Effect of Organic manure and inorganic fertilizer on growth, fruit yield and quality of Bitter gourd (*Momordica charantia* L.)

Comment [A71]: The Effect of Some Organic and Mineral Fertilizer on Growth, Fruit Yield and Quality of Bitter Gourd (*Momordica charantia* L.)

ABSTRACT

The experiment was conducted on bitter gourds at the department of horticulture in Shuats, Uttar Pradesh. To find out the effect of organic and inorganic fertilizers on the growth, fruit yield, and quality of bitter gourd with three different varieties: TMBI 1309, TMBI 3346, and VNR 22. Experimental factors included N:P:K(RDF) alone and with the combination of six various treatments, including V1, V2, and V3, i.e., V1+fym (18 t/ha), V1+vermicompost (1.23 t/ha), V1+poultry manure (12.5 t/ha), V1+NPK(100%)+FYM, V1+NPK+VC, and V1+NPK+PM. same as applied for the other two varieties. It revealed that variety V2 (TMBI 3346) was recorded as significantly taller plants (201.71) and also recorded in T7 NPK + PM (210.30 cm), with the earliest 50% male flower initiation (57.52), and hybrid v2 with days to germination (65.09) in T7 (69.87 cm). IT also revealed that V2 was recorded with fruit length (cm), fruit diameter (cm), and fruit weight (kg) of 17.64, 14.40, and 72.78, respectively. Data also revealed that more fruits per plant, yield per acre, and yield per hectare were recorded in TMBI 3346. The effect on TSS due to varieties and treatments was found to be maximum in hybrid V2 (VNR 22) (1.85) and treatments T7 (NPK (100%) + PM (12.5/ha) recorded (1.65).

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KEYWORDS: N:P:K, Vermicompost (VC), Poultry manure (PM) , FYM

INTRODUCTION

Bitter gourd (*Momordica charantia* L.), is an important vegetable crop and is grown for itsimmaturetuberculatefruitswhichhaveauniquebittertaste.Thesomaticchromosomenumber of *Momordica charantia* is 2n=2x=22. It belongs to the family "Cucurbitaceae".Fruits are considered to be a rich source of vitamins and minerals and 88mg vitamin C per100g.Bittergourdisagreen-skinnedvegetablewithwhitetotranslucentfleshandatastethatfitsits name. Unless you grew up with bitter gourd as part of your regular diet, it might take you awhile to warm up to the bitter flavour. *Momordica charantia* likely originated in eastern India orsouthern China. It favours hot and humid climates with plenty of sunshine and regular

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wateraccess.Today,youcanfindbittergourdgrowinginfieldsacrossAsia,thoughithasalsobecomepopularintheCaribbeanandSouthAmerica.

Agricultural yard Essentially, cow feces, urine, waste straw, and other dairy wastes are used to prepare manure.FYM has a lot of nutrients. While the plants may immediately use a tiny amount of N, a bigger amount becomes available as the FYM breaks down. Plants are provided with a balanced nutrition when urine and cow manure are combined. Potassium and phosphorus availability from FYM is comparable to that from inorganic sources. Soil fertility is increased with FYM application.

It has been demonstrated that vermicompost, as opposed to compost made using other ways of composting, is more nutrient-rich. It has also performed better than a commercial plant medium with added nutrients; nevertheless, pH and magnesium levels needed to be adjusted. increases in the soil's accessible nitrogen and phosphorus levels, as well as a rise in the vermicompost's overall nitrogen content. increases agricultural production, plant development, and germination enhances the structure and growth of roots, microorganisms that enrich the soil.

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One of the most crucial elements in raising plant productivity is plant nutrition. One of the elements that has the biggest effects on a plant's growth, development, yield, and fruit quality is nitrogen (N). In contemporary agriculture, reducing reliance on chemical fertilizers and promoting sustainable output are essential goals that can be met with the use of an integrated plant nutrient supply system (IPNS).However, organic manures such as FYM, poultry, and pig manure are readily available in the area, are inexpensive, and can be effectively used for tomato cultivation. Integrated nutrition sources improve soil fertility and nutrient use, which in turn increases tomato yield.In addition to balancing the nutrition supply, organic manures enhance the chemical and physical characteristics of the soil. Vermicomposting recognized to boost plant protein synthesis, have a discernible impact on plant yield and growth. The use of biofertilizers, which are more affordable and environmentally friendlier than chemical fertilizers, can help lessen reliance on fertilizers.

MATERIALS AND METHODS

The investigation was carried out at the Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (U.P.) during July-October, 2023. The experiment was conducted in Factorial Randomized Block Design with 21 treatments in three replications *viz.*T0: V1T0 TMBI-1309+Control (Water Spray),T1: V1T1 TMBI-1309 + FYM (18 t/ha) , T2: V1T2 TMBI-1309+Vermicompost (1.25 t/ha), T3: V1T3TMBI-1309 + Poultry manure (12.5 t/ha), T4: V1T4TMBI-1309 + NPK (100%) + FYM (18t/ha), T5: V1T5 TMBI-1309+ NPK (100%) +Vermicompost (1.25t/ha), T6: V1T6 TMBI-1309 + NPK (100%) +Poultry manure (12.5t/ha), T7: V2T0 TMBI-3346+Control (Water Spray),T8: V2T1 TMBI-3346 + FYM (18 t/ha) , T9: V2T2TMBI-3346+Vermicompost (1.25 t/ha), T10: V2T3 TMBI-3346 + Poultry manure (12.5 t/ha), T11: V2T4 TMBI-3346 + NPK (100%) + FYM (18t/ha), T12: V2T5 TMBI-3346+ NPK (100%) +Vermicompost (1.25t/ha), T13: V2T6 TMBI-3346 + NPK (100%) +Poultry manure (12.5t/ha), T14: V3T0 VNR-22+Control (Water Spray),T15: V3T1 VNR-22 + FYM (18 t/ha) , T16: V3T2 VNR-22 +Vermicompost (1.25 t/ha), T17: V3T3 VNR-22 + Poultry manure (12.5 t/ha), T18: V3T4 VNR-22 + NPK (100%) + FYM (18t/ha), T19: V3T5 VNR-22 + NPK (100%) +Vermicompost (1.25t/ha), T20: V3T6 VNR-22 + NPK (100%) +Poultry manure (12.5t/ha), with three Bitter gourd hybrids TMBI-1309 ,TMBI-3346 and VNR-22. Crop was planted with the spacing of 150×75 cm with the application of FYM@ 18 tonnes + NPK 100:25:50 as basal dose along with spraying of insecticide which was done at 15, 30 and 45 Days after emergence of two true leaf stage. Plot size was 3×1.5 m. The data was recorded for the following parameters *viz* Vine length(cm), appearance of first male flower, appearance of first female flower, , days to first harvest, number of fruits per plant, length of fruit(cm), fruit weight(g), diameter of fruit(cm), fruit yield/acre (q/acre), fruit yield/hectare (q/ha), TSS (oBrix) . TSS was measured with the help of hand refractrometer method.

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RESULTS AND DISCUSSION

A .Growth Parameters

1.Vinelength

Comment [A712]: (cm)

Vine length varies significantly between different Hybrids. Longer vine length at 60days after sowing was found in variety TMBI-3346 (201.71 cm) in Table 1. Due to the different concentrations of organic and inorganic fertilizer the longer vine length was recorded in NPK (100%) +Poultry manure (12.5t/ha) (210.30 cm) in Table 2. Interaction data revealed T6: TMBI-1309 + NPK (100%) +Poultry manure (12.5t/ha)was recorded with longer vine length

(214.08 cm) in Table 3. Similar findings of Mujahid et al. (2010) [7] in lettuce and Bano and Kale (1987) [3] in brinjal and radish were also observed.

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2. Appearanceofmaleflowerin50s%plants.

Appearance of 1st male flower varie significantly between different Hybrids. Early male flower initiation was found in variety TMBI-3346 (57.52) in Table 1. Due to the different concentrations oforganic and inorganic fertilizer the earliest male flower was recorded in NPK (100%) +Poultry manure (12.5t/ha) (61.83 cm) in Table 2. Interaction data revealed that T13: V2T6 TMBI-3346 + NPK (100%) +Poultry manure (12.5t/ha)was recorded with earliest male flower initiation (65..57) in Table 3. Early male flower initiation may be due to presence of GA3 and N,P,K. Similar findings were reported by Patle et al. [8].

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3.Appearanceoffirstpistillateflowersin50%of plants.

Appearance of 1st Female flower varies significantly between different Hybrids. Early female flower initiation was found in variety TMBI-3346 (46.45) in Table 1. Due to the different concentrations of organic and inorganic fertilizer the earliest female flower was recorded in NPK (100%) +Poultry manure (12.5t/ha) (52.45) in Table 2. Interaction data revealed that T13: V2T6 TMBI-3346 + NPK (100%) +Poultry manure (12.5t/ha)was recorded with earliest female flower initiation (54.50) in table 3. Early female flower initiation may be due to presence of GA3 and N,P,K. Similar findings were reported by Patle et al. [8].

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4.Daystothefirstharvest.

Days to first harvest varies significantly between different Hybrids. Earliest days to harvest was found in variety TMBI- 3346 (65.09) in Table 1. The earliest number of fruits was found in treatment NPK (100%) +Poultry manure (12.5t/ha) (69.87) in Table 2. Interaction data revealed that early number of days to first harvest was recorded in T13: V2T6 TMBI-3346 + NPK (100%) +Poultry manure (12.5t/ha) (72.03) in Table 3. Early number of days to first harvest might have increased metabolic activity leading to active translocation of nutrients to develop fruits which result in early maturity of fruits. Similar findings were reported by Anjanappa et al. [2].

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(B).YieldParameters.

1.No. offruits perplant

Number of fruits per plant varies significantly between different Hybrids. Maximum number of Bitter Gourd fruits per plant was found in variety VNR-22 (40.63) in Table 1. The maximum number of Bitter gourd fruits per plant was found in treatment NPK (100%) +Poultry manure (12.5t/ha)(47.63) in Table 2. Interaction data revealed that maximum

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number of Bitter gourd fruits per plant was recorded in T20: V3T6 VNR-22 + NPK (100%) +Poultry manure (12.5t/ha) (51.17) in Table 3. The Similar result were reported by the Sekhar and Rajashree, (2009) [9] in tomato hybrid and Jose (1989)[4] in Brinjal.

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2.Fruitlength(cm)

Fruit length varies significantly between different Hybrids. Maximum fruit length was found in variety TMBI- 3346 (17.64 cm) in Table 1. Maximum length of fruit was recorded in NPK (100%) +Poultry manure (12.5t/ha) (20.15) in Table 2. Interaction data revealed in T13: V2T6 TMBI-3346 + NPK (100%) +Poultry manure (12.5t/ha) is recorded with maximum fruit length (20.69) in Table 3. Maximum length of fruit was might be due to growth hormones and macronutrients that have affected treated plants along with increase photosynthesis causing the cell elongation and division. Similar findings previously also reported by Abusaleh (1992) [1] in okra.

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2.Fruitdiameter(cm)

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Fruit diameter varies significantly between different Hybrids. Maximum fruit girth was found in variety VNR-22 (14.40cm) in Table 1.Average girth of fruit was significant due to treatments. Maximum fruit diameter was recorded NPK (100%) +Poultry manure (12.5t/ha) (15.06cm) in Table 2. The interaction effect on average diameter of fruit due to Hybrids and treatments was found significant. Interaction data revealed in T6: V1T6 TMBI-1309 + NPK (100%) +Poultry manure (12.5t/ha)is recorded with maximum fruit diameter (15.46) in Table 3. The integrated use of NPK along with organic manures significantly influenced the length diameter ratio of fruit result are conformity with finding of Mausi (1960) [7] also reported that application of muskmelon resulted in bigger fruit.

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4.Fruitweight(kg)

Fruit weight varies significantly between different Hybrids. Heavier fruit weight was found in variety TMBI- 1309(72.85 Kg) in Table 1. Due to different concentrations heavier fruit weight was recorded NPK (100%) +Poultry manure (12.5t/ha) (86.03.66 Kg) in Table 2. The interaction effect on average weight of fruit due to Hybrids and treatments was found significant. Interaction data revealed that T6: V1T6 TMBI-1309 + NPK (100%) +Poultry manure (12.5t/ha)is recorded with maximum fruit weight (88.89 Kg) in Table 3. Similar result has been obtained by Vadiraj et al. (1993) [12] in cardamom and Sekhar and rajashree (2009) [10] in tomato.

TABLE NO .1Impact of three hybrids on growth, yield and quality of bitter gourd

Hybrids	Vine length(cm) 60 days	Appearance of first male flower	Appearance of first female flower	Days to first harvest	No. of fruits per plant	Length of fruits (cm)	Average weight of fruits(kg)	Fruit diameter (cm)	Yield/acre (q/acre)	Yield/hectare (q/ha)	TSS (oBrix)
V_1 (TMBI-1309)	191.65	54.72	43.02	62.62	39.23	16.61	72.85	14.04	4.83	12.07	1.00
V_2 (TMBI - 3346)	201.71	57.52	46.45	65.09	38.31	17.64	70.78	14.00	6.18	15.46	1.53
V_3 (VNR 22)	189.91	55.15	45.35	64.44	40.63	17.44	71.95	14.40	7.57	18.92	1.85
SEm±	1.10	1.46	0.20	0.34	0.21	0.11	0.43	0.09	0.04	0.09	0.01
CD or LSD	3.14	4.18	0.59	0.97	0.60	0.31	1.22	0.25	0.11	0.27	0.02

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TABLE NO .2. Impact of different concentrations of Organic manure and inorganic fertilizer on growth, yield and quality of bitter gourd.

TREATMENTS	Vine length(cm) 60 days	Appearance of first male flower	Appearance of first female flower	Days to first harvest	No. of fruits per plant	Length of fruits (cm)	Average weight of fruits(kg)	Fruit diameter (cm)	Yield/acre (q/acre)	Yield/hectare (q/ha)	TSS (oB
T_0	166.76	50.40	39.92	59.16	31.61	12.75	54.13	12.79	5.60	14.00	1.32
T_1	188.18	52.56	41.95	60.19	34.00	14.19	62.57	13.92	5.83	14.56	1.37
T_2	192.97	53.39	42.89	61.41	36.41	16.28	69.56	14.10	6.04	15.10	1.41
T_3	197.88	56.03	43.88	63.34	38.35	18.07	71.39	14.15	6.16	15.39	1.46
T_4	200.16	57.39	44.46	66.55	40.78	19.16	76.35	14.37	6.42	16.04	1.50
T_5	204.72	58.98	49.05	67.85	46.94	19.98	82.98	14.61	6.51	16.26	1.55
T_6	210.30	61.83	52.45	69.87	47.65	20.15	86.03	15.06	6.80	17.00	1.62
SEm±	1.68	2.23	0.31	0.52	0.32	0.16	0.65	0.13	0.06	0.14	0.01
CD or LSD	4.80	6.38	0.89	1.48	0.92	0.47	1.87	0.38	0.17	0.41	0.04

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TABLE NO .3. Interaction Effect of Organic manure and inorganic fertilizer on growth yield and quality of two different hybrids of bitter gourd.

Notation	Treatment combination	Vine length(cm) 60 days	Appearance of first male flower	Appearance of first female flower	Days to first harvest	No. of fruits per plant	Length of fruits (cm)	Average weight of fruits(kg)	Fruit diameter (cm)	Yield/acre (q/acre)	Yield/hectare (q/ha)	TSS (oBrix)
T_0	V1T0	177.17	51.16	37.33	57.57	30.34	12.38	52.09	11.03	4.27	10.67	0.85
T_1	V1T1	185.81	51.64	39.49	58.50	33.48	14.01	60.74	14.05	4.37	10.93	0.89
T_2	V1T2	185.99	52.71	41.21	61.93	37.11	15.11	71.37	14.22	4.70	11.74	0.93
T_3	V1T3	186.33	53.88	43.36	61.93	38.98	16.41	72.29	14.04	4.72	11.80	0.97
T_4	V1T4	191.83	56.40	44.02	64.48	41.41	19.30	76.76	14.43	5.09	12.72	1.02
T_5	V1T5	200.36	57.50	46.65	65.81	46.05	19.49	87.81	15.04	5.15	12.86	1.11
T_6	V1T6	214.08	59.78	49.09	68.14	47.27	19.55	88.89	15.46	5.50	13.76	1.24
T_7	V2T0	158.14	46.87	39.75	58.43	33.44	12.02	60.46	13.27	5.64	14.09	1.38
T_8	V2T1	202.64	52.18	42.99	60.58	34.24	13.84	64.97	13.59	5.89	14.73	1.42
T_9	V2T2	208.50	53.77	43.14	60.89	34.98	16.40	67.36	13.95	5.96	14.91	1.48
T_{10}	V2T3	209.03	60.16	43.56	64.51	37.01	19.87	69.99	14.06	6.22	15.54	1.54
T_{11}	V2T4	209.53	61.23	43.62	68.54	40.05	20.24	76.67	14.32	6.38	15.96	1.59
T_{12}	V2T5	211.30	62.86	50.62	70.67	43.92	20.39	74.13	14.34	6.36	15.89	1.63
T_{13}	V2T6	212.87	65.57	54.50	72.03	44.51	20.69	81.87	14.47	6.83	17.06	1.67
T_{14}	V3T0	158.14	53.17	42.68	61.46	31.06	13.87	49.83	14.08	6.90	17.25	1.74
T_{15}	V3T1	202.64	53.86	43.36	61.50	34.27	14.70	62.01	14.11	7.21	18.03	1.79
T_{16}	V3T2	208.50	53.71	44.32	61.42	37.13	17.32	69.96	14.14	7.46	18.64	1.82
T_{17}	V3T3	209.03	54.03	44.72	63.59	39.06	17.94	71.91	14.36	7.53	18.83	1.86
T_{18}	V3T4	209.53	54.54	45.73	66.63	40.87	17.94	75.63	14.36	7.78	19.46	1.89
T_{19}	V3T5	211.30	56.60	49.87	67.08	50.84	20.08	87.00	14.47	8.01	20.04	1.91
T_{20}	V3T6	212.87	60.13	53.75	69.43	51.17	20.20	87.32	15.25	8.08	20.19	1.94

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	S.Ed(±)	2.91	3.87	0.54	0.90	0.56	0.29	1.13	0.23	0.10	0.25	0.02
	CD or LSD	8.32	11.06	1.55	2.57	1.59	0.82	3.24	0.66	0.29	0.72	0.06

5.Yieldperacre(q/acre)

Fruit yield quintal per acre varies statistically between different Hybrids. Maximum fruit yield quintal per acrewas found in variety VNR-22 (7.57) in Table 1. Due to the different concentrations of organic and inorganic fertilizer the maximum fruit yield tonns per hectare was found in treatment NPK (100%) +Poultry manure (12.5t/ha)(6.80) in Table 2. The interaction effect on average fruit yield quintal per acredue to Hybrids and treatments was found maximum in treatment T20: V3T6 VNR-22 + NPK (100%) +Poultry manure (12.5t/ha)(8.08) in Table 3.

6. Yieldperhectare(t/ha)

Fruit yield tonns per hectare varies statistically between different Hybrids. Maximum fruit yield tonns per hectare was found in variety VNR-22(18.92) in Table 1. Due to the different concentrations of organic and inorganic fertilizer the maximum fruit yield tonns per hectare was found in treatment NPK (100%) +Poultry manure (12.5t/ha)(17.00) in Table 2. The interaction effect on average fruit yield tonns per hectare due to Hybrids and treatments was found maximum in treatment T20: V3T6 VNR-22 + NPK (100%) +Poultry manure (12.5t/ha)(20.19) in Table 3.

[C]. QualityParameters

1. TSS(°Brix)

TSS varies statistically between different Hybrids. Maximum TSS was found in variety VNR-22(1.85) in Table 1. Due to the different concentrations of organic and inorganic fertilizerthe maximum TSS was found in treatment NPK (100%) +Poultry manure (12.5t/ha)(1.62) in Table 2. The interaction effect on TSS due to Hybrids and treatments was found maximum in treatment T20: V3T6 VNR-22 + NPK (100%) +Poultry manure (12.5t/ha) (1.94) in Table 3. .Increased in Total soluble solids content of fruits in treatments of organic manures, previously also reported by Sekhar and Rajashree (2009) [10]

CONCLUSION

From the present investigation, it was concluded that the influence oforganic manures withdifferenttreatmentcombinationsplayedtheirsignificanteffecton,growthyieldandqualityof bitter gourd. Hybrid TMBI-3346 and treatment NPK (100%) + Poultry manure (12.5 t/ha)recorded best in vine length, appearance of male flower in 50%plants, Appearance of firstpistillate flowers in 50% of plants, days to first harvest, average fruit weight (g)**,** length

offruit (cm)**,** fruit diameter (cm), number of fruits per plant**,** yield (t/ha)**,** TSS (°Brix), Fruitshape,Fruit colour ,with net return(327850) andBenefit Costratio(4.75).

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