The Pharma Innovation Journal 2022; 11(12): 2697-2700

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(12): 2697-2700

www.thepharmajournal.com
Received: 10-10-2022
Accepted: 14-11-2022

M Queeny Amulya
PG Scholar, Department of Vegetable Science, College of Horticulture, SKLTSHU, Rajendranagar, Hyderabad, Telangana, India

M Padma
Senior Professor (Hort.) Retd. And Former Dean of PG Studies, Sri Konda Laxman Telangana State Horticultural University, Mulugu, Siddipet, Telangana, India

IV Srinivas Reddy
Associate Professor (Hort.) and Head Dept. of Horticulture, Agricultural College, PJTSAU, Aswaraopeta, Bhadradri Kothagudem, Telangana, India

B Naveen Kumar
Scientist (SSAC), Grape Research Station, Rajendranagar, Hyderabad, Telangana, India

S Praneeth Kumar
Scientist (Crop Physiology), Floricultural Research Station, SKLTSHU, ARI, Rajendranagar, Hyderabad, Telangana, India

Corresponding Author:
M Queeny Amulya
PG Scholar, Department of Vegetable Science, College of Horticulture, SKLTSHU, Rajendranagar, Hyderabad, Telangana, India

Standardization of organic cultivation practices on quality in bitter gourd (*Momordica charantia* L.) var. Pusa Aushadhi

M Queeny Amulya, M Padma, IV Srinivas Reddy, B Naveen Kumar and S Praneeth Kumar

Abstract
The present investigation entitled "Standardization of organic cultivation practices on quality in bitter gourd (*Momordica charantia* L.) var. Pusa Aushadhi" was carried out during *rabi* season in the year 2021-2022 at P.G research farm, College of Horticulture, Rajendranagar, Hyderabad. Sri Konda Laxman Telangana State Horticultural University. The experiment was carried out with twenty (20) treatments in Randomized Block Design with three (3) replications *i.e.* T_1: Farmyard manure (25 t/ha) + AMC (12.5 kg/ha), T_2: Farmyard manure (25 t/ha) + VAM (10 kg/ha), T_3: Farmyard manure (30 t/ha) + AMC (12.5 kg/ha), T_4: Farmyard manure (30 t/ha) + VAM (10 kg/ha), T_5: Vermicompost (10 t/ha) + AMC (12.5 kg/ha), T_6: Vermicompost (10 t/ha) + VAM (10 kg/ha), T_7: Vermicompost (12 t/ha) +AMC (12.5 kg/ha), T_8: Vermicompost (12 t/ha) +VAM (10 kg/ha), T_9: Poultry manure (6 t/ha) + AMC (12.5 kg/ha), T_{10}: Poultry manure (6 t/ha) + VAM (10 kg/ha), T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha), T_{12}: Poultry manure (8 t/ha) + VAM (10 kg/ha), T_{13}: Neem cake (1 t/ha) + AMC (12.5 kg/ha), T_{14}: Neem cake (1 t/ha) + VAM (10 kg/ha), T_{15}: Neem cake (2 t/ha) + AMC (12.5 kg/ha), T_{16}: Neem cake (2 t/ha) + VAM (10 kg/ha), T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha), T_{18}: RDF(40: 80: 50 NPK kg/ha) + VAM (10 kg/ha), T_{19}: RDF (40: 80: 50 NPK kg/ha), T_{20}: Absolute control. Different treatment combinations of RDF and organic manures along with bio fertilizers have a significant influence on quality. The results on quality parameters indicated that among all treatments, T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly lowest fruit pH (6.54), highest TSS (5.18 ^{0}Brix), highest ascorbic content (107.11 mg/100 g) and highest chlorophyll content (1.59) compared to the other treatments.

Keywords: Bitter gourd, farmyard manure, vermicompost, poultry manure, neem cake, AMC, VAM, Pusa Aushadhi

Introduction
Bitter gourd (*Momordica charantia* L.) is diploid in nature (2n=22) and belongs to family Cucurbitaceae. It grows best in well-drained loamy soil with a pH of 6.5-7.0. Although the plant is adaptable to a wide range of climates, it produces best in hot climates (Binder *et al.*, 1989) [5]. Nationally, bitter gourd is grown in an area of 107,000 ha with an annual production of 12,92,000 MT (NHB data base 2019-2020 3rd advance estimate) [14].

Momordicin, Momordicinin, and Momordicilin are three pentacyclic triterpenes, accumulate over time and cause the fruit to become bitter; the bitterness then dissipates as the fruit ripens [(Begum *et al.*, 1997) [3]; (Cantwell *et al.*, 1996)] [6]. Fruits have a high vitamin C content (88 mg/100g). It has antioxidant, antimicrobial, antiviral, antihepatotoxic, antiulcerogenic, and blood sugar lowering properties (Behera *et al*., 2011) [4]. It also has a lot of medicinal properties like germicidal effect, laxative, curing blood diseases, rheumatism, diabetes, asthma, AIDS etc. It possesses anti-inflammatory, antiviral, anticancer, anti-leukemia, anti-tumor, analgesic, abortifacient, immune suppressive, blood-cleansing, blood sugar-lowering, hormone-balancing properties that combat free radicals, kill cancer cells, kill leukemia cells, and prevent tumors (Taylor, 2005) [21].

The utilization of pricey commercial fertilizers, which are tremendously expensive for small and marginal farmers made it possible to substitute a combination of organic manures and bio-fertilizers in place of chemical fertilizers which increase soil fertility, crop productivity and yielding high-quality fruits. Organic farming involves the use of organic manures and naturally occurring substances such as biofertilizers, biopesticides, botanicals, and integrated pest management. To maintain environmental quality and safety.

Organically grown vegetables are nutritious and valuable, with lower post-harvest losses.

Farmyard manure enhances soil permeability to air and water while continuing to increase nutrient uptake, improves soil moisture holding capacity, cation exchange capacity (CEC) and moderates soil pH. They also rise soil bulk density and promote microorganism activity (Subedi, 1998) [20].

Vermicompost has been found to have high potential as a soil amendment. It has been discovered to be an ideal organic nutrient source because it is high in macro and micro-nutrients, which help to increase yields (Hidalgo *et al.*, 1999) [10].

Poultry manure is the best and richest because liquid and solid excreta are expelled simultaneously, preventing urine loss. It contains growth-promoting substances that promote plant growth and yield of crop (Samman *et al.*, 2008) [18]. It improves soil structure, nutrient retention, aeration, soil moisture holding capacity, water infiltration, and P availability to plants (Garg and Bahl, 2008) [9].

Neem cake boosts soil aeration, water holding capacity, soil texture, and organic matter content for better crop development and increase in dry matter.

Arka Microbial Consortium is a carrier-based product that contains N-fixing, P- and Zn-solubilizing, and Plant Growth Promoting Microbes in a single formulation. The novelty of this technology is that farmers need not apply Nitrogen fixing, Phosphorous solubilizing and growth promoting bacterial inoculants separately (Aswathi *et al.*, 2020) [2].

Mycorrhiza has a symbiotic relationship with plant roots and fungal mycelia which facilitates nutrient uptake, particularly phosphorus, zinc and sulphur and production of growth hormones such as gibberellic acid, indole acetic acid, dihydrozeatin which accelerates plant growth (Ikiz *et al.*, 2009) [11] and crop yield (Dasgan *et al.*, 2008) [7].

Material and Methods

The present investigation was carried out during *rabi* season in the year 2021-2022 at P.G research farm, College of Horticulture, Rajendranagar, Hyderabad. Sri Konda Laxman Telangana State Horticultural University. The experimental site is situated at a latitude of 17º.32' North, longitude of 78º.40' East and altitude of 542.3 m above mean sea level. The plots were demarcated into three (3) replications, each replication with twenty (20) treatments and experimental design followed is Randomized Block Design (RBD). The experimental field had sixty (60) plots.

The experimental field was thoroughly ploughed and eventually the soil was brought to a fine tilth and divided into plots of 1.5 m × 7.5 m size. The experiment was executed on a pandal system. The pit size of 60 cm^3 were dug with a spacing of 1.5 × 1.0 m and were kept open for solarization for about 15 days. Good agricultural practices were followed during the entire crop period

The protrays were selected, cleaned and filled with cocopeat: perlite: vermiculite in the ratio of 3:1:1 suitable for rooting media. The seeds were soaked for overnight and imbibed seeds were sown and were kept in shade net for germination purpose. The seedlings at two leaf stage planted into already prepared plots.

The biofertilizers *viz*., Arka Microbial Consortium (AMC) and Vesicular Arbuscular Mycorrhiza (VAM) were added (12.5 kg/ha and 10 kg/ha) respectively to all organic manures for multiplication purpose. Biofertilizers enriched organic manures *viz*., well decomposed farmyard manure (25 t/ha and 30 t/ha), vermicompost (10 t/ha and 12 t/ha), poultry manure (6 t/ha and 8 t/ha) and neem cake (1 t/ha and 2 t/ha) were applied to the respective pits 15 days before transplanting of seedlings and were thoroughly mixed with soil. The recommended doses of Nitrogen, Phosphorous and Potassium @ 40: 80: 50 kg/ha were applied to the respective pits in the form of Urea, Single Super Phosphate and Muriate of Potash respectively. Half dose of urea and the entire dose of Single Super Phosphate and Muriate of Potash were applied at the time of transplanting as a basal application and the remaining half dose of Urea was divided into two split doses and were applied at 30 and 60 days after transplanting of seedlings. All other cultural and plant protection measures were done as per the recommended package of practices for the healthy crop.

The observations were recorded on quality parameters like fruit pH, total soluble solids, ascorbic acid content and chlorophyll content. The data collected were analyzed statistically by following the analysis of variance (ANOVA) technique (Panse and Sukhatme 1985) [15]. Statistical significance was tested with 'F' value at 5 per cent level of significance and whenever the F value was found significant, critical difference was worked out at five per cent level of significance.

Results and Discussion

Quality parameters

Fruit pH

The data pertaining to fruit pH as influenced by different treatment combinations of RDF and organic manures along with bio fertilizers are presented in the table 1.

The results revealed that among different combinations of RDF and organic manures along with biofertilizers had shown non-significant results on fruit pH in bitter gourd.

Total soluble solids (^{0}Brix)

The data pertaining to TSS as influenced by different treatment combinations of RDF and organic manures along with bio fertilizers are presented in the table 1.

Significant differences were observed among the treatments on total soluble solids. Significantly the highest TSS (5.18 ^{0}Brix) recorded in T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) whereas T_{20}: Absolute control recorded significantly the least TSS (3.88 ^{0}Brix). Due to synchronization of availability of proper forms of nutritive elements through organic sources and biofertilizers supplemented. In other words, organic manure takes time to mineralize and absorb. These results may be explained by the presence of nitrogen, either in the form of mineral fertilizer or in combination with organic fertilizer which could activate numerous enzymes that might have a direct impact on photosynthesis and led to increase fruit sugars contents or numerous enzymes that are involved in the metabolism of sugar contents. The results are in support with earlier findings of Kameswari *et al.* (2011) [12] in ridge gourd; Singh *et al.* (2017) [19]; Ahmad and Prasad (2022) [1] in cucumber.

Ascorbic acid content (mg/100 g)

The data pertaining to ascorbic acid content as influenced by different treatment combinations of RDF and organic manures along with bio fertilizers are presented in the table 1.

Significant differences were observed among the treatments on ascorbic acid content. Significantly the highest ascorbic content (107.11 mg/100 g) was recorded in T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) and the least ascorbic

content was recorded in T_{20}: Absolute control (54.43 mg/100 g). The reason for increase in ascorbic acid content in bitter gourd fruits with poultry manure might be due to slow but continuous supply of all major and micronutrients leading to protein synthesis and enhancement of enzymatic activities for amino acid synthesis at higher level of nutrients. The synergistic effects of biofertilizers have resulted in increased production of growth-promoting substances such as gibberellic acid, indole acetic acid and dihydrozeatin, which has improved nutrient assimilation and resulting in better quality fruits. The results are in support with earlier findings of Meerabai *et al.* (2007) [13] and Dodake *et al.* (2015) [8] in bitter gourd; Pranali *et al.* (2018) [16] in ridge gourd.

Chlorophyll content (DA meter)

The data pertaining to chlorophyll content as influenced by different treatment combinations of RDF and organic manures along with bio fertilizers are presented in the table 1.

Significant differences were observed among the treatments on chlorophyll content of fruits. Significantly highest chlorophyll content in fruits (1.59) was recorded in T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) and the least chlorophyll content in fruits was recorded in T_{20}: Absolute control (1.04). The chlorophyll content was in decreasing trend with DA reading linked to last harvest of fruits. With the advancement of ripening might be attributed to the reason that during fruit maturation and ripening, led to decrease in chlorophyll concentration substantially, while increase in carotenoids concentration. The results are in support with earlier findings of Rahman *et al.* (2019) [17] noticed that decreasing trend in DA reading with degradation of chlorophyll content in tomato.

Table 1: Effect of different treatment combinations of RDF and organic manures along with biofertilizers on fruit pH, total soluble solids, ascorbic acid content and chlorophyll content in bitter gourd.

Treatments	Fruit pH	Total soluble solids (^{0}Brix)	Ascorbic acid content (mg/100 g)	Chlorophyll content (DA meter)
T_1	6.70	3.94	73.52	1.14
T_2	6.74	3.92	70.76	1.05
T_3	6.67	4.18	78.23	1.17
T_4	6.67	4.12	73.75	1.15
T_5	6.60	4.88	97.76	1.38
T_6	6.61	4.85	96.92	1.35
T_7	6.58	4.96	98.35	1.45
T_8	6.59	4.94	98.05	1.42
T_9	6.56	5.06	104.12	1.52
T_{10}	6.57	5.01	102.95	1.49
T_{11}	6.54	5.18	107.11	1.59
T_{12}	6.55	5.12	106.87	1.54
T_{13}	6.65	4.26	84.55	1.25
T_{14}	6.67	4.24	82.17	1.24
T_{15}	6.64	4.38	89.35	1.30
T_{16}	6.64	4.35	85.28	1.27
T_{17}	6.61	4.77	92.15	1.34
T_{18}	6.62	4.75	91.06	1.33
T_{19}	6.63	4.42	90.12	1.31
T_{20}	6.76	3.88	54.43	1.04
S.E (m) ±	0.10	0.07	1.29	0.02
CD at 5%	N.S	0.20	3.69	0.06

Conclusion

Based on the study, it was concluded that, different treatment combinations of RDF and organic manures along with bio fertilizers have a significant influence on quality in bitter gourd. The experimental results revealed that application of T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly lowest fruit pH (6.54), highest TSS (5.18 ^{0}Brix), highest ascorbic content (107.11 mg/100g) and highest chlorophyll content (1.59) compared to the other treatments. Hence Poultry manure (8 t/ha) + AMC (12.5 kg/ha) was proved to be the best treatment in bitter gourd (*Momordica charantia*. L) var. Pusa Aushadhi.

Acknowledgments

At the very outset, I submit the commodious and indefinite thanks to COH, Rajendranagar, Hyderabad for giving me a platform to conduct research work and to ICAR for giving me timely scholarship.

References

1. Ahmad S, Prasad VM. Effect of different organic manures on growth, yield and quality of cucumber (*Cucumis sativus* L.) cv. Harsh under Prayagraj agro climate condition. International Journal of Plant and Soil Science. 2022;34(22):716-724.
2. Aswathi NC, Prasad VM, Sreekumar G. Effect of different concentration of Arka Microbial Consortium on the growth, yield and quality of lettuce (*Lactuca sativa*) cv. Grand Rapid under poly house in Prayagraj agro climatic condition. International Journal of Current Microbiology and Applied Sciences. 2020;9(12):1135-1143.
3. Begum S, Ahmed M, Siddiqui BS, Khan A, Saify ZS, Arif M. Triterpenes, a sterol and a monocyclic alcohol from bitter gourd (*Momordica charantia* L.). Phytochemistry. 1997;44(7):1313-1320.
4. Behera TK, Wang YH, Kole C. (Eds.). Genetics, genomics and breeding of cucurbits. CRC Press, 2011.
5. Binder RG, Flath RA, Mon TR. Volatile components of bitter melon. Journal of Agricultural and Food Chemistry. 1989;37(2):418-420.
6. Cantwell M, Nie X, Zong RJ, Yamaguchi M. Asian vegetables: Selected fruit and leafy types. Progress in

new crops; c1996. p. 488-495.
7. Dasgan HY, Kusvuran S, Ortas I. Responses of soilless grown tomato plants to Arbuscular Mycorrhizal fungal (*Glomus fasciculatum*) colonization in re-cycling and open systems. African Journal of Biotechnology. 2008;7(20):3606-3613.
8. Dodake SB, Prachi A, Dabke DJ. Effect of integrated nutrient supply system on yield, fruit quality, nutrient uptake by bitter gourd (*Momordica charantia* L.) and changes in soil properties of lateritic soils of coastal region. Journal of the Indian Society of Coastal Agricultural Research. 2015;33(2):85-88.
9. Garg S, Bahl GS. Phosphorus availability to maize as influenced by organic manures and fertilizer P associated phosphatase activity in soils. Bioresource Technology. 2008;99(13):5773-5777.
10. Hidalgo P, Sindoni M, Matta F, Nagel DH. Earthworm castings increase germination rate and seedling development of cucumber. Mississippi Agricultural and Forestry Experiment Station Res Rep. 1999;22:135-142.
11. Ikiz O, Abak K, Daşgan HY, Ortaş I. Effects of mycorrhizal inoculation in soilless culture on pepper plant growth. In International Symposium on Strategies Towards Sustainability of Protected Cultivation in Mild Winter Climate. 2008;807:533-540.
12. Kameswari PL, Narayanamma M, Ahmed SR, Chaturvedi A. Influence of integrated nutrient management in ridge gourd. Vegetable Science. 2011;38(2):209-211.
13. Meerabai M, Jayachandran BK, Asha KR. Biofarming in bitter gourd (*Momordica charantia* L.). In I International Conference on Indigenous Vegetables and Legumes. Prospectus for Fighting Poverty, Hunger and Malnutrition. ISHS Acta Horticulturae. 2006;752:349-352.
14. National Horticulture Board Ministry of Agriculture and Farmers Welfare, Government of India; c2019-2020. https://www.nhb.gov.in/
15. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. ICAR, New Delhi; c1985.
16. Pranali R, Salvi VG, Jadhav S. Growth, yield and quality of ridge gourd as influenced by integrated nutrient management in coastal region of Maharashtra. International Journal of Chemical Studies. 2018;6(5):2357-2360.
17. Rahman MA, Islam MN, Nasrin TAA, Begum MM. Non-destructive quality assessment of tomato fruit using differential absorbance technique. International Journal of Agricultural Research, Innovation and Technology. 2019;9(2):42-50.
18. Samman S, Chow JW, Foster MJ, Ahmad ZI, Phuyal JL, Petocz P. Fatty acid composition of edible oils derived from certified organic and conventional agricultural methods. Food Chemistry. 2008;109(3):670-674.
19. Singh V, Prasad VM, Kasera S, Singh BP, Mishra S. Influence of different organic and inorganic fertilizer combinations on growth, yield and quality of cucumber (*Cucumis sativus* L.) under protected cultivation. Journal of Pharmacognosy and Phytochemistry. 2017;6(4):1079-1082.
20. Subedi KD. Relay-planted green manures as a substitute for inorganic fertilizers for rice in the intensive cropping systems in Nepal. Tropical Agriculture. 1998;75:422-427.
21. Taylor L. Bitter melon: Herbal properties and actions. The healing Power of rainforest herbs; c2005. p. 1-5.