

Yields of Seed Cotton and Intercrop in Cotton Based Systems as Influenced by Intercropping, Weed Control and Fertility Management Practices

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 and intercrops yield. Results indicated that the treatment of cotton + pigeonpea registered significantly greater seed cotton yield during both the years of experimentation and in pooled analysis also. While, treatment of cotton + marigold recorded significantly higher intercrop yield which was nearly followed by cotton + cowpea and cotton + clusterbean during the years of experimentation. Normal weeding recorded significantly higher values for seed cotton yield during both the years of experimentation and in pooled analysis with increased intercrop yields also. In case of fertility management, increased dose of RDF increased the seed cotton yield and intercrops yield during the years of experimentation.

Keywords: Seed Cotton Yield, Intercrops Yield, Intercropping, Weed Control and Fertility Management Practices etc.

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 can be 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

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 fairly leveled and uniform in topography. The soil was medium black cotton belongs to vertisols. It was clayey in texture and moderately alkaline in nature (pH 8.3), 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 calcareous. The total rainfall received during 2007-2008 in 23rd - 52 nd 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. It was deficit by 30.70 % as against normal rainfall of 762.8 mm. Soon after sowing to flowering and boll development stage had adversely affected the cotton yields. AKH-8828 an American hirsutum variety was used for experiment. It has a bushy, branchy growth habit attaining the height of about 70-80 cm, 2-4 monopodias, 12-20 sympodias, 50 % flowering at 70-



B. V. Saoji

Professor of Agronomy and
Chief Seed Production officer,
Central Demonstration
Farm Wani- Rambhapur,
Dr. PDKV, Akola
Maharashtra

D. G. Giri

Ex. Head,
Deptt. of Agronomy and
Associate Dean Lower
Agricultural Education,
Dr. PDKV, Akola,
Maharashtra

75 and 50 % boll bursting at 120-125 days after sowing. Crop duration is 170-180 days and average yield is 12-14 q ha⁻¹ under rainfed condition.

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 Main plot (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 Sub plot (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- 100 % 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 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 Yield

The seed cotton yield ha⁻¹ during 2007-08 was higher (12.59 q ha⁻¹) as compared to the year 2008-09 (10.63 q ha⁻¹). The average pooled seed cotton yield was (11.61 q ha⁻¹).

Effect of Intercropping

During 2007-08, treatments of cotton + pigeonpea (I₃) and cotton + blackgram (I₁) being par recorded significantly highest seed cotton yield over other treatments. Treatment of cotton + cowpea (I₅) was significantly superior over cotton + clusterbean (I₄), cotton + soybean (I₂) and cotton + marigold. During 2008-09, cotton + pigeonpea (I₃) recorded significantly highest seed cotton yield over other treatments of intercropping. Treatment of cotton + blackgram (I₁) recorded second best position. Treatments of cotton + cowpea (I₅) and cotton + soybean (I₂) being par produced significantly more seed cotton yield ha⁻¹ over the rest of treatments.

In pooled analysis, cotton + pigeonpea (I₃) resulted in greater production of seed cotton yield over other treatments. Treatment of cotton + blackgram (I₁) stood at second position followed by the treatment of cotton + cowpea (I₅). Treatments of cotton + clusterbean (I₄) and cotton + soybean (I₂) being par recorded higher seed cotton yield than the treatment of cotton + marigold (I₆). Cotton + redgram intercropping was multitier crop combination harvest solar energy efficiently beside the deeper root system explored the moisture and nutrient from deeper section of soil. Similar results were reported by Pothiraj and Srinivasan (1993). Seed cotton yield recorded significantly more in cotton + pigeonpea system because of more number of cotton plants in the plot. Cotton intercropped with blackgram significantly increased seed cotton yield in individual

year and in pooled also (Table 1). It might be due to the least depressing effect of blackgram in cotton because of its short duration (Balsubramanian et al., 1994), no competition for natural resources (Tomar et al., 1994), complementary effect (Harisudan et al., 2009) and more availability of nitrogen through decay of root nodules (Umarani et al., 1984). Reduction in other cotton based intercropping might be due to medium to long duration of intercrops, their spreading habit coupled with smothering effect on cotton in early stages (Tomar et al. 1997). But yield reduction was well compensated by intercrop yields. Similar results were reported by Patel et al. (2006).

Effect of Weed Management

During both the years of study and in pooled analysis, normal weeding (W₂) treatment gave significantly higher seed cotton yield than the treatment of no weeding (W₁). Weeding increased seed cotton yield (Table 1), it might be due to the effective control of weeds and elimination of competition for light, nutrients, moisture etc. Similar results were reported by Agrawal et al. (2007).

Effect of Fertility Management

During both the years of study, treatments of 125 % RDF (F₃) and 100 % RDF (F₂) being par recorded significantly higher seed cotton yield than 75 % RDF (F₁) to base crop of cotton. In pooled analysis every additional dose of RDF to cotton was found significantly superior to its lower dose of RDF in recording higher seed cotton yield in 2007-08, 2008-09 and in pooled analysis (Table 1). Similar results were reported by Kubsad et al. (2004) and Kote et al. (2005).

Effect of Interaction

Interaction effects of intercropping × weed management × fertility management (I×W×F) were found significantly superior in recording higher seed cotton yield ha⁻¹ in pooled analysis (Table 2). Treatment combination of intercropping of cotton + pigeonpea with normal weeding under 100 % RDF and 125 % RDF (I₃W₂F₂ and I₃W₂F₃) being par recorded significantly greater seed cotton yield ha⁻¹ over other treatment combinations (Table 2). Increase in yield under efficient weed control with increasing level of fertilizers was owing to reduced depletion of nutrients by weeds and concomitant increase in nutrient uptake by crop ultimately resulted in marked improvement in yield.

Intercrop Yield

Intercrops yield ha⁻¹ was higher (84.28 q ha⁻¹) during 2008-09 as compared to the year 2007-08 (45.52 q ha⁻¹). The average yield of intercrops was (64.90 q ha⁻¹).

Effect of Intercropping

During 2007-08 the treatment of cotton + marigold (I₆) recorded highest yield which was nearly followed by treatments of cotton + cowpea (I₅) and cotton + clusterbean (I₄). While, the lowest seed yield was noted in the treatment of cotton + blackgram (I₁). During 2008-09 the treatment of cotton + marigold (I₆) recorded highest yield of intercrop (289.07 q ha⁻¹) nearly followed by treatment of cotton + clusterbean (I₄). Treatment of cotton + cowpea stood at third position. Whereas, the treatment of cotton + pigeonpea (I₃) recorded lowest yield among the tested intercrops. The intercrops like marigold, cowpea and

clusterbean showed their better performance under adverse condition of climate indicated that these crops may aquent with the changing scenario of climate in coming future. The average values of intercrops yield followed the similar trend as recorded during 2008-09 (Table 1).

Effect of Weed Management

Normal weeding treatment (W_2) recorded greater values of intercrops yield during both the years of study and in average also. It means that intercrops also require weeding for better performance.

Effect of Fertility Management

Every added dose of fertilizers increased the yields of intercrop except during 2007-08 where 100 % RDF gave maximum yield of intercrops than 125 % and 75 % RDF. During 2008-09, numerically 125 % RDF (F_3) to base crop of cotton recorded higher values of yields over its lower doses of 100 % (F_2) and 75 % RDF (F_1). The similar trend of intercrops yield was also observed in average.

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