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STUDIES ON HIGH VALUE INTERCROPS IN RAINFED SORGHUM

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ABSTRACT

The results of the experiments conducted during North-East monsoon seasons of 1985 1987 revealed that sole sorghum was superior to intercropped sorghum in respect of grain and straw yield. The grain yield recovery of sorghum was high (83.2%) in sorghum + pigeonpea (2:1) system followed by sorghum + greengram in 4:2 ratio. Sunflower as intercrop reduced the grain yield recovery at both the planting pattern. Sorghum (CSH 9) intercropped with sunflower (Co. 1) registered maximum return of Rs.5,156 ha^{-1} with benefit cost ratio of 2.231.

KEYWORDS : Sorghum, Rainfed Sorghum, Intercrops, Grain Yield

Sorghum is the principle millet crop in Tamil Nadu occupying an area of 6.8 lakh ha. More than 85 per cent of the area is under rainfed and it is grown either as pure crop or as mixed crop with two or three pulses. More recently it has been realised that intercropping offers potential for increasing the land productivity and experimental results have shown that intercropping in sorghum has given higher returns than sole cropping. (Satyanarayanan and Reddi 1979). High yield of sorghum was possible when it was grown in paired rows with one row of lab-lab (Chamy 1977) and one row of cowpea (AICSIP 1979). Chandrasekar *et al.* (1988) reported highest gross returns from sorghum+redgram. But information on the suitability of high value intercrops like sunflower in sorghum and their crop geometry requirements are rather limited. Hence attempts were made to attain maximum possible yield recovery of high value intercrops by reducing mutual species competition through manipulation of plant density and planting pattern of base and intercrop.

MATERIALS AND METHODS

The field experiments were conducted at Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore during North-East monsoon seasons of 1985 - 1986, 1986 - 1987 and 1987 - 1988. The soil type was clay loam with low in available N, medium in available P and high K in available in all the three years. The treatment consisted of two planting pattern of 3:3 and 4:2 ratio for sorghum and intercrops maintaining 50 and 66 percent of plant density of sorghum respectively. Sorghum (CSH 9) was intercropped with high value intercrops viz., pigeonpea (Co 5), sunflower (Co 1) and greengram (Co 4). The six combinations were compared with recommended sorghum intercropped with pigeonpea in 2:1 paired row system (60/30 x 15 cm) with full density of sorghum and intercrops and also with sole crops of sorghum and intercrops. The eleven treatments were tried in a randomised block design with three replications. In pure stand of sorghum a plant population of 1,48,000 plant ha^{-1} with a spacing of 45 x 15 cm was maintained. The dates of sowing and harvesting and rainfall data for the three years are as follows.

Details	1985 - 1986	1986 - 1987	1987 - 1988
Sowing Date	11.7.1985	21.9.1986	7.10.1987
Harvesting Date	13.10.1985	8.1.1987	20.1.1988
Rainfall (mm)	229.5	215.6	507.0
Rainy days	11	15	26

RESULT AND DISCUSSIONS

The result of the grain yield data revealed that sole sorghum recorded higher yield in

all the three years than intercropped sorghum (Table 1). During 1985-1986 and 1987-1988, sole sorghum yielded on a par with sorghum + pigeonpea in 2:1 and sorghum + pigeonpea/ greengram in 4:2 row pattern. But sunflower as intercrop significantly reduced the grain yield of sorghum. During 1986-1987 and in pooled mean, sole sorghum was superior to intercropped sorghum. This was in line with the findings of Rangaswami (1986), who found that yield of sorghum was markedly increased under pure stand than sorghum intercropped with legumes. With regard to straw yield, sole sorghum recorded the highest yield and was superior to intercropped sorghum except during 1985 - 1986, wherein sole sorghum yielded on a par with sorghum intercropped with pigeonpea in 2:1 row pattern.

Sorghum Grain Yield Recovery

Among the different systems and row pattern tried, mean grain yield recovery was high (83.2%) in sorghum intercropped with pigeonpea in 2:1 row pattern followed by sorghum + greengram in 4:2 row pattern (77.4%). In general, sunflower reduced the grain yield recovery of sorghum under both planting pattern.

Intercrop Yield Recovery

Among the inercrops, maximum grain yield recovery was recorded (73.7%) in sorghum intercropped with sunflower in 3:3 row pattern. In pigeonpea and greengram also, the yield recovery was high in 3:3 than 4:2 row pattern. The yield recovery was least in 2:1 paired row pattern.

Economics

Comparative economics (Table 2) showed that sorghum intercropped with sunflower (Co 1) in 4 : 2 row pattern gave maximum net return of Rs. 5156 ha $^{-1}$ with the benefit : cost ratio of 2.23 followed by sorghum intercropped with sunflower in 3:3 row pattern, which recorded a net return of Rs. 4,553 with B:C ratio of 2.08. Ramamoorthy *et al.* (1988) also observed increased monetary returns with intercropping of sunflower in rainfed sorghum. Among the planting pattern , 4:2 row pattern for sorghum and intercrop was found suitable. Sorghum (CSH 9) intercropped with sunflower (CO 1) proved beneficial at 4:2 pattern.

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Table 1. Grain and straw yield of sorghum (kg.ha^{-1})

Cropping system	Sorghum grain Yield (kg.ha^{-1})			Pooled Mean	Sorghum straw Yield (kg.ha^{-1})			Pooled Mean
	1985-1986	1986-1987	1987-1988		1985-1986	1986-1987	1987-1988	
A. Check treatment :								
Sorghum + pigeoppea (2 : 1)	2,401	2,377	1,151	1,976	8,747	7,708	6,667	7,707
B. Cropping system :								
Sorghum + pigeonpea (3 : 3)	2,167	2,362	907	1,812	5,802	5,702	5,160	5,585
Sorghum + sunflower (3 : 3)	1,884	1,549	945	1,459	4,877	5,683	3,704	4,755
Sorghum + greengram (3 :3)	2,006	2,115	960	1,694	5,105	5,939	5,370	5,471
Sorghum + pigeonpea (4 : 2)	2,340	1,994	1,145	1,826	7,099	7,644	5,778	6,840
Sorghum + sunflower (4 : 2)	2,130	1,977	1,114	1,740	6,623	7,580	4,377	6,193
Sorghum + greengram (4 : 2)	2,389	1,963	1,162	1,838	8,167	5,981	6,959	7,036
C. Sole crops :								
Sorghum	2,531	3,251	1,347	2,376	9,586	8,429	8,432	8,815
Pigeonpea	—	—	—	—	—	—	—	—
Sunflower	—	—	—	—	—	—	—	—
Greengram	—	—	—	—	—	—	—	—
SEd	132	142	110	127	431	235	146	316
CD (5%)	282	303	231	272	922	503	312	676

Table 2. Intercrop yield (kg.ha^{-1}) Grain yield recovery (%) and Economics

Cropping system	Intercrop seed yield (kg.ha^{-1})				Mean Grain yield recovery (%)		Return (Rs.ha^{-1})		B : C ratio
	1985-1986	1986-1987	1987-1988	Mean	Base crop	Inter crop	Gross	Net	
A. Check treatment :									
Sorghum + pigeoppea (2 : 1)	358	290	157	268	83.2	33.0	7,092	3,092	1.77
B. Cropping system :									
Sorghum + pigeonpea (3 : 3)	420	567	275	461	76.3	51.8	7,184	3,284	1.84
Sorghum + sunflower (3 : 3)	636	1,039	794	823	61.4	73.7	8,753	4,553	2.08
Sorghum + greengram (3 : 3)	586	354	416	452	71.3	61.0	7,129	3,299	1.83
Sorghum + pigeonpea (4 : 2)	327	417	196	313	76.9	38.5	6,875	2,875	1.72
Sorghum + sunflower (4 : 2)	494	1,227	67	779	73.3	69.7	9,356	5,156	2.23
Sorghum + greengram (4 : 2)	537	434	313	428	77.4	57.8	7,635	3,635	1.91
C. Sole crops :									
Sorghum	—	—	—	—	100.0	—	6,481	2,731	1.73
Pigeonpea	654	1,307	474	812	—	100.0	4,872	2,372	1.95
Sunflower	1,531	703	1,118	1,117	—	100.0	6,702	3,402	2.03
Greengram	1,012	652	559	741	—	100.0	4,446	1,946	1.78

Value of the produce :

Sorghum grain : Rs. 2.50 / kg
Pigeonpea " : Rs. 6.0 /kg
Sunflower seeds : Rs. 6.0 / kg
Sorghum straw : Rs. 240 /ton
Greengram : Rs. 6.0 /kg