***Original Research Article***

# EFFECT OF DIFFERENT INORGANIC FERTLIZERS AND BIO FERTILIZERS ON GROWTH, YIELD AND QUALITY OF OKRA(*Abelmoschus esculentus L. Moench* )


## ABSTRACT

Thise study ~~entitled **Effect of different inorganic fertilizers and bio-fertilizers in growth, yield and quality on Okra (*Abelmoschus esculentus L. Moench*),**~~ was carried out during March – June 2023on research plot ~~at~~of Department of Horticulture, in Naini Agricultural Institute, SHUATS, Prayagraj. The objective of the experiment was ~~carried out~~ to screen out the best combination of b~~B~~iofertilizer and inorganic manures for growth, yield and quality of okra and to work out the economics. The design of the experiment was ~~carried under~~rRandomized b~~B~~lock d~~D~~esign (RBD) with three replications. There were 15 treatments $T_1$ 100:80:80 (RDF) (Control), $T_2$ (75% N +100% PK + Azotobacter), $T_3$ (75% N + 100% Pk + Azospirillum), $T_4$ (75% P + 100% NK + PSB), $T_5$ (75% N + 100% PK + Azotobacter + Azospirillum), $T_6$ (75% NP + 100% K + Azotobacter + PSB), $T_7$ (75% NP + 100% K + Azospirillum + PSB), $T_8$ (75% NP + 100% K + Azotobacter + Azospirillum + PSB), $T_9$ (50% N + 100% PK + Azotobacter), $T_{10}$ (50% N + 100% PK + Azospirillum), $T_{11}$ (50% P + 100% NK + PSB), $T_{12}$ (50% N + 100% PK + Azotobacter + Azospirillum), $T_{13}$ (50% NP + 100% K + Azotobacter + PSB), $T_{14}$ (50% NP + 100% K + Azospirillum + PSB), $T_{15}$ (50% NP + 100% K + Azospirillum + Azotobacter + PS). Not recommended to list all treatments in the abstract; rewrite it. The result shows that $T_8$ 75%N + 100%PK + Azotobacter + Azospirillum + PSB was found superior in terms of plant height (9.30cm in 20 days, 30.23cm in 40 days, 43.58cm in 60 days), plant spread (19.94$cm^2$ in 20 days, 34.64 $cm^2$ in 40 days, 60.74 $cm^2$ in 60 days), days to first flowering (33.98 days), days to 50% flowering (42.43days), days to fruit setting (46.95 days), days to first fruit picking (48.68 days), fruit weight (9.83g), length of fruit at marketable stage (13.10cm), girth of fruit (2.02cm), no. of fruit per plant (23.98/plant), no. of seeds per fruit (48.39), fruit yield per plant(g) 235.65g, fruit yield per plot (kg) 7.78kg, fruit yield (t/ha) 19.44~~ t/ha~~, TSS (14.61$^o$Brix), ascorbic acid (21.31 mg/100g). Net economic returns of treatment was highest in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) Rs.472592.83 with highest cost benefit ratio of (4.27). Need to put a type of conclusive remark



**Keywords:**Inorganic fertilizers,Bio- fertilizers,Okra, Growth, Yield, Quality.




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## 1. Introduction

Bhindi or Okra botanically known as (*Abelmoschus ~~E~~esculentus* L. Moench) belongs to the family Malvaceae having chromosome number of Okra 2n=130. It's ori~~o~~gin is tropical Africa. Okra seed germinates in 25-35$^{o}$C but fast germination observed at 35$^{o}$C. ~~s~~Seeds of okra does not germinate below 20$^{o}$C temperature. Temperature above 42$^{o}$C cause flower drop. ~~(~~**(P.Muthukumar and R. Selvakumar., 2013 what does it put citation like this? Is it possible?)**

Its tender green fruits are used as a vegetable and are generally marketed in fresh form, but sometimes in canned or dehydrated form. Major states of cultivation in India are Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh, Karnataka and Assam **(Anon., 2011).** West Bengal and Karnataka are major producers of okra. Okra is a good source of vitamin A and C. Vitamin A is high as 88 I. U. and vitamin C 13 mg per 100 gm of edible portion. It is rich source of Calcium, Potassium and other mineral matters. Calcium and Potassium content ranges from 66 mg to 103 mg per 100 gm of edible portion. It contains 89.6% water and the food value per 100 gm of edible portion is carbohydrates 6.4 gm, protein 1.9 gm, fiber 1.2 gm, magnesium 53 mg, phosphorus 56 mg, sulphur 30 mg, and oxalic acid 8 mg. Rahman and **(Akter., 2012).** Okra is cultivated for its fibrous fruits or pods containing round, white seeds. The fruits are harvested when immature and consumed ~~eaten~~ as a vegetable.

Inorganic fertilizers are industrially manufactured chemicals containing plant nutrients. Nutrient content is higher fertilizers than organic manures and nutrients are released almost immediately.**(T.Yellamanda Reddy and G.H SanjaraReddy., 2016).** Nitrogen impart green colour to plant, encourages vegetative growth. It is present in most of substances of cells. Nitrogen is essential constituent of protean. It is constituent of protoplasmof chlorophyll and coenzyme. It plays an important role in synthesis of Auxin. While Phosphorus can increase the disease resistance, enhance new cell formation and necessary for root development and required for formation and maturity of grain. It is essential constituent for nucleic acid & phytin. The most essential function are energy storage and transfer of energy (ADT and ATP), act as energy currency. Potassium on the other hand helps in stomata regulation, provide disease and drought tolerance in plant. It is responsible for quality products. It is essential for formation and translocation of sugars, helps in chlorophyll formation. It is useful in stress condition because it secretes 60 enzymes.**(Nem Raj Sunda., 2019)**

Biofertilizers have also become an important component for the crops, it holds a great promise to improve crop yields through better nutrient supplies. Azotobacter and Azospirillum are the two most important non-symbiotic N-fixing bacteria and considered to be very important for fixation of N in non-leguminous crops. Under appropriate conditions, Azotobacter and Azospirillum an enhance plant development and promote the yield of several agricultural/horticultural important crops in different soils and climatic regions **(Jagnow, 1987; Becking, 1992; Okon and Labandera-Gonzalez, 1994).** These beneficial effects of Azotobacter and Azospirillum on plants are attributed mainly to an improvement in root development, an increase in the rate of water and mineral uptake by roots, displacement of fungi and plant pathogenic bacteria and, to a lesser extent, biological N2fixation. **(Okon and Itzigsohn, 1995).** Besides N2fixation, Azotobacter synthesizes and secretes considerable amounts of biologically active substances like B vitamins, nicotinic acid, pentothenic acid, biotin, heteroxins, gibberellins etc. which enhance root growth of plants **(Mishutin, 1970Rao, 1986).** Another important characteristic of Azotobacter association with crop improvement is excretion of ammonia in the rhizosphere in the presence of root exudates, which helps in modification of nutrient uptake by the plants (Narula and Gupta, 1986). The ability of Azospirillum to produce plantgrowth regulatory substances along with N2fixation stimulate growth and thereby productivity. The changes that occur in the plant roots help in transport of minerals and water **(Sarig et al., 1988).** All these factors combined produce positive effects on crop yield especially for cereals and vegetables. What is your

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objective in this research and report/article? Do you have yield and quality constraint in Okra and you want to tackle this agenda? What is your objective, not clear or alined to the title with objective,

## 2. Materials and Methods

The experiment, **"The Effect of different Inorganic Fertilizers and Bio-Fertilizers on Growth Yield and quality of Okra" (*Abelmoschusesculentus*)** **(please improve your writing, no need toput here the whole title** is conducted at Vegetable Research Farm,Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, and PRAYAGRAJ (UP) during March – June2022. Check when your research conducted? in 2022? Or 2023?? See your first page and here? All the facilities necessary forcultivation, including labour were made available in the department. The experiment was conducted in Randomized Block Design with 15 treatments in three replications *viz.*$T_1$ 100:80:80 (RDF) (Control), $T_2$ (75% N +100% PK + Azotobacter), $T_3$ (75% N + 100% Pk + Azospirillum), $T_4$ (75% P + 100% NK + PSB), $T_5$ (75% N + 100% PK + Azotobacter + Azospirillum), $T_6$ (75% NP + 100% K + Azotobacter + PSB), $T_7$ (75% NP + 100% K + Azospirillum + PSB), $T_8$ (75% NP + 100% K + Azotobacter + Azospirillum + PSB), $T_9$ (50% N + 100% PK + Azotobacter), $T_{10}$ (50% N + 100% PK + Azospirillum), $T_{11}$ (50% P + 100% NK + PSB), $T_{12}$ (50% N + 100% PK + Azotobacter + Azospirillum), $T_{13}$ (50% NP + 100% K + Azotobacter + PSB), $T_{14}$ (50% NP + 100% K + Azospirillum + PSB), $T_{15}$ (50% NP + 100% K + Azospirillum + Azotobacter + PS). This lengthy list of the treatments is advisable to put in table to be clear. Just you moved to data record without showing the stepwise application of treatments? How come? You only put the treatments list and how they were applied not mentioned here.The data was recorded for the following parameters viz plant height (cm), plant spread ($cm^2$), days to first flowering, days to 50% flowering, days to first fruit setting, days to first fruit picking, weight of the fruit (g), length of the fruit at marketable stage (cm), girth of the fruit (cm), no. of seeds per fruit, No. of fruit per plant (g), average yield (kg), total yield (t/ha), TSS ($^oBrix$), ascorbic acid (mg/100g), cost of cultivation (Rs.), gross return (Rs.), Benefit cost ratio.

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## 3. Results and Discussion

The Study on Effect of different inorganic fertilizers and Bio Fertilizers on growth, yield and quality of okra (*Abelmoschus esculentus*) var. TMOH 346 in Prayagraj was carried out at Research Field of Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) in the year 2021- 2022. The experiment was conducted in a Randomized Block Design (R.B.D.) with three replications.mean data of all the traits were subjected to statistical analysis and salient features of experimental finding are mentioned below:

### 3.1 Growth Parameter

Thedifferencesinplantgrowth amongtheplantsmightbedue to influence of various levels of inorganic fertilizers and biofertilizers, soil and environmentalconditions. Nitrogen can impart green colour to the plant, encourage vegetative growth. It is present in most of substances of cells it is essential constitute of protein. It plays an important role in synthesis of auxin. Phosphorus enhances new cell formation and necessary for root development **(Nem Raj Sunda, 2011).**

In table no. 1 Statistical analysis showed that all the traits were found significantFrom the experiment it was observed that $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) shows the maximum plant height 9.30cm in 20 Days, 30.23cm in 40 Days and 43.58cm in 60 days, followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 9.27cm in 20 days, 29.29cm in 40 Days and 41.81cm in 60 days. The minimum plant height 6.63cm in 20 days 23.22cm in 40 days and 30.58cm in 60 days was found in $T_1$ RDN (100:80:80) N:P: K.The maximum plant spread 19.94cm$^2$ in 20 days, 34.64cm$^2$ in 40 days and 60.74cm$^2$ in 60 days was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 17.67cm$^2$ in 20 days, 32.87cm$^2$ in 40 days and 57.08cm$^2$ in 60 days. The minimum plant spread 13.07cm² in 20 days 19.79cm² in 40 days and 40.41cm² in 60 days was found in $T_1$ RDN (100:80:80) N:P: K.

### 3.2 Earliness parameter

**Khan et al., (2013)** reported the difference in days to flowering might be due to the genetic variation among the treatments. The early flowering may be attributed to the genetic makeup of the cultivar. Regarding the nitrogen fertilizer treatments, the higher doses of N delayed blooming. This may be due to the fact that excessive supply of N promotes luxuriant and succulent vegetative growth dominating the reproductive phase. As P enhances development of reproductive parts stimulates blooming and fruit setting, therefore minimum days to flowering were recorded in plot fertilized with lowest dose of N (100 kg ha-1) combined with phosphorus and potassium. The results are in line with that of who reported that number of days to flowering was reduced by P and increased by N in okra. Thedifferencesindays to first fruit settingamongtheplantsmightbeduetoexpression to the growing soil and environmentalconditions. This may be due to the continued release of nutrients during the growing period of crop **(Gurjar et al., 2022)**. The faster and more vegetative growth results in early flowering as well as early picking of fruits. Days to first pickings and productive span were significantly affected with the application of different fertilizer treatments. This increase might have been on account of combined effect of chemical fertilizers and biofertilizers, which favourably influenced flowering and fruit and ultimately resulted in increased productive span. These findings are in agreement with the results of **(Kanzariya et al., 2010).** The least number of days to flowering 33.98 days was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 34.21 days. The maximun number of days was found in $T_1$ RDN (100:80:80) N:P:K 51.26days (table no. 2).The least number of days to 50% flowering 42.43 days was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 44.23 days. The maximun number of

days was found in $T_1$ RDN (100:80:80) N:P:K 64.51days (table no. 2).The least number of days to first fruit setting 46.95 days was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 49.05 days. The maximun number of days was found in $T_1$ RDN (100:80:80) N:P:K 69.76 days (table no. 2).The least number of days to first fruit picking 48.68 days was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 51.38 days and the maximun number of days was found in $T_1$ RDN (100:80:80) N:P:K 72.66 days (table no. 2).

### 3.3 **Yield parameter**

Increase in yield attributes fruit weight(g), length of fruit at marketable stage(cm), girth of fruit(cm), no. of fruit per plant, fruit yield per plant(g), fruit yield per plot (kg), fruit yield (t/ha) might occur due to increased photosynthetic area and translocation of photosynthates in plants which subsequently accelerated the formation of more number of large sized fruits with more number of seeds/ fruits resulting in increase in fruit weight. The increase in fresh fruits weight of okra due to bio-fertilizer application could be attributed to easy solubilization effect of released plant nutrient leading to improve nutrient status and water holding capacity of the soil. The results obtained were in agreement with the findings of **(Premsekhar and Rajashree 2009).**The maximum number of fruits per plant 23.98 was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 22.82 and the minimun was found in $T_1$ RDN (100:80:80) N:P:K 15.71 (table no. 2).The maximum length of the fruit 13.10 cm was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 11.80cm and the minimum length of the fruit was found in $T_1$ RDN (100:80:80) N:P:K 7.40cm (table no. 2).The maximum weight of the fruit 9.83g was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 8.23g and the minimum weight of the fruit was found in $T_1$ RDN (100:80:80) N:P:K 6.06g (table no. 2).The maximum girth of the fruit 2.02cm was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 1.90cm and the minimum girth of the fruit was found in $T_1$ RDN (100:80:80) N:P:K 1.20cm (table no. 2).The maximum number of seeds per fruit 48.39 was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 42.31 and the minimum number of seeds per plant was found in $T_1$ RDN (100:80:80) N:P:K 26.64 (table no. 2).The maximum number of seeds per fruit 48.39 was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 42.31 and the minimum number of seeds per plant was found in $T_1$ RDN (100:80:80) N:P:K 26.64(table no. 2). ).The maximum fruit yield per plant (g) was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) 235.65g followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 187.86g and the minimum fruit yield per plant (g) was found in $T_1$ RDN (100:80:80) N:P:K 95.19g(table no. 2) .The maximum fruit yield per plot (kg) was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) (7.78kg) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) (6.20kg) and the minimum fruit yield per plot (kg) was found in $T_1$ RDN (100:80:80) N:P:K 95.(3.14kg) (table no. 2).The total yield per hectare varies from 19.44 to 7.85 t/ha. The maximum yield tonnes per

hectare of okra was recorded in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) (19.44t/ha)whereas minimum average yield per hectare was recorded in $T_1$ RDN (100:80:80) N:P:K (7.85 t/ha) (table no. 2).

**3.4 Qualityparameter**

The maximum vitamin C (mg/100g) 21.31 was observed in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) 19.86 and the minimum vitamin C was recorded in $T_1$ RDN (100:80:80) N:P:K 16.09 (table no. 3).The maximum TSS (□ Brix) was recorded in $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) (14□ Brix) followed by $T_{15}$ (50% + 100% PK + Azotobacter + Azospirillum + PSB) (13.91□ Brix) and the minimum TSS (□ Brix) was recorded in $T_1$ RDN (100:80:80) N:P:K (11.30□ Brix)(table no. 3Significantly, the maximum net returns per hectare was obtained by $T_8$ (75%N + 100%PK + Azotobacter + Azospirillum + PSB) Rs.47,2592.83 with cost benefit ratio of 4.27 and minimum net returns per hectare was obtained in $T_1$ RDN (100:80:80) N:P:K Rs.123415.05 with 1.10 cost benefit ratio (table no. 3).

**Table 1: Effect of different inorganic fertilizers and bio fertilizers on growth parameter of okra (TMOH 346)**

| Treatment | Plant height (cm) | | | Plant spread ($cm^2$) | | |
|---|---|---|---|---|---|---|
| | 20 DAS | 40 DAS | 60 DAS | 20 DAS | 40 DAS | 60 DAS |
| $T_1$ | 6.63 | 23.22 | 30.58 | 13.07 | 19.79 | 40.41 |
| $T_2$ | 7.12 | 27.05 | 36.33 | 14.90 | 27.16 | 48.86 |
| $T_3$ | 7.34 | 27.17 | 37.08 | 15.10 | 26.81 | 49.30 |
| $T_4$ | 7.37 | 26.70 | 34.67 | 14.02 | 22.44 | 44.75 |
| $T_5$ | 7.73 | 27.80 | 37.16 | 15.75 | 28.47 | 50.31 |
| $T_6$ | 9.23 | 29.27 | 41.34 | 17.41 | 31.54 | 55.97 |
| $T_7$ | 9.17 | 29.10 | 40.32 | 16.64 | 29.48 | 55.77 |
| $T_8$ | 9.30 | 30.23 | 43.58 | 19.94 | 34.64 | 60.74 |
| $T_9$ | 7.93 | 25.80 | 36.09 | 14.75 | 26.51 | 46.92 |
| $T_{10}$ | 7.71 | 25.51 | 35.23 | 14.57 | 25.59 | 46.17 |
| $T_{11}$ | 7.58 | 27.10 | 35.18 | 14.23 | 24.48 | 45.56 |
| $T_{12}$ | 7.43 | 27.65 | 37.62 | 15.34 | 28.13 | 49.67 |
| $T_{13}$ | 9.06 | 29.03 | 38.41 | 16.03 | 29.16 | 53.67 |
| $T_{14}$ | 7.84 | 27.85 | 38.10 | 16.19 | 28.88 | 52.61 |
| $T_{15}$ | 9.27 | 29.29 | 41.81 | 17.67 | 32.87 | 57.08 |

| | | | | | | |
|---|---|---|---|---|---|---|
| F-Test | S | S | S | S | S | S |
| SE(d) ± | 0.54 | 0.61 | 0.65 | 0.25 | 0.63 | 0.5 |
| $CD_{0.05}$ | 1.10 | 1.24 | 1.34 | 0.52 | 1.3 | 1.03 |
| C.V. | 8.22 | 2.71 | 1.81 | 1.98 | 2.82 | 1.22 |



**Table 2: Effect of different inorganic fertilizers and bio fertilizers on earliness and yield parameter of okra (TMOH 346)**

| Treatment | Days to first flowering | 50% flowering | Days to first fruit setting | Days to first fruit picking | No. of fruit per plant | Fruit length (cm) | Fruit weight (g) | Fruit girth (cm) | No. of seeds per plant | Fruit yield (g) | Fruit yield (kg) | Fruit yield (t/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | 51.26 | 64.51 | 69.76 | 72.66 | 15.71 | 7.40 | 6.06 | 1.20 | 26.64 | 95.19 | 3.14 | 7.85 |
| $T_2$ | 42.83 | 53.54 | 58.20 | 61.09 | 19.86 | 9.68 | 7.54 | 1.49 | 33.83 | 149.72 | 4.94 | 12.35 |
| $T_3$ | 42.03 | 52.68 | 56.82 | 59.83 | 20.48 | 9.92 | 7.58 | 1.54 | 34.43 | 155.15 | 5.12 | 12.80 |
| $T_4$ | 46.77 | 57.82 | 62.34 | 65.15 | 19.21 | 8.13 | 7.09 | 1.23 | 29.97 | 136.16 | 4.49 | 11.23 |
| $T_5$ | 38.58 | 48.69 | 53.24 | 56.35 | 20.76 | 11.19 | 7.71 | 1.71 | 37.22 | 159.96 | 5.28 | 13.20 |
| $T_6$ | 34.84 | 44.17 | 49.56 | 51.61 | 22.69 | 11.58 | 8.16 | 1.87 | 40.30 | 185.11 | 6.11 | 15.27 |
| $T_7$ | 37.20 | 46.86 | 51.11 | 54.01 | 21.64 | 11.48 | 8.06 | 1.85 | 39.82 | 174.31 | 5.75 | 14.38 |
| $T_8$ | 33.98 | 42.43 | 46.95 | 48.68 | 23.98 | 13.10 | 9.83 | 2.02 | 48.39 | 235.65 | 7.78 | 19.44 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $T_9$ | 43.73 | 54.39 | 58.83 | 61.54 | 20.20 | 9.55 | 7.45 | 1.44 | 32.97 | 150.56 | 4.97 | 12.42 |
| $T_{10}$ | 44.74 | 55.62 | 59.84 | 63.28 | 19.69 | 9.16 | 7.37 | 1.39 | 31.90 | 145.08 | 4.79 | 11.97 |
| $T_{11}$ | 45.52 | 56.43 | 60.98 | 63.57 | 19.63 | 8.92 | 7.24 | 1.33 | 31.12 | 142.04 | 4.69 | 11.72 |
| $T_{12}$ | 40.94 | 51.38 | 55.90 | 59.04 | 20.26 | 10.98 | 7.66 | 1.64 | 35.75 | 155.11 | 5.12 | 12.80 |
| $T_{13}$ | 38.12 | 48.00 | 52.40 | 55.15 | 21.37 | 11.45 | 7.89 | 1.81 | 39.06 | 168.54 | 5.56 | 13.90 |
| $T_{14}$ | 38.44 | 48.35 | 52.60 | 55.46 | 20.58 | 11.31 | 7.82 | 1.77 | 38.47 | 161.01 | 5.31 | 13.28 |
| $T_{15}$ | 34.21 | 44.23 | 49.05 | 51.38 | 22.82 | 11.80 | 8.23 | 1.90 | 42.31 | 187.86 | 6.20 | 15.50 |
| F-Test | S | S | S | S | S | S | S | S | S | S | S | S |
| SE(d) ± | 0.57 | 0.57 | 0.62 | 0.59 | 0.14 | 0.20 | 0.06 | 0.03 | 0.71 | 1.90 | 0.06 | 0.15 |
| **$CD_{0.05}$** | 1.18 | 1.18 | 1.28 | 1.21 | 0.29 | 0.42 | 0.14 | 0.07 | 1.45 | 3.90 | 0.12 | 0.32 |
| **C.V.** | 1.72 | 1.37 | 1.37 | 1.24 | 0.84 | 2.46 | 1.10 | 2.64 | 2.40 | 5.26 | 1.45 | 1.45 |



**Table 3: Effect of different inorganic fertilizers and bio fertilizers on quality parameter economic parameters of okra (TMOH 346)**

| Treatment | Ascorbic acid (mg/100g) | TSS ($^{o}$Brix) | Total cost of cultivation (Rs. ha-1 | Net return (Rs. ha-1) | B:C |
|---|---|---|---|---|---|
| $T_1$ | 16.09 | 11.30 | | | |
| $T_2$ | 17.07 | 12.81 | 112190.60 | 123415.05 | 1.10 |
| $T_3$ | 17.40 | 13.08 | 110241.60 | 260310.12 | 2.36 |
| $T_4$ | 15.87 | 12.23 | 110136.60 | 273853.13 | 2.49 |
| $T_5$ | 17.59 | 13.25 | 110286.60 | 226710.14 | 2.06 |
| $T_6$ | 19.29 | 13.80 | 110361.60 | 285545.67 | 2.59 |
| $T_7$ | 19.17 | 13.74 | 110511.60 | 347626.33 | 3.15 |
| $T_8$ | 21.31 | 14.61 | 110406.60 | 321017.25 | 2.91 |

| | | | | | |
|---|---|---|---|---|---|
| $T_9$ | 16.89 | 12.68 | 110631.60 | 472592.83 | 4.27 |
| $T_{10}$ | 16.77 | 12.55 | 108067.60 | 264564.44 | 2.45 |
| $T_{11}$ | 16.66 | 12.41 | 107962.60 | 251101.16 | 2.33 |
| $T_{12}$ | 17.50 | 13.17 | 108112.60 | 243440.77 | 2.25 |
| $T_{13}$ | 18.52 | 13.51 | 108187.60 | 275707.65 | 2.55 |
| $T_{14}$ | 17.89 | 13.40 | 108337.60 | 308795.93 | 2.85 |
| $T_{15}$ | 19.86 | 13.91 | 108232.60 | 290257.83 | 2.68 |
| F-Test | S | S | 108457.60 | 356504.81 | 3.29 |
| SE(d) $\pm$ | 0.32 | 0.08 | | | |
| $CD_{0.05}$ | 0.66 | 0.18 | | | |
| C.V. | 2.22 | 0.83 | | | |

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