Indian Journal of Agricultural Sciences **81** (4): 377–9, April 2011

Evaluation of dwarf fieldpea (*Pisum sativum*) genotypes for yield and related attributes and their interrelationships*

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Received: 29 September 2009; Revised accepted: 21 January 2011

Key words: Correlation, Path analysis, *Pisum sativum*, Yield components

Fieldpea (*Pisum sativum* L.) also referred to as drypeas, is one of the important cool season grain legumes occupying an area of 6.9 million ha globally (FAOSTAT 2008). The major pea growing countries include former USSR, China, France, Australia and India. Besides being a major source of plant-based dietary protein for humans and animals, this annual legume is a significant contributor to agricultural sustainability because of its ability to fix atmospheric nitrogen. It can also be grown in rotation with cereals thus allowing diversification of agricultural production systems. In India, pea is grown in an area of 0.59 million ha with production of 0.80 million tonnes and average productivity of 1 356 kg/ha (FAOSTAT 2008). The major pea growing states of India are Uttar Pradesh, Madhya Pradesh, Bihar, Assam and Orissa which together account for about 95% of the total area and production of pea in India. Pea is amongst the crops which have been extensively subjected to genetic studies but minimal efforts have been directed towards pea breeding.

Pea breeding programme around the world are small and restricted, thus providing little chance for rare gene combinations to occur. Therefore, efficient pea breeding programme are needed to bridge the gap between potential yield and the actual yield realized at the farmers' field. Information on performance of filedpea cultivars under rainfed, semi-arid environment will help the farmers to select high-yielding locally-adapted cultivars. Correlation studies help in indirect selection for yield based on component traits. Path coefficient analysis (Dewey and Lu 1959) has been used to determine the direct and indirect effects of individual yield components on final seed yield. Path coefficient analysis partitions correlation coefficients into direct and indirect effects of various yield components, based on the assumption of mutual relationships among the component traits.

The present study was conducted to evaluate improved dwarf fieldpea genotypes for their suitability for cultivation under rainfed, semi-arid conditions, and to asses the relationship between seed yield and its component traits.

Field experiments were conducted during the crop seasons 2005–07 at the research farm of the Regional Agricultural Research Station, Raigarh of Indira Gandhi Agricultural University, Raipur (Chhattisgarh). Twelve genotypes, including two checks ('KPMR 400' and 'Paras') were sown in randomized complete block design with three replications. Each plot consisted of four rows of 4 m length with row spacing of 30 cm and plant spacing of 10 cm. The standard package of practices was followed to raise a healthy crop of fieldpea. Observations were recorded for days to 50% flowering, plant height, pods/plant, pod length, seeds/pod and seed yield/plot.

The mean values for different traits over two years were calculated to compare the performance of different varieties. Correlation coefficients among yield components were determined which were then partitioned into direct and indirect effects using path coefficient analysis (Dewey and Lu 1959). Yield was kept as dependent variable and other contributing traits as causal variables.

The mean number of days to 50% flowering among the genotypes varied from 59 to 68 days (Table 1). The check variety 'Paras' was the earliest to flower. Mean plant height ranged from 44.3 cm ('KPMR 686') to 65.8 cm ('IPFD 2-5'). The range of variation in the mean number of pods/plant was from 6 in the genotypes 'IPFD 2–5' 'HFP 0129' and 'KPMR 400' to 12 in 'Paras'. Not much variation was observed for pod length which was in the range of 6.4 to 7.6 cm. The mean number of seeds among the genotypes varied from 5 to 6. Mean seed yield over two years ranged from 373 kg/ha in 'IPFD 1-9' to 809 kg/ha in the check variety 'Paras'. The entries 'KPMR 683' (767 kg/ha) and 'IPFD 04–06' (736 kg/ha) were at par with the best check during both the years.

*Short note

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Table 1 Performance of fieldpea (dwarf) entries during 2005–06 and 2006–07 at Raigarh

Entry	50% flowering			Plant height (cm)			Pods/plant			Pod length (cm)			Seeds/pod			Seed yield (kg/ha)		
	2005–2006	2006–2007	Mean	2005–2006	2006–2007	Mean	2005–2006	2006–2007	Mean	2005–2006	2006–2007	Mean	2005–2006	2006–2007	Mean	2005–2006	2006–2007	Mean
'IPFD 04–06'	69	66	68	71.3	53.6	62.5	12	6	9	7.2	7	7.1	4.2	6	5	1 007	465	736
'IPFD 2–5'	67	65	66	79.8	51.7	65.8	6	5	6	7	6.5	6.8	4.2	5.6	5	573	277	425
'IPFD 99–13'	60	62	61	52.8	44.8	48.8	12	6	9	6.5	6.3	6.4	5.2	5.3	5	938	257	598
'IPFD 1–9'	66	68	67	60.6	48.8	54.7	9	8	9	7.1	7	7.1	4.2	6	5	510	236	373
'HFP 0129'	58	60	59	53.7	38.9	46.3	7	5	6	7.7	7.4	7.6	4	6.5	5	688	374	531
'KPMR 686'	65	67	66	47.7	40.8	44.3	11	7	9	6.5	7.2	6.9	5.2	5.7	6	830	347	589
'KPMR 683'	62	63	63	58.4	43.7	51.1	13	7	10	6.9	6.9	6.9	4.8	5.9	5	1 014	520	767
'NDP 1'	66	65	66	50.8	41.2	46	8	7	8	6.8	6.7	6.8	4.8	5.3	5	757	333	545
'NDP 2'	62	60	61	67.1	42.9	55	11	8	10	6.9	6.5	6.7	4.8	5.1	5	684	312	498
'DDR 49'	61	60	61	64	45.9	55	8	5	7	6.8	6.8	6.8	6.4	5.4	6	566	257	412
'KPMR 400' (check)	65	66	66	59.5	45.3	52.4	8	4	6	7.2	6.5	6.9	5	5	5	653	305	479
'Paras' (check)	59	60	60	64.1	55.8	60	16	8	12	6.8	6.8	6.8	4.6	5.9	5	1 145	472	809
Grand mean																780.3	346.3	
SEM±																43.61	13.35	
CV (%)																9.68	6.67	
LSD (*P*=1%)																173.9	53.23	
LSD (*P*=5%)																127.9	39.16	

Table 2 Correlation coefficients for seed yield and yield-related variables in dwarf fieldpea grown at Raigarh during 2005–06 and 2006–07

Character	50% flowering	Plant height	Pods/ plant	Pod length	Seeds/ pod	Seed yield
50% flowering	1.000	0.197	–0.174	0.030	–0.425	–0.159
Plant height		1.000	0.079	–0.105	–0.332	0.045
Pods/plant			1.000	–0.338	0.087	0.664*
Pod length				1.000	–0.023	–0.053
Seeds/pod					1.000	0.097
Seed yield						1.000

Table 3 Direct (bold diagonal values) and indirect effects of different characters on seed yield in dwarf fieldpea

	50% flowering	Plant height	Pods/ plant	Pod length	Seeds/ pod
50% flowering	**–0.030**	0.005	–0.125	0.006	–0.015
Plant height	–0.006	**0.026**	0.057	–0.020	–0.012
Pods/plant	0.005	0.002	**0.719**	–0.066	0.003
Pod length	–0.001	–0.003	–0.243	**0.194**	–0.001
Seeds/pod	0.013	–0.009	0.062	–0.005	**0.035**

Correlation analysis revealed that seed yield was positively correlated with plant height, number of pods/plant and number of seeds/pod but significant positive correlation of seed yield was observed only with number of pods/plant (r = 0.664) (Table 2). Negative but non-significant correlation of seed yield was observed with days to 50% flowering and pod length. Path coefficient analysis gives better insight into the interrelationship between different yield components and their effect on seed yield as it partitions the correlation coefficients into direct and indirect effects. Path analysis revealed maximum direct effect of number of pods/plant on seed yield (Table 3). Therefore number of pods/plant can be safely used as a selection criterion for improving seed yield in fieldpea.

The results of evaluation of 12 fieldpea (dwarf) genotypes over two years indicated the superiority of the genotypes 'KPMR 683', 'IPFD 04–06' and 'Paras'. These genotypes gave consistently higher yield during both the crop seasons and were found suitable for cultivation under rainfed, semi-arid environments of Chhattisgarh.

Significant positive correlation was found between seed yield and number of pods/plant. Similar results were also obtained by Joshi *et al*. 1992, Mahanta *et al*. 2001 and Kumar *et al*. 2003. Amongst the logical yield components (pods/plant, seeds/pod and seed weight), pods/plant appears to be most closely related to yield (Pandey and Gritton 1975). Precisely for this reason, 'podding intensity' is the most frequent selection criterion for grain yield in pea.

In conclusion, the present investigation revealed that the number of pods/plant is the foremost yield-contributing trait

in fieldpea which can be targeted to increase seed yield of fieldpea.

SUMMARY

A study was conducted during 2005–07 at Regional Agricultural Research Station, Raigarh (Chhattisgarh) to evaluate the improved dwarf fieldpea (*Pisum sativum* L.) genotypes for their suitability for cultivation under rainfed, semi-arid conditions, and to asses the relationship between seed yield and its component traits. Twelve dwarf fieldpea genotypes, including two checks ('KPMR 400' and 'Paras') were sown in randomized complete block design with three replications. The results showed that mean seed yield over two years ranged from 373 kg/ha in 'IPFD 1–9' to 809 kg/ha in the check variety 'Paras'. The entries 'KPMR 683' (767 kg/ha) and 'IPFD 04–06' (736 kg/ha) were at par with the best check during both the years. Correlation analysis revealed that seed yield was positively correlated with plant height, number of pods/plant and number of seeds/pod but significant positive correlation of seed yield was observed only with number of pods/plant (r = 0.664). Path analysis revealed maximum direct effect of number of pods/plant on seed yield. It can be concluded that in dwarf fieldpea pods/plant is the foremost yield-contributing trait which can be used for direct selection of high-yielding genotypes in pea breeding programmes.

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