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Research Paper

Effect of different agronomic practices on growth parameters of lentil

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ABSTRACT

A pure and healthy seed of lentil genotype LH 90-54 was sown on November 17, 2005 as per planting technique treatments with three replications and total number of treatment combinations 18 were tested against the growth parameters of lentil [*Lens culinaris* (Medic) L.] at Pulse Research Area of CCS Haryana Agricultural University, Hisar during *Rabi* 2005-06. The observation on growth parameters *viz.,* plant population per meter row length recorded at 30 DAS and at harvest revealed that, initial plant population was higher than those recorded at harvest in planting technique, irrigation or weed control treatments. Plant height varied significantly with planting technique. Maximum values were associated with raised bed planting. The plant height was increased significantly at 60, 120 DAS and at harvest. When irrigation was given at flowering as compared to unirrigated. Plant height was significantly affected by weed control measures only at 90, 120 DAS and at harvest. When weeds were kept under check either chemically or manually, plant height was significantly increased. The planting technique resulted in significant increase in number of branches per plant at 120 DAS and at harvest. Irrigating the crop at flowering stage resulted in significant increase in number of branches at harvest over unirrigated condition. One hand weeding at 30 DAS and application of pendimethalin @ 1 kg a.i.ha^{-1} produced significantly higher number of branches as compared to weedy check. Dry matter accumulation in plants was maximum in raised bed planting and was minimum in zero tillage. Dry matter was significantly improved by applying one irrigation at flowering stage. Controlling the weeds resulted in a perceptible improvement in the dry matter yield of lentil at 120 DAS and at harvest.

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Lentil [*Lens culinaris* (Medic) L.] is one of the oldest and valuable human food crop. Mostly it is consumed as a dry grain (decorticated and split). Dehulled lentil grains contain 24-26 per cent protein, 1.3 per cent fat, 2.2 per cent ash, 3.2 per cent fibre and 57 per cent carbohydrate. It is a rich source of calcium (68 mg/100g grain), phosphorus (300 mg/100g grain) and iron (7 mg/100g grain). India represents 50 per cent of the world's acreage and 41 per cent of the world's production. The production of lentil in India is around 1.00 million tonnes from an area of 1.4million hectare with the productivity of 660 kg/hectare (Anonymous, 2005).

Inadequate soil moisture and heavy infestation of weeds are the important factors, which results in poor productivity of this crop. Timely sowing of lentil is very essential for getting higher yield. Lentil can be sown 7-10 days earlier by zero tillage machine directly without any field preparation after the harvest of rice crop by using residual soil moisture.

Another technology *i.e.* raised bed planting system that is a form of conventional tillage where in sowing is done on raised beds. The important factor including weed management favors the introduction of bed planting because herbicide resistance is already a serious issue. Thus, this system provides an elbow space for increasing the productivity of dry or limited irrigated areas in the later part of crop growth.

Lentil normally meets most of its water requirement from conserved soil moisture. In the absence of enough stored soil moisture and adequate winter rains, the crop responds very well to supplemental irrigation. Water being the scarce commodity in lentil growing areas of India, it warrants judicious use to achieve higher efficiency.

Weeds in lentil have been reported to offer serious

competition and cause yield reduction to the extent of 70 per cent (Singh and Singh, 1985). Weed emergence in lentil begins almost with the crop emergence leading to crop-weed competition from initial stages. 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.

RESEARCH PROCEDURE

The field experiment was conducted during the *Rabi* season of 2005-06 at Pulse Research Area of CCS Haryana Agricultural University, Hisar. The experiment was laid out in split plot design with three replications and total number of treatment combinations 3 x 2 x 3 = 18. The grass plot size was 2.4 x 1.8 m. The experimental field was prepared for sowing as per planting technique treatment. The field was ploughed with pressure harrow particularly the area allotted to raised bed and flat bed planting treatments. No harrowing or other tillage practices was done in the experimental area allocated for zero till planting treatment. The experimental area allotted for zero tillage treatment was sprayed with non-selective herbicide *i.e.* glyphosate @ 1 per cent solution 10 days before sowing to check the weeds and left over plants of the previous crop. One pre-sowing irrigation was applied on 13th November 2005. The field was ploughed and prepared as per treatments. Raised bed of 67.5 cm were prepared with tractor drown raised bed planter.

A pure and healthy seed of lentil genotype LH 90-54 was sown on November 17, 2005 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. 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. Recommended seed rate (35 kg ha^{-1}) was used for sowing of the crop. In all the planting techniques, the number of rows per plot were kept same.

After two weeks of germination, lentil plants were thinned to keep an intra-row spacing of about 7 cm. Gaps were filled wherever necessary to maintain uniform plant population. No weeding was carried out in weedy check plot, however, one hand weeding at 30 DAS and pendimethalin @ 1.0 kg a.i. ha^{-1} (pre-emergence) application were done in their respective treatments. One pre-sowing irrigation was applied for field preparation on 13th November 2005 and one post sowing irrigation was applied at flowering stage on 17th February 2006 as per treatment. To keep the crop free from insects particularly pod borer, first spray of endosulfon @ 1 litre ha^{-1} was done on 17th March and second spray was repeated on 8th April.

The observation on growth parameters is mentioned below:

Plant population:

The number of plants per meter row length was recorded at 20 days after sowing and at harvest in all the treatments.

Plant height:

Three plants were selected at random and tagged from the plot and the height per plant was measured from the ground level to the top most point at 30, 60, 90 and 120 days after sowing as well as at harvest and the average was worked out to express the result in centimeter.

Number of branches:

The number of branches of the three plants selected for recording height was counted per plant and the average was worked out to report as total number of branches per plant.

Dry matter production:

Three plants from each treatment were collected from border rows. The plant samples were first sun dried and then placed in oven at 70^0 C up to a constant weight, the samples were then cooled and weighed. The dry matter of plants was recorded at 30, 60, 90 and 120 days after sowing and the average dry matter (g) at harvest and was reported as per plant.

Statistical analysis:

The experimental data relating to each character were analyzed statistically by applying the technique of 'analysis of variance' for split-plot design and significance was tested by variance ratio 'F value differences'. Standard error and critical difference (C.D.) were worked out for each character studied to evaluate differences between treatment means.

RESEARCH ANALYSIS AND REASONING

The results obtained from the present investigation have been discussed in the following sub heads :

Plant population:

Data presented in (Table 1) on plant population per metre row length recorded at 30 DAS and at harvest

revealed that, plant population did not differ significantly either due to planting technique, irrigation or weed control treatments. However, initial plant population was higher than those recorded at harvest, which decreased due to mortality of some plant. Maximum mortality (28.87 per cent) was recorded in zero till planting.

In the present investigation initial as well as final plant population (Table 1) were not significantly affected by different planting methods. The uniform plant stand in all the planting technique was achieved because uniform seed rate *i.e.* 35kg $ha^{-1}$was used in all the three planting techniques.

Plant population of lentil recorded at 30 days stage and at harvest (Table 1) did not vary significantly due to irrigation treatment, obviously, because soil moisture was adequate as a result of a pre-sowing irrigation. This ensured good germination and uniform establishment of seedlings. It was not adversely affected at harvest also even in the unirrigated plot probably because the stored moisture in the soil profile catered the need of water for survival of lentil plants. Similar finding have also been reported by Anwar *et al*. (2003)

There was no significant effect of weed control treatments on population per meter row length of lentil was observed because of uniform seed rate (35kg ha^{-1}) was used in all the treatments. Similar findings were also reported by Bradley and Donald (2001).

Plant height:

Data on plant height presented in (Table 2) and indicated that in general, it increased progressively up to harvest. The height of the plant was non significant up to 90 DAS in all the planting techniques but the maximum increase in plant height was recorded between the period of 60-90 DAS and plant height was significant only at 120 DAS and at harvest. The tallest plants (43.34 cm) were observed in the flat bed system compared to other planting techniques. The plant height was 2.5 and 10.6 per cent lower in raised bed and zero tillage, respectively than flat bed system.

The plant height was increased significantly at 60, 120 DAS and at harvest. When irrigation was given at flowering produced significantly taller plants at 120 DAS and at harvest as compared to unirrigated.

Plant height was significantly affected by weed control measures only at 90, 120 DAS and at harvest. When weeds were kept under check either chemically or manually, plant height was significantly increased. Significantly, taller plants (44.02 cm) were observed in pendimethalin sprayed plot and the per cent increase in plant height was 4.9 and 11.7 per cent in hand weeding and pendimethalin, respectively over the weedy check. However, significantly taller plants were also recorded under one hand weeding at 30 DAS over the weedy check.

Number of branches per plant:

Data pertaining to number of branches per plant at 30 days interval starting from 30 DAS as influenced by planting technique, irrigation and weed management are

Table 1: Effect of different treatments on plant population (per metre row length)

Treatments	Initial (30DAS)	Final (At harvest)	Mortality (%)
Planting technique			
Zero tillage	74.83	53.22	28.87
Raised bed	75.50	54.05	28.41
Flat bed	75.72	54.55	27.95
S E.±	0.31	0.44	-
C.D. (P=0.05)	NS	NS	-
Irrigation			
No irrigation	75.55	53.85	28.72
One irrigation at flowering	75.14	54.03	28.09
S E.±	0.25	0.20	-
C.D. (P=0.05)	NS	NS	-
Weed management			
Weedy check	75.44	54.22	28.50
One hand weeding at 30 DAS	75.05	53.66	28.50
Pendimethalin @1.00 kg a.i./ ha (pre-emerg)	75.55	53.94	28.60
S E.±	0.45	0.57	-
C.D. (P=0.05)	NS	NS	-

NS=Non-significant

Table 2: Effect of different treatments on plant height (cm)

Treatments	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
Planting technique					
Zero tillage	6.68	8.23	27.01	38.86	39.16
Raised bed	6.83	9.07	27.62	42.99	42.25
Flat bed	6.73	8.98	27.32	41.86	43.34
S E.±	0.06	0.29	0.31	0.36	0.32
C.D. (P=0.05)	NS	NS	NS	1.27	1.09
Irrigation					
No irrigation	6.69	8.35	27.00	39.70	40.00
One irrigation at flowering	6.81	9.16	27.63	42.77	43.17
S E.±	0.05	0.24	0.25	0.29	0.26
C.D. (P=0.05)	NS	0.76	NS	0.93	0.83
Weed management					
Weedy check	6.68	8.32	26.38	39.07	39.40
One hand weeding at 30 DAS	6.76	8.92	26.43	41.03	41.34
Pendimethalin @1.00 kg a.i./ ha (pre-emerg)	6.81	9.04	29.13	43.60	44.02
S E.±	0.07	0.36	0.22	0.54	0.64
C.D. (P=0.05)	NS	NS	0.66	1.58	1.87

NS=Non-significant

presented in (Table 3).

Planting technique failed to produce any significant effect on number of branches up to 90 DAS, however, the per cent increase in number of branches was higher between 60 and 90 DAS. But the planting technique resulted in significant increase in number of branches per plant at 120 DAS and at harvest. The highest numbers of branches (11) per plant were recorded in raised bed and per cent increase in number of branches was 19.2 and 12.1 per cent in raised bed over zero tillage and flat bed, respectively.

Irrigating the crop at flowering stage resulted in significant increase in number of branches at harvest over unirrigated control by a margin of 11.0 per cent.

The different weed management practices influenced the number of branches significantly after 90 DAS (Table 3). One hand weeding at 30 DAS and application of pendimethalin @ 1 kg a.i.ha^{-1} produced significantly higher number of branches as compared to weedy check.

Table 3: Effect of different treatments on number of branches

Treatments	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
Planting technique					
Zero tillage	0.51	1.33	3.33	8.17	9.17
Raised bed	0.55	1.51	3.76	10.19	10.93
Flat bed	0.55	1.45	3.74	9.37	9.75
S E.±	0.02	0.12	0.21	0.38	0.07
C.D. (P=0.05)	NS	NS	NS	1.19	0.23
Irrigation					
No irrigation	0.50	1.29	3.50	8.47	9.43
One irrigation at flowering	0.57	1.57	3.72	10.01	10.47
S E.±	0.02	0.10	0.17	0.30	0.06
C.D. (P=0.05)	NS	NS	NS	0.97	0.19
Weed management					
Weedy check	0.53	1.37	3.39	7.70	8.14
One hand weeding at 30 DAS	0.55	1.45	3.62	10.00	10.06
Pendimethalin @1.00 kg a.i./ ha (pre-emerg)	0.53	1.47	3.82	10.03	11.65
S E.±	0.02	0.14	0.13	0.62	0.14
C.D. (P=0.05)	NS	NS	NS	1.82	0.42

NS=Non-significant

Dry matter accumulation:

Data on dry matter accumulation in lentil at various stage of growth as influenced by planting technique, irrigation and weed management are given in (Table 4).

The planting technique had no significant effect on dry matter accumulation up to 90 DAS, however the significant effect was observed only at 120 DAS and at harvest. Moreover maximum dry matter accumulation was recorded between 90 and 120 DAS. Raised bed planting resulted in higher dry matter accumulation at 120 DAS and at harvest however, it was significant only at 120 DAS and at harvest. Zero till sowing accumulated lower dry matter throughout the crop growth and it was significantly lower in later growth stages as compared to raised bed and flat bed planting technique.

Irrigation did not have any significant effect on dry matter accumulation in lentil plants up to 90 DAS. It was significantly improved by applying one irrigation at flowering stage compared with the unirrigated control at 120 days and harvest stages of the crop.

Controlling the weeds resulted in a perceptible improvement in the dry matter yield of lentil at 120 DAS and at harvest. Application of pendimethalin @ 1 kg a.i.ha^{-1} produced the highest (11.65 g plant^{-1}) amount of dry matter of lentil at harvest and the lowest amount of dry matter of lentil *i.e.* 8.14 g plant^{-1} was recorded in weedy check treatment. The per cent increase in dry matter accumulation in lentil was 23 and 43 per cent in one hand weeding and pendimethalin application over weedy check, respectively.

Plant height was significantly higher at 120 DAS and at harvest. The number of branches and dry matter accumulation were significantly higher at all the stages under raised bed planting than in zero tillage and flat bed planting except at 30, 60 and 90 DAS. This increase in plant height, number of branches and dry matter accumulation was primarily due to early pick up of growth owing to more free space availability on both sides of bed and plants in this method might have less competition for light and thus, had high photosynthetic rate which resulted in higher value for growth parameters till harvest.

Plant growth parameters *viz.,* plant height, number of branches and dry matter accumulation of lentil remained non-significant up to 90 DAS because of the similar inputs supplied to all the treatments. However, 90 DAS there was variation in these parameters and have been found superior in irrigated plots. This might be because of the reason that irrigation was applied at flowering (17th February 2006) which resulted in both utilization of increase soil moisture and inputs. The availability of sufficient soil moisture in pulses had positive effect on the growth parameters *viz.,* plant height, number of branches and dry matter accumulation because of the cell elongation and increased crop growth rate. The similar results have been reported by Youseti *et al*. (1997) and Reddy and Ahlawat (1998).

Weed control measures increased significantly the height of plants, number of branches and dry matter accumulation as compared to unweeded control (Table 2, 3 and 4). The weed control measures provided a favourable

Table 4 : Effect of different treatments on dry matter of plant (g)

Treatments	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
Planting technique					
Zero tillage	0.51	1.33	3.33	8.17	9.17
Raised bed	0.55	1.51	3.76	10.19	10.93
Flat bed	0.55	1.45	3.74	9.37	9.75
S E.±	0.02	0.12	0.21	0.38	0.07
C.D. (P=0.05)	NS	NS	NS	1.19	0.23
Irrigation					
No irrigation	0.50	1.29	3.50	8.47	9.43
One irrigation at flowering	0.57	1.57	3.72	10.01	10.47
S E.±	0.02	0.10	0.17	0.30	0.06
C.D. (P=0.05)	NS	NS	NS	0.97	0.19
Weed management					
Weedy check	0.53	1.37	3.39	7.70	8.14
One hand weeding at 30 DAS	0.55	1.45	3.62	10.00	10.06
Pendimethalin @1.00 kg a.i./ ha (pre-emerg)	0.53	1.47	3.82	10.03	11.65
S E.±	0.02	0.14	0.13	0.62	0.14
C.D. (P=0.05)	NS	NS	NS	1.82	0.42

NS=Non-significant

and a comparatively competition free environment both above ground and in the rhizosphere enabling the crop plants to utilize the water, nutrients and light resources in a better way. This can be visualized by the reduced dry matter accumulation of weeds in pendimethalin @ 1.0 kg a.i. ha^{-1} (18.5%) and hand weeding at 30 DAS (52.3%) treatments. Reduction in dry matter accumulation of weeds by weed control treatments and increased plant growth parameters have also been reported by Hanson and Thill (2001).

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LITERATURE CITED

Anonymous (2005). All India Coordinated Research Project on MULLaRP (ICAR) Annual Report (*Rabi*), pp 54-58.

Anwar, M.R., Mckenzie, B. A. and Hill, G. D. (2003). Phenology and growth response to irrigation and sowing date of Kabuli chickpea (*Cicer arietinum* L.) in a cool-temperate subhumid climate. *J. agric. Sci.*, **141**: 273-284.

Bradley, D.H. and Donald, C.T. (2001). Effect of pendimethalin on lentil (*Lens culinaris*) and pea (*Pisum sativum*) Crop. *Weed Technol.*, **15**(1): 190-194.

Hanson, B.D. and Thill, D.C. (2001). Effects of imazethapyr and pendimethalin on lentil (*Lens culinaris*), Pea(*Pisum sativum*) and a subsequent winter wheat (*Triticum aestivum*) crop. *Weed Technol.*, **16**: 1.190-194.

Reddy, N.R.N. and Ahlawat, I.P.S. (1998). Response of chickpea (*Cicer arietinum* L.) genotypes to irrigation and fertilizers under late sown conditions. *Indian J. Agron.,* **43**: 95-105.

Singh, G. and Singh, D. (1985). Effect of herbicide on weed control in lentil (*L. esculenta*). *Ann. Conf.* of ISWS held on April 4-5, 1985, Gujarat. 59 pp.

Youseti, B., Kasemi-Arbat, H., Rahimzadeh-Khoyi, F. and Moghaddam, M. (1997). Study for same agronomic trials in chickpea (*Cicer arietinum* L.) cultivars under two irrigation regimes and path analysis of trials under study. *Iranian J. Agric. Sci.,* **28**: 147-162.

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