

# Periodic Research

## Influence of Intercropping, Weed Control and Fertility Management Practices on Stalk Yield, Biological Yield and Harvest Index of Cotton

### 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 stalk yield, biological yield and harvest index of cotton. Results revealed that the treatment of cotton + pigeonpea and cotton + cowpea being par recorded significantly higher stalk yield over other treatments during 2008-09 and in pooled analysis. Normal weeding and higher fertility levels also recorded significantly higher values of biological yield during both the years of study and harvest index in 2007-08 only.

**Keywords:** Biological yield, fertility management, harvest index, intercropping, stalk yield and weed control etc.

### Introduction

Intercropping is most common practice in long duration rainfed cotton crop as a risk covering factor. The assumption is that the growing of different intercrops like pulses, oilseed, vegetable, flowers etc. having characters of short duration, non competitive, less input user, ability of suppressing weeds, exploit better environment and resources to fulfill the nutritional requirement of main crop and give the additional yield and return. Therefore, the interest of farmers is rapidly growing in diversified intercropping to maximize production. There is need to adopt profitable and resource efficient cropping system along with weed control and fertilizer management practices which gives higher returns than existing cropping system. Keeping in view, the maintenance of natural resources optimally and effectively in conservative way to sustain productivity this 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 ( $p^H$  8.3). medium in organic carbon (0.51 %) and available potassium ( $239.41 \text{ kg ha}^{-1}$ ), low in available nitrogen ( $169.76 \text{ kg ha}^{-1}$ ) and phosphorous ( $28.68 \text{ kg ha}^{-1}$ ) and slightly calcareous.

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  $45 \times 10 \text{ cm}$  for drilling and  $45 \times 30 \text{ cm}$  for dibbling by reducing the recommended spacing of  $60 \times 30 \text{ cm}$  and plant population of cotton (Anonymous, 2007). Treatment combinations were 36 with 12 Main plot (A) Intercropping (6) viz., I<sub>1</sub>- Cotton + blackgram (1:1), I<sub>2</sub>- Cotton + soybean (1:1), I<sub>3</sub>- Cotton + pigeonpea (6: 2), I<sub>4</sub>- Cotton + clusterbean (1:1), I<sub>5</sub>-Cotton + cowpea (1:1), I<sub>6</sub>- Cotton + marigold (1:1) and (B) Weed management (2) W<sub>1</sub>- No weeding and W<sub>2</sub>- Normal weeding at 25 and 50 days after sowing and three Sub plot (C) Fertilizer management (3) F<sub>1</sub>- 75 % Recommended dose of fertilizer ( $37.5, 18.75, 18.75 \text{ kg NPK ha}^{-1}$ ) to base crop of cotton, F<sub>2</sub>- 100 % Recommended dose of fertilizer ( $50, 25, 25 \text{ kg NPK ha}^{-1}$ ) to base crop of cotton and F<sub>3</sub>-125 % Recommended dose of fertilizer ( $62.5, 31.25, 31.25 \text{ kg NPK ha}^{-1}$ ) to base crop of cotton. The experiment was laid out in split plot design with three replications. The gross plot size was  $6.30 \text{ m} \times 3.60 \text{ m}$ ,

### B. V. Saoji

Professor of Agronomy and  
Director of Farms, Central  
Research station, Dr. PDKV,  
Akola (MS)

net 5.40 m × 3.00 m and recommended dose of fertilizers of cotton was 50, 25, 25 kg NPK ha<sup>-1</sup> with no fertilizers to the intercrops.

## Results and Discussion

### Effect of intercropping

During the year 2007-08, treatments of cotton + pigeonpea (I<sub>3</sub>), cotton + clusterbean (I<sub>4</sub>) and cotton + blackgram (I<sub>1</sub>) being par recorded significantly higher stalk yield over the treatments of cotton + soybean (I<sub>2</sub>), cotton + cowpea (I<sub>5</sub>) and cotton + marigold (I<sub>6</sub>). Treatment of cotton + cowpea (I<sub>5</sub>) stood at second position followed by treatment of cotton + soybean (I<sub>2</sub>). Treatments of cotton + pigeonpea (I<sub>3</sub>), cotton + blackgram (I<sub>1</sub>), cotton + clusterbean (I<sub>4</sub>) and cotton + cowpea (I<sub>5</sub>) being par recorded significantly higher biological yield ha<sup>-1</sup> over the treatments of cotton + soybean (I<sub>2</sub>) and cotton + marigold (I<sub>6</sub>). However, treatment differences between cotton + soybean (I<sub>2</sub>) and cotton + marigold (I<sub>6</sub>) did not reach to the level of significance (Table 1). While, treatment of cotton + blackgram (I<sub>1</sub>), cotton + pigeonpea (I<sub>3</sub>) and cotton + cowpea (I<sub>5</sub>) being par recorded significantly higher values of harvest index over other treatments. Treatment of cotton + blackgram (I<sub>1</sub>) system recorded highest harvest index. Similar results were reported by Padhi et al. (1993) and Tengade (2008). During 2008-09, treatment of cotton + pigeonpea (I<sub>3</sub>) and cotton + cowpea (I<sub>5</sub>) being par recorded significantly more stalk yield over other treatments of intercropping. Treatment of cotton + blackgram (I<sub>1</sub>) showed second position followed by treatments of cotton + clusterbean (I<sub>4</sub>) and cotton + soybean (I<sub>2</sub>). However, the treatments of cotton + pigeonpea (I<sub>3</sub>), cotton + blackgram (I<sub>1</sub>) and cotton + cowpea (I<sub>5</sub>) being par produced higher biological yield and harvest index over other treatments. Treatment of cotton + pigeonpea recorded maximum biological yield and harvest index because of more number of plants in plot.

In pooled analysis, treatments of cotton + pigeonpea (I<sub>3</sub>) and cotton + cowpea (I<sub>5</sub>) being par recorded significantly greater stalk yield over other treatments. Treatment of cotton + blackgram (I<sub>1</sub>) and cotton + clusterbean (I<sub>4</sub>) being par recorded greater stalk yield over the treatment of cotton + soybean (I<sub>2</sub>) and cotton + marigold (I<sub>6</sub>). Stalk yield was maximum in cotton + pigeonpea (6:2) intercropping because of more number of cotton plants in the plot.

### Effect of weed management

Normal weeding (W<sub>2</sub>) recorded significantly higher stalk yield than the treatment of no weeding (W<sub>1</sub>) during the year 2007-08, 2008-09 and in pooled analysis. In case of biological yield and harvest index, normal weeding (W<sub>2</sub>) recorded significantly higher values for these characters (Table 1). It might be due to weeding treatment that has prevented competition with cotton and helped to improve growth of cotton. Similar results were reported by Chalka and Nepalia (2006) and Pandey et al. (2000).

### Effect of fertility management

Every increased level of RDF to cotton crop resulted significantly in recording higher stalk yield during the years of experimentation and in pooled analysis. Stalk yield, biological yield and harvest index of cotton was more with higher levels of fertilizers and more availability of nutrients (Table 1). Similar line of work

were corroborated by many workers namely, Kote et al. (2005), Moola and Giri (2006), Srinivasan (2006), Hanumanthappa et al. (2008), Tengade (2008), Katkar et al. (2005), Raskar (2006) and Wankhade et al. (2001).

### Effect of interaction

Interaction effects of intercropping × weed management × fertility management (I×W×F) were found significantly superior in recording higher stalk yield (Table 2). Treatment combination of cotton + clusterbean with normal weeding under various fertility management (I<sub>4</sub>W<sub>2</sub>F<sub>1</sub>, I<sub>4</sub>W<sub>2</sub>F<sub>2</sub> and I<sub>4</sub>W<sub>2</sub>F<sub>3</sub>) recorded significantly higher stalk yield over other treatment combinations.

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**Table 1. Stalk yield, biological yield and harvest index of cotton as influenced by different treatments during 2007-08 and 2008-09**

| Treatments   |  | Stalk yield (q ha <sup>-1</sup> ) |              |              | Biological yield (q ha <sup>-1</sup> ) |              | Harvest index (%) |              |
|--|--|-----------------------------------|--------------|--------------|--|--------------|-------------------|--------------|
| I) Main plot   |  | 2007-08                           | 2008-09      | pooled       | 2007-08                                | 2008-09      | 2007-08           | 2008-09      |
| <b>A) Intercropping (6)</b>  |  |                                   |              |              |  |              |                   |              |
| I <sub>1</sub>   | Cotton + blackgram (1:1)                                 | 34.58                             | 31.68        | 33.13        | 48.88                                  | 43.72        | 29.26             | 27.54        |
| I <sub>2</sub>   | Cotton + soybean (1:1)                                   | 31.30                             | 26.64        | 28.97        | 42.43                                  | 36.57        | 26.23             | 27.15        |
| I <sub>3</sub>   | Cotton + pigeonpea (6:2)                                 | 36.03                             | 33.41        | 34.72        | 50.45                                  | 46.81        | 28.58             | 28.63        |
| I <sub>4</sub>   | Cotton + clusterbean (1:1)                               | 35.21                             | 28.75        | 31.98        | 47.56                                  | 38.54        | 25.97             | 25.40        |
| I <sub>5</sub>   | Cotton + cowpea (1:1)                                    | 33.68                             | 33.04        | 33.36        | 47.07                                  | 43.81        | 28.45             | 24.58        |
| I <sub>6</sub>   | Cotton + marigold (1:1)                                  | 29.05                             | 21.28        | 25.16        | 39.03                                  | 29.14        | 25.57             | 26.97        |
| S. E. (m) ±  |  | 0.53                              | 0.52         | 0.47         | 1.31                                   | 1.85         | 0.36              | 0.42         |
| C. D. at 5%  |  | 1.56                              | 1.53         | 1.37         | 3.86                                   | 5.42         | 1.05              | 1.25         |
| <b>B) Weed management (2)</b>                                      |  |                                   |              |              |  |              |                   |              |
| W <sub>1</sub>   | No weeding   | 30.97                             | 25.67        | 28.32        | 42.80                                  | 34.99        | 27.64             | 26.64        |
| W <sub>2</sub>   | Normal weeding (2 hoeings + 2 weedings at 25 and 50 DAS) | 35.65                             | 32.59        | 34.12        | 49.01                                  | 44.53        | 27.26             | 26.81        |
| S. E. (m) ±  |  | 0.31                              | 0.30         | 0.27         | 0.76                                   | 1.07         | 0.21              | 0.25         |
| C. D. at 5%  |  | 0.90                              | 0.89         | 0.80         | 2.23                                   | 3.13         | 0.61              | NS           |
| <b>II) Sub plot</b>  |  |                                   |              |              |  |              |                   |              |
| <b>C) Fertility management (3)</b>                                 |  |                                   |              |              |  |              |                   |              |
| F <sub>1</sub>   | 75 % RDF of base crop of cotton                          | 30.89                             | 25.69        | 28.29        | 42.27                                  | 35.01        | 26.92             | 26.62        |
| F <sub>2</sub>   | 100 % RDF of base crop of cotton                         | 33.30                             | 29.78        | 31.54        | 46.20                                  | 40.70        | 27.92             | 26.83        |
| F <sub>3</sub>   | 125 % RDF of base crop of cotton                         | 35.74                             | 31.69        | 33.72        | 49.25                                  | 43.35        | 27.43             | 26.90        |
| S. E. (m) ±  |  | 0.35                              | 0.39         | 0.32         | 0.51                                   | 0.52         | 0.34              | 0.32         |
| C. D. at 5%  |  | 1.00                              | 1.10         | 0.91         | 1.45                                   | 1.48         | 0.95              | NS           |
| <b>D) Interaction effects</b>                                      |  |                                   |              |              |  |              |                   |              |
| Intercropping x weed management (I x W)                            |  |                                   |              |              |  |              |                   |              |
| S. E. (m) ±  |  | 0.90                              | 0.46         | 0.66         | 0.86                                   | 0.80         | 0.51              | 0.60         |
| C. D. at 5%  |  | 2.63                              | NS           | 1.65         | 2.52                                   | 2.35         | NS                | NS           |
| Intercropping x fertility management (I x F)                       |  |                                   |              |              |  |              |                   |              |
| S. E. (m) ±  |  | 0.45                              | 0.54         | 0.79         | 1.25                                   | 1.27         | 0.82              | 0.79         |
| C. D. at 5%  |  | NS                                | NS           | 2.24         | NS                                     | NS           | NS                | NS           |
| Weed management x fertility management (W x F)                     |  |                                   |              |              |  |              |                   |              |
| S. E. (m) ±  |  | 0.16                              | 1.11         | 0.45         | 0.72                                   | 0.74         | 0.47              | 0.45         |
| C. D. at 5%  |  | NS                                | NS           | 1.29         | NS                                     | NS           | NS                | NS           |
| Intercropping x Weed management x fertility management (I x W x F) |  |                                   |              |              |  |              |                   |              |
| S. E. (m) ±  |  | 0.51                              | 0.32         | 1.11         | 1.76                                   | 1.80         | 1.16              | 1.11         |
| C. D. at 5%  |  | NS                                | NS           | 3.16         | NS                                     | NS           | NS                | NS           |
| <b>GM</b>  |  | <b>33.31</b>                      | <b>29.13</b> | <b>29.19</b> | <b>45.90</b>                           | <b>39.76</b> | <b>27.43</b>      | <b>26.74</b> |

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**Table. 2**  
Stalk yield of cotton ( $q\ ha^{-1}$ ) as influenced by intercropping  $\times$  weed management  $\times$  fertility management interactions (pooled)

| Treatments                    | Intercropping $\times$ weed management $\times$ fertility management |                |                |
|-------------------------------|--|----------------|----------------|
|                               | F <sub>1</sub>   | F <sub>2</sub> | F <sub>3</sub> |
| I <sub>1</sub> W <sub>1</sub> | 16.06  | 19.50          | 20.57          |
| I <sub>1</sub> W <sub>2</sub> | 19.92  | 25.58          | 22.97          |
| I <sub>2</sub> W <sub>1</sub> | 13.77  | 18.03          | 19.68          |
| I <sub>2</sub> W <sub>2</sub> | 20.45  | 23.76          | 24.76          |
| I <sub>3</sub> W <sub>1</sub> | 31.70  | 35.28          | 34.53          |
| I <sub>3</sub> W <sub>2</sub> | 37.03  | 42.90          | 37.54          |
| I <sub>4</sub> W <sub>1</sub> | 29.19  | 31.96          | 38.37          |
| I <sub>4</sub> W <sub>2</sub> | 40.73  | 45.02          | 42.17          |
| I <sub>5</sub> W <sub>1</sub> | 30.30  | 30.64          | 30.95          |
| I <sub>5</sub> W <sub>2</sub> | 35.57  | 36.82          | 38.20          |
| I <sub>6</sub> W <sub>1</sub> | 21.22  | 24.83          | 27.47          |
| I <sub>6</sub> W <sub>2</sub> | 23.06  | 28.46          | 31.88          |
| S. E. (m) $\pm$               | 1.11   |                |                |
| C. D. at 5%                   | 3.16   |                |                |