



Chemical weed management in lentil

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ABSTRACT

The effect of chemical weed management practices in lentil was studied during 2010-11 and 2011-12 at Agra (Uttar Pradesh). The treatments included: control, pendimethalin 0.50 kg/ha, pendimethalin 0.75 kg/ha, pendimethalin 1.0 kg/ha, pendimethalin 1.25 kg/ha, pendimethalin 1.50 kg/ha and hand weeding. All herbicidal treatments including hand weeding significantly controlled the weeds. Among all the treatments hand weeding gave the highest weed control (84.8%) and produced lower weed biomass (54.0 g/m²). It gave maximum net income (₹ 30,850) with CBR of 1:4.4. Pendimethalin 1.5 kg/ha controlled the weeds effectively but germination of seeds were affected. Highest grain yield (1.50 t/ha) was recorded from hand weeding plot with 48.6 and 52.0% increase in yield during 2011 and 2012, respectively.

Key words: Chemical control, Hand weeding, Lentil, Pendimethalin, Weed

Weeds control is one of the major limitations to growing lentil crop world-wide. Lentil yield reduction in excess of 80% due to weed competition has been recorded (Mohamed *et al.* 1997). Weeds compete with lentil for nutrients moisture and space as well as harbouring insects, pests and pathogens that may adversely affect the crop. Relatively short height and slow early growth of the crop demands special attention to be paid for controlling weeds (Yadav *et al.* 2007). This paper presents the observations on effect of various doses of pendimethalin to prevent weed infestation and subsequent grain yield increases in cultivar 'Pusa lentil-62' in semi-arid region of Agra.

MATERIALS AND METHODS

A field experiment was conducted during *Rabi* season 2010-11 and 2011-12 at the experimental farms of Dayalbagh Educational Institute, Agra under irrigated conditions. Agra is situated in western Uttar Pradesh between 27-11° latitude North and 78° longitude east with an altitude of 169 m above sea level. Dayalbagh Eco-village is situated at a distance of about two km from the city of Agra on its northern periphery. The soil of Dayalbagh eco-village was sandy loam in texture, low in organic carbon (0.4%), K (115.8 kg/ha), medium in P (40 kg/ha) with the pH of 7.2. The experiment was laid out under RCBD with seven treatments and four replications. The treatments included: 1) control, 1) pendimethalin 0.50 kg/ha, 2) pendimethalin 0.75 kg/ha, 3) pendimethalin 1.0 kg/ha, 4) pendimethalin 1.25 kg/ha, 5) pendimethalin 1.50 kg/ha, 6) hand weeding, 7). Different concentrations of pendimethalin was applied at pre-sowing stage of crop

with flat fan nozzle by foot sprayer. A basal dose of urea (46% N) and Phosphorus (16% P₂O₅) by single super phosphate was applied in each plot. Four to five irrigations were given during the cropping period. All other agronomic practices were kept uniform in each treatment. Four hand weedings were done at different DAS. Cultivar 'Pusa lentil' with a seed rate of 20 kg/ha was sown at 25 cm row spacing on 4 November 2010 and 11 November 2011, respectively. Data on plant population density, weed density, plant height, pods/plant, 100-seed weight, grain yield, biological yield and harvest index were recorded and analysed statistically (Gomez and Gomez 1976). Dry weight of weeds was calculated by drying the samples in an oven at 70°C for 48 hours.

RESULTS AND DISCUSSION

Weed density

Density of weeds were significantly influenced by the application of herbicide and hand weeding (Table 1). *Chenopodium alba*, *Asphodelus tenuifolius*, *Fumaria officianalis* were the dominant weed species. *Spergula arvensis*, *Amaranthus*, *Chenopodium murale* and common grass were other less dominant weed species. Hand weeding provided highest weed control (84.8%). Among all the herbicidal applications, pendimethalin 1.50 kg/ha gave maximum mortality of weeds (79.2%) followed by pendimethalin 1.25 kg/ha (75.4%). Application of pendimethalin as pre-emergence proved better for control of weeds and high yield (Yasin *et al.* 1995).

Weed biomass

Hand weeding and herbicide treatments significantly reduced the dry weight of weeds. Among all the treat-

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ments, hand weeding produced the lowest weed biomass (54.0 g/m²). According to Ahmad *et al.* (1996), pre-sowing application of herbicide and hand weeding were equally and much more effective in reducing the dry weight of weeds (Table 1).

Vegetative traits of lentil

Application of hand weeding showed significant increase in plant population density (17.9 and 19.8%) in the two years. This increase in plant population density was due to reduction in competition between weeds and plants. Pendimethalin 1.50 kg/ha showed significant reduction in plant population density because germination

of seeds was. Application of herbicide and hand weeding improved the plant height and primary branches of plant, as result of increase in the lateral growth of plants (Table 2).

Reproductive traits and yield components of lentil

Application of all the treatment influenced grain yield and biological yield significantly over control (Table 3). Maximum grain yield and biological yield was obtained in hand weeding (1.50 and 4.14 t/ha) with an average increase of 49.3 and 30%, respectively. This increase in yield was due to the increase in pods/plant (18.5%). Among the herbicides pendimethalin 1.25 kg/ha gave the average

Table 1. Impact of different weed control treatments on weed growth in lentil

Treatment	Average weed density/m ²						Total weeds	Mortality (%)	Average weed biomass (g/m ²)
	<i>C. album</i>	<i>F. officianalis</i>	<i>A. tenuifolius</i>	<i>C. murale</i>	<i>S. arvensis</i>	Others			
Pendimethalin 0.50 kg/ha	6.2	4.5	8.0	3.2	3.0	5.5	30.4	47.7	183.0
Pendimethalin 0.75 kg/ha	4.7	4.2	5.2	3.0	3.2	4.0	24.3	58.2	147.0
Pendimethalin 1.00 kg/ha	4.0	3.0	4.0	2.5	2.2	3.2	18.9	67.5	114.0
Pendimethalin 1.25 kg/ha	2.7	2.0	2.7	2.7	2.0	2.2	14.3	75.4	85.5
Pendimethalin 1.50 kg/ha	2.5	1.5	2.2	2.2	1.7	2.0	12.1	79.2	73.5
Hand weeding	1.7	1.5	2.0	2.0	1.5	2.0	10.7	84.8	54.0
Control (weedy plot)	13.5	12.2	13.5	6.0	6.0	7.0	58.2	-	349.5
LSD (P=0.05)	2.31	1.55	1.65	1.47	1.37	1.42	4.22	-	25.3

Table 2. Impact of weed control treatments on vegetative traits of lentil

Treatment	Plant population (m ²)		Plant height (cm)		Branches/plant	
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
	Pendimethalin 0.50 kg/ha	62	60.0	27.7	27.1	6.2
Pendimethalin 0.75 kg/ha	65	64.0	29	28.7	6.7	7.0
Pendimethalin 1.00 kg/ha	66	69.2	29.7	30	7.5	7.5
Pendimethalin 1.25 kg/ha	68.2	71.2	30.5	30.5	7.5	7.5
Pendimethalin 1.50 kg/ha	65.5	66.2	29.7	29.5	6.7	7.5
Hand weeding	68.5	72.0	30.5	31.0	7.5	8.0
Control (weedy plot)	56.2	57.7	25.3	25.5	6.0	6.5
LSD (P=0.05)	3.19	3.09	1.14	1.07	1.07	0.96

Table 3. Impact of weed control treatments on reproductive traits of lentil

Treatment	Pods/plant		Grain yield (t/ha)		Biological yield (t/ha)		Harvest index (%)	
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
Pendimethalin 0.50 kg/ha	58.0	58.0	0.87	0.90	3.42	3.42	25.4	26.0
Pendimethalin 0.75 kg/ha	62.0	62.0	0.97	1.00	3.71	3.74	26.1	26.4
Pendimethalin 1.00 kg/ha	68.2	68.2	1.12	1.46	3.81	3.84	29.3	38.0
Pendimethalin 1.25 kg/ha	69.0	69.0	1.18	1.54	4.09	4.11	28.8	37.4
Pendimethalin 1.50 kg/ha	66.2	66.2	1.06	1.05	3.78	3.81	28.0	27.5
Hand weeding	69.5	69.5	1.50	1.58	4.14	4.16	36.2	37.9
Control (weedy plot)	56.5	56.7	0.77	0.80	2.81	3.03	25.1	26.0
LSD (P= 0.05)	2.93	3.52	0.41	0.64	0.39	0.35	NS	NS

Table 4. Impact of hand weeding and pendimethalin on the economic returns of lentil (pooled data of two years)

Treatment	Grain yield (t/ha)	Additional income (x10 ³ /ha)	Additional expenditure (x10 ³ /ha)	Net benefit (x10 ³ /ha)	Cost: benefit ratio (CBR)
Pendimethalin 0.50 kg/ha	0.88	4.81	1.21	3.61	1:2.8
Pendimethalin 0.75 kg/ha	0.98	9.91	1.81	8.10	1:4.4
Pendimethalin 1.0 kg/ha	1.29	17.90	2.41	15.49	1:6.4
Pendimethalin 1.25kg/ha	1.36	21.35	3.02	18.33	1:6.0
Pendimethalin 1.50kg/ha	1.06	13.85	3.62	10.22	1:2.8
Hand weeding	1.54	37.85	7.00	30.85	1:4.4
Control (weedy plot)	0.78	-	-	-	-

yield (1.36 t/ha) with an average increase of 42.3% followed by pendimethalin 1.0 kg/ha (1.29 t/ha) with an average increase of 39.5%. Pendimethalin 1.50 kg/ha produced lower grain yield (1.06 t/ha) than other treated plots. It was due to the phytotoxicity of lentil crop which affected germination. However control gave the lowest yield of 0.78 t/ha. Weed growth was significantly reduced by the use of herbicides and resulted in increase in yield up to 50% than control (Choudhary *et al.* 2011).

Economics

The highest additional return of ₹ 30,850 with cost: benefit ratio of 1: 4.4 obtained by hand weeding (Table 4). Among the herbicide pendimethalin 1.25 kg/ha gave the maximum net return of 18,329 with CBR of 1:6.0 followed by pendimethalin 1.0 kg/ha (₹ 15,488) with CBR of 1:6.4 and this treatment provide maximum CBR. Lowest CBR (1:2.8) was obtained by the application of pendimethalin 1.50 kg/ha due to phototoxic effect of crop by affecting germination, followed by hand weeding (1:4.4) due to high labour cost.

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