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Seed Cotton Equivalent Yield and Sustainable Yield Index of Cotton as Influenced by Intercropping, Weed Control and Fertility Management Practices

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Abstract

Two years field experiment was carried out at the Agronomy Research Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) during kharif 2007-08 and 2008-09 with an object to study the effect of intercropping, weed control and fertility management practices on seed cotton yield, seed cotton equivalent yield and sustainable yield index.

Results indicated that the treatment of cotton + pigeonpea significantly resulted in recording greater seed cotton yield and seed cotton equivalent yield in pooled analysis. Normal weeding recorded significantly higher values for seed cotton yield, equivalent yield and sustainable yield index during both the years of experimentation and in pooled analysis. In case of fertility management, increased dose of RDF increased the seed cotton yield, equivalent yield and sustainable yield index during the experimentation.

Keywords: Cotton yield , sustainable yield, significantly resulted, Seed cotton equivalent yield, sustainable yield index, pooled analysis

Introduction

Cotton being a long duration, wide spaced, slow growing at early stage offers a great scope for intercropping of short duration, fast growing, non - competitive intercrops with dissimilar growth habit and productive that utilize the available resources very efficiently and effectively. Intercropping enables crop diversification within agro eco-region and ensures better return to the growers. Similarly, growing short duration intercrops in cotton does not affect the crop yield of base crop of cotton, minimize the losses, helps to safe guard the economy of farmer through extra yields of companion crop and protects from adverse climatic risk, improves soil fertility through biological fixation of nitrogen extraction from component crop of legume (Willey, 1979).

Though the intercropping being potential biological tool to manage weeds, the system itself not ensures complete weed control. Intercropping along with minimum cultural methods of weed control that will be helpful in limiting crop weed competition and economical one. Besides, various factors responsible for low yield, major one is nutrient management. Adequate nutritional supply is essential for higher yields. Considering this fact the present investigation was undertaken.

Materials and Methods

The experimental site was fairely leveled and uniform in topography. The soil was medium black cotton belongs to vertisols. It was clayey in texture and moderately alkaline in nature (p^H 8.3). As for as nutrient status is concerned, it was medium in organic carbon content medium in organic carbon (0.51 %) and available potassium (239.41 kg ha^{-1}), low in available nitrogen (169.76 kg ha^{-1}) and phosphorous (28.68 kg ha^{-1}) and slightly calcarious.

AKH-8828 an American hirsutum variety was used for experiment. The intercrops and their varieties popular among the farmers of this area were used in replacement series of experiment and adopted spacing of 45 × 10 cm for drilling and 45 × 30 cm for dibbling by reducing the recommended spacing of 60 × 30 cm and plant population of cotton (Anonymous, 2007).

Treatment combinations were 36 with 12 Main plots (A) Intercropping (6) viz., I_1- Cotton + blackgram (1:1), I_2- Cotton + soybean (1:1), I_3- Cotton + pigeonpea (6: 2), I_4- Cotton + clusterbean (1:1),I_5-Cotton + cowpea (1:1), I_6- Cotton + marigold (1:1) and (B) Weed management (2)W_1- No weeding and W_2- Normal weeding at 25 and 50 days after sowing and three sub plot (C) Fertilizer management (3) F_1- 75 % Recommended dose of fertilizer (37.5, 18.75, 18.75 kg NPK ha^{-1}) to base crop of cotton, F2- 100 % Recommended dose of fertilizer (50, 25 , 25 kg NPK ha^{-1}) to base crop of cotton and F_3-125 % Recommended dose of fertilizer (62.5, 31.25, 31.25 kg NPK ha^{-1}) to base crop of cotton. The experiment was laid out in split plot design with three replications. The gross plot size was 6.30 m × 3.60 m, net 5.40 m × 3.00 m and recommended dose of fertilizers of cotton was 50, 25, 25 kg NPK ha^{-1} with no fertilizers to the intercrops.

Results and Discussion

Seed cotton equivalent yield and sustainable yield index

Effect of intercropping

During 2007-08, cotton + cowpea intercropping recorded significantly higher seed cotton equivalent yield over other treatments of intercropping. While, treatment of cotton + clusterbean ranked second and cotton + marigold at third. During 2008-09, cotton + marigold recorded significantly higher seed cotton equivalent yield over other treatments. While, treatment of cotton + clusterbean ranked second and cotton + cowpea at third. Similar trend was also observed in pooled analysis (Table 1). The higher equivalent yield was due to higher yields of both component crops in the system (Marer et al. (2007).

In broad sense, it might be due to better utilization of growth resources by the component crops (Ramesh Babu et al., 1996 and Sanjay et al., 2003), better exploitation of incident energy (Verma and Kanke, 1969), higher market price and additional yields of intercrops cumulatively produced maximum seed cotton equivalent yield (Sankarnarayan et al., 2006).

Treatment of cotton + marigold intercropping system recorded higher value of sustainable yield index as compared to other intercropping systems. Cotton + clusterbean, cotton + cowpea and cotton + pigeonpea being par recorded second best position. Biological diversity is more important in yield stability (Willey,1979) perhaps the most interesting biological and economic aspect of intercropping is the potential for compensation among the components of the system often referred to as biological or economic buffering in the system that leads to greater stability in total yields of component crops. Similar results were reported by Sankarnarayan et al. (2010).

Effect of Weed Management

Normal weeding (W_2) treatment resulted in higher seed cotton equivalent yield and sustainable yield index of cotton than the treatment of no weeding (W_1) during both the years of study and in pooled results also. Hand weeding twice at 25 and 50 DAS recorded higher yield (Table 1). It might be due to accountable improvement in yield of both component crops favourabely reflected on equivalent yield. Similar results were reported by Manickam et al. (2000).

Effect of fertility Management

Treatments of 125 % and 100 % RDF (F_3 and F_2) to base crop of cotton being par recorded significantly higher seed cotton equivalent yield than the treatment of 75 % RDF (F_1) during 2007-08, 2008-09 and in pooled analysis (Table 1). Similar results were confirmed by Kote et al. (2005), Giri et al. (2006) and Madhavi Latha and Prasad (2008). While, every increased level of RDF to cotton resulted in recording more values of sustainable yield index.

Effect of Interaction

Interaction effects of intercropping × weed management × fertility management were found significant during and 2008-09 and in pooled (Table 2). The treatment combination of cotton + clusterbean with normal weeding under different fertility management levels were found significantly superior over other treatment combinations in recording higher seed cotton equivalent yield.

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Table 1. Seed Cotton Equivalent Yield and Sustainable Yield Index As Influenced By Different Treatments During 2007-08 and 2008-09

Treatments		Seed cotton equivalent yield (q ha^{-1})			Sustainable Yield index
I) Main plot					
A) Intercropping (6)		**2007-2008**	**2008-2009**	**pooled**	**(SYI)**
I_1	Cotton + blackgram (1:1)	18.05	23.49	20.77	0.68
I_2	Cotton + soybean (1:1)	20.61	19.54	20.08	0.60
I_3	Cotton + pigeonpea (6:2)	26.69	25.61	26.15	0.75
I_4	Cotton + clusterbean (1:1)	33.04	42.77	37.91	0.79
I_5	Cotton + cowpea (1:1)	36.08	36.94	36.51	0.76
I_6	Cotton + marigold (1:1)	28.89	49.02	38.96	0.83
S. E. (m) ±		0.46	0.45	0.35	
C. D. at 5%		1.36	1.32	1.02	
B) Weed management (2)					
W_1	No weeding	24.37	28.31	26.34	0.66
W_2	Normal weeding (2 hoeings + 2 weedings at 25 and 50 DAS)	30.67	33.40	32.03	0.80
S. E. (m) ±		0.27	0.26	0.20	
C. D. at 5%		0.79	0.76	0.59	
II) Sub plot					
C) Fertility management (3)					
F_1	75 % RDF of base crop of cotton	24.97	28.20	26.58	0.63
F_2	100 % RDF of base crop of cotton	28.81	31.62	30.22	0.75
F_3	125 % RDF of base crop of cotton	28.79	32.74	30.76	0.83
S. E. (m) ±		0.27	0.41	0.24	
C. D. at 5%		0.77	1.16	0.67	
D) Interaction effects					
Intercropping x weed management (I x W)					
S. E. (m) ±		0.66	0.64	0.49	
C. D. at 5%		1.93	1.87	1.46	
Intercropping x fertility management (I x F)					
S. E. (m) ±		0.67	1.00	0.58	
C. D. at 5%		1.90	2.85	1.65	
Weed management x fertility management (W x F)					
S. E. (m) ±		0.39	0.58	0.33	
C. D. at 5%		1.10	1.65	0.95	
Intercropping x Weed management x fertility management (I x W x F)					
S. E. (m) ±		0.94	1.42	0.82	
C. D. at 5%		NS	4.03	2.33	
GM		**27.52**	**32.85**	**29.19**	**0.74**

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Table 2. Seed Cotton Equivalent Yield (Q Ha^{-1}) As Influenced By Intercropping × Weed Management X Fertility Management Interactions During 2008-09 And In Pooled

Treatments	Intercropping × weed management × fertility management					
	2008-09			Pooled		
IxWxF	F_1	F_2	F_3	F_1	F_2	F_3
I_1W_1	16.51	22.27	23.29	16.06	19.50	20.57
I_1W_2	23.17	29.29	26.39	19.92	25.58	22.97
I_2W_1	13.11	16.67	19.18	13.77	18.03	19.68
I_2W_2	19.13	24.10	25.07	20.45	23.76	24.76
I_3W_1	32.44	35.46	36.72	31.70	35.28	34.61
I_3W_2	37.28	42.07	37.70	37.03	42.90	37.54
I_4W_1	32.72	35.92	45.00	29.19	31.96	38.37
I_4W_2	46.20	49.38	46.03	40.73	45.02	42.17
I_5W_1	36.56	35.54	34.90	30.30	30.65	30.95
I_5W_2	37.99	36.67	38.92	35.57	36.61	38.20
I_6W_1	20.51	24.62	26.80	21.22	24.83	27.47
I_6W_2	22.79	27.51	31.47	23.06	28.46	31.88
S. E. (m) ±	1.42			0.82		
C. D. at 5%	4.03			2.33		