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# Response of Nitrogen through Organic Sources on Growth, Yield and Quality of Cotton

**V.E. Bonge*, V.A. Khadse and A.S. Chavan**

Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar po, Akola (MS) 444104, India
**Corresponding author*

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**A B S T R A C T**

A field experiment was carried out at Agronomy farm, Dr. PDKV, Akola during *kharif* season of 2013-14 on clayey soil. The experiment was laid in factorial randomized block design with nine treatments and three replications. Treatments consist of nitrogen application through organic sources viz., 100 % RDN through soybean straw compost, 125 % RDN through soybean straw compost, 150 % RDN through soybean straw compost and Nitrogen levels Viz. 100 % RDN through pigeonpea stalk compost, 125 % RDN through pigeonpea stalk compost, 150 % RDN through pigeonpea stalk compost, 100 % RDN through FYM, 125 % RDN through FYM, 150 % RDN through FYM. Experimental results revealed that growth characters were significantly higher with application of 150 % RDN through FYM followed by 150 % RDN through soybean straw compost and 150 % RDN through pigeonpea stalk compost. Yield attributes and seed cotton yield were recorded significantly higher in 150 % RDN application through FYM followed by soybean straw compost and pigeonpea stalk compost with same level of nitrogen. Cotton stalk and biological yield were significantly maximum with application of 150 % RDN through FYM. The next best treatment was 150 % RDN application through soybean straw compost followed by 150 % RDN through pigeonpea stalk compost.

## Introduction

Cotton (*Gossypium spp*.) is most important natural source of fiber used in textile industry. It is also a valuable source of oil. The cultivated species of cotton contains 14 to 26 percent of oil. Cotton seed meal contains high percent of protein, which is rich in essential amino acids like lysine, methionine, tryptophan which is used as animal feed concentrate and fertilizer. Nearly one third of India's export earnings are from textile sectors of which cotton alone constitutes nearly 70 per cent of raw material. Cotton contributes 29.8 per cent of the Indian agricultural gross domestic product. Still there exits large potential for export of raw cotton and value added products.

India has unique place among the cotton growing countries of the world.

All the four lint bearing *Gossypium* spp. viz., *Gossypium hirsutum*, *Gossypium herbaceum*, *G. arboreum* and *G. barbadense* are grown commercially under diverse ecosystems over 85 lakh ha and with the production of 188.78 lakh bales in India (Anon., 2004).

In India, a major part of residues is used as animal feed, while some find use as fuel and some may make housing materials in the rural areas. Farmer collects left over in field that is straw, leaves, twigs and stubbles along with huge amount of grasses and weeds and burns it out for clean cultivation of any crop. So, it is necessary to find out alternative to farm yard manure by using compost straw of major cultivated crops like soybean straw, pigeonpea stalk, cotton stalk and many other prevailed on the farm. It is real pathway to sustainable agriculture by recycling the farm waste backs to soil. The productivity of cotton is controlled by many factors of which the mineral nutrition particularly nitrogen is by and large the most important factor, but the heavy and imbalance use of chemical fertilizers has led to think about the use of organic manures in intensively growing areas for sustainable production system. Therefore, to sustain the production potential of cotton, a field experiment was carried out.

## Materials and Methods

A field experiment was conducted during *kharif* season of 2013-14 at Dr. PDKV, Akola. The topography of field was fairly uniform and leveled. The soil characterized as clayey in texture and slightly alkaline in reaction (pH-7.6). The soil is high in nitrogen, medium phosphorous and fairly rich in potash. The experiment was laid in factorial randomized block design with nine treatments and three replications. Treatments consist of nitrogen application through organic sources viz., 100 % RDN through soybean straw compost, 125 % RDN through soybean straw compost, 150 % RDN through soybean straw compost, 100 % RDN through pigeonpea stalk compost, 125 % RDN through pigeonpea stalk compost, 150 % RDN through pigeonpea stalk compost, 100 % RDN through FYM, 125 % RDN through FYM, 150 % RDN through FYM. The gross and net plot size were 7.2 m x 6.0 m and 6.0 m x 5.4 m respectively. *Deshi* cotton (AKA-8) was sown on June 17$^{th}$, 2013.

## Results and Discussion

### Effect on Boll weight (g)

The results of boll weight has been presented in table 1. It could be seen from the data presented in table 1 that the mean boll weight was recorded significant difference among organic sources of nitrogen. FYM ($C_3$) was found significantly higher boll weight (1.66 g) over pigeonpea stalk compost ($C_2$) treatment (1.32 g). However, it was at par with soybean straw compost (1.64 g). Similar observations were recorded by Ramprakash and Mangal Prasad, (2000) and Prakash *et al.,* (2001). The levels of nitrogen were significantly influenced boll weight. Nitrogen level with 150% RDN was recorded maximum boll weight (1.63 g) than the 100% RDN level, however it was at par with level of 125% RDN. The present results are in accordance with the findings of Sisodia and Khamparia (2007) and Rao and Setty (2007).

### Effect on Seed cotton yield plant$^{-1}$ (g)

The data on yield of seed cotton per plant (g) as influenced by different treatments is presented in table 1. FYM ($C_3$) recorded significantly more seed cotton yield (29.60 g) over pigeonpea stalk compost ($C_2$) (23.27 g), but it was at par with soybean straw compost ($C_1$) (28.27 g). The similar results were conformed in response of FYM for cotton by Prakash *et al.,* (2001) and Hulihalli and Patil (2004).

The nitrogen level with 150 % RDN ($N_3$) (29.11 g) recorded significantly higher yield of seed cotton per plant being at par with level of 125 % RDN ($N_2$) (27.08 g) as compared to the level of 100 % RDN ($N_1$) (24.95 g). Similar results were obtained by Brar *et al.,* (2000) and Nehra and Kumavat (2003).

**Table.1** Yield attributes and Seed cotton yield as influenced by different treatments

| Treatments | Boll Wt. (g) | SCY plant$^{-1}$ (g) | SCY (kg ha$^{-1}$) | Stalk Yield (kg ha$^{-1}$) | H.I. (%) |
|---|---|---|---|---|---|
| | **Sources of Nitrogen** | | | | |
| $C_1$- Soybean straw compost | 1.64 | 28.27 | 1518 | 3021 | 33.45 |
| $C_2$- Pigeonpea stalk compost | 1.32 | 23.27 | 1314 | 2778 | 32.12 |
| $C_3$- FYM | 1.66 | 29.60 | 1604 | 3128 | 33.90 |
| SE (m)± | 0.07 | 0.49 | 30 | 42 | - |
| CD P= 0.05 | 0.22 | 1.47 | 90 | 126 | - |
| | **Nitrogen Level** | | | | |
| $N_1$- 100 % RDN | 1.37 | 24.95 | 1310 | 2827 | 31.66 |
| $N_2$- 125 % RDN | 1.61 | 27.08 | 1536 | 3027 | 33.66 |
| $N_3$- 150 % RDN | 1.63 | 29.11 | 1591 | 3073 | 34.11 |
| SE (m)± | 0.07 | 0.49 | 30 | 42 | - |
| CD P= 0.05 | 0.22 | 1.47 | 90 | 126 | - |
| | **A x B** | | | | |
| SE (m)± | 0.13 | 0.85 | 52 | 73 | - |
| CD P= 0.05 | NS | NS | NS | NS | - |
| GM | 1.33 | 27.04 | 1479 | 2976 | 33 |

**Table.2** Ginning percentage, seed index (g), lint index and Micronaire Value as Influenced by different treatment

| Treatments | Ginning (%) | Seed Index (g) (100 seed wt.) | Lint index | Micronaire value ($10^{-6}$ g inch$^{-1}$) |
|---|---|---|---|---|
| **Sources of Nitrogen** | | | | |
| $C_1$- Soybean straw compost | 40.97 | 6.19 | 4.30 | 5.78 |
| $C_2$- Pigeonpea stalk compost | 40.63 | 6.17 | 4.22 | 5.61 |
| $C_3$- FYM | 40.86 | 6.18 | 4.27 | 5.73 |
| SE (m)± | 0.23 | 0.04 | 0.05 | 0.08 |
| CD P= 0.05 | NS | NS | NS | NS |
| **Nitrogen Level** | | | | |
| $N_1$- 100 % RDN | 40.76 | 6.17 | 4.24 | 5.82 |
| $N_2$- 125 % RDN | 40.45 | 6.17 | 4.19 | 5.60 |
| $N_3$- 150 % RDN | 41.25 | 6.20 | 4.35 | 5.70 |
| SE (m)± | 0.23 | 0.04 | 0.05 | 0.08 |
| CD P= 0.05 | NS | NS | NS | NS |
| **A x B** | | | | |
| SE (m)± | 0.41 | 0.06 | 0.09 | 0.15 |
| CD P= 0.05 | NS | NS | NS | NS |
| GM | 40.82 | 6.18 | 4.26 | 5.71 |

## Effect on cotton stalk yield (kg ha$^{-1}$)

The results on cotton stalk yield (kg ha$^{-1}$) have been presented in table 1. FYM ($C_3$) produced significantly highest cotton stalk yield (3128 kg ha$^{-1}$) as compared to pigeonpea stalk compost ($C_2$) (2778 kg ha$^{-1}$). However, soybean straw compost ($C_1$) (3021 kg ha$^{-1}$) being at par with FYM ($C_3$) significantly higher cotton stalk yield over pigeonpea stalk compost ($C_2$). The increase in stalk yield with organic sources treatments might have attributed to the higher photosynthetic activity leading to better supply of carbohydrates resulted in more number of branches and dry matter accumulation. Similar data supplied by Pagaria *et al.,* (1995) and Prakash *et al.,* (2001).

The treatment differences in cotton stalk yield (kg ha$^{-1}$) due to levels of nitrogen were significant. Nitrogen level with 150 % RDN ($N_3$) produced significantly higher cotton stalk yield (3073 kg ha$^{-1}$) as compared to the cotton stalk yield (2827 kg ha$^{-1}$) was produced by 100 % RDN level ($N_1$).

The nitrogen level 125 % ($N_2$) produced cotton stalk yield (3027 kg ha$^{-1}$) which remained at par with 150 % RDN level and both were significant over 100 % RDN ($N_1$) (2827 kg ha$^{-1}$). Similarly, other researchers also observed that increase in nitrogen levels reflects on maximum dry matter accumulation per plant viz. Prakash and Prasad (2000) and Sisodia and Khamparia (2007).

## Effect on harvest index

The data is presented in table 1 showed that the mean harvest index was 33 per cent. The organic sources of nitrogen, FYM ($C_3$) registered significantly highest harvest index (33.90) which was followed by soybean straw compost ($C_1$) (33.45) and pigeonpea stalk compost ($C_2$) (32.12).

The levels of nitrogen with 150 % RDN ($N_3$) recorded higher harvest index (34.11) which was followed by level of nitrogen with 125 % RDN ($N_2$) (33.66) over a 100 % RDN level ($N_1$) (31.66).

## Effect on ginning per cent, seed index, lint index and micronaire value ($10^{-6}$ g inch$^{-1}$)

Data representing among qualities of fiber is presented in table 2. Treatments viz., organic sources of nitrogen, levels of nitrogen and interaction effects were not showed significant result in respect of ginning per cent, seed index, lint index and Micronaire value ($10^{-6}$ g inch$^{-1}$). These results corroborate with the findings of Sawaji *et al.,* (1993) and Chabra *et al.,* (1995).

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