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Number of Green Bolls, Picked Bolls and Seed Cotton Yield Per Plant as Influenced by Rainfed Cotton Based Intercropping Systems

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 number of green bolls, picked bolls and seed cotton yield plant^{-1}. Results indicated that the treatment of cotton + blackgram and cotton + pigeonpea being par exhibited significantly greater number of green bolls plant^{-1} during the years of experimentation. Intercropping of cotton + blackgram, cotton + pigeonpea, cotton + clusterbean and cotton + cowpea being par recorded significantly more number of picked bolls plant^{-1} and cotton + blackgram during 2007-08 and 2008-09 respectively. Intercropping of cotton + blackgram, cotton + cowpea and cotton + clusterbean being par marked higher seed cotton yield plant^{-1} over the other treatments of intercropping. Normal weeding and increased fertilizer dose significantly increased the number of green bolls, number of picked bolls and seed cotton yield plant^{-1} during both the years of study.

Keywords: Green Bolls, Burst Bolls Picked, Seed Cotton Yield, Intercropping, Weed, Fertility, Risk Covering Factor, Rainfed etc

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Introduction:

Cotton (Gossypium spp.) is an important cash crop of rainfed Akola. It is predominantly grown on any type of soil. Among the major cotton growing states, Maharashtra ranks first with an area of 40.00 lakh hectares, production of 77.31 lakh bales and productivity of 329 kg lint ha-1. Whereas, Vidarbha occupies 15.4 lakh hectares area with production of 32.00 lakh bales and productivity of 352 kg lint ha-1 (Anonymous, 2011, d). Though the area under cotton is more, the productivity is very low as compared to the states of India and other countries of cotton world. There are many reasons for low productivity of cotton, the major one is aberrant weather condition, October heat creates hot days and humid nights cause soil and plant moisture loss through soil cracks and transpiration which drop down the reproductive parts like green bolls, flower buds etc. From the data, it was observed that near about 50% of green bolls were lost due to above reason. If we succeed to save the shedding of green bolls on plant itself by any means, definitely it will doubled the seed cotton yield. Initially slow growing and wider spacing of cotton facilitate to grow short duration intercrops as a risk covering factor along with the impact of weed and fertility management practices on total income of system. The information is very meager on the aspect and hence this study was undertaken.

Materials and Methods

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. The experimental site was fairely leveled and uniform in topography. The soil was medium black cotton belonging to vertisols. It was clayey in texture and moderately alkaline in nature (pH 8.3). As regard nutrient status, it was 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. The total rainfall received during 2007-2008 in 23rd - 52nd MW at Akola centre was 771.0 mm in 43 rainy days, it was said to be normal year.

Whereas, during 2008-2009 the total rainfall recorded was 528.2 mm in 42 rainy days and it was stated to be abnormal year and deficit by 30.70 % as against normal rainfall of 762.8 mm. Soon after sowing, the deficit rain had adversely affected the flowering and boll development stages and ultimately the cotton yields.

AKH-8828 an American hirsutum variety, intercrops and their varieties popular among the farmers 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. Treatment combinations were 36 with 12 Main plots (A) Intercropping (6) viz., I1- Cotton + blackgram (1:1), I2- Cotton + soybean (1:1), I3- Cotton + pigeonpea (6: 2), I4- Cotton + clusterbean (1:1),I5-Cotton + cowpea (1:1), I6- Cotton + marigold (1:1) and (B) Weed management (2) W1- No weeding and W2- Normal weeding at 25 and 50 days after sowing and three Sub plots (C) Fertilizer management (3) F1- 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 F3-125 % 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 and crop was sown at the spacing of 45 × 30 cm distance. The gross plot size was 6.30 m × 3.60 m, net plot size 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

Number of green bolls plant-^{1}, Number of bolls picked plant -^{1} and Seed cotton yield plant-^{1}

Data in respect of number of green bolls (29.57 and 27.95 plant-1), number of picked bolls (17.56 and 13.56 plant-1) and seed cotton yield (66.48 g and 33.78 g plant-1) were recorded and noted the higher values for each observation during 2007-08 than 2008-09 (Table 1).

Effect of Intercropping

During 2007-08, intercropping of cotton + blackgram, cotton + pigeonpea, cotton + clusterbean being par recorded significantly higher number of green bolls plant-1. While, treatment of cotton + soybean, cotton + cowpea and cotton + marigold being par registered more number of green bolls plant-1over rest of treatments. Intercropping of cotton + blackgram, cotton + pigeonpea, cotton + clusterbean and cotton + cowpea being par recorded significantly more number of picked bolls plant-1 than cotton + soybean and cotton + marigold which were found equally effective in registering more number of picked bolls plant-1. Seed cotton yield plant-1 was not influenced significantly due to different treatments of intercropping during 2007-08 (Deshmukh et al., 1987).

During 2008-09, intercropping of cotton + blackgram and cotton + pigeonpea being par recorded significantly higher number of green bolls plant-1 over other treatments. Whereas, treatment of cotton + clusterbean, cotton + soybean and cotton + cowpea being par recorded significantly maximum number of green bolls plant-1. Treatment of cotton + marigold recorded lowest number of green bolls plant-1. Intercropping of cotton + blackgram recorded significantly higher number of picked bolls plant-1over other intercropping. Other treatments like cotton + clusterbean and cotton + cowpea being par recorded significantly greater number of picked bolls plant-1 over cotton + soybean, cotton + clusterbean and cotton + marigold. Treatments of cotton + soybean and cotton + pigeonpea being par recorded significantly maximum number of picked bolls plant-1 than the treatment of cotton + marigold. Increased number of bolls picked plant-1 due to intercrop of blackgram in cotton was reported by many workers namely, Sharma (2002) and Turkhede (2010). The increase in number of bolls picked plant-1. It might be due to increased photosynthetic efficiency on account of higher nitrogen status of soil as an additional advantage of nitrogen fixation by legume root nodules in intercropping (Agrawal and Porwal, 2006). Intercropping of cotton + blackgram, cotton + cowpea and cotton + clusterbean being par marked higher seed cotton yield plant-1 over the rest of treatments. Treatments of cotton + soybean and cotton + pigeonpea being par recorded significantly greater seed cotton yield plant-1 than the treatment of cotton + marigold. The increase in seed cotton yield plant-1 might be due to symbiotic nitrogen fixation of legume (Patra et al., 1990).

Effect of Weed Management

Normal weeding recorded significantly higher values for number of green bolls plant-1, number of picked bolls plant-1 and seed cotton yield plant-1 at the level of significance during the years of experimentation. The seed cotton yield plant-1 increased due to weed control in cotton based system reported by Gnanavel and Babu (2008). Hand weeding twice not only control the weeds but also create the favorable environment for growth and recorded higher values of yield attributes. Higher seed cotton yield obtained under hand weeding twice was obviously due to cumulative effect of reduced weed competition and higher values of yield attributes. Similar results were reported by Baldev Ram et al. (2005).

Effect of Fertility Management

Treatments of 100 % RDF and 125 % RDF to base crop of cotton being par recorded greater values of number of green bolls plant-1 and number of picked bolls plant-1 over the treatment of application of 75 % RDF to cotton during 2007-08 only. Application of fertilizers influenced the number of green bolls plant-1 indicated the increased efficiency of uptake of applied fertilizers (Khawale and Prasad, 2001 and Turkhede, 2010). Number of picked bolls plant-1 was increased with the increase in fertilizer levels (Kalyankar, 2001, Suresh et al., 2004, Kote et al., 2005 and Tengade, 2008).

Effect of Interaction

None of the interaction was found significant.

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Table 1. Number of green bolls plant $^{-1}$, picked bolls plant $^{-1}$ and seed cotton yield plant^{-1} as influenced by different treatments during 2007-08 and 2008-09

Treatments		2007-08			2008-09		
I) Main plot **A) Intercropping (6)**		**Number of green bolls plant^{-1}**	**Number of picked bolls plant^{-1}**	**Seed cotton yield plant^{-1} (g)**	**Number of green bolls plant^{-1}**	**Number of picked bolls plant^{-1}**	**Seed cotton yield plant^{-1} (g)**
I_1	Cotton + blackgram (1:1)	37.29	18.84	70.56	34.86	16.97	43.00
I_2	Cotton + soybean (1:1)	30.06	16.68	66.16	28.48	13.23	33.86
I_3	Cotton + pigeonpea (6:2)	32.97	17.63	64.50	33.16	12.54	30.10
I_4	Cotton + clusterbean (1:1)	31.92	17.44	67.72	29.14	14.89	35.68
I_5	Cotton + cowpea (1:1)	24.98	19.16	70.67	26.34	15.41	38.64
I_6	Cotton + marigold (1:1)	20.17	15.63	59.28	15.69	8.30	21.38
S. E. (m) ±		1.90	0.68	3.48	1.29	0.51	2.68
C. D. at 5%		5.58	1.99	NS	3.79	1.49	7.87
B) Weed management (2)							
W_1	No weeding	23.60	15.49	58.67	25.49	11.93	30.63
W_2	Normal weeding at 25 and 50 DAS)	35.54	19.64	74.29	30.41	15.19	36.92
S. E. (m) ±		1.10	0.39	2.01	0.75	0.29	1.55
C. D. at 5%		3.22	1.15	5.88	2.19	0.86	4.54
II) Sub plot							

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C) Fertility management (3)							
F_1	75 % RDF of base crop of cotton	27.84	16.76	64.97	26.59	13.11	31.97
F_2	100 % RDF of base crop of cotton	29.22	17.79	66.32	27.96	13.76	34.63
F_3	125 % RDF of base crop of cotton	31.63	18.14	68.15	29.29	13.81	34.73
S. E. (m) ±		1.02	0.37	1.42	0.86	0.28	1.45
C. D. at 5%		2.89	1.04	NS	NS	NS	NS
D) Interaction effects							
Intercropping x weed management (I x W)							
S. E. (m) ±		2.69	0.96	4.91	1.83	0.72	3.80
C. D. at 5%		7.89	NS	NS	NS	NS	NS
Intercropping x fertility management (I x F)							
S. E. (m) ±		2.49	0.89	3.49	2.09	0.68	3.56
C. D. at 5%		NS	NS	NS	NS	NS	NS
Weed management x fertility management (W x F)							
S. E. (m) ±		1.44	0.52	2.01	1.21	0.39	2.06
C. D. at 5%		NS	NS	NS	NS	NS	NS
Intercropping x Weed management x fertility management (I x W x F)							
S. E. (m) ±		3.52	1.26	4.93	2.96	0.96	5.03
C. D. at 5%		NS	NS	NS	NS	NS	NS
GM		**29.57**	**17.56**	**66.48**	**27.95**	**13.56**	**33.78**