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Performance of bitter gourd (*Momordica charantia* L.) hybrids under Prayagraj Agro-climatic condition

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Abstract

The present investigation entitled “Performance of bitter gourd (*Momordica charantia* L.) hybrids under Prayagraj Agro-climatic conditions” was undertaken at Horticulture Research Farm, Department of Horticulture, SHUATS, Prayagraj, during 2021. The study revealed that hybrid 2020/BIGHYB-5 was recorded with minimum days to 1st female flowering (44.33 days), minimum node at which 1st female appears (13.83 node), maximum vine length (3.49 m), maximum no. of fruits (29.70 fruits), maximum fruit weight (44.50 g), maximum fruit length (14.25 cm), with maximum fruit diameter (6.3 cm), maximum fruit yield (1.32 kg/plant), maximum fruit yield (117.32 q/ha) and with cost Benefit Ratio of 1:2.62 which was found to be more productive and economically viable.

Keywords: Performance, growth, yield, hybrids and bitter gourd

Introduction

Bitter gourd (*Momordica charantia* L.), $2n=22$, is a yearly, creeper plant. It's having the stamens and the pistils in separate flowers on the same plant with heterogamy (Singh *et al.*, 2013) [2]. It used as a vegetable and reported contain 2.1 g of protein, 4.2 g of carbohydrates, 1.8 mg of iron, 20 mg of calcium, 88 mg of vitamin C, 55 mg of phosphorus and 210 IU of vitamin A in 100 g of edible portion. In India the per head land resources (0.121 hectare) are decreasing due to the over population, therefore, it is very important to enhance the production and productivity per unit area. India is the second largest producer of vegetables but as compared with China we are still lagging in production and average productivity. The higher productivity in these countries is due to the large range of maximal area under hybrids like those pollinated by natural agencies in India. Therefore, hybrid can play a vital role in increasing total production and productivity due to their high yield capacity, early maturing, superior quality, disease and pest resistance. The fast increase in productivity per unit area can be achieved by the use of quality seeds with inborn and hybrid ability along with the application of improved vegetable cultivation technologies. Therefore, growing of hybrid vegetable is one of the better options because the complete potential of hybrids in vegetable crops has not been utilized. Therefore, an experiment entitled “Performance of bitter gourd (*Momordica charantia* L.) hybrids under Prayagraj agro-climatic condition” was conducted with the following objectives: To determine the performance of various hybrids of Bitter gourd in terms of growth, yield and quality.

To work out the economics of various hybrid.

Materials and Methods

The experiment was carried out at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj from February to May 2021. The design was laid out in RBD comprising 11 (9 hybrids + 2 local check variety) with 3 replications in Gross area 81.9 m² with Net area 42 m² having plot size 2m x 1m with spacing 1.00 m x 0.75 m keeping Row to Row distance 1.00 m and Plant to Plant distance 0.75 m with sub irrigation channel 1m, thus making a total 33 plots. The plot size was of 2 m². The plants were planted with a spacing of 90 cm between the rows and 90 cm between the plants. There were four plants in each plot.

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Table 1: Details of different hybrids of Bitter Gourd

Sr. No.	Entry Code	Trial Name	Source
1	2020/BIGHYB-1	Bitter Gourd Hybrid IET	IIVR, Varanasi
2	2020/BIGHYB-2	Bitter Gourd Hybrid IET	IIVR, Varanasi
3	2020/BIGHYB-3	Bitter Gourd Hybrid IET	IIVR, Varanasi
4	2020/BIGHYB-4	Bitter Gourd Hybrid IET	IIVR, Varanasi
5	2020/BIGHYB-5	Bitter Gourd Hybrid IET	IIVR, Varanasi
6	2020/BIGHYB-6	Bitter Gourd Hybrid IET	IIVR, Varanasi
7	2020/BIGHYB-7	Bitter Gourd Hybrid IET	IIVR, Varanasi
8	2020/BIGHYB-8	Bitter Gourd Hybrid IET	IIVR, Varanasi
9	2020/BIGHYB-9	Bitter Gourd Hybrid IET	IIVR, Varanasi
10	C1	Katedar Aman	National Agro Hybrid Seeds (REGD.)
11	C2	Laxmi Kathi	Shankar Seeds Company

Results and Discussion

In order to evaluate the listed hybrids, the mean of 11 hybrids including 2 check varieties for 15 characters. Wide range of variation in mean performance of hybrids was observed for all characters under study (Table 2 & 3). The mean performance was highly significant for all characters, suggesting that there is ample scope for selection in different traits for the improvements of Bitter gourd. Analysis of variance showed significant differences among the hybrids for the study of the characters at 0.1% and 5% significance.

Growth parameters

Crop growth parameters in Bitter Gourd were measured in terms of days to 1st female flowering, node at which 1st female flower appears, vine length (m) and number of primary branches are shown in table 2.

From the following table the results revealed that, the variety 2020/BIGHYB-5, IET (44.33 days) required significantly minimum days for appearance of first female flower followed by 2020/BIGHYB-7, IET (44.41 days). The variety 2020/BIGHYB-3, IET (46.83) required significantly maximum days for the appearance of first female flower. Similar results were also reported by Rao (2008) in ridge gourd. The variety 2020/BIGHYB-5, IET (13.83 node)

required significantly lower nodal position for production of first female flower followed by 2020/BIGHYB-2, IET (17.13 node) while 2020/BIGHYB-4, IET (29.36 node) required significantly higher nodal position for first female flower. Node to first female flower recorded wide range of variability. Considerable variation for the character was reported by Thakur *et al.* (1944) ^[9] in bitter gourd and Varalakshmi, *et al.* (1995) in ridge gourd.

Length of vine significantly shortest in variety 2020/BIGHYB-1, IET (2.23 m) at final harvesting which was followed by KATEDAR AMAN (2.38 m) and the longest length of vine was observed in 2020/BIGHYB-5, IET (3.49 m). The similar finding was recorded by Rani (2014). The vine length is directly proportionate are in agreement with the findings of Islam *et al.*, (2014) ^[5]

Minimum number of primary branches per plant were noticed in variety 2020/BIGHYB-4, IET (16.02) followed by 2020/BIGHYB-2, IET (16.7). while the maximum number of primary branches were recorded in treatment 2020/BIGHYB-5, IET (24.34). The similar finding was recorded by Rani (2014). The vine length is directly proportionate and increased vine length may contribute more number of branches. These findings are in agreement with the findings of Islam *et al.*, (2014) ^[5].

Table 2: Performance of Bitter Gourd (*Momordica charantia* L.) under Prayagraj agro-climatic condition in respect of growth parameters.

Trail Code	Avg. days to 1 st female flowering	Avg. node at which 1 st female flower appears	Avg. no. of primary branches	Avg. no. of Vine Length (m)
2020/BIGHYB-1	45.58	22.93	21.75	2.23
2020/BIGHYB-2	46.50	17.13	16.70	3.39
2020/BIGHYB-3	46.83	20.54	21.13	3.48
2020/BIGHYB-4	45.08	29.36	16.02	3.38
2020/BIGHYB-5	44.33	13.83	24.34	3.49
2020/BIGHYB-7	44.41	25.48	20.27	3.25
2020/BIGHYB-8	45.91	27.52	22.04	3.41
2020/BIGHYB-9	46.00	23.51	20.17	2.66
KATEDAR AMAN (C1)	45.50	24.27	22.05	2.38
LAXMI KAATHI (C2)	45.00	20.36	21.10	3.34
F-Test	S	S	S	S
SEM.(±)	0.26	1.48	0.79	0.15
C.V.	1.252	1.705	1.622	7.132
C.D. 5%	0.978	0.658	0.572	0.380

Yield parameters

The observation regarding yield *viz.*, number of fruits per plant, fruit weight (g), fruit length (cm), fruit diameter (cm), yield kg/plant and yield q/ha were shown in Table 3. As regards with number of fruits per plant, the maximum number of fruits were produced by variety 2020/BIGHYB-5, IET (29.25) followed by 2020/BIGHYB-4, IET (28.33). While the

minimum number of fruits per plant were recorded in variety 2020/BIGHYB-9, IET (24.67). This finding was supported by Srivastava and Srivastava, (1976); Singh, *et al.* Resmi (2004), Singh *et al.*, (1977) and Varalakshmi *et al.* (1995) in bitter gourd.

Maximum weight of fruit at marketable stage was recorded by variety 2020/BIGHYB-5 (44.50 g) followed by

2020/BIGHYB-8, IET (43.91 g). While minimum weight was recorded by variety KATEDAR AMAN (35.86 g). These findings are in the conformity with the work done by Islam *et al.*, (2010) [5].

The fruit length varied from 9.44 cm to 14.25 cm. It was significantly highest in 2020/BIGHYB-5, IET (14.25 cm) followed by 2020/BIGHYB-3 (13.52 cm) While the lowest average length of fruit was recorded by KATEDAR AMAN (9.44 cm). The variation might be due to the vigour of the crop and environmental factors. These findings are in the conformity with the work done by Nugullie and Biswas (2015) [6].

The fruit diameter varied from 5.4 cm to 6.3 cm. It was significantly highest in 2020/BIGHYB-5, IET (6.3 cm) followed by 2020/BIGHYB-7 (6.17cm). While minimum diameter at marketable stage was recorded by KATEDAR AMAN (5.4 cm). The variation might be due to the vigour of the crop and environmental factors. These findings are in the

conformity with the work done by Nugullie and Biswas (2015) [6].

The variety 2020/BIGHYB-5, IET (1.28 kg) recorded highest yield per plant followed by 2020/BIGHYB-1, IET (1.17 kg) While the lowest yield was recorded by the variety 2020/BIGHYB-3, IET (0.92 kg). Fruit yield per plant in bitter gourd (Yadav *et al.*, 2008). Fruit yield ha⁻¹ was affected by varieties.

The highest yield quintal per hectare recorded in variety 2020/BIGHYB-5, IET (114.06 q) followed by 2020/BIGHYB-8, IET (104.58 q). While lowest yield quintal per hectare recorded in variety KATEDAR AMAN (83.24 q). These findings are in the conformity with the work done by Islam *et al.*, (2010) [5] and (Yadav *et al.*, 2008).

The highest cost Benefit Ratio of 1:2.62 was found in 2020/BIGHYB-5, IET to be more productive and economically viable among all others different hybrids of bitter gourd.

Table 3: Performance of Bitter Gourd (*Momordica charantia* L.) under Prayagraj Agro-climatic condition in respect to yield parameters.

Trail code	Avg. no. of fruits/plant	Avg. fruit weight (g)	Avg. fruit length(cm)	Avg. fruit diameter (cm)	Avg. fruit yield (kg/plant)	Avg. fruit yield(q/ha)
2020/BIGHYB-1	26.91	42.32	11.05	5.73	1.13	100.43
2020/BIGHYB-2	25.92	40.06	11.27	5.77	1.03	91.54
2020/BIGHYB-3	27.49	40.17	13.52	5.67	1.10	97.76
2020/BIGHYB-4	27.03	37.75	10.72	6.01	1.02	90.65
2020/BIGHYB-5	29.70	44.50	14.25	6.3	1.32	117.32
2020/BIGHYB-7	25.16	43.38	10.53	6.17	1.09	96.87
2020/BIGHYB-8	27.57	43.91	13.43	6.16	1.21	107.54
2020/BIGHYB-9	24.66	41.19	11.35	5.56	1.01	89.76
KATEDAR AMAN	26.20	35.86	9.44	5.4	0.93	82.65
LAXMI KATHI	26.75	36.49	10.46	5.62	0.97	86.21
F – Test	S	S	S	S	S	S
SEM (±)	0.44	0.97	0.49	0.09	0.03	3.28
C.V.	2.014	1.36	1.91	2.57	2.48	2.48
C.D. (5%)	0.92	0.95	0.38	0.25	0.046	4.080

Economics: The observation regarding economics *viz.* cost of cultivation and cost benefit ratio is shown in Table 4 and 5 respectively.

Gross Return: Higher Gross return (1,75,980 INR/ha) was obtained by 2020/BIGHYB-5, which was significantly superior over rest of the treatments. And minimum gross return was obtained by KATEDAR AMAN (Check) (1,23,975 INR/ha).

Net Return: Higher Net return (1,08,935 INR/ha) was

obtained by 2020/BIGHYB-5, which was significantly superior over rest of the treatments. And minimum net return was obtained by KATEDAR AMAN (Check) (56,930 INR/ha).

Benefit Cost Ratio: Higher Benefit Cost Ratio (1:2.62) was obtained by 2020/BIGHYB-5, which was significantly superior over rest of the treatments. And minimum benefit cost ratio was obtained by KATEDAR AMAN (Check) (1:1.84).

Table 4: Cost of cultivation

Sr. No.	Particulars	Unit	Quantity	Rate/Unit	Cost (INR/ha)
A	Land Preparation	Hrs.	2.5	600	1,500
	Ploughing	Hrs.	2	700	1,400
	Levelling	Labour	5	300	1,500
B	Fertilizers, manures and seed				
	Cost of seed	Kg	1.5	2,500	3,750
	FYM	Tonnes	15	700	10,500
	Urea	Kg	202.5	5.7	910
	DAP	Kg	217	22	4,774
	MOP	Kg	166	18.5	3,071
	Labour for seed sowing	Mandays	5	300	1,500
	Labour for fertilizer application	Mandays	2	300	600
C	Gap filling	Mandays	5	200	1,000
	Intercultural Operations				

	Weeding and Hoeing	Mandays	5	270	1,350
	Insecticides and Pesticides		3	420	1,260
	Spraying of chemical 6 times	Mandays	5	270	1,350
D	Irrigation				
	Irrigation	Labour	12	270	3,240
	Tuber well charges	Irrigation	4	400	1,600
F	Harvesting				
	Mandays	Labour	12	270	3,240
	Transportation				5,000
	Rental value of land	Months			6,000
	Supervision charges	Days	90	150	13,500
	Total Cost of Cultivation				67,045

Table 5: Cost Benefit Ratio

Selling Price: 15/kg					
Trail Code	Fruit yield q/ha	Cost of Cultivation (INR/ha)	Gross Return (INR/ha)	Net Return (INR/ha)	Benefit Cost Ratio
2020/BIGHYB-1	100.43	67,045	1,50,645	83,600	1:2.24
2020/BIGHYB-2	91.54	67,045	1,37,310	70,265	1:2.04
2020/BIGHYB-3	97.76	67,045	1,46,640	79,595	1:2.18
2020/BIGHYB-4	90.65	67,045	1,35,975	68,930	1:2.02
2020/BIGHYB-5	117.32	67,045	1,75,980	1,08,935	1:2.62
2020/BIGHYB-7	96.87	67,045	1,45,305	78,260	1:2.16
2020/BIGHYB-8	107.54	67,045	1,61,310	94,265	1:2.40
2020/BIGHYB-9	89.76	67,045	1,34,640	67,595	1:2.00
KATEDAR AMAN (C1)	82.65	67,045	1,23,975	56,930	1:1.84
LAXMI KATHI (C2)	86.21	67,045	1,29,315	62,270	1:1.92

Conclusion

On the basis of overall findings of the present research study it was concluded that there is wide range of variation in Bitter Gourd hybrids for all the characters studied. 2020/BIGHYB-5, IET resulted in highest growth and yield. Since this is based on one season trial therefore, further evaluation trials are needed to substantiate the findings.

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