Biological Forum – An International Journal **16(6): 101-104(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Organic Amendments on Fruit Yield and Quality of Banana cv. *Neypoovan*

K.B. Sujatha[1], P. Paramaguru[2], E. Somasundaram[3], A. Renuka Devi[4], R. Nageswari[5*] and B. Senthamizh Selvi[6]

[1]Associate Professor, Department of Crop Physiology, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India.
[2]Dean, Forestry College and Research Institute, Mettupalayam, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India.
[3]Director, Directorate of Agri-Business Development, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India.
[4]Associate Professor, Department of Soil Science, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India.
[5]Associate Professor, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India.
[6]Associate Professor, Department of Horticulture, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India.

(Corresponding author: R. Nageswari)*
(Received: 29 March 2024; Revised: 22 April 2024; Accepted: 17 May 2024; Published: 15 June 2024)
(Published by Research Trend)

ABSTRACT: Continuous and indiscriminate use of inorganic fertilizer is degrading agricultural lands, which in turn will reduce the yield and quality of fruit produced. Today, growing awareness of health makes consumers more concerned about food quality and safety. An experiment was conducted in 2022 with six different treatment combinations of organic inputs at the Horticultural College and Research Institute, TNAU, Coimbatore, to understand its influence on the fruit yield and quality of banana cv. *Neypoovan*. The common organic inputs given to all treatments are FYM at 8 kg/plant, Neem cake at 1 kg/plant, Vermicompost at 5 kg/plant (applied at 3rd and 4th month after planting), green manuring with sunnhemp and cowpea as intercrop and AM (25 g), *Azophos at* 50 g, Phosphate solubilizing bacteria at 50 g, and *T. viridie* at 50 *g* per plant. The treatment combination of coconut cake at 1 kg/plant and potash solubilizing bacteria at 50 kg/plant, along with the common organic inputs, can be considered the best treatment as it registered significantly higher bunch weight (12.48 kg/plant), more hands per bunch (11.8), more fruits per bunch (186.63), and the highest BCR of 3.2. The fruit quality was also better compared to other treatments, with significantly lower titratable fruit acidity (0.235%) and a high TSS (31°B).

Keywords: Banana, vermi compost, Sunnhemp, organics, fruit yield, quality.

INTRODUCTION

Banana is one of the important fruit crops grown in India. The estimated global production of banana is 86.0 million tonnes. India is the leading country in banana production in the world. The total area under banana in India is 9.24 lakh hectares with a production of 33.60 MT, out of which, Andhra Pradesh state shares a production of 5.80 MT (Anonymous, 2024). The Banana is believed to have originated in the hot, tropical regions of South East Asia. The banana is a quickly growing plant that has a yield potential of up to 100t/ha. Because of its high nutritious value, palatability and cheaper price, the fruit is very popular among all classes of people in India. Management practices have a significant influence on fruit quality of banana. The current agricultural policy emphasizes a shift towards safe agricultural practices, for which organic management is the best option. Chemical fertilizers have some deleterious effects on fruit quality, in addition to adverse effects on soil, water and environmental conditions (Dutta *et al*., 2010). The study conducted to determine the effect of organic fertilizer application on dwarf banana Cavendish (*Musa paradisiaca* L.) at Halu Oleo University showed that organic fertilizer influenced the growth of plant height, leaf number and leaf area. The treatment of organic fertilizer of goat manure at a dose of 170 g per plant was a good dose of fertilizer in stimulating the growth of banana plants (Muhidin *et al.,* 2022). The advantages of practising organic fertilization for crops are many. For instance, organic mulching plays an important role in conservation of soil moisture during the dry periods, as well as improving the physical, biological and chemical properties of soil. It is a practice, which helps in proper growth and development of the plants by modifying soil temperature, providing better nutrient availability and by better moisture conservation.

Organic fertilization can be a substitute for supplying nutrients to banana production. Ramesh *et al.* (2010) reported that organic farming improves soil quality (physical, chemical and biological) subsequently enhancing the soil health and sustainability of crop production. Studies have revealed that organic manure supports better quality and post-harvest life of fruits when compared to the inorganic fertilizer (Patel *et al.,* 2012 and 2012a). Fruit quality parameters like TSS, reducing sugar, non-reducing sugar, total sugar registered highest value when treated with organic amendments as compared to inorganic treatments (Vanilarasu and Balakrishnamurthy 2014). An investigation carried out by Eman *et al.* (2003) in two seasons during 2000 - 2002 on the second and third rations of Williams banana revealed that the fruit quality properties were also improved by the application of biofertilizer. The treatment of bio-fertilizer plus 75 per cent NPK gave the highest values of fruit quality. Shefalika Nayak *et al*. (2022) found that denavelling along with bunch feeding was a viable proposition for enhancing the productivity, quality and profitability of banana cultivation. An *in-vitro* study with banana showed that application of vermicompost at 50% + peat moss at 50% significantly increased total chlorophyll content in banana plants. The nutrient analysis in plats proved that vermicompost at 75% with peat moss gave the highest mineral content values (Hassen *et al*., 2022). Neypoovan is one of the few AB genome cultivars and is grown widely because of the sweet, sub-acid flavour of the fruit; hence, it is the choice diploid cultivar in south India. The role of the organic inputs on this cultivar is very little studied and keeping in view all these parameters, a study was proposed to understand the influence of different combinations of organic inputs on the fruit yield and quality of banana cv. *Neypoovan*.

MATERIALS AND METHODS

The experiment was conducted at the Horticultural College and Research Institute, TNAU, Coimbatore, to understand the influence of organic amendments on fruit yield and quality of banana cv. *Neypoovan* with the objective of evaluating different organic input combinations and developing an economical organic production module. The banana cv. *Neypoovan* was planted in the organic field at the Orchard, Horticultural College and Research Institute, TNAU, Coimbatore. The design adopted for the study was RBD with 4 replications per treatment and the number of plants per treatment was nine. The control was the inorganic treatment with RDF, maintained in another field separately. The following were the common organic inputs given, irrespective of treatments for improving the soil organic carbon and other nutrients.

(a) FYM @ 8 kg/plant (0.50%N, 0.25%P, 0.5%K)
(b) Neem cake@ 1kg/plant (4%N, 1%P, 1%K)
(c) Vermicompost @5kg/plant (2%N, 1% P, 1%K) (Applied at 3rd and 4th month after planting)
(d) Triple green manuring with sunhemp and cowpea as intercrop
(e) AM (25g), Azophos @50g, Phosphate solubilizing bacteria@50g and *T. viridie* @50g per plant

The six treatment combinations imposed in addition to the common organic inputs are

(a) T1 (Groundnut cake@1kg/plant)
(b) T2 (Groundnut cake@1kg/plant + Potash solubilizing bacteria@50g/plant)
(c) T3(Coconut cake@1kg/plant)
(d) T4 (Coconut cake@1kg/plant + Potash solubilizing bacteria@50g/plant)
(e) T5 (Sesamum cake@1kg/plant)
(f) T6 (Sesamum cake @1kg/plant + Potash solubilizing bacteria @50g/plant).
(g) The potash solubilizing bacteria used for the study was *Bacillus mucilaginosus* and it was applied at 5 MAP (months after planting).

The soil nutrient status before and after the experiment was taken (Tables 1 & 3) and the observations taken for understanding the influence of organic amendments were yield and yield parameters, fruit quality like TSS(^{0}B) & titratable acidity (%) and shelf life of fruits. The TSS of the fruit was determined by are fractometer and the result was expressed in °Brix. The titratable acidity of the fruit was determined by taking 10g of homogenized pulp that was dissolved in 100 ml of distilled water and filtered. About 10ml of filtrate was titrated against 0.1 N NaOH using phenolphthalein as indicator. Titratable acidity was expressed in percentage in terms of anhydrous malic acid. Shelf-life of fruits after harvest by counting the number of days from the day of harvesting to the day until the fruits remain in edible condition, as evident by over softening and onset of decay (Vanilarasu and Balakrishnamurthy 2014).

RESULTS AND DISCUSSION

A study was proposed to understand the influence of different combinations of organic inputs on the fruit yield and quality of banana cv. Neypoovan and the experiment was conducted in the organic field at the Orchard, Horticultural College and Research Institute, TNAU, Coimbatore and the control was the inorganic treatment with RDF maintained in another field separately. The results of the experiment are discussed with substantiated evidence. The treatment T4 with the treatment combination of coconut cake @ 1kg/plant + potash solubilizing bacteria @ 50g/plant along with the common organic amendments, significantly produced a higher bunch weight (12.48 kg/plant), a higher number of hands per bunch (11.80) and the number of fruits per bunch (186.63) (Table 2). Organic manures *viz*., FYM, vermicompost, green manure and AM improves the physical properties of soil (water holding capacity, soil aeration, drainage and water retention capacity), prevent soil degradation and increase important beneficial microorganism population. The addition of neem cake protects the plant from harmful soil borne microorganisms enhancing its ability to survive well under the disease free conditions, increasing and improving yield and yield parameters (Dipta *et al*., 2021). Biofertilizers are naturally occurring products obtained from living microorganisms and don't have any adverse effect on plants, soil health and

environment. Besides, their role in fixing atmospheric nitrogen and phosphorous solubilization, these are also helpful in stimulating the plant growth hormones. Biofertilizers *viz.,* Azotobacter, PSB and Azospirillum, fix atmospheric nitrogen and solubilize phosphorus to increase the fertility of soil and increases number and biological activities. Biofertilizers are the derived product of living microorganisms that are capable offixing atmospheric nitrogen and also convert insoluble phosphorus to soluble phosphorus for uptake of plants (Deshmukh *et al*., 2014). Further, PSB is also helpful in cell elongation and cell division in meristmatic region of plant, this is due to the production of plant growth substances (IAA and GA) by PSB.

The treatment T4 with the application of coconut cake @ 1kg/plant + Potash solubilizing bacteria @ 50g/plant along with common organic inputs significantly improved the fruit quality that was also better compared to other treatments with significantly lowest titratable fruit acidity (0.235%) and high TSS (31°B) (Table 2). The finding is in accordance with the results of Athani and Hulamani (2000) in banana and Anonymous, 2001 in custard Apple and also corroborates with the studies of Bodur *et al.* (2023); Vazquez *et al.* (2012). The TSS has been reported associated with regular and sustained nitrogen from soil, as reported by Chattopadhyay *et al*. (1980); Bellie (1987). Bakheit and Elsadig (2015) also observed a higher TSS of Dwarf Cavendish at the green and ripe stages in plants treated with organic fertilizers (manures and mompost) than inorganic fertilizers (Urea and NPK). The higher content of TSS in banana fruits might be due to the accumulation of sugars and other soluble components from the hydrolysis of proteins and the oxidation of ascorbic acid (Marriot *et al.*, 1981). There were no significant differences among treatments for the shelf life of the fruits, which might be due to the efficiency of the common organic inputs applied to the plants. The economics of different organic input combinations were evaluated and it was observed theT4 treatment with the application of coconut cake @ 1kg/plant + Potash solubilizing bacteria @ 50g/plant resulted in a higher BCR of 3.2 compared to other treatments along with the common organic amendments (Table 2).

Table 1: Soil nutrient status before the initiation of experiment.

Parameter	Value	Comments
Organic Carbon (%)	0.55	Low
pH	8.01	Slightly alkaline
EC (dSm^{-1})	0.28	Non saline
Available N ($Kg\ ha^{-1}$)	134	Low
Available P(Olsen's) ($Kg\ ha^{-1}$)	11.0	Medium
Available K ($Kg\ ha^{-1}$)	577	High
Available Zn (ppm)	1.43	Sufficient
Available Cu (ppm)	3.97	Sufficient
Available Fe (ppm)	0.09	Deficient
Available Mn (ppm)	1.83	Deficient
Available B (ppm)	0.62	Sufficient

Table 2: Effect of organic nutrient amendments on yield and quality parameters of banana cv. Ney Poovan.

Treatments	Yield (t/ha)	Bunch weight (kg/plant)	Hands/ bunch	Fingers/ bunch	Shelf life (days)	TSS (^{0}B)	Titratable acidity (%)	BCR
T1	23.25	7.68	9.12	145.35	3	31	0.335	2.9
T2	31.88	10.53	10.38	176.78	4	31	0.335	3.0
T3	20.52	6.78	8.26	122.31	3	28	0.402	2.4
T4	37.78	12.48	11.80	186.63	4	31	0.235	3.2
T5	28.61	9.45	10.68	142.36	3	30	0.246	2.8
T6	30.46	10.06	11.01	159.85	3	30	0.380	3.0
Control	22.64	7.48	10.12	130.12	3	30	0.313	2.8
SEd	0.47	0.12		2.64		0.49	0.08	
CD(P=0.05)	1.62	0.22	NS	6.02	NS	0.98	0.164	
CV %	3.07	4.56		3.27		0.13	2.01	

Table 3: Soil nutrient status before the initiation of experiment.

Parameter	Value	Comments
Organic Carbon (%)	0.58	Medium
pH	8.04	Slightly alkaline
EC (dSm^{-1})	0.28	Non saline
Available N ($Kg\ ha^{-1}$)	140	Low
Available P(Olsen's)($Kg\ ha^{-1}$)	11.0	Medium
Available K ($Kg\ ha^{-1}$)	405	High
Available Zn (ppm)	1.33	Sufficient
Available Cu (ppm)	3.97	Sufficient
Available Fe (ppm)	0.19	Deficient
Available Mn (ppm)	1.79	Deficient
Available B(ppm)	0.59	Sufficient

CONCLUSIONS

According to the current study's findings, an organic manure schedule that includes 50 g of phosphate solubilizing bacteria, 50 g of coconut cake, 1 kg of neem cake, 1 kg of FYM, 5 kg of vermicompost (applied at the third and fourth months after planting), triple green manuring with sunnhemp and cowpea as intercrop and AM (25 g), 50 g of azophos, 50 g of phosphate solubilizing bacteria, and 50 g of *T. viridie* per plant are recommended for improving the fruit yield and quality in banana cultivar *Neypoovan.*

Acknowledgement. The author takes the privilege to express his deep sense of gratitude and indebtedness to The Dean, Director and Head of the department, Horticultural College and Research Institute, TNAU, Coimbatore for their support to carry out the research successfully.
Conflict of Interest. None.

REFERENCES

Anonymus (2001). 36th Meeting of Horticulture and Forestry Sub Committee of Agricultural Research Council of GAU, Navsari, 67-68.

Anonymous (2024).https://worldpopulationreview.com/country-rankings/banana-production-by-country.

Athani, S. I. and Hulamani, N. C. (2000). Effect of vermicompost on fruit yield and quality of banana cv. Rajapuri (Musa AAB). *Karnataka. J. Agric. Sci*., *13*, 942-946

Bakheit, I. and Elsadig, E. H. (2015). Effects of organic and chemical fertilizers on yield and total soluble solids (TSS) in banana Cavendish group (AAA). *J. Hortic. For., 7*(4), 94-98.

Bellie, T. (1987). Studies on the effect of increased dose of Phosphorous and split application of fertilizers to Nendran banana (AAB). M.Sc. (Hort) Thesis, Tamil Nadu Agricultural University, Coimbatore

Bodur, E., Kilic, D. and Caliskan, O. (2023). Effects of Organic and Conventional Production Systems on Plant Vigor, Fruit Yield and Fruit Quality Attributes of Bananas Cultivated in the Mediterranean Region of Turkey. *Erwerbs-Obstbau, 65,* 143–152.

Chattopadhyay, P. K., Holder, N. C., Maiti, S. C. and Bose, T. K. (1980). Effect of nitrogen nutrition on growth, yield and quality of giant Governor Banana. National Symposium on Banana Production Technology. Tamil Nadu Agricultural University, Coimbatore, p: 109-112.

Deshmukh, R. P., Nagre, P. K., Wagh, A. P., and Dod, V. N. (2014). Effect of different bio-fertilizers on growth, yield and quality of cluster bean. *Indian J Adv Plant Res., 1*(2), 39–42.

Dipta, B., Bhardwaj, S., and Kaushal, M. (2021). Overview of Nutrient and Disease Management in Banana. In: Kaushal, M., Prasad, R. (eds) Microbial Biotechnology in Crop Protection. Springer, Singapore.

Dutta, P., Kundu, S. and Biswas, S. (2010). Integrated nutrient management in litchi cv. Bombai in new alluvial zone of West Bengal. *Indian Journal of Horticulture, 67,*181.

Eman, A. A., Moniem, A. E. and Radwan, S. M. A. (2003). Response of Williams banana plants to biofertilization in relation to growth, productivity and fruit quality. *Arab Univ. J. Agric. Sci., 11,*751-763.

Hassan, S. A. M., Rania A. Taha, Nagwa S. M. Zaied, Entsar M. Essa, Abd El-RheemKh. M. (2022). Effect of vermicompost on vegetative growth and nutrient status of acclimatized Grand Naine banana plants. *Heliyon, 8*(10), e10914.

Marriot, J., Robinson, M. and Karikari, S. K. (1981). Starch and sugar transformation during the ripening of plantains and bananas. *J. Sci. Food and Agric.,* 1021-1026.

Muhidin, Nuraida, W., Florista, D. A., Nurmas, A, Yusuf, D. N., Alam, S., and Amai, S. (2022). The effect of organic manure on the growth of dwarf banana (*Musa paradisiaca* L.) under the natural shade. The 5th International Conference on Agriculture, Environment, and Food Security IOP Conf. Series: *Earth and Environmental Science, 977,* 012007.

Patel, K. M., Patel, H. C., Patel, K. A., Chauhan, V. B. and Patel, J. S. (2012). Effect of organic manures or chemical fertilizers on yield and quality of banana fruits cv. Basrai. *Asian J. Hort., 7*(2), 420-422.

Patel, K. K., Vijay anand, Kaswala, A. R., Italiya, A., Pawar, S., Patel, J. L., Kolambe, B. N. and Patil, R. G. (2012a). Comparative performance of FYM, biocompost and banana pseudostem based vermicompost on productivity of banana. *The Asian Journal of Horticulture, 7*(1), 140-143.

Ramesh, P., Parwar, N. R., Singh, A. B., Ramana, S. and SubbaRao, A. (2010). Status of organic farming in India. *Current Science, 98*(9), 1190-1194184.

ShefalikaNayak, Sunil Samal, Subash Ch. Swain and Saudamini Swain (2022). Impact of Denavelling and Bunch Feeding on Yield, Yield Attributing Characters and Shelf-life in Banana cv. Champa. *Biological Forum – An International Journal, 14*(4), 1329-1333.

Vanilarasu, K. and Balakrishnamurthy, G. (2014). Effect of Organic Manures and Amendments on Quality Attributes and Shelf Life of Banana cv. Grand Naine. *Agrotechnol, 3,* 1000119.

Vazquez-OvandoAndrino-Lopez, D. K., Adriano-Anaya, M.L.A., Salvador Figueroa, M., and Ovando-Medina, I. (2012). Sensory and physico-chemical quality of banana fruits Grand Nain grown with biofertilizer. *Afr J Agric Res 7,* 4620–4626.

How to cite this article: K.B. Sujatha, P. Paramaguru, E. Somasundaram, A. Renuka Devi, R. Nageswari and B. Senthamizh Selvi (2024). Organic Amendments on Fruit Yield and Quality of Banana cv. *Neypoovan*. *Biological Forum – An International Journal, 16*(6): 101-104.