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# Comparison of Different Intercropping Arrangements of Cumin (*Cuminum cyminum*) and Lentil (*Lens culinaris*)

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Keywords: row intercropping, strip intercropping, cumin, lentil, LER.

## Abstract

*To evaluate the effect of different intercropping pattern of cumin and lentil on plant growth and yield, an experiment was conducted in Agricultural Research Station of Ferdowsi University of Mashhad, Iran in the growing season of the year 2004. Treatments were: A: row intercropping of cumin and lentil B: strip intercropping of cumin and lentil (three cumin rows and three lentil rows) C: strip intercropping of cumin and lentil (four cumin rows and four lentil rows) D: sole crop of cumin (six rows) E: sole crop of lentil (six rows). For this purpose a complete randomized block design with 4 replications was used. Results showed economic and biologic yield of cumin, 1000-seed weight, number of seed per umbel were affected by different intercropping and there was a decreasing trend in these parameters from intercropped to the sole crop. Biological and economic yield and also harvest index for lentil were higher in sole crop compared with intercrop. The highest Land Equvalent Ratio -LER (1.86) was obtained from treatment A (row intercropped) and the least (1.26) was obtained in treatment C (strip intercropped). There was a decreasing trend in LER from row intercropped to strip cropping.*

## Introduction

Intercropping has been considered as one of the practice for enhancing biodiversity of cropping system and it has been reported to increase sustainable yield production when it is done particularly with combination of medicinal plant and a field crop the beneficial effect may be increased (Guldan, *etal.*1999). In other words intercropping crops such as lentils (nitrogen fixer) with medicinal plants may increase nitrogen availability for the medicinal plants. Also intercropping lentil with other plants has been reported to reduce lodging and thereby facilitating mechanical harvesting of lentils (Bagheri, *etal.* 1998).

Pulses are the second source of food after cereals for humans. Lentil which is a pulse crop is an important crop in Iran with more 260.000 ha. Iran ranks forth in term of lentil acreage (Sabaghpour, et al. 2003). Cumin is an important medicinal cash crop of Iran with 35.811 ha (Kafi, *etal.* 2003). Iran is the major cumin producing country and the main growing area is Khorasan province. Growing nature of cumin and lentil are almost similar in terms of period of growth, time of sowing and scale of biomass production and therefore intercropping of these two plants is facilitated. The purpose of this study was to evaluate intercropping cumin and lentil with different planting pattern in terms of feasibility of intercropping and yield advantages.

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## Materials and methods

Our experiment was conducted in 2004 as a Complete Randomized Block with four replications and five treatments including different planting pattern for lentil and cumin:

-Row intercropping of lentil and cumin

-Strip intercropping of lentil and cumin with three rows each

-Strip intercropping of lentil and cumin with four rows each

-Pure stand of lentil and cumin

Seeds were sown in April on rows at a distance of 25 cm. The distance in the rows was 10 cmr for lentils and 5 cm for cumin. At the time of harvest total biomass and yield and yield components were measured. Land Equivalent Ratio, which shows relative area under sole crop to achieve intercrop yields under the same conditions, was calculated as follows:

$$LER = I_a/S_a + I_b/S_b$$

where LER is land equivalent ratio , I= multiple cropping yield, S= sole cropping yield and a, b refer to the component crop.

Statistical analysis of the results was carried out by MSTAT-C software. For the comparison of means Duncan Multiple Range Test (DMRT) was used.

## Results

Table 1 and 2 show different plant criteria associated with intercropping pattern. As it is apparent plant height for both cropping was not affected by planting pattern but out of the expectation height of plant particularly for lentil was somehow higher in pure stand.

Biological yield in row intercropping was somehow more than strip intercropping. However, in case of lentil biological yield in pure stand was much higher compared with the other treatments.

Harvest index for both plant species was higher in pure stand. Similar findings have been reported elsewhere (Abbasi, 2005). Economic yield for lentil was also higher in pure stand. This was not the case for cumin and in general yield in intercropped plots was slightly higher than in strip intercropped plots.

Thousand seed weight was higher in intercropped than in other systems. There are reports (Calavan & Weil 1988) which confirm our results.

**Tab. 1: Yield structure of lentils under intercropping and strip cropping**

| Treat-ment | Biological yield (kg/ha) | Har-vest index | Econ. Yield (kg/ha) | Thousand seed weight (g) | Number of pods per plant | Number of seeds per pod | Par-tial LER | Total LER |
|---|---|---|---|---|---|---|---|---|
| A | $2651^{b}$ | $0.17^{ab}$ | $453^{b}$ | $35.55^{a}$ | $2.12^{a}$ | $1.43^{a}$ | $0.53^{b}$ | 1.9a |
| B | $2272^{c}$ | $0.13^{b}$ | $302.3^{c}$ | $21.32^{b}$ | $1.55^{b}$ | $1.25^{b}$ | $0.36^{c}$ | 1.5b |
| C | $1047^{d}$ | $0.13^{b}$ | $185.1^{d}$ | $20.89^{b}$ | $1.27^{b}$ | $1.1^{b}$ | $0.22^{d}$ | 1.3c |
| D | $3159^{a}$ | $0.2^{a}$ | $858.9^{a}$ | $25.29^{b}$ | $1.36^{b}$ | $1.25^{b}$ | 1 | |

significant for $P<0.05$

**A**-Row intercropping of lentil and cumin, **B**-Strip intercropping of lentil and cumin with three rows each, **C**-Strip intercropping of lentil and cumin with four rows each, **D**-Pure stand of lentil and cumin

Number of pods per plant for lentil and number of umbels per plant for cumin was also higher in intercropped. However for cumin no differences were observed between different planting patterns. This was also to some extent true for number of seeds per pod for lentil and number of seeds per umbel for cumin.

In general partial land equivalent ratio for cumin was higher than for lentil. Total land equivalent ratio for intercropped was higher than for pure. It appears that intercropping of cumin and lentil is advantageous compared with sole cropping.

**Tab. 2 Yield structure of cumin under intercropping and strip cropping**

| Treat-ment | Biological yield (kg/ha) | Har-vest index | Econ. Yield (kg/ha) | Thousand seed weight (g) | Number umbels per plant | Number of seeds per pod | Par-tial LER | Total LER |
|---|---|---|---|---|---|---|---|---|
| A | $1220^{a}$ | $0.33^{d}$ | $394.2^{a}$ | $1.757^{a}$ | $15.49^{a}$ | $17.74^{a}$ | $1.34^{a}$ | $1.86^{a}$ |
| B | $803.7^{b}$ | $0.42^{c}$ | $339.9^{b}$ | $1.375^{ab}$ | $18.67^{a}$ | $9.29^{ab}$ | $1.14^{b}$ | $1.5^{b}$ |
| C | $598.1^{c}$ | $0.51^{b}$ | $308.8b^{c}$ | $1.34^{ab}$ | $16.91^{a}$ | $7.87^{b}$ | $1.04^{bc}$ | $1.26^{c}$ |
| D | $505.7^{c}$ | $0.58^{a}$ | $298.6^{c}$ | $1.056^{b}$ | $16.15^{a}$ | $8.71^{b}$ | 1 | |

significant for $P<0.05$

**A**-Row intercropping of lentil and cumin, **B**-Strip intercropping of lentil and cumin with three rows each, **C**-Strip intercropping of lentil and cumin with four rows each, **D**-Pure stand of lentil and cumin

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