Original Research Article

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

Comment [mh1]: Influence of Panchgavya on the Hybrids of Bitter gourd (*Momordica charantia* L.) for Growth, Yield and Quality parameters.

ABSTRACT

An experiment entitled **Influence of Panchagavya onGrowth, Yield and Quality Parameters of Bitter Gourd (*Momordica charantia*L.)** 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 on bitter gourd. Experiment was laid out in Factorial Randomized Block Design with three replications with twelve treatment combinations. 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. The results revealed that hybrid TMBI-1304 resulted superior with 5% spray in Vine length (140.50cm), Appearance of fist male flower (33.11), Appearance of first female flower (35.11), Days to 50% flowering (36.15), Days to 1st harvest (49.77), Number of fruits per plant (41.55), Length of fruit (14.34cm) Average fruit weight (153.66g), Girth of fruit (17.67cm), Average fruit yield per plant (56.76), TSS (4.17), Ascorbic acid (2.05).

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

1.INTRODUCTION

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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 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.*Momordicacharantia* 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 popularin the Caribbean and South America.It has the benefit

of reducing the diabetes mellitus by lowering the sugar levels in blood because of presence of three different groups of constituents.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***)***.* Role of foliar applied panchagavya in production of many plantations crops has been well documented in India *(Selvaraj, 2003).*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**). Panchagavya was prepared following the procedures outlined by Selvaraj et al. (2006). It contained fresh cow dung 7 kg, cow urine 10 L, cow milk 3 L, curd 2 L, ghee 1 Kg, water 10 L, tender coconut water 3 L, Jaggery 3 kg and well ripened banana 12 number. Cow dung and ghee were mixed in an 80 L plastic container and stirred thoroughly both in morning and evening hours and kept aside for 3 days. After 3 days cow urine and water added to the mixture and kept for 15 days mixing twice every day. After 15 days the rest of the materials were added. The panchagavya was ready in 30 days after proper sieving through a fine cloth (**Sarkar *et al.*, 2014**). The chemical compositionof Panchagavya is pH :5.45, ECdsm2 :10.22, Total N :229, Total P :209, Total K :232Sodium :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. InadditionPanchagavya 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 vegetablecropfor farmers. As the world is growing towards organic farming so, one of the most important organic productused 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 onchemical 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,

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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. Thereforethe present investigation was executed to study the mean performance of different concentrationof Panchagavya and interaction effect between hybrids and different concentrations of Panchagavya on growth,yield and quality parameters under PrayagrajAgro-climatic conditions

2.MATERIALS AND METHODS

The investigationwas 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 gourdhybridsTMBI-1305 and TMBI-1304 (Trimurti plant science Pvt. Ltd. Crop was planted with the spacing of 150×75 cm with the addition of NPK as basal dose along withspraying of Panchagavyawhich was done at 15, 30 and 45 Days after emergence of two true leaf stage. 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 havest, number of fruits per plant, length of fruit(cm), average fruit weight(g), girth of fruit(cm), average yield per plant(Kg), total yield(t/ha), TSS(^{o}Brix) and ascorbic acid(mg/100g).

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.Significant and longer vine length was recorded with the application of 5% spray of

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Panchagavya which may be due to presenceof auxin in Panchagavya that leads to epical dominance and GA_3 in Panchagavyathat leads to cell elongation and cell division resulting in increased vine length.

3.2 Earliness Parameter

3.2.1Influence 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%sprayof 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.Significant and early male flower initiation was recorded with application of 5% spray of Panchagavya which may be due to presence of GA_3 and N,P,K.

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.Significant and early female flower initiation was recorded with application of 5% spray of Panchagavya which may be due to presence of GA_3 and N,P,K.

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 flowerinitiation(36.15) in table 3. Significant and early 50% flowering was recorded with application of 5% spray of Panchagavya which may be positively affected by Panchagavya due to cell differentiation and flower bud formation activity of cytokinin present in Panchagavya.

3.3 Yield Parameters

3.3.1 Influence of Panchagavya on Days to firstharvest

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

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3.Significant and early number of days to first harvest was recorded with application of 5% spray of Panchagavya which might have increased metabolic activity leading to active translocation of nutrients to develop fruits which result in early maturity of fruits.

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.

Significant and more number of fruits per plant was recorded with 5% spray of Panchagavya which 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.

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.Significant and maximum length of fruit was recorded with application of 5% spray of Panchagavya which might be due to growth hormones and macronutrients that have affected treated plants along with increase photosynthesis causing the cell elongation and division.

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 differentconcentrations 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 in TMBI-1304+ 5% spray is recorded with maximum fruit weight (153.66g)in table no 3.Significant and heavier fruits was recorded with application of 5% spray of Panchagavya which 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.

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

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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.Significant and higher girth of fruit was recorded with application of 5% spray of Panchagavya which 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.

3.3.6. Influence of Panchagavya on Average Fruit yield per plant

Average number of fruits per plant varies significantly between different Hybrids. Maximum number of fruits per plant was found in variety TMBI-1304 (5,667.07) in table no 1. Due to different concentration maximum number of fruits per plant was found in treatment 5% Spray (4,667.16) 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 (6,385.55) in table no 3.Significant and maximum fruit yield was recorded with application of 5% spray of Panchagavya which might be due to microbes present in Panchagavya that produces growth hormones which may cause increase in weight of fruit, number offruits/plant,cell division and cell elongation by translocation of more amount of carbohydrates to the developing fruits.

3.3.7 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. Significant and maximum TSS was observed with application of 5% spray of Panchagavya which might be due to quick metabolic transformation of starch and pectin into soluble compounds and rapid

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translocation of sugars from leaves to developing fruits.

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. Significant and maximum Vitamin C was observed with application of 5% spray of Panchagavya which might be due to quick metabolic transformation of starch and pectin into soluble compounds and rapid translocation of sugars from leaves to developing fruits.

4.CONCLUSION

From the present investigation, it is concluded that the influence of Panchagavya with different treatment combinations rendered their significant effect on, growth yield and quality of bitter gourd. Treatment T_{11}(TMBI-1304+ 5% spray of Panchagavya) recorded best in 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 (g), yield (t/ha), TSS (°Brix) and Ascorbic Acid (mg/100g

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

Hybrids	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)	Calculate Plot/Yield	Average fruit yield per plant (kg)	Total Yield (t/ha)	TSS (^{o}Brix)	Ascorbic Acid (mg/100 g)
V1	132.130	36.033	38.055	39.206	53.130	34.048	10.067	77.538	15.585		2643.802	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		5667.075	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		70.777	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		33.909	0.302	0.016	0.011

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

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

Hybrids	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)	Calculate Yield/Plot	Average fruit yield per plant (kg)	Total Yield(t/ha)	TSS (^{o}Brix)	Ascorbic Aci (mg
P_0	132.490	36.720	38.775	39.927	53.111	33.833	10.658	86.869	15.328		2958.001	26.293	2.832	1.33
P_1	133.528	35.543	37.527	38.710	52.667	35.611	10.794	112.833	15.911		4121.1314	36.632	3.053	1.38
P_2	134.720	35.330	37.330	38.570	52.444	36.222	10.852	114.222	16.072		4248.611	37.765	3.137	1.44
P_3	135.353	34.848	36.845	37.928	52.056	37.167	11.544	115.278	16.161		4394.500	39.062	3.272	1.66
P_4	136.300	34.405	36.435	37.663	51.722	38.145	12.228	116.500	16.233		4543.223	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		4667.164	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		122.590	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		58.733	0.522	0.027	0.020

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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	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)	Calculate Yield/Plot (Kg)	Total Yield(t/ha)	TSS (^{o}Brix)	Ascorbic Acid (mg/100g)
$V_1 \times P_0$	129.81	37.110	39.220	40.227	54.111	32.333	10.150	74.227	15.356	2399.957		21.333	2.527	1.137
$V_1 \times P_1$	130.95	36.583	38.550	39.750	53.333	32.889	10.300	75.000	15.367	2466.596		21.925	2.630	1.157
$V_1 \times P_2$	131.94	36.330	38.330	39.663	53.222	33.333	10.360	76.000	15.621	2533.740		22.522	2.603	1.177
$V_1 \times P_3$	132.133	35.477	37.470	38.720	52.889	34.222	10.689	78.000	15.678	2669.852		23.732	2.720	1.477
$V_1 \times P_4$	133.36	35.370	37.430	38.527	52.667	35.400	10.956	80.333	15.711	2843.891		25.279	2.847	1.670
$V_1 \times P_5$	134.570	35.330	37.330	38.350	52.556	36.111	11.067	81.667	15.778	2948.773		26.211	3.433	1.823
$V_2 \times P_0$	135.16	36.330	38.330	39.627	52.111	35.333	11.167	99.511	15.300	3516.045		31.253	3.137	1.527
$V_2 \times P_1$	136.10	34.503	36.503	37.670	52.000	38.333	11.289	150.667	16.455	5775.667		51.339	3.477	1.603
$V_2 \times P_2$	137.500	34.330	36.330	37.137	51.667	39.111	11.344	152.444	16.522	5963.482		53.008	3.670	1.720

Comment [mh53]: You have simply multiplied average fruit yield per plant with the total plant population. No plot yield in the table

Comment [mh50]: Simply Mathematically manipulated. Be conscious. Just you increased one cm vine length per increase of one percent concentration of panchagavya.

Comment [mh52]: Calculate Yield/Plot (Kg)

Comment [mh51]: Results are wrong. Bitter gourd will not bears 2.5 quintal fruits per plant. The results should be in Kgs. but you have given in gm.

$V_2 \times P_3$	138.57	34.200	36.220	36.800	51.222	40.111	12.400	152.556	16.644	6119.148		54.392	3.823	1.847
$V_2 \times P_4$	139.23	33.440	35.440	36.157	50.778	40.889	13.500	152.667	16.756	6242.555		55.489	4.157	2.020
$V_2 \times P_5$	140.50	33.110	35.110	37.478	49.778	41.556	14.344	153.667	17.678	6385.555		56.760	4.177	2.050
$CD_{(0.005)}$	0.375	0.642	0.304	0.353	0.633	0.826	0.571	1.891	0.557	173.368		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	83.060		0.739	0.039	0.028