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Short Communication

Integrated weed management in Lentil (*Lens culinaris* Medikus)

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Weeds cause heavy loss to the lentil (*Lens culinaris* Medikus) crop as they rob the soil of its nutrients and moisture (1). The crop competes poorly with many weed species because of its weak stem, short stature, slow initial growth and long duration. Weeds in lentil have been reported to cause yield reduction to the extent of 70% (3). Though conventional method of weed management through manual weeding, hoeing or intercultivation is effective, it has certain limitations such as non-availability of sufficient manpower during peak periods and/or high labour wages. Under these circumstances, use of herbicides becomes necessary to avert losses due to weeds (2). Furthermore, Integrated Weed Management (IWM) involving both chemical and other agronomic manipulation seems to be a good offer. Keeping this background in view, the present investigation was initiated to identify a sound IWM practice in lentil.

A two-year field investigation was conducted at the Pulses and Oilseeds Research Sub-station, Beldanga, Murshidabad, West Bengal, India during *rabi*, 2003-04 and 2004-05. The soil of the experimental field was sandy loam in texture and slightly alkaline in reaction (pH 7.5 and EC 0.37 dsm^{-1}) besides having a content of organic carbon 0.25%, available P_2O_5 55 kg ha^{-1}, available K_2O 38 kg ha^{-1} and available SO_4 19.6 kg ha^{-1}. The treatments, including one hand weeding (HW), 25% higher seed rate, pendimethalin 30 EC as pre-emergence (1.0 kg ha^{-1}) and their suitable combinations were tested against weedy and weed free checks in a randomized block design with four replications. Lentil variety B 256 (Ranjan) was sown at a row spacing of 25 cm during December 04, 2003 and November 30, 2004. The individual plot size was 4.0 m x 3.0m. The recommended seed rate was 30 kg ha^{-1}. A uniform fertilizer dose of 20:40:20 kg N: P_2O_5: K_2O ha^{-1} was given as basal through urea, single super phosphate and muriate of potash, respectively, in all the plots. A knapsack sprayer fitted with flat-fan nozzle was used for herbicide application with a spray volume of 600 l ha^{-1}. The previous crop was green gram and soybean grown in 2003 and 2004, respectively. The crop was unirrigated and harvested on March 12 and 29 in 2004 and 2005, respectively. Weed data were recorded at 55 days after sowing (DAS) and harvest by placing a quadrate of 50 cm x 50 cm area randomly at four spots in each plot. Observations on height of crop plants were recorded at 30 DAS and harvest, whereas data on seed yield and yield attributes were recorded at harvest. Data on weed density and biomass were statistically analyzed after subjecting them to square root transformation $\sqrt{(x + 0.50)}$, where X represented actual weed density/ biomass. Major weed flora in the experimental site consisted of *Cyperus rotundus*, *Anagallis arvensis*, *Chenopodium album*, *Solanum nigrum* and *Vicia sativa*. The treatments weed free, 25% higher seed rate + hand weeding at 30 DAS, pendimethalin 0.75 kg ha^{-1} as pre-emergence (PE) + hand weeding at 40 DAS and pendimethalin as PE at 1.00 kg ha^{-1} significantly reduced both the density and biomass of weeds over the weedy check. Among the weed management treatments, 25% higher seed rate +

hand weeding at 30 DAS, pendimethalin as PE at 0.75 kg ha^{-1} + hand weeding at 40 DAS proved their superiority over the others in minimizing weed growth till crop harvest (Table 1). Season-long crop-weed competition resulted an average yield reduction to the tune of 49.77% as compared to weed free. The highest seed yield was obtained under weed free treatment, which was statistically at par with 25% higher seed rate + hand weeding at 30 DAS (850.00 kg ha^{-1}), pendimethalin as PE at 0.75 kg ha^{-1} + hand weeding at 40 DAS (837.50 kg ha^{-1}) and pendimethalin as PE at 1.0 kg ha^{-1} (820.00 kg ha^{-1}) in the second year (Table 2). Considering mean data of two years, weed free treatment recorded the highest seed yield (1004.50 kg ha^{-1}) along with maximum yield attributes and it was closely followed by 25% higher seed rate + hand weeding at 30 DAS (899.63 kg ha^{-1}), pendimethalin as PE at 0.75 kg ha^{-1} + hand weeding at 40 DAS (872.75 kg ha^{-1}) and pendimethalin as PE at 1.0 kg ha^{-1} (832.50 kg ha^{-1}). Higher seed yields might be attributed to effective suppression of weed growth (Table 1) under these treatments which accommodated significantly more productive pods/plant as compared to other treatments (Table 2). Singh and Sardana (4) recorded better weed management and higher seed yield with the pre-emergence application of pendimethalin at 0.5 kg ha^{-1}.

Among the treatments of weed management practices in lentil crop, the weed free treatment recorded the highest seed yield (1004.50 kg ha^{-1}) along with maximum yield attributes and it was closely followed by 25% higher seed rate + hand weeding at 30 days after sowing (DAS) with economic yield of 899.63 kg ha^{-1}, pendimethalin at 0.75 kg ha^{-1} + hand weeding at 40 DAS (872.75 kg ha^{-1}) and pendimethalin at 1.0 kg ha^{-1} (832.50 kg ha^{-1}). The increased yield in these treatments was probably due to effective suppression of both the weed density and biomass. Further, season-long crop-weed competition led to average yield reduction of 49.77% over weed free conditions.

Literature Cited

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Table 1.
Effect of treatments on growth of crop plants and associated weeds in lentil

Treatments	Plant height (cm)				Weed density (No. m^{-2})				Weed biomass (g m^{-2})			
	30 DAS		Harvest		55 DAS		Harvest		55 DAS		Harvest	
	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05
Weedy check	8.57	9.93	26.75	31.03	12.82 (164.00)	15.05 (227.00)	18.34 (336.00)	17.26 (297.75)	8.89 (78.57)	15.01 (225.00)	9.12 (82.73)	15.62 (244.75)
Weed free	9.37	11.45	29.25	34.93	0.70 (0.00)	0.71 (0.00)	0.70 (0.00)	0.71 (0.00)	0.70 (0.00)	0.71 (0.00)	0.70 (0.00)	0.71 (0.00)
HW (30 DAS)	8.82	10.55	27.55	33.20	0.41 (108.00)	13.39 (179.00)	16.62 (276.00)	13.19 (174.50)	7.04 (49.17)	9.00 (81.00)	7.50 (55.90)	9.98 (99.50)
25% higher seed rate	8.75	11.28	27.00	32.60	10.58 (111.50)	13.61 (187.50)	16.71 (279.00)	14.09 (198.50)	7.67 (58.33)	10.72 (115.00)	8.10 (65.20)	10.86 (117.50)
25% higher seed rate + HW (30 DAS)	8.92	11.33	28.95	33.85	7.14 (50.50)	10.08 (101.50)	11.53 (132.50)	11.22 (126.00)	4.64 (21.08)	7.28 (52.50)	4.52 (20.02)	8.05 (65.00)
Pendimethalin 1.00 kg ha^{-1}	8.87	10.93	27.67	33.40	9.94 (98.50)	12.41 (154.00)	15.89 (252.00)	12.96 (170.00)	6.52 (42.07)	7.96 (63.00)	6.82 (46.10)	8.96 (81.00)
Pendimethalin 0.75 kg ha^{-1} + HW (40 DAS)	8.87	10.68	28.60	33.60	7.34 (53.50)	10.09 (101.50)	14.57 (212.00)	11.68 (137.00)	5.49 (29.74)	7.73 (59.50)	4.81 (22.67)	8.70 (76.00)
SEm±	0.36	0.51	0.59	1.09	0.33	0.45	0.47	0.56	0.19	0.29	0.16	0.47
C.D. (P=0.05)	NS	NS	NS	NS	0.99	1.34	1.41	1.66	0.55	0.85	0.48	1.40
C.V. (%)	6.00	9.34	4.00	6.57	8.00	8.39	7.00	9.65	6.00	6.88	5.00	10.49

Original figures are in parentheses, transformed to √(X + 0.50); HW-Hand weeding; DAS: Days after sowing; NS- Non significant

Table 2.
Effect of treatments on seed yield and yield attributes of lentil

Treatments	Pods plant^{-1}		Seeds pod^{-1}		100-seed weight (g)		Seed yield (Kg ha^{-1})		
	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	Mean
Weedy check	52.50	60.55	1.77	1.63	1.52	1.43	506.00	500.00	503.00
Weed free	72.90	92.45	2.02	1.80	1.87	1.78	1064.00	945.00	1004.50
HW (30 DAS)	63.90	72.03	1.90	1.70	1.70	1.56	753.00	693.75	723.38
25% higher seed rate	58.50	66.43	1.85	1.70	1.59	1.55	672.00	675.00	673.50
25% higher seed rate + HW (30 DAS)	69.30	82.95	1.95	1.78	1.76	1.69	949.25	850.00	899.63
Pendimethalin 1.00 kg ha^{-1}	66.40	78.13	1.92	1.73	1.73	1.59	845.00	820.00	832.50
Pendimethalin 0.75 kg ha^{-1} + HW (40 DAS)	66.95	79.98	1.95	1.73	1.76	1.67	908.00	837.50	872.75
SEm±	2.50	4.93	0.06	0.11	0.12	0.07	22.16	46.50	-
C.D. (P=0.05)	NS	14.64	NS	NS	NS	NS	65.84	138.14	-
C.V. (%)	8.00	12.96	6.00	13.19	15.00	8.98	5.00	12.23	-

HW-Hand weeding; DAS-Days after sowing; NS-Non significant