

Short Communication

Effect of different weed management practices on seed yield and quality of vegetable pea

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Received: May 2016 / Accepted: June 2016

Garden pea (*Pisum sativum* L.) also known as vegetable pea is an herbaceous annual of Fabaceae (Leguminosae) family, originally from the Mediterranean basin and near East, but now widely grown in India for its green seed pod. It occupies 0.49 mha area and its annual production is around 4.81 mt (NHB 2014). Uttar Pradesh is the highest producer of vegetable pea. Pea is highly nutritive containing high percentage of protein (6.2g/100g of fresh wt.) and carbohydrate (16.9g/100g of fresh wt.) along with minerals vitamin A, B and C (Makasheva 1983). It is well understood that weeds interfere with crop growth and reduce yield and quality either through the competition for light, food, water, nutrients, space, allelopathic effect or harbor insects & diseases (Dittmar and Boyd 2015). Along with competition, weeds in seed production field also give risk of seed purity contamination. Pea is very sensitive to the competition of weeds because of its short life cycle, sparse canopy and shallow roots. Wider spacing provides the luxurious growth of weed during the crop growth periods. Hence, early season weed control is extremely important, and a major emphasis on control should be made during this period. Weeds present at harvest reduce harvest efficiency and increase mechanical damage to the pods (Dittmar and Boyd 2015). Variable climatic conditions and soil types influence the severity and diversity of weeds. So there is a need to develop total weed control program that integrates chemical, mechanical, and cultural methods which can overcome weed problems and best suitable for production practices. Considering these points, the present study was conducted to evaluate the effect of different weed management practices on seed yield and quality of vegetable pea cv. Kashi Udai and to identify

the best weed management practice for better seed yield and quality along with less chemical use and higher economic return.

The field experiment was conducted during the rabi season of 2014-15 and 2015-16 at research farm of ICAR-Indian Institute of Vegetable Research, Varanasi (82.50° N, 25.10° E) by using the seeds of one of the most popular vegetable pea cultivar 'Kashi Udai'. Eight treatments viz; pre-emergence (PE) application of pendimethalin @ 0.75 kg a.i./ha. (T1), pre-emergence application of pendimethalin @ 0.75 kg a.i./ha followed by one hand weeding at 40 DAS. (T2), stale seed bed by glyphosate @ 1.0 kg a.i./ha at 15 days (T3), stale seed bed by glyphosate @ 1.0 kg ai/ha followed by one hand weeding at 40 DAS (T4), mulching with black polythene (T5), mulching with local grass/straw mulch (T6), weed free plot (T7), control with no weeding (T8) were evaluated in randomized block design with three replications. Seeds of pea taken from seed production unit were sown in first week of November in 2014 and 2015 in plot size of 3 X 3 m with spacing of 30 X 10 cm² between rows and plant respectively. A uniform basal dose @ 20 kg N/ha, 60 kg P/ha and 50 kg K/ha was applied at sowing in both the years. Remaining dose of nitrogen was applied in 2 split doses @ 10 Kg/ha each after irrigation. In weed free plot (T7), all weeds were removed regularly from plots 20 day intervals to keep the plots weed free for whole season. Pendimethalin was applied just after sowing as an aqueous solution (sprayed) and in treatment T6, 2-3 cm thick straw or grass mulch was applied. Other recommended cultural practices were followed as per recommendations of the crop. Three rouging were done to meet the seed certification standards. Seed quality parameters like germination percentage (ISTA 2012) and vigour index-I & II (Abdul-Baki and Anderson, 1973) were calculated. Statistical analysis was carried out by using software AgRes 3.01. Major weed floras found in the experimental field were grouped into broad leaf weeds (*Chenopodium album*,

Portulaca, *Melilotus alba*, *Anagallis arvensis*, *Convolvulus arvensis*, *Parthenium hysterophorus*, *Solanum nigrum*), grassy weeds (*Cynodon dactylon*, *Avena fatua*) and sedges (*Cyperus rotundus*). Among them the three weeds *Cyperus rotundus*, *Chenopodium album* and *Cynodon dactylon* covered more than 80% weedy area.

Plant growth parameters for pea under eight weed management treatments including control are shown in Table-1 and in Fig. 1. Plant height significantly increased with all treatments except T3 and T4 as compared to the control (no weeding). Plant height was highest in mulching with black polythene (47.53 cm) followed by T7 (45.27) and T2 (44.37). Number of pods per plant and number of seeds per pod were also significantly higher in all the treatments. Higher pod and seed numbers were recorded in T7 (8.69 & 8.47) followed by T2 (8.39 & 8.26), respectively. Seed yield was significantly higher in all the treatments compared to weedy check, and was maximum in T7 (13.58 q/ha) followed by T2 (13.49 q/ha) & T5 (12.95 q/ha) treatments. Data

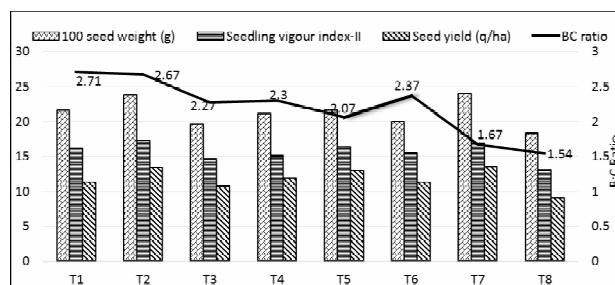


Fig.1: Effect of weed management treatments on different parameters

indicated that, yield loss of due to weeds in weedy plot over the weed free plot (T7) and T2 was 32.5 and 34 % respectively. Halker *et al.* (2001a) also reported 44% yield loss in pea due to weeds in USA conditions. This reduction in seed yield in weedy control over the T7 and T2 was probably due to reduced to the seed size (weight) than to seed number as evident from 100 seed weight data. Use of large seeded wheat has increased wheat yield by 18% and reduced weed biomass by 25% (Stougaard and Xue 2004) as compared to when small

Table 1: Effect of different weed management treatments on plant growth and seed yield parameters of vegetable pea cv. Kashi Udai

Treatments	Plant Height (cm)	No. of Pods per Plants	No. Seeds per Pods	Seed yield (q/ha)	BC ratio
T1 Pendimethalin @ 0.75 kg a.i./ha (Pre-emergence)	42.63	7.93	7.67	11.28	2.71
T2 Pendimethalin @ 0.75 kg a.i./ha (Pre-emergence) + one Hand weeding at 40 DAS	44.37	8.39	8.26	13.49	2.67
T3 Stale seed bed by Glyphosate (1.0 kg a.i./ha) at 15 days before sowing	41.3	8.14	7.1	10.75	2.27
T4 Stale seed bed by Glyphosate (1.0 kg a.i./ha) + one Hand weeding at 40 DAS	41.83	8.06	7.07	11.91	2.30
T5 Mulching (Black polythene)	47.53	8.12	7.97	12.95	2.07
T6 Mulching (Straw mulch/ or grass mulch)	44.9	8.1	7.23	11.30	2.37
T7 Weed free check (Hand weeding)	45.27	8.6	8.47	13.58	1.67
T8 No weeding (weedy check/ Control)	40.4	7.37	6.93	9.10	1.54
Pop. Mean	43.83	8.28	7.28	11.79	
CV	5.19	4.39	3.81	16.89	
CD 5%	1.72	0.27	0.21	1.75	

Table-2 Effect of different weed management treatments on seed quality parameters of vegetable pea cv. Kashi Udai

Treatments	100 seed weight (g)	Germination (%)	Seedling length (cm)	Dry weight of seedling (g)	Seedling vigour index-I	Seedling vigour index-II
T1 Pendimethalin @ 0.75 kg a.i./ha (Pre-emergence) (T1)	21.56	91 (72.5)	16.66	0.177	1525.39	16.21
T2 Pendimethalin @ 0.75 kg a.i./ha (Pre-emergence) + one Hand weeding at 40 DAS (T2)	23.83	92 (73.5)	18.52	0.189	1698.47	17.33
T3 Stale seed bed by Glyphosate (1.0 kg a.i./ha) at 15 days before sowing (T3)	19.64	90 (71.5)	15.74	0.163	1409.67	14.6
T4 Stale seed bed by Glyphosate (1.0 kg a.i./ha) + one Hand weeding at 40 DAS (T4)	21.09	90 (71.5)	14.83	0.169	1328.17	15.14
T5 Mulching (Black polythene) (T5)	21.6	91 (72.5)	16.97	0.179	1549.19	16.34
T6 Mulching (Straw mulch/ or grass mulch) (T6)	20.03	90 (71.5)	16.66	0.171	1507.23	15.47
T7 Weed free check (Hand weeding) (T7)	24.2	92 (73.5)	18.49	0.183	1710.14	16.93
T8 No weeding (weedy check/control) (T8)	18.29	87 (68.7)	14.64	0.148	1294.03	13.08
Pop. Mean	21.12	91 (72.5)	16.71	0.177	1526.6	16.15
CV	14.31	1.19	7.16	5.44	8.15	6.44
CD 5%	2.28	0.82	0.9	0.01	73.83	0.78

Arcsine transformed values of germination percentage are given in parenthesis.

seed was used under weed conditions. Probably due to more competition to weeds than small seeded varieties. Early pea growth period (first 1 to 3 week) is sensitive for weed competition and can cause 40-70% yield loss or decreases yield at an average rate of 45 kg/ha/day (Harker *et al.* 2001b). Therefore, Weed removal at early stages in peas could be helpful to minimize yield losses and maximize nitrogen uptake and fixation.

Effects of various weed control treatments on seed quality components for pea are shown in Table-2 and in Fig.1. 100 seed weight (seed index) were significantly higher in all the treatments compared to control i.e. weedy check (18.29 g), and was found maximum in T7 (24.2 g) treatment followed by T2 (23.83). Germination percentage was also significantly increased in most of the treatments compared to control (87%). T7 and T2 are showing highest germination percentage (92%). Seedling length and dry weight of seedling was highest in T7 (18.49 cm & 0.183 g, respectively) followed by T2 (18.52 cm and 0.184g, respectively). Both of this parameter was significantly higher in all the treatments except T4 compared to control (T8). Vigour index-I was significantly higher in all the treatments except T4 (1328.17) as compared to control (1297.3) and highest in weed free plot (T7) 1710.14 followed insignificantly by T2 (1698.47). Similarly, vigour index-II was also significantly higher in all the treatments except T3 (1328.17) as compared to control (13.08) and highest in T2 (17.33) followed by weed free plot (T2) 16.93. Two hand weeding with post emergence application of imazethapyr @ 75g ha⁻¹ (20DAS) was found most effective for controlling weeds and in obtaining optimum seed yield and quality in garden pea under Karnal (Haryana) conditions (Rana *et al.* 2015). Application of pendimethalin at various doses have been found effective and recommended for weed control for higher yields and quality of peas (Singh *et al.* 2003). Flowering is very critical stage of pea; hence, weeding just before flowering along with pre-emergence application of pendimethalin gave the most efficient

weed control along with enhanced seed yield and quality.

It is concluded from the present investigation that weed free treatment (T7) was the most effective for controlling weeds and obtaining higher seed yield and quality in garden pea cv. Kashi Udai under Varanasi (U.P.) conditions but B:C ratio of T7 is very low as compared to T1 and T2. Though the B:C ratio of T1 is maximum but seed yield and quality in this treatment are significantly lower than T2 while treatment T2 is at par with T7 in all quality and yield parameters with higher economic returns. Therefore, application of pendimethalin (pre-emergence) @ 0.75 kg a.i./ha followed by one hand weeding at 30 to 40 DAS (T2) is recommended for pea weed management to obtain higher seed yield and quality with high B:C ratio (2.67) and less chemical use.

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