Ann. Agric. Res. New Series Vol. 46 (3) : 314-320 (2025)

Correlation studies among horticultural traits in Gladiolus genotypes

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Received: May 2025; Revised Accepted: August 2025

Abstract

The present investigation was carried out at department of Horticulture (Floriculture and Landscaping), BAU, Sabour during 2022-23 to evaluate thirteen genotypes of gladiolus under Bihar conditions in Randomized Block Design (RBD) with three replications. The experimental findings revealed that there were significant differences among all genotypes for various growth, floral and corm attributes. Based on their correlation coefficient, spike length (0.556, 0.588), rachis length (0.516, 0.557), floret size (0.415, 0.457), spike vase life (0.412. 0.496), average fresh weight of spike (0.477, 0.494) and spike yield per plot (0.492, 0.529) recorded highly significant and positive correlation with spike yield per plant, whereas plant height (0.310, 0.328) and corm diameter (0.322, 0.345) had significant positive correlation with number of spikes per plant at phenotypic and genotypic level, respectively.

Key words: Gladiolus, correlation, horticultural traits, genotypic and phenotypic.

Introduction

In India, one of the most significant commercial trades in agriculture is floriculture. Now-a-days floriculture is becoming important from export angle. In today's modern world, flowers have become a popular social engagement tool. They are used widely to create and foster social bonds and flower are distinct in their ability to add a unique charm and effervescence to any occasion. In India, floriculture has been practiced for generations and has a great deal of potential to help small and marginal farmers and made lucrative business. The demand of cut flower, mainly in international trade market are chrysanthemum, carnation, tuberose, rose, orchid, gladiolus, gerbera, gypsophila and statice. Among these flowers, gladiolus ranked 4th in cut flower and 1st in bulbous flower in the world (Anonymous, 2022).

Materials and Method

The study was conducted at vegetable seed production D-2 plot, Sabour of Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India during winter season (2022-23). Bihar Agricultural University is located in Bhagalpur district of Bihar. Latitudinal existence of BAU is on the latitude of 25^{o} 15′ 40′′ north and longitudinally the location is of 80^{o} 2′ 42′′ east. It is located on the vast Indo-Gangetic plains of north India at an altitude of 46 meter above mean sea level. The experiment was laid out in Randomized Block Design (RBD) with three replications. The experiment was conducted in open field using a harrow and a plough, the land was levelled and made fine tilth, vermicompost at the rate 800 g/m^2, nitrogen half dose, phosphorus and potash full dose were incorporated into the soil during the bed prepara-

tion. The data on twenty two horticultural traits *viz*., days taken to sprouting, number of stems per corm, plant height, leaf length and width, days taken to spike initiation, spike and rachis length, days taken to first floret showing colour and first floret opening, floret size, spike longevity, average fresh weight of spike, number of florets per spike, spike vase life, number of spikes per plant, spike yield per plot, number of corms and cormels per plant, corm diameter, weight of corms per plant along with corm yield per plot were recorded among thirteen germplasm of gladiolus.

Results and Discussion

The correlation coefficients at genotypic and phenotypic level of different characters in gladiolus are presented in Table 1. At genotypic level, days taken to sprouting showed highly significant and positive correlation with spike longevity (0.615) and spikes yield per plot (0.666), whereas days taken to sprouting had highly significant but negative correlation with leaf length (-0.477), plant height (-0.477), days taken to first floret showing colour (-0.558), days taken to spikes initiation (-0.623) and number of cormels per corm (0.495) alongwith significant and negative correlation with average fresh weight of spikes (-0.394) and weight of corms per plant (-0.344). Leaf length showed highly significant and positive correlation with plant height (0.688), spike length (0.495), rachis length (0.516), days taken to first floret showing colour (0.527), number of florets per spikes (0.565), average fresh weight of spikes (0.439), corm diameter (0.778), weight of corms per plant (0.877) and corm yield per plot (0.638), whereas it had significant positive correlation with number of leaves per plant (0.316), days taken to spikes initiation (0.320) and florets size (0.332). Leaf length showed highly significant but negative correlation with spike vase life (-0.409), spike longevity (-0.785) whereas, significant but negative correlation with spikes yield per plot (-0.382).

Leaf width showed highly significant and positive correlation with corm diameter (0.482) and weight of corms per plant (0.437) along with significant and positive correlation with days taken to first floret showing colour (0.380), days taken to first floret opening (0.381), while showed highly significant and negative correlation with spike vase life (-0.485) and number of corms per plant (-0.459). Number of stems per corm showed highly significant and positive correlation with number of corms per plant (0.681) and corm yield per plot (0.445), whereas it showed highly significant but negative correlation with plant height (-0.439), spike length (-0.414), floret size (-0.423) and significant but negative correlation with number of floret per spikes (-0.355) and average fresh weight of spikes (-0.334). On the other hand plant height showed highly significant and positive correlation with spike length (0.909), rachis length (0.925), days taken to first floret showing colour (0.406), number of floret per spikes (0.871), floret size (0.595), average fresh weight of spikes (0.642), corm diameter (0.775) and weight of corms per plant (0.787), whereas significant and positive correlation with number of spikes per plant (0.328). Plant height showed highly significant but negative positive correlation with spike longevity (-0.501) and significant and negative correlation with number of corms per plant (-0.304).

Spike length showed highly significant and positive correlation with rachis length (0.964), days taken to first floret showing colour (0.400), number of floret per spikes (0.938), floret size (0.732), average fresh weight of spikes (0.745), corm diameter (0.675), weight of corms per plant (0.671) and number of spikes per plants (0.588), whereas it had signficant positive correlation with spike vase life (0.369) and significant negative correlation with number of corms per plant (-0.398). Rachis length was highly significant and positive correlated with days taken to first floret showing colour (0.481), number of floret per spikes (0.930), floret size (0.601), average fresh weight of spikes (0.709), corm diameter (0.737), weight of corms per plant (0.698), number of spikes per plants (0.557) and significant positive correlation with spike vase life (0.353) and had highly significant but negative correlation with number of corm per plants (-0.408) along with significant but negative correlation with spike longevity (-0.360).

Days taken to first floret showing colour achieved highly significant and positive correlation with days taken to spike initiation (0.563),

days taken to first florets opening (0.544), number of florets per spike (0.401), average fresh weight of spike (0.462), corm diameter (0.437), weight of corms per plant (0.453), whereas highly significant and negative correlation with spike longevity (-0.611). Days taken to spike initiation highly significant and positive correlation with number of corms per plant (0.432), number of cormel per corms (0.678), corm yield per plot (0.548) and significant but positive correlation with days taken to first floret opening (0.393) along with highly significant but negative correlation with spike longevity (0.500) and significant but negative correlation with spike vase life (-0.330). Days taken to first floret opening highly significant and positive correlation with number of cormels per corm (0.479) and significant and negative correlation with floret size (-0.349). Number of florets per spike had highly significant and positive correlation with floret size (0.621), average fresh weight of spike (0.694), corm diameter (0.692), weight of corms per plant (0.639), number of spikes per plant (0.457), whereas attained significant and positive correlation with spike vase life (0.374) and significant but negative correlation with spike longevity (-0.378) and number of corms per plant (-0.326).

Floret size was highly significant and positive correlated with number of florets per spike (0.621), average fresh weight of spike (0.694), corm diameter (0.692), weight of corms per plant (0.639) and significant but negative correlation with spike longevity (-0.378). Number of florets per spike attained highly significant positive correlation with average fresh weight of spike (0.521) and corm diameter (0.428), whereas had highly significant but negative correlation with number of corms per plant (-0.438). Spike vase life highly significant and positive correlation with number of spikes per plant (0.496) and significant positive correlation with spike longevity (0.356) and average fresh weight of spike (0.320), whereas spike longevity was highly significant but negative correlation with corm diameter (0.580), weight of corms per plants (-0.604) and corms yield per plot (-0.445). Average fresh weight of spike was highly significant and positive correlated with corm diameter (0.541), weight of corms per plant (0.556) and number of spikes per plant (0.477), whereas had highly significant but negative correlation with spike yield per plot (0.506) and number of corms per plant (-0.480).

Spike yield per plot had highly significant and positive correlation with number of spikes per plant (0.492), whereas number of corms per plant had highly significant and positive correlation with corm yield per plot (0.625). Corm diameter was highly significant and positive correlated with weight of corms per plant (0.920), corms yield per plot (0.480) and number of spikes per plant (0.345), while weight of corms per plant was highly significant and positive correlated with corm yield per plot (0.586).

At phenotypic level, the studied horticultural traits showed almost similar trend as that of genotypic level except for twenty trait interrelations. Days taken to sprouting had significant but negative correlation with leaf length (-0.475) and days taken to first floret showing colour (-0.528),while leaf length reflected non significant correlation with numbers of leaves per plant (0.296), days taken to spike initiation (0.302) and number of florets per spike (0.263) and was highly significant but negative correlated with spike vase life (-0.337) along with highly significant and positive correlated with average fresh weight of spike (0.383). Number of stems per corm showed significant but negative correlation with spike length (-0.384) and floret size (-0.337) alongwith nonsignificant correlation with average fresh weight of spike (0.304) and significant positive correlation with corm yield per plot (0.394). Spike length showed significant and positive correlation with days taken to first floret showing colour (0.355) and significant and negative correlation with number of corms per plant (-0.351). Rachis length had significant but positive correlation with number of florets per spike (0.349). Days taken to spikes initiation had significant and positive correlation with number of corms per plant (0.354) and non significant correlation with spike vase life. Similiarly, floret size had non significant correlation with number of corms per plant and floret size with non significant correlation with average fresh weight of spike at phenotypic level.

At both phenotypic and genotypic level, days taken to sprouting showed highly significant and positive correlation with spike longevity and

Table 1. Genotypic and phenotypic correlation among thirteen genotypes of gladiolus for twenty two characters

Traits		LL	LW	S/C	PH	SpL	RL	FFC	DSI	FFO	F/S	FS	VL	SL	FWS	SY/Pt	C/P	Co/C	CD	CW	CY/Pt	S/P
DSp	P	-0.475*	0.241	0.005	-0.437**	-0.230	-0.263	-0.528*	0.534**	-0.294	-0.243	0.035	0.051	0.568**	-0.332*	0.576**	-0.079	-0.457**	-0.184	-0.322*	-0.272	0.235
	G	-0.477**	0.251	-0.001	-0.477**	-0.278	-0.275	-0.558**	0.623**	-0.301	-0.248	-0.019	0.064	0.615**	-0.394*	0.666**	-0.104	-0.495**	-0.196	-0.344*	-0.304	0.249
LL	P		0.296	-0.178	0.640**	0.475**	0.506**	0.492**	0.302	-0.020	0.557**	0.263	-0.337*	-0.745**	0.385*	-0.346*	-0.069	0.153	0.753**	0.844**	0.586**	-0.035
	G		0.316*	-0.180	0.688**	0.495**	0.516**	0.527**	0.320*	-0.040	0.565**	0.332*	-0.409**	-0.785**	0.439**	-0.382*	-0.081	0.160	0.778**	0.877**	0.638**	-0.026
LW	P			-0.145	0.162	0.164	0.229	0.345*	0.028	0.360*	0.106	-0.056	-0.415**	0.026	0.175	0.236	-0.422**	0.115	0.477**	0.429**	0.071	0.265
	G			-0.160	0.177	0.163	0.307	0.380*	0.031	0.381*	0.120	-0.065	-0.485**	0.022	0.180	0.263	-0.459**	0.116	0.482**	0.437**	0.081	0.292
S/C	P				-0.427**	-0.384*	-0.299	0.134	0.285	0.260	-0.321*	-0.337*	0.235	-0.023	-0.304	0.094	0.595**	-0.154	-0.133	-0.139	0.394*	-0.167
	G				-0.439**	-0.414**	-0.287	0.161	0.306	0.276	-0.355*	-0.423**	0.229	-0.011	-0.334*	0.155	0.681**	-0.156	-0.139	-0.141	0.445**	-0.151
PH	P					0.865**	0.893**	0.404**	0.123	-0.017	0.825**	0.519**	0.095	-0.493**	0.610**	-0.231	-0.360*	0.227	0.752**	0.760**	0.260	0.310*
	G					0.909**	0.925**	0.406**	0.120	-0.004	0.871**	0.595**	0.166	-0.501**	0.642**	-0.261	-0.394*	0.228	0.775**	0.787**	0.286	0.328*
SpL	P						0.944**	0.355*	0.023	0.049	0.907**	0.655**	0.341*	-0.294	0.715**	-0.087	-0.351*	0.284	0.665**	0.651**	0.199	0.556**
	G						0.964**	0.400**	0.014	0.052	0.938**	0.732**	0.369*	-0.298	0.745**	-0.102	-0.398**	0.292	0.675**	0.671**	0.206	0.588**
RL	P							0.453**	0.057	0.075	0.911**	0.551**	0.317*	-0.343*	0.659**	-0.061	-0.392*	0.180	0.724**	0.686**	0.197	0.516**
	G							0.481**	0.044	0.070	0.930**	0.601**	0.353*	-0.360*	0.703**	-0.073	-0.408**	0.184	0.737**	0.698**	0.225	0.557**
FFC	P								0.547**	0.507**	0.349*	-0.003	-0.174	-0.577**	0.407**	-0.131	-0.212	0.266	0.401**	0.428**	0.184	0.161
	G								0.563**	0.544**	0.401**	0.023	-0.138	-0.611**	0.462**	-0.147	-0.232	0.278	0.437**	0.453**	0.214	0.194
DSI	P									0.374*	-0.075	-0.214	-0.304	-0.456**	-0.177	0.085	0.354*	0.624**	0.004	0.158	0.450**	-0.107
	G									0.393*	-0.085	-0.252	-0.303*	-0.500**	-0.189	0.117	0.432**	0.678**	0.010	0.188	0.548**	-0.115
FFO	P										-0.022	-0.294	0.091	0.212	0.229	-0.079	0.026	0.448**	-0.090	--0.029	0.073	0.144
	G										-0.006	-0.349*	0.088	0.251	0.276	-0.078	0.066	0.479**	-0.104	0.026	0.111	0.181
F/S	P											0.564**	0.358*	-0.358*	0.646**	-0.177	-0.301	0.120	0.680**	0.617**	0.235	0.415**
	G											0.621**	0.374*	-0.378*	0.694**	-0.194	-0.326*	0.127	0.692**	0.639**	0.255	0.457**
FS	P												0.202	-0.168	0.471**	-0.227	-0.425**	0.101	0.381*	0.501**	-0.022	0.145
	G												0.176	-0.186	0.521**	-0.234	-0.438**	0.114	0.428**	0.553**	0.025	0.180
VL	P													0.321*	0.295	0.017	0.137	-0.155	-0.049	-0.178	-0.060	0.412**
	G													0.356*	0.320*	0.048	0.190	-0.168	-0.067	-0.199	-0.051	0.496**
SL	P														-0.163	0.243	0.011	-0.045	-0.573**	-0.588**	-0.414**	0.150
	G														-0.166	0.258	0.009	-0.045	-0.580**	-0.604**	-0.445**	0.165
FWS	P															-0.461**	-0.406**	0.121	0.511**	0.524**	0.015	0.477**
	G															-0.506**	-0.480**	0.128	0.541**	0.556**	0.002	0.494**
SY/Pt	P																0.137	-0.082	-0.092	-0.264	-0.011	0.492**
	G																0.147	-0.089	-0.108	-0.289	-0.027	0.529**
C/P	P																	0.116	-0.282	-0.231	0.663**	-0.133
	G																	0.125	-0.307	-0.243	0.625**	-0.175
Co/C	P																		-0.059	0.170	0.280	0.002
	G																		-0.060	0.171	0.297	0.004
CD	P																			0.906**	0.450**	0.322*
	G																			0.920**	0.480**	0.345*
CW	P																				**0.553****	**0.137**
	G																				**0.586****	**0.153**
CY/Pt	P																					**0.011-**
	G																					**0.013**

DSp (Days taken to sprouting), S/C (Number of stems per corm), ,PH (Plant height), LL (Leaf length,), LW (Leaf width), DSI (Days taken to spike initiation), SpL (Spike length), RL (Rachis length), FFC (Days taken to first floret showing colour), FFO (Days taken to first floret opening), F/S (Floret size), SL (Spike longevity), FWS (Average fresh weight of spike), FS (Number of florets per spike), VL (Spike vase life), S/P (Number of spikes per plant), SY/Pt (Spike yield per plot), C/P (Number of corms per plant,) Co/C (Number of cormels per plant), CD (Corm diameter), CW (Weight of corms per plant), CY/Pt (Corm yield per plot).

spike yield per plot, whereas indirect effective and negative correlation with leaf length, plant height, days taken to first florets showing, days taken to spike initiation and number of cormels per corm. Leaf length exhibited highly significant and positive correlation at both genotypic and phenotypic level with plant height, spike length, rachis length, days taken to first floret showing, number of florets per spike, corm diameter, weight of corms per plant and corms yield per plot, whereas indirect and negative correlation with spike longevity and spike vase life. Similar results were also found by Verty *et al*. (2017), Vetrivel *et al*. (2018) and Vinutha *et al*. (2023). Leaf width showed highly significant and positive correlation with corm diameter and weight of corms per plant whereas spikes vase life and number of corm per plant at both genotypic and phenotypic level. Similar results were also found by Verty *et al*. (2017), Baruah and Bora (2022) and Vinutha *et al*. (2023).

Number of stems per corm exhibited highly significant and positive correlation at phenotypic level number of corm per plant, corm yield per plot at genotypic level showed positive and significant at phenotypic level with corms yield per plot at both genotypic and phenotypic level indirect and negative correlation with florets size. Similar results were also found by Verty *et al*. (2017), Vetrivel *et al*. (2018) and Vinutha *et al*. (2023). Plant height exhibited highly significant and positive correlation at both phenotypic and genotypic level with spike length, rachis length, days taken to first floret showing colour, number of florets per spike, florets size, average fresh weight of spike, corm diameter and weight of corms per plant, whereas significant and positive correlation at phenotypic level with number of spikes per plant. Similar results were also found by Ramzan *et al*. (2016), Vetrivel *et al*. (2018), Baruah and Bora (2022) and Vinutha *et al*. (2023).

Spike length showed positive and highly significant correlation at both phenotypic and genotypic level with rachis length, days taken to first florets showing colour, number of florets per spike, floret size, average fresh weight of spike, corm diameter, weight of corms per plant and number of spikes per plant, whereas significant and positive correlation at both level with spike vase life. Similar results were also found by Verty *et al*. (2018), Vetrivel *et al*. (2018) and Kumar *et al*. (2022). Rachis length showed positive and highly significant correlation at both phenotypic and genotypic level with days taken to first floret showing colour, number of florets per spike, floret size, average fresh weight of spike, corm diameter, weight of corms per plant and number of spikes per plant, whereas significant and positive correlation at both level with spikes vase life. Similar results were also found by Kumar (2015) and Azimi (2019), Vetrivel *et al*. (2018). Days taken to first floret showing colour showed positive and highly significant correlation at both phenotypic and genotypic level with days taken to spike initiation, days taken to first floret opening, average fresh weight of spike, corm diameter, weight of corms per plant whereas significant and positive correlation at genotypic level with number of florets per spike. Similar results were also found by Kumar *et al*. (2022).

Days taken to spike initiation exhibited highly significant and positive correlation at both phenotypic and genotypic level with days taken to first floret opening, number of corms per plant, number of cormels per plant. Similar results were also found by Kumar (2015) and Azimi (2019) and Kumar *et al*. (2022). Days taken to first florets opening exhibited highly significant and positive correlation at both phenotypic and genotypic level with number of cormels per plant. Similar results were also found by Vinutha *et al*. (2011). Number of florets per spikes showed highly significant and positive correlation at both phenotypic and genotypic level with floret size, average fresh weight of spike, corm diameter, weight of corms per plant and number of spikes per plant, whereas significant and positive correlation at both level with spike vase life. Similar results were also found by Kumar *et al*. (2011), Kumar *et al.* (2015), Pal and Singh (2015). Floret size showed highly significant and positive correlation at both phenotypic and genotypic level with average fresh weight of spike and weight of corms per plant. Florets size showed significant and positive correlation at level of phenotypic and highly significant and positive correlation at genotypic with corm diameter, whereas showed significant and negative correlation with number of corms per plant. Similar results were also recorded by Kanawjia and

Saravanan (2016). Spike vase life exhibited highly significant and positive correlation at both phenotypic and genotypic level with number of spike per plant, whereas showed significant and positive correlation at both genotypic level with spike longevity and average fresh weight of spike. Similar results were also recorded by Kanawjia and Saravanan (2016). Spikes longevity showed significant and negative correlation at both phenotypic and genotypic level with corm diameter, weight of corms per plant, corm yield per plot. Similar results were also found by Rashmi *et al.* (2014). Average fresh weight of spikes exhibited highly significant and positive correlation at both phenotypic and genotypic level with weight of corms per plant, spike yield per plant, whereas corm diameter exhibited highly significant and positive correlation at genotypic level. Average fresh weight of spikes exhibited significant and negative correlation at both phenotypic and genotypic level with number of corms per plant, whereas spike yield per plot exhibited significant and negative correlation at genotypic level. Similar results were also found by Pattnaik *et al*. (2012). Spikes yield per plot exhibited highly significant and positive correlation at both phenotypic and genotypic level with number per spikes per plant. Similar results were also found by Chopde *et al*. (2012), Pattnaik *et al*. (2012) and Thakur and Dhatt (2011).

Number of corms per plant exhibited highly significant and positive correlation at both phenotypic and genotypic level with corm yield per plot. Similar results were also found by Thakur and Dhatt (2011). Corm diameter exhibited highly significant and positive correlation at both phenotypic and genotypic level with weight of corms per plant and corm yield per plot, whereas number of spikes per plant exhibited significant and positive correlation at phenotypic and genotypic level. Similar results were also found by Chopde *et al*. (2011). Weight of corms per plant exhibited highly significant and positive correlation at both phenotypic and genotypic level with corms yield per plot. Similar results were also found by Rashmi *et al.* (2011), Thakur and Dhatt (2011)

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