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Morphological Characterization of Okra {*Abelmoschus esculentus* (L.) Moench} Genotypes

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Abstract

The present study entitled "Morphological characterization of okra {*Abelmoschus esculentus* (L.) Moench} genotypes" was carried out at the Research farm of Department of Vegetable Science, CCS HAU, Hisar during spring summer season of the year 2012 on the basis of morphological descriptors with the objective to identify key diagnostic characters of the genotypes. Observations were recorded for 14 morphological characters. Analysis of variance studies indicated significant differences among all the genotypes for all the characters under study. Highest mean fruit yield per plant was recorded for the genotype Hisar Naveen. Serration of leaf blade margin, vein colour, intensity of colour between vein, depth of lobing and petal base colour distinguished all the 20 genotypes by assigning them key diagnostic features that would certainly help the plant breeders, to use these diagnostic characters for trait specific use in breeding programme. The genotype Hisar Naveen was found as superior with high mean values for internodal length, number of nodes at first flowering, petiole length, plant height and flower diameter were recorded maximum in HBT-1-1, HBT-51-1-1, HBT-70-1 and HBT-6-7-1 respectively.

Key words : Okra, characterization, Hisar Naveen.

Okra {*Abelmoschus esculentus* (L.) Moench} is a member of family Malvaceae having somatic chromosome number 2n=130. It is an important vegetable crop, which is primarily grown for tender fruits in both spring summer and rainy seasons throughout India. The green tender fruits of okra are rich in calcium (Ca), phosphorus (P), magnesium (Mg), iron (Fe), vitamin A and C and also good source of carbohydrate, protein and other mineral

matters (Aykroyd, 1963). Okra is also a good source of mucilage which is renewable and inexpensive source of biodegradable material, and has potential for use as food, non-food products, and medicine (Kumar *et al*. 2010). Immature green fruits are used for preparation of curry, soup and are also canned, dehydrated and frozen for off season consumption. Being a rich source of iodine, it is also beneficial against goitre (Chauhan, 1972). India is the second largest producer of okra after China, where it has been cultivating for more than a century. Okra has a great potential as foreign exchange earner vegetable, which accounts for about 60% of the export of total fresh vegetables excluding potato, onion and garlic. In India, it is mainly grown in states like Gujarat, Maharashtra, Andhra Pradesh, Uttar Pradesh, Tamil Nadu, Karnataka, Haryana, Punjab and occupies an area of 4.98 lakh hectare with an average production and productivity of 5.75 mt and 11.75 t ha^{-1}, respectively. Characterization of available germplasm for morphological and agronomical characters is an important activity to make easy for the research workers to utilize the germplasm in breeding programme (De Vicente *et al*. 2005). Characterization is used to distinguish the genotypes on the basis of their highly heritable characters, which helps in selecting the most suitable genotypes as per the need of the user. However, as the recent definition of IBPGR, characterization consists of recording those traits that are highly heritable and can be easily seen by the eyes and equally expressed in all environmental conditions. It provides information on diversity within and between crop collections/germplasm and make possible for the identification of unique accession(s) essential to promote better utilization for crop improvement for development of variety (s) or hybridization programme. It is conducted with diligence in fields following adequate cultural and plant protection measures. For each accession, several morphological characters are recorded using descriptors. Descriptors of genotype of the crop species is needed for identification of variety, verify the purity of variety, establishing the distinctness of the new genotypes from the existing varieties and documentation of genetic resources. By taking into account the above mentioned aspects or questions, the characterization of germplasm has been carried out for different field crops by various researchers. Following the field crops, some due consideration has been given to horticultural crops for characterization; however, little work is done in vegetable crops.

Materials and Methods

The present investigation was carried out on twenty genotypes of okra obtained from department of Vegetable Science, CCS Haryana Agricultural University, Hisar to ascertain the stable diagnostic characters of the plant as well as seed and key characteristics for identification of a genotype in okra during the rainy season of year 2012.Twenty genotypes of okra were evaluated for thirty-one morphological were grouped into different category based on visual and measurable observations taken for various morphological characters into the field at different growth stages of plant are given in following subhead and presented in Tables 1.

Observations recorded

Leaf characters : Observations for leaf characters were recorded on fully expanded leaves (4th leaves from the top of plant) of the plant.

Serration of leaf blade margin : Serration of leaf blade margin was recorded on thirty competitive plants in each genotype at harvest maturity (60 days old crop) and genotypes were grouped as week, medium and strong serration of leaf blade margin.

Depth of lobing : Depth of lobing was judged at active vegetative growth before flowering (30 days old crop) on randomly selected thirty plants of each genotype and genotypes were classified into deeply, medium and shallow lobed.

Colour between veins : Colour between veins was recorded at harvest maturity on thirty competitive plants in each genotype and these were classified as light green, green and dark green colour.

Intensity of colour between veins : Intensity of colour between veins was assessed by visual observation on thirty competitive plants in each genotype at harvest maturity of crop. Genotypes were categorized as light and dark intensity colour between veins.

Vein colour : It was assessed by visual observation on thirty competitive plants in each genotype at harvest of crop (60 days old crop) and genotypes were classified as light green and purple vein colour.

Length of leaf blade (cm) : Length of leaf blade was measured in centimeter on randomly selected thirty competitive plants in each genotype. This observation was recorded on the middle lobe of the leaf and it was measured from top to base of middle lobe of the leaf at harvest maturity of crop (60 days old crop). Average was calculated and grouped as small, medium and large lobe.

Petiole length (cm) : Thirty randomly selected competitive plants of each genotype were evaluated for petiole length at harvest maturity. Petiole length was measured in centimeter from the axil of leaf to base of leaf and average was also calculated. Based on petiole length, genotypes were categorized as short, medium and long petiole genotype.

Table 1. Mean performance of okra genotypes for different characters

Genotype	Leaf blade length (cm)	Petiole length (cm)	Length of leaf (cm)	No. of nodes at 1st flowering	Stem diameter (cm)	Internodal length (cm)	No. of branches plant^{-1}	Plant height (cm)
HBT-1-1	7.26	12.70	10.70	5.43	1.53	6.43	1.40	90.00
HBT-6	3.60	18.53	9.00	5.33	1.63	6.00	2.03	95.00
HBT-12	8.90	24.43	11.86	4.73	1.72	5.90	2.10	99.97
HBT-17	8.86	23.26	12.46	5.76	1.62	6.26	3.26	105.0
HBT-19-1	8.86	19.06	11.93	5.53	1.74	5.80	2.63	140.0
HBT-34	9.46	20.73	13.40	5.00	1.37	6.06	2.06	135.0
HBT-36	10.00	18.63	12.93	4.86	1.84	5.00	1.23	110.0
HBT-36-1	10.66	24.73	13.00	4.70	1.71	6.00	2.86	114.6
HBT-42	8.13	16.00	10.60	4.80	1.80	5.60	1.60	85.0
HBT-49-1	12.46	26.60	16.86	4.33	1.72	4.60	2.06	150.0
HBT-50	11.73	25.76	14.06	4.90	1.88	5.53	2.00	145.0
HBT-51-1-1	10.06	27.30	13.06	5.33	1.90	5.30	2.40	146.3
HB-25-2	8.80	20.56	12.53	5.63	1.54	6.13	2.46	109.9
HBT-70-1	10.80	23.13	13.13	5.30	1.55	5.23	2.66	156.0
HBT-71	10.93	20.70	13.33	3.90	1.84	5.43	1.90	154.3
HBTC-6-7-1	10.30	16.20	14.60	3.33	1.06	5.86	2.00	75.0
HRB-105-2	10.66	16.10	12.80	4.73	1.84	5.80	2.20	107.0
BB-1	12.66	25.26	14.86	5.40	2.02	5.56	3.00	115.0
Hisar Naveen	10.13	22.10	15.86	5.00	1.99	5.66	3.33	124.6
Hisar Unnat	6.06	21.63	10.67	4.13	1.76	5.50	2.63	135.5

Leaf length (cm) : Length of leaf was measured in centimeter in randomly selected thirty competitive plants of each genotype. It was taken on middle lobe of the leaf from top to base of the leaf and the average was calculated.

B. Stem characters

Number of nodes at first flowering : The number of nodes on main stem at which the first flowering appeared was counted at forty days old crop on thirty competitive plants in each genotype and the average was calculated.

Stem colour : Stem colour of randomly selected thirty plants of each genotype was visually assessed at active vegetative growth stage (30 days old crop) and genotypes were classified into green, sparsely pigmented and purple colour.

Internodal length (cm) : Internodal length was measured in centimetre as distance between two nodes on the stem and it was taken from three different position of the plant (lower, middle and upper) and the average was calculated by summing values and dividing with three.

Stem diameter (cm) : Diameter of stem was measured in centimetre with digital Vernier Caliper at ten centimetre above the ground level in 70 days old crop. Thirty randomly selected competitive plants were taken for this observation for each genotype and their average was estimated dividing the total of all observation with number of observations.

Number of branches plant^{-1} : Number of primary branches born on the main stem was counted at 70 days old crop in thirty randomly selected competitive plants in each genotype and the average was calculated.

Plant height (cm) : Plant height of thirty randomly selected competitive plants of each genotype was measured in centimetre. It was taken from bottom to top of the plant at final harvest and average was calculated.

Results and discussion

Leaf characters : With respect to serration of leaf blade margin, variation was observed among the genotypes and genotypes were classified into weak (10 genotypes), medium (five genotypes) and strong (five genotypes). On the basis of depth of lobing, genotypes were grouped into three categories, five genotypes were with shallow, eight genotypes were medium and remaining seven genotypes were with deep depth of lobing. It has been observed that deeply lobed varieties are high yielder than medium or shallow lobed (In persented data). Regarding intensity of colour between veins, Out of twenty genotypes, three genotypes had light, six genotypes had medium and eleven genotypes had dark intensity of colour between veins. On the basis of vein colour, genotypes were classified into green (11 genotypes) and purple (9 genotypes) vein colour. West African accessions were distinguished based on red vein colour from Asian accessions. (Martin *et al*. 1981). Mandal *et al*., 1994 also documented okra accessions on the basis of leaf traits. Wide variation in length of leaf blade was observed, for petiole length (12.7-27.30 cm) and leaf length (9.0-16.86 cm). Among all the genotypes, HBT-49-1has high value for leaf blade length (12.46 cm), petiole length (26.60 cm) and leaf length (16.86 cm) and low value for these traits HBT-42 (Table 1).

Stem characters : Based on stem colour assessment genotypes characterized as, green stem colour (9 genotypes) and sparsely purple pigmentation (11 genotypes). Low variation was observed for nodes at first flowering (3.3-5.7) and grouped as few nodes (8 genotypes) and medium (12 genotypes). Moderate variation for stem diameter was noticed, which stated as medium size (9 genotypes) and large (11 genotypes) size of stem diameter. Manjunath *et*

al., (2007) reported that cotton genotypes can be differentiated based on stem pigmentation. Regarding number of branches per plant, four genotype showed few (<2), sixteen genotypes showed medium (2-4) and none of genotype had much (> 4) number of branches per plant, which indicated less variation for this trait (Table 4.1). However, vide variation was observed for plant height among these genotypes (75.0 to 156 cm). The maximum plant height was recorded in HBT-70-1(156 cm) followed by HBT-71 (154.03 cm). Minimum plant height was observed in HBT-6-7-1 (75cm) followed by HBT-42 (85 cm) with a grand mean of 119.65 cm. Mandal *et al*. 1994 also documented okra accessions on the basis of leaf traits. Wide variation in length of leaf blade was observed, for petiole length (12.7-27.30 cm) and leaf length (9.0-16.86 cm). Among all the genotypes, HBT-49-1has high value for leaf blade length12.46 cm), petiole length (26.60 cm) and leaf length (16.86 cm) and low value for these traits HBT-42. Plant height was categorized as short (2), medium (12) and tall (6) genotype, respectively. Much variation was also not found for inter-nodal length. Shortest intermodal length was found in HBT-49-1 (4.60). Shorter distance between nodes on stem with tall height is considered as desirable trait with breeding point of view in okra. Eftal Duzyaman (2005) characterized some genotypes collected from Turkish for branches plant^{-1} and inter-nodal length and reported vide variation.

Conclusion

The significant outcomes are made from the study. On the basis of serration of leaf blade margin the genotypes were grouped into three categories *viz*. weak (10 genotypes), medium (5 genotypes) and strong (5 genotypes). On the basis of depth of lobing the genotypes were grouped into three categories *viz*. shallow (5 genotypes), medium (eight genotypes) and deep (7 genotypes). All genotypes exhibited green colour between veins. On the basis of intensity of colour between veins the genotypes were categorized as light (three genotypes), medium (6 genotypes) and dark (11 genotypes).On the basis of vein colour the genotypes were grouped into two classes *viz*. green (11 genotypes) and purple (9 genotypes).The study revealed that on the basis of stem colour the genotypes were grouped into viz. green (9 genotypes) and sparsely purple pigmented (11 genotypes).

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