

Crop-weed competition in field pea under rainfed subtropical conditions of Kandi belt of Jammu

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ABSTRACT

A study on crop-weed competition in field pea comprising of weedy and weed-free conditions upto 30, 60 and 90 days after sowing and at harvest was conducted at the experimental research farm of Pulses Research sub-station, Samba, SKUAST, Jammu during *rabi* seasons of 2003-04 and 2004-05 to find out the critical period of crop-weed competition in field pea. Weed competition index increased with an increase in duration of weedy condition ranging from 7.3 to 42.0 during *rabi* 2003-04 and 1.19 to 56.3 during *rabi* 2004-05. On the other hand, increase in weed-free period from sowing to harvest decreased weed competition index from 2.9 to 42.0 during *rabi* 2003-04 and 4.3 to 22.0 during 2004-05. Weed free condition beyond 60 days after sowing did not bring significant improvement in field pea seed yield. The highest additional net return (Rs. 2040/ha) and additional net return/rupee invested (0.35) were kept weed free upto 60 days after sowing. The critical period for crop-weed competition was observed to be between 30-60 days after sowing when the crop should be kept free from weeds to prevent the potential yield loss and to economize weeding in field pea.

Key words : Field pea, Critical growth period, Subtropical, Kandi conditions

Field pea is an important *rabi* pulse crop grown in rainfed subtropical conditions of Kandi belt of Jammu. It ranks an important position among *rabi* crops particularly after wheat, oilseed and chickpea. It also covers a significant area under rainfed conditions of Jammu. Among the several factors responsible for low yield during *rabi* season, competition due to weeds is the important one. Uncontrolled weed growth in field pea has been reported to cause yield reduction ranging between 37.3 to 64.4% (Kumar *et al.* 1993, Tewari *et al.* 1997, Banga *et al.* 1998). Removal of weeds throughout the crop season may not be beneficial and economical. It is, therefore, utmost important to know the critical period of crop-weed competition to optimize herbicide use or adopt integrated weed management practices. Information on this aspect particularly in rainfed areas of Jammu region of Jammu & Kashmir is meager. Hence, the present study was undertaken to evaluate the critical period for crop weed competition in field pea.

MATERIALS AND METHODS

The experiment was conducted at Pulses Research sub-Station, Samba of SKUAST, Jammu in 2003-2004 and 2004-2005 with latitude 32.34°N and longitude 75.70°E having mean sea level of 400 meters. The soil of the experimental field was sandy loam in texture, low in organic carbon (0.42%), medium in available phosphorus (14 kg/ha) and low in available potassium (182 kg/ha) with pH of 7.2. Eight treatments comprising with weedy check

and weed free conditions upto 30,60 and 90 days after sowing and harvest stage were evaluated in randomized block design with three replications. The cultivar '*Rachna*' was sown on 27th November 2003 and 26th November, 2004, respectively, at a row spacing of 25 cm. Uniform dose of 20 kg nitrogen, 17 kg phosphorus, 16 kg potassium and 20 kg sulphur/ha were applied common to all the plots as a basal application at sowing time. The recommended cultural practices and plant protection measures were followed to raise the healthy crop. Two quadrates of 25 x 25 cm were placed randomly in each plot and weeds within the quadrates were removed and after drying in hot air oven (70 ± 1°C for 72 hrs), weed dry weight was recorded in case of initial weed-free situation. However, in case of weed infested treatments, it was at their respective period of completion. Effect of crop weed competition on yield and yield attributes were also recorded for proper estimation.

RESULTS AND DISCUSSION

Weed flora

The predominant weed species infesting the crop were *Anagalis arvensis* (25%), *Fumaria parviflora* (15%), *Melilotus indica* (12%), *Cynodon dactylon* (11%), *Convolvulaceae arvensis* (10%), *Avena fatua* (6%), *Vicia sativa* (7%), *Cornopus didymus* (5%), *Trianthema monogyna* (3%) and *Medicago denticulata* (2%). The other weeds were *Euphorbia helioscopia* (1.5%), *Cannabis sativa* (1.5%) and *Chenopodium album* (1%).

Effect on weed dry weight

Dry weight of weeds was significantly influenced due to crop–weed competition period during both the years. Competition decreased with increase in the duration of weed-free situation, whereas the weed dry matter accumulation increased with increase in the weedy duration in experimental plots (Table 1). However, decrease or increase in dry matter accumulation of weeds was only significant upto 60 days after sowing which might be due to increase in the duration of weed-free and weedy condition, respectively. The lowest dry weight was recorded in the plots which were kept weed free upto harvest stage and it was statistically at par with the plots kept weed free upto 90 days after sowing. These results are in close conformity with the findings of Singh *et al.* (1991).

Effect on yield attributes

Yield attributes *viz.*, number of pods/plant, pod weight/plant, pod length and number of seeds/pod were influenced significantly due to different weed free and weedy check periods during both the years of experimentation. Values of all the yield attributing characters increased with increasing the duration of weed free situation and decreased with increased weedy period. However, this increase and decrease in all the yield parameters was significant upto 60 days after sowing due to increase in the weed-free and weedy period, respectively. Maximum values for all above attributes were recorded in plots kept weed-free till harvest (Table 2) which resulted in significant improvement in yield over weedy plot upto 60, 90 days after sowing and upto harvest stage of crop. Remarkable improvement in yield and yield attributes due to weed control treatments over weedy

check was also reported by Rana (2002), Tripathi *et al.* (1991) and Ved Prakash *et al.* (2000). The minimum values for all the yield attributes, however, were registered in the weedy plots upto harvest stage.

Effect on seed yield

Seed yield increased with increase in duration of weed free condition and decreased with increased weedy duration during both the years (Table 1). Decrease in seed yield with delayed weed removal was attributed to increased weed competition (Table 1). Weedy situation upto 30 days after sowing had no significant effect on crop–weed competition and produced seed yield at par with weed free situation with the life cycle of crop. However, the seed yield reduced significantly when weedy period increased from 30 days to 60 days after sowing. Therefore, unchecked weed growth till harvest yielded at par with that of whole season weed-free condition. Bhya *et al.*, (2004). also reported similar results in pea. The seed yield reduced by 7.3, 30.1, 34.1 and 42.0% during 2003-04 and 1.19, 32.2, 45.1 and 56.3 during 2004-05 due to uninterrupted weed growth upto 30, 60, 90 days and harvest stage, respectively. Banga *et al.* (1985) and Tripethi *et al.* (2000) have also reported 59.5 to 64.4 and 77.2% yield reduction, respectively in pea due to season long crop weed –competition. This was due to reduced crop-weed competition and improvement in yield attributes (Table 2) in these treatments. Ved Prakash and Pandey (2001) also reported similar results in fieldpea. However, the highest seed yield was obtained when the plots were kept weed free upto harvest which was significantly higher than the yield obtained under the weedy plots upto 60, 90 days after sowing and harvest stage and free plots only upto 30 days after sowing during

Table 1. Weed dry weight of weeds and pea seed yield as influenced by crop-weed competition

| Treatments | Weedy dry weight (g/m ²) | | | Seed yield (q/ha) | | | Weed competition index | | |
|------------------------------|--------------------------------------|---------|-------|-------------------|---------|------|------------------------|---------|------|
| | 2003-04 | 2004-05 | Mean | 2003-04 | 2004-05 | Mean | 2003-04 | 2004-05 | Mean |
| Weedy period (DAS) | | | | | | | | | |
| 0-30 | 10.7 | 15.3 | 13.0 | 9.5 | 8.3 | 8.8 | 7.3 | 1.2 | 5.3 |
| 0-60 | 98.8 | 115.6 | 107.2 | 7.2 | 5.6 | 6.4 | 30.1 | 32.2 | 31.1 |
| 0-90 | 165.3 | 178.9 | 172.1 | 6.7 | 4.5 | 5.6 | 34.1 | 45.1 | 39.8 |
| Upto harvest | 220.6 | 295.5 | 258.1 | 5.9 | 3.6 | 4.7 | 42.0 | 56.3 | 49.4 |
| Weed-free period(DAS) | | | | | | | | | |
| 0-30 | 220.6 | 310.6 | 265.6 | 8.6 | 6.5 | 7.6 | 15.3 | 22.0 | 18.3 |
| 0-60 | 102.3 | 140.2 | 121.3 | 9.7 | 7.0 | 8.3 | 4.8 | 16.3 | 10.8 |
| 0-90 | 59.5 | 62.6 | 61.1 | 10.2 | 8.0 | 9.1 | 2.9 | 4.3 | 2.1 |
| Upto harvest | 0 | 0 | 0 | 10.3 | 8.4 | 9.3 | | | |
| LSD (P=0.05) | 69.3 | 88.4 | - | 1.5 | 1.2 | - | - | - | - |

DAS - Days after sowing

Table 2. Yield attributes of field pea as influenced by duration of crop-weed competition

| Treatments | No. of pods/plant | | | Pod weight (g/plant) | | | Seeds/pod | | | Pod length (cm) | | |
|--------------------------------|-------------------|---------|------|----------------------|---------|------|-----------|---------|------|-----------------|---------|------|
| | 2003-04 | 2004-05 | Mean | 2003-04 | 2004-05 | Mean | 2003-04 | 2004-05 | Mean | 2003-04 | 2004-05 | Mean |
| Weedy period (DAS) | | | | | | | | | | | | |
| 0-30 | 28.5 | 27.2 | 27.9 | 51.0 | 51.0 | 51.0 | 5.3 | 5.5 | 5.4 | 7.6 | 6.3 | 7.5 |
| 0-60 | 25.1 | 24.6 | 24.9 | 57.0 | 52.0 | 54.5 | 4.6 | 4.5 | 4.6 | 7.2 | 6.2 | 7.0 |
| 0-90 | 23.5 | 23.5 | 23.5 | 54.0 | 50.0 | 52.0 | 4.3 | 4.2 | 4.3 | 7.0 | 6.1 | 6.8 |
| Upto harvest | 21.0 | 20.8 | 20.9 | 52.5 | 54.8 | 53.7 | 3.9 | 3.3 | 3.6 | 6.0 | 6.1 | 6.7 |
| Weed - free period(DAS) | | | | | | | | | | | | |
| 0-30 | 28.2 | 27.9 | 28.0 | 56.0 | 49.8 | 52.9 | 4.2 | 4.3 | 4.2 | 6.9 | 6.2 | 7.0 |
| 0-60 | 30.5 | 30.3 | 30.4 | 51.4 | 50.9 | 51.1 | 5.2 | 5.8 | 5.5 | 7.2 | 6.9 | 7.4 |
| 0-90 | 30.2 | 29.5 | 29.8 | 52.0 | 50.2 | 51.1 | 5.6 | 5.9 | 5.8 | 7.9 | 7.1 | 7.5 |
| Upto harvest | | | | 52.0 | 51.5 | 51.7 | 6.2 | 6.0 | 6.1 | 8.0 | 7.0 | 7.6 |
| LSD (P=0.05) | 1.9 | 1.6 | - | 3.2 | 1.9 | - | 0.5 | 0.4 | - | 0.4 | 0.2 | - |

both the years. Weed-free condition beyond 60 days after sowing could not bring further significant improvement in seed yield. It appears that the crop required initial weed-free period with 60 days and weeds emerging after 60 days after sowing had no adverse effect on the crop yield. Similar results have also been reported by Tripathi *et al.* (2001)

Economics

Additional mean gross returns compared to plots kept weedy upto harvest stage increased with increasing the duration of weed-free situation and decreased with increased weedy period (Table 3). In case of additional mean net returns and net returns/rupee invested, it was increased with increase in duration of weed-free period upto 60 days after sowing and decreased with increased period. The additional net returns over weedy check ranged from Rs 2740 to 2040/ha being highest under weed free situation upto 60 days and lowest under weedy upto 90

days of the crop. Weed-free conditions beyond 60 days after sowing could not enhance the additional net return/rupee invested mainly because of higher labour cost involved in repeated manual weeding for maintaining weed-free situation upto the harvest stage. Ved Prakash and Pandey (2001) also reported lower benefit cost ratio under repeated manual weeding. The additional net returns and net returns/rupee invested decreased significantly when the plots were kept weedy beyond 30 and 90 days stage. It might be due the drastic reduction in seed yield because severe crop weed competition. The highest additional net returns/rupee invested (0.35) was recorded where the plot were kept free upto 60 days stage, whereas it was lowest (-0.36) under the plots where weeds were not removed till 90 days after sowing.

Thus, the results show that to realize the potential seed yield and higher monetary returns of field pea, crop should be kept weed free upto initial 60 days after sowing,

Table 3. Monetary returns as influenced by duration of crop-weed competition

| Treatments | Additional seed yield (q/ha) | Additional seed returns (Rs/ha) | Treatment cost (Rs/ha) | Additional mean net returns (Rs/ha) | Additional net returns /rupee invested |
|--------------------------------|------------------------------|---------------------------------|------------------------|-------------------------------------|--|
| Weedy period upto | | | | | |
| 0-30 | 4.1 | 11564 | 9000 | 2564 | 0.28 |
| 0-60 | 1.7 | 4760 | 7500 | -2740 | -0.36 |
| 0-90 | 1.1 | 3080 | 4800 | -1720 | -0.36 |
| Harvest | - | - | - | - | |
| Weed - free period upto | | | | | |
| 0-30 | 1.3 | 3640 | 4200 | 560 | 0.13 |
| 0-60 | 2.8 | 7840 | 5800 | 2040 | 0.35 |
| 0-90 | 3.0 | 8400 | 7000 | 1400 | 0.20 |
| Harvest | 3.2 | 8960 | 7800 | 1160 | 0.14 |

which is more crucial from crop- weed competition point of view.

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