**Response of Inorganic Fertilizers and Vermicompost on Reproductive Traits and Yield of Lady’s Finger (*****Abelmoschus Esculentus* L.)**

**ABSTRACT**

An experiment was conducted at college orchard, Baba Raghav Das Post Graduate College, Deoria (Uttar Pradesh) during two corresponding years 2022-23 and 2023-24. The main objective of experiment was to evaluate the effect of inorganic fertilizer (NPK), vermicompost and their combinations on reproductive traits viz. number of tender fruits per plant, length of fruits, diameter of fruit and tender fruit yield of lady’s finger. The experiment consists of nine treatment combinations viz. , Control (T1), 25% inorganic fertilizers(T2), 50% inorganic fertilizers (T3),75% inorganic fertilizers (T4),100 % inorganic fertilizers (T5), 25% inorganic fertilizers +Vermicompost (T6), 50 % inorganic fertilizers +Vermicompost (T7), 75% inorganic fertilizers+ Vermicompost (T8) and100% inorganic fertilizers+ Vermicompost (T9). The number of tender fruits per plant, length of fruits and diameter of fruits were recorded to increase significantly under the treatment containing 100 % fertilizers association with vermicompost when compared to control (T1). It was followed by 75 % fertilizers +Vermicompost (T8) and 50 % fertilizers(T7) +Vermicompost respectively during both year of experimentation. Weight of fruit, number of seeds and seed weight per plant were highest under the treatment of full dose N, P, K +vermicompost than control during corresponding years of trial. The highest yield per hectare was registered maximum (102.90 and 103.00 q/ha) under full dose of N, P, K. with vermicompost followed by 75 % doses of N, P, K with vermicompost (102.70 and 102.80 q/ha) over control.

**Key words**: Okra, Inorganic fertilizers, Lady’s finger and Vermicompost

**INRTODUCTION**

Okra is one of the major vegetables in India. Lady’s finger or okra is commonly grown in almost all parts of the plains and consumed by the common people in all the states. The tender fruits are cooked as vegetables. It contains vitamin A, B and C. Okra belonging to the family Malvaceae is an herbaceous annual with bisexual flowers and erect vegetative growth with or without branches (**Hazra and Som, 2015**). In north India it is grown mostly spring and summer (March to June) and rainy (July to September) season. “Okra is a traditional vegetable crop commercially cultivated in West Africa, India, Southeast Asia, Brazil, Turkey and northern Australia. Okra is a warm season vegetable crop mostly grown in tropical and subtropical climate. It requires a long growing period of about 4 to 6 months with high temperature, humidity and light intensity. Hot and humid weather is suitable for growth of okra. It is most sensitive to the frost so that crop required long frost-free period” (**Sharma,2011**). “Okra is also a good source of iodine which helps in remedy of goitre for sick and eldered people. Mature and dry seed are used as substitutes of coffee in Africa. The plants fibre can be used for paper making” (**Singh**,**1980).** “Organic farming proves many advantages for recycle and regenerates the waste matter into wealth and can wipe out the use of inorganic fertilizers and pesticides. Vermicompost is a safe and non-polluting conversion of organic wastage into organic manures in available form” as reported by **Narkhede *et. al .* (2011)**. According to **Barry *et. al.*** **(1988),** “okra dry seed contains 18-20 % crude protein. The stem and root are used as clarifier in jaggery preparation”. “Vermicompost is a source of micro and macro nutrients and acts as a chelating agent. Vermicompost is greatly humified through the fragmentation of parent organic materials by earthworms and colonization by microorganisms” (**Edward and Burrow, 1988**). “The use of inorganic fertilizers for a long time has resulted in poor soil health, reduce in production and enhance the disease and pest infestation” (**Ansari and Ismail, 2001).** Among the plant nutrient nitrogen, phosphorus and potash influences vegetative and reproductive phase of crops (**Attarde *et.al*,2012**). “Among various factors affecting successful cultivation of okra, the judicious inorganic and vermicompost is one of the vital importance. Nitrogen is an essential micronutrient and help in growth and development of crop plants. Nitrogen also helps in cell division, cell elongation and linear increase in green pod yield of okra” **(Hooda *et. .al*,** **1980**). Phosphorous is a major essential element. Phosphorous is a key constituent of ATP which transforms energy to the plant. Phosphorous take part in various physiological process and helps in nutrient uptake by promoting root growth and their by ensuring a good pod yield. The information about the inclusion of organic nutrient source as a substitute and their effect on yield attributing characters in okra is very scanty. Keeping this view, the experiment was planned.

**MATERIALS AND METHODS**

The experiment was carried out at college orchard, B. R. D. P. G. College, Deoria (UP) during two corresponding years 2022-23 and 2023-24.The experiment was conducted during first week of July (Kharif Crop) of 2022 and 2023 The main objective of experiment was to assess the effect inorganic fertilizers, vermicompost and their combinations on reproductive traits viz. number of tender fruits per plant, length of fruits, diameter of fruit, weight of fruit, number of seeds and seed weight per plant and tender fruit yield(q/ha) of lady’s finger. There were nine treatments, i.e. Control (T1), 25% inorganic fertilizers (T2), 50% inorganic fertilizers (T3), 75% inorganic fertilizers (T4),100 % inorganic fertilizers (T5), 25% inorganic fertilizers +Vermicompost (T6), 50 % inorganic fertilizers +Vermicompost (T7),75% inorganic fertilizers+ Vermicompost (T8) and 100% inorganic fertilizers +Vermicompost (T9). Inorganic fertilizers means N, P and K. The N, P and K doses (125 kg,75 kg and 60 kg /ha) were applied in the form of ammonium sulphate, single super phosphate and potassium sulphate, respectively. The experiment was laid out in randomized block design (RBD) with three replications. Good quality of okra c.v. Arka Anamica seeds was sown in a distance of 45x30 cm. The net plot size was 16 m x5m. Arka Anamica is resistance to a yellow vain mosaic virus. Vermicompost was directly applied in the ridge at the sowing time@ 6q/ha. The data were recorded at the reproductive stage. The data, so, obtained were processed statistically. The soil pH of the experimental field was 7.3, organic carbon 0.52 %, available nitrogen 221 kg/ha, available phosphorus 18 kg/ha and available potash 171 kg/ha.

**RESULT AND DISCUSSION**

It is evident from the data given in Table-1 that inorganic fertilizers and vermicompost had a significant promotive influence on number of tender fruits. The highest (16.80 and 16.91) and lowest (13.07 and 13.10) numbers of immature fruits per plant were recorded in T9 and T1, respectively during both year of experimentation. Vermicompost contributes macro and micronutrients in amount that is required by plants. “The soil enriched with vermicompost provides additional substances that are not found in chemical fertilizers” **(Kale,1998, Ansari and Ismail, 2001**). These findings are in conformity with the reports of Das ***et.al.* (2014), Mishra *et.al.* (2019)** in okra and **Ansari (2008a)** in spinach, onion and potato.

Response of inorganic fertilizers and vermicompost promoted length and diameter of fruit during 2022-23 and 2023-24 and data obtained in this regard are presented in Table-1. The maximum length and diameter of fruits were with100% recommended dose of fertilizers+ vermicompost. This might be attributed due to increased availability of N, P, K and water at critical stages of the crop growth. Vigorous growth and development of plants leading to longer and wider fruits. The results of present investigations with the observation of **Naidu *et. al.* (2000), Das *et.al.* (2014), Mishra *et.al.* (2019)** in okra.

The fruit weight, number of seed and seed weight per fruit and tender fruit yield were greatly affected by application of inorganic fertilizers and vermicompost. The highest fruit weight, number of seed per fruit(dry) and seed weight(dry) per fruit were recorded under T9 followed by T8 and T6 during both the years of investigation. This might occur due to increased photosynthetic area and translocation of photosynthates in plants which ultimately accelerated the formation of more number of large sized fruits, a large number of seed per fruits resulting in increased seed weight and fruit weight. The maximum tender fruit yield (102.90 and 103.00 q/ha) was observed in T9 followed by T8 and T6. Similar findings were observed by **Ansari (2008b), Das *et.al.* (2014), Mishra *et.al.* (2019)** in okra.

A high economic advantage was registered under full dose of inorganic fertilizers and vermicompost(T9) which gave a net return Rs. 85710.00 and Rs.85766.00 with output/input ratio of 2.72 and 2.82 and benefit /cost ratio of 1.72 and 1.82 during 2022-23 and 2023-24., respectively (Table-2 and Table-3). Similar findings were reported by **Firoj (2009)** and **Bairwa *et.al.* (2009), Goya** ***et.al. (*2024), Choudhary *et. al.* (2024)**in okra.

**CONCLUSION**

Production of tender fruit, length of fruit, diameter of fruit, weight of fruit, no of seed per fruit, seed weight per fruit and tender fruit yield (q/ha) were boosted under the influence of full dose of inorganic fertilizers with vermicompost. Hence, T9 was best during both year of experimentation.

Disclaimer (Artificial intelligence):

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**REFERENCES**

Ansari, A. A. and Ismail, S. A. (2001). A case study of organic farming in Uttar Pradesh. *J. Soil* *Biol.Ecol*.,27:25-27

Ansari, A.A. (2008a). Effect of Vermicompost, Vermiwash on the productivity of spinach (*Spinacea oleracea*), Onion (*Allium cepa*) and potato (*Solanum tuberosum*). *World J.Agric.Sci.,***4(5**):554-557

Ansari, A.A. (2008b). Effect of Vermicompost on the productivity of Potato(*Solanum tuberosum*), spinach (*Spinacea oleracea*) and Turnip (*Brassica compestris*). *World J.* *Sci.*,**4(3):**333-336

Attarde, S.B., Narkhede, S.D., Patil, R.P. and Ingle, S.T. (2012). Effect of organic and inorganic fertilizers on growth and nutrient content of *Abelmoschus esculentus* L. (Okra crop). *Int.J.Curr.Res****.****,***4 (10**):137-140

Bairwa, H.I., Shukla, A.K., L.N., Mahawer, Kaushik, R. A., Sukhla, K.B. and Ameta, K.D. (2009). Response of Integrated Management on yield, quality and physico-Chemical characteristic of okra c.v. Arka Anamica. *Indian J.Hort.*,**66(3)**:310-314

Berry, S.K., Kaira, C.L., Sehgal, R.C., Kulkarni, S.G, Kaur, Sukhvir, Arora, S.K. and Sharma, B.R. (1988). Quality Characteristics of seeds of five okra cultivars. *J. Fd. Sci. Technol*., **25(2**):303-305

Choudhary, Bidisha, Narendra Swaroop, Tarence Thomas, Kamlendra Kumar and Ashima Thomas (2024). Effect of recommended dose of fertilizers, vermicompost and zinc on physico-chemical properties of soil, growth and yield of okra (*Abelmoschus esculentus* L.). var. Super Green. *International Journal of Plant &Soil Science,***36(6):**570-76 http://doi.org/10.9734/ijpss/2024/v36i64660

Das, Ajay Kumar, B. Prasad and Singh, Ramakant (2014). Response of chemical fertilizer and vermicompost on okra (*Abelmoschus esculentus* L.) c.v. Prabhani Kranti, *The Asian Journal of* *Horticulture*, **9(2):**372-376

Edwards, C.A. and Burrows, I. (1988). Potential of earthworm composts as plant growth media. SBP Academic Publication, The Hague, pp 21-32

Firoj,Z.A.(2009). Impact of nitrogen and phosphorus on the growth and yield of okra in hill slop condition. *Bangladesh J.Agril.Res*..**34(4)**:713-722

Goyal, A. K., Rajiv, Nirankar, Singh, D. B., Kishor, B., Sindhesh, & Maurya, B. K. (2024). Efficacy of Nano-fertilizers Applications on Growth Parameters and Flowering Dynamics in Okra (Abelmoschus esculentus). International Journal of Plant & Soil Science, **36(9),** 585–596. https://doi.org/10.9734/ijpss/2024/v36i95008

Hazra, P. and Som, M.G. (2015) Vegetable Crops (Book), *Kalyani Publishers*, pp.418-425

Hooda, R.S., Pandita, M.L. and Sindhu, A.S. (1980). Studies on the effect of nitrogen and phosphorus on growth and green pod yield of okra *(**Abelmoschus esculentus* L.). *Haryana J.Hort.Sci.,*9:180-183.

https://www.cabdirect.org/cabdirect/abstract/19810301203

Kale, R.D. (1988) Earthworm Cinderella of Organic Farming. Prism Book Pvt. Ltd., Bangalore, India.pp.88

Mishra, B., Sahu, G.S., Tripathy,P., Mohanty and Pradhan, S. (2019). Effect of Organic and Inorganic Fertilizers on growth, Yield and Quality of Okra under Integrated Nutrient Management, *Int. J. Curr. Microbiol. App. Sci.,***8(8):**66-73

Naidu, A.K., Kushwah, S.S., Dwivedi, Y.C. (2000). Performance of organic manures, bio and chemical fertilizers and their combinations on microbial populations of soil of soil and growth and yield of okra. *JNKVV Res.* J.**33(1)**:34-38

Narkhede, S.D., Attarde and Ingle, S.T. (2011). Study on effect of chemical fertilizer and vermicompost on growth of Chilli pepper (*Capsicum annum*). *J. Appl. Sci.* *Environ.Sanita*.,**6(30)**:327-332

Sharma, J.P. (2011). Quality Seed Production of Vegetable Crops Technological Interventions (Volume II, Edited Book), *Kalyani Publishers*. pp.484-515

Singh, S.P. (1989). Production of Technology of Vegetable Crops. Agric. Res. Comm. Centre, Karnal, pp.70

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **No. of immature fruit** | | **Length of fruits(cm)** | | **Diameter of fruit** | | **Weight of fruit(g)** | | **No. of seed/fruit** | | **Seed Weight(g)** | | **Tender Fruit Yield(q/ha)** | | |
| **2022-23** | **2023-24** | **2022-23** | **2023-24** | **2022-23** | **2023-24** | **2022-23** | **2023-24** | **2022-23** | **2023-24** | **2022-23** | **2023-24** | **2022-23** | **2023-24** |
| **T1** | 13.07 | 13.10 | 9.10 | 9.20 | 1.01 | 1.04 | 10.09 | 10.30 | 47.50 | 48.08 | 2.10 | 2.20 | 80.10 | 80.15 |
| **T2** | 14.08 | 14.12 | 10.06 | 10.18 | 1.20 | 1.25 | 10.60 | 11.14 | 47.60 | 45.12 | 2.15 | 2.34 | 97.25 | 97.30 |
| **T3** | 14.01 | 14.15 | 10.20 | 10.35 | 1.10 | 1.15 | 11.30 | 12.30 | 48.10 | 48.15 | 2.30 | 2.45 | 98.00 | 98.00 |
| **T4** | 13.11 | 13.15 | 10.80 | 10.90 | 1.30 | 1.35 | 11.65 | 12.88 | 48.40 | 48.80 | 2.45 | 2.60 | 99.08 | 99.20 |
| **T5** | 13.53 | 13.70 | 10.90 | 11.00 | 1.10 | 1.17 | 11.80 | 12.90 | 48.70 | 49.05 | 2.48 | 2.65 | 100.2 | 100.50 |
| **T6** | 16.11 | 16.30 | 12.45 | 12.62 | 1.40 | 1.45 | 14.20 | 14.30 | 52.20 | 52.40 | 3.55 | 3.70 | 102.10 | 102.24 |
| **T7** | 14.44 | 14.53 | 9.80 | 10.50 | 1.25 | 1.30 | 11.50 | 11.80 | 48.75 | 48.90 | 2.60 | 2.62 | 98.00 | 98.01 |
| **T8** | 16.50 | 16.80 | 12.60 | 12.70 | 1.50 | 1.55 | 14.80 | 14.95 | 52.35 | 52.36 | 3.65 | 3.95 | 102.70 | 102.80 |
| **T9** | 16.80 | 16.91 | 12.90 | 12.92 | 1.60 | 1.65 | 15.00 | 15.20 | 52.80 | 53.00 | 3.70 | 3.90 | 102.90 | 103.00 |
| **SE±** | 0.32 | 0.461 | 0.462 | 0.288 | 0.113 | 0.194 | 0.294 | 0.285 | 0.462 | 0.286 | 0.076 | 0.084 | 0.454 | 0.527 |
| **CD (0.05)** | 0.828 | 1.198 | 1.199 | 0.745 | 0.294 | 0.502 | 0.762 | 0.738 | 1.197 | 0.742 | 0.196 | 0.214 | 1.175 | 1.366 |

TABLE-1: RESPONSE OF INORGANIC FERTILIZERS AND VERMICOMPOST ON REPRODUCTIVE TRAITS AND YIELD OF LADY’S FINGER (*Abelmoschus esculentus* L.)

TABLE-2: RESPONSE OF INORGANIC FERTILIZERS AND VERMICOMPOST ON ECONOMICS OF LADY’S FINGER CULTIVATION DURING 2022-23

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Treatments | Cost of cultivation (Rs/ha) | Gross Return (Rs/ha) | Net return (Rs/ha) | Output-Input ratio | Benefit: Cost ratio |
| T1 | 45200 | 115400 | 70200 | 2.56 | 1.56 |
| T2 | 45600 | 118300 | 72700 | 2.59 | 1.59 |
| T3 | 46380 | 120400 | 74020 | 2.65 | 1.65 |
| T4 | 46800 | 123200 | 76800 | 2.65 | 1.65 |
| T5 | 47480 | 125200 | 77520 | 2.63 | 1.63 |
| T6 | 47390 | 124000 | 76610 | 2.61 | 1.61 |
| T7 | 53480 | 127000 | 73520 | 2.37 | 1.37 |
| T8 | 48420 | 130000 | 81580 | 2.68 | 1.68 |
| T9 | 49690 | 135400 | 85710 | 2.72 | 1.72 |

TABLE-3: RESPONSE OF INORGANIC FERTILIZERS AND VERMICOMPOST ON ECONOMICS OF LADY’S FINGER CULTIVATION DURING 2023-24

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Treatments | Cost of cultivation (Rs/ha) | Gross Return (Rs/ha) | Net return (Rs/ha) | Output-Input ratio | Benefit: Cost ratio |
| T1 | 45780 | 116220 | 70440 | 2.53 | 1.53 |
| T2 | 46290 | 119150 | 72860 | 2.57 | 1.57 |
| T3 | 47201 | 121413 | 74212 | 2.57 | 1.57 |
| T4 | 47380 | 124270 | 76890 | 2.62 | 1.62 |
| T5 | 47420 | 124380 | 76960 | 2.62 | 1.62 |
| T6 | 48313 | 124520 | 76207 | 2.57 | 1.57 |
| T7 | 54510 | 128480 | 73970 | 2.35 | 1.35 |
| T8 | 47380 | 131216 | 81836 | 2.76 | 1.76 |
| T9 | 48190 | 135980 | 85766 | 2.82 | 1.82 |