

LENTIL YIELD AS INFLUENCED BY DENSITY OF WHEAT INTER-CROPPING

A. Khaliq¹, M. Bismillah Khan², M. Farrukh Saleem¹ and S. I. Zamir¹

¹Department of Agronomy, University of Agriculture, Faisalabad, Pakistan.

²Bahauddin Zakariya University, Multan.

Abstract: Studies on agro-economic relationship of component crops in a lentil-wheat intercropping systems were conducted at the Agronomic Research Area, University of Agriculture, Faisalabad during the year 1996-97. Intercropping systems included lentil alone, lentil + one row of wheat, lentil + two rows of wheat, lentil + three rows of wheat, lentil + four rows of wheat and lentil alone. Lentil alone and wheat alone produced their maximum respective grain yields of 10.99 and 42.10 q ha⁻¹ as compared to those recorded in various intercropping systems. While in terms of monetary gain, the highest net income of Rs.21680.13 ha⁻¹ was obtained from an intercropping system of lentil + two rows of wheat as against the lowest of Rs. 10819.28 ha⁻¹ in case of wheat alone.

Keywords: Lentil, Wheat density, Intercropping

INTRODUCTION

The population of Pakistan is increasing at an alarming rate but the rate of increase in food production is too low to meet its rapidly increasing demand. Thus the farmers and agronomists are faced with the task of increasing food production. In modern agriculture, intercropping is a useful proposition for increasing the productivity and income per unit area/time besides enhancing the land and water-use efficiency especially under small holding conditions in irrigated as well as in rainfed areas. Intercropping is gaining interest among the small farmers as a potentially beneficial system of crop production. Thus it is imperative to look for such intercropping systems/patterns, which have the potential of raising minor crops such as pulses in association with major food crops of Pakistan like wheat.

Sutradhar *et al.* [1991] observed that the 2:1 wheat : lentil intercrop was associated with greater soil water depletion and from a greater soil depth with concomitant higher water expense efficiency. Mandal *et al.* [1990] reported that intercropping provides farmers' profit oriented and subsistence oriented requirements from the same piece of land.

Zaman [1989] concluded that 100:33 lentil : wheat intercropping ratio gave the maximum net return of \$ 185.6 ha⁻¹. Similarly, intercropping of methra and linseed in wheat enhanced farm income by 156 and 66%, respectively over wheat alone [Saeed *et al.* 1997]. Thus keeping in view the importance of intercropping in intensive agriculture of Pakistan, the present study was planned to assess the agro-economic advantages of lentil based intercropping system using different wheat densities under agro-climatic conditions of Faisalabad.

MATERIALS AND METHODS

A field experiment was conducted during 1996-97 at the Agronomic Research Area, University of Agriculture, Faisalabad. The experiment was laid out in randomized complete block design with four replications. Plot size measured 4.8 x 10 m. The intercropping systems comprised lentil alone, lentil + one row of wheat, lentil + two rows of wheat, lentil + three rows of wheat, lentil + four rows of wheat and wheat alone. Lentil cv. Local Masoor was sown on October 10, 1996 in the pattern of four row strips, 100 cm apart (20/100 cm) keeping row to row distance of row 20 cm in each strip. Wheat cv. Inqalab-91 was interplanted on the same day between lentil strips according to the treatments. Fertilizer nitrogen and phosphorus @ 50 kg N and 75 kg P₂O₅ ha⁻¹ was applied in the form of Urea and SSP, respectively. All the phosphorus and half of nitrogen were side dressed at sowing while remaining half nitrogen was applied with first irrigation. All other agronomic practices were kept uniform and normal for all the treatments. Observations on different parameters of both the associated crops were recorded by using standard procedures. The data collected were analyzed statistically using Fisher's analysis of variance technique and the treatment's means were compared at 0.05 probability level [Steel and Torrie 1984].

Table-1: Lentil yield, yield components and net income as influenced by density of wheat intercropping

Treatment	Grain yield (q ha ⁻¹)		Plant population m ²	No. of pods per plant	No. of grains per plant	1000-grain weight (g)	LER*	Net income (Rs. ha ⁻¹)
	Lentil	Wheat						
Lentil alone	10.99a	-	212.80a	87.40a	139.90a	17.90bc	1.00	21079.53
Lentil + one row of wheat	8.79b	21.80e	195.80b	72.50b	123.30b	17.71c	1.10	10819.28
Lentil + two rows of wheat	7.96c	23.96d	184.0bc	57.08c	97.03c	18.45bc	1.29	19937.53
Lentil + three rows of wheat	7.29c	28.23c	172.8cd	55.30c	96.78c	18.83b	1.33	21680.13
Lentil + four rows of wheat	5.49d	35.05b	162.0d	36.10d	70.40d	20.31a	1.33	21317.33
Wheat alone	-	42.10a	-	-	-	-	1.00	19047.53

Any two means in a column not sharing a letter differ significantly at 0.05 probability.

*Land equivalent ratio

RESULTS AND DISCUSSION

Grain yield of lentil was significantly reduced by various lentil-wheat intercropping systems (Table 1). Lentil alone produced significantly maximum grain yield (10.99 q ha⁻¹) followed by lentil + one row of wheat intercropping system while minimum lentil grain yield (5.49 q ha⁻¹) was recorded from lentil + four rows of wheat intercropping system. The increase in grain yield in case of lentil alone may be attributed to more number of plants per unit area and more number of pods and grains per plant in this treatment. Ahmad [1989], Malik [1991] and Asghar [1994] also reported higher grain yield of pulses when sown alone. The number of plants per unit area of lentil was significantly affected by density of wheat intercropping (Table 1). With the increase in density of wheat intercropping, the number of

lentil plants per unit area decreased. Maximum number of lentil plants (212.80) was recorded from plot sown alone as compared to the minimum (162.0) from lentil + four rows of wheat intercropping system which was statistically at par with lentil + three rows of wheat. Tariq and Rehman [1994] reported similar trend of plant population in lentil-linseed intercropping system.

There were significant differences in number of pods per plant of lentil by density of wheat intercropping systems (Table 1). Maximum number of pods per plant (87.40) was recorded from lentil alone plots against minimum pods per plant (36.10) in case of lentil + four rows of wheat intercropping system. By increasing the number of lines of wheat crop there was progressive decrease in the number of pods per plant of lentil because of natural competition among the two crops for nutrients, light and water from the same nutritional area. Malik [1991] also reported decrease in number of pods per plant of gram by increasing the density of lentil intercropping. Data regarding the number of grains per plant of lentil presented (Table 1) indicated a progressive decrease in the number of grains per plant with each successive increase in the intensity of intercropping from one to four rows of wheat. Lentil alone produced maximum number of grains per plant (139.90) whereas lentil + four rows of wheat produced minimum number of grains per plant (70.40). This decrease in number of grains per plant with increase in the density of wheat intercropping was mainly due to less number of pods per plant. These results are in accordance with the findings of Ahmad [1989]. Data (Table 1) revealed that significantly maximum 1000-grain weight (20.31g) was recorded from plot of lentil + four rows of wheat intercropping system followed by lentil + three rows of wheat, whereas, the differences among lentil + three and two rows of wheat intercropping system and lentil alone were non-significant. Minimum 1000-grain weight (17.71 g) was recorded from lentil + one row of wheat intercropping system which was statistically at par with lentil alone and lentil + two rows of wheat intercropping system. The increase in 1000-grain weight in case of lentil + four rows of wheat intercropping systems was mainly due to less number of grains and pods per plant thereby resulting in more bold grains. These findings are in line with the results of Ahmad [1989] and Tariq [1994] but contradictory to the findings of Malik (1991). Land equivalent ratio (LER) of both the component crops varied from 1.10 to 1.33 (Table 1). Highest LER (1.32) was observed in case of lentil + three and four rows of wheat. By contrast, the minimum LER (1.00) was recorded in case of lentil and wheat alone. Highest net income of Rs. 21680.13 ha⁻¹ was recorded in case of lentil + two rows of wheat intercropping system. Ahmad [1989] also reported additional economic benefits in different intercropping systems. The results led to the conclusion that although the lentil grain yield was reduced by different intercropping systems but at the cost of this reduction in lentil yield, the additional wheat yield produced by different intercropping systems compensated more than the losses in lentil alone. Lentil + three rows of

wheat was the most economical intercropping system in terms of net benefits.

References

- Ahmad, N. (1989) "Studies on agro-economic relationship of component crops in a lentil-wheat intercropping system", M.Sc. (Hons) Thesis, University of Agriculture, Faisalabad.
- Asghar, M. and Tahir, S.M. (1994) "Effect of planting patterns on gram-lentil intercropping productivity", *J. Agric. Res.*, 32, 457-460.
- Mandal, B.K., Dhare, M.C., Mandal B.B., Das, S.K. and Nandy, R. (1990) "Rice, mungbean, soybean, peanut, ricebean and blackgram yields under different intercropping systems", *Argon. J.*, 82, 1063-1066.
- Malik, M.A., Ali, A., Sabir, M.R. and Tanvir, A. (1991) "Exploitation of biological potential of gram and lentil under varying intercropping systems", *Pak. J. Agri. Sci.*, 28, 382-384.
- Saeed, M., Khan S.A., Gill M.B. and Ahmad, R. (1990) "Production potential and net income of different wheat-based legume and non-legume intercropping systems", *Proceedings of International Science Conference*, Rawalakot, 46-49.
- Sutradhar, A.K., Singh, G., Das, D.K., Singh, R.K. and Singh, G. (1991) "Root growth and soil water depletion by intercropped wheat and lentil under dry land condition". *Annals of Agri. Res.* 12, 336-343.
- Steel, R.G.D. and Torrie, J.H. (1984) "Principles and Procedures of Statistics" McGraw Hill Book Co., Inc., Singapore, pp. 172-177.
- Tariq, M. and Rehman, S. (1984) "Studies on different lentil-linseed intercropping systems", *J. Agric. Res.*, 32, 519-524.
- Zaman, S.M. (1989) "Effect of mixed cropping lentil and wheat at varying seeding ratios", *Lens* 16, 16-18. (Field Crop Absts. 1991, 44, 458)