Weed Dynamics in Bt cotton under Moisture Conservation and Integrated Nutrient Management Practices

Ch. Pragathi Kumari1*, K. B. Suneetha Devi2, K. Bhanu Rekha3, S. Sridevi4 and S. Narender Reddy5

1AICRP on Integrated Farming Systems, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad-30, Telangana, India.
2Agricultural College, Jagtial, Jagtial District, Professor Jayashankar Telangana State Agricultural University, Telangana, India.
3College of Agriculture, Rajendrangar, Professor Jayashankar Telangana State Agricultural University, Telangana, India.
4Agricultural Polytechnic, Torna, Siddipet District, Professor Jayashankar Telangana State Agricultural University, Telangana, India.
5Department of Crop Physiology, College of Agriculture, Rajendrangar, Professor Jayashankar Telangana State Agricultural University, Telangana, India.

Authors’ contributions

This work was carried out in collaboration among all authors. Author CPK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors KBSD and KBR managed the analyses of the study. Authors SS and SNR managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

A field investigation was conducted to evaluate the effect of moisture conservation practices [flat bed sowing, ridge and furrow, broad bed and furrow (BBF) and poly mulch on BBF] and integrated nutrient management treatments [Farmer’s practice, 100% recommended dose of fertilizers (RDF)]
of 150:60:60 NPK kg ha⁻¹, 125% RDF, 100% RDF along with 25% N through Farm Yard Manure (FYM) or press mud and their combined effect on weed dynamics of Bt cotton at College Farm, Professor Jayashankar Telangana State Agricultural University (PJTSAU), Telangana, India. The experiment was laid out in strip-plot design and replicated thrice. Pooled data of the two years (2015 and 2016) indicated that poly mulch on broad bed (M₄) registered significantly lower weed density and dry weight at 30 days after sowing (DAS) and it was followed by broad bed and furrow (M₅) which was at par with flat bed (M₁) and ridge and furrow (M₂) methods. Among nutrient management practices, lower weed density was recorded with the application of 100% RDF (S₂) followed by 125% RDF (S₃) and 100% RDF (S₄) along with pressmud equivalent to 25% RDN (S₅). However, the interaction effect on weed density and drymatter was found to be non-significant at 30 DAS. Contrary to this, at 60 and 90 DAS, the interaction was found to be significant. At 60 DAS, poly mulch on broad bed (M₄S₅) along with 100% RDF and poly mulch on broad bed (M₄S₅) along with 125% RDF recorded lower weed density over other treatment combinations. At 90 DAS also similar results were observed with respect to weed density. However, lower weed dry weight was observed with poly mulch on broad bed (M₃S₅) along with 125% RDF.

Keywords: Bt cotton; poly mulch; ridge and furrow; broad bed and furrow; farm yard manure; pressmud; weed density; weed drymatter; yield.

1. INTRODUCTION

Cotton (Gossypium hirsutum L.), the “white gold or the king of fibres” is one of the most important commercial crops being cultivated under rainfall conditions in India. The productivity of cotton in India is significantly lower (568 kg ha⁻¹) in comparison to the four major cotton-growing countries i.e. China (1300 kg ha⁻¹), USA (900 kg ha⁻¹), Pakistan (700 kg ha⁻¹) and Brazil (2027 kg ha⁻¹). India ranks first in area with 11.88 m ha⁻¹, accounting to 30 per cent of world coverage and 22 per cent (351 lakh bales of lint) of the world cotton production (second rank) with a productivity of 568 kg ha⁻¹. Telangana ranked third in area (1.65 m ha) with a production of 5 million bales and productivity of 515 kg ha⁻¹[1].

Among the various biological factors limiting yields of cotton, weed infestation is one of the serious factor. It was considered as a problem since 10,000 B.C [2]. Weeds compete for nutrients, water, light and thus reduce the yield of cotton substantially [3] to an extent of 34-61.4 per cent [4]. Although several techniques are followed for weed management, yet cotton yields are significantly reduced due to weed infestation [5]. Mulching is the practice of covering the soil surface to provide favourable conditions towards better plant growth and development. The main objective of mulching is water-saving and weed control [6]. Integrated use of chemical fertilizers and organic manures is not only essential for achieving higher yields but also has crucial role in improving soil health. Though, Farm Yard Manure (FYM) is the commonly recommended organic manure, its availability is becoming meager on account of low or negligible maintenance of cattle population in the farms. In this context, alternate organic sources like presssed are one of the sound option on account of its rich nutrient content [7].

2. MATERIALS AND METHODS

A field experiment was conducted during kharif, 2015 and 2016 at College Farm, situated at an altitude of 542 m above mean sea level at 17°19' N latitude, 78°23' E longitude, College of Agriculture, Rajendranagar, Professor Jayashankar Telangana State Agricultural University (PJTSAU), Hyderabad, Telangana, India under rainfall conditions. The soil of the experimental site was sandy loam with soil pH of 7.33, low available N (182 kg ha⁻¹), medium in P₂O₅ (46.8 kg ha⁻¹) and high in K₂O (432 kg ha⁻¹). The experiment was laid out in strip plot design with three replications. The gross and net plot size were 7.2 m x 5.4 m and 5.4 m x 4.2 m respectively. There were twenty treatments comprised of four in-situ moisture conservation practices viz., flat method (M₁), ridge and furrow (M₂), BBF (M₃) and poly mulch on BBF (M₄) as main plots and five integrated nutrient management (INM) practices as sub plots viz farmer’s practice (S₁), 100% recommended dose of fertilisers (RDF, S₂), 125% RDF (S₃), 100% RDF along with 25% N through FYM (S₄) and 100% RDF along with 25% RDN through pressmud (S₅).

Neeraja BT-II Bt cotton seeds were dibbled at one seed hill¹ on 7th July during, 2015 and 2nd July during, 2016. The recommended dose of
fertilizer (RDF) in Telangana state was 150:60:60 NP and K kg ha⁻¹. Entire P fertilizer was applied as basal and N and K applied at 20, 40, 60 and 80 days after sowing (DAS) in equal splits. In integrated nutrient management treatments (S₄ and S₅), 25 per cent nitrogen was applied through organic manures as basal and remaining as that of the recommended dose of fertilizers (100 per cent RDF). Farmers practice of nutrient management was decided after surveying 30 cotton growing farmers for nutrient management in Southern Telangana Zone. It accounted to 50 kg of DAP at 20-25 DAS, 50 kg of 14-35-14 at 40-45 DAS, 50 kg of urea and 25 kg of muriate of potash at 60-65 DAS, 75 kg urea and potash 25 kg at 80-100 DAS. Based on the above, farmers practice of nutrient management was fixed with 3.75 t FYM ha⁻¹, 184-101-92 kg N, P₂O₅ and K₂O ha⁻¹ respectively. The details of the nutrient content of organic manures and amount of organics added were:

In M₁ treatment, simple flat bed method of sowing was imposed without any soil moisture conservation treatments (check). In M₂ treatment, ridges and furrows were laid at 90 cm apart respectively. While in M₃ and M₄ broad bed and furrow treatment, beds of 120 cm width and furrows of 60 cm were laid out. In M₅ treatment, polythene mulch with black (upper) and grey (bottom) having 25 μ thickness was laid before sowing of the crop on the raised (broad) beds (120 cm). Before laying the film, small circular holes were made as per the intra row spacing (60 cm) of the crop and the sheet was spread on the raised bed. After that, the sides of the polythene film were inserted tightly into the soil. In all the treatments, sowing was done adopting an intra row spacing of 60 cm, thus a uniform plant population (18,519 plants ha⁻¹) was maintained. A total rainfall of 375.3 mm was received in 27 rainy days during 2015-16 and 741.1 mm in 37 rainy days during 2016-17, as against the decennial average of 616 mm received in 37 rainy days for the corresponding period indicating that 2016-17 was comparatively a wet year.

Pre-emergence herbicide pendimethalin (Stomp 30% EC) at 1.0 kg a.i. ha⁻¹ was done to prevent the weed growth. Post emergence spray of quizalofop-p- ethyl (Targasuper 5% EC) at50 g a.i ha⁻¹ and pyrithiobac sodium (Hiltweed 10% EC) at 62.5 g a.i ha⁻¹ was carried out. Later, hand weeding was done at 40 DAS. The herbicide application and hand weeding were followed as a common practice in all the treatments. The crop was sprayed with monocrotophos at 1 ml l⁻¹ against aphids and bollworms and drenching of carbendazim at 1 gl⁻¹ of water was done against wilt. The seed cotton was harvested thrice, when the bolls were fully burst at 100 days after sowing (DAS), 125 and 150 DAS respectively during both the years of experimentation. The crop was finally terminated on 10th December, 2015 and 6th December, 2016 during first and second year of experimentation.

2.1 Weed Data

2.1.1 Weed density (No.m⁻²)

Weed density was recorded species wise in each treatment plot at 30, 60 and 90 DAS by using a quadrant (50 cm x 50 cm =0.25 m²). The weed count was expressed as number per meter square. The data was statistically analyzed after subjecting the values to square root transformation by using the formula.

\[ X = \sqrt{x+1} \]

Where X = Transformed value, x = Original value

2.1.2 Weed dry matter (g m⁻²)

The weeds present in each treatment plot at 30, 60 and 90 DAS stages were cut close to the ground surface within the quadrant area of 50 cm x 50 cm (0.25 m²) and shade dried first for 4-5 days and then in hot air oven at 65 ± 5°C temperature till constant weight was obtained and expressed as g m⁻².

2.1.3 Weed flora

During crop growth period (2015 and 2016) the predominant weed species were as follows.

Five plants in each net plot were selected at random and tagged for taking observations on bolls plant⁻¹ and boll weight. Destructive sampling for drymatter production at harvest was done in gross plots from the second row on both sides of border rows of the plot. The seed cotton in the net plot was harvested separately. The total seed cotton yield was obtained by adding the weight from each picking and expressed as kg ha⁻¹. Statistical analysis of the data of various growth, yield and yield attributes were carried out through analysis of variance technique as described by Panse and Sukhatme [8].
Table 1. Details of the nutrient content (%) and quantity of organic sources added are

| S. no. | Nutrient source | Nitrogen content (%) | Amount of material added (kg ha\(^{-1}\)) |
|--------|-----------------|----------------------|-----------------------------------------|
|        |                 | 2015 | 2016 | 2015 | 2016 |
| 1.     | Pressmud        | 1.92 | 2.24 | 1953 | 1674 |
| 2.     | FYM             | 0.49 | 0.72 | 7653 | 5208 |

Table 2. Weed flora observed in the experimental plot during 2015 and 2016

| S. no. | Weed species | Common Name       | Family          |
|--------|--------------|-------------------|-----------------|
| I. Grasses |              |                   |                 |
| 1      | Cynodon dactylon | Bermuda grass    | Poaceae         |
| 2      | Echino cloaclofana | Jungle rice         | Poaceae         |
| 3      | Eleusine indica   | Goose grass       | Poaceae         |
| II. Sedges |              |                   |                 |
| 1      | Cyperus rotundus   | Purple nut sedge  | Cyperaceae      |
| III. Broad leaved weeds | |                   |                 |
| 1      | Parthenium hysterophorus | Congress weed | Asteraceae      |
| 2      | Celosia argentea     | Foxtail amaranth  | Amaranthaceae   |
| 3      | Commelina benghalensis | Bengal dayflower | Commelinaceae   |
| 4      | Euphorbia geniculata  | Milkweed          | Euphorbiaceae   |
| 5      | Tri antheme maportulacastrum | Carpet weed | Aizoaceae      |

3. RESULTS AND DISCUSSION

3.1 Effect of Moisture Conservation Treatments on Yield, Weed Density and Weed Drymatter

Perusal of the data revealed that poly mulch on broad bed recorded significantly lower weed density at all the stages of crop growth. The poly mulch treatment recorded significantly lower weed density till harvest over rest of the treatments. On the other hand, flat bed method recorded higher weed density at all the stages as compared to other land configurations.

Pooled data revealed that at 30 DAS, among moisture conservation practices, poly mulch on broad bed recorded significantly lower weed density (3.1) and it was followed by BBF (6.4). This might be because black polythene mulch by its nature had absorbed higher quantum of sunlight owing to its dark color thus, increasing soil temperature, that suppressed weed inoculum that finally reflected in lower weed density in comparison to the non-mulched treatments [12]. The treatments BBF was on par with ridge & furrow (6.7) and flat bed methods.

At 40 DAS, manual weeding was done in all treatments as a common practice. Hence, at 60 DAS, weed density in all the treatments was low as compared to 90 DAS. At this stage, lower weed density was recorded under poly mulch on broad bed and it was followed by ridge & furrow, which was on par with BBF. BBF was in turn on par with flat bed method. At 90 DAS stage, weed density followed similar trend as that of 30 DAS.

In general the weed density was relatively higher at 90 DAS as compared to 30 and 60 DAS. From the data it is clearly evident that at 30 DAS the interaction effect of moisture conservation practices and integrated nutrient management practices was non significant. Contrary to this, at 60 as well as at 90 DAS it exerted significant effect (Tables 4 and 5).
Table 3. Effect of moisture conservation practices and INM on kapas yield of Bt cotton (Pooled mean, 2015 and 2016)

| Treatments              | S1   | S2   | S3   | S4   | S5   | Mean   |
|-------------------------|------|------|------|------|------|--------|
| M1 - Flat bed (control) | 1566 | 1447 | 1695 | 1758 | 1843 | 1662   |
| M2 - Ridge & furrow     | 1871 | 1779 | 2076 | 2125 | 2195 | 2009   |
| M3 - BBF                | 1687 | 1590 | 1898 | 1938 | 2004 | 1823   |
| M4 - Poly mulch on BBF  | 2018 | 1888 | 2293 | 2346 | 2370 | 2183   |
| Mean                    | 1785 | 1676 | 1990 | 2042 | 2103 | 1919   |

| S.E.m²                  | 26   | 21   | 18   | 29   |
| Sub treatments (S)      |      |      |      |      |
| S1: Farmerspractise     |      |      |      |      |
| S2: 100% RDF            |      |      |      |      |
| S3: 125% RDF            |      |      |      |      |
| S4: 100% RDF + FYM equiv to 25% RDN | | | | |
| S5: 100% RDF + Press mud equiv to 25% RDN | | | | |
| CV                      | 7.2  |      |      |      |

Similar to the weed density, higher weed dry weight was recorded at 90 DAS as compared to 30 and 60 DAS. Similarly, the interaction effect was non-significant at 30 DAS. In the same line as that of weed density the interaction effect was and significant at 60 & 90 DAS. Moisture conservation practices, as well as integrated nutrient management practices, exerted significant effect independently over weed dry weight (Tables 4 and 6).
Table 4. Effect of moisture conservation practices and INM on weed density (No m⁻²) and weed dry weight (g m⁻²) at 30 DAS

| Treatments                                      | Weed density (No m⁻²) | Weed dry weight (g m⁻²) |
|------------------------------------------------|-----------------------|-------------------------|
| Main treatments                                 |                       |                         |
| M₁ – Flat bed (control)                        | 2.8 (6.7)             | 1.3(0.8)                |
| M₂ – Ridge & furrow                            | 2.8 (6.7)             | 1.4(0.9)                |
| M₃ – Broad bed and furrow                      | 2.7 (6.4)             | 1.3(0.8)                |
| M₄ – Poly mulch on broad Bed                   | 2.0 (3.1)             | 1.2(0.4)                |
| S.Em±                                          | 0.03                  | 0.03                    |
| CD at 5%                                        | 0.1                   | 0.06                    |
| Sub treatments                                 |                       |                         |
| S₁                                              | 2.7 (6.2)             | 1.3(0.8)                |
| S₂                                              | 2.4 (5.0)             | 1.3(0.6)                |
| S₃                                              | 2.5 (5.2)             | 1.3(0.6)                |
| S₄                                              | 2.8 (6.9)             | 1.4(1.0)                |
| S₅                                              | 2.5 (5.2)             | 1.3(0.6)                |
| S.Em±                                          | 0.1                   | 0.03                    |
| CD at 5%                                        | 0.2                   | NS                      |
| CV                                              | 6.2                   | 6.8                     |
| Interaction                                    |                       |                         |
| M XS                                            |                       |                         |
| S.Em±                                          | 0.1                   | 0.03                    |
| CD at 5%                                        | NS                    | NS                      |
| S X M                                          |                       |                         |
| S.Em±                                          | 0.1                   | 0.02                    |
| CD at 5%                                        | NS                    | NS                      |

Sub treatments (S), S₁: Farmers practice, S₂: 100% RDF, S₃: 125% RDF, S₄: 100% RDF + FYM equivalent to 25% RDN, S₅: 100% RDF + Pressmud equivalent to 25% RDN

Data subjected to square root transformation. Original values are given in parenthesis

At 30 DAS, among moisture conservation practices, poly mulch on broad bed recorded significantly lower weed dry matter (0.4 g m⁻²). It was followed by BBF method (0.8 g m⁻²) which was on par with flat bed (0.8 g m⁻²) and ridge & furrow (0.9 g m⁻²). Weed dry weight recorded under ridge and furrow and flat bed was on par with each other.

In poly mulch treatment, the lower weed dry weight could be attributed to the reduced weed seed germination on account of high temperatures that suppressed the weed growth as compared to the non-mulched treatments [13].

Similarly at 60 DAS, poly mulch on broad bed maintained its superiority in terms of lower weed dry weight (0.4 g m⁻²) and it was followed by BBF (0.6 g m⁻²) which in turn was on par with ridge and furrow (0.6 g m⁻²) and flat bed methods (0.6 g m⁻²).

Contrary to 30 and 60 DAS, at 90 DAS, all the land configurations recorded lower weed dry weight as compared to flat bed method. Poly mulch on broad bed recorded significantly lower weed dry weight and it was followed by BBF, which was in turn comparable with ridge and furrow and in turn on par with flat bed method.

3.2 Effect of Integrated Nutrient Management on Yield, Weed Density and Weed Drymatter

Seed cotton yield was significantly higher (2103 kg ha⁻¹) in 100 per cent RDF + 25 per cent RDN through press mud (S₅) treatment and it was on par with 100 per cent RDF + FYM (2042 kg ha⁻¹). Application of 100 per cent RDF + 25 per cent RDN through FYM was in turn on par with 125 per cent RDF (1990 kg ha⁻¹) followed by Farmers practice (1785 kg ha⁻¹) and (S₂) 100 per cent RDF (1676 kg ha⁻¹).

Improved yield under conjunctive use of nutrients could be ascribed to the favorable soil physicochemical properties that favored slow and steady supply of the nutrients by the nutrient needs of the cotton crop coinciding with the critical stages apart from reduced losses of nutrients, common under inorganic fertilization [14].
Table 5. Effect of moisture conservation practices and INM on weed density (No m\(^{-2}\)) of Bt cotton (Pooled mean, 2015 and 2016)

| Treatments                      | 60 DAS S1 | 60 DAS S2 | 60 DAS S3 | 60 DAS S4 | 60 DAS Mean | 60 DAS S5 | 90 DAS S1 | 90 DAS S2 | 90 DAS S3 | 90 DAS S4 | 90 DAS Mean |
|--------------------------------|-----------|-----------|-----------|-----------|-------------|-----------|-----------|-----------|-----------|-----------|-------------|
| M1 - Flat bed (control)        | 2.8 (6.6) | 2.8 (6.5) | 2.6 (5.9) | 2.6 (5.8) | 2.6 (5.3)   | 2.6 (5.6) | 5.4 (28.2) | 5.8 (32.6) | 6.6 (42.1) | 6.6 (42.1) | 5.2 (26.5)  |
| M2 - Ridge & furrow            | 2.8 (6.6) | 2.8 (6.5) | 2.6 (5.9) | 2.6 (5.8) | 2.6 (5.3)   | 2.6 (5.6) | 5.7 (31.2) | 5.5 (28.9) | 6.1 (36.0) | 5.4 (28.2) | 5.7 (31.3)  |
| M3 - BBF                       | 2.1 (7.0) | 2.5 (5.4) | 2.6 (5.7) | 2.9 (7.3) | 2.6 (5.9)   | 2.7 (6.3) | 5.7 (31.2) | 5.4 (28.2) | 5.1 (25.4) | 5.9 (34.0) | 5.5 (28.8)  |
| M4 - Poly mulch on BBF         | 2.1 (7.3) | 2.0 (2.8) | 2.0 (2.8) | 2.2 (4.0) | 2.1 (3.1)   | 2.3 (4.2) | 4.2 (16.2) | 3.9 (14.0) | 4.6 (20.0) | 4.2 (16.6) | 4.2 (16.9)  |
| Mean                           | 2.6 (6.0) | 2.4 (4.9) | 2.4 (5.1) | 2.7 (6.5) | 2.5 (6.1)   | 2.5 (5.5) | 5.2 (25.9) | 5.1 (25.2) | 5.8 (33.0) | 5.1 (25.0) | 5.3 (27.8)  |

Sub treatments (S), S1: Farmers practice, S2: 100% RDF, S3: 125% RDF, S4: 100% RDF + FYM equivalent to 25% RDN, S5: 100% RDF + Press mud equivalent to 25% RDN

Table 6. Effect of moisture conservation practices and INM on weed dry weight (g m\(^{-2}\)) of Bt cotton (Pooled mean, 2015 & 2016)

| Treatments                      | 60 DAS S1 | 60 DAS S2 | 60 DAS S3 | 60 DAS S4 | 60 DAS Mean | 60 DAS S5 | 90 DAS S1 | 90 DAS S2 | 90 DAS S3 | 90 DAS S4 | 90 DAS Mean |
|--------------------------------|-----------|-----------|-----------|-----------|-------------|-----------|-----------|-----------|-----------|-----------|-------------|
| M1 - Flat bed (control)        | 1.29 (0.7) | 1.25 (0.6) | 1.25 (0.6) | 1.34 (0.8) | 1.26 (0.6)   | 1.28 (0.6) | 6.2 (37.3) | 6.0 (34.6) | 6.5 (41.2) | 5.7 (31.6) | 6.0 (35.2)  |
| M2 - Ridge & furrow            | 1.29 (0.7) | 1.28 (0.6) | 1.21 (0.5) | 1.32 (0.7) | 1.20 (0.4)   | 1.26 (0.6) | 5.8 (32.3) | 5.5 (29.4) | 5.5 (29.5) | 6.2 (37.0) | 5.3 (27.5)  |
| M3 - BBF                       | 1.31 (0.7) | 1.22 (0.5) | 1.23 (0.5) | 1.29 (0.7) | 1.25 (0.6)   | 1.26 (0.6) | 5.8 (32.8) | 5.4 (28.3) | 5.1 (25.0) | 6.0 (35.0) | 5.5 (29.2)  |
| M4 - Poly mulch on BBF         | 1.21 (0.5) | 1.11 (0.2) | 1.16 (0.3) | 1.22 (0.6) | 1.19 (0.4)   | 1.18 (0.4) | 4.3 (17.6) | 4.1 (16.1) | 3.8 (13.8) | 4.6 (20.2) | 4.0 (15.3)  |
| Mean                           | 1.27 (0.6) | 1.22 (0.5) | 1.21 (0.5) | 1.29 (0.7) | 1.23 (0.5)   | 1.24 (0.6) | 5.5 (30.0) | 5.2 (26.3) | 5.1 (25.7) | 5.8 (33.3) | 5.1 (25.9)  |

Sub treatments (S), S1: Farmers practice, S2: 100% RDF, S3: 125% RDF, S4: 100% RDF + FYM equivalent to 25% RDN, S5: 100% RDF + Press mud equivalent to 25% RDN

- Data subjected to square root transformation. Original values are given in parenthesis.
At all the crop growth stages, significant differences were observed in terms of weed density due to integrated nutrient management practices. At 30 DAS, application of 100 per cent RDF recorded lower weed density (5.0) followed by 125 per cent RDF (5.2) and (S3) 100 per cent RDF along with 25 per cent RDN through pressmud (5.1) treatment.

Contrary to this, higher weed density in S4 (6.9) and S1 treatments (6.2) was due to the due to viable weed seed from FYM that might have contributed to the soil weed seed bank, which in resulted in higher weed seed density in FYM applied plots compared to either pressmud treated plots or plots applied with inorganic fertilizers alone [15].

At 60 and 90 DAS, lower weed density was observed in S2 and S3 treatments, which in turn was comparable with S5 and followed by S1 and S4 treatments.

At 30 DAS, there were no significant differences observed in terms of weed dry weight among different integrated nutrient management practices. At 60 and 90 DAS, (S3) application of 125 per cent RDF recorded lower weed dry weight (0.5 gm−2) followed by 100 per cent RDF (0.5 gm−2) and (S3) 100 per cent RDF + 25 per cent RDN through pressmud (0.5 gm−2). These treatments were in turn on par with (S1) farmers’ practice (0.6 gm−2) and (S2) 100 per cent RDF + 25 per cent RDN through FYM (0.7 gm−2). Contrary to this, higher weed dry matter was observed in case of S4 and S1 plots applied with FYM as compared to either pressmud applied plots or plots applied with inorganic fertilizers alone.

3.3 Interaction between Soil Moisture Conservation Practices and Integrated Nutrient Management

Treatment combination involving poly mulch on broad bed and application of RDF along with 25 per cent RDN through pressmud (M3S3) recorded significantly higher mean seed cotton yield (2370 kg ha−1) over rest of the treatment combinations. This treatment was comparable with (M4S4) poly mulch on broad bed and application of RDF along with 25 per cent RDN through FYM (2346 kg ha−1). While, M3S5 and M4S4 treatments were in turn on par with poly mulch on broad bed and application of 125 per cent RDF (M5S5) indicating that poly mulch was more effective when RDF was applied either with pressmud or FYM equivalent to 25 per cent RDN or with 125 per cent RDF alone.

At 30 DAS, the interaction between soil moisture conservation practices and integrated nutrient management practices on weed density and dry matter was found to be non-significant. However, at 60 and 90 DAS, the interaction was found to be significant at 5 per cent level of significance. At 60 DAS, (M3S2) poly mulch on broad bed along with 100 % RDF and (M4S3) poly mulch on broad bed along with 125 per cent RDF recorded lower weed density. These treatments were followed by (M4S4) poly mulch on broad bed along with pressmud. At 90 DAS also similar results were observed with respect to weed density whereas, lower weed dry weight was observed with M3S3, which was comparable with M5S5 and M4S2.

4. CONCLUSION

From the above results, it can be concluded that in Telangana region, Bt cotton in red soils could be profitably cultivated with lower weed infestation and favourable moisture conservation by following application of inorganic fertilizers alone or pressed equivalent to 25 per cent RDN along with 100 per cent RDN or 125 per cent RDF with in-situ moisture conservation practice of poly mulch on broad bed compared to ridge and furrow and flat bed sowing.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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