

Cotton (*Gossypium hirsutum*) - based intercropping system under different sowing environments

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ABSTRACT

A field experiment was conducted during 1993-94 and 1994-95 to study the performance of cotton (*Gossypium hirsutum* L.) - based intercropping system under different sowing environments. The pre-monsoon cotton recorded significantly higher seed-cotton yield of 677 and 628 kg/ha during 1993-94 and 1994-95 respectively. An intercropping of blackgram (*Phaseolus mungo* L.) or clusterbean [*Cymopsis tetragonoloba* (L.) Taubert] reduced the seed-cotton yield and the mean reduction was 10.5 and 12.1% respectively compared with sole cotton. The statistical model with competition co-efficients and correlated error structures used for analysis of the data from intercropping systems revealed that clusterbean combination had a greater suppression effect on seed-cotton yield ($r = 0.3918$). However, clusterbean, as an intercrop component, could produce the maximum component yield in association.

Key words: Cotton-based intercropping, Seed-cotton yield, Blackgram, Clusterbean

In southern district of Tamil Nadu, cotton is being cultivated on black cotton soils, coinciding with the onset of monsoon. High intensity of rain during the monsoon season and poor infiltration rate of the Vertisols provide considerable scope for soil erosion and run-off (Ital *et al.*, 1994) and hence surface cover with organic mulch is an effective *in-situ* moisture-conservation practice for checking over land run-off. Rafey and Verma (1988) suggested that the only way to increase the cropping intensity and resource utilization was through some viable intercropping systems. Commonly, blackgram is being raised as an intercrop with cotton. And clusterbean,

a leguminous vegetable crop, is a new introduction in rainfed tract for providing green vegetable and fodder. The present study was undertaken to study the effect of sowing time and organic mulches on cotton-based intercropping system.

MATERIALS AND METHODS

A field experiment was conducted at Agricultural Research Station, Kovilpatti, during the winter (*rabi*) season of 1993 and 1994 under rainfed condition. The experimental variables consisted of 3 sowing dates, viz. pre-monsoon (30 September), monsoon (14 October) and late monsoon (28 October), and

cropping systems, viz. sole cotton, cotton + blackgram and cotton + clusterbean, in the main plot; and mulching practices comprising unmulched control, mulching with *subabul* loppings and pearl millet straw in the subplots. The treatments were replicated thrice in split-plot design. The soil was clay loam with low available N (134 kg/ha), medium P (8.7 kg/ha) and high K (367 kg/ha) and the pH was 7.8.

'MCU 10' cotton, 'Co 5' blackgram and 'Pusa Navbagar' clusterbean were used as test crops. The sowing was done by adopting a spacing of 45 cm for pure stand of cotton and paired row system (30/60 cm) at 2 : 1 ratio for intercropping of cotton with 15 cm as intra-row spacing. Intra-row spacing of 10 cm and 15 cm was adopted for blackgram and clusterbean respectively.

The statistical model with competition co-efficients and correlated error structures as described by Singh and Gilliver (1988) were used for the analysis of data from intercropping experiment. The land-equivalent ratio, an index for comparing the efficiency of in-

tercropping system was calculated (Willey, 1979).

RESULTS AND DISCUSSION

Sowing time

During 1993-94, pre-monsoon sowing resulted in significant increase in number of bolls, boll weight and seed-cotton yield compared with late monsoon sowing, but it was at par with monsoon sowing (Tables 1, 2). But during 1994-95, premonsoon sowing resulted in significantly higher number of bolls, boll weight and seed-cotton yield over the monsoon and late-monsoon sowings. Pre-monsoon dry sowing registered significantly higher seed-cotton yield than the monsoon and late monsoon sowings. There was a progressive decline in the yield of seed cotton, as the sowing was delayed and the yield reduction under late monsoon sowing was 22.9 and 37.3% compared with pre-monsoon sowing during 1993-94 and 1994-95 respectively.

During both the years, higher blackgram grain yield and clusterbean pod yield were

Table 1. Effect of sowing time, intercropping and mulching on yield components, and yield of cotton and intercrops

Treatment	Bolls/plant		Boll weight (g)	
	Y ₁	Y ₂	Y ₁	Y ₂
<i>Sowing time</i>				
Premonsoon	7.14	6.63	3.26	3.02
Monsoon	6.99	5.17	3.24	2.75
Late monsoon	4.05	3.70	2.57	2.31
CD (P = 0.05)	0.39	0.14	0.05	0.12
<i>Intercropping</i>				
Sole cotton	6.84	5.46	3.12	2.76
Cotton + blackgram	6.04	5.10	3.02	2.67
Cotton + clusterbean	5.31	4.95	2.93	2.65
CD (P = 0.05)	0.39	0.14	0.05	0.12
<i>Mulching</i>				
Control	5.04	4.47	2.82	2.53
<i>Subabul</i> loppings	6.63	5.59	3.13	2.79
Pearl millet straw	6.51	5.45	3.12	2.76
CD (P = 0.05)	0.47	0.0	0.05	0.11

Y₁, 1993-94; Y₂, 1994-95

of blackgram and clusterbean under intercropping situations, whereas the increase in the variation of error variance of intercropped cotton might be due to competitive effect of the intercrop components.

The intercrop combinations showed an increase in yield of both base crop and intercrops under pre-monsoon sowing during both the years. However, the differences between combinations of the pre-monsoon sowing showed varied performance for yield. The possible reason might be the environmental influence of the seasons. The intercrop combinations under the late monsoon sowings showed considerable decrease in yield. Among the intercrop combinations, clusterbean could produce maximum of the associated component yields (Table 2).

Land-equivalent ratio (LER)

The overall mean LER in cotton + blackgram intercropping system was 1.226 and 1.224, while the cotton + clusterbean intercropping system recorded the mean LER of 1.242 and 1.230 during 1993-94 and 1994-95 respectively (Table 3). The higher LER in cotton + clusterbean combinations was due to the high yield of clusterbean under intercropping system. Advantages of intercropping on LER were reported by Bhuva *et al.* (1995). Hence the clusterbean combination could be taken as a high-yielding intercrop combination for rainfed cotton.

Mulching

Mulching treatments had marked influence on bolls/plant, boll weight and finally on seed-cotton yield. Mulching with *subabul* loppings recorded significantly higher seed-cotton yield of 657 and 544 kg/ha, being 15.1 and 17.7% higher than unmulched control during 1993-94 and 1994-95 respectively. However, mulching with *subabul* loppings and pearl millet straw had comparable val-

Table 3. Land-equivalent ratio for different intercropping combinations

Treatment combination	1993-94	1994-95
S1C1	1.000	1.000
S1C2	1.229	1.198
S1C3	1.256	1.235
S2C1	1.000	1.000
S2C2	1.233	1.229
S2C3	1.253	1.239
S3C1	1.000	1.000
S3C2	1.217	1.244
S3C3	1.216	1.216
C2 Mean	1.226	1.224
C3 Mean	1.242	1.230

S1, Premonsoon; S2, monsoon; S3, late monsoon;
C1, Sole cotton; C2, cotton + blackgram; C3 cotton + clusterbean

ues for seed-cotton yield during both the years. *Subabul* mulching also recorded significantly higher yield of blackgram (199 kg/ha during both the years) and clusterbean (2,959 and 2,712 kg/ha during 1993-94 and 1994-95) than unmulched control but at par with pearl millet straw mulching. Improvement in soil-moisture status and nutrient availability through mulching helped better growth, yield components and seed-cotton yield. Venkatachalam *et al.* (1981) and Tarhalkar and Venugopal (1992) also reported increased seed-cotton yield due to mulching with pearl millet straw and *subabul* loppings.

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