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DUS Characterization of Bottle Gourd [*Lagenaria siceraria* (Mol.) Standl.] Genotypes

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A B S T R A C T

The Present study was carried out for characterization of Bottle gourd genotypes based on DUS guidelines. Four Bottle gourd genotypes were characterized based on the DUS guidelines given by PPV and FRA. A total of 31 characters given in DUS guidelines were used for characterization. The genotypes for study were obtained from Directorate of Research, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad, U.P. Among the 31 characters studied 18 characters were visually examined and 13 characters were measured. The fruit shape in longitudinal section was expressed as cylindrical (Desi Lauki-404), round (Desi Lauki Gol-417), elongate curved (Desi Lauki-398) and (Lauki-426). The fruit skin colour has been grouped as dark green (Desi lauki-398) and light green (Desi Lauki-404, Desi Lauki Gol-417, Lauki-426). There was no change in the expression of characters of the respective genotypes for a period of two consecutive years. In the present study the main focus was on characterization of the 4 bottle gourd genotypes based on DUS guidelines, tests for Distinctiveness, Uniformity and Stability were not part of the present study.

Introduction

The "Protection of Plant Varieties and Farmer's Rights Act" (PPV&FR Act, 2001) was passed by the Government of India with the main objective of providing an effective system of protection against unlawful commercial exploitation of new plant varieties, the rights of farmers and plant breeders and to encourage the development of new varieties of plants. Genotypes of different crops are still unreleased as a commercial variety. Such genotypes can be characterized based on the DUS guidelines given by the PPV&FRA for different crops. These set of guidelines help in the characterization of different genotypes based on morphology. There are mainly two categories of characterization that is based on visually observed characters and measurable characters. The genotypes are compared with different standard reference varieties with regard to their performance. Each and every character comprises of a reference variety by which the genotypes can be compared and categorized. The present study was carried out

with the objective to 'characterize bottle gourd genotypes based on DUS guidelines'.

Materials and Methods

The study material comprised of genetically pure seed of 4 genotypes of Bottle gourd, *viz*. Desi Lauki-404, Desi Lauki-398, Desi Lauki Gol-417 and Lauki-426. The seeds of all the genotypes were sown with five rows of 6.4m length keeping a row to row and plant to plant spacing of 4.0m and 0.80m respectively in Randomized Block Design and replicated thrice. The experiments were carried out at Field Experiment station, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad (Uttar Pradesh). For two consecutive years from *kharif*-2016 to 2017.

All genotypes under study were evaluated for 31 DUS characters at specified stage of crop growth period when the characters under study exhibited full expression following the guidelines of Srivatava *et al.*, (2001). The observations for characterization of Bottle gourd genotypes based on DUS guidelines were made on plants randomly selected from each replication. The observations for few characters were made on group of plants or part of plants. For few characters only a single observation was recorded from a group of plants. All observations on leaf were recorded on fully developed leaves, preferably between 15^{th} and 20^{th} nodes. Fruit length and width was recorded at marketable maturity of the fruit. Observations on the ovary were recorded on the day of anthesis. All the observations on the seeds were made on fully developed, matured and dry seeds, after washing and drying.

Results and Discussion

Among the 4 bottle gourd genotypes considerable variation was observed for all important characters. The states of expression of particular traits of Bottle gourd genotypes are presented in Table 1, 2, 3, 4 and 5 respectively. In the present study all the 4 genotypes under study had andro monecious sex expression. The leaf shape of the genotypes was found to be Orbicular (Desi Lauki-404, Desi Lauki gol-417, Lauki-426) and Obovate (Lauki-398) (Table 1). The ovary length was expressed as short (Desi Lauki-398 and Desi Lauki Gol-417) and medium (Desi Lauki-404 and Lauki-426) (Table 6 and 7). On the basis of fruit shape the Bottle gourd genotypes have been grouped in to cylindrical (Desi Lauki-404), round (Desi Lauki Gol-417), elongate curved (Desi Lauki-398 and Lauki-426) (Table 3). On the basis of fruit length the Bottle gourd genotypes have been grouped in to short (Desi Lauki Gol-417), medium (Desi Lauki-398), long (Desi Lauki-404 and Lauki-426) (Table 6 and 7). On the basis of fruit skin colour the Bottle gourd genotypes have been grouped in to light green (Desi Lauki-404, Desi Lauki Gol-417, Lauki-426) and Dark green (Desi Lauki-398) (Table 4) The studies of Sivaraj *et al.*, (2005), Miadenovic *et al.*, (2012), Mladenovic *et al.*, (2011) described the morphological characterization of bottle gourd genotypes. Earlier morphological characterization of Potato (Gopal *et al.*, 2008), Forage sorghum (Joshi *et al.*, 2009), Jute (Begum *et al.*, 2011), Pearl millet (Singh *et al.*, 2016) has been done using DUS guidelines.

In the 31 DUS characters considered for study the genotypes morphologically differed in leaf shape that is Orbicular (Desi Lauki-404, Desi Lauki gol-417, Lauki-426) and Obovate (Lauki-398) (Table 1). Fruit skin colour differed as light green (Desi Lauki-404, Desi Lauki Gol-417, Lauki-426) and Dark green (Desi Lauki-398) (Table 4). Fruit shape the Bottle gourd genotypes have been grouped in to cylindrical (Desi Lauki-404), round (Desi Lauki Gol-417), elongate curved (Desi Lauki-398 and Lauki-426) (Table 3).

Table.1 Pooled morphological characterization of bottle gourd genotypes based on DUS guidelines (*kharif* -2016 and 2017)

CHARACTER GENOTYPES	Plant growth habitat (m)	Stem: shape	Stem: pubescence	Stem: length of internodes of main stem(b/w 15-20 node) cm	Stem: no of primary branches	Leaf blade: margin	Leaf: shape
DESI LAUKI-404	Medium viny	Angular	Present	Long	Medium	Serrate	Orbicular
DESI LAUKI-398	Short viny	Angular	Present	Long	Less	Serrate	Obovate
DESI LAUKI GOL - 417	Long viny	Angular	Present	Medium	Medium	Serrate	Orbicular
LAUKI-426	Medium viny	Angular	Present	Long	Medium	Serrate	Orbicular

Table.2 Pooled morphological characterization of Bottle gourd genotypes based on DUS guidelines (*kharif* -2016 and 2017)

CHARACTER GENOTYPES	Leaf: length (b/w 15-20 node) cm	Leaf: width (b/w 15-20 node) cm	Leaf: pubescence nature(15-20 node)	Leaf blade: no of lobes	Tendril: branching	Petiole: length (15-20 nodes) cm	Ovary: length (on the day of anthesis) cm
DESI LAUKI-404	Medium	Medium	Soft	5 lobes	Branched	Medium	Medium
DESI LAUKI-398	Medium	Medium	Soft	3 lobes	Branched	Medium	Short
DESI LAUKI GOL - 417	Medium	Broad	Soft	5 lobes	Branched	Long	Short
LAUKI-426	Medium	Broad	Soft	5 lobes	Branched	Long	Medium

Table.3 Pooled morphological characterization of bottle gourd genotypes based on DUS guidelines (*kharif* -2016 and 2017)

CHARACTER GENOTYPES	Peduncle length (cm)	Fruit :length (cm)	Fruit: diameter(cm)	Fruit : shape in longitudinal section	Fruit: neck	Fruit: skin colour	Fruit: shape of base at blossom end
DESI LAUKI-404	Medium	Long	Large	Cylindrical	Straight	Light green	Semi blunt
DESI LAUKI-398	Medium	Medium	Large	Elongate curved	Crooked	Dark green	Blunt
DESI LAUKI GOL - 417	Medium	Short	Large	Round	Crooked	Light green	Semi blunt
LAUKI-426	Medium	Long	Large	Elongate curved	Crooked	Light green	Blunt

Table.4 Pooled morphological characterization of Bottle gourd genotypes based on DUS guidelines (*kharif* -2016 and 2017)

CHARACTER GENOTYPES	Fruit: shape of apex at peduncle end	Fruit: Pubescence	Flesh: texture	Fruit: gelatinous flesh	Seed: texture at marketable stage
DESI LAUKI-404	Flat	Present	Soft	Present	Soft
DESI LAUKI-398	Flat	Present	Soft	Present	Soft
DESI LAUKI GOL - 417	Depressed	Present	Soft	Present	Soft
LAUKI-426	Raised	Present	Soft	Present	Soft

Table.5 Pooled morphological characterization of Bottle gourd genotypes based on DUS guidelines (*kharif* -2016 and 2017)

CHARACTER GENOTYPES	Seediness(no of seeds/fruit at time of extraction	Seed: length	Seed: width	Seed: shape	Seed: intensity of brown colour of testa
DESI LAUKI-404	High	Large	Large	Rectangular	Light
DESI LAUKI-398	Medium	Large	Large	Rectangular	Light
DESI LAUKI GOL - 417	High	Large	Large	Rectangular	Light
LAUKI-426	High	Large	Large	Rectangular	Light

Table 6 2016 data for quantitative characters performance of various characteristics in bottle gourd genotypes (*kharif*-2016)

NO.	Genotypes	Characters												
		Plant: growth habit	**Stem: length of internodes of main stem (b/w 15-20th node)**	**Stem: no of primary branches**	**Leaf: length (b/w 15-20th node)**	**Leaf: width (b/w 15-20th node)**	**Petiole: length (b/w 15-20th node)**	**Ovary: length (on the day of anthesis)**	**Peduncle: length**	**Fruit: length**	**Fruit: diameter**	**Seediness**	**Seed: length**	**Seed: width**
1	**DESI LAUKI-404**	5.08	14.49	8.27	16.18	17.77	13.49	2.91	11.90	47.31	27.30	512.80	2.04	0.84
2	**DESI LAUKI-398**	3.16	13.55	5.33	19.01	18.37	12.94	2.09	10.18	28.95	25.64	327.00	1.91	0.76
3	**DESI LAUKI GOL - 417**	5.91	12.22	7.53	15.31	22.91	16.68	2.09	13.04	18.40	35.69	413.93	1.82	0.87
4	**LAUKI-426**	4.73	15.83	7.73	17.00	24.20	17.36	2.85	10.70	67.03	26.34	451.13	1.61	0.69
	MEAN	4.72	14.02	7.22	16.88	20.81	15.12	2.49	11.46	40.42	28.74	426.22	1.85	0.79
	CV	5.24	5.85	7.38	5.09	5.95	5.99	6.95	5.43	5.82	8.13	5.32	5.10	5.55
	Max	5.91	15.83	8.27	19.01	24.20	17.36	2.91	13.04	67.03	35.69	512.80	2.04	0.87
	Min	3.16	12.22	5.33	15.31	17.77	12.94	2.09	10.18	18.40	25.64	327.00	1.61	0.69
	SEM	0.20	0.67	0.43	0.70	1.01	0.74	0.14	0.51	1.92	1.91	18.51	0.08	0.04
	CD @ 5%	0.49	1.64	1.06	1.72	2.48	1.81	0.34	1.24	4.70	4.67	45.30	0.19	0.09
	CD @ 1%	0.75	2.48	1.61	2.60	3.75	2.74	0.52	1.88	7.12	7.07	68.63	0.29	0.13

Table.7 2017 data for quantitative characters Performance of various characteristics in Bottle gourd genotypes *kharif* (2017)

NO.	Genotypes	Characters												
		Plant: growth habit	**Stem: length of internodes of main stem (b/w 15-20th node)**	**Stem: no of primary branches**	**Leaf: length (b/w 15-20th node)**	**Leaf: width (b/w 15-20th node)**	**Petiole: length (b/w 15-20th node)**	**Ovary: length (on the day of anthesis)**	**Peduncle: length**	**Fruit: length**	**Fruit: diameter**	**Seediness**	**Seed: length**	**Seed: width**
1	**DESI LAUKI-404**	5.13	14.45	8.13	16.17	18.29	13.79	2.77	11.85	47.85	26.53	505.73	2.03	0.80
2	**DESI LAUKI-398**	3.11	14.74	5.00	19.01	17.95	12.52	2.17	10.17	29.09	24.99	316.27	1.92	0.76
3	**DESI LAUKI GOL - 417**	6.24	13.42	7.67	15.41	21.81	16.83	2.74	12.70	18.09	35.61	408.60	1.81	0.89
4	**LAUKI-426**	5.03	16.77	7.73	17.09	22.97	16.57	2.87	10.84	65.22	24.67	454.53	1.63	0.69
	MEAN	4.88	14.84	7.13	16.92	20.26	14.93	2.64	11.39	40.06	27.95	421.28	1.85	0.78
	CV	5.22	5.08	5.70	5.03	5.10	5.17	5.36	5.30	5.11	5.14	5.55	5.15	5.72
	Max	6.24	16.77	8.13	19.01	22.97	16.83	2.87	12.70	65.22	35.61	505.73	2.03	0.89
	Min	3.11	13.42	5.00	15.41	17.95	12.52	2.17	10.17	18.09	24.67	316.27	1.63	0.69
	SEM	0.21	0.62	0.33	0.69	0.84	0.63	0.12	0.49	1.67	1.17	19.08	0.08	0.04
	CD @ 5%	0.51	1.51	0.81	1.70	2.06	1.54	0.28	1.21	4.09	2.87	46.70	0.19	0.09
	CD @ 1%	0.77	2.28	1.23	2.57	3.12	2.34	0.43	1.83	6.20	4.35	70.76	0.29	0.14

Different shapes of fruit, leaf and the colour of the fruit skin clearly indicate the morphological differentiation present among the different genotypes under study. There was no major variation in the individual characters of the respective genotypes during the period of study. The genotypes have been characterized using the DUS guidelines for the two consecutive years. It is concluded that the DUS guidelines can be effectively used for morphological characterization of genotypes which later on helps in the process of testing for DUS of the respective genotypes which can be used for developing new varieties.

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