

## Effect of Irrigation and Weed Management on Lentil (*Lens culinaris Medic. L.*) under Different Planting Techniques

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### ABSTRACT

Raised bed planting of lentil produced significantly higher yield as compared to zero till sowing; however, it was at par with the yield obtained in flat sowing. Weed dry weight was found higher in flat bed sowing and it was the lowest in zero till sowing. Irrigating lentil at flowering stage increased the grain yield significantly over no irrigation to the tune of 9.01 and 10.73% during 2005-06 and 2006-07, respectively. This may be due to more number of pods/plant, grains/plant and 1000-grain weight recorded under irrigated treatment. Application of pendimethalin (pre-emergence) @ 1.0 kg/ha controlled weeds more effectively as compared with one hand weeding at 30 days after sowing (DAS). One hand weeding at 30 DAS and pendimethalin @ 1.0 kg/ha produced 14.09 and 30.67 during 2005-06 and 2006-07 and 30.67 and 38.10% higher grain yield over weedy check. The dominant weed flora consisted of *Chenopodium album* and *Melilotus indica*.

**Key words :** Irrigation, weed management, planting techniques

### INTRODUCTION

Lentil (*Lens culinaris Medic. L.*) is one of the oldest and valuable human food crops. Mostly it is consumed as a dry grain (decorticated and split). India represents 50% of the world's acreage and 41% of the world's production. The production of lentil in India is around 1.0 mt from an area of 1.4 million hectare with the productivity of 660 kg/ha. In Haryana, lentil is an important winter season pulse crop next to chickpea. Lentil covers an area of 0.04 lakh ha and production is about 0.04 lakh tonnes.

Inadequate soil moisture and heavy infestation of weeds are the important factors, which result in poor productivity of this crop. Timely sowing of lentil is very essential for getting higher yield. Sowing of field crops directly without any field preparation with zero tillage machine can be advanced for 5-6 days and helps in improving the grain yield. Zero tillage has been found effective in reducing the cost of cultivation without sacrificing the crop yield as compared to conventional tillage in some of the crops (Malik *et al.*, 2000). Raised bed planting system has been reported to save irrigation water. Weeds in lentil have been reported to offer serious competition and cause yield reduction to the extent of 70% (Singh and Singh, 1985). Weed emergence in lentil begins almost with the crop emergence leading to crop-

weed competition from initial stages. The magnitude of loss as a result of crop-weed competition would depend upon type of weed species, their densities and duration of competition with crops. Moreover, labour requirement to remove weeds manually may not be met due to the peak sowing season and hence the use of herbicide can be explored to economize the weed control particularly in the initial stage as lentil is a slow growing crop. Keeping this in view, the present investigation was planned.

### MATERIALS AND METHODS

The field experiment was conducted during **rabi** seasons of 2005-06 and 2006-07 at Pulse Research Area of CCS Haryana Agricultural University, Hisar on lentil crop. The experiment was laid out in split plot design allocating planting techniques (Zero tillage, raised bed and flat bed) and irrigation (No irrigation and one irrigation at flowering) to main plot and the weed management [weedy check, hand weeding at 30 DAS and pendimethalin (pre-emergence) @ 1.0 kg/ha] to sub-plot with three replications. The soil of the experimental field was sandy loam, low in organic carbon (0.42%), low in available nitrogen (187 kg/ha), medium in available phosphorus (14 kg/ha) and high in potash (343 kg/ha). Lentil genotype, LH 90-54 was sown at recommended seed rate (35 kg/ha) on November 17 and 12 during

**rabi** 2005-06 and 2006-07, respectively, as per planting technique treatments. In flat bed, the sowing was done with hand plough, whereas zero till drill machine was used to sow directly the seeds in zero tillage planting treatment. In plots, where lentil was sown in zero tillage condition, glyphosate @ 1% was sprayed once 10 days before sowing of the crop to control prevailing weeds. The seeds on raised beds were sown with the help of raised bed planter having two rows on each raised bed of 67.5 cm. In all the planting techniques, the number of rows per plot was kept the same.

## RESULTS AND DISCUSSION

### Effect of Planting Techniques

Significant effect of planting techniques on number of pods per plant was observed during both the years of study. Higher number of pods was recorded in raised bed as compared to zero till during both the years and also as compared to flat bed sowing during 2005-06 only. More number of pods was also recorded with flat bed planting as compared to zero tillage sowing during both the years of study. 1000-grain weight was influenced significantly during 2006-07 only. Raised bed and flat bed planting technique produced bolder seeds than zero tillage planting technique (Table 1). This might be ascribed to better utilization of solar radiation in raised bed planting, higher dry matter production and translocation of photosynthates to the productive parts. Beneficial effect of bed planting on yield attributes of wheat has been reported by Mascagni *et al.* (1995). Number of grains per pod was not affected.

Grain yield was significantly higher under raised bed planting system. Raised bed planting technique increased the grain yield by 27.07 and 37.0% in 2005-06 and 12.60 and 7.35% in 2006-07 over the zero tillage and flat bed planting. The increase in grain yield could be attributed to higher number of pods/plant, increased number of grains/pod and 1000-grain weight in raised bed planting. Tripathi (1999) and Chauhan *et al.* (1997) have reported higher grain yield of wheat under bed planting. The lowest grain yield was recorded under zero till sowing which may be ascribed to poor development of the plant as reflected in the lower plant height, dry matter accumulation and yield attributes.

Similarly, stover yield was recorded 32.85 and 38.22% higher in 2005-06 and 17.35 and 2.89% higher during 2006-07 under raised bed planting over the zero

tillage and flat bed. This was mainly because of higher dry matter accumulation under raised bed planting of lentil (Table 1). Weed dry weight was significantly influenced by planting techniques during both years of study and it was observed that significantly lower dry matter of weeds was recorded in zero tillage treatment over the rest two practices. This might be due to less disturbance and less exposure of the soil which inhibited the buried weed seeds to reach the top soil resulting in less density and ultimately poor dry weight.

### Effect of Irrigation

Number of pods/plant and 1000-grain weight increased significantly with irrigation over the un-irrigated check during 2005-06 only because of the better plant growth in irrigated plots. Positive impact of irrigation on number of pods/plant in pulses has also been reported by Reddy and Ahlawat (1998). In the year 2006-07, very good rains were received (142 mm) during February and March, which coincided with flowering and pod formation/development stages, hence, no significant effect of irrigation was obtained.

Grain yield and stover yield of lentil increased significantly with irrigation. The increased productivity of grain and stover resulted due to positive effect of irrigation on growth and yield attributes. 9.01 and 10.73% higher grain yield and 8.47 and 8.90% higher stover yield was recorded during 2005-06 and 2006-07, respectively, when crop was irrigated at flowering stage as compared to un-irrigated plots. Irrigation at flowering helped in maintaining the soil moisture at the reproductive stage. As a result the physiological processes were not influenced negatively even with the rise in temperature (31°C) and ultimately resulted in bolder seeds and more number of pods and hence reflected in higher yield. The similar findings have also been reported by Singh and Singh (1983) and Oweis *et al.* (2004).

Application of irrigation at flowering in lentil resulted in higher weed dry weight as compared to unirrigated treatment (Table 1). This might be due to the better growth of weeds in irrigated treatment.

### Effect of Weed Management

Weed control treatments influenced the number of pods/plant, number of grains/pod and 1000-grain weight significantly (Table 1). As far as weed control is concerned, pendimethalin @ 1.0 kg/ha application proved

Table 1. Effect of irrigation and weed control practices on the yield attributes and yield of lentil under different planting techniques

Treatments	Plant height (cm)		Crop dry matter (g/plant)		Pods/plant		Grams/pod		1000-grain weight (g)		Grain yield (kg/ha)		Stover yield (kg/ha)		Weed dry weight at 120 DAS (g/m <sup>2</sup> )	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Zero tillage	39.16	32.13	8.17	8.21	56.49	46.73	1.28	1.57	28.2	26.8	798	735	2815	2653	44.00	37.39
Raised bed	42.25	35.26	10.19	11.02	73.46	52.54	1.25	1.71	28.8	28.3	1014	1007	3740	3667	51.95	42.06
Flat bed	43.34	37.20	9.37	9.89	64.68	50.37	1.35	1.68	28.5	28.2	900	938	3187	3564	71.70	45.64
LSD (P=0.05)	1.09	3.30	1.19	1.21	5.22	3.06	NS	NS	NS	1.3	58	82	192	333	5.74	3.62
No irrigation	40.00	33.60	8.47	8.53	62.62	48.93	1.26	1.65	28.0	27.6	865	848	3115	3154	53.12	39.74
One irrigation at flowering	43.17	36.13	10.01	10.89	67.13	50.83	1.33	1.65	29.0	27.9	943	939	3379	3435	58.64	43.65
LSD (P=0.05)	0.83	NS	0.97	1.21	4.26	NS	NS	NS	0.5	NS	48	67	156	272	4.69	2.95
Weedy check	39.40	32.64	7.70	6.52	60.00	45.29	1.18	1.54	27.7	27.4	809	727	2925	2710	67.06	50.13
One hand weeding at 30 DAS	41.34	34.18	10.00	9.89	65.14	51.29	1.34	1.62	28.9	28.2	923	950	3304	3477	56.58	41.23
Pendimethalin @ 1.00 kg/ha (PRE)	44.02	37.77	10.03	12.72	69.48	53.06	1.37	1.79	29.0	27.6	980	1004	3511	3697	44.01	33.73
LSD (P=0.05)	01.87	01.83	1.82	2.11	4.41	2.51	0.07	0.12	0.6	1.3	27	85	123	352	4.60	2.26

I-2005-06, II-2006-07. NS-Not Significant.

best followed by hand weeding. Contribution of weed control measures towards the enhancement of yield attributes could be ascribed to their effect in reducing the crop-weed competition in legumes have been reported by several workers (Ahlawat *et al.*, 1981; Das, 1985; Singh, 1985).

Controlling weeds either manually or chemically improved the grain and stover productivity of lentil by their marked effect in boosting the growth and yield parameters. Saxena and Wassimi (1980) and Singh (1985) have also reported increase in grain and straw yield in lentil by weed suppression. Application of pendimethalin @ 1.0 kg/ha and one hand weeding at 30 days after sowing produced significantly higher grain yield by a margin of 14.1 and 21.1% and 30.6 and 38.1% during 2005-06 and 2006-07, respectively, over the weedy check treatment. Chemical weed control (pendimethalin) treatment also produced significantly higher grain yield as compared to one hand weeding treatment during 2005-06 only. Weedy check plot reduced the grain productivity significantly as compared to pendimethalin application and hand weeding to the tune of 16.69 and 26.69% and 11.47 and 22.06%, respectively. In pendimethalin treated plots, there was reduced competition by weeds with crop because pendimethalin reduced the weed growth effectively as compared to weedy check plot as is evident from the lower weed dry matter recorded in this treatment (Table 1).

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