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Effect of non-chemical and chemical weed control on green pea (*Pisum sativum*) under dry temperate conditions of Himachal Pradesh

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Abstract

A field experiment was conducted at Research farm of CSK HPKV, HAREC, Kukumseri , Lahaul & Spiti during 2004 and 2005 in split-split plot design with four methods of weed control viz. weedy check, farmer's practice, hand weeding twice, and chemical control in main plots, three seed rates viz. 120, 160 and 200 kg/ha and two row spacings viz. 20 and 30 cm in sub-sub plot treatments in pea under high hill dry temperate conditions of Himachal Pradesh. Chemical control (Pendimethalin @1.20 kg/ha) remained statistically at par with hand weeding twice (25-30 and 40-50 days) during both the years of study. Growth and yield parameters viz. plant height and pods/plant were significantly increased with hand weeding twice remaining at par with chemical control. However, seeds/pod and shelling percentage were maximum with chemical control followed by hand weeding twice. Hand weeding twice gave 73.6 and 48.3% higher green pod yields compared to weedy check during both years. Use of 160 kg/ha seed rate resulted in significantly higher green pod yields (8.37 & 8.43 t/ha) during both years. Similarly, closer sowing of pea at 20 cm row spacing produced significantly higher green pods (8.23 & 8.24 t/ha) and lesser weed dry matter accumulation during both years. Hence, treatment combination of hand weeding twice + 160 kg/ha seed rate + 20 cm row spacing found better for getting higher yields of pea under dry temperate conditions.

Key words:Pea, weed control, hand weeding twice, seed rate, row spacing.

Introduction

Pea (*Pisum sativum*) is the most important off season vegetable cash crop of dry temperate zones of Himachal Pradesh especially in Lahaul and Spiti district. This zone comprises single seasoned cropped area i.e. only a *kharif* (summer) season. As during winters from November to end of March, the area remains cut off from rest of the world due to heavy snowfall. In Lahaul and Spiti fields are made available for sowing from April, but sometimes with late occurrence of snowfall, early sown crop especially pea experiences heavy losses due to cold injuries. Weed problem is very aggressive in the cultivated fields as the seed is imported from adjoining States. These dry temperate areas were traditionally known for organic farming, but because of commercial growing of pea, farmers are using chemical fertilizers and pesticides. However, the use of herbicides is still very less for want of timely availability. Only pre emergence herbicides are effective in pea crop, henceforth farmers miss the proper time of spray due to one or the other reason and they only go for hand weeding using hired labour or self labour. Gopinath *et al.* (2009) have also reported non chemical methods of weed control as better option for pea crop. Here is the ample scope of introducing non chemical methods of weed control using methods, seed rate and row spacing in suppressing and controlling weeds below threshold level to obtain higher productivity of green pea. Farmers of these areas are already using higher seed rate because of bird attack and less germination due to low temperature. Therefore, seed rate plays a major role in weed control. Keeping in view all these factors, a field experiment was formulated to study the effect of different methods of weed control, seed rate and row spacing on growth and yield of green pea under high hill dry temperate conditions of Himachal Pradesh.

Material and Methods

A field experiment was conducted during the summer seasons of 2004 and 2005 at CSK HPKV, Highland Agricultural Research and Extension Centre, Kukumseri (32^0 49' 15'' N latitude, 76^0 41' 2'' longitude and 2672 m above msl), Lahaul and Spiti (H.P.). The experiment was laid out in split-split plot design with three replications. The soil of the experimental plot was sandy loam in texture, neutral in reaction (pH 6.9) and rich in organic matter (OC 2.5%), the fertility of the soil was low in available N (262 kg/ha), high in available P (34.7 kg/ha) and medium in available K (172 kg/ha). Twenty four treatment combinations constituting of four methods of weed control (weedy check, farmer's practice, hand weeding twice and chemical weed control) as main plot factors and three seed rates (120,160 and 200 kg/ha) and two row spacings (20 and 30 cm) as

sub-sub plot factors were evaluated in pea crop. Variety 'Palam Priya' was sown on May 8 amd May 11 during 2004 and 2005, respectively using plant to plant spacing 5 cm. Recommended dose of fertilizers used was 20:60:30 NPK/ha. Half dose of N and full doses of P_2O_5 and K_2O were applied at sowing time and remaining N was applied after hoeing (40-50 DAS). For chemical weed control pendimethalin @ 1.2 kg a.i./ha was applied as pre-emergence herbicide within 48 hours of sowing. First hand weeding was done at 25-30 DAS and second at 40-50 DAS. Data on weeds were recorded at the time of flowering by placing 50 cm X 50 cm quadrat randomly at two places. Weed samples were oven dried at temperature of 70 ± 5^0C till constant weight.

Results and Discussion

Effect of weed control

All the growth and yield attributes of pea were significantly affected by methods of weed control. Significantly taller plants were recorded with hand weeding twice and chemical weed control. Both treatments remained statistically at par with each other during both years of experimentation. Farmer's practice followed these treatments (Table1). However, the later remained statistically superior to weedy check treatment where significantly small plants were obtained. Similarly, number of pods/plant followed same trend as that for plant heigh. In case of seeds/pod and shelling percentage chemical weed control resulted in significantly higher number than hand weeding twice. However, hand weeding twice produced significantly more seeds/pod than all other weed control methods. The positive effect on all the yield contributing characters by using different weed control methods manifested in green pod yield of pea. Hand weeding twice and chemical weed control remaining at par with each other resulted in significantly higher green pod yields of pea than all other treatments under study. Farmer's practice of weed control resulted in significantly higher green pod yield of pea compared to weedy check. Hand weeding twice resulted in 73.6 and 43.3% higher green pod yield of pea compared to weedy check during 2004 and 2005, respectively. Chemical weed control gave 78.5 and 52.8% higher green pod yield compared to weedy check. Weed dry weight was also significantly affected by different weed control methods (Table 3). Hand weeding twice and chemical method of weed control remaining statistically at par with each other recorded significantly lowest weed dry matter accumulation during first year of study. However, in the second year chemical weed control resulted in significantly lower weed dry weight than all other treatments. Hence, it was observed that hand weeding twice could replace the chemicals. Studies conducted by Bharat (2004) on pea also corroborated the findings.

Table 1. Effect of methods of weed control, seed rate and row spacing on growth, yield attributes and yield of pea

Treatment	Plant height (cm.)		Pods/plant		Seeds/pod		Shelling (%)		Green pod yield (t/ha)	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Methods of weed control										
Weedy check	47.98	48.45	6.33	6.40	5.26	5.33	52.17	52.29	5.07	6.06
Farmers practice (One Hand weeding)	52.07	51.93	7.16	7.23	6.03	6.10	53.02	53.22	8.14	8.14
Hand weeding twice	54.18	54.04	8.29	8.36	7.26	7.32	54.03	54.14	8.80	8.99
Chemical control	53.59	53.73	8.30	8.37	7.68	7.75	55.68	55.75	9.05	9.26
CD (P=0.05)	1.29	1.63	0.19	0.18	0.06	0.07	0.55	0.59	0.34	0.28
Seed rate (kg/ha)										
120	49.82	49.75	7.63	7.70	6.24	6.49	53.50	53.60	7.01	7.71
160	52.09	52.19	7.59	7.65	6.77	6.83	54.03	54.05	8.37	8.43
200	53.97	54.17	7.35	7.42	6.49	6.55	53.65	53.91	8.07	8.05
CD (P=0.05)	0.69	0.88	0.10	0.10	0.09	0.10	0.37	NS	0.22	0.18
Row spacing (cm)										
20	52.52	52.64	7.42	7.49	6.46	6.52	53.64	53.75	8.23	8.24
30	51.39	51.44	7.62	7.69	6.66	6.73	53.81	53.95	7.86	7.89
CD (P=0.05)	0.56	0.72	0.08	0.08	0.07	0.08	NS	NS	0.14	0.15

Effect of seed rate

Increasing the seed rate up to 200 kg/ha increased the plant height of pea plants significantly. Seed rates of 160 and 120 kg/ha followed it and significantly small plants were observed by using 120 kg/ha seed rate (Table1). However, response of yield attributes to the seed rates was different. Pods/plant were significantly higher at 120 and 160 kg/ha seed rates than 200 kg/ha, the former two were statistically at par with each other. However, seeds/pod were significantly higher with 160 kg/ha seed rate followed by 200 kg/ha. Shelling percentage was also higher using 160 kg/ha seed rate during 2004 but during 2005, the differences were non- significant. Green pod yields were significantly higher using 160 kg/ha seed rate followed by 200 kg/ha during 2004 and 2005, respectively. Seed rate of 200 kg/ha remained statistically superior to 120 kg/ha seed rate. Boerboom and Young (1995) also got positive influence of crop density on pea yields. Seed rate effected the dry matter accumulation of weeds. Significantly lowest weed dry weight was recorded with 200 kg/ha seed rate followed by 160 kg/ha and later remained superior to 120 kg/ha as far as weed dry weight is concerned (Table 3).

Effect of row spacing

Significant taller plants were recorded at 20 cm row spacing (Table 1). However, all the yield contributing characters were significantly better at 20 cm row spacing except, shelling percentage where the differences were non- significant. Mishra *et al.* (2000) reported row spacing in soybean crop acted as a non chemical method of weed control. Weed dry weight was also significantly reduced at a spacing of 20 cm compared to 30 cm. Green pod yields were significantly higher at 20 cm row spacing as compared to 30 cm row spacing. Hence, closer spacing was found better for suppressing weeds and giving higher green pod yields of pea (Table 3).

Table 2. Integrated effects of methods of weed control x seed rate x row spacing on green pod yield (q/ha)

Treatment	Seed rate (kg/ha)											
Methods of weed control	120				160				200			
	Row spacing (cm)				Row spacing (cm)				Row spacing (cm)			
	20		30		20		30		20		30	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Weedy check	5.64	5.79	5.38	5.47	6.14	6.27	5.78	5.87	6.48	6.48	6.51	6.48
Farmers practice (One Hand weeding)	7.65	7.53	7.27	7.20	8.90	9.01	8.56	8.53	8.49	8.44	8.00	8.10
Hand weeding twice	8.73	8.77	8.31	8.24	9.50	9.51	9.10	9.18	8.85	8.78	8.31	8.28
Chemical control	9.30	9.46	9.18	9.19	9.70	9.68	9.27	9.35	9.27	9.15	8.63	8.72
CD (P=0.05)	M x RS 2004=0.20				SR x RS 2004= 0.17				M x SR x RS 2004= 0.34			
		2005 0.36				2005 NS				2005 NS		

Table 3. Effect of methods of weed control, seed rate and row spacing on weed dry weight

Treatment	Weed dry weight (g/m^2) at flowering	
	2004	2005
Methods of weed control		
Weedy check	295.6	294.6
Farmer's practice (One Hand weeding)	149.24	147.3
Hand weeding twice	51.20	51.6
Chemical control	48.00	47.4
CD (P=0.05)	4.27	2.9
Seed rate (kg/ha)		
120	143.57	140.9
160	137.56	136.7
200	129.8	128.1
CD (P=0.05)	3.53	2.2
Row spacing (cm)		
20	133.84	132.4
30	139.28	138.1
CD (P=0.05)	2.88	1.8

Integrated effect of weed control methods, seed rate and row spacing

Weed control methods interacted significantly with seed rate and row spacing in influencing the green pod yield of pea (Table 2). Interaction of hand weeding twice + 160 kg/ha seed rate + 20 cm row spacing remained statistically at par with chemical weed control + 160 kg/ha seed rate + 20 cm row spacing. All combinations of other treatments remained statistically inferior. Hence, the chemicals could be replaced with hand weeding twice using 160 kg/ha seed rate and 20 cm row spacing for getting higher yields of green pea under dry temperate conditions of Himachal Pradesh.

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