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Pawan Kumar

Ph.D. Research Scholar,
Division of Plant Breeding and
Genetics, Rajasthan Agricultural
Research Institute, S.K.N.
Agriculture University, Jaipur,
India

DK Garg

Professor, Department of Plant
Breeding and Genetics, College of
Agriculture, S.K. Rajasthan
Agricultural University, Bikaner,
India

Babu Lal Jat

Ph.D. Research Scholar,
Department of Plant Breeding
and Genetics, College of
Agriculture, S.K. Rajasthan
Agricultural University, Bikaner,
India

Correlation coefficient and Path coefficient analysis for seed yield and its component traits in cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] Genotypes

Pawan Kumar, DK Garg and Babu Lal Jat

Abstract

The present study was carried out on thirty genotypes of Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] Genotypes with view to find out the correlation and path co-efficient values among the grain yield components. The seed yield per plant had positive correlation with biological yield (0.8056), Harvest Index (0.8715), Cluster per plant (0.7694) and test weight (0.7322) while negative correlated with days to 50% flowering(-0.1862) and Days to maturity (-0.3490) at genotypic level. Seed yield had significant negative correlated with Days to maturity (-0.2808) at phenotypic level.

Keywords: Correlation coefficient, Path coefficient, component traits, Genotypes

Introduction

Cluster bean, $2n=2x=14$ commonly known as guar, is an important self-pollinated leguminous crop belong to family Fabaceae. Guar is a crop of semi-arid-Sub tropical areas spread over the North and North Western part of India and East and South East of Pakistan. Guar is mainly cultivated for food as vegetable, feed and fodder. Its young pods are known for cheap source of energy (16 Kcal), moisture (8 g), protein (3.2 g), fat (1.4 g), carbohydrate(10.8 g), Vitamin A (65.3 IU), Vitamin C (49 mg), calcium (57 mg) and iron (4.5 mg) for every 100 g of edible portion [3]

The production of guar in India showed wide variation in the recent past ranging from 0.2 to 2.7 million tonnes due to the over dependence of this crop on monsoon. India is the largest producer with an area of 5.15 million hectares with production of 2.46 million tones and productivity 478 kg/ha [1]. Rajasthan ranks first position in area and production in India. In Rajasthan, it is cultivated on 4.56 million hectares area with the production of 2.02 million tones and productivity 447 kg/ha [1]. Cluster bean is mainly exported to USA, Germany, Netherlands, Italy, UK, Japan and France [5]. Grain yield is a complex trait, which is influenced by many independent traits and its improvement is essentially linked with deep understanding of interrelationship between them. Studies on the correlation of traits and their relative direct and indirect effect on yield are important, as they are helpful in selecting desirable traits.

Experimental**Materials and Method**

The 30 genotype of cluster bean (Table 1) were evaluated in randomized block design with three replications at the Research Farm, College of Agriculture, Beechwal, Bikaner during Kharif- 2014. Each genotype was sown in double row plot of 4 m row length. Row to row and plant to plant distances were maintained as 40 cm and 15 cm, respectively. Uniform recommended package of practices were adopted to raise a good crop. The experiment was sown on August 7, 2014 with three irrigations. Observations were recorded on individual plant basis on five randomly selected plants from each replication for characters viz., plant height, number of branches per plant, number of clusters per plant, number of pods per plant, number of seeds per pod, pod length, 100-seed weight, biological yield per plant, harvest index and seed yield per plant while days to 50% flowering and days to maturity were recorded on plot basis. Genotypic and phenotypic correlation coefficients were calculated using the formula suggested by [6].

Correspondence**Pawan Kumar**

Ph.D. Research Scholar,
Division of Plant Breeding and
Genetics, Rajasthan Agricultural
Research Institute, S.K.N.
Agriculture University, Jaipur,
India

Result and Discussion

The result on correlation in the present study revealed that in general the value of genotypic correlation co-efficient were higher than of their corresponding phenotypic correlation coefficients for most of the characters, indicating a strong inherent association among characters.

The correlation study (Table 2) revealed that seed yield was significantly positively correlated with Pods per cluster (0.2153) and positively correlated with all the characters except days to 50% flowering (-0.1862, -0.1121) and Days to maturity (-0.3490, -0.2808) at both genotypic and phenotypic levels. Thus, these attributes can serve as selection indices for seed yield improvement in cluster bean, similar finding of positive correlation had been reported by [7] for seed yield with number of clusters, [2] and [4] for seed yield with number of clusters per plant and number of pods per plant. Seed yield was significantly negatively correlated with Days to maturity (-0.2808) at phenotypic level and negatively correlated with days to flowering (-0.1862) and Days to maturity (-0.3490) at both genotypic and phenotypic levels. Similarly Days to flowering had positive correlation for most of the other characters but characters Cluster per plant (-0.2626), Seeds per pod (-0.2273) and Harvest Index (-0.2139) had significant negatively correlated with Days to flowering. Likewise, Days to maturity had positive correlation with Branches per plant (0.0246, 0.0250) and biological yield (0.0141). Similarly plant height had positive correlation with Pods per cluster, Seeds per pod, Pod length, Test weight, biological yield and Harvest Index whereas number of branches showed significantly

negative correlation (-0.2221) with plant height. Branches per plant also had positive association for Cluster per plant (0.3852, 0.3446), Biological yield (0.0681, 0.0400) and Harvest index (0.2366, 0.1899) at both genotypic and phenotypic levels while significantly negative correlation was recorded for pod per cluster (-0.3205) at phenotypic level. Cluster per plant had positive correlation for most of the characters. Pod per cluster had significant positive correlation with pod length (0.2736) and Harvest index (0.2613) at phenotypic level. Seed per pod had significant positive correlation with biological yield (0.3074) at phenotypic level. Pod length had positive correlation for Test weight, Biological yield and Harvest Index at both genotypic and phenotypic levels. Test weight with Biological yield, Harvest Index and Biological yield with Harvest Index had positive correlation, respectively.

Conclusion

The study revealed that seed yield per plant exhibited highly positive correlation with Plant height (0.1334, 0.0910), Branches per plant (0.1854, 0.1489), Cluster per plant (0.7694, 0.6255), Pods per cluster (0.3270, 0.2153), Seeds per pod (0.7208, 0.5596), Pod length (0.5984, 0.4354), Test weight (0.7322, 0.5264), Biological yield (0.8056, 0.7530) and Harvest Index (0.8715, 0.6760) while days to 50% flowering (-0.1862, -0.1121) and Days to maturity (-0.3490, -0.2808) showed negative correlation with seed yield per plant. Hence these characters may be given consideration while making selection for the pearl millet genotypes.

Table 1: List of cluster bean genotypes used in the study

S. No.	Germplasm name	Source	S. No.	Germplasm name	Source
1.	RGC- 1066	ARS, Durgapura	16.	RGr -13-1	ARS, Durgapura
2.	RGC- 1038	ARS, Durgapura	17.	RGr -13-4	ARS, Durgapura
3.	RGC-986	ARS, Durgapura	18.	RGr -13-5	ARS, Durgapura
4.	RGC-1002	ARS, Durgapura	19.	RGr -13-3	ARS, Durgapura
5.	RGC-936	ARS, Durgapura	20.	RGr -12-1	ARS, Durgapura
6.	RGC-1055	ARS, Durgapura	21.	HG -2-20	CCSHAU, Hisar
7.	RGC-1033	ARS, Durgapura	22.	GAUG -003	GAU, Gujarat
8.	RGC-1003	ARS, Durgapura	23.	GAUG- 9703	GAU, Gujarat
9.	RGC-1031	ARS, Durgapura	24.	CAZG – 302	CAZRI, Jodhpur
10.	RGC-1017	ARS, Durgapura	25.	CAZG – 307	CAZRI, Jodhpur
11.	RGC-471	ARS, Durgapura	26.	HGS -884	CCSHAU, Hisar
12.	RGC-197	ARS, Durgapura	27.	HGS -26-05	CCSHAU, Hisar
13.	RGr -12-03	ARS, Durgapura	28.	HGC – 365	CCSHAU, Hisar
14.	RGr -12-5	ARS, Durgapura	29.	RGM – 114	ARS, Mandore
15.	RGr -13-2	ARS, Durgapura	30.	RGM – 115	ARS, Mandore

Table 2: Genotypic (G) and Phenotypic (P) Correlation coefficient among 12 characters in cluster bean

		yield per plant	days to 50% flowering	Days to maturity	Plant height	Branches per plant	Cluster per plant	Pods per cluster	Seeds per pod	Pod length	Test weight	biological yield	Harvest Index
yield per plant	G	1.00	-0.1862	-0.3490	0.1334	0.1854	0.7694	0.3270	0.7208	0.5984	0.7322	0.8056	0.8715
	P	1.00	-0.1121	-0.2808**	0.0910	0.1489	0.6255	0.2153*	0.5596	0.4354	0.5264	0.7530	0.6760
days to 50% flowering	G		1.00	0.5933	0.1462	-0.1238	-0.2996	0.0647	-0.2412	-0.2187	-0.2999	-0.0835	-0.2282
	P		1.00	0.3654	0.0285	-0.0907	-0.2626*	0.0715	-0.2273*	-0.1145	-0.2018	0.0291	-0.2139*
Days to maturity	G			1.00	-0.0458	0.0246	-0.1914	-0.2628	-0.6452	-0.6597	-0.3789	0.0141	-0.5565
	P			1.00	-0.0525	0.0250	-0.1256	-0.2358*	-0.4520	-0.4245	-0.3010**	-0.0726	-0.3618
Plant height	G				1.00	-0.2762	-0.1959	0.4626	0.2602	0.0897	0.2945	0.1873	0.0386
	P				1.00	-0.2221*	-0.1474	0.3710	0.1765	0.0608	0.134	0.0811	0.0307
Branches per plant	G					1.00	0.3852	-0.3517	-0.2310	-0.1733	-0.0998	0.0681	0.2366
	P					1.00	0.3446	-0.3205**	-0.1904	-0.1033	-0.0706	0.0400	0.1899
Cluster per plant	G						1.00	0.1162	0.5068	0.4924	0.7565	0.6915	0.6076
	P						1.00	0.0911	0.4631	0.3335**	0.4342	0.4163	0.4819

Pods per cluster	G							1.00	0.6552	0.4815	0.6024	0.1588	0.3818
	P							1.00	0.5250	0.2736**	0.3664	0.0622	0.2613*
Seeds per pod	G							1.00	0.6781	0.7537	0.5465	0.6466	
	P							1.00	0.4695	0.4613	0.3074**	0.5086	
Pod length	G								1.00	0.5970	0.2496	0.6850	
	P								1.00	0.2593	0.1752	0.4608	
Test weight	G									1.00	0.4082	0.7774	
	P									1.00	0.2934	0.4790	
Biological yield	G										1.00	0.4121	
	P										1.00	0.0307	
Harvest Index	G											1.00	
	P											1.00	

G – Genotypic, P – Phenotypic

* Significant at 5% probability level

** Significant at 1% probability level

Table 3: Path matrix among 12 characters in cluster bean

Characters		days to 50% flowering	Days to maturity	Plant height	Branches per plant	Cluster per plant	Pods per cluster	Seeds per pod	Pod length	Test weight	biological yield	Harvest Index	yield per plant
days to 50% flowering	G	-0.1842	-0.1093	-0.0269	0.0228	0.0552	-0.0119	0.0444	0.0403	0.0552	0.0154	0.0420	-0.1862
	P	0.0077	0.0028	0.0002	-0.0007	-0.0020	0.0005	-0.0017	-0.0009	-0.0016	0.0002	-0.0016	-0.1121
Days to maturity	G	0.3199	0.5391	-0.0247	0.0132	-0.1032	-0.1417	-0.3478	-0.3556	-0.2043	0.0076	-0.3000	-0.3490
	P	0.0033	0.0090	-0.0005	0.0002	-0.0011	-0.0021	-0.0040	-0.0038	-0.0027	-0.0007	-0.0032	-0.2808
Plant height	G	0.0070	-0.0022	0.0482	-0.0133	-0.0094	0.0223	0.0125	0.0043	0.0142	0.0090	0.0019	0.1334
	P	0.0005	-0.0009	0.0169	-0.0037	-0.0025	0.0063	0.0030	0.0010	0.0023	0.0014	0.0005	0.0910
Branches per plant	G	-0.0194	0.0038	-0.0432	0.1565	0.0603	-0.0550	-0.0361	-0.0271	-0.0156	0.0107	0.0370	0.1854
	P	0.0007	-0.0002	0.0016	-0.0074	-0.0025	0.0024	0.0014	0.0008	0.0005	-0.0003	-0.0014	0.1489
Cluster per plant	G	0.0685	0.0438	0.0448	-0.0881	-0.2287	-0.0266	-0.1159	-0.1126	-0.1730	-0.1581	-0.1389	0.7694
	P	-0.0044	-0.0021	-0.0025	0.0057	0.0167	0.0015	0.0077	0.0056	0.0072	0.0069	0.0080	0.6255
Pods per cluster	G	-0.0154	0.0627	-0.1104	0.0840	-0.0277	-0.2387	-0.1564	-0.1150	-0.1438	-0.0379	-0.0911	0.3270
	P	-0.0008	0.0026	-0.0041	0.0036	-0.0010	-0.0111	-0.0058	-0.0030	-0.0041	-0.0007	-0.0029	0.2153
Seeds per pod	G	-0.1313	-0.3511	0.1416	-0.1257	0.2758	0.3566	0.5442	0.3691	0.4102	0.2974	0.3519	0.7208
	P	-0.0007	-0.0014	0.0005	-0.0006	0.0014	0.0016	0.0030	0.0014	0.0014	0.0009	0.0015	0.5596
Pod length	G	-0.0593	-0.1788	0.0243	-0.0470	0.1335	0.1305	0.1838	0.2711	0.1619	0.0677	0.1857	0.5984
	P	-0.0010	-0.0037	0.0005	-0.0009	0.0029	0.0024	0.0041	0.0086	0.0022	0.0015	0.0040	0.4354
Test weight	G	0.0078	0.0099	-0.0077	0.0026	-0.0197	-0.0157	-0.0197	-0.0156	-0.0261	-0.0107	-0.0203	0.7322
	P	0.0006	0.0009	-0.0004	0.0002	-0.0013	-0.0011	-0.0013	-0.0008	-0.0029	-0.0009	-0.0014	0.5264
biological yield	G	-0.0275	0.0047	0.0617	0.0224	0.2278	0.0523	0.1800	0.0822	0.1345	0.3294	0.1358	0.8056
	P	0.0211	-0.0526	0.0587	0.0289	0.3016	0.0451	0.2227	0.1269	0.2126	0.7245	0.0223	0.7530
Harvest Index	G	-0.1524	-0.3715	0.0258	0.1579	0.4056	0.2549	0.4317	0.4573	0.5190	0.2751	0.6676	0.8715
	P	-0.1391	-0.2352	0.0200	0.1235	0.3133	0.1699	0.3307	0.2996	0.3114	0.0200	0.6502	0.6760

G – Genotypic, P – Phenotypic

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