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STUDY ON THE GROWTH, YIELD AND YIELD ATTRIBUTES OF EIGHT VARIETIES OF BITTER GOURD (*MOMORDICA CHARANTIA* L.)

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ABSTRACT

Seeds of eight varieties of bitter gourd (V_1, V_2, V_4, V_5, V_6, V_7, V_9 and V_{10}) were sown in the experimental field and their growth, yield and yield attributes were studied. The length, number of nodes and leaves and number of branches per plant were highest in V_1. The number of female flowers, number of fruits and yield per plant were found maximum in V_4. Chlorophyll a and total pigment contents of leaves were highest in V_2. Total NPK and Vitamin C contents of fruits were found highest in V_6.

Key words: Growth, yield, yield attributes bitter gourd.

INTRODUCTION

Bitter gourd (*Momordica charantia* L.) is a cultivated species of Cucurbitaceae. Different varieties of bitter gourd are cultivated in this country. The varieties vary in size, shape, colour, spine characters and bitterness. The market preference of colour, shape, size and bitterness also vary with locations. The varieties can be classified into small fruit type locally known as " Ucchya", 5-7.5 cm long and large fruit type locally known as "Korella", 15-18 cm long (Sikdar 2004).

Bitter gourd can be cultivated in any season but it is popularly cultivated in Kharif season in Bangladesh. Each and every part of it is nutritive and has medicinal significance (Sirohi and Chowdhury 1980). Some workers reported on the characteristics of different Varieties of bitter gourd.

Thakur and Khattra (1996) studied to find out the most suitable genotype of long fruited bitter gourd. Awasthi and Jaiswal (1986) estimated the physical, biochemical and organoceptic characteristics of edible fruits of different cultivars of bitter gourd. Celine and Sirohi (1998) studied the gene action of vine length, fruit number, fruit length, grith, flesh thickness, number of seeds per fruit and fruit weight of ten true breeding lines of bitter gourd. Seeds of most of the available varieties in Bangladesh are imported from other countries. These

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varieties vary in size, shape, colour, spine characters, bitterness and yield. The male to female sex ratio also vary greatly with the varieties. No Systematic work was so far done in Bangladesh on the collection of germplasm of bitter gourd and their performances in the field. Hence the present investigation was undertaken to study the growth, yield and yield attributes of different varieties of bitter gourd.

MATERIALS AND METHODS

Seeds of 10 varieties (V_1, V_2, V_3, V_4, V_5, V_6, V_7, V_8, V_9 and V_{10}) of bitter gourd of **(***Momordica charantia* L.) were collected from seed dealers. Among them seeds of V_3 and V_8 did not germinate. Seeds of other varieties (V_1, V_2, V_4, V_5, V_6 , V_7, V_9 and V_{10}) were sown in the experimental field. The name of these varieties are as follows :

Taj 88 (V_1), Tia (V_2), Chottrola (V_4), Gojnee (V_5), Eureka (V_6), Raja (V_7), Pashapashi (V_9) and Shahparan (V_{10})

The experimental field was prepared in the botanical garden, University of Chittagong by ploughing, cross- ploughing and leveling. The pits were made at a spacing of 4m × 4m measuring 60 cm × 60 cm × 45 cm. The experiment was laid out in a randomized complete block design (RCBD) with three replications. In each pit 10 kg rotten cowdung, 22og N, 375g P_2O_5 and 115g K_2O were applied following Paleda and Chang (2003). Six seeds were sown in each pit and after germination four uniform seedlings were kept per pit at equal distance. Each Seedling was provided with a support (branched bamboo stick). Watering, weeding, mulching and other cultural practices were done as and when required.

The length of main vine, length of primary and secondary branches, number of nodes and leaves, number of branches and number of female and male flowers were recorded at the opening of first flower and continued at 15 days interval till final harvest. Data of three plants of each replication was taken. The final data (addition of all counts) were given in the tables. The fruits of all varieties were harvested at marketable stage. The number of fruits per plant was recorded in the field. Fresh weight, length, diameter, flesh thickness, cavity and number of seeds per fruit were recorded just immediately after harvest. Yield per plant was calculated by multiplying the fresh weight per fruit and number of fruits per plant. Plants were finally harvested after four month of sowing.

After harvesting, 100g of plant and fruit samples were dried in oven at 65^0C till a constant dry weight was obtained. Then grinded in an electric grinder and sieved (60 mesh) and stored in airtight containers. For determination of NPK dried plant and fruit samples were digested following modified microKjeldhal

method as described by Jackson (1973). Chlorophyll a, b and carotenoid contents of fresh leaves were determined spectrophotometrically (Spectronic-21D Milton Roy) and calculated following Wettstein (1957). Vitamin C content of fresh fruits was estimated following Pleshkov(1976).

REASULTS AND DISCUSSION

Results presented in Table 1 reveal that the length of main vine and secondary branches per plant was found maximum in V_1 which resulted the highest total length per plant. The highest number of nodes and leaves was found in V_1 and it was statistically different from other varieties. The number of primary branches per plant was found maximum in V_6 and minimum in V_2, whereas, the number of secondary branches per plant was recorded maximum in V_1 and minimum in V_5.

It was also revealed from table 1 that all the varieties of bitter gourd showed some differences in the male, female, total number of flowers and male to female sex ratio. The number of male and total flowers per plant was recorded highest in V_1, where as, lowest in V_9 and were significantly different from all other varieties. In V_4 the number of female flowers was obtained highest which produced the lowest male to female sex ratio. In V_1, on the other hand, the number of male flowers was highest where the male to female sex ratio was highest.

Table 2 shows that the number of fruits per plant was highest in V_4 followed by V_1, V_2, V_7 V_5, V_9, V_6 and V_{10}. The differences were found significant in all the varieties from V_6 and V_{10}. The fresh weight, circumference and diameter per fruit were significantly highest in V_7. The length per fruit was significantly higher in all the varieties from V_4 and maximum length per fruit was in V_6. The flesh thickness per fruit was maximum in V_4 where the number of seeds per fruit was significantly lowest. The difference in yield was found significant in all the varieties from V_{10} and V_6 (Table 2). The yield per plant was highest in V_4 mainly due to highest number of fruits per plant. The characteristics of fruits of eight varieties of the present investigation differ greatly. The differences of characteristics among the varieties were also reported by Awasti and Jaiswal (1986) and Celine and Sirohi (1998).

The NPK concentrations of plants and fruits varied greatly (Table 3). The N and K concentrations of plant were maximum in V_6 but P concentration was highest in V_7. The total NPK concentrations of plants was recorded maximum in

V_6. The highest total NPK concentrations of fruits was obtained in V_6 where N, P and K concentration were also maximum individually.

The Chlorophyll a and Chlorophyll b content of leaves were significantly highest in V_2 and V_9 respectively. The highest carotenoid content was found in V_5. The total pigment content of leaves was highest in V_2 where chlorophyll a was also highest (Table 4). The vitamin C content of fresh fruit was found maximum in V_6 and minimum in V_9 (Table 4).

The differences of growth, yield and yield attributes of the eight varieties of bitter gourd may be due to genetic diversity of the varieties (Jeffrey 1990). The variation of sex expression of the varieties may be due to environmental and other factors. The variation of sex expression of cucurbits were also observed by Whitaker (1931), Mining and Matzekestich (1944), Nitsch *et al.* (1952) and Rahman *et al.* (1995).

Among the eight varieties the length of plant, number of branches, number of male and total flowers were highest in V_1 but the number of female flowers was highest in V_4 where male to female sex ratio was lowest. The number of fruits per plant was highest in V_4 which resulted the maximum yield per plant. So, V_4 (Chottrola) may be recommended for the growers for better yield.

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TABLE 1: MORPHOLOGICAL DIFFERENCES AMONG EIGHT VARITIES OF BITTER GOURD.

Variety	Length of main vine/ Plant (m)	Length of branches /plant (m)		Total Length/ Plant(m) (A+B)	No.of nodes and leaves/ plant	No.of branches/ plant		No. of flowers/plant			Male to Female Sex ratio (M/F)
		Primary (A)	Secondary (B)			Primary	Secondary	Male (m)	Female (f)	Total (M+F)	
V_1	4.52f	32.43de	13.39d	50.35e	1001.33e	571.67c	341.33f	908.61g	47.00b	955.61h	19.33e
V_2	4.46e	31.72a	12.47c	48.65a	905.67a	481.33a	340.00f	706.83b	50.56c	757.39b	13.98a
V_4	4.27a	32.24bc	12.36ab	48.88b	927.67b	544.67b	309.00c	804.00e	57.92e	861.92f	13.88a
V_5	4.39c	32.39cde	12.37ab	49.15cd	918.83ab	551.83b	209.33a	790.17d	49.67c	839.84d	15.91c
V_6	4.35b	32.54e	12.43bc	49.32d	973.77d	583.67c	315.33d	863.50f	45.44b	908.94g	19.00d
V_7	4.41cd	32.30bcd	12.31a	49.02bc	918.50ab	545.67b	294.33b	799.92e	53.00d	852.92e	15.09b
V_9	4.34b	32.22b	12.44bc	49.00bc	906.94a	495.27a	337.00ef	694.17a	46.33b	740.50a	14.98b
V_{10}	4.44de	32.30bcd	12.43bc	49.16cd	958.06c	546.83b	332.00e	776.84c	40.00a	816.84c	19.42e

*Means followed by same letter (s) did not differ at 5% level of significant by DMRT

TABLE 2: YIELD AND YIELD ATTRIBUTES OF EIGHT VARITIES OF BITTER GOURD.

Variety	No. of fruits/plant	F.wt./ fruit (g)	Length/ fruit (cm)	Circumference/ fruit (cm)	Diameter/ fruit (cm)	Flesh thickness/ fruit (cm)	No. of seeds/fruit	Yield/plant (kg)
V_1	19.33c	74.37a	15.78b	11.36a	3.45a	1.0a	18.00b	1.44d
V_2	18.80c	88.57f	19.53e	12.20d	3.75de	0.99a	24.33f	1.67f
V_4	22.85d	82.21e	14.55a	11.68bc	3.66bcd	1.04b	15.83a	1.88g
V_5	18.56c	82.85e	18.43d	11.72c	3.71cde	1.0a	22.92e	1.54e
V_6	14.89a	78.46c	20.22f	11.57b	3.55ab	0.99a	18.73bc	1.17b
V_7	18.79c	89.73g	18.66d	12.36e	3.81e	0.98a	17.76b	1.69f
V_9	16.81b	79.97d	17.91c	11.56bc	3.60bc	0.98a	19.72c	1.34c
V_{10}	14.69a	75.29b	18.57d	11.43a	3.54ab	1.0a	21.26d	1.11a

*Means followed by same letter (s) did not differ at 5% level of significant by DMRT

TABLE 3: N, P AND K CONTENT OF WHOLE PLANTS AND FRUITS OF EIGHT VARITIES OF BITTER GOURD.

Variety	NPK concentrations (g % of dry wt. basis)							
	N		P		K		Total	
	Plant	Fruit	Plant	Fruit	Plant	Fruit	Plant	Fruit
V_1	2.41a	3.02a	0.50a	0.88cd	2.42a	3.04a	5.33a	6.94a
V_2	3.02b	3.55bc	0.65f	0.83b	3.05e	3.56c	6.72d	7.94c
V_4	2.95b	3.92cde	0.66f	0.87c	2.97d	3.92d	6.58cd	8.71d
V_5	3.02b	4.02de	0.56d	0.69a	3.03e	4.11e	6.61cd	8.82d
V_6	4.15d	4.83f	0.59e	1.18g	4.17g	4.90g	8.91f	10.91f
V_7	2.82b	3.69cd	0.68g	0.90e	2.91c	3.92d	6.41c	8.51d
V_9	3.55c	4.22e	0.54c	0.95f	3.57f	4.26f	7.66e	9.43e
V_{10}	2.72b	3.22ab	0.52b	0.89de	2.72b	3.24b	5.96b	7.35b

*Means followed by same letter (s) did not differ at 5% level of significant by DMRT

TABLE 4: CHLOROPHYLL A, B AND CAROTENOID CONTENTS OF LEAVES AND VITAMIN C CONTENTS OF FRUITS OF EIGHT VARITIES OF BITTER GOURD.

Variety	Chlorophyll a (mg/g)	Chlorophyll b (mg/g)	Carotenoids (mg/g)	Total pigments (mg/g)	Vitamin C (mg/100g)
V_1	1.60a	1.29e	0.23a	3.12ab	24.60b
V_2	2.32e	1.14c	0.42bc	3.88d	27.80e
V_4	1.72b	0.74a	0.55de	3.01a	25.20c
V_5	2.31e	0.96b	0.59e	3.86d	27.20d
V_6	1.95d	0.81a	0.49cde	3.25bc	37.40h
V_7	1.53a	1.25de	0.44bcd	3.22b	32.00g
V_9	1.87cd	1.49f	0.39bc	3.75d	18.20a
V_{10}	1.84c	1.20cd	0.35ab	3.39c	30.40f

*Means followed by same letter (s) did not differ at 5% level of significant by DMRT

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