Influence of Panchgavya on Growth, Yield and Quality parameters of Bitter gourd (*Momordica charantia* L.)

ABSTRACT

The Present experiment aims to highlights the **Influence of Panchagavya on Growth, Yield and Quality Parameters of Bitter Gourd (*Momordica charantia* L.). *The Experiment*** was conducted at Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during July-October, 2022.. The Experiment was laid out in factorial randomized block design with twelve treatment combinations and replicated thrice. The experiment consisted of two factors. Factor 1: Hybrids as TMBI-1304, TMBI-1305 and Factor 2: Different concentrations of Panchagavya P_0: Control (water spray), P_1: 1% spray of Panchagavya, P_2: 2% spray of Panchagavya, P_3: 3% spray of Panchagavya, P_4: 4% spray of Panchagavya, P_5: 5% spray of Panchagavya. Among different concentrations 5% spray of Panchagavya gave better results in Vine length (140.500cm), Appearance of 1st male flower (33.110), Appearance of 1st female flower (35.110), Days to 50% flowering (36.157), Days to 1st harvest (49.778), Number of fruits per plant (41.556), Length of fruit (14.344cm) Average fruit weight (153.667g), Girth of fruit (17.678), Average fruit yield per plant (56.760), Average fruit yield per plot (5.66) TSS (4.177) and Ascorbic acid (2.050). The best interaction results were found in TMBI-1304 along with 5% spray of Panchagavya which gave maximum growth, yield and quality characteristics in bitter gourd

Key words- *Panchagavya, Growth, Yield, and Quality.*

1.INTRODUCTION

Bitter gourd (*Momordica charantia* L.), is an important vegetable crop and is grown for its immature tuberculate fruits which have a unique bitter taste. The somatic chromosome number 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 it contains 88mg vitamin C per 100g. Bitter gourd is a green-skinned vegetable with white to translucent flesh and a taste that fits its name. Unless you grew up with bitter gourd as part of your regular diet, it might take you a while to warm up to the bitter flavour. *Momordica charantia* likely originated in eastern India or

southern China. It favours hot and humid climates with plenty of sunshine and regular water access. Today, you can find bitter gourd growing in fields across Asia, though it has also become popular in the Caribbean and South America. Due to the existence of three separate constituent groups, it offers the advantage of lowering blood sugar levels, hence minimising the risk of developing mellitus. They are steroidal saponins known as charantin, insulin, like peptides and alkaloids.

Panchagavya is a term used in Ayurveda fermented product made from five ingredients obtained from cow such as milk, urine, dung, curd and butter *(***Amalraj *et al.*2011***)***.* Panchagavya is a popular foliar nutrition prepared by organic growers of Tamil Nadu as an indigenous material and used widely for agricultural and horticultural crops (**Swaminathan *et al.* 2007**). The chemical composition of Panchagavya is pH :5.45, ECdsm2 :10.22, Total N :229, Total P :209, Total K :232 Sodium :90 Calcium :25 IAA :8.5, GA (ppm):3.5. Panchagavya plays an important role in quality of fruits and vegetables. It is used as a foliar spray, soil application along with irrigation as well as seed treatment. Panchagavya acts as an excellent growth promoter and immunity booster for plants. It is abundant in beneficial microbial loads and attests fertilizers that have miraculous effects on plants which enhance the biological and metabolic efficiency of crops. In addition Panchagavya also includes growth hormones, Auxins and Gibberellins which have advantageous effect on crops and acts as tonic for enhancing soil quality production. Panchagavya has played a significant role in providing resistance to pests and diseases, resulting in increased overall yields. The demand of bitter gourd is increasing day by day and is one of the most important vegetable crop for farmers. As the world is growing towards organic farming so, one of the most important organic product used is Panchagavya which plays a role in producing larger leaves, denser canopy, lateral shoots which results in higher yield. Today's production includes the use of chemical fertilizers, pesticides and growth regulators to enhance crop yields. However, over-dependence on chemical fertilizers adversely affects the soil, the environment and also humans. Today's organic bitter melon farming relies on bulky organic fertilizers such as manure, vermicompost and in some cases poultry manure. As a result, farmers are not getting the desired yield from organic bitter gourd cultivation. Several studies show that the application of liquid organic fertilizers together with conventional bulky organic fertilizers can improve fruit yield in addition to better quality and preservation. Therefore, the present investigation was executed to study the mean performance of different concentration of Panchagavya and interaction effect between hybrids and different concentrations of Panchagavya on growth, yield and quality

parameters under Prayagraj Agro-climatic conditions.

2.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, 2022. The experiment was conducted in Factorial Randomized Block Design with 12 treatments in three replications *viz.* T_0: V_1P_0 (TMBI-1305)+ Control, T_1: V_1P_1(TMBI-1305+ 1% Spray of Panchagavya), T_2: V_1P_2 (TMBI-1305+ 2% Spray of Panchagavya), T_3: V_1P_3 (TMBI-1305+ 3% Spray of Panchagavya), T_4: V_1P_4 (TMBI-1305+ 4% Spray of Panchagavya), T5: V_2P_5 (TMBI-1305+ 5% Spray of Panchagavya), T_6:V_2P_0(TMBI-1304+Control), T_7: V_2P_1 (TMBI-1304+ 1% Spray of Panchagavya), T_8: V_2P_2 (TMBI-1304+ 2% Spray of Panchagavya), T_9: V_2P_3 (TMBI-1304+ 3% Spray of Panchagavya) T_{10}: V_2P_4 (TMBI-1304+ 4% Spray of Panchagavya) $T_{11:}$ V_2P_5(TMBI-1304+ 5% Spray of Panchagavya) with two Bitter gourd hybrids TMBI-1305 and TMBI-1304. Crop was planted with the spacing of 150×75 cm with the application of FYM@ 18 tonnes + NPK 100:50:50 as basal dose along with spraying of Panchagavya 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, appearance of 50% flowering, days to first harvest, number of fruits per plant, length of fruit(cm), average fruit weight(g), girth of fruit(cm), average yield per plant(kg), average yield per plot (kg) total yield(t/ha), TSS (^{o}Brix) and ascorbic acid(mg/100g). TSS was measured with the help of hand refractrometer and Vitamin C was measured by nutrilization method.

Traditional Panchagavya

Panchagavya consists of nine products viz. cow dung, cow urine, milk, curd, jaggery, ghee, banana, Tender coconut and water.

Method of preparation:

In a wide mouthed mud vessel 5 kg of Cow dung and 500 gm of Cow ghee were mixed thoroughly and kept it for 3 days. After 3 days the following ingredients are added and kept it for 19 days with regular mixing both in morning and evening hours daily. On the 20th day 20 liters panchagavya is ready for use. The container was always kept covered with a mosquito net or cotton cloth. 1. Fresh cow's urine –3 liters 2. Cow's milk –2 liters 3. Cow's curd –2 liters 4. Jaggery –500 gms 5. Water or sugarcane juice -3 liters 6. Ripe banana fruit -1 bunch (12 nos.) 7. Tender coconut water –3 liters **(Sailaja *et al.* 2014)**

3.RESULTS AND DISCUSSION:

3.1 Growth parameters

3.1.1 Vine length

Vine length varies significantly between different Hybrids. Longer vine length at 90days after sowing was found in variety TMBI-1304 (137.84cm) in Table no.1. Due to the different concentrations of Panchagavya the longer vine length was recorded in 5% spray of Panchagavya (137.53 cm) in Table 2. Interaction data revealed TMBI-1304 + T_{11} 5% Spray of Panchagavya was recorded with longer vine length (140.50cm) in Table 3. Longer vine length may be due to presence of auxin in Panchagavya that leads to epical dominance and GA_3 in Panchagavya that leads to cell elongation and cell division resulting in increased vine length. Similar results were reported by **Kameswari *et al.* (2011).**

3.2 Earliness Parameter

3.2.1 Influence of Panchagavya on Appearance of first male flower

Appearance of 1st male flower varies significantly between different Hybrids. Early male flower initiation was found in variety TMBI-1304 (34.32) in Table 1. Due to the different concentrations of Panchagavya the earliest male flower was recorded in 5% spray of Panchagavya (34.22) in Table 2. Interaction data revealed that TMBI-1304 + T_{11} 5% spray of Panchagavya was recorded with earliest male flower initiation (33.11) in Table 3. Early male flower initiation may be due to presence of GA_3 and N,P,K. Similar findings were reported by **Patle *et al.* (2018)**.

3.2.2 Influence of Panchagavya on Appearance of first Female flower

Appearance of 1st Female flower varies significantly between different Hybrids. Early female flower initiation was found in variety TMBI-1304 (36.32) in Table 1. Due to the different concentrations of Panchagavya the earliest female flower was recorded in 5% spray (36.22) in Table 2. Interaction data revealed that TMBI-1304 + T_{11} 5% Spray of Panchagavya was recorded with earliest female flower initiation (35.10) in table 3. Early female flower initiation may be due to presence of GA_3 and N,P,K. Similar findings were reported by **Patle *et al.* (2018)**.

3.2.3 Influence of Panchagavya on Appearance of 50% flowering

Days to 50% flowering varies significantly between different Hybrids. Least number of days taken for 50% flowering was found in hybrid TMBI-1304 (37.47) in table 1. Due to different concentrations least number of days to 50% flowering was found in 5% spray of Panchagavya (37.25) in table 2. Interaction data revealed that TMBI-1304 + T_{11} 5% Spray of Panchagavya was recorded with earliest flower initiation (36.15) in table 3. Early 50% flowering was positively affected by Panchagavya due to cell differentiation and flower bud formation activity of cytokinin present in Panchagavya. Similar

findings were also reported by **Patle *et al.* (2018)**

3.3 Yield Parameters

3.3.1 Influence of Panchagavya on Days to first harvest

Days to first harvest varies significantly between different Hybrids. Earliest days to harvest was found in variety TMBI- 1304 (51.25) in table 1. The earliest number of fruits was found in treatment 5% Spray of Panchagavya (51.16) in table 2. Interaction data revealed that early number of days to first harvest was recorded in TMBI-1304+ 5% spray of Panchagavya (49.77) 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.* (2012).**

3.3.2 Influence of Panchagavya on Number of fruits per plant

Number of fruits per plant varies significantly between different Hybrids. Maximum number of Bitter Gourd fruits per plant was found in variety TMBI- 1304 (39.22) in table no. 1. The maximum number of Bitter gourd fruits per plant was found in treatment 5% Spray (38.83) in table no. 2. Interaction data revealed that maximum number of Bitter gourd fruits per plant was recorded in TMBI-1304 + 5% spray of Panchagavya (41.55) in table no.3.

More number of fruits per plant was might be due to presence of auxin and kinetin in Panchagavya which upon applying on foliar spray favoured the plants to produce more number of fruits per plant. Similar findings were reported by **Nileema *et al*.(2010).**

3.3.3 Influence of Panchagavya on Length of fruit (cm)

Fruit length varies significantly between different Hybrids. Maximum fruit length was found in variety TMBI-1304 (12.34 cm) in table no.1. Maximum length of fruit was recorded in 5% spray (12.70) in table no 2. Interaction data revealed in TMBI-1304+ 5% spray is recorded with maximum fruit length (14.34) in table no 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 were reported by **Sangeeta *et al.* (2018**)

3.3.4 Influence of Panchagavya on Average weight of fruit (g)

Fruit weight varies significantly between different Hybrids. Heavier fruit weight was found in variety TMBI- 1304(143.58g) in table no 1. Due to different concentrations heavier fruit weight was recorded 5% spray (117.66g) in table no 2. The interaction effect on average weight of fruit due to Hybrids and treatments was found significant. Interaction

data revealed that TMBI-1304+ 5% spray is recorded with maximum fruit weight (153.66g) in table no 3. Heavier fruits was may be due to the metabolic activity, leading to active translocation of more amount of carbohydrates to developing fruits and utilization of NPK in Panchagavya. (**Sangeeta *et al.* 2018**).

3.3.5 Influence of Panchagavya on girth of fruit (cm)

Fruit girth varies significantly between different Hybrids. Maximum fruit girth was found in variety TMBI- 1304(16.55cm) in table no 1. Average girth of fruit was significant due to treatments. Maximum fruit girth was recorded 5% spray (16.72cm) in table no 2. The interaction effect on average girth of fruit due to Hybrids and treatments was found significant. Interaction data revealed in TMBI-1304+ 5% spray is recorded with maximum fruit girth (17.67) in table no 3. Higher girth of fruit was may be due to NPK along with combination with cytokinin increases efficiency of chlorophyll pigment, photosynthates and increases allocation in the economic part which results in higher girth. Similar findings were reported by **Shafeek *et al.* (2016).**

3.3.6. Influence of Panchagavya on Average Fruit yield per plant (kg)

Average number of fruits per plant varies significantly between different Hybrids. Maximum number of fruits per plant was found in variety TMBI-1304 (5.66) in table no 1. Due to different concentration maximum number of fruits per plant was found in treatment 5% Spray (4.66) in table no 2. The interaction effect on average number of fruits per plant due to Hybrids and treatments was found significant. Interaction data revealed that maximum number of fruits per plant was recorded in TMBI-1304 + 5% spray (6.38) in table no 3. Maximum fruit yield was might be due to microbes present in Panchagavya that produces growth hormones which may cause increase in weight of fruit, number of fruits/plant, cell division and cell elongation by translocation of more amount of carbohydrates to the developing fruits. Similar results were observed by **Sanjiv *et al.* (2019)**.

3.3.7. Influence of Panchagavya on Average Fruit yield per plot (kg)

Average number of fruits per plant varies significantly between different Hybrids. Maximum number of fruits per plot was found in variety TMBI-1304 (5.66) in table no 1. Due to different concentration maximum number of fruits per plot was found in treatment 5% Spray (4.66) in table no 2. The interaction effect on average number of fruits per plot due to Hybrids and treatments was found significant. Interaction data revealed that maximum number of fruits per plant was recorded in TMBI-1304 + 5% spray (6.38) in table no 3.

3.3.8 Influence of Panchagavya on Total yield (t/ha)

Fruit yield tonns per hectare varies statistically between different Hybrids. Maximum fruit yield tonns per hectare was found in variety TMBI-1304(50.37) in table no 1. Due to the different concentrations of Panchagavya the maximum fruit yield tonns per hectare was found in treatment 5% spray of Panchagavya (41.48) in table no 2. The interaction effect on average fruit yield tonns per hectare due to Hybrids and treatments was found maximum in treatment TMBI-1304,5% spray (56.76) in table no 3.

3.4. Quality Parameters

3.4.1. Influence of Panchagavya on TSS(^{0} Brix)

TSS varies statistically between different Hybrids. Maximum TSS was found in variety TMBI-1304(3.74) in table no 1. Due to the different concentrations of Panchagavya the maximum TSS was found in treatment 5% spray of Panchagavya (3.805) in table no 2. The interaction effect on TSS due to Hybrids and treatments was found maximum in treatment TMBI-1304, 5% spray (4.17) in table no 3. Maximum TSS might be due to quick metabolic transformation of starch and pectin into soluble compounds and rapid translocation of sugars from leaves to developing fruits. Similar findings were reported by **Kameswari *et al*. (2011)**.

3.4.2. Influence of Panchagavya on Ascorbic Acid (mg/100g)

Vitamin-C varies statistically between different Hybrids. Maximum content of Vitamin-C was found in variety TMBI-1304(1.79) in table no 1. Due to the different concentrations of Pancahgavya the maximum content of Vitamin-C was found in treatment 5% spray (1.937) in table no 2. The interaction effect of Vitamin -C due to Hybrids and treatments was found maximum in treatment TMBI-1304,5% spray (2.05) in table no 3. Maximum vitamin C was might be due to quick metabolic transformation of starch and pectin into soluble compounds and rapid translocation of sugars from leaves to developing fruits. Similar findings were reported by **Meenakshi *et al.* (2007)**

4.CONCLUSION

Based on the findings of the experiment it is concluded that hybrid TMBI-1304 is superior with interaction of 5% Panchagavya spray with respect to vine length, days to first appearance of male flowers, first appearance of female flowers, Appearance of 50% pistillate flowers, days to first harvest, average fruit weight (g)**,** length of fruit (cm)**,** fruit Girth (cm), number of fruits per plant**,** average yield per plant (kg), average yield per plot (kg) yield (t/ha)**,** TSS ($^{\circ}$Brix) and Ascorbic Acid (mg/100g). Hence treatment T_{11} (TMBI-1304 +5% spray of Panchagavya) is best suited for getting higher yield.

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Table 1: Influence of two hybrids on growth, yield and quality of Bitter gourd.

Hybrids	Vine length at 90DAS (cm)	Appearance of first male flower	Appearance of first female flower	Days to 50% flowering	Days to first harvest	No. of fruits per plant	Length of fruits (cm)	Average weight of fruits(g)	Girth of fruits (cm)	Average fruit yield per plant (kg)	Average fruit yield per plot (Kg)	Total Yield(t/ha)	TSS (^{o}Brix)	Ascorbic Acid (mg/100g)
V1	132.130	36.033	38.055	39.206	53.130	34.048	10.067	77.538	15.585	2.644	21.15	23.500	2.793	1.407
V2	137.846	34.322	36.322	37.478	51.259	39.222	14.344	143.585	16.559	5.66	45.33	50.374	3.740	1.794
$CD_{(0.005)}$	0.153	0.262	0.124	0.144	0.258	0.337	0.233	1.092	0.227	0.071	0.566	0.629	0.033	0.024
S.Ed(±)	0.073	0.125	0.259	0.069	0.124	0.162	0.112	0.523	0.109	0.034	0.27	0.302	0.016	0.011

Note: V1- Hybrid 1(TMBI-1305), V2- Hybrid 2(TMBI-1304)

Table 2: Influence of different concentrations of Panchagavya on growth, yield and Quality of Bitter gourd

Hybrids	Vine length at 90 DAS (cm)	Appearance of first male flower	Appearance of first female flower	Days to 50% flowering	Days to first harvest	No. of fruits per plant	Length of fruits (cm)	Average weight of fruits(g)	Girth of fruits (cm)	Average fruit yield per plant (kg)	Average fruit yield per plot(kg)	Total Yield(t/ha)	TSS (^{o}Brix)	Ascorbic Acid (mg/100g)
P_0	132.490	36.720	38.775	39.927	53.111	33.833	10.658	86.869	15.328	2.95	23.66	26.293	2.832	1.332
P_1	133.528	35.543	37.527	38.710	52.667	35.611	10.794	112.833	15.911	4.12	32.96	36.632	3.053	1.380
P_2	134.720	35.330	37.330	38.570	52.444	36.222	10.852	114.222	16.072	4.24	33.98	37.765	3.137	1.448
P_3	135.353	34.848	36.845	37.928	52.056	37.167	11.544	115.278	16.161	4.39	35.15	39.062	3.272	1.662
P_4	136.300	34.405	36.435	37.663	51.722	38.145	12.228	116.500	16.233	4.54	36.34	40.384	3.502	1.845
P_5	137.535	34.220	36.220	37.253	51.167	38.833	12.706	117.667	16.728	4.66	37.33	41.485	3.805	1.937
$CD_{(0.005)}$	0.265	0.454	0.215	0.250	0.448	0.584	0.404	1.891	0.394	0.123	0.981	1.090	0.057	0.041
S.Ed(±)	0.127	0.217	0.449	0.120	0.214	0.280	0.193	0.906	0.189	0.059	0.470	0.522	0.027	0.020

Note: P- Different concentrations of Panchagavya

Table 3: Interaction influence of Panchagavya on growth yield and quality of two different hybrids of Bitter gourd

Interaction of Hybrids and different doses of Panchagavya	Treatment Notation	Vine length at 90 days(cm)	Appearance of first male flower	Appearance of first female flower	Days to 50% flowering	Days to first harvest	No. of fruits per plant	Length of fruits (cm)	Average weight of fruits(g)	Girth of fruits (cm)	Average fruit yield per plant (kg)	Average fruit yield per plot (kg)	Total Yield (t/ha)	TSS (^{o}Brix)	Ascorbic Acid (mg/100 g)
$V_1 \times P_0$	T_0	129.81	37.11	39.22	40.22	54.11	32.33	10.15	74.22	15.35	2.40	19.200	21.33	2.52	1.13
$V_1 \times P_1$	T_1	130.95	36.58	38.55	39.75	53.33	32.88	10.30	75.00	15.36	2.46	19.73	21.92	2.63	1.15
$V_1 \times P_2$	T_2	131.94	36.33	38.33	39.66	53.22	33.33	10.36	76.00	15.62	2.53	20.27	22.52	2.60	1.17
$V_1 \times P_3$	T_3	132.133	35.47	37.47	38.72	52.88	34.22	10.68	78.00	15.67	2.67	21.35	23.73	2.72	1.47
$V_1 \times P_4$	T_4	133.36	35.37	37.43	38.52	52.66	35.40	10.95	80.33	15.71	2.84	22.75	25.27	2.84	1.67
$V_1 \times P_5$	T_5	134.57	35.33	37.33	38.35	52.55	36.11	11.06	81.66	15.77	2.94	23.59	26.21	3.43	1.82
$V_2 \times P_0$	T_6	135.16	36.33	38.33	39.62	52.11	35.33	11.16	99.51	15.30	3.51	28.12	31.25	3.13	1.52
$V_2 \times P_1$	T_7	136.10	34.50	36.50	37.67	52.00	38.33	11.28	150.66	16.45	5.77	46.20	51.33	3.47	1.60
$V_2 \times P_2$	T_8	137.50	34.33	36.33	37.13	51.66	39.11	11.34	152.44	16.52	5.96	47.70	53.00	3.67	1.72
$V_2 \times P_3$	T_9	138.57	34.20	36.22	36.80	51.222	40.111	12.400	152.556	16.64	6.11	48.95	54.39	3.82	1.84
$V_2 \times P_4$	T_{10}	139.23	33.44	35.44	36.15	50.778	40.889	13.500	152.667	16.75	6.24	49.94	55.48	4.15	2.02
$V_2 \times P_5$	T_{11}	140.50	33.11	35.11	37.47	49.77	41.55	14.34	153.66	17.67	6.38	51.08	56.76	4.17	2.05
$CD_{(0.005)}$		0.375	0.642	0.304	0.353	0.633	0.826	0.571	1.891	0.557	0.173	1.387	1.542	0.081	0.058
S.Ed(±)		0.180	0.307	0.635	0.169	0.303	0.396	0.274	0.906	0.267	0.083	0.665	0.739	0.039	0.028