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STANDARDIZATION OF ORGANIC CULTIVATION PRACTICES ON GROWTH IN BITTER GOURD (*MOMORDICA CHARANTIA* L.) VAR. PUSA AUSHADHI

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ABSTRACT

The present investigation entitled "Standardization of organic cultivation practices on growth 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, Sri Konda Laxman Telangana State Horticultural University, Rajendranagar, Hyderabad. The experiment was carried out with twenty (20) treatments in Randomized Block Design with three (3) replications *i.e.* $\mathbf{T_1}$**:** Farmyard manure (25 t/ha) + AMC (12.5 kg/ha), $\mathbf{T_2}$**:** Farmyard manure (25 t/ha) + VAM (10 kg/ha), $\mathbf{T_3}$**:** Farmyard manure (30 t/ha) + AMC (12.5 kg/ha), $\mathbf{T_4}$**:** Farmyard manure (30 t/ha) + VAM (10 kg/ha), $\mathbf{T_5}$**:** Vermicompost (10 t/ha) + AMC (12.5 kg/ha), $\mathbf{T_6}$**:** Vermicompost (10 t/ha) + VAM (10 kg/ha), $\mathbf{T_7}$**:** Vermicompost (12 t/ha) +AMC (12.5 kg/ha), $\mathbf{T_8}$: Vermicompost (12 t/ha) +VAM (10 kg/ha), $\mathbf{T_9}$**:** Poultry manure (6 t/ha) + AMC (12.5 kg/ha), $\mathbf{T_{10}}$**:** Poultry manure (6 t/ha) + VAM (10 kg/ha), $\mathbf{T_{11}}$**:** Poultry manure (8 t/ha) + AMC (12.5 kg/ha), $\mathbf{T_{12}}$**:** Poultry manure (8 t/ha) + VAM (10 kg/ha), $\mathbf{T_{13}}$: Neem cake (1 t/ha) + AMC (12.5 kg/ha), $\mathbf{T_{14}}$**:** Neem cake (1 t/ha) + VAM (10 kg/ha), $\mathbf{T_{15}}$**:** Neem cake (2 t/ha) + AMC (12.5 kg/ha), $\mathbf{T_{16}}$**:** Neem cake (2 t/ha) + VAM (10 kg/ha), $\mathbf{T_{17}}$**:** RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha), $\mathbf{T_{18}}$**:** RDF(40: 80: 50 NPK kg/ha) + VAM (10 kg/ha), $\mathbf{T_{19}}$**:** RDF (40: 80: 50 NPK kg/ha), $\mathbf{T_{20}}$**:** Absolute control. Different treatment combinations of RDF and organic manures along with bio fertilizers have a significant influence on growth in bitter gourd. The results on growth showed that among the treatments, T_{17} RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) recorded significantly maximum vine length (69.27, 180.29, 298.04 cm), maximum vine diameter (1.96, 3.11, 4.82 mm), maximum leaf area (45.76, 67.61, 94.82 cm²), maximum chlorophyll content (43.81, 49.45, 57.35 SPAD units) at 30, 60, 90 DAS respectively compared to the other treatments.
Keywords**:** Bitter gourd, Farmyard manure, Vermicompost, Poultry manure, Neem cake, AMC, VAM, Pusa Ausadhi.

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).

Annual production of bitter Gourd in India, cultivated over 114,771 ha and yields about 12,448 kgs/ha. In Telangana, bitter gourd crop occupies 960 ha and 22,660 MT in production (Ministry of Agriculture and Farmers Welfare).

Momordicin, Momordicinin, and Momordicilin are three pentacyclic triterpenes that build over time and induce bitterness in the fruit; the bitterness then diminishes as the fruit ripens [(Begum *et al.,* 1997) ; (Cantwell *et al.,* 1996)]. Fruit contains a high concentration of vitamin C (88 mg/100g). It contains antioxidant, antimicrobial, antiviral, antihepatotoxic, antiulcerogenic, and blood sugar-lowering effects (Behera *et al*., 2011). It also has a variety of medical characteristics, including a germicidal impact, laxative action, and the ability to treat blood illnesses such as rheumatism, diabetes, asthma, and AIDS. Bitter gourd possesses hypoglycemic (blood sugar-lowering) properties and is therefore utilized as an anti-diabetic and hypoglycemic agent (Palaniswamy *et al*., 2011). It has anti-inflammatory, antiviral, anticancer, anti-leukemia, anti-tumour, analgesic, abortifacient, immune suppressive, blood-cleansing, blood sugar-lowering, and hormone-balancing properties that combat free radicals, kill cancer cells, and prevent tumours (Taylor, 2005).

The use of expensive commercial fertilizers, which are prohibitively expensive for small and marginal farmers, allowed them to replace chemical fertilizers with a combination of organic manures and bio-fertilizers, increasing soil fertility, crop productivity, and fruit yield. Organic farming makes use of organic manures and naturally occurring compounds like biofertilizers, biopesticides, botanicals, and integrated pest control. To ensure environmental quality and safety. Organically cultivated veggies are nutritious and profitable, with fewer post-harvest losses. Biofertilizers are associations that supplement plant nutrition. Some of the ways that carrier-based microorganisms found in biofertilizers boost productivity include biological nitrogen fixation, solubilization of insoluble phosphate, and manufacture of hormones, vitamins, and other plant growth factors (Bhattacharyya *et al*., 2000).

Farmyard manure increases soil permeability to air and water while also increasing nutrient uptake, improving soil moisture holding capacity, cation exchange capacity (CEC), and soil pH. They also increase soil bulk density and stimulate microbial activity (Subedi, 1998).

Vermicompost has been shown to have a great potential as a soil amendment. It has been determined to be an ideal organic nutrition source due to its high macro and micronutrient content, which aids in yield enhancement (Hidalgo *et al.,*1999).

Poultry manure is the best and richest because liquid and solid excreta are released simultaneously, reducing urine loss. It includes growth-promoting chemicals that improve plant development and agricultural yield (Samman *et al.,* 2008). It enhances soil structure, nutrient retention, aeration, soil moisture holding capacity, water infiltration, and plant P availability (Garg and Bahl, 2008).

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 includes N-fixing, P- and Zn-solubilizing, and Plant Growth Promoting Microbes in a single formulation. The peculiarity of this technology is that farmers have no requirement to use nitrogen-fixing, phosphorus-solubilizing, and growth-promoting bacterial inoculants individually. It can be simply applied using seed, soil, water, and nursery medium like coco-peat (Aswathi *et al.,* 2020).

Mycorrhiza forms symbiotic relationships with plant roots and fungal mycelia, facilitating nutrient uptake, particularly phosphorus, zinc, and sulphur, as well as the production of growth hormones such as gibberellic acid, indole acetic acid, and dihydrozeatin, which accelerates plant growth (Ikiz *et al.,* 2009) and crop yield (Dasgan *et al.,* 2008).

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 17^0.32' North, longitude of 78^0.40' 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 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 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.

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 farm yard manure (25t/ha and 30t/ha), vermicompost (10t/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 @ 60:120:30 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 growth parameters like vine length, vine diameter, leaf area, chlorophyll content. The data collected were analyzed statistically by following the analysis of variance (ANOVA) technique (Panse and Sukhatme 1985) . 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

Growth parameters

The data recorded on growth parameters *viz*., vine length, vine diameter, leaf area and chlorophyll content are presented in Table 1

Vine length (cm)

The data pertaining to vine length at 30, 60 and 90 days after sowing as influenced by different treatment combinations of RDF and organic manures along with bio fertilizers are presented in the Table 1

AT 30 DAS

Significant differences in vine length were observed among the treatments at 30 DAS. Significantly maximum vine length (69.27 cm) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) which was on par with T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (68.94 cm) and it was followed by T_{19}: RDF (40:80:50 NPK kg/ha) (66.54 cm). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum vine length (64.21 cm), whereas T_{20}: Absolute control recorded significantly minimum vine length (43.21 cm).

AT 60 DAS

Significant differences in vine length were observed among the treatments at 60 DAS. Significantly maximum vine length (180.29 cm) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) which was on par with T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (179.13 cm) and T_{19}: RDF (40: 80: 50 NPK kg/ha) (177.00 cm). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum vine length (174.48 cm), whereas T_{20}: Absolute control recorded significantly minimum vine length (145.12 cm).

AT 90 DAS

Significant differences in vine length were observed among the treatments at 90 DAS. Significantly maximum vine length (298.04 cm) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) which was on par with T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (297.06 cm) and T_{19}: RDF (40: 80: 50 NPK kg/ha) (296.19 cm). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum vine length (290.14 cm), whereas T_{20}: Absolute control recorded significantly minimum vine length (255.73 cm).

The significant increasing effect among different treatment combinations of RDF and organic manures along with biofertilizers was observed in vine length because of continuous vegetative growth might be boosted by split application of nitrogen due to ready availability of nutrients, their improved absorption and translocation by plants which led to higher photosynthetic activity than other treatments. Furthermore, increased plant height could be due to growth-promoting substances secreted by biofertilizers i.e., AMC. This in turn, might have resulted in improved growth and development due to better water transportation, uptake, and deposition of nutrients. The lowest plant height in absolute control might be due to decreased nutrient availability, reduced nitrogen availability and higher ABA content in the leaves.

The results are in support with earlier findings of Reddy and Rao (2004) , Ambede (2008) , Sureshkumar and Karuppaiah (2008) and Patel *et al.* (2020) in bitter gourd

Vine diameter (mm)

The data pertaining to vine diameter at 30, 60 and 90 days after sowing as influenced by different treatment combinations of RDF and organic manures along with bio fertilizers are presented Table 1

AT 30 DAS

Significant differences in vine diameter were observed among the treatments at 30 DAS. Significantly maximum vine diameter (1.96 mm) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) and it was followed by T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (1.83 mm). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded maximum vine diameter (1.55 mm), whereas T_{20}: Absolute control recorded minimum vine diameter (1.06 mm).

AT 60 DAS

Significant differences in vine diameter were observed among the treatments at 60 DAS. Significantly maximum vine diameter (3.11 mm) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) and it was followed by T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (2.97 mm). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum vine diameter (2.69 mm), whereas T_{20}: Absolute control recorded significantly minimum vine diameter (2.16 mm).

AT 90 DAS

Significant differences in vine diameter were observed among the treatments at 90 DAS. Significantly maximum vine diameter (4.82 mm) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) and it was followed by T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (4.64 mm). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum vine diameter (4.28 mm), whereas T_{20}: Absolute control recorded significantly minimum vine diameter (3.61 mm).

The significant increasing effect among different treatment combinations of RDF and organic manures along with biofertilizers was observed in vine diameter due to presence of readily available nutrients might have resulted in higher vine diameter with application of NPK fertilizers and biofertilizers. The inorganic sources of nutrients might have prolonged nutrient availability which increased the vine diameter and presence of biofertilizers enhanced the solubilization of nutrients and growth promoting substances synthesized by these microorganisms.

The results are in support with earlier findings of Oloyede (2010) in pumpkin; Nayak *et al. (*2016) in pointed gourd

Leaf area (cm^2)

The data pertaining to leaf area at 30, 60 and 90 days after as influenced by different treatment combinations of RDF and organic manures along with bio fertilizers are presented in the Table 1

AT 30 DAS

Significant differences in leaf area were observed among the treatments at 30 DAS. Significantly maximum leaf area (45.76 cm^2) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) and it was followed by T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (43.50 cm^2). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum leaf area (39.31 cm^2), whereas T_{20}: Absolute control recorded significantly minimum leaf area (33.89 cm^2)

AT 60 DAS

Significant differences in leaf area were observed among the treatments at 60 DAS. Significantly maximum leaf area 67.61 cm^2) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) and it was followed by T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (65.01 cm^2). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum leaf area (59.76 cm^2), whereas T_{20}: Absolute control recorded significantly minimum leaf area (42.18 cm^2)

AT 90 DAS

Significant differences in leaf area were observed among the treatments at 90 DAS. Significantly maximum leaf area (94.82 cm^2) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) which was on par with T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (92.98 cm^2) and it was followed by T_{19}: RDF (40: 80: 50 NPK kg/ha) (90.45 cm^2). Apart RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum leaf area (86.92 cm^2), whereas T_{20}: Absolute control recorded significantly minimum leaf area (57.48 cm^2).

The significant increasing effect among different treatment combinations of RDF and organic manures along with biofertilizers was observed in leaf area might be due to supply of adequate nitrogen and other nutrients which led to higher metabolic activity in leaves, synthesis of carbohydrates and phytohormones which in turn might have contributed to increased leaf area. The bio-fertilizers produce the growth promoting substances viz., auxin, gibberellins and cytokinin which encourage towards vigorous growth of the plant in terms of leaf area.

The results are in support with earlier findings of Mia *et al.* (2018) in bottle gourd.

Chlorophyll content (SPAD meter)

The data pertaining to chlorophyll content at 30, 60 and 90 days after sowing as influenced by different treatment combinations of RDF and organic manures along with bio fertilizers are presented in the Table 1

AT 30 DAS

Significant differences in chlorophyll content of leaves were observed among the treatments at 30 DAS. Significantly maximum chlorophyll content in leaves (43.81 SPAD units) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) which was on par with T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (43.30 SPAD units) and it was followed by T_{19}: RDF (40: 80: 50 NPK kg/ha) (41.40 SPAD units). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum chlorophyll content in leaves (40.59 SPAD units), whereas T_{20}: Absolute control recorded significantly minimum chlorophyll content in leaves (33.88 SPAD units).

AT 60 DAS

Significant differences in leaf chlorophyll content of leaves were observed among the treatments at 60 DAS. Significantly maximum chlorophyll content in leaves (49.45 SPAD units) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) which was on par with T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (48.93 SPAD units) and it was followed by T_{19}: RDF (40: 80: 50 NPK kg/ha) (46.99 SPAD units). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum chlorophyll content in leaves (46.14 SPAD units), whereas T_{20}: Absolute control recorded significantly minimum chlorophyll content in leaves (37.02 SPAD units)

AT 90 DAS

Significant differences in leaf chlorophyll content in leaves were observed among the treatments at 90 DAS. Significantly maximum chlorophyll content in leaves (57.35 SPAD units) was recorded in T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) which was on par with T_{18}: RDF (40: 80: 50 NPK kg/ha) + VAM (10 kg/ha) (56.80 SPAD units) and it was followed by T_{19}: RDF (40: 80: 50 NPK kg/ha) (53.63 SPAD units). Apart from RDF, among organic manures T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) recorded significantly maximum chlorophyll content in leaves (52.69 SPAD units), whereas T_{20}: Absolute control recorded significantly minimum chlorophyll content in leaves (41.71 SPAD units).

The significant increasing effect among different treatment combinations of RDF and organic manures along with biofertilizers was observed in leaf chlorophyll content because nitrogen is a major constituent of chlorophyll, proteins, amino acids and the synthesis of which will be advanced by increased nitrogen supply in soil. Better nutrient availability and balanced C/N ratio in bitter gourd supplementation might have increased synthesis of higher chlorophyll index and integration with biofertilizers enhance the availability of nutrients due to bio active substances produced around the rhizosphere of the roots.

The results are in support with earlier findings of Meenakshi (2002) , Assubaie and El-Garawany (2004) in bitter gourd; Vamsi *et al.* (2021) in cucumber.

Table 1 : Effect of different treatment combinations of RDF and organic manures along with biofertilizers on vine length (cm), vine diameter (mm), leaf area (cm^2) and chlorophyll content (SPAD meter) at different growth stages in bitter gourd

Treatments	Vine length (cm)			Vine diameter (mm)			Leaf area (cm^2)			Chlorophyll content (SPAD meter)		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
T_1	53.16	157.22	272.17	1.24	2.36	3.78	35.91	49.56	69.68	36.07	40.49	44.90
T_2	52.74	156.75	271.13	1.21	2.32	3.75	35.72	48.49	67.72	35.82	40.22	45.01
T_3	55.21	160.76	275.95	1.29	2.41	3.85	36.62	51.75	73.88	36.96	41.50	46.57
T_4	54.71	159.17	273.89	1.26	2.37	3.80	36.23	50.58	72.01	36.37	40.79	45.32
T_5	57.23	164.33	278.33	1.35	2.48	3.90	37.16	53.88	77.02	38.25	43.26	48.8
T_6	56.14	163.12	277.33	1.32	2.44	3.88	36.91	52.77	75.22	37.75	42.65	47.78
T_7	62.66	172.14	287.53	1.44	2.58	4.09	38.62	57.65	83.67	39.83	45.24	51.45
T_8	61.54	171.76	285.33	1.42	2.54	4.07	38.10	56.78	82.12	39.78	45.18	51.34
T_9	59.28	168.13	282.69	1.41	2.52	3.99	37.88	55.90	81.11	39.65	44.90	51.02
T_{10}	58.62	166.12	280.99	1.39	2.51	3.93	37.52	54.89	79.02	38.34	43.41	49.03
T_{11}	64.21	174.48	290.14	1.55	2.69	4.28	39.31	59.76	86.92	40.59	46.14	52.69
T_{12}	63.44	174.24	289.00	1.49	2.62	4.18	38.97	59.41	86.51	40.35	45.77	52.21
T_{13}	46.76	151.75	264.79	1.15	2.26	3.64	34.61	45.15	62.25	34.69	38.72	43.5
T_{14}	45.23	149.71	262.22	1.12	2.22	3.63	34.33	44.11	60.67	34.43	37.69	42.45
T_{15}	49.54	154.12	269.23	1.19	2.30	3.69	35.21	47.44	66.65	35.36	39.76	44.48
T_{16}	48.56	153.10	267.52	1.17	2.27	3.66	34.87	46.56	65.17	35.04	39.20	43.88
T_{17}	69.27	180.29	298.04	1.96	3.11	4.82	45.76	67.61	94.82	43.81	49.45	57.35
T_{18}	68.94	179.13	297.06	1.83	2.97	4.64	43.50	65.01	92.98	43.30	48.93	56.80
T_{19}	66.54	177.00	296.19	1.75	2.88	4.53	42.33	63.21	90.45	41.40	46.99	53.63
T_{20}	43.21	145.12	255.73	1.06	2.16	3.61	33.89	42.18	57.48	33.88	37.02	41.71
S.E (m) ±	0.87	2.01	2.65	0.02	0.03	0.06	0.48	0.77	1.07	0.53	0.63	0.70
CD at 5 %	2.49	5.77	7.58	0.07	0.09	0.16	1.39	2.20	3.07	1.53	1.80	2.01

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 growth in bitter gourd. The experimental results revealed that application of T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) significantly increased growth was proved to be the best treatment in bitter gourd (*Momordica charantia*. L) var. Pusa Aushadhi.

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