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IDENTIFICATION AND DEVELOPMENT OF SUPERIOR GENOTYPES OF VEGETABLE MESTA (*HIBISCUS SABDARIFFA* L.) IN BANGLADESH

M. Rafiqul Islam, Hosne Ara Begum, M. Mozibur Rahman, Mahboob Hossain, AKM Shahadat Hossain, M. Harun-or-Rashid and M.I. Talukder

Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka-1207, Bangladesh

ABSTRACT

Eight selected advanced superior genotypes of smooth mesta (*Hibiscus sabdariffa* L.) containing different traits were evaluated for further identification and development of higher yield of edible leaves and pericarp (calyces). The study was undertaken to develop edible vegetable mesta containing the highest amount of fleshy calyces (pericarp) and edible smooth leaves. The genotypes revealed significant differences for all the characters with wide range of variability. Among the studied eight genotypes treatment M-780 (cordate leaf) gave the highest amount of green leaves (104.70g/plant) in 45 days and the treatment M-715 (lobed leaf, red and long fruit) gave the highest number of fruits (70.30 /plant) which also gave the highest amount of pericarp (calyces) 41.25 g/10 fruits. The highest genotypic variance and phenotypic variance were observed in weight of leaves/plant. Heritability and genetic advance were the highest in the weight of pericarp. These two genotypes can be devloped as vegetable mesta varieties. Leaves could be used for cooking purpose, preparation of soup, tea and pericarp for cooking purpose and preparation of jam, jelly, tea and confectionery materials.

Key words : Edible vegetable Mesta, Development, prickle free and bristle free fruits, fleshy pericarp.

INTRODUCTION

Mesta (*Hibiscus sabdariffa* L.) is commonly known as Roselle. It is a fibre yielding plant like jute (*Corchorus* sp.) and kenaf (*Hibiscus cannabinus*) in different countries of the world. Mesta belongs to the family Malvaceae. In many countries of the world, Mesta is cultivated for industrial uses and paper pulp production. Some genotypes of mesta are dwarf and bushy type, which are not suitable for fibre production. Some countries of Africa and Asia are using mesta as vegetables. In certain areas of Bangladesh peoples are using mesta leaves and pericarp as vegetables. But due to the lack of improved variety of vegetable mesta farmers do not cultivate in large scale. Leaves and fruits of mesta contain prickles so the peoples are reluctant to grow mesta. It is very essential to develop a new vegetable mesta variety containing prickle free smooth leaves and fruits. Leaves and fruits are nutritious. It contains large amount of protein, carotin, calcium, ascorbic acid and CHO etc. Dempsy (1975) reported that leaves of mesta contains 18-22% protein, carotien and large amount of calcium. In some countries of the world, leaves of mesta are used to prepare soup and cooking with pulse, fish and meat. Fruits of mesta are used to prepair jam-jelly and confectionary materials and is very delecious (Abbas and Islam, 2006). Georgi (1923) reported that 20% edible oil can be prepared from the seeds of mesta. Chowdhury *et al.* (1983) suggested that knowledge of genetic variability among different parameters contributing to yield is important for yield improvement. Katiyar *et al.* (1974) reported that heritability value alone provides the indication of the amount of genetic progress that would result from selecting the best individual. Jhonson *et al.* (1955) mentioned that heritability along with genetic advance would be more useful in predicting yield under phenotypic selection than heritability estimation along, Robinson *et al.* (1951) stated the need to estimate genotypic and phenotypic variance for various characters for choosing individuals based on phenotypic expression with a aim to identify superior genotypes. Banerjee *et al.* (1988) reported that fibre yield was significant positively correlated with the plant height, green weight basal diameter and stick weight in *Hibiscus sabdariffa*. Mesta can be cultivated in marginal, unfertile, sandy soil and hilly region of Bangladesh. It is drought tolerant, nematode resistant. Very little research work has been done with a view to develop superior vegetable mesta. So, the present study was undertaken to identify and develop superior vegetable mesta containing higher amount of prickle free smooth leaves and higher amount of pericarp which will be suitable for vegetable and profitable in the farmers field.

MATERIALS AND METHODS

The experiment was conducted at Bangladesh Jute Research Institute during the year 2005-2006. Six advanced lines of smooth mesta containing higher amount of foliaceous edible calyces and 2 lines fleshy edible having higher amount of edible delicious smooth leaves were developed through pure line selection. The selected materials were used for further evaluation. The seeds of these advanced lines were sown in randomized complete block design

(RCBD) with three replications. The unit plot size of the experiment was 3.0m x 3 lines for each plot. The plants were grown in rows 30cm space and 6-7cm distance between the plants. Usual agronomic practices were employed and the recommended doses of fertilizers were applied. Plant height (m), Base diameter (mm), Weight of leaf/plant (gm), No. of fruits/plant, weight of 10 fruits/plant and weight of pericarp of 10 fruits (gm) data were recorded. Variance and covariance were calculated according to Zaman *et al.* (1982) and Al-Jabouri *et al.* (1958).

Genotypic variance (δ^2g) and phenotypic variance (δ^2p) were calculated as per Johnson *et al.* (1955). Heritability (Hb) in Broad sense and genetic advance (GAPM) were estimated by using the formula of Hanson *et al.* (1956). Genotypic and phenotyhpic coefficient of variations (GCV and PCV) were worked out following the formula of Burton *et al.* (1953). Correlation coefficients were calculated according to Al-Jibouri *et al.* (1958).

RESULTS AND DISCUSSION

The result of the expeirment presented in Table 1. The results of the present investigation showed significant differences and considerable genetic variability among the studied characters. The components of genetic variance of 10 characters of *H. sabdariffa* with reference to the economic potentials of the plants for fibre, fruits and seed has revealed a good deal of prospect for improvement. The high degree of genotypic variation indicated the predominance of additive gene effects. The treatment 300M (cordate leaf) gave the highest plant height (2.56meter). The treatment 300M (lobed leaf) gave the highest base diameter (18.32mm). The highest amount of smooth green leaf/plant (104.70gm) was obtained from the genotype M-780 (leafy cordate) which was significant. The treatment M-715 (red, long fruit) gave the highest number of fruits/plant (68/plant) which also gave the highest weight of 10 fruits/plant (70.30gm) and the highest weight of pericarp of 10 fruits (41.25gm) which were also significant. Early flowering was observed in Acc. 2065. The finding of early flowering is in agreement with the finding of Sobhan *et al.* (1995). Leaves and fruits of M-715 and M-780 were smooth and free from prickles.

Table 1. Mean performance of eight vegetable type mesta (*H. sabdariffa*) grown at Central Station, Dhaka and Manikganj.

Treatments	Plant height (m)	Base diameter (mm)	Weight of leaf/plant (g)	No. of branch/ plant	Days to flowering	No. of fruits/ plant	Weight of 10 fruits/ g plant	Weight of Pericarp of 10 fruits (g)	Fibre weight/ plant (g)	1000 seed weight (g)
300M (Cordate leaf)	2.56	15.26	36.73	5	195	49	48.25	14.20	16	105.2
300M (Lobed leaf)	2.42	18.32	38.80	6	198	45	45.36	13.18	18	107.4
Acc-2065	1.73	14.75	41.85	8	96	58	56.65	19.50	12	101.2
M-715 (red, long fruit)	2.40	16.36	63.74	24	186	68	70.30	41.25	14	103.2
M-720 (green with red stripe long fruit).	2.24	17.24	52.34	18	204	54	65.75	38.25	15	98.5
M-750 (Leafy habit)	2.38	14.76	94.58	15	192	41	40.25	18.20	13	99.6
M-780 (Leafy cordate)	2.17	12.05	104.70	12	185	36	38.22	16.75	12	100.7
M-1003(green fruit with red stripe Intermediate type)	2.12	12.24	43.44	10	196	38	25.20	15.12	10	98.6
LSD (1%)	0.22**	0.64**	6.14**	6.80**	4.34**	7.90**	3.41**	2.59**	2.97**	2.37**
CV (%)	5.50	2.39	5.89	7.35	2.37	9.27	4.01	6.72	7.36	6.54

* and ** indicates significant at 5% and 1% level of probability, respectively.

The magnitude of dominance effect was higher than the additive effect in the cases of the yield of fruits, calyces and seed along with the associated characters like number of branched and number of fruits/plant.

Correlation, coefficient among the nine characters presented in the table 2. Correlation, Coefficient indicated that plant height has got positive significant correlation with base diameter (r=0.89). The result is agreement with the findings of Islam *et al.* (2002), Begum *et al* (1991). The number of branch has got also significant positive correlation with number of fruits (r=0.93). Similar result was obtained by Islam *et al.* (2002). The number of branch has got also significant positive correlation with leaf weight (r =0.84), weight of 10 fruits (r =0.91) and weight of pericarp (r=0.74). Finally days of flowering also showed significant positive correlation with weight of pericarp (r =0.81). Phenotypic variance (δ^2p) were higher than genotypic variance (δ^2G) for all the characters. The highest genotypic variance and phenotypic variance were observed in weight of leaf/plant (390.08 gm & 702.13 gm) respectively. The Genotypic Coefficient of Variation (GCV) and Phenotypic Coefficient Variation (PCV) were also

the highest in weight of leaf/plant. The difference between GCV and PCV was very close in all characters. High heritability (98.25%) coupled with high phenotypic coefficient of variation (125.58) and genetic advance as percent of mean (102.83) were observed for weight of pericarp of 10 fruits. Heritability estimate alone indicate the basis for selection of phenotypic expression but Johnson *et al* (1955) suggested that heritability estimates coupled with genetic advance should be simultaneously considered. The highly significant and positive correlation was due to the considerable amount of direct influence of the traits on leaf weight and fruit weight suggesting that character were genetically linked up with the leaf and fruit yield. From our study it can be concluded here that the advance line M-715 contained the highest number of fruits and the highest amount of pericarp (calyces) which was smooth and free from prickles. This line can be develop as a new edible mesta variety for cooking purpose, preparation of Soup, Tea and preparing Jam, Jelly and confectionary materials. On the other hand, another advanced line M-780 (leafy cordate) gave the highest amount of leaf which could be used for cooking purpose as vegetable. However, if the two lines develop as edible mesta variety. It will partially fulfill the requirements of vegetable as well as nutrient and also extends the diversified use.

Table 2. Correaltion co-efficient among the 9 characters of Mesta.

Treatments	Plant height (m)	Base diam. (mm)	Leaf wt/plant(gm)	No. of branch	Days of flowering	No.of fruits/ plant	Wt. of 10 fruits/ plant (gm)	Wt. of pericarp of 10 fruit(gm)	1000 seed weight (gm)
Plant height (m)	-	0.893	0.049	0.356	0.432	0.057	0.038	0.046	0.357
Base diameter(mm)		-	0.436	0.425	0.253	0.480	0.656	0.389	0.253
Leaf wt/plant(g)			-	0.843**	0.450	0.358	0.175	0.053	0.627
No. of branch				-	0.325	0.938**	0.857**	0.66**	0.421
Days of flowering					-	0.253	0.057	0.438	0.523
No.of fruits/plant						-	0.911**	0.744**	0.357
Weight of 10 fruits/ plant(g)							-	0.818**	0.458
Wt. of pericarp of 10 fruits (g)								-	0.393
1000 seed weight(g)									-

Table 3. Estimates of Genetic parameters of different characters of Mesta.

Characters	Genotypic variance (δ^2g)	Phenotypic variance(δ^2p)	Genotypic Coefficient of Variation (%)	Phenotypic Coefficient of Variation (%)	Heritability (Hb %)	GAPM
Plant height (m)	0.06	0.21	10.10	9.48	28.29	5.52
Base diameter (mm)	0.06	0.20	1.66	2.92	32.58	1.96
Weight of leaf/plant (g)	390.08	702.33	98.24	44.13	44.52	90.11
No.of fruits/plant	112.62	132.98	21.83	23.71	84.69	41.37
Weight of 10fruit/plant (g)	205.82	209.63	29.43	29.71	98.18	60.07
Weight of pericarp of 10 fruits(g)	123.38	125.58	50.36	50.81	98.25	92.83
No. of branch/plant	39.75	42.78	51.29	53.21	92.92	91.85
Fibre weight/plant(g)	6.19	7.10	18.10	19.37	87.18	34.80
1000 seed weight(g)	11.16	11.64	3.29	3.35	95.87	6.62
Days to flowering	1230	1236	19.32	19.37	99.51	39.70

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