



Response of Lentil (*Lens culinaris* Medik) and Weeds to different Weed Management Practices under Temperate Conditions

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ABSTRACT

An experiment was conducted in Rabi season to evaluate the effect of handweeding, pendimethaline and fluchloralin alone and in combinations on different weed species and seed yield of lentil under temperate conditions. Although fluchlorin + HW at 150 and 180 DAS was equally found good for reducing weed population but its effectiveness could not match with pendimethaline + HW at 150 and 180 DAS with respect to yield. The season long competition causes reduction in yield by 52.52 % and 53.19 % during 2004-05 and 2005-06 respectively. Significantly higher yield was obtained under weed a free condition which was at par with pendimethaline+ HW at 150 and 180 DAS.

Keywords: Lentil, weed management, weed index, temperate conditions, yield.

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INTRODUCTION

Legume commonly used as pulses are the rich source of proteins for millions of vegetarian population and India is a major pulse growing country in the world. Lentil (*Lens culinaris* Medik) is the third most important pulse crop of North India (Singh *et al.*, 2013b and Singh *et al.*, 2014). In India it is cultivated in area of 1.47 million ha with the production of 0.9 million tones and productivity of 675 kg/ha (Singh *et al.*, 2013a and Deokaran *et al.*, 2014). Lentil (*Lens culinaris* Medik) is marginal winter season pulse crop of temperate Kashmir. Being hardier than chickpea and peas, it is more capable of withstanding extremes of weather and soil conditions and performs better under low temperature. Here life cycle of this crop is complex, as the crop remains almost dormant during peak winter season (15 December to 15 February) and takes 200–250 days as compared to 120–130 days under sub tropical conditions. Although critical period of weed removal in lentil is first 50–60 days (Singh, 1993), but under Kashmir conditions the crop is to be kept weed free before and after peak winter season for obtaining higher seed yield. The magnitude of yield loss as a result of crop weed competition would depend upon type of weed species associated with crop, their densities and duration of competition. Kumar *et al.*, 2012 also reported yield loss of 54–65 % due to weeds. Conventional method of weed management though effective, but has certain limitations

such as non availability of sufficient manpower during peak period and unfavorable soil conditions in wet season. Under such conditions, use of herbicides becomes necessary to avoid losses due to weeds. Keeping this in view present study was planned to evaluate the comparative efficacy of handweeding and some herbicides alone and their combinations.

A field experiment was conducted during Rabi season at RRS, Wadura of Sher-e-Kashmir University of Agricultural Sciences and Technology-Kashmir. The experimental site was situated at 34.20° north latitude and 74.24° east longitude and an altitude of 1587 m above mean sea level. The soil of the experimental site was sandy loam in texture with pH 6.86, EC 0.20 ds/m, nitrogen 333 kg/ha, phosphorus 6 kg/ha and potassium 199 kg/ha. The experiment was laid out in randomized block design with three replications and fifteen treatments viz. pre-emergence application of pendimethaline, pre plant incorporation (PPI) of fluchlorine alone and followed by handweeding (HW) at 30, 30+150, 150, 150+180 days after sowing respectively ; HW at 30, 30+150, 150, 150+180 DAS, weed free and weedy check. All the herbicides were applied with Knapsack sprayer using spray volume of 500 litres/ ha. Fluchloralin was applied as pre plant incorporation on a well prepared field one day before date of sowing, whereas pendimethalin was applied two days after sowing. Lentil cultivar "Shalimar Massor-1" was sown on 15th and 10th of November during 2004 and 2005, respectively with row spacing of 23 cm using a seed rate of 45 kg/ha. Nitrogen, phosphorus and potassium were applied

Table 1: Effect of different weed management practices on density (No/ M²) of different weed species

Treatments	<i>Delphenium roylei</i>		<i>Neslia apiculata</i>		<i>Convolvulus arvensis</i>		Others	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
HW at 30 DAS	20.1 (4.53)	23.1 (4.84)	60.1 (7.77)	64.2 (8.03)	15.1 (3.93)	17.3 (4.18)	8.1 (2.91)	12.1 (3.53)
HW at 30 and 150 DAS	20.24 (4.53)	24.2 (4.95)	55.2 (7.44)	58.3 (7.64)	14.3 (3.80)	18.2 (4.30)	7.2 (2.74)	10.2 (3.24)
HW at 30, 150 and 180 DAS	18.3 (4.30)	22.2 (4.74)	42.3 (6.51)	45.3 (6.74)	14.2 (3.80)	18.0 (4.30)	7.1 (2.74)	9.5 (3.08)
Fluchlorolin	8.3 (2.91)	12.3 (3.53)	41.9 (6.44)	44.4 (6.67)	12.3 (3.53)	15.3 (3.93)	6.5 (2.55)	8.4 (2.91)
Fluchlorolin+ HW at 30 DAS	6.1 (2.55)	10.9 (3.24)	36.9 (6.03)	38.3 (6.20)	8.1 (2.91)	10.2 (3.24)	5.3 (2.34)	6.5 (2.55)
Fluchlorolin + HW at 150 DAS	6.2 (2.55)	9.2 (2.91)	42.3 (6.51)	45.3 (6.74)	10.2 (3.24)	9.3 (3.08)	5.3 (2.34)	6.3 (2.55)
Fluchlorolin+ HW at 30 and 180 DAS	5.2 (2.34)	8.2 (2.91)	40.1 (6.36)	46.3 (6.81)	8.3 (2.91)	10.2 (3.24)	4.6 (2.12)	5.8 (2.34)
Fluchlorolin + HW at 150 and 180 DAS	5.4 (2.34)	7.3 (2.74)	41.3 (6.44)	43.8 (6.59)	12.2 (3.53)	10.3 (3.24)	4.5 (2.12)	5.6 (2.34)
pendimethaline	16.2 (4.05)	20.1 (4.52)	38.6 (6.20)	42.3 (6.51)	6.2 (2.55)	6.2 (2.55)	3.2 (1.87)	4.9 (2.34)
pendimethaline + HW at 30 DAS	15.3 (3.93)	18.9 (4.30)	30.1 (5.52)	34.2 (5.87)	3.1 (1.87)	4.3 (2.12)	2.5 (1.58)	4.1 (2.12)
pendimethaline + HW at 150 DAS	14.2 (3.80)	17.3 (4.18)	38.5 (6.20)	42.4 (6.51)	3.2 (1.87)	3.5 (1.87)	3.1 (1.87)	3.9 (2.12)
pendimethaline + HW at 30 and 180 DAS	13.6 (3.67)	15.3 (3.93)	36.3 (6.03)	43.5 (6.59)	3.0 (1.87)	4.1 (2.12)	2.6 (1.58)	2.5 (1.58)
pendimethaline + HW at 150 and 180 DAS	12.9 (3.53)	15.3 (3.93)	36.9 (6.03)	41.4 (6.44)	3.0 (1.87)	4.1 (2.12)	3.2 (1.87)	3.9 (2.12)
Weed free	0.00 (0.71)	0.00 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)
Weedy check	29.0 (5.43)	32.9 (5.69)	90.3 (9.51)	102 (10.12)	21.2 (4.63)	24.5 (4.95)	12.6 (3.53)	16.4 (4.06)
CD (P = 0.05)	0.053	0.0783	0.114	0.119	0.057	0.0745	0.047	0.0518

Data is subjected to transformation and figures within parenthesis indicate original values

Table 2: Effect of different weed management practices on weed density, weed biomass, weed index and seed yield in lentil

Treatments	Weed population (No. /M ²)		Weed dry weight (g/ M ²)		Seed yield (kg/ ha)		Weed index (%)	
	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06	2004-05	2005-06
HW at 30 DAS	103 (10.17)	116 (10.79)	201.2 (14.19)	274.2 (15.56)	413	412	38.72	38.78
HW at 30 and 150 DAS	96 (9.82)	110 (10.51)	86.3 (9.29)	120.2 (10.97)	589	588	12.16	12.63
HW at 30, 150 and 180 DAS	81 (9.03)	94 (9.72)	36.2 (6.03)	60.3 (7.77)	631	629	6.37	6.53
Fluchlorolin	67 (8.22)	79 (8.92)	86.1 (9.29)	100.3 (10.02)	556	555	17.5	17.53
Fluchlorolin+ HW at 30 DAS	55 (7.45)	64 (8.03)	80.3 (8.96)	90.6 (9.51)	570	570	15.43	15.30
Fluchlorolin + HW at 150 DAS	63 (7.97)	68 (8.28)	36.4 (6.03)	48.5 (6.96)	611	612	9.34	9.06
Fluchlorolin+ HW at 30 and 180 DAS	57 (7.58)	69 (8.34)	30.2 (5.52)	44.6 (6.67)	641	642	4.89	4.60
Fluchlorolin + HW at 150 and 180 DAS	62 (7.91)	65 (8.09)	50.1 (7.10)	65.3 (8.09)	642	640	4.74	4.90
pendimethaline	63 (7.97)	73 (8.57)	40.2 (6.36)	55.4 (7.44)	542	544	19.58	19.16
pendimethaline + HW at 30 DAS	56 (7.51)	68 (8.28)	36.6 (6.03)	50.6 (7.10)	560	562	16.91	16.49
pendimethaline + HW at 150 DAS	58 (7.65)	66 (8.15)	30.5 (5.52)	45.5 (6.74)	600	603	10.97	10.40
pendimethaline + HW at 30 and 180 DAS	54 (7.38)	64 (8.03)	30.2 (5.52)	44.6 (6.67)	643	644	4.59	4.30
pendimethaline + HW at 150 and 180 DAS	54 (7.38)	64 (8.03)	20.3 (4.52)	21.3 (4.63)	665	663	1.33	1.34
Weed free	0 (0.71)	0 (0.71)	0.0 (0.71)	0.0 (0.71)	674	673	--	--
Weedy check	152 (12.35)	174 (13.21)	248.3 (15.75)	427.6 (20.67)	335	332	52.52	53.19
CD (P = 0.05)	0.107	0.115	0.226	0.284	10.80	10.63	--	--

Data is subjected to transformation and figures within parenthesis indicate original values

as per the recommendations. Observations on weed density and weed dry weight were observed by least count quadrat method. To avoid insect pest attack, endosulfan was sprayed twice after pod formations. The crop was harvested on 20th and 15th of June during 2005 and 2006 respectively. The data on weeds was subjected to square root transformation before statistical analysis.

Dominant weeds of the experimental field were *Delphinium roylei* (18.7 %), *Neslia apiculata* (58.89 %), *Convolvulus arvensis* (13.8 %), *Digitaria Sanguinalis*, and others (8.56 %) of total population under weedy check conditions (Table 1).

All the herbicidal treatments were found significantly effective in reducing population and dry weight of weeds over hand weeding (Table 2). *Delphinium roylei* was more effectively controlled by fluchlorine incorporated plots and its least density was observed in treatment Fluchlorine + HW at 150 and 180 DAS, However it was at par with fluchlorine + HW at 30 and 180 DAS (Table 2). The density of *Neslia apiculata*, *Convolvulus arvensis* and other weeds was found least in treatment pendimethaline + HW at 150 and 180 DAS however density of *Convolvulus arvensis* was found at par with pendimethaline + HW at 30 and 180 DAS. The pendimethaline was more effective over fluchlorine in lentil as its more selectivity against *Neslia apiculata*, *Convolvulus arvensis* and others which constitute 81.25 % of weed population. Although pendimethaline + HW at 30 and 180 DAS was at par with pendimethaline+ HW at 150 and 180 DAS in registering weed population, however least weed biomass was observed in pendimethaline + HW at 150 and 180 DAS. These results are in corroboratory with the findings of Punia et al., 2003 and Sharma et al., 2007.

None of the herbicides were found to cause toxicity to the crop. Season long competition between weeds and crops caused 52.52 % and 53.19 % reduction in yield during both the years as compared to weed free treatment. Treatments that reduced weed biomass and weed density significantly also resulted in significantly higher seed yield as evidenced from comparatively less dry weight of weeds and more seed yield. These results are in line with the findings of (Moorthy and Saha, 2000). After weed free plots, maximum seed yield was observed in treatment pendimethaline + HW at 150 and 180 DAS. Though both these treatments were at par. Although fluchlorine combined with HW at 150 and 180 DAS was found equally good in registering seed yield but its effectiveness could not match with pendimethaline + HW at 150 and 180 DAS which may due to escape of some weed species. These results confirm the findings of (Vyas et al., 2000). Application of herbicides alone controlled weeds effectively at early stages

of crop growth; however supplementary handweeding controlled the weeds substantially at later stages. Thus it was concluded that in lentil under temperate conditions of Kashmir combinations of pendimethaline and HW at 150 and 180 DAS Causes negligible competition between weeds and lentil thereby increasing seed yield.

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