ECONOMICALLY SUITABLE ROW PATTERN FOR COTTON INTERCROPPING UNDER *VERTISOLS* OF CHHATTISGARH

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Abstract: An experiment was conducted under *Vertisols* of Chhattisgarh during rainy season of 2008-2009 to study of economically profitable crops in different combination of cotton intercropping. The experiment was laid out in randomized block design with three replications. The results revealed that, the growth characters of cotton like- plant height, number of branches, dry matter accumulation were the highest with sole cotton. The green bolls per plant in cotton were the highest under sole cotton. Sole cotton resulted in maximum seed cotton and stalk yield as compared to other treatments. However, cotton + soybean (1:1) and (2:2) and cotton + coriander (1:1) recorded the highest plant height, Dry matter accumulation, leaf area index and crop yield at different stages of crop growth period at 30 DAS, 60 DAS, 90 DAS, 120 DAS and at harvest stage excelled over sole cotton and other treatment combinations. The highest net income 52605.50 Rs. / ha and benefit ratio 2.70 was found in cotton + soybean (1:1) and followed by cotton + soybean (2:2).

Keyword: Cotton Intercropping, Row ratio, yield and Economics

INTRODUCTION

Cotton is the world's principal fibre crop, used in almost half of all textiles (Rabobank, 1996). In India, cotton is grown in nearly 9 million hectares, which is about 27 per cent of world's cotton area, but production is only 15.6 per cent. During the year 2007-08, 25.81 million tonnes of cotton was produced, whereas, 35 million bales will be needed by 2010 to meet the anticipated domestic and export requirements, but due to population pressure, increase in cotton growing area beyond 9 million hectares is not enough. Therefore to meet the anticipated demand there is urge to increase the area under cotton and the other crops should be grown in subsidiary crop as an intercrops. Cotton is wider row spacing crop and its long duration makes it possible to grow early maturing intercrops within the available interspace. Successful cultivation of soybean (*Glycine max* L.), urdbean (*Phaseolus mungo* L.), maize(*Zea mays L.*) coriander (*Coriandrum sativum* L.) and pigeonpea (*Cajanus Cajan L.*) under upland situation as intercrops with cotton has been reported in Chhattisgarh as well as in other agro climatic regions of India. Hence, the present experiment was conducted to identify a suitable intercrops with cotton and to select the most efficient cotton based intercropping system Vertisols of Chhattisgarh

MATERIAL AND METHOD

The experiment was conducted on a well drained Vertisols during the rainy *(kharif)* session of at the Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh 2008-2009. The soil of experiment field was clayey in texture (*Vertisols*)locally known as *kanhar*. The soil was low in organic carbon (0.43%) and total N low (217 kg/ha), medium in available P (12.76 kg/ha) exchangeable K was high (3.64.44 kg/ha) with pH 7.15. The experiment was laid out in randomized block design with three replications. The 5 intercrops- soybean, blackgram, maize, coriander and pigeon pea, were each planted in two different row pattern viz. 1:1 and 2:2, with sole cotton as check.

RESULT AND DISCUSSION

Data of plant height presented in the table 1 indicates that the different treatments of row arrangement of cotton with different intercrops significantly influenced plant height of cotton at 60, 90, 120 DAS and at harvest. The significantly maximum plant height was recorded under sole cotton at all the stages of crop growth. At 30 DAS, 60 DAS, 90 DAS, 120 DAS and at harvest sole cotton crop produced significantly taller plant, which was *at par* with cotton + soybean (1:1). The taller plant showed their superiority in yield due to adequate nutrient and light availability, the sole cotton must have been in a better position to photosynthesis. Similar results have been reported by Sethi *et al.* (1988) and Solaiappan and Dason (1995). The data revealed that the dry matter accumulation of cotton increased with the age of crop. In general, it is observed that different intercropping treatments of cotton significantly influenced dry matter accumulation of cotton at different stages. At 30 DAS, significantly maximum dry matter accumulation per plant was observed under sole cotton, however, it was found comparable to cotton + soybean (1:1). Whereas, at 60 and 90 DAS, significantly higher dry matter accumulation plant^{-1} was noticed under sole cotton. At 120 DAS and at harvest stage, sole cotton produced significantly maximum dry matter accumulation plant^{-1} which was statistically *at par* with cotton + soybean (1:1) and cotton + soybean (2:2). Dry matter accumulation plant^{-1} throughout crop growth period *viz.*60, 90, 120 DAS and at harvest was recorded the highest under sole cotton. This might be due to better position for photosynthesis which produced higher

dry matter. Similar results were also reported by Dodamani *et al.* (1990) and Solaiappan and Dason (1995). At all the crop growth stages, different intercropping treatment accumulated significantly lesser dry matter than the sole crop. More competition for nutrient, moisture and environmental resource with consequently reduction in stem elongation, leaf number and area might have contributed in decreasing the dry matter of cotton under intercropping situation. This is in conformity with the finding of Solaiappan *et al.* (1991). Performance of intercropping system of planting cotton was equally good. The seed cotton was significantly higher in the normal planting than in intercropping. How- ever, the reduction in cotton yield was lower than the reduction in intercropping yield in almost all the intercropping indicate the superiority of sole cotton. The results showed that different intercropping treatments have significant impact on yield. The significantly highest total yield was recorded under economically suitable row arrangement of following treatment cotton + soybean (1:1), followed by cotton + soybean (2:2), cotton + urdbean (1:1) and sole cotton. Whereas, it was the lowest under cotton + maize (1:1). The highest net income and B:C ratio was noticed under cotton + soybean (1:1) which was excelled over all other intercropping treatments. Whereas, the lowest B:C ratio was observed under cotton + maize (1:1). Similar results were also reported by Singh and Singh (1995). The higher economic returns were obviously due to higher seed and stalk yield production of component crops. This could be attributed to higher yield advantage under intercropping of cotton with soybean, coriander and blackgram. The return was reduced in cotton + maize, cotton + pigeonpea intercropping as compared with cotton alone. This results corroborates the findings of Nagre (1979) and Birajdar *et al.* (1987) who reported that monetary returns were decreased when cotton was intercropped with pigeonpea than cotton alone. Similarly, Rao *et al.* (1998) also reported that blackgram, greengram and cowpea were found to be most suitable crops for intercropping in cotton.

Table 1. Plant height, Dry matter accumulation and yield of cotton at various stages under different intercropping and row arrangement.

Treatments	Plant height (cm)					Dry matter (g plant^{-1})					LAI				
	30 DAS	60 DAS	90 DAS	120 DAS	At harvest	30 DAS	60 DAS	90 DAS	120 DAS	At harvest	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
T1- Sole cotton	22.3	79.9	160.6	172.3	176.1	7.1	31.5	62.4	96.7	122.9	1.1	1.5	2.2	3.1	3.2
1:1 row combination (Without sacrificing cotton row)															
T2- Cotton + Soybean	21.6	79.1	157.9	170.5	175.1	6.9	28.9	59.5	95.6	121.3	0.9	1.4	2.3	2.9	3.1
T3- Cotton + Urdbean	21.4	77.7	153.1	169.4	174.9	6.5	28.4	58.8	93.7	120.5	0.9	1.3	2.2	2.8	2.9
T4- Cotton + Maize	19.6	65.8	89.3	104.4	107.2	3.0	18.0	37.8	72.9	89.7	0.7	1.3	1.9	2.6	2.8
T5- Cotton + Coriander	20.5	75.2	142.9	164.1	166.1	5.5	26.9	55.4	92.5	118.3	0.8	1.3	2.2	2.8	2.9
T6- Cotton +Pigeonpea	20.5	65.2	94.3	135.4	137.8	3.4	17.9	37.1	74.3	88.4	0.8	1.3	2.1	2.7	2.8
2:2 row combination															
T7- Cotton + Soybean	20.6	77.6	147.1	166.8	168.9	5.8	28.3	59.1	95.5	120.1	0.8	1.4	2.1	2.8	3.0
T8- Cotton + Urdbean	20.3	74.9	146.4	164.2	165.9	5.1	26.8	56.7	92.8	117.9	0.8	1.3	2.1	2.8	2.9
T9- Cotton + Maize	19.8	67.5	135.4	152.9	154.5	4.6	21.5	41.9	85.7	93.7	0.7	1.3	2.0	2.7	2.8
T10- Cotton + Coriander	20.9	70.8	138.4	164.0	167.4	4.8	25.5	50.1	87.1	100.1	0.8	1.3	2.1	2.8	2.8
T11- Cotton + Pigeonpea	20.1	67.6	134.6	162.4	164.5	4.7	23.1	44.3	86.4	95.3	0.7	1.3	2.0	2.7	2.8
SEm±	**0.43**	**0.53**	**1.24**	**1.34**	**0.89**	**0.08**	**0.35**	**0.42**	**0.59**	**1.01**	**0.02**	**0.01**	**0.01**	**0.02**	**0.02**
CD (P= 0.05)	**NS**	**1.58**	**3.67**	**3.94**	**2.63**	**0.25**	**1.02**	**1.23**	**1.73**	**2.97**	**0.05**	**0.02**	**0.02**	**0.06**	**0.07**

Table 2. Total yield and economics of cotton at various stages under different intercropping and row arrangement.

Treatments	Total yield (kg ha^{-1})	Economics	
		Net income (Rs)	B:C ratio
T1- Sole cotton	2511	39712.50	2.21
1:1 row combination (Without sacrificing cotton row)			
T2- Cotton + Soybean	3340	52605.50	2.70
T3- Cotton + Urdbean	2632	38264.00	2.00
T4- Cotton + Maize	1429	20544.50	1.15
T5- Cotton + Coriander	2789	44518.50	2.35
T6- Cotton +Pigeonpea	2272	34002.50	1.89
2:2 row combination			
T7- Cotton + Soybean	2867	47970.00	2.61
T8- Cotton + Urdbean	2296	36446.00	2.01
T9- Cotton + Maize	1514	22580.50	1.27
T10- Cotton + Coriander	2113	30376.50	1.68
T11- Cotton + Pigeonpea	2332	37221.70	2.09
SEm±	**0.27**	-	-
CD (P= 0.05)	**0.78**	-	-

REFERENCES

Birajdar, J.M., Pawar, K.R., Shinde, V.S. and Chavan, D.A. (1987). Studies on planting pattern, spacing and intercropping in Hybrid -4 cotton under rainfed conditions. *Journal of* Maharashtra *Agriculture University* **12**(*1*): 67-69.

Dodamani, B.M., Hosmani, M.M. and Hunshal, C.S. (1990). Studies on fertilizer in Chilli-cotton-onion intercropping. *Haryana Journal of Agronomy* **10**(1): 127-131.

Dodamani, B.M., Hosmani, M.M. and Hunshal, C.S. (1990). Studies on fertilizer in Chilli-cotton-onion intercropping. *Haryana Journal of Agronomy* **10**(1): 127-131.

Nagre, K.T. (1979). Studies on the effect of intercropping on the growth, yield and economics of rainfed American cotton. *Indian Journal of Agronomy* **24**(4): 390-394.

Rabobank, (1996). www.copyright©2008. Cropbiotech Net. The cotton crop.

Rao, Satyanarayan, Manjappa, K., Chandranath, H.T., Desai, B.K. and Nadagouda, V.B. (1998). Performance of cotton based intercropping systems under irrigation. *Journal of Cotton Research Development* **12**(1): 31-37.

Sethi, H.N., Bharad, G.M., and Bathkal, B.G. (1988). Biomass production of cotton (*Gossypium hirsutum*) varieties as influenced by intercrop. *Indian Journal of Agronomy* **37**(3): 451-455

Singh, V.P. and Singh, V.K. (1995). Productivity potential and economics of maize (*Zea mays*) and soybean (*Glycine max*) intercropping patterns under rainfed low hill or valley situation of Uttaranchal. *Indian Journal of Agronomy* **46**(1): 27-31.

Solaiappan, U. and Dason, A.A. (1995). Influence of sowing time intercropping and mulching on the growth and yield of rainfed cotton (*Gossypium hirsutum*). *Indian Journal of Agronomy* **43**(4): 616-621.

Solaiappan, U., Dason, A.A. and Steriff Mohamed, E. (1991). Effect of intercropping plant geometry and irrigation methods on summer irrigated cotton (*Gossypium species*). *Indian Journal of Agronomy* **38**(1): 16-18.