

## Research Article

# Effect of Integrated Nutrient Management on Growth Parameters of Okra [*Abelmoschus esculents* (L.) Moench]

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**Abstract**

A field experiment was conducted at the Horticulture Research Farm II, Department of Horticulture, School of Agricultural Science & Technology, Babasaheb Bhimrao Ambedkar University, (A Central University), Vidya-Vihar, Rae Bareli Road, Lucknow (UP.)-226025 during the year 2015-2016 to find out the effect of integrated nutrient management (INM) on growth of okra [*Abelmoschus esculents* (L.) Moench]. The experiment organic fertilizer and inorganic fertilizer were applied in different combinations along with bio-fertilizer. The experiment was laid out in Randomized Block Design with three replications and nineteen different treatment combinations. After analysis of performance of different treatment the results indicated that application of treatment T<sub>13</sub> (RDF + Vermicompost) were maximum plant height (cm) 30 DAS, 60 DAS and 90 DAS, number of branch per plant, Stem Diameter (mm), number of flower buds and Days to 50% flowering under the treatment T<sub>13</sub> has obtained better response of okra over the control.

**Keywords:** Okra, INM, PSB, Vermicompost and vegetative growth**\*Correspondence**

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**Introduction**

The Okra is also known as lady's finger and locally known as bhindi [*Abelmoschus esculents* (L.) Moench] is one of the most important rainy and summer season vegetable crop, belongs to the family Malvaceae and native of tropical and subtropical Africa. It is commonly used for its tender pods. The dried stems and roots of okra are used for clarification of sugarcane juice in gur or jiggery manufacture in India. Fully ripen fruits and stem containing crude fibre are used in the paper industry. It is a good source of vitamins A and B, Protein and minerals. It is also an excellent source of iodine and is useful for the treatment of goiter. Fruit is useful against genito-urinary disorders, spermetorrhoea and chronic dysentery. Fruits are also dried or frozen for use during off-season. Dried fruit contain 13-22% edible oil and 20-24% protein and used for refined edible oil. Dry fruit skin and fibres are used in manufacture of paper, card board and fibres. The requirements of fertilizers in okra are important for the early growth and total production of fruit yield. Integrated use of organic and inorganic fertilizers can improve crop productivity [1] and [2]. The integrated nutrient management is helpful in increasing the yields in crops as well as maintains soil fertility in better condition. The precise information on integrated nutrient management for maximum production and better quality will be of immense value to okra growers. The most important elements present in inorganic fertilizers are phosphorus, potassium and nitrogen which influence vegetative and reproductive phase of plant growth. Compared to inorganic fertilizers the organic fertilizer having lowered the nutrient content, solubility and nutrient release rates are typically low than inorganic fertilizers and therefore inorganic fertilizers are more preferred than organic fertilizers. Besides this application of organic manures not only produced the highest and sustainable crop yield but also improved the soil fertility and productivity of soil [3]. A combination of organic and inorganic sources of nutrients might be helpful to obtain a good economic return with good soil health for the subsequent crop yield [4] by considering above aspects present investigation assess the effect of INM on growth parameter of okra.

**Materials and Methods**

The experiment was conducted at Horticulture Research Farm-II of the Department of Horticulture, School of Agricultural Science & Technology, Babasaheb Bhimrao Ambedkar University, (A Central University), Vidya Vihar, Rae Bareli Road, Lucknow (U.P), during the year 2015-2016. The experiment was laid out in Randomized Block Design with three replication and 19 treatments. Treatment combinations were T<sub>0</sub>-Control, T<sub>1</sub>- RDF (Recommended

dose of fertilizer), T<sub>2</sub>- FYM (Farmyard manure), T<sub>3</sub>- Neem Cake, T<sub>4</sub>- Karanj Cake, T<sub>5</sub>- Bone Meal, T<sub>6</sub>- Vermicompost, T<sub>7</sub>- Fish gyano, T<sub>8</sub>- Mahua Cake, T<sub>9</sub>- RDF + FYM, T<sub>10</sub>- RDF + Neem Cake, T<sub>11</sub>- RDF + Karanj Cake, T<sub>12</sub>-RDF + Bone Meal, T<sub>13</sub>- RDF + Vermicompost, T<sub>14</sub>- RDF + Fish gyano, T<sub>15</sub>- RDF + Mahua Cake, T<sub>16</sub>- RDF + *Azospirillum*, T<sub>17</sub>- RDF + VAM (*Vesicular-Arbuscular Mycorrhiza*), T<sub>18</sub>- RDF + PSB (Phosphate Solubilizing Bio-fertilizers). The plot size was 1.8 × 1.2 m and spacing followed was 45 × 30 cm to keep 16 plants per plot for each treatment. The land was brought to a fine tilth through tillage and ploughing. Bunds and irrigation channels were maintained properly. The seeds were sown directly to the field. Light irrigation was given after sowing. All other recommended cultural practices were followed to raise healthy crop. The observations were recorded in five randomly taken and tagged plants for each replication on morphological traits viz., Plant height (cm), number of branch per plant, Stem diameter (mm), Number of flower buds, day of 50% flowering **Figures 1 and 2**.The data based on the mean of individual plants selected for observations were statistically analyzed as described by [5].



**Figure 1** A general view of experimental field of okra at vegetative growth



**Figure 2** A view of okra field at initiation of flower

## Result and Discussion

The findings of the present study as well as relevant discussion have presented under the following heads.

**Plant height (cm)**

The result revealed that the combination of different organic and inorganic fertilizers affected growth parameter like plant height of okra as shown in (Table 1). Significant difference in the plant height was recorded due to application of different combinations of organic and inorganic fertilizers. The maximum plant height at 30 DAS (43.40 cm), 60 DAS (92.50 cm) and 90 DAS (148.83 cm) was recorded from T<sub>13</sub> treatment (RDF + Vermicompost) while the minimum plant height at 30 DAS (27.43 cm), 60 DAS (66.68 cm) and 90 DAS (117.65 cm) was recorded from T<sub>0</sub> control. The probable reasons for increased morphological characters may be due to cumulative effect of continuous supply of nutrients, vitamins and growth promoting substances present in Vermicompost which ultimately lead to enhanced cell division. These results were in close conformity with the findings of [6] and [7].

**Table 1** Effect of INM on morphological traits of okra

Treatments No.	Treatments Combination	Plant Height (cm)			No. of branch per plant	Stem Diameter (mm)	No. of flower buds	Days to 50% flowering
		30 DAS	60 DAS	90 DAS				
T <sub>0</sub>	Control	27.43	66.68	117.65	3.12	16.96	15.77	47.66
T <sub>1</sub>	RDF	36.53	81.45	136.55	4.15	23.18	25.24	44.78
T <sub>2</sub>	FYM	37.63	82.37	137.65	4.22	23.90	25.83	44.55
T <sub>3</sub>	Neem Cake	30.47	69.33	121.25	3.33	18.33	17.15	47.00
T <sub>4</sub>	Karanj Cake	32.65	73.15	124.82	3.65	19.58	19.83	46.33
T <sub>5</sub>	Bone Meal	31.17	70.56	122.43	3.43	18.80	18.30	46.89
T <sub>6</sub>	Vermicompost	38.48	83.85	138.37	4.28	24.53	26.60	44.22
T <sub>7</sub>	Fish gyano	31.85	72.02	123.54	3.57	19.15	19.30	46.55
T <sub>8</sub>	Mahua Cake	29.25	67.96	119.54	3.25	17.85	16.73	47.33
T <sub>9</sub>	RDF + FYM	42.33	90.87	145.82	4.60	28.33	29.06	43.00
T <sub>10</sub>	RDF + Neem Cake	35.96	79.90	135.65	4.05	22.68	24.30	45.11
T <sub>11</sub>	RDF +Karanj Cake	33.57	74.68	125.25	3.70	20.00	20.80	46.00
T <sub>12</sub>	RDF + Bone Meal	35.33	78.21	133.72	3.95	21.85	23.45	45.33
T <sub>13</sub>	RDF + Vermicompost	43.40	92.50	148.83	4.73	29.67	29.80	42.66
T <sub>14</sub>	RDF + Fish gyano	34.10	75.80	127.67	3.76	20.63	22.37	45.89
T <sub>15</sub>	RDF + Mahua Cake	34.78	76.67	129.84	3.87	21.10	22.90	45.55
T <sub>16</sub>	RDF + Azospirillum	39.00	85.00	140.67	4.33	25.45	27.37	43.89
T <sub>17</sub>	RDF + VAM	41.50	88.96	143.57	4.53	27.78	28.33	43.33
T <sub>18</sub>	RDF + PSB	40.63	86.78	142.57	4.45	26.80	27.80	43.66
SEm ±		1.55	0.708	0.771	0.10	1.47	0.461	0.271
CD (5%) (P=0.05%)		4.47	2.039	2.22	0.29	4.24	1.327	0.781

**Number of branch per plant**

The data revealed that the combination of different organic and inorganic fertilizers affected growth parameter like number of branch per plant of okra as shown in (Table 1). Significant difference in the number of branch was recorded due to application of different combinations of organic and inorganic fertilizers. The maximum number of branch per plant were (4.73) recorded from T<sub>13</sub> treatment (RDF + Vermicompost), while the minimum number of branch per plant was recorded were (3.12) from T<sub>0</sub> control. These results are closely confined with the findings of [8].

**Stem diameter (mm)**

The integrated nutrient management significantly higher stem diameter (mm) recorded in the treatment RDF along with vermicompost application. The maximum stem diameter was recorded in T<sub>13</sub> (29.67mm) followed by T<sub>9</sub> (28.33mm) and minimum stem diameter was recorded in T<sub>0</sub> (16.96). It is clearly indicates that maximum stem diameter was found with the treatment (T<sub>13</sub>). The reason for maximum diameter of stem due to the higher concentration of soil enzymes, soil organic matter and soil for rapid mineralization and transformation of plant nutrients in soil, resulting in increased to the diameter of stem. The result of this study is agreements with the [7].

**Number of flower buds**

Number of flowers buds per plant increased significantly among the different treatments due to the integrated

application of organic and inorganic fertilizers. The maximum number of flowers buds were (29.80) recorded in T<sub>13</sub> (RDF + Vermicompost) followed by T<sub>9</sub> (29.06) whereas, minimum (15.77) number of flowers buds were registered in control. Application of RDF + vermicompost significantly increased the number of flower buds per plant. This might be due to the better availability and uptake of plant nutrients more specifically N, P and K resulting in better photosynthesis and protein synthesis [9]. Observed that application of recommended dose of N through vermicompost significantly improved flower buds per plant.

### *Day to 50% flowering*

Early 50% flowering was recorded with T<sub>13</sub> (42.66 days) which was on a par with T<sub>10</sub> (43.00 days) and late 50% flowering was recorded T<sub>0</sub> (47.66 days). Early 50% flowering might be due to the enhanced production of growth positive influence on the physiological activity of the plants thereby resulting in early flowering. The result of this study is agreements with the [10].

### **Conclusion**

From the above findings it is concluded that the combinations of T<sub>13</sub> (RDF + Vermicompost) resulted in maximum growth of okra under Lucknow condition.

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