



Research Article

ASSOCIATION OF CHARACTERS AND PATH ANALYSIS IN RAJMASH (*Phaseolus vulgaris* L.) GENOTYPES DURING RABI SEASON

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Abstract: The present investigation was carried out for fifty-four diverse genotypes of Rajmash bean and was conducted at ZARS, Ganeshkhind, Pune during rabi, 2019 (October to February) in a Randomized Block Design with three replications. The study revealed that seed yield per plant recorded highly significant positive correlation with harvest index (0.8837) followed by number of pods per plant (0.7422), number of seeds per pod (0.6217), 100-seed weight (0.5779), plant height (0.5114), number of secondary branches per plant (0.3337) and protein content (0.2067) at genotypic level. However, days to 50 per cent flowering (0.0550) and plant spread (0.1046) showed non-significant positive correlation with seed yield per plant. The number of secondary branches per plant, plant spread, number of seeds per pod, 100-seed weight, protein content and harvest index showed highly significant correlation with each other. Number of secondary branches per plant (0.3982) recorded highest positive direct effect on seed yield per plant followed by harvest index (0.3815), number of pods per plant (0.2498), 100-seed weight (0.2392), number of seeds per pod (0.1832), plant height (0.1773) and days to maturity (0.1459) and correlation of these characters with seed yield was positively significant. While, the characters days to 50 per cent flowering (-0.2387), number of primary branches per plant (-0.0800) and plant spread (-0.1139) showed negative direct effect with seed yield per plant.

Keywords: Direct effect, Indirect effect, Rajmash bean, Genotypic

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Introduction

Pulses are the important constituents of predominantly vegetarian Indian diet. They are important source of protein and calories. On an average, pulses contain 22 to 24 per cent protein as against 8 to 10 per cent in cereals. Rajmash bean (*Phaseolus vulgaris* L.) is also known as kidney bean, French bean, dwarf bean, snap bean, string bean haricot bean, or garden bean and dried bean is called as Rajmash. It belonging to family leguminosae, sub family papilionaceae. The genus *Phaseolus* has over 50 species and Rajmash (*Phaseolus vulgaris* L.) is one of them accounting for 90% of cultivated species worldwide. It is bisexual and self-pollinated crop with simple type of pistil and di-adelphous (9+1) condition of stamens. This crop is used for grain and green pod vegetables. Nutritive content of mature 100 gm of Rajmash bean is 21 gm protein, 61 gm carbohydrates, 2 gm sugar, 14 gm dietary fibres, 1 gm fat, 4.5 mg vitamin C, 140 mg magnesium and 6.7 mg iron. Rajmash bean possesses medicinal properties, which are useful against diabetes, contain cardiac problems and a good natural cure for bladder burn. It has both carminative and reparative properties against constipation and diarrhea, diuretic, dropsy, dysentery, and kidney solvent respectively. So, there is urgent need to organize strong and efficient breeding programme to develop high yielding and good quality varieties of Rajmash bean. Yield is very complex trait and highly influenced by environmental fluctuations. Hence, direct selection for yield as such does not give expected results. Determination of correlation coefficient of yield component has been useful to plant breeders in selecting suitable genotypes. Path coefficient analysis is simply a standardized partial regression coefficient, which splits the correlation coefficients into direct and indirect cause of the yield components on yield.

Materials and methods

The present investigation was carried out for fifty-four diverse genotypes of Rajmash bean and was conducted at ZARS, Ganeshkhind, Pune during rabi, 2019 (October to February) in a Randomized Block Design with three replications. The experimental material was collected from Zonal Agricultural Research Station, Ganeshkhind, Pune (25 genotypes) and Agricultural Research Station, Sangla, Himachal Pradesh (29 genotypes). Each entry was represented by single row of 4 m length with spacing 30 cm between rows and 10 cm between plants. Observations were recorded for twelve different yield and yield contributing characters viz., days to 50 per cent flowering, days to maturity, plant height (cm), plant spread (cm), number of primary branches per plant, number of secondary branches per plant, number of pods per plant, number of seeds per pod, 100-seed weight (g), harvest index (%), protein content (%) and seed yield per plant (g). Observations on the five randomly selected plants from each experimental plot in each replication were recorded and their mean was used for statistical analysis. The genotypic and phenotypic correlation coefficients were worked out by adopting the method described by Singh and Chaudhary (1977) [1] and path analysis as suggested by Dewey and Lu (1959) [2].

Result and discussion

The results of genotypic correlation of different eleven characters in 54 genotypes are presented in [Table-1]. It revealed that the seed yield per plant had recorded highly significant positive correlation with harvest index (0.8837) followed by number of pods per plant (0.7422), number of seeds per pod (0.6217), 100-seed weight (0.5779), plant height (0.5114), number of secondary branches per plant

Table-1 Genotypic Correlation of 11 characters in 54 genotypes of Rajmash bean

SN	Days to 50% Flowering (No.)	Days to maturity (No.)	Primary branches per plant (No.)	Secondary branches per plant (No.)	Plant height (cm)	Plant spread (cm)	Pods per plant (No.)	Seeds per pod (No.)	100-seed weight (g)	Harvest index (%)	Protein content (%)	Seed yield per plant (g)
1	1											
2		1										
3			1									
4				1								
5					1							
6						1						
7							1					
8								1				
9									1			
10										1		
11											1	

Table-2 Direct (diagonal) and indirect (above and below diagonal) path effects of different characters towards grain yield at genotypic level

SN	Days to 50% flowering (No.)	Days to maturity (No.)	Primary branches per plant (No.)	Secondary branches per plant (No.)	Plant height (cm)	Plant spread (cm)	Pods per plant (No.)	Seeds per pod (No.)	100-seed weight (g)	Harvest index (%)	Protein content (%)	Seed yield per plant (g)
1	1											
2	-0.2387	1										
3	-0.0475	-0.057	1									
4	0.0556	-0.0839	0.2511	1								
5	0.0066	0.024	-0.0897	0.0035	1							
6	0.0206	0.0082	-0.0574	-0.016	-0.005	1						
7	0.0244	-0.0069	-0.1365	0.0175	0.06811	0.0369	1					
8	0.0045	0.015	0.1032	0.039	0.043	0.0203	0.0443	1				
9	0.0288	0.0276	0.0629	-0.0263	0.0219	0.0555	0.1046	0.0814	1			
10	0.0808	0.0673	0.0069	0.0332	0.1449	0.0499	0.263	0.2219	0.2506	1		
11	-0.0005	-0.0018	0.0032	-0.001	0.002	-0.0001	0.0047	0.0001	0.0033	0.0054	0.0195	1

(0.3337) and protein content (0.2067) at genotypic level. However, days to 50 per cent flowering (0.0550) and plant spread (0.1046) showed non-significant positive correlation with seed yield per plant. The similar, findings was reported by Singh *et al.* (2009)[3]. The association between characters were significantly and positively correlated for days to 50 per cent flowering with days to maturity (0.8257), number of primary branches per plant (0.5935), harvest index (0.2118). Days to maturity with harvest index (0.1763). Number of primary branches per plant with number of secondary branches per plant (0.6307), number of seeds per pod (0.5631), plant spread (0.5036), 100-seed weight (0.2631) and protein content (0.1631). Number of secondary branches per plant with number of seeds per pod (0.2128), plant height with number of pods per plant (0.2727), number of seeds per pod (0.2346) and harvest index (0.3798). Plant spread with 100-seed weight (0.2320). Number of pods per plant with number of seeds per pod (0.2417), 100-seed weight (0.4374), harvest index (0.6894) and protein content (0.2440). Number of seeds per pod with 100-seed weight (0.3403), harvest index (0.5817), 100 seed weight with harvest index (0.6569), protein content (0.1702) and harvest index with protein content (0.2790). The similar results were reported by Arun kumar *et al.* (2014) [4] and Patil, (2018) [5]. Asati and Singh (2008) [6] reported plant height; number of branches per plant, 100-seed weight had significant positive correlation with seed yield. Kanwar *et al.*, (2017) [7] reported for plant height, number of branches per plant, 100-seed weight with seed yield per plant. Shinde and Dumbre (2001) [8] reported for plant height, number of branches per plant, number of pods per plant and number of seeds per pod. Whereas, significant negative association were observed for days to 50 per cent flowering with plant spread (-0.1806), days to maturity with number of secondary branches per plant (-0.2107) and number of primary branches per plant with plant height (-0.5060) and pods per plant (-0.5465).

The results of direct and indirect contribution of different 11 characters in seed yield per plant (g) are presented in [Table-2]. It indicated that number of secondary branches per plant (0.3982) recorded highest positive direct effect on seed yield per plant followed by harvest index (0.3815), number of pods per plant (0.2498), 100-seed weight (0.2392), number of seeds per pod (0.1832) and plant height (0.1773) and correlation of these characters with seed yield was positively significant, indicating true and perfect relationship between yield and these characters, suggesting direct selection based on these characters would help in selecting the high yielding genotypes in French bean. Similar, findings were reported by Kulkarni and Musmade (2014) [9], Panda *et al.* (2016)[10], Singh *et al.*, (2018)[11] and Jhanvi, *et al.* (2019)[12]. While, the characters days to 50 per cent flowering (-0.2387), number of primary branches per plant (-0.0800) and plant spread (-0.1139) showed negative direct effect with seed yield per plant.

Among the indirect contributors, number of secondary branches per plant exhibited significant and positive correlation with seed yield per plant via., days to 50 per cent flowering, number of primary branches per plant, number of seeds per pod, plant spread and harvest index. Likewise, plant height through its positive indirect effect via, plant height followed by harvest index, number of pods per

plant, number of seeds per pod and days to maturity, number of pods per plant through its positive indirect effect via, harvest index, 100-seed weight, plant height, protein content and number of seeds per pod, Number of seeds per pod through its positive indirect effect via, harvest index, number of primary braches per plant, 100-seed weight, number of pods per plant and plant height, and 100-seed weight through its positive indirect effect via, harvest index, number of pods per plant, number of seeds per pod, number of primary branches per plant and plant spread. From the present study, it could be concluded that the characters, number of secondary branches per plant, harvest index, number of pods per plant, 100-seed weight, number of seeds per pod, were major yield contributing characters and will help in improving seed yield. Therefore, emphasis should be given on these characters in selection programme to develop desirable genotypes in French bean. Similar, findings were reported by Asati and Singh (2008) [6], Karasu and Oza (2010) [13], Pandey *et al.* (2013) [14] and Singh *et al.* (2018) [15].

Conclusion

The various quantitative characters were studied and their relations with yield as well as among themselves were examined by using correlation analysis. Number of secondary branches per plant, plant height, number of pods per plant, number of seeds per pod, 100-seed weight, protein content and harvest index showed highly significant positive correlation with seed yield per plant and among themselves indicating that simultaneous selection for this character would result in improvement of high yielding Rajmash bean genotypes.

Application of research: Academic importance and helpful for identification of direct and indirect contribution of important characters in seed yield in Rajmash bean.

Research Category: Adaptability of genotypes

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Study area / Sample Collection: College of Agriculture, Pune, 411005

Cultivar / Variety / Breed name: Rajmash bean (*Phaseolus vulgaris* L.)

Conflict of Interest: None declared

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