

Intercrop association of pigeon pea (*Cajanus cajan*) with little millet (*Panicum sumatrense* L.)

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ABSTRACT

A field experiment was conducted during the (*Kharif*) 2002 on red sandy loam soil to evaluate the economically and biologically sustainable intercrop association of pigeonpea cv. ASHA (ICPL-87119) and little millet cv. SUKHEMA at Saidapur farm, Main Agricultural Research Station, Dharwad. Considering LER (Land equivalent ratio) differed significantly due to various treatments. All intercropping treatments recorded the land equivalent ratio more than unity (1.00). Among the various row proportions 4:2 row proportion recorded significantly higher land equivalent ratio (1.40) which was at par with 2:1, 6:2 and 3:1 row proportions (1.36, 1.30 and 1.28, respectively). Significant reduction in land equivalent ratio was observed in 5:1 row proportion (1.21). Area time equivalent ratio (ATER) differed significantly due to various treatments. Among different row proportions intercropping of little millet and pigeonpea in 4:2 row ratio recorded significantly higher area time equivalent ratio value (1.06) which was at par with 2:1 row proportion (1.04). Row proportions 5:1, 3:1 and 6:2 recorded area time equivalent ratio value less than unity (1.00) that obtained under sole crops. Intercropping of little millet and pigeonpea in 4:2 row proportion recorded significantly higher gross and net returns (12095 Rs./ha and 6608 Rs./ha, respectively) followed by 2:1 row proportion (11854 and 6367 Rs./ha, respectively) and lowest gross and net returns were recorded with sole little millet (6316 and 2610 Rs./ha, respectively). Maximum benefit:cost ratio was realised with 4:2 row proportion (2.20) followed by 2:1 row proportion (2.16) and least benefit:cost ratio was recorded with 5:1 row ratio (1.65). Intercropping of little millet with pigeonpea in 4:2 and 2:1 row proportions was optimum to get higher yield, net returns and efficient use of natural resources on alfisols of Northern Transitional Zone of Karnataka.

Key words : Pigeon pea, Little millet, *Kharif*, Intercrop

INTRODUCTION

Little millet (*Panicum sumatrense* L.) is an important food crop for the tribal folk, suitable for shallow gravels and poor alfisols. It is quick germinating, short duration crop tolerant to both drought and excess moisture. It becomes available for consumption at the time when there is an acute shortage of food grains in their households due to the crop is of short duration (80-90 days), it is harvested early in end of August or beginning of September in comparison to other rainy season (*Kharif*) crops. It would be a advantage, if extra yield could be harvested from the same unit of land in addition to sole component. Thus intercropping of some other crops with little millet may be sustainable cropping system under low management conditions. The information on growing of little millet in association with other crops is inadequate. Hence, an experiment was conducted to evaluate the comparative performance of little millet with pigeonpea at different row ratios under rainfed conditions on shallow alfisols of transitional tract of Dharwad.

MATERIALS AND METHODS

The field experiment was conducted at Saidapur farm, Main Agricultural Research Station, Dharwad during the *Kharif* season 2002 using Sukshema (TNAU-63)

variety of little millet and Asha (ICPL-87119) variety of pigeonpea in 2:1, 3:1, 5:1, 4:2 and 6:2 row ratio. It was laid out in Randomized Block Design with three replications. The crops were sown on 14th June 2003 on alfisols (red soil). Both the crops were fertilized separately as per the recommendation. The data on dry matter accumulation per m row length in leaf, stem and reproductive parts and total dry matter production, yield and yield components were recorded in both the crops. Harvest index and LMGEY were also computed. Little millet was harvested on 7th September 2002 and that of pigeonpea on 10th December 2002.

The grain yield was statistically analysed. It was further computed in terms of little millet equivalent yield and land equivalent ratio (LER) as described by Willey (1979). Also calculated area time equivalent ratio (ATER) as proposed by Heibsch and Macollan (1978) for little millet + pigeonpea intercropping system. The intercropping system was also evaluated on the basis of different economical parameters viz., gross returns (Rs. ha⁻¹), net returns (Rs. ha⁻¹) and B:C ratio.

RESULTS AND DISCUSSION

Little millet yield obtained in sole and intercropping treatments differed significantly (Table 1). Growing of little millet as an entire crop with normal row spacing (30

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cm) recorded significantly higher grain yield (783 kg/ha) than the intercropped little millet. It was at par with little millet in relay intercropping systems (776 kg/ha). The extent of reduction in grain yield of little millet due to intercropping was 29.88 per cent compared to sole cropping. The higher yield of little millet under sole cropping could be attributed to higher population and competition free environment as compared to intercropped little millet (population varied from 66.67- 83.33%) which resulted in better growth and yield components. Similar findings had been reported by Balasubramanian *et al.* (1984) in pearl millet + pulses, Jadhav *et al.* (1990) in pearl millet + greengram, Ahmad and Prasad (1996) in little millet + pigeonpea or groundnut, Dubey and Shrivastava (1997) in kodo millet + pigeonpea or soybean or blackgram and Shashidhar *et al.* (2000) in little millet + pigeonpea.

The gross returns, net returns and benefit:cost ratio were significantly influenced due to intercropping system (Table 2). All intercropping treatments except little millet + relay intercropping horsegram and 5:1 row ratio recorded higher gross returns over both the sole crops. Intercropping of little millet + pigeonpea in 4:2 row proportions recorded significantly higher gross returns (12095 Rs./ha) which was at par with 2:1 row proportions (11854 Rs./ha). The lowest gross returns (6316 Rs./ha) was recorded with sole little millet. The increased gross returns in intercropping system was mainly due to higher little millet equivalent yield. These results are in conformity with findings of Dubey and Shrivastava (1997) in kodo millet + pigeonpea under 2:1 row proportion, Shashidhar *et al.* (2000) in foxtail millet + pigeonpea and finger millet + pigeonpea in 4:2 row ratio.

Net returns (6608 and 6367 Rs/ha) were significantly higher with little millet + pigeonpea in 4:2 and 2:1 row proportions, respectively. Whereas, lowest net returns

(2610 Rs./ha) was recorded with sole little millet. The higher net returns in 4:2 and 2:1 row ratios was mainly due to higher little millet equivalent yield and gross returns. Patel *et al.* (1998) also reported higher net returns in pearl millet + cluster bean under 2:1 row proportion. Anonymous (1998) in kodo millet + pigeonpea intercropping under same row proportion and Shashidhar *et al.* (2000) in foxtail millet + pigeonpea and finger millet + pigeonpea in 4:2 row ratio.

Among different treatments, significantly higher benefit:cost ratio was observed in little millet + pigeonpea in 4:2 row proportion (2.20) which was at par with 2:1 row proportion (2.16) which may be attributed to higher returns in these treatments and lower cost of cultivation. Significantly lower benefit:cost ratio (1.65) was recorded with 5:1 row ratio which was at par with sole little millet (1.80).

Biological feasibility:

All intercropping treatments recorded the land equivalent ratio more than unity (1.00). Among the various row proportions 4:2 row proportion recorded significantly higher land equivalent ratio (1.40) which was at par with 2:1, 6:2 and 3:1 row proportions (1.36, 1.30 and 1.28, respectively). Significant reduction in land equivalent ratio was observed in 5:1 row proportion (1.21) (Table 1). The obvious reason for yield advantage in intercropping system was due to the fact that the component crops differed in utilisation of growth resources and converting them more efficiently resulting in higher yield per unit area than that produced by the sole crops. Among different row proportions intercropping of little millet and pigeonpea in 4:2 row ratio recorded significantly higher area time equivalent ratio value (1.06) which was at par with 2:1 row proportion (1.04). Row proportions 5:1, 3:1 and 6:2 recorded area time equivalent ratio value less than unity

Table 1 : Grain yield (kg ha⁻¹) of little millet and pigeonpea land equivalent ratio (LER) and area time equivalent ratio (ATER) as influenced by intercropping of little millet and pigeonpea in different row proportions

Treatments	Grain yield (kg/ha)	Grain yield (kg/ha)	LER	ATER
Sole pigeonpea (60 x 30 cm)	-	682	1.00	1.00
Sole pigeonpea (90 x 20 cm)	-	637	1.00	1.00
Sole little millet (30 cm)	783	-	1.00	1.00
Little millet + pigeonpea (2:1)	465	522	1.36	1.04
Little millet + pigeonpea (3:1)	540	400	1.28	0.91
Little millet + pigeonpea (5:1)	650	260	1.21	0.76
Little millet + pigeonpea (4:2)	510	515	1.40	1.06
Little millet + pigeonpea (6:2)	580	380	1.30	0.90
Little millet + relay horsegram	776	350	-	-
S.E.±	21	19	0.04	0.03
CD (P = 0.05)	74	58	0.12	0.09

Table 2 : Gross returns (Rs. ha⁻¹), cost of cultivation (Rs. ha⁻¹), net returns (Rs. ha⁻¹) and B:C ratio as influenced by intercropping of little millet and pigeonpea in different row proportions

Treatments	Gross returns (Rs./ha)	Cost of cultivation (Rs./ha)	Net returns (Rs./ha)	B:C ratio
Sole pigeonpea (60 x 30 cm)	10383	4950	5433	2.10
Sole pigeonpea (90 x 20 cm)	9737	4950	4787	1.97
Sole little millet (30 cm)	6316	3706	2610	1.80
Little millet + pigeonpea (2:1)	11854	5487	6367	2.16
Little millet + pigeonpea (3:1)	10595	5555	5040	1.91
Little millet + pigeonpea (5:1)	9296	5622	3674	1.65
Little millet + pigeonpea (4:2)	12095	5487	6608	2.20
Little millet + pigeonpea (6:2)	10589	5555	5034	1.91
Little millet + relay horsegram	9557	5506	4051	1.74
S.E.±	273	-	137	0.06
C.D. (P = 0.05)	818	-	411	0.18
Cropping systems				
Sole pigeonpea (60 x 30 cm)	10383	4950	5433	2.10
Sole pigeonpea (90 x 20 cm)	9737	4950	4787	1.97
Sole little millet	6316	3706	2610	1.80
Relay little millet	9557	5506	4051	1.74
Intercropped mean	10886	5541	5345	1.88
S.E.±	247	-	105	0.06
C.D. (P = 0.05)	855	-	364	0.20

(1.00) that obtained under sole crops. The higher area time equivalent ratio values under 4:2 and 2:1 row proportions were mainly attributed to higher partial land equivalent ratio values and yield of component crops in intercropping system. These results are in line with work carried out by Ahmad and Prasad (1996) where intercropping of little millet and pigeonpea in 2:2 and 2:1 row proportions recorded higher values of area time equivalent ratio compared to 4:1, 6:1, 4:2 and 6:2 row proportions.

Based on these results, it may be summarised that for increasing the productivity per unit area in little millet and pigeonpea intercropping system on alfisols, growing of little millet and pigeonpea in 5:1 row ratio have been found superior over other intercropping systems and also growing sole crops alone

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