypic level with corms/plant (rg: -0.62; rp: -0.57), shoot/plant (rg: -0.62; rp: -0.57), floret remain open at a time (rg: -0.52; rp: -0.46) and durability of whole spike (rg: -0.12; rp: -0.12) .

Days to last floret opening showed significant and positive correlation at both genotypic and phenotypic level with plant height (rg: 0.52; rp: 0.51) rechis length (rg: 0.52; rp: 0.50), durability of whole spike (rg: 0.38; rp: 0.37), leaves/shoot (rg: 0.32; rp: 0.24), floret/spike (rg: 0.28; rp: 0.28), diameter of first floret (rg: 0.11; rp : 0.11), cormels/plant (rg: 0.08; rp: 0.08), and floret open at first (rg: 0.05; rp: 0.04) whereas significant and negative correlation was recorded at genotypic and phenotypic level with corms/plant (rg: -0.57; rp: -0.52), shoot/plant (rg: -0.57; rp: -0.52) and florets remain open at a time(rg: -0.53; rp: -0.48).

Durability of whole spike showed significant and positive correlation at both genotypic and phenotypic level with florets/spike (rg: 0.52; rp: 0.51), rachis length (rg: 0.36; rp: 0.34), plant height (rg: 0.03; rp: 0.02), corms/plant (rg: 0.02; rp: 0.02), leaves/shoot (rg: 0.02; rp: 0.02) and shoot/plant (rg: 0.02; rp: 0.02) whereas significant and negative correlation was recorded at genotypic and phenotypic level with cormels/plant (rg: -0.33; rp: -0.32), florets open at first (rg: -0.15; rp: -0.16), florets remain open at a time (rg: -0.09; rp: -0.07), diameter of first floret (rg: - 0.05 rp: -0.03). Similar findings also reported by Sandu et al., (1990).

Diameter of first floret showed significant and positive correlation at both genotypic and phenotypic level with leaves/shoot (rg: 0.37; rp: 0.29), plant height (rg: 0.36; rp :0.34), cormels/plant (rg: 0.26; rp: 0.25), rechis length (rg: 0.23; rp: 0.22), florets open at first (rg: 0.23; rp: 0.21) and florets/spike (rg: 0.17; rp: 0.17) whereas significant and negative correlation

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was recorded at genotypic and phenotypic level with corms/plant (rg: -0.13; rp: -0.14), at both shoots/plant (rg: -0.13; rp: -0.14) and florets remain open at a time(rg: -0.02; rp: -0.02).

Floret/spike showed significant and positive correlation genotypic and phenotypic level with rachis length (rg: 0.62; rp: 0.60), Plant height (rg: 0.48; rp: 0.47), leaves/shoot (rg: 0.24; rp: 0.17) and florets open at first(rg: 0.09; rp: 0.07) and cormels/plant (rg: 0.01; rp: 0.01), whereas significant and negative correlation was recorded at genotypic and phenotypic level with florets remain open at a time (rg: -0.16; rp: -0.13), corms/plant (rg: -0.13; rp: -0.14) and shoots/plant (rg: -0.13; rp: -0.13). Similar findings also reported by Neeraj et al. (1997-98) and Sirohi et al. (1998-99).

Floret open at first significant and positive correlation at both genotypic and phenotypic level with cormels/plant (rg: 0.31; rp: 0.29), leaves/shoot (rg: 0.28; rp: 0.25), cormels/plant (rg: 0.07; rp: 0.05), shoots/plant (rg: 0.07; rp: 0.05), florets remain open at a time (rg: 0.06; rp: 0.04) and plant height (rg: 0.03; rp: 0.01) whereas significant and negative correlation was recorded at genotypic and phenotypic level with rechis length (rg: -0.04; rp: -0.03).

Floret remain open at a time showed significant and positive correlation at both genotypic and phenotypic level with shoot/plant (rg: 0.44; rp: 0.38) and corms/plant (rg: 0.44; rp: 0.38) whereas significant and negative correlation was recorded at genotypic and phenotypic level with cormeles/plant (rg: -0.50; rp: -0.45), rechis length (rg: -0.44; rp: -0.38), Plant height (rg: -0.37; rp: -0.32) and leaves/shoot (rg: - 0.19; rp: -0.11).

Shoots/plant showed significant and positive correlation at both genotypic and phenotypic level with corms/plant (rg: 1.00; rp: 1.00) whereas significant and negative correlation was recorded at genotypic and phenotypic level with Plant height (rg: -0.60; rp: -0.54), rechis length (rg: -0.40; rp: -0.36), cormels/plant (rg: -0.16; rp: -0.14) and leaves/shoots (rg : - 0.13; rp :-0.12).

Rechis length showed significant and positive correlation at both genotypic and phenotypic level with Plant height (rg: 0.85; rp: 0.83), leaves/shoot (rg: 0.43; rp: 0.34) and cormels/plant (rg: 0.31; rp: 0.30) whereas significant and negative correlation was recorded at genotypic and phenotypic level with corms/plant (rg: -0.40; rp: -0.36). Similar findings also reported by Anuradha [4].

Plant height showed significant and positive correlation at both genotypic and phenotypic level with leaves/shoot (rg: 0.48 rp: 0.35) and cormels/plant (rg: 0.39; rp: 0.38) whereas significant and negative correlation was recorded at genotypic and phenotypic level with corms/plant (rg: -0.60; rp: -0.54).

Leaves/shoot showed significant and positive correlation at both genotypic and phenotypic level with cormels/plant (rg: 0.33; rp: 0.26) whereas significant and negative correlation was recorded at genotypic and phenotypic level with (rg: -0.13; rp: -0.12).

Corms/plant showed significant and negative correlation was recorded at genotypic and phenotypic level with cormels/plant (rg: -0.16; rp: -0.14). Similar findings also reported by Singh [5], Misra [6], Sandu et al., Anuradha [1], Manjunatha [7], Neeraj [8], Sirohi et al. (1998-99), John [9], Manoj [10], Balaram & Janakiram [11], Prabhat kumar et al. (2011), Rahul [12], Rashmi & Sanjay [13] in gladiolus.

Conclusion

On the basic of the present investigation it is concluded that shoots/plant exhibited a highly significant correlation with corms/plant. Days to 50% heading ,days to first floret colour showing, days to first floret opening and rachis length showed significant positive correlation with spike yield. The results of investigation revealed that days to first floret colour showing, days to first floret opening, days to last floret opening, florets/spike, rachis length, plant height, shoot/plant and corms/plant are important spike quality characters. Hence, these characters may be considered as selection indices in gladiolus breeding programme [14].

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