Effect of Organic Source of Nitrogen on Growth, Yield and Economics of Baby Corn

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Authors’ contributions

This work was carried out in collaboration among all authors. Author PPK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author TSB guided and managed the analyses of the study. Author ACS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The experiment was conducted during rabi season of 2016-17 at Agronomy Organic Farm, College of Agriculture, Pune and experiment layout was randomized block design with twelve treatments and three replications. The treatments consisted of 6 different organic manures, i.e. FYM, vermicompost, poultry manure, seed cake, castor seed cake and cotton seed cake and their combinations. Growth characters like plant height (176.67 cm), leaf area plant\(^{-1}\) (87.33 dm\(^2\)), dry matter plant\(^{-1}\) (452.13 g), days to silk initiation (77.33) were significantly the very best recorded in 100% RDN through poultry manure. The yield and yield attributing characters that are cob yield, green fodder yield, number of baby cobs plant\(^{-1}\), length (with husk and without husk), weight (with husk and without husk) and girth (with husk and without husk) of baby corn were maximum with the applying of 100% RDN through poultry manure. Among various treatments maximum gross (3, 41,667 Rs. ha\(^{-1}\)) and net monetary returns (2, 55,397 Rs. ha\(^{-1}\)) were obtained by application of 100% RDN through poultry manure. The utmost benefit-cost ratio (3.96) was recorded with the applying of 100% RDN through poultry manure, whereas, minimum B: C ratio (1.50) was registered in absolute control.

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1. INTRODUCTION

India’s rank in terms of World’s Organic Agricultural land was 15 as per 2013 data. The total area under organic certification is 5.71 million hectares during (2015-16). This includes 26% cultivable area with 1.49 million hectare and rests 74% (4.22 million hectares) forest and wild area for collection of minor forest produce. Anon [1].

Corn (Zea mays L.) ‘Queen of cereals’ is a versatile crop and is widely used as food, feed and fodder. Baby corn is an unfertilized immature young cob of corn harvested just before or after two to three days of silk emergence. Improved production technology for baby corn can help to fetch a higher economic return (4-5 times) and a quality product as compared to grain corn. Also, the early harvest of corn for baby corn gives nutritious green fodder for livestock. Thus, there is an immense scope of growing corn as baby corn to improve the socio-economic status of poor farmers, and this has vast potential to generate employment opportunities in the rural areas as a small-scale enterprise Sharma and Banik [2].

Organic farming is an approach to produce food products that are intended to overcome the negative impacts of the Green Revolution on soil, air, water, landscape, and humans worldwide. A central element of the organic farming approach is the efficient use of on-farm and local resources such as farmyard manure, indirect crop protection and local seeds. It pursues a course of promoting the powers of self-regulation and resistance which plants and animals possess naturally Yuda et al. [3].

2. MATERIALS AND METHODS

The field experiment was conducted during rabi season of 2016-17 at Agronomy Organic Farm, in Plot No. 3 ‘B’ Division, College of Agriculture, Pune (M.S.) The experiment was designed in a randomized block design with twelve treatments and three replications. Gross and net plot sizes were 4.20 × 3.60 m² and 3.80 × 2.40 m², respectively. All the twelve treatments consisted of T₁ (100% RDN through FYM), T₂ (100% RDN through vermicompost), T₃ (100% RDN through poultry manure), T₄ (100% RDN through neem seed cake), T₅ (100% RDN through castor seed cake), T₆ (100% RDN through cotton seed cake), T₇ (50% RDN through FYM + 50% RDN through vermicompost), T₈ (50% RDN through vermicompost + 50% RDN through poultry manure), T₉ (50% RDN through poultry manure+ 50% RDN through neem seed cake), T₁₀ (50% RDN through neem seed cake + 50% RDN through castor seed cake), T₁₁ (50% RDN through castor seed cake + 50% RDN through cotton seed cake) and T₁₂ (Absolute control).

Baby corn variety Gold-999 was sown @ 30 kg seed ha⁻¹ at the spacing of 60×10 cm⁻², in November 2016 and harvested in February 2017. Nitrogen analysis of organic manures were administered by using micro kjeldahl method and the results found were N content in FYM (0.50%), vermicompost (1.2%), poultry manure (2.9%), neem seed cake(4.5%), castor seed cake(4.4%) and cotton seed cake(3.8%). Nitrogen was applied @ 120 kg N ha⁻¹ to the soil 12 days before sowing through six organic sources as per treatments.

3. RESULTS AND DISCUSSION

3.1 Plant Height

The plant height increased with the advancement of crop age and maximum plant height was recorded at harvest stage. At 42, 56, 70 DAS and at harvest significantly the best plant height (36.67 cm, 78 cm, 110 cm, 176.67 cm ) was recorded by treatment T₅ (100% RDN through poultry manure) which was found at par with T₇ (50% RDN through FYM + 50% RDN through vermicompost) and T₈ (50% RDN through vermicompost + 50% RDN through poultry manure). The mean plant height at 28, 42, 56, 70 DAS and at harvest was 8.68 cm, 31.50 cm, 61.50 cm, 150.70 cm. Rock bottom plant height was recorded in T₁₂ (Absolute control) in any respect stages of growth (Table 1).

It might be because of more availability and release of nutrients by poultry manure throughout the season. Nitrogen increases photosynthetic activity and helps in maintaining higher auxin level which could have resulted in better plant height. The favorable effect of vermicompost on growth could be attributed to the presence of relatively readily available plant nutrients, growth enhancing substances and number of beneficial micro-organisms like nitrogen-fixing, phosphate solublising, cellulose decomposing and other
beneficial microbes. These results were confirmed with Farhad et al. [4], Gudugi et al. [5], Amos et al. [6], Simon and Balabbo [7], Ranjan et al. [8], Kalra and Sharma [9], Shiyam et al. [10] and Yogananda et al. [11].

3.2 Dry Matter

The dry matter plant\(^1\) of baby corn increased continuously with the advancement within the crop age up to the harvest of the crop. The mean dry matter plant\(^1\) of baby corn at 28, 42, 56, 70 DAS and at harvest was 1.56 g, 18.89 g, 137.61 g, 270.23 g, and 370.08 g, respectively (Table 2). Dry matter plant\(^1\) differed significantly at 42, 56, 70 DAS and at harvest except at 28 DAS. The treatment T\(_3\) (100% RDN through poultry manure) recorded significantly higher dry matter plant\(^1\) in any respect stages than all other treatments under study. However, at 56 DAS treatments T\(_7\) (50% RDN through FYM + 50% RDN through vermicompost), T\(_8\) (50% RDN through vermicompost + 50% RDN through poultry manure) and T\(_5\) (100% Castor seed cake) were found to be at par with treatment T\(_5\) (100% RDN through poultry manure). At 42, 70 DAS and at harvest treatments T\(_7\) (50% RDN through FYM + 50% RDN through vermicompost) and T\(_8\) (50% RDN through vermicompost + 50% RDN through poultry manure) were found to be at par with T\(_5\) (100% RDN through poultry manure).

Timely and optimum availability of essential nutrients through poultry manure may have attributed to achieve higher dry matter plant\(^1\). As increment within the leaf area of the crop is the factor to extend biomass production because of the maximum leaf area absorb more radiation and can increase the photosynthesis rate. Similar results were reported by Kalra and Sharma [9], Boateng et al. [12], Agba et al. [13], Shinde et al. [14].

3.3 Leaf Area

The leaf area plant\(^1\) of baby corn increased continuously with the advancement within the crop age up to the harvest of the crop. The mean leaf area 4.15 dm\(^2\), 14.15 dm\(^2\), 47.83 dm\(^2\), 67.00 dm\(^2\), and 70.58 dm\(^2\) of baby corn at 28, 42, 56, 70 DAS and at harvest, respectively (Table 3). Leaf area plant\(^1\) differed significantly at 42, 56, 70 DAS and at harvest except at 28 DAS. The treatment T\(_5\) (100% RDN through poultry manure) recorded significantly the best leaf area plant\(^1\) at 42, 56, 70 DAS and at harvest than remainder of the treatments under study but, it had been at par with treatments T\(_7\) (50% RDN through FYM + 50% RDN through vermicompost) and T\(_8\) (50% RDN through vermicompost + 50% RDN through poultry manure).

Table 1. Plant height (cm) of baby corn as influenced periodically by different treatments

| Symbol | Treatment                                      | 28   | 42   | 56   | 70    | At harvest |
|--------|-----------------------------------------------|------|------|------|-------|------------|
| T\(_1\) | 100% RDN through FYM                          | 8.67 | 24.00| 42   | 66.33 | 116.67     |
| T\(_2\) | 100% RDN through VC                           | 8.67 | 31.33| 56.33| 74.00 | 144.33     |
| T\(_3\) | 100% RDN through PM                           | 9.00 | 36.67| 78.00| 110   | 176.67     |
| T\(_4\) | 100% RDN through NSC                          | 8.27 | 26.00| 47.67| 68.33 | 145.67     |
| T\(_5\) | 100% RDN through CSC                           | 9.00 | 34.67| 76.33| 99.00 | 165.67     |
| T\(_6\) | 100% RDN through CoSC                          | 8.33 | 31.67| 57.67| 86.00 | 154.00     |
| T\(_7\) | 50% RDN through FYM + 50% RDN through VC      | 8.93 | 35.67| 76.67| 109.67| 174.00     |
| T\(_8\) | 50% RDN through VC + 50% RDN through PM       | 9.00 | 36.00| 77.33| 109.33| 175.33     |
| T\(_9\) | 50% RDN through PM + 50% RDN through NSC      | 8.67 | 32.67| 57.67| 87.00 | 157.00     |
| T\(_10\)| 50% RDN through NSC + 50% RDN through CSC     | 8.33 | 31.33| 57.33| 86.67 | 149.00     |
| T\(_11\)| 50% RDN through CSC + 50% RDN through CoSC    | 9.00 | 34.33| 69.33| 94.33 | 158.67     |
| T\(_12\)| Absolute control                               | 8.33 | 23.67| 41.67| 60.00 | 91.33      |
| S.Em+  |                                               | 0.26 | 0.60 | 0.54 | 0.70 | 1.27       |
| C.D. at 5% |                                             | NS  | 1.77 | 1.59 | 2.06 | 3.72       |
| General mean |                                          | 8.68 | 31.50| 61.50| 87.56| 150.70     |

(Note: RDN- Recommended Dose of Nitrogen, FYM-Farm Yard Manure, VC- Vermicompost, PM- Poultry Manure, NSC- Neem Seed Cake, CSC- Castor Seed Cake, CoSC-Cotton Seed Cake)
Table 2. Dry matter plant\(^1\) (g) of baby corn as influenced periodically by different treatments

| Symbol | Treatment | Days after sowing | At harvest |
|--------|-----------|------------------|------------|
|        |           | 28 | 42 | 56 | 70 |          |
| T\(_1\) | 100% RDN through FYM | 1.50 | 14.78 | 100.57 | 220.27 | 310.20 |
| T\(_2\) | 100% RDN through VC | 1.52 | 23.67 | 115.00 | 244.87 | 356.80 |
| T\(_3\) | 100% RDN through PM | 1.71 | 26.33 | 174.00 | 365.80 | 452.13 |
| T\(_4\) | 100% RDN through NSC | 1.56 | 12.38 | 86.00 | 198.27 | 254.43 |
| T\(_5\) | 100% RDN through CSC | 1.57 | 24.85 | 172.33 | 327.87 | 428.03 |
| T\(_6\) | 100% RDN through CoSC | 1.48 | 13.51 | 139.33 | 257.50 | 338.33 |
| T\(_7\) | 50% RDN through FYM + 50% RDN through VC | 1.60 | 25.67 | 173.67 | 359.21 | 446.13 |
| T\(_8\) | 50% RDN through VC + 50% RDN through PM | 1.63 | 25.83 | 172.77 | 360.50 | 451.20 |
| T\(_9\) | 50% RDN through PM + 50% RDN through NSC | 1.57 | 18.33 | 148.33 | 232.73 | 436.50 |
| T\(_10\) | 50% RDN through NSC + 50% RDN through CSC | 1.55 | 17.00 | 159.33 | 338.70 | 436.50 |
| T\(_11\) | 50% RDN through CSC + 50% RDN through CoCS | 1.47 | 11.67 | 63.33 | 93.07 | 187.13 |
| T\(_12\) | Absolute control | S. Em | 0.08 | 0.47 | 3.29 | 2.94 | 2.24 |
|        | C.D. at 5% | NS | 1.38 | 9.65 | 8.63 | 6.58 |
|        | General mean | 1.56 | 18.89 | 137.61 | 270.23 | 370.08 |

Table 3. Leaf area plant\(^1\) (dm\(^2\)) of baby corn as influenced periodically by different treatments

| Symbol | Treatment | Days after sowing | At harvest |
|--------|-----------|------------------|------------|
|        |           | 28 | 42 | 56 | 70 |          |
| T\(_1\) | 100% RDN through FYM | 4.07 | 13.00 | 43.67 | 54.67 | 59.33 |
| T\(_2\) | 100% RDN through VC | 4.13 | 14.90 | 49.33 | 64.33 | 67.33 |
| T\(_3\) | 100% RDN through PM | 4.30 | 16.17 | 52.67 | 84.33 | 87.33 |
| T\(_4\) | 100% RDN through NSC | 4.00 | 13.00 | 42.33 | 52.67 | 55.67 |
| T\(_5\) | 100% RDN through CSC | 4.00 | 14.83 | 49.33 | 75.67 | 79.00 |
| T\(_6\) | 100% RDN through CoSC | 4.17 | 14.97 | 49.00 | 64.67 | 65.67 |
| T\(_7\) | 50% RDN through FYM + 50% RDN through VC | 4.20 | 16.33 | 51.00 | 82.33 | 86.33 |
| T\(_8\) | 50% RDN through VC + 50% RDN through PM | 4.30 | 16.00 | 52.33 | 83.33 | 87.00 |
| T\(_9\) | 50% RDN through PM + 50% RDN through NSC | 4.17 | 14.30 | 48.30 | 63.67 | 69.00 |
| T\(_10\) | 50% RDN through NSC + 50% RDN through CSC | 4.17 | 12.33 | 49.00 | 64.33 | 67.33 |
| T\(_11\) | 50% RDN through CSC + 50% RDN through CoCS | 4.27 | 14.33 | 50.04 | 70.00 | 73.67 |
| T\(_12\) | Absolute control | S. Em | 0.15 | 0.28 | 0.74 | 0.76 | 1.22 |
|        | C.D. at 5% | NS | 0.83 | 2.17 | 2.23 | 3.57 |
|        | General mean | 4.15 | 14.15 | 47.83 | 67.00 | 70.58 |

Nutrient availability through poultry manure is quick and continuous which resulted in higher uptake and vigorous growth of the plant as compared to other manures. N is a vital constituent of amino acids and chloroplasts which directly influenced plant leaf area and development through greater photosynthates. Similar results were observed by Amos et al. [6], Said et al. [15], Wailare and Kesawani [16].
3.4 Days to Silk Initiation

The earlier silk initiation (77.33) was observed in T₃ (100% RDN through poultry manure) it would flow from to less availability of nitrogen to the crop. The mean number of days required for silk initiation was 80.17 (Table 4) Application of organic manures induced crop to achieve to tasseling, silking and harvest stage before that within the non-manure or non-fertilized plot. Nutritional status of a crop is understood to influence floral induction within the crop. Certain crop like maize attains reproductive stage only N content within the plant is above the edge level. Increase in N level advanced the tasseling and silking stage in maize. This is often probably because poultry manure and vermicompost supplied major nutrients also as micro-nutrients ensuring balanced plant nutrition thus, reducing the amount of maturity.

Beside the appliance of two vermiwash sprays may have attributed to the presence of growth hormones, enzymes, micronutrients and other secretions of earthworms which are needed to stimulate the expansion and development of crop and even develop resistance within the crop. Similar results were found by More et al. [17].

3.5 Number of Baby Corn

The data concerning number of baby cobs plant⁻¹ was found to be non-significant (Table 5). The mean number of baby corn plant⁻¹ was 3.99. This could be attributed to the explanation that cob bearing potential of a variety controlled by its genetic makeup instead of the agronomic practices. These results were confirmed with Farhad et al. [4].

3.6 Length, Weight and Girth of Baby Corn

The mean length of baby corn with husk and without husk was 25.56 cm and 8.95 cm, respectively. Treatment T₃ recorded significantly the longest length of cob both with husk (32.33 cm) and without husk (11.00 cm) than the remainder of the treatments except treatment T₇ and T₈ which were found to be at par with it (Table 6).

The mean weight of baby corn with husks and without husk was 61.59 g and 12.60 g, respectively. Significantly, the best weight of baby corn (76.33 g) with husks and (15.20 g) without husk was recorded in T₃ than the rest of the treatments except treatment T₇ and T₈ which were found to be at par with it.

The mean girth of baby corn with husk and without husk was 7.68 cm and 3.20 cm, respectively. Significantly, the very best girth of baby corn (9.00 cm) with husk and (4.00 cm) without husk was recorded in T₃ than remaining of the treatments except treatment T₇ and T₈ which were found to be at par with it. Obtaining best results regarding yield attributing characters could be because of increasing photosynthetic area, better dry matter accumulation and also thanks to the translocation of photosynthates towards the sink, during which potassium plays a vital role and nitrogen and phosphorous are

| Symbol | Treatment                              | Days to silk initiation |
|--------|----------------------------------------|-------------------------|
| T₁     | 100% RDN through FYM                   | 80.00                   |
| T₂     | 100% RDN through VC                    | 80.00                   |
| T₃     | 100% RDN through PM                    | 77.33                   |
| T₄     | 100% RDN through NSC                   | 83.67                   |
| T₅     | 100% RDN through CSC                   | 78.33                   |
| T₆     | 100% RDN through CoSC                  | 79.67                   |
| T₇     | 50% RDN through FYM+ 50% RDN through VC| 78.00                   |
| T₈     | 50% RDN through VC+50% RDN through PM  | 77.67                   |
| T₉     | 50% RDN through PM+50% RDN through NSC| 80.00                   |
| T₁₀    | 50% RDN through NSC+ 50% RDN through CSC| 80.33                  |
| T₁₁    | 50% RDN through CSC+ 50% RDN through CoSC| 80.33                  |
| T₁₂    | Absolute control                       | 86.67                   |
| S. Em+ |                                        | 0.41                    |
| C.D. at 5% |                                    | 1.19                    |
| General mean |                                | 80.17                   |
required for correct development. The results indicated the number of baby corn, length, weight and girth of baby corn were confirmed with Gudugi et al. [5], Amos et al. [6], Ranjan et al. [8], Shiyam et al. [10], Shinde et al. [14], Udom and Bello [18], Keerthirani [19], Hekmat and Abraham [20], Shah and Wani [21].

### 3.7 Yield Studies

The baby corn (with husk) yield differed significantly because of various sources of organic manure. The treatment T3 produced the highest baby corn yield (135.23 q ha⁻¹) which was significantly superior over remaining of the treatments, but, it was at par with treatments T7 and T8. Significantly rock bottom yield (37.76 q ha⁻¹) was obtained from treatment T₁₂ (Absolute control) (Table 7). The information regarding the dry cob yield followed an identical trend as fresh baby cob yield.

The differences in green fodder yield of baby corn was thanked to various treatments under study were found significant. From the info summarized in Table 7 it had been revealed that the mean green fodder yield of baby corn under experimental conditions was 312.71q ha⁻¹. The green fodder yield from treatment T₇, T₈, T₉ and T₁₁ were at par with T₃. Treatment T₁₂ produced significantly rock bottom green fodder yield (164.47q ha⁻¹) compared to all or any other treatments.

The higher yield and good yield attributes were found in 100% poultry manure treatment which might be assigned to higher mineralization potential of poultry manure enabling it to active and fast release of its nutrients for plant uptake. The general improvement reflected within the better source-sink relationship, which successively enhanced the yield and yield attributes. Additionally, the availability of plant nutrients through the organic source provided externally, the formation of organic acids through decomposition process also provide the native nutrients within the soil and increases their availability to plants. These results regarding baby corn and green fodder yields of experimental baby corn were almost like Sharma and Banik [2], Farhad et al. [4], Amos et al. [6], Ranjan et al. [8], Shiyam et al. [10], Boateng et al. [12], Agba et al. [13], Shinde et al. [14], Wailare and Kesarwani [16], Udom and Bello [18], Keerthirani [19], Hekmat and Abraham [20].

### 3.8 Economics

The maximum cost of cultivation (1, 76,420 Rs. ha⁻¹) was recorded in T₅ (Table 8). The high value of cultivation is because of the high cost of castor seed cake. The highest gross monetary returns (3, 41,667 Rs. ha⁻¹), net monetary returns (2, 55,397 Rs. ha⁻¹) and B: C ratio (3.96) was obtained from T₃. The lower net monetary returns among the treatments were noticed because of high cost of organic manures. Poultry manure treated plots obtained higher B:C ratio thanks to the low cost of poultry manure compared to other treatments, and also because of high available N content within the manure than remaining of the treatments. Similar results were observed by Sharma and Banik [2], Keerthirani [19], Manjunath et al. [22], Negi et al. [23].

### Table 5. Number of baby corn plant¹ as influenced by different treatments

| Symbol | Treatment                                      | Number of baby corn plant¹ |
|--------|-----------------------------------------------|-----------------------------|
| T₁     | 100% RDN through FYM                          | 3.93                        |
| T₂     | 100% RDN through VC                            | 4.00                        |
| T₃     | 100% RDN through PM                            | 4.17                        |
| T₄     | 100% RDN through NSC                           | 3.93                        |
| T₅     | 100% RDN through CSC                           | 4.00                        |
| T₆     | 100% RDN through CoSC                          | 4.00                        |
| T₇     | 50% RDN through FYM+ 50% RDN through VC        | 4.00                        |
| T₈     | 50% RDN through VC+50% RDN through PM          | 4.10                        |
| T₉     | 50% RDN through PM+50% RDN through NSC         | 4.00                        |
| T₁₀    | 50% RDN through NSC+ 50% RDN through CSC       | 3.97                        |
| T₁₁    | 50% RDN through CSC+ 50% RDN through CoCS      | 4.00                        |
| T₁₂    | Absolute control                               | 3.77                        |

S. Em+: 0.07
C. D. at 5%: NS
General mean: 3.99
Table 6. Length, weight and girth of baby corn as influenced by different treatments

| Symbol | Treatment | Length of baby cob (cm) | Weight of baby cob (g) | Girth of baby cob (cm) |
|--------|-----------|-------------------------|-----------------------|-----------------------|
|        |           | With husk                | Without husk          | With husk             | Without husk          |
| T₁     | 100% RDN through FYM | 20.00                    | 7.33                  | 42.00                 | 8.73                 | 6.87                 | 2.00                 |
|        | RDN through VC         | 24.00                    | 8.67                  | 58.67                 | 13.27                | 7.33                 | 3.00                 |
| T₃     | 100% RDN through PM    | 32.33                    | 11.00                 | 76.33                 | 15.20                | 9.00                 | 4.00                 |
| T₄     | 100% RDN through NSC   | 17.67                    | 6.83                  | 56.33                 | 9.67                 | 6.00                 | 2.17                 |
| T₅     | 100% RDN through CSC   | 31.00                    | 10.00                 | 71.00                 | 14.07                | 9.00                 | 3.53                 |
| T₆     | 100% RDN through CoSC  | 25.33                    | 9.33                  | 63.67                 | 13.47                | 8.00                 | 3.47                 |
| T₇     | 50% RDN through FYM+ 50% RDN through VC | 31.33                  | 10.33                 | 74.17                 | 14.33                | 8.67                 | 3.90                 |
|        | 50% RDN through VC+50% RDN through PM  | 31.67                   | 10.67                 | 75.00                 | 14.70                | 9.00                 | 3.93                 |
| T₉     | 50% RDN through PM+50% RDN through NSC | 24.33                   | 8.67                  | 62.00                 | 13.50                | 7.33                 | 3.41                 |
| T₁₀    | 50% RDN through NSC+ 50% RDN through CSC | 23.67                   | 9.00                  | 59.00                 | 12.67                | 7.67                 | 3.60                 |
| T₁₁    | 50% RDN through CSC+ 50% RDN through CoCS | 27.00                   | 9.33                  | 63.53                 | 13.30                | 8.33                 | 3.30                 |
| T₁₂    | Absolute control       | 18.33                    | 6.20                  | 37.33                 | 8.33                 | 5.00                 | 2.08                 |
| S. Em+ |                        | 0.37                     | 0.44                  | 1.46                  | 0.31                 | 0.21                 | 0.06                 |
| C.D. at 5% |                        | 1.09                     | 1.28                  | 4.28                  | 0.90                 | 0.63                 | 0.18                 |
| General mean |                        | 25.56                    | 8.95                  | 61.59                 | 12.60                | 7.68                 | 3.20                 |
| Symbol | Treatment | Baby corn (with husk) | Dry cob | Green fodder | Stover |
|--------|-----------|----------------------|--------|-------------|--------|
| T₁     | 100% RDN through FYM | 89.55 | 16.12 | 298.98 | 74.74 |
| T₂     | 100% RDN through VC | 98.68 | 17.76 | 324.56 | 81.14 |
| T₃     | 100% RDN through PM | 135.23 | 24.34 | 355.99 | 89.00 |
| T₄     | 100% RDN through NSC | 73.83 | 13.29 | 255.12 | 63.78 |
| T₅     | 100% RDN through CSC | 109.65 | 19.74 | 350.15 | 87.54 |
| T₆     | 100% RDN through CoSC | 95.03 | 17.11 | 314.33 | 78.58 |
| T₇     | 50% RDN through FYM+ 50% RDN through VC | 113.30 | 20.39 | 351.97 | 87.99 |
| T₈     | 50% RDN through VC+50% RDN through PM | 120.61 | 21.71 | 354.17 | 88.54 |
| T₉     | 50% RDN through PM+50% RDN through NSC | 102.34 | 18.42 | 313.96 | 78.49 |
| T₁₀    | 50% RDN through NSC+ 50% RDN through CSC | 98.68 | 17.76 | 321.64 | 80.41 |
| T₁₁    | 50% RDN through CSC+ 50% RDN through CoCS | 103.44 | 18.62 | 347.22 | 86.81 |
| T₁₂    | Absolute control | 73.67 | 6.73 | 164.47 | 41.12 |

S. E m+ | 7.63 | 1.37 | 9.40 | 2.35 |
C. D. at 5% | 22.67 | 4.03 | 27.56 | 6.89 |
General mean | 99.14 | 17.85 | 312.71 | 78.18 |

| Symbol | Treatment | CoC (Rs. ha⁻¹) | GMR (Rs. ha⁻¹) | NMR (Rs. ha⁻¹) | B:C ratio |
|--------|-----------|----------------|---------------|----------------|-----------|
| T₁     | 100% RDN through FYM | 1,21,820 | 2,38,889 | 1,17,069 | 1.96 |
| T₂     | 100% RDN through VC | 1,43,820 | 2,62,281 | 1,18,461 | 1.82 |
| T₃     | 100% RDN through PM | 86,270 | 3,41,667 | 2,55,397 | 3.96 |
| T₄     | 100% RDN through NSC | 1,18,020 | 3,41,667 | 2,55,397 | 3.96 |
| T₅     | 100% RDN through CSC | 1,76,420 | 2,89,327 | 1,12,907 | 1.64 |
| T₆     | 100% RDN through CoSC | 1,49,660 | 2,52,924 | 1,03,264 | 1.69 |
| T₇     | 50% RDN through FYM+ 50% RDN through VC | 1,32,820 | 3,12,061 | 1,79,241 | 2.35 |
| T₈     | 50% RDN through VC+50% RDN through PM | 1,15,045 | 2,97,003 | 1,81,958 | 2.58 |
| T₉     | 50% RDN through PM+50% RDN through NSC | 1,02,145 | 2,67,471 | 1,65,326 | 2.62 |
| T₁₀    | 50% RDN through NSC+ 50% RDN through CSC | 1,47,220 | 2,61,696 | 1,14,476 | 1.78 |
| T₁₁    | 50% RDN through CSC+ 50% RDN through CoCS | 1,63,040 | 2,76,316 | 1,13,276 | 1.69 |
| T₁₂    | Absolute control | 71,635 | 1,07,620 | 35,985 | 1.50 |

S. E m+ | 15437 | 15437 | - |
C. D. at 5% | 45277 | 45277 | - |
General mean | 2,58,828 | 1,31,502 | - |

Note: CoC: Cost of Cultivation GMR: Gross Monetary Returns, NMR: Net Monetary Returns

4. CONCLUSIONS
The application of 100% RDN through poultry manure recorded highest yield among all treatments with the lowest cost of cultivation (86.270 Rs. ha⁻¹), higher values of gross monetary returns (3, 41,667 Rs. ha⁻¹), net monetary returns (2, 55,397 Rs. ha⁻¹) and benefit cost ratio (3.96).
Thus, from the economic point of view poultry manure would be advisable as the best and cheaper organic source of nitrogen among other organic sources followed by 50% RDN through vermicompost + 50% RDN through neem seed cake.

The above conclusions, however, are based on one season study. For confirmation of these results, the investigation needs to be repeated.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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