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Dwarf field pea (*Pisum sativum* L.) as influenced by new varieties and row spacings

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A field experiment was conducted at Kanpur (Uttar Pradesh) during *Rabi* 2010-11 to evaluate the performance of 3 field pea varieties at different row spacings with uniform plant spacing 10 cm within row. The results revealed that variety 'indra' gave highest of 18.84 q/ha grain yield, 20.70 q/ha straw yield, Rs. 18008/ha net return and 0.76 B:C ratio. It was followed by variety 'Sapna', while variety 'Jai' remained at bottom Among row spacings, 15 cm recorded highest values of 19.20 q/ha grain yield, 20.89 q/ha straw yield and Rs, 17695/ha net return. Benefit : cost ratio was computed highest of 0.75 in 20 cm row spacing. The row spacing of 15 cm and 20 cm were found at par in all respect, but 25 cm row spacing performed significantly poorest. Varieties x row spacing interaction was not found significant. However, the combination of variety 'indra' and 15 cm row spacing gave highest seed yield of 19.68 q/ha and earned maximum net return of rs. 18749/ha.

Key words : Field pea, Varieties, Row spacing, Yield, Economics

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INTRODUCTION

Field pea is an important *Rabi* pulse crop of Uttar Pradesh. Here it is grown on 3.2 lakh ha area and produces 3.0 lakh tones annually with average productivity of 9.38 q/ha (Verma, 2009). Among all pea producing states of India, Uttar Pradesh has largest area and maximum production and alone contribute to more than 50 per cent of total pea production in the country. However, productivity level is much lower than the potential of existing genotypes. Now a days, a number of leaflers, short statured with erect growing habit are available which has yield potential of 25-30 q/ha. If these varieties are practiced, the productivity of pea may certainly be increased. Such varieties being short statured and erect growing habit require higher plant density to exploit their yield potential. The present study was, therefore, conducted on different field pea varieties with different row spacing at variable plant densities to find out the optimum level for higher production and profit from field pea cultivation in central Uttar Pradesh.

RESEARCH METHODOLOGY

A field experiment was conducted at Student's instructional Farm of C.S. Azad university of Agriculture and Technology, Kanpur during *Rabi* 2010-11. the soil was sandy loam with 7.6 pH having 0.42 per cent organic carbon, 11.7 kg/ha available P_2O_5 and 187.3 kg/ha available K_2O. the nine treatment combinations consisting of three varieties 'Jai', 'indra' and 'Spana' and three row spacing 15 cm, 20 cm and 25 cm were tested in Factorial Randomized Block Design with four replications. An uniform plant spacing of 10 cm within row was maintained in all row spacings. Therefore, plant stand per unit area varied in different row spacings. Fertilizers were applied uniformly in all treatments plots @ 40 kg N + 60 kg P_2O_5 + 40 kg K_2O/ha as basal. Sowing was done on 21st, November, 2010 after pre-sowing irrigation. Two more irrigations were applied in standing crop on 31.12.2010 and 02.02.2011, harvesting of all varieties was done on 07.03.2011. Observations were recorded on plant stand, growth characters, yield attributes and crop yields. Economics of pea cultivation under different treatments was also worked out on the basis of market rates of different inputs and crop produce.

RESEARCH FINDINGS AND ANALYSIS

The findings of the present study as well as relevant discussion have been presented under following heads :

Plant stand and growth :

Plant stand per unit area was not influenced significantly

by varieties, but it varied significantly due to row spacing (Table 1). The row spacing of 15 cm maintained significantly maximum plant population, while 25 cm row spacing maintained lowest population. The plant stand in 15 cm row spacing was recorded 18.0 and 45.4 per cent higher than in 20 cm and 25 cm row spacing, respectively. It was attributed to more number of plant rows adjusted in 15 cm row spacing per unit area.

Plant height was recorded significantly highest in variety 'jai' but number of branches/plant and dry matter/plant were found significantly highest in variety 'Indra'. It might be attributed to genetic make up of different varieties. These results support the findings of Singh and Singh (2008). Plant growth in terms of height, branches and dry matter improved significantly with each wider row spacing, thus all maximized under 25 cm row spacing (Table 1). It might be attributed to letter interception of light which increased the photosynthetic activity in wider row plants. Sen *et al.* (2005) also reported similar results.

Yield attributes and yield :

Pods/plant and grain weight/plant were recorded highest in variety 'indra', but seeds/pod were maximum in variety 'jai' while variety 'Sapna' recorded highest 100-seed weight. Better performance of variety 'indra' might be attributed to more number of branches and higher dry matter accumulation. Though variety 'Indra' produced highest grain and straw yield, the difference were found significant only in case of straw yield. it was followed by variety 'Sapna' without any significant variation. Higher grain and straw yield of Indra might be attributed to more grain weight/plant and higher dry matter accumulation/plant. These results are in accordance to the findings of Kumar and Kumar (2005).

Increase in row spacing increased all yield attributes significantly upto row spacing of 25 cm. It might be attributed to reduced under ground and over ground competition between crop plants under wider row spacing which perhaps increased the light interception and plant canopy. Thus more accumulation of photosynthates and their translocation from source to sink in reproductive crop phase which resulted in improvement of all yield attributes. Sen *et al.* (2005) also reported similar findings. However, grain and straw yields were recorded significantly highest under closed row spacing of 15 cm and it might be attributed to highest plant density per unit area. Higher plant stand in 15 cm row spacing could not only compensated for poor yield attributes but it also increased the grain and straw yields over wider row spacings. These results corroborate to the findings of Sen *et al.* (2005.).

Economics :

Total cost of pea cultivation was common for all varieties because similar inputs and operations were applied in different test varieties. Among row spacing, 15 cm row spacing required

Table 1: Effect of varieties and row spacings on growth, yield attributes, yield and economics of field pea

Treatments	Growth characters				Yield attributes			Yields		Economics		
	Plant stand (m^2)	Plant height (cm)	No. of branches / plant	Dry matter/ Plant (g)	Pods per plant	Seeds per pod	100 seed weight (g)	Grain wt./plant (g)	Grain (q/ha)	Straw (q/ha)	Cost of cult. (Rs/ha)	Net return Rs./ha	B:C ratio
Varieties													
Jai	50.87	46.33	3.50	11.78	8.34	4.86	20.21	4.54	17.94	19.64	23818	16069	0.67
Indra	50.70	44.48	3.71	12.23	9.11	4.57	19.65	4.88	18.84	20.70	23818	18008	0.76
Sapna	51.04	43.77	3.50	11.75	8.78	4.61	20.70	4.68	18.12	20.37	23818	16503	0.69
S.E. ±	0.76	0.58	0.05	0.09	0.12	0.04	0.11	0.06	0.37	0.18	-	371	0.01
C.D. (P = 0.05)	NS	1.71	0.13	0.27	0.35	0.10	0.33	0.19	NS	0.54	-	1082	0.04
Row spacing													
15 cm	60.20	43.23	3.31	10.10	7.46	4.48	19.58	4.11	19.20	20.89	24935	17695	0.71
20 cm	51.01	45.03	3.57	11.73	8.97	4.69	20.22	4.71	18.63	20.23	23644	17669	0.75
25 cm	41.40	46.32	3.82	13.92	9.97	4.86	20.76	5.29	17.07	19.79	22875	15216	0.66
S.E. ±	0.76	0.58	0.05	0.09	0.12	0.04	0.11	0.06	0.37	0.18	-	371	0.01
C.D. (P = 0.05)	2.21	1.71	0.13	0.27	0.35	0.10	0.33	0.19	1.09	0.54	-	1082	0.04

highest cost for pea cultivation which was found Rs. 1291/ha or 5.5 per cent and Rs. 2060/ha or 9.0 per cent higher than the cultivation cost in 20 cm and 25 cm row spacing, respectively. These variable costs are attributed to higher cost of seed material in closer row spacings.

Net return was worked out significantly highest from variety 'indra'. It might be attributed mainly to highest grain and straw yields of 'indra' as these were the only source of income. Other both varieties remained at par with each other. Variety 'indra' earned Rs. 1505/ha or 9.1 per cent and Rs. 1939/ha or 12.1 per cent more return than the varieties 'Sapna' and 'Jai', respectively. The row spacings of 15 cm and 20 cm earned almost similar net return but significantly higher over 25 cm row spacing. Net return with 15 cm and 20 row spacings was worked out Rs. 2479/ha or 16.3 per cent and Rs. 2453/ha or 16.1 per cent of higher, respectively over 25 cm row spacing. It might be attributed to higher grain and straw yield under closer row spacings because of higher plant population per unit area. Though cultivation cost was also higher in closer row spacings, the increased yields could not only compensate for higher cost but also increased the net return over widest row spacing of 25 cm. these results confirm the findings of Sharma (2002).

Benefit : cost ratio was computed significantly highest of 0.76 in variety 'indra' which might be attributed to highest net return. Among row spacings, 15 cm and 20 cm spacings being at par recorded significantly higher B:C ratio over 25 cm row spacing which seems to be attributed to higher net return values under 15 cm and 20 cm row spacings. Sharma (2002) also reported similar results.

The results of present study may be concluded that the combination of variety 'indra' and 15x10 cm spacing is most suitable for higher productivity and profitability from irrigated field pea cultivation in central part of Uttar Pradesh.

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