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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences, 3 (3): 481-482, 2000

Biological Assessment of Proportional Linseed-methra Intercropping

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Abstract: The intercropping proportions comprised 100 cm spaced 4-row trips of linseed intercropped with one, two , three and four rows of methra along with sole cropping of the component crops. Intercrop was sown between the strips of linseed at the time of planting linseed. Different yield components of linseed were invariably influenced significantly by the associated methra crop in different proportions. The yield of linseed intercropped with one, two, three and four rows of methra was reduced by 6.94, 6.92, 8.46 and 18.36 percent respectively. However at the cost of this much reduction in linseed yield an additional harvest of 156, 220, 326 and 379 kg ha^{-1} of methra was obtained from the respective intercropping patterns which compensated more than the losses caused in the yield of linseed. The highest total grain yield of 1223 kg ha^{-1} was recorded for linseed + three rows of methra intercropping system against the minimum of 980 kg ha^{-1} in case of linseed + one row of methra intercropping pattern. By contrast, the highest net income (Rs. 7665) was obtained from an intercropping pattern of linseed + four rows of methra against the minimum (Rs. 3683 ha^{-1}) in case of sole cropping of linseed. On the whole linseed-methra intercropping in different proportions gave 17 to 38 percent yield advantage over mono cropping of the component crops with the maximum (38%) in linseed + three rows of methra intercropping pattern.

Key words: Biological assessment, linseed-methra intercropping, proportion

Introduction

In modern agriculture, intercropping is a useful proposition for increasing the productivity and income per unit area/time besides enhancing the water and land-use efficiency especially under small holding conditions in irrigated as well as in rainfed areas. Inter/relay cropping is gaining interest among the small fgrmers as a potentially beneficial system of crop production. This necessitates to develop an appropriate intercropping technology for different crops especially the minor crops which are grown on a limited area. The area under these crops can not be increased because of the inflexibility of the existing cropping systems. Hence the only way to increase the productivity of these crops is to grow them in association with each other in such a pattern that the productivity of the base crop is least affected by the associated culture and the production per unit area is also increased. Linseed and methra are minor crops which are of economic value in Pakistan because of their common use in animal feed etc. However, to grow them as, sole crop on large area is not possible because of nonavailability of sufficient area in the rabi season. So the only possibility is to grow them in association with each other on a limited land area. Consequently the present study was planned to assess the bio-economic efficiency of linseed-methra intercropping in different proportions in independent strips at constant population density of linseed under the agro-ecological conditions of Faisalabad in irrigated environment.

Materials and Methods

In a field study the bio-economic efficiency of linseed-methra intercropping in different proportions in independent strips at constant population density of linseed (*Linum usitatissimum*), was determined at the Agronomic Research Area, University of Agriculture, Faisalabad during the year 1990-91 on a sandy-clay loam soil. The intercropping treatments comprised linseed + one row of methra (*Trigonella foenugraecurn*), linseed + two rows of methra, linseed + three rows of methra, linseed + four rows of methra, linseed seed alone and methra alone. Linseed was sown in 100 cm spaced 4-row strips with 20 cm space between the rows in a strip (20/100 cm) on the 11th of November, using normal seed rate ha^{-1} while methra was interplanted between the strip of linseed on the same day. The experiment was laid out in a randomized complete block design with three replications. The net plot size measured 4.80 m x 5.00 m. A basal dose of 100 kg N and 100 kg P_2O_5 ha^{-1} in the form of urea and SSP, respectively, was applied. The whole of P_2O_5 and half of N was incorporated in the soil at the time of seedbed preparations, while the remaining half of N was topdressed with first irrigation only in the linseed strips. In all three irrigations excluding soaking irrigation were given to mature the crops. Observations on desired parameters of both the component crops were recorded using standard procedures. Land equivalent ratio was worked out as under:

$$\text{LER} = \frac{\text{Yield of crop a in intercropping system}}{\text{Yield of crop a in pure stand}}$$

$$\frac{\text{Yield of drop b in intercropping system}}{\text{Yield of crop b in pure stand}}$$

The data collected were statistically analyzed using Fisher's analysis of variance technique and treatment means were compared by using LSD test at 0.05 P (Steel and Torrie, 1984).

Results and Discussion

The data pertaining to different agronomic traits of linseed as influenced by .intercropping of methra in different proportions are given in Table 1.

The different intercropping treatments influenced the final plant density m^{-2} of linseed significantly. Intercrooping in the pattern of 100 cm spaced 4-row strips of linseed + one row of methra did not affect the final stand density of linseed to a significant extent compared to pure stand of linseed whereas two, three and four row patterns of intercropping reduced the plant density m^{-2} of linseed significantly. However, the differences among them were non-significant. This shows that the economic thresh hold level of inter-crop competition in a linseed-methra intercropping system starts beyond one row of methra. Reduction in wheat plant density m^{-2} as a result of methra and linseed intercropping has also been reported by Nazir *et al.* (1997). The various patterns of intercropping affected significantly the number of

Table 1: Agronomic traits of linseed as affected by methra intercropping in different proportions

Intercroping pattern	Plant density m^{-2}	No. of capsules $plant^{-1}$	No. of seeds $capsule^{-1}$	1000-seed weight (g)	Seed yield kg ha^{-1} Linseed	Methra	Land Equivalent Ratio (LER)	Net imam ft31-01
Linseed alone	189.86 a	18.56 a	8.20	5.91 a	979 a	-	1.00	6133
Linseed + one row of methra.	192.07 a	18.18 a	8.60	5.78 ab	932 a	156 e	1.17	7693
Linseed + two rows of methra.	179.94 b	19.10 a	8.67	5.42 b	920 a	220 a	1.25	8515
linseed + three rows of methra.	179.77 b	19.66 a	8.87	5.43 b	897 a	326 c	1.38	8881
Linseed + four rows of methra.	173.00 ab	15.00 b	9.00	5.37 c	800 b	379 b	1.35	9665
Methra alone	-	-	-	-	-	710 a	1.00	6913

Any two means in a column not sharing a letter differ significantly at p = 0.05 (LSD), NS: Non-significant
Market rates (Rs. kg^{-1}) Linseed = 10, Methra = 15

capsules $plant^{-1}$ of linseed. There was no significant decrease in the number of capsules $plant^{-1}$ with one, two and three rows of methra intercropping whereas four rows pattern of intercropping decreased significantly the number of capsules $plant^{-1}$ (15.00) compared to pure stand of linseed (18.56). This might be attributed to severe inter-crop competition at the proportion of 50 : 50 of the component crops. Decrease in the number of pods $plant^{-1}$ of soybean with an intercropping rate of 3-4 rows of mungbean between soybean strips has also been observed by Nawaz (1990).

Seed number $capsule^{-1}$ is an important yield component in linseed. The number of seeds $capsule^{-1}$ was not affected significantly by any pattern of intercropping. However, the average number of seed $capsule^{-1}$ of linseed varied from 7.78 to 8.67. These results are not in consonance with those of Nazir *et al*. (1997) who reported that grains $spike^{-1}$ of wheat were reduced significantly by methra and linseed intercropping.

The data on 1000-seed weight of linseed revealed that there were significant differences among the various patterns of linseed-methra intercropping. The maximum 1000-seed weight of 5.91 grams was recorded in pure stand which was at par with the pattern of linseed + one row of methra (5.78 g). Significantly the minimum 1000-seed weight (5.37 g) was recorded for linseed four rows of methra intercropping system which was ascribed to neck to neck competition of the component crops for essential growth factors. These findings are corroborated with those of Rahman and Shamsuddin (1981) and Verma *et al*. (1989).

The different combinations of linseed-methra intercropping affected significantly the seed yield of linseed ha^{-1}. Intercropping of four rows of methra between the linseed strips decreased the seed yield of linseed significantly compared to all other treatments including pure stand which were at par with one another and yielded on the average from 897 to 979 kg seed ha^{-1} against the minimum of 800 kg ha^{-1} in the treatment of linseed four rows of methra which was ascribed to exhaustive competition between the component crops for essential growth factors. The reduction in seed yield of linseed as a result of one, two, three and four rows of methra intercropping amounted to 4.80, 6.03, 8.38 and 18.28 percent respectively compared with sole cropping of linseed. However, at the cost of this much reduction in linseed yield an additional yield of 156, 220, 326 and 379 kg ha^{-1} of methra was obtained showing a yield advantage of 17, 25, 38 and 38 percent, respectively over sole cropping of linseed. Yield advantages of different wheat, chickpea and soybean etc-based intercropping systems over sole cropping has also been reported by Rahman and Shamsuddin (1981), Tareen *et al*. (1988), Verma *et al*. (1989), Aslam (1990), Nawaz (1990), Nazir *et al*. (1997) and Ahmed *et al*. (1998).

Land equivalent ratio is the relative land area under sole crop that is required to produce the yields required in intercropping systems. The highest LER of 1.35 was recorded in case of linseed + three rows of methra against the lowest of 1.17 for linseed + one row of methra intercropping system. While LER of 1.35 and 1.25 was recorded for linseed + four rows of methra and linseed + two rows of methra intercropping system, respectively. In other words, linseed-methra intercropping in different proportions gave 17 to 38 percent yield advantage over monocropping of the component crops.

Regarding monetary gain, the highest net income of Rs.9665 ha^{-1} was obtained from linseed + four rows of methra followed by linseed + three rows of methra (Rs.8881 ha^{-1}) intercropping system against the minimum of Rs. 6133 ha^{-1} from sole cropping of linseed and 6913 ha^{-1} from monocropping of methra. Higher yield advantage and net income ha^{-1} in different intercropping systems has also been reported by Gupta and Pradhan (1988), Aslam (1990), Nazir *et al*. (1997) and Ahmed *et al*. (1998).

The results led to the conclusion that linseed-methra intercropping in the pattern of 100 cm spaced four-row strips of linseed + four or three rows of methra between the strips proved to be highly productive and profitable compared to sole cropping of the component crops.

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