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PERFORMANCE OF BITTER GOURD GENOTYPES FOR YIELD AND EARLINESS

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ABSTRACT

The present investigation was undertaken at Model Orchard, College of Horticulture, Rajendranagar, Hyderabad during summer 2010 and 2011 in a randomized block design with three replications to evaluate the bitter gourd genotypes for their growth and yield so as to select the desirable parents in breeding programme (heterosis breeding) for the crop improvement. The seed of eight genotypes viz., IC -033227, IC-044417, IC-044438, IC-045339, IC-085622, IC-470550, IC-470558, IC-470560 and control MBTH 101 was sown at spacing of 2.0 m between rows and 0.5 m between plants and good crop was raised by following the recommended package of practices. The analysis revealed the significant differences among the genotypes for fifteen characters studied. The genotypes viz.,IC-044438 followed by IC-033227 and IC-470560 recorded highly significant yield (1.58, 1.38 and 1.36 kg/plant respectively) and yield related traits like number of fruits/vine (21.6, 20.00 and 22.47 respectively), average fruit weight(73.33, 69.24 and 60.68g respectively), pulp thickness (3.53, 3.69 and 3.48 cm respectively) while IC-470560 and IC-044438 were found early as they recorded minimum days to 1st male flower (37.47 and 39.13 respectively), 1st female flower appeared (47.40 and 45.13 respectively) and sex ratio (male to female) (7.16 and 7.38 respectively). Based on the results, genotypes viz., IC-044438, IC-033227 and IC-470560 may be selected as parents in further breeding programme to improve the crop in terms of yield and earliness.

Key words: Bitter gourd, earliness, performance, yield

INTRODUCTION

Bitter gourd (*Momordica charantia* L.) is one of the most important monoecious cucurbits grown throughout India owing to its nutritive value and therapeutic properties. Among the cucurbits, it is considered as prized vegetable because of its high nutritive values especially ascorbic acid and iron (Behera, 2004). A compound known as charantin present in the bitter gourd is used in the treatment of diabetes to lower blood sugar levels (Shetty *et al.* 2005).The crop is extensively grown in India, China, Japan, South East Asia, Tropical Africa and South America. Karnataka, Maharashtra, Tamil Nadu, Kerala and Andhra Pradesh are the major bitter gourd growing states in India. Bitter gourd is cultivating an area of 6.76 million hectares with an annual production of 101.43 million tonnes in India (Rai and Pandey, 2007). In spite of the potential economic and medicinal importance of the crop due attention was not given towards a need based crop improvement programme. There is a prime need for its improvement and to develop varieties or hybrids suited to specific agro ecological conditions. A good approach for its improvement through assessment of genetic variability and exploitation of hybrid vigour has not been adopted so far in this crop in relation to its importance. Owing to the existence of wide variability, monoecious nature, conspicuous and convenient architecture of flowers for crossing and large number of seed per fruit, bitter gourd can serve as the most potent material for the exploitation of heterosis on commercial scale. Hence, in the present investigation, genotypes were evaluated to identify the best genotypes which can be utilized as parents in exploitation of heterosis to improve the crop.

MATERIAL AND METHODS

The study was conducted at college of Horticulture, Rajendranagar, Hyderabad during summer 2010 and 2011 in red sandy soil. The experimental site is situated at $17^0 19^1$ Northern Latitude, $78^0 2^1$ Eastern Longitude and 542.4 m from Mean Sea Level. The climatic conditions of experiment site were recorded as minimum temperature 20.3^0C and 18.1^0C, maximum temperature 35.6^0C and 34.4^0C, average rainfall 17.7 mm and 5.5 `mm and humidity 56.1% and 43.9% for 2010 and 2011 respectively during the crop growth period (January to May). The experiment was conducted in a randomized block design with three replications using eight genotypes viz., IC -033227, IC-044417, IC-044438, IC-045339, IC-085622, IC-470550, IC-470558, IC-470560 and control MBTH-101. Seed was sown on 3rd January 2010 and 2011 in rows at spacing of 2m between rows and 0.5 m between plants. A basal dose of 50 kg/ha N and 60 kg/ha P_2O_5 along with 20 tonnes of FYM was applied before final ploughing and as top dressing additional 50 kg/ha N and 80 kg/ha K_2O was applied at 45 days after sowing. Need based plant protection measures were taken to raise healthy crop. Data were recorded on five randomly

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selected plants in each genotype for fifteen characters viz., vine length (m), number of laterals/vine, internodal length (cm), days to 1st male flower appeared, days to 1st female flower appeared, node number at which 1st male flower appeared, node number at which 1st female flower appeared, sex ratio (male to female), number of fruits/vine, average fruit weight (g), fruit length (cm), fruit girth (cm), pulp thickness (cm), number of seeds/fruit and yield/vine (kg). Data on growth parameters viz., plant height, number of branches/vine, internode length were recorded at the time of last harvest while yield parameters like pulp thickness, average fruit weight, fruit length and fruit girth were recorded at peak fruiting time.

RESULTS AND DISCUSSION

The mean values of all genotypes along with control MBTH-101for fifteen yield and yield attributing traits are presented in Table 1 and 2. The results revealed that the significant differences were observed among the genotypes for all the characters studied. To support higher yields in bitter gourd, the ideal plant type should have longer vine length with more number of laterals (Dey *et al*. 2005). Among genotypes, IC-044438 recorded significantly highest vine length of 2.29 m followed by IC-470560 (2.27 m) and IC-470558 (2.15 m) whereas minimum vine length was recorded in IC-045339 (1.64 m). The mean number of laterals/vine was 5.66 with a range from 5.33 in IC-044417 to 6.27 in IC-470560 which is similar to that of control. Other genotypes with more number of laterals were IC-085622 (6.07) and IC-044438 (6.00). Lower internode length is desirable for higher productivity. The shortest internode length (6.03cm) was observed in IC-470558 followed by IC-470550 (6.45 cm) and IC-470550 (6.82 cm) which were on par to control (6.63) whereas longest internode length (7.87 cm) in IC-044417. Significant variation among the genotypes for vine length and number of primary branches was also reported by Samadia (2002) in bottle gourd.

In bitter gourd, earliness is a useful character for realizing the potential economic yield in a short time possible, as such due consideration is given by a vegetable grower. Minimum days to first male and female flower appeared and node number at which first male and female flower appeared traits are considered as desirable. Among the genotypes, IC-470560 recorded minimum days (37.47) forthe appearance of first male flower followed by IC-044438 (39.13) while maximum was observed in IC-045339 (45.47) followed by IC-470558 (45.20) and IC-470550 (45.20). The appearance of first female flower in the parent IC-044438 (45.13 days) considered early whereas IC-0470550 flowered late (57.27). The node number at which 1st male flower appeared in IC-470560 (6.73) followed by IC-085622 (7.40) while highest node number (10.93) in IC-045339. Out of eight parents, IC-470560 found the earliest (12.07) parent followed by IC-470558 (14.73) and IC-044438 (14.93) which were on par with control (14.53)while IC-470550 was identified as late (17.40) in terms of node number at which 1st female flower appeared. Similar findings were reported by Aruna and Swaminathan (2012) in bitter gourd. Lowest sex ratio (male to female) is advantageous as lower sex ratio is obtained when number of female flowers is more. The genotype IC-470560 recorded significantly lowest sex ratio (7.16) followed by IC-044438 and IC-085622 (7.38) which were recorded lower values than control (7.47) whereas IC-045339recorded highest sex ratio (9.38). in the

Table 1: *Per se* performance of bitter gourd genotypes for growth and earliness characters (mean of two years)

Genotypes	Vine length (m)	No. of laterals/ vine	Inter-nodal length (cm)	Days to 1st male flower	Days to 1st female flower	Node No. at 1st male flower	Node No. at 1st female flower	Sex ratio
IC-033227	2.01	5.47	6.83	40.73	50.73	9.20	15.13	8.46
IC-044417	1.84	5.33	7.87	43.13	48.93	8.53	16.40	8.69
IC-044438	2.29	6.00	6.82	39.13	45.13	8.20	14.93	7.38
IC-045339	1.64	5.80	7.11	45.47	54.93	10.93	16.87	9.38
IC-085622	1.99	6.07	6.95	42.20	51.87	7.40	16.80	7.38
IC-470550	1.76	4.67	6.45	45.20	57.27	9.73	17.40	8.49
IC-470558	2.15	5.67	6.03	42.33	53.47	8.47	14.73	7.80
IC-470560	2.27	6.27	6.88	37.47	47.40	6.73	12.07	7.16
MBTH-101 (Check)	2.51	6.27	6.63	42.87	51.00	8.80	14.53	7.47
SE(m)±	0.06	0.13	0.22	0.78	0.79	0.38	0.49	0.31
CD (0.05p)	0.17	0.37	0.63	2.19	2.22	1.07	1.38	0.86
C.V (%)	4.41	3.83	6.18	3.22	2.64	7.76	5.64	6.94

present study, the variation in sex ratio among the genotypes may be due to environmental condition. The results obtained are in line with those of Pandey and Singh (2007) in sponge gourd and Munshi and Acharya (2005) in bottle gourd.

Yield is greatly influenced by number of fruits, average fruit weight, fruit length and fruit girth hence, the desirable genotype should have more number of fruits, fruit length, girth and high average fruit weight for selection. In the present investigation, number of fruit per plant, average fruit weight (g), fruit length (cm), fruit girth (cm), pulp thickness (cm), Number of seeds/fruit and yield (kg/pl) showed significant variation among the genotypes (Table 2). The genotype, IC-470560 recorded significantly more number of fruits/vine (22.47) which was on par with control (24.13) while IC-470550 recorded less number of fruits (13.20). The more number of fruits in IC-470560 could be attributed due to long vine length and more number of primary branches. These traits probably increase the number of leaves and hence the photosynthetic efficiency. Similar results were reported by Harika *et al.* (2012) in bottle gourd.

Table 2: *Per se* performance of bitter gourd genotypes for yield and yield attributes (mean of two years)

Genotypes	No. of fruits /vine	Ave. fruit weight (g)	Fruit length (cm)	Fruit girth (cm)	Pulp thick ness (cm)	No. of seeds /fruit	Yield/ vine (kg)	Relative yield (%)
IC-033227	20.00	69.24	15.95	12.89	3.69	20.73	1.38	76.67
IC-044417	19.27	69.17	15.07	12.97	3.67	21.07	1.32	73.33
IC-044438	21.60	73.33	17.35	12.35	3.53	20.47	1.58	87.78
IC-045339	17.27	56.88	12.63	9.79	3.09	20.73	0.98	54.44
IC-085622	18.67	70.93	15.75	12.43	3.49	21.00	1.33	73.89
IC-470550	13.20	57.34	14.48	11.03	3.33	17.00	0.75	41.67
IC-470558	17.67	69.03	16.29	12.41	3.47	19.47	1.22	67.78
IC-470560	22.47	60.68	15.84	12.55	3.48	20.53	1.36	75.56
MBTH-101 (Check)	24.13	74.47	17.50	12.97	3.68	19.73	1.80	-
SE(m)±	0.50	2.22	0.21	0.22	0.06	0.91	0.04	-
CD (0.05p)	1.42	6.27	0.61	0.63	0.16	2.57	0.11	-
C.V (%)	4.26	5.48	2.30	3.05	2.65	8.06	4.78	-

Out of eight genotypes, six were recorded highest average fruit weight which was on par with control (74.26). However, the maximum fruit weight (73.33 g) was recorded inIC-044438 followed by IC-085622 (70.93). Average fruit weight was lowest in IC-045339 (56.88). Among genotypes, significant fruit length was observed in IC-044438 (17.35 cm) which was on par with control (17.50 cm) while minimum was observed in IC-045339 (12.63 cm). The minimum fruit girth of 9.79 cm was observed in parent IC-045339 while maximum in IC-044417 (12.97 cm) which is similar to that of control. The genotype, IC-045339 recorded significantly minimum pulp thickness of 3.09 cm while significantly maximum (3.69 cm) was recorded by IC-033227. The mean number of seeds/fruit was 20.12 which ranged from 17.00 in IC-470550 to 21.07 in IC-085622. With regard to yield per vine, IC-044438 recorded a maximum yield of 1.58 kg/vine which might be due to maximum fruit weight and the minimum was recorded in IC-470550 (0.75 kg/vine). These results are in consonance with the findings of Chaubey and Ram (2004), Behera *et al.* (2006) and Tewari and Ram (2001). These variations in yield and yield attributes among the genotypes could be explained on the fact that genotypes differ in their morphological and physiological characteristics and thereby translocation of carbohydrates from source to sink. Out of eight genotypes, five recorded more than 70% relative yield (Table 2) and among those five genotypes, IC 044438 recorded maximum (87.78%) followed by IC-033227 (76.67%) and IC-470560 (75.56%).

From the above results it can be concluded that the genotypes viz., IC-044438 followed by IC-033227 and IC-470560 recorded highly significant yield and yield related traits like number of fruits/vine, average fruit weight, pulp thickness while IC-044438 and IC-470560 were found early as they recorded minimum days to 1st male & female flower appeared and sex ratio (male to female). Hence, these genotypes may be selected as parents in further breeding programme to improve the crop in terms of yield and earliness.

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