**Response of Integrated Nutrient Management on Growth and Yield of Cluster bean (*Cyamopsis tetragonoloba* L.)**

# Abstract

A field experiment was conducted at Research Farm, Mewar University Gangrar, Chittorgarh (Rajasthan) during rainy season to response of integrated nutrient management on growth and yield of cluster bean variety “RGC-1033‟ was used in this study. The result revealed that the maximum growth parameters like plant height (27.00 67.55 cm at 30 and 60 DAS), number of branches per plant (3.65 and 12.75 at 30 and 60 DAS), minimum days taken to 50% flowering (38.51 days), minimum days taken to first fruit picking (42.75 days), number of root nodules per plant (33.85) and yield parameters like number of cluster per plant (29.20), number pods per plant (8.32), pod yield per plant (180.63 g) and pod yield (158.09 q/ha) was recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium. Therefore, it was concluded that treatment T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium was found superior in growth and yield as compare to other treatments. So, it was concluded that the treatment Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium are better among all the treatments combination for higher yield.

**Key words: - Biofertilizer, Growth, Cluster bean, Yield**

**1. Introduction**

Cluster bean (*Cyamopsis tetragonoloba* L.) belongs to family Fabaceae is an important drought resistant leguminous vegetable crop. It is a short duration crop mainly in arid and semi-arid regions of tropical India. Its deep penetrating root system enables the plant to utilize available moisture more efficiently and thus offers better scope for rainfed cropping. Cluster bean is used for human consumption, cattle feed, medicinal and industrial purposes as well as for soil improvement. Cluster bean is rich source of protein and minerals. For human consumption immature pods are being dried, salted and preserved for vegetable purpose. Seed coats and cotyledons obtained after processing of cluster bean are used as high protein cattle feed as well as emergency fuel when wood or dung is in short supply (Patel *et al.* 2018). The basic concept underlying the principle of integrated nutrient management is to maintain or adjust plant nutrient supply to achieve a given level of crop production by optimizing the benefits from all possible sources of plant nutrients. Integrated nutrient management not only aims at reducing the use of inorganic fertilizers, but also helps in restoring the soil organic matter, enhances nutrient use efficiency and maintains soil quality in terms of physical, chemical and biological properties. Bulky organic manures may not be able to supply adequate amount of nutrients, nevertheless their role becomes important in meeting the above objectives (Rao and Reddy 2008). Use of inorganic fertilizers alone though increases the production at a faster rate, it may not sustain the productivity in long run and affects soil health. Moreover, inorganic fertilizers are costly and their imbalanced use deteriorate soil physio-chemical environment. On the other hand, organic sources of nutrients are cheaper, ecofriendly, improve soil properties and can substitute nutrient requirement of crops partially (Narayana *et al.* 2009). The judicious use of fertilizer and organic manures plays a vital role to achieve higher yield of cluster bean. Among different plant nutrients nitrogen is the most important nutrient for plant growth and development. The use of organic manure (FYM) or other farm waste to improve the physical, chemical and biological properties of the soil. Integrated nutrient management system through efficient use of organic matter improving soil physical condition and conservation of moisture, can substantially enhance crop production. In plant nutrition, organic matter levels of a soil are the key property that decides the availability status of essential nutrient. Most soils of India are deficient in nitrogen and organic matter (Joshi *et al*. 2016).

# 2. Materials and Methods

A field experiment was conducted during Kharif season of 2024-25 at research farm, Department of Agriculture (Horticulture) Vegetable Science, Faculty of Agriculture and Veterinary Sciences, Mewar University Gangrar, Chittorgarh (Rajasthan). Soil of the experimental field was sandy loam in texture, saline in reaction with a pH value of 7.6, poor in organic carbon (0.16%), deficient in available zinc (0.48 ppm) and iron (1.2 ppm) low in available nitrogen (176 kg/ha) and phosphorus (20.2 kg/ha) but medium in available potassium (320 kg/ha). The experiment was laid out in randomized block design with three replications – Control, RDF 100%, FYM 10 t/ha, Vermicompost 5 t/ha, FYM 10 t/ha + Rhizobium, FYM 10 t/ha + PSB, Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium, Vermicompost 5 t/ha + FYM 10 t/ha + PSB and Vermicompost 5 t/ha + Rhizobium + PSB. The total treatment combination is 9 and three replications than total number of plots is 27.

**3. Results and Discussion**

The purpose of this study was to determine the extent of performance for growth and yield parameters.

# 3.1 Growth parameters

Significant differences were found on plant height at 30 and 60 DAS. The maximum plant height was recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (27.00 and 67.55 cm), it was found at par with T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB (26.32 and 66.05 cm), T2-RDF 100% (25.78 and 65.12 cm) and T9-Vermicompost 5 t/ha + Rhizobium + PSB (25.25 and 64.85 cm). The minimum plant height was recorded with T1-Control (20.45 and 55.36 cm), respectively. Significant differences were found on the number of branches per plant at 30 and 60 DAS. The maximum number of branches per plant was recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (3.65 and 12.75), it was found at par with T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB (3.58 and 12.00), T2-RDF 100% (3.45 at 30 DAS) and T9-Vermicompost 5 t/ha + Rhizobium + PSB (3.35 at 30 DAS). The minimum number of branches per plant was recorded with T1-Control (2.85 and 7.36), respectively. Significant differences were found on days taken to 50% flowering. The minimum days taken to 50% flowering was recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (38.51 days), it was found at par with T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB, T2-RDF 100%, T9-Vermicompost 5 t/ha + Rhizobium + PSB and T4-Vermicompost 5 t/ha. The maximum days taken to 50% floweringwere recorded with T1-Control (43.01 days). Significant differences were found on days taken to first fruit picking. The minimum days taken to first fruit pickingwas recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (42.75 days), it was found at par with T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB, T2-RDF 100%, T9-Vermicompost 5 t/ha + Rhizobium + PSB and T4-Vermicompost 5 t/ha. The maximum days taken to first fruit pickingwere recorded with T1-Control (47.25 days). Significant differences were found in the number of root nodules per plant. The maximum number of root nodules per plantwas recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (33.85), it was found at par with T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB (32.36). The minimum number of root nodules per plantwas recorded with T1-Control (20.36). Similar results also confirmed by Pandey *et al.* (2015), Sandeep *et al.* (2016), Kasana *et al.* (2017), Prajapati *et al*. (2017), Jaishankar *et al.* (2018), Sharma *et al. (*2019), Brahmbhatt *et al.* (2021), Singh *et al.* (2023) and Brahmbhatt *et al.* (2024).

* 1. **Yield parameters**

Significant differences were found in the number of clusters per plant. The maximum number of clusters per plantwas recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (29.20), it was found at par with T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB, T2-RDF 100% and T9-Vermicompost 5 t/ha + Rhizobium + PSB (28.42, 27.56 and 25.36). The minimum number of clusters per plantwas recorded with T1-Control (16.32). Significant differences were found in the number of pods per cluster. The maximum number of pods per cluster was recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (8.32), closely followed by T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB and T2-RDF 100% (8.12 and 7.95). The minimum number of pods per cluster was recorded with T1-Control (6.85). Significant differences were found on pod yield per plant. The maximum pod yield per plant was recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (180.63 g), it was found at par with T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB and T2-RDF 100% (176.45 and 173.85 g). The minimum pod yield was recorded with T1-Control (140.36 g). Significant differences were found on pod yield. The maximum pod yield was recorded with T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium (158.09 q/ha), closely followed by T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB and T2-RDF 100% (154.00 and 150.00 q/ha). The minimum pod yield was recorded with T1-Control (114.00 q/ha). Similar findings also observed by Jatav *et al.* (2016), Virendra *et al.* (2017), Komal (2017), Kasana *et al.* (2017), Asha *et al*. (2017), Patel *et al*. (2018), Rolaniya *et al.* (2023) and Patel *et al.* (2024).

# Conclusion

Based on one year experimentation, it was concluded that treatment T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium was found superior in growth and yield as compare to other treatments. So, it was concluded that the treatment Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium are better among all the treatments combination for higher yield.

**Table 1 Response of integrated nutrient management on growth parameters of cluster bean**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Treatments** | **Plant height (cm)** | **Number of branches per plant** | **Days taken to 50% flowering** | **Days taken to first fruit picking** | **Number of root nodules per plant at 40 DAS** |
|  | **30 DAS** | **60 DAS** | **30 DAS** | **60 DAS** |
| T1-Control | 20.45 | 55.36 | 2.85 | 7.36 | 43.01 | 47.25 | 20.36 |
| T2-RDF 100% | 25.78 | 65.12 | 3.45 | 11.45 | 39.76 | 44.00 | 30.32 |
| T3-FYM 10 t/ha  | 23.58 | 60.36 | 3.00 | 9.36 | 41.61 | 45.85 | 24.52 |
| T4-Vermicompost 5 t/ha  | 25.00 | 63.45 | 3.20 | 10.75 | 40.51 | 44.75 | 27.85 |
| T5-FYM 10 t/ha + Rhizobium | 24.35 | 62.78 | 3.15 | 10.00 | 40.76 | 45.00 | 26.32 |
| T6-FYM 10 t/ha + PSB | 24.00 | 61.42 | 3.05 | 9.85 | 40.88 | 45.12 | 25.45 |
| T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium | 27.00 | 67.55 | 3.65 | 12.75 | 38.51 | 42.75 | 33.85 |
| T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB | 26.32 | 66.05 | 3.58 | 12.00 | 39.01 | 43.25 | 32.36 |
| T9-Vermicompost 5 t/ha + Rhizobium + PSB | 25.25 | 64.85 | 3.35 | 11.00 | 40.11 | 44.35 | 28.45 |
| S. Em. ± | 0.61 | 1.05 | 0.12 | 0.35 | 0.72 | 0.67 | 0.99 |
| CD% | 1.82 | 3.16 | 0.37 | 1.04 | 2.14 | 2.02 | 2.97 |

**Table 2 Response of integrated nutrient management on growth parameters of cluster bean**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Treatments** | **Number of clusters per plant** | **Number of pods cluster**  | **Pod yield per plant (g)**  | **Pod yield per hectare (q/ha)**  |
| T1-Control | 16.32 | 6.85 | 140.36 | 114.00 |
| T2-RDF 100% | 27.56 | 7.95 | 173.85 | 150.00 |
| T3-FYM 10 t/ha  | 19.85 | 7.25 | 159.36 | 126.00 |
| T4-Vermicompost 5 t/ha  | 23.75 | 7.75 | 167.58 | 144.00 |
| T5-FYM 10 t/ha + Rhizobium | 22.63 | 7.58 | 164.57 | 140.00 |
| T6-FYM 10 t/ha + PSB | 20.36 | 7.45 | 162.36 | 132.00 |
| T7-Vermicompost 5 t/ha + FYM 10 t/ha + Rhizobium | 29.20 | 8.32 | 180.63 | 158.09 |
| T8-Vermicompost 5 t/ha + FYM 10 t/ha + PSB | 28.42 | 8.12 | 176.45 | 154.00 |
| T9-Vermicompost 5 t/ha + Rhizobium + PSB | 25.36 | 7.89 | 170.52 | 148.00 |
| S. Em. ± | 0.82 | 0.06 | 2.59 | 2.29 |
| CD% | 2.45 | 0.17 | 7.76 | 6.68 |

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