Journal of Crop and Weed 7(2): 191-194 (2011)

Effect of nutrients and weed management on productivity of lentil (*Lens culinaris* L.)

N. AGGARWAL AND H. RAM

Department of Plant Breeding and Genetics
Punjab Agricultural University, Ludhiana-141 004, Punjab, India
Received: 04.05.2011, Revised: 30.09.2011, Accepted : 29.10.2011

ABSTRACT

An experiment comprised of all combinations of four nutrient [FYM @ 15 t ha^{-1}, recommended dose of 12.5 kg N and 20 kg P_2O_5 ha^{-1} (RDF), FYM + RDF and control) and three weed management [pre-emergence application of pendimethalin @ 0.45 kg ha^{-1}, two hand weedings (30 and 60 days after sowing (DAS) and weedy check] treatments was conducted at PAU Seed Farm, Naraingarh in 2006-07 and 2007-08 in RBD with three replications. The application of FYM + RDF resulted in better growth of the crop and more weed suppression which consequently showed highest grain yield, gross returns and net returns in lentil. Pre-emergence application of pendimethalin @ 0.45 kg ha^{-1} proved slightly toxic for the crop during the initial stage of crop growth and the crop had dwarf plant with low yield attributes. Two hand weedings significantly reduced the weeds biomass and increased grain yield of lentil as compared to other weed control treatments.

Key words: FYM, lentil, pendimethalin and recommended dose of nutrients

Lentil (*Lens culinaris* L.) is the important *rabi* pulse crop in India. It is grown on an area of 1100 hectares, producing 0.7 thousand tonnes with an average productivity of 665 kg ha^{-1} in Punjab (Anonymous, 2011). It has been recognized as one of the most complete and cheapest sources of vegetable protein for humans and, it provides a good source of minerals. This crop is rich sources of carbohydrates, dietary fibre, vitamins, minerals, high energetic value (Costa *et al.*, 2006) and oleic, linoleic and palmitic acid (Roy *et al.*, 2010). Lentil straw is a valued animal feed (Sarker *et al.*, 2003). In spite of the importance of this crop in our daily diet and in agricultural production, productivity of this crop is very low in India as well as in Punjab. Being leguminous crop, it plays an important role in the maintaining and improving the fertility status of the soil. Even then fertilizers play significant role in boosting up the production of pulses. The use of farmyard manures and other forms of organic matter can also change plant-available micro nutrients by changing both physical and biological characteristics of the soil. In many circumstances these changes improve soil physical structure and water holding capacity, resulting in more extensive root development and enhanced soil micro-flora and fauna activity all of which can affect available micronutrients levels in soil to plant (Stevenson, 1991). Lentil is a poor competitor to weeds because of slow growth rate and limited leaf area development in early stages of crop growth and establishment. Weeds affect growth, yield and quality of crop plants adversely and reduce soil fertility, compete with the crop plants for soil moisture, nutrients, space and sunlight. Considerable yield losses in lentil recorded to the extent of 30-100 per cent if weeds are not controlled within critical growth period of crop (Bekir and Barboras, 2005). Previously no herbicide was recommended for chemical weed management in lentil under Punjab conditions. Moreover, many times labour is not available for controlling weeds particularly at the critical period of crop weed competition. Therefore, there was a need to find out the effective weed management strategies for controlling weeds. Keeping in view, the present experiment was planned to find out the effect of fertilizers and weed management practices on lentil under Punjab conditions.

MATERIALS AND METHODS

An experiment was conducted at Punjab Agricultural University Seed Farm, Naraingarh for two consecutive *rabi* seasons of the year 2006-07 and 2007-08. The soil of the experimental site was sandy loam in texture with pH 7.1, low in available nitrogen and medium in available phosphorus and high in potassium. Twelve treatments comprising of all combinations of four nutrient treatments [FYM @ 15 t ha^{-1}, Recommended dose of fertilizers (RDF) of 12.5 kg N and 20 kg P_2O_5 ha^{-1}, FYM @ 15 t ha^{-1} + RDF and Control) and three weed management practices [pendimethalin @ 0.45 kg ha^{-1}, two hand weedings at 30 and 60 days after sowing (DAS) and weedy check] were tested in a randomized block design with three replications. The lentil variety 'LL 147' was sown using seed rate of 30 kg ha^{-1} at row spacing of 22.5 cm during the first week of November in both the years. Pendimethalin was applied as pre-emergence using Knapsack sprayer fitted with flat fan nozzle by mixing in 500 litres of water ha^{-1}. In general, weather conditions were favourable for plant growth and no severe pest and diseases were noticed during the study period. The crop received three irrigations in each of the years. Two sprays of endosulfan were done to prevent the damage from pod borers. The observations on weed dry matter were taken randomly from 0.5m × 0.5m quadrate from 2 spots from each plot at the time of harvest. The data on plant height, branches $plant^{-1}$, pods $plant^{-1}$, seeds pod^{-1}, 100-seed weight, biological yield and grain yield were recorded at the time of harvest. The

Email: hr_saharan@yahoo.com

economics was calculated by using prevailing prices of inputs and outputs. The data was analysed using standard ANOVA for factorial randomized block design.

RESULTS AND DISCUSSION

The dominant weed flora of the experimental field comprised of *Eleusine indica*, *Poa annua* (*bhuin*) and *Asphodolus tenuifolius* (*piaji*) among monocots and *Chenopodium album* (*bathu*), *Medicaga denticulata* (*maina*), *Melilotus indica* (*wild senji*), *Fumaria parviflora* (*pitpapra*) and *Digera arvensis* as dicot were found dominant weeds.

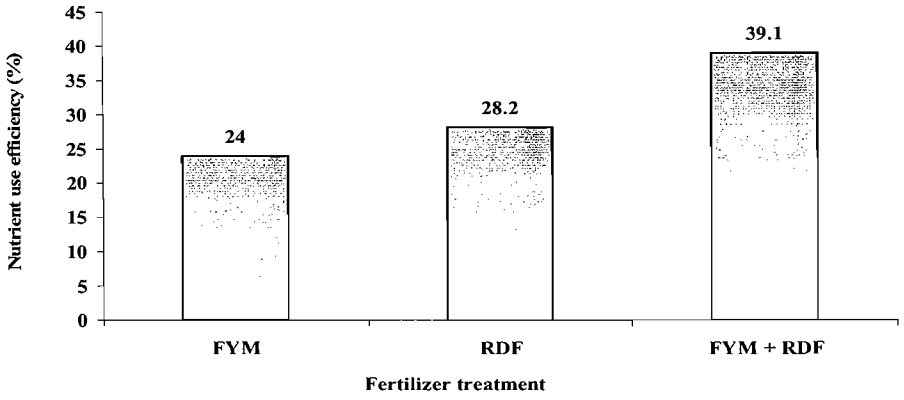
Effect of nutrients management

The results given in table-1, revealed that differences due to different fertilizer treatments were found non-significant with regards to dry weight of weeds at the time of harvest. In general, maximum dry weight of weeds was observed under FYM application @ 15 t ha^{-1} while lowest in case of FYM @ 15 t ha^{-1} + RDF treatment. Further, FYM @15t ha^{-1} + RDF resulted in significantly higher plant height, branches $plant^{-1}$, number of pods $plant^{-1}$ as compared to the other fertilizer treatments. The difference with respect to number of seeds pod^{-1} and 100 seed weight of lentil was found to be non-significant in different fertilizer treatments. However, application of 15 tonnes FYM alongwith RDF recorded the highest biological yield and grain yield (Table 2) of lentil which was significantly higher than other nutrient treatments, which may be due to the better plant nutrition in this case. Zeidan (2007) also reported that application of FYM along with phosphorus resulted in higher yield of lentil. Nutrient use efficiency was also the highest in 15 tonnes FYM alongwith RDF and was 15.1 per cent and 10.9 per cent higher than alone FYM and RDF respectively (Fig. 1).

Table 1: Effect of nutrients and weed control treatments on weeds dry matter, growth, yield contributing characters and yield of lentil

Treatment	Dry matter (kg ha^{-1})	Plant height (cm)	Branches $plant^{-1}$	Pods $plant^{-1}$	Seeds pod^{-1}	100-seed weight (g)	Biological yield (kg ha^{-1})
Nutrient levels							
FYM	777	28.8	7.62	40.1	1.84	1.77	2633
RDF	778	29.2	7.79	41.7	1.87	1.77	2627
FYM + RDF	688	30.3	8.27	46.3	1.83	1.75	2876
Control	742	24.7	6.79	32.3	1.78	1.69	2097
LSD(0.05)	**44**	**1.0**	**0.24**	**2.7**	**NS**	**NS**	**136**
Weed control treatment							
Pendimethalin 0.45 kg ha^{-1}	589	26.9	6.83	36.8	1.90	1.74	2294
2 HW (30 & 60 DAS)	378	32.0	9.08	50.9	1.83	1.75	3143
Control	1273	25.8	6.93	32.7	1.76	1.75	2238
SEm(±)	**25.9**	**0.6**	**0.1**	**1.6**	**0.05**	**0.03**	**80.5**
LSD(0.05)	**38**	**0.9**	**0.21**	**2.4**	**0.08**	**NS**	**118**

Fig.1. Nutrient use efficiency of different fertilizer treatments



Effect of weed management practices

Effect on weeds

Different weed management practices significantly influenced dry weight of weeds at harvest (Table 1). Two hand weedings at 30 and 60 DAS recorded significantly reduced the dry weight of weeds as compared to pendimethalin @ 0.45kg ha^{-1} and unweeded control. Similarly, application of pendimethalin @ 0.45kg ha^{-1} was also found significantly superior for reducing dry weight of weeds as compared to unweeded control. The weed control efficiency was highest (70.3%) in two hand weeding followed by pendimethalin @ 0.45kg ha^{-1} (54.7%) as shown in the figure-2.

Effect on crop

Pre-emergence application of pendimethalin @ 0.45kg ha^{-1} proved to be toxic for the lentil. Although the crop in this treatment recovered later on but could not match with the non herbicide treatment in terms of vegetative as well as reproductive growth which is evident from lower plant height, branches $plant^{-1}$, pods $plant^{-1}$, biological yield and grain yield of lentil (Table 1 & 2). Hand weeding twice at 30 and 60 DAS resulted in better vegetative and reproductive growth and recorded higher biological and grain yield of lentil than other weed control treatments. The increase in biological and grain yield was mainly due to effective weed control at critical crop-weed competition stages which might have helped in increasing nutrient uptake by the crop. These results are in conformity with the findings of Sadiq *et al.* (2002). Interaction between nutrients and weed control treatments was found to be significant for grain yield of lentil (Table 2). Combined application of 15 t ha^{-1} FYM and RDF resulted in highest grain yields of lentil in all the weed management treatments. In spite of phytotoxicity on lentil, the crop received pendimethalin @0.45 kg ha^{-1} alongwith FYM+RDF recorded statistically similar yield as recorded in two hand weeding in RDF.

Fig. 2. Weed control efficiency of different treatments

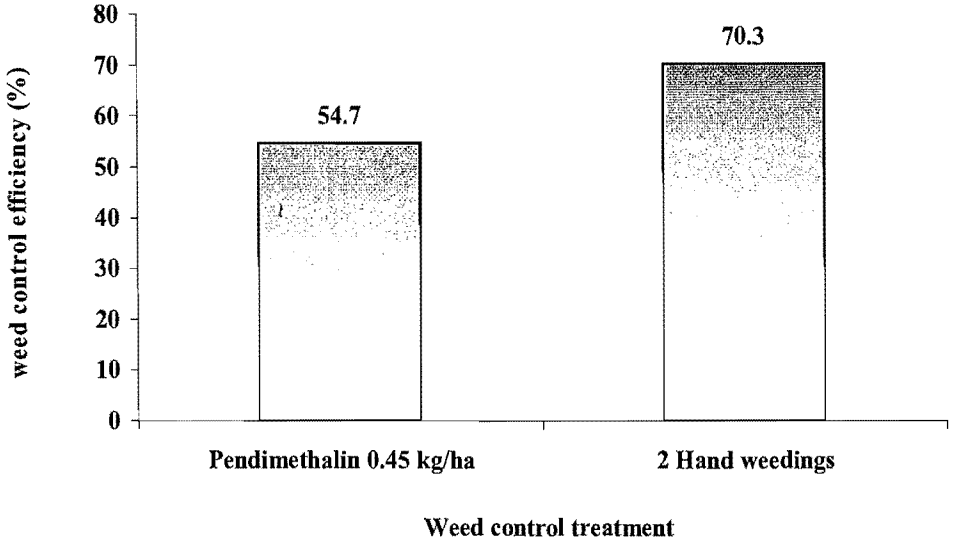


Table 2: Interactive effect of fertilizers and weed control treatments on grain yield of lentil (Two years pooled data)

Weed control treatments	Nutrient levels				
	FYM	RDF	FYM + RDF	Control	Mean
Pendimethalin 0.75 kg ha^{-1}	934	876	1022	730	891
2 HW (30 & 60 DAS)	1020	1150	1286	986	1111
Control	866	790	968	640	816
Mean	**940**	**939**	**1092**	**785**	
			SEm(±)	**LSD 0.05)**	
Nutrient levels			**31**	**53**	
Weed control treatment			**31**	**46**	
Fertilizer × weed control treatments			**31**	**92**	

All the fertilizer treatments resulted in significantly higher gross and net returns over unfertilized control. Application of 15 t ha^{-1} FYM along with RDF realized maximum gross returns which was significantly higher than all other fertilizer treatments as well as unfertilized control. Maximum net returns were obtained in FYM + RDF which were statistically on par with RDF (Table 3) but significantly higher than FYM as well as unfertilized control. Amongst weed management practices, two hand weedings at 30 and 60 DAS resulted in significantly higher gross returns and net returns over pre-emergence application of pendimethalin 0.45 kg ha^{-1} and un-weeded control which might be due to higher weed control efficiency of 70.3% in this treatment. In can be concluded that combined application of 15 tonnes.ha^{-1} FYM and recommended dose of fertilizers (12.5 kg N and 20 kg P_2O_5 ha^{-1}) is needed to obtain higher yields of lentil. Further, hand weeding twice at 30 and 60 DAS is required to obtain effective weed control and higher grain yield of lentil. Pendimethalin @ 0.45 kg ha^{-1} was not safe to the lentil crop.

Table 3: Economics of different fertilizer and weed control treatments in lentil

Treatment	Cost of cultivation	Gross returns (₹ha^{-1})	Net Returns (₹ ha^{-1})
Nutrient levels			
FYM	14000	35233	20267
RDF	10500	32853	20970
FYM + RDF	14750	38220	22003
Control	9500	27487	16520
LSD(0.05)	-	**1770**	**1770**
Weed control treatments			
Pendimethalin 0.45 kg ha^{-1} (PE)	10295	31162	18368
2 HW (30 & 60 DAS)	13100	40618	25080
Weedy check	9500	28560	16372
SEm(±)	-	**1045**	**1045**
LSD(0.05)	-	**1534**	**1534**

REFERENCES

Anonymous. 2011. *Package of Practices* for *Rabi Crops of Punjab*. Punjab Agricultural University, Ludhiana, pp. 34-35.

Bekir, B. and Barboras, H. G. 2005. Densities and important values of weeds in lentil production. *Int. J. Bot.*, **1**: 15-18.

Costa, G. E., Monici, K. Q., Reis, S. and Oliveira, A. C. 2006. Chemical composition, dietary fiber and resistant starch contents of raw and cooked pea, common bean, chickpea and lentil legumes. *Food Chem.*, **94**: 327-30.

Roy, F., Boye J.I. and Simpson, B.K. 2010. Bioactive proteins and peptides in pulse crops: Pea, chickpea and lentil. *Food Res. Int.*, **43**: 432-42.

Sadiq, M., Jamil, M., Mehdi, S.M., Sarfraj, M., Gondal, M.R. and Hassan, G. 2002. Effect of various weedicides on weed control and yield of lentil (*Lens culinaris*) crop in salt affected soil. *Asian J. Pl. Sci.*,**1**: 215-16.

Sarker, A., Erskine, W. and Singh, M. 2003. Regression models for lentil seed and straw yields in Near East. *Agr. Forest Meteorol.*, **116**: 61-72.

Stevenson, F. J. 1991. Organic matter micronutrient reaction in soil. *In: Micronutrients in Agriculture,* (Eds. Mortvedt, J. J. *et al.*) SSSA 4, *Soil Sci. Soc. America*, Madison, Wl, pp: 145-86.

Zeidan, M. S. 2007. Effect of organic manure and phosphorus fertilizers on growth, yield and quality of lentil plants in Sandy Soil. *Res. J. Agric. Biol. Sci.*, **3**: 748 -52.