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Weed management in field pea (*Pisum sativum*) through agronomic manipulations

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SUMMARY

A field experiment was conducted during the winter season of 2004-05 and 2005-06 at Kanpur (Uttar Pradesh) to find out the effect of pea genotypes and row spacings on weed dynamics, crop yield and economics of field pea (*Pisum sativum*). *Anagallis arvensis, Chenopodium album, Parthenium hysterophorus, Asphodelus tenuifolius and Cyperus rotundus* were the major weeds causing 32.4% reduction in grain yield of pea. Tall genotype 'JP-885' showed significant reduction in weed population and dry matter than dwarf genotype 'sapna' and increase in grain yield by 23.0 per cent. The closer row spacing of 30 and 40 cm reduced intensity and dry biomass of weeds than 50 cm significantly and increased the grain yield by 17.4% and 34.3%, respectively. The combination of tall genotype and medium row spacing of 40 cm reduced weed population and weed dry weight effectively which resulted highest grain yield and net profit from field pea cultivation.

Key words : Field pea, Genotypes, Row spacing, Yield, Economics, Weeds

PEA (*Pisum sativum*) is an important pulse crop grown in entire Uttar Pradesh. It is grown in various crop rotations and growing conditions. The productivity of field pea in the State is low being only 12.97 q/ha during 2004-2005. Besides other constraints, weeds pose a serious problem and reduce the grain field of field pea upto 34.29 per cent (Mishra and Bhan, 1997). Thus, proper weed management in field pea is important for yield increase. Now a days the number of herbicides are available in market which are efficient in controlling weeds, but most of the farmers are not capable of using those because one or the another reason. Keeping this in view, an investigation was carried out to manage the weeds in field pea through agronomic manipulations.

MATERIALS AND METHODS

A field experiment was conducted during the winter season of 2004-05 and 2005-06 at Students' Instructional Farm of C.S. Azad University oF Agriculture and Technology, Kanpur. The soil was sandy clay loam, low in available nitrogen (111 Kg/ha), medium in available phosphorus (18 kg/ha) and potassium (141 kg/ha), with pH 8.1. The treatment combinations comprising of 3 row spacing (30, 40, 50 cm), 2 genotypes (Dwarf 'Sapna' and tall 'J.P. 885') and 2 weeding treatments (weed free and weedy check) were replicated four times in a split plot design with row spacings in main plots and combinations of other two factors in sub plots. The crop was sown on December 14, 2004 and December 19, 2005 in furrows behind plough using 100, 75 and 60 Kg seed/ha in 30, 40 and 50 cm row spacings, respectively keeping plant distance constant in all row spacing. Uniform dose of diammonium phosphate (18:46:0) @ 122.5 kg/ha + urea (46%N) @ 40.8 Kg/ha was applied at the time of sowing. Total 2 irrigations were applied at critical stages of crop. The data on weed population were recorded at 90 days after sowing by placing a quadrate of 0.5 M X0.5M twice in a plot and transformed to (x+0.5) for statistical analysis. The data on weed dry weight, growth characters, yield attributes and yields of crop were recorded. Net profit was also worked out for different treatments.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented below.

Weed:

The experimental field was infested with *Anagallis arvensis, Parthenium hysterophorus, Chenopodium album, Asphodelus tenuifolius, Cyperus rotundus* and other miscellaneous spp. such as *Cynodon dactylon, Fumaria parviflora* etc. Among these, the growth and intensity of *Anagallis arvensis* (20.90%) and *Chenopodium album* (20.00%) were more than the others at 90 days after sowing stage. The results showed (Table 1) that total weed population/m^2 and weed dry weight increased with each wider crop row significantly

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upto 50 cm row spacing, where maximum weed values were recorded. In wider crop rows, more space was available for weeds survival and growth because of which intensity and weed dry weight were recorded higher in wider than closer row spacing. These results are supported by the findings of Townley and Wright (1994). In the plots of tall pea variety, intensity and dry weight of weeds were recorded significantly lower than dwarf variety. It might be because of the rapid growth rate and more canopy coverage by tall pea variety which suppressed the weeds more effectively than the slow growing and less canopy structured dwarf variety (Mishra and Bhan, 1997). Weed position was observed negligible in weed free treatment due to eradication of weeds and the position was *vice - versa* in the treatment of weedy check.

Crop characters:

The row spacing of 30 cm maintained significantly maximum number of plants / m^2 while 50 cm row spacing maintained significantly minimum plants (Table 1). It was according to the number of seeds sown in different spacing treatments. As plant distance within row was similar in all spacing, more number of rows/unit area in closer spacing resulted in significantly more population than wider rows. Singh and Sakhon (2002) also observed similar effect of row spacing on field pea. Among yield attributes, pods/plant and grain weight/plant were recorded highest under 40 cm spacing, which being at par with 50 cm row spacing were significantly higher than under 30 cm row spacing during both years. Lower values of these yield indices under 30 cm spacing might be associated with crowdy population which restricted the elopement of individual plant (Hooda *et al*., 1994). Other growth or yield attributes were not influenced significantly by row spacing. Tall genotype showed significantly higher plant height, dry matter/ plant, pods/plant, grain weight/plant and 100 grain weight than dwarf genotype. Similarly all these attributes except plant

Table 1: Effect of row spacing, genotype and weed management on weed dynamics and growth and yields attributes of field pea

Treatments	Weed dynamics no. of weeds/ m^2 At 90 DAS		Dry wt. of weed/ m^2 At 90 DAS (g)		Growth character of pea: No. of plants/m^2 at harvest		Plant height at maturity (cm)		Dry wt/plant at maturity (g)		Yield attributes of pea: No. of pods/plant		Grian wt/ plant (g)		100 grian wt. (g)	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2000-06
Row spacing 30 cm	6.58 (42.83)	6.47 (41.31)	50.48	43.38	53.76	43.62	52.00	47.52	7.76	5.64	9.26	7.23	4.16	3.28	22.82	22.32
40 cm	7.69 (58.67)	7.65 (58.00)	55.63	55.10	45.38	36.47	51.00	46.83	8.44	6.38	10.38	8.04	5.00	4.11	22.78	22.27
50 cm	8.15 (66.00)	8.39 (69.90)	56.92 (0.36)	62.91 0.30	36.38	28.35	51.44	46.32	8.01	6.24	9.57	7.75	4.66	3.78	22.69	22.21
S. E. ±	0.21	0.18	1.73	1.95	0.31	0.82	1.08	0.92	0.29	0.31	0.36	0.30	0.23	0.21	0.29	0.23
C.D. (P=0.05)	0.50	1.43	4.11	4.72	0.75	1.98	N.S.	N.S.	N.S.	N.S.	0.88	0.73	0.57	0.51	N.S.	N.S.
Pea genotype dwarf	7.73 (59.33)	8.80 (77.02)	57.84	67.32	44.96	35.92	32.38	30.14	7.71	5.74	8.92	7.01	4.19	3.37	22.24	21.97
Tall	7.27 (52.33)	5.97 (35.12)	53.51	40.27	45.38	36.37	70.58	63.64	8.42	6.43	10.55	8.34	5.02	4.08	23.09	22.56
S. E. ±	0.19	0.15	1.55	1.61	0.26	0.38	0.71	0.75	0.24	0.19	0.31	0.25	0.15	0.13	0.25	0.21
C.D. (P=0.05)	0.40	0.32	3.19	3.37	N.S.	N.S.	1.41	1.57	0.48	0.40	0.63	0.53	0.31	0.27	0.52	0.44
Weed management weed free	2.04 (3.67)	2.35 (5.04)	5.38	9.20	46.00	36.89	51.09	46.45	8.75	6.56	10.54	8.39	5.55	4.54	23.19	22.71
Weedy check	10.42 (108.0)	10.37 (107.10)	105.97	98.39	44.34	35.40	51.88	47.33	7.38	5.61	8.92	6.96	3.65	2.91	22.23	21.82
S. E. ±	0.19	0.15	1.55	1.61	0.26	0.38	0.71	0.75	0.24	0.19	0.31	0.25	0.15	0.13	0.25	0.21
C.D. (P=0.05)	0.40	0.32	3.19	3.37	0.53	0.80	N.S.	N.S.	0.48	0.40	0.63	0.53	0.31	0.27	0.52	0.44

NS-Non significance

Table 2: Effect of row spacing, genotype and weed management on yield (q/ha) and net profit (Rs./ha) of field pea

Treatments	Grain yield (q/ha)			Straw yield (q/ha)			Net profit (Rs./ha)		
	2004-05	2005-06	Mean	2004-05	2005-06	Mean	2004-05	2005-06	Mean
Row spacing									
30 cm	21.32	12.68	17.00	48.85	20.68	34.77	24812	13787	19300
40 cm	24.09	14.78	19.44	46.83	19.23	33.03	33681	15168	24425
50 cm	17.12	11.84	14.48	39.76	18.45	29.11	19284	12566	15925
S.E. ±	0.50	0.43	-	0.90	0.78	-	733	456	-
C.D. (P=0.05)	1.21	1.04	-	2.21	1.89	-	1793	1104	-
Genotype dwarf	18.77	11.74	15.25	41.96	15.98	28.97	21664	11559	16612
Tall	22.92	14.46	18.71	48.34	22.92	35.63	30183	16121	23152
S.E. ±	0.56	0.47	-	0.68	0.57	-	641	396	-
C.D. (P=0.05)	1.14	0.96	-	1.41	1.16	-	1314	808	-
Weed management weed free	24.76	19.33	22.05	48.85	22.41	35.63	32.250	17226	24738
Weed check	16.92	12.87	14.90	14.44	16.49	28.97	19601	10454	15028
S.E. ±	0.56	0.47	-	0.68	0.57	-	641	396	-
C.D. (P=0.05)	1.14	0.96	-	1.41	1.16	-	1314	808	-

height were significantly higher under weed free plots than the weedy check. Such higher growth and yield attributes are attributed to lower weed intensity and dry weed biomass under tall genotype and weed free treatments plots. Mishra and Bhan (1997) also reported similar results.

Yield and economics:

The row spacing of 40 cm produced significantly highest grain yield followed by 30 cm, while 50 cm spacing produced minimum (Table 2). On means basis over years. 40 cm spacing produced 19.44 q/ha grain, which was found 2.40 and 4.96 q/ha or 14.4 and 34.3% higher than the grain yield under 30 and 50 cm row spacings, respectively. These are attributed to yield indices like pods/plant and grain weight/plant which also maximized under same row spacing of 40 cm. However, straw yield was produced highest under 30 cm row spacing and reduced significantly at 50 cm row spacing. It was attributed to significantly more number of plants /m^2 in 30 cm spacing. These results colloborate with the findings of Singh *et al*. (1991). The grain and straw yields were significantly higher in tall genotype than dwarf by the margin of 3.46 and 6.66 q/ha or 23.0 and 23.0%, respectively on mean basis of both years. Presence of weeds (weedy check) caused 7.15 q/ha or 32.4% reduction in grain yield and 6.66 q/ha or 18.7% reduction in straw yield. Similar results were reported by Mishra and Bhan (1997).

Net profit was significantly maximum under 40 cm row spacing and minimum under 50 cm spacing. On mean basis, 40 cm spacing recorded Rs. 5125 / ha or 26.6° and Rs. 8500/ha or 53.4% higher net profit than 30 and 50 cm row spacings, respectively. Tall genotype over dwarf and weed free over weedy check recorded Rs. 6540/ha or 39.4% and Rs. 9710/ha or 64.6% more net profit, respectively on the basis of two years mean values.s

Interaction effect between treatment factors was not found significant on yield or economics of field pea crop in present study.

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