

CHARACTERIZATION AND SCREENING OF PUMPKIN GERMPLASMS IN BANGLADESH

S.Rahman¹, AMM M Hoque², MS Rahman³ and H Rahman⁴

¹ Scientific Officer, ² Principal Scientific Officer, Plant Genetic Resources Centre, BARI, Gazipur.

³ Scientific Officer, Agricultural Economics Division, BARI, Gazipur.

⁴ Assistant Horticulture Development Officer, Orange Development Project, Gazipur.

Corresponding authors' email: razbau@yahoo.com

ABSTRACT

Twenty accessions of pumpkin were characterized and qualitative variations of different twenty characters were observed to characterize as well as to screen out the better qualitative and quantitative characters for future improvement program of pumpkin. Highest qualitative variation was found in fruit shape, flesh color and skin color. In quantitative traits, the highest mean value was found in seeds per fruit (273.39). The lowest mean value was recorded in flesh thickness (3.18) followed by no. of fruits per plant (3.55) and fruit weight (3.86). The highest standard deviation (SD) was found in seeds per fruit (273.39) and lowest in flesh thickness (0.33) followed by length of main vine (0.58), no. of fruits per plant (0.67) and fruit weight (0.88). The maximum co-efficient of variation (CV%) was obtained from seeds per fruit (25.17) and lowest was in opening of 1st male flower (1.79). The studied accessions were divided and sub-divided into different category based on fruit shape, flesh color, flesh thickness and skin color.

Keywords: Characterization, screening, pumpkin, germplasma

INTRODUCTION

Pumpkin is a common vegetable in Bangladesh belonging to the family Cucurbitaceae. The plant is unisexual trailing vine type. Botanically it is a fruit; referring to a plant part which grows from a flower; however, it is widely regarded as a vegetable in culinary terms, referring to how it is eaten. It is considered to be a good source of vitamins A, B and C. The seeds are good source of protein (34% of seed wt.), fat (46%), contain some iron and are high in unsaturated oils (Langer & Hill, 2002). Due to the high content of β -carotene and vitamin A pumpkin consumption will reduce the risk of cancer and heart diseases (Tao *et al.*, 2007). So, the vegetable has a good demand in Bangladesh. A scattered distributed of landraces of any specific crop is very important to meet the present and future need of crop improvement programme. It has no practical use until a collection have been properly characterized and documented. Further development and sustainability of pumpkin, exploration and conservation of its genetic diversity is necessary. Therefore, the present study was undertaken to characterize as well as to screen out the better qualitative and quantitative characters for future improvement program of pumpkin.

MATERIALS AND METHODS

A large number of pumpkin accessions were collected by PGRC from different parts of Bangladesh. Characterization of those pumpkin accessions were initiated before 1998. It was screened to 142 accessions in 1999. In 2003 and 2006 the accessions were screened to 54 and 36 respectively. Finally better 20 accessions were selected among the collection and brought under further characterization in 2007. The seeds were sown in poly bags at first, and then transplant the seedling following recommended spacing (4mX4m) in the field following RCB design with 3 replications. A basal dose of fertilizer consisting of 15 kg cow dung, 150 g TSP, 100 g MP and 60 g Gypsum per pit were applied at the time of final land preparation. First and 2nd top dressing was completed at 30 and 60 days after transplanting with 40 g urea/pit respectively (BARC, 2005). Recommended cultural practices were followed. The data were recorded as per IBPGR descriptors (IBPGR, 1985).

Table 1. Source of studied accessions of pumpkin

Sl. no.	Accessions	Source of collection
1	BD-232	Pabna
2	BD-2147	Kusta
3	BD-2150	Kusta
4	BD-2157	Kusta
5	BD-2177	Mymensingh
5	BD-2183	Mymensingh
7	BD-2203	Comilla
8	BD-2205	Chittagong
9	BD-2214	Noakhali
10	BD-2222	Barisal
11	BD-2224	Barisal
12	BD-2227	Barisal
13	BD-2229	Barisal
14	BD-2232	Farid pur
15	BD-2236	Farid pur
16	BD-2237	Farid pur
17	BD-2242	Jessore
18	BD-4589	Nababgonj
19	BD-7350	Farid pur
20	BD-7351	Noakhali

RESULTS AND DISCUSSION

Qualitative Characters

Qualitative variations of different characters are shown in Table 2. Twenty qualitative characters were studied. All the accessions showed angular stem shape, tendrils present, reniform leaf shape, dented leaf margin, prostrate growth habit and monoecious sex type. The highest variability was observed in fruit shape such as globular-8, flattened-6, elliptical-2, heart-3 and elongate-1. Harry (2000) was also found significant variability in fruit shape. Fifteen accessions showed depressed stem and fruit shape but 4 accessions showed round. Only one accession was found pointed. Four categories blossom and fruit shape was found where depressed is 13, flattened 3, rounded 2, and pointed 2. Shallow leaf lobes was found in 3 accessions but intermediate and deep type leaf lobes found in 12 and 5 accessions respectively. Among all the accessions, 5 were superficial fruit ribs and 13 were intermediate and rest were deep type. Two types of leaf size were found where 4 were small and rest was intermediate type. Flower color was mostly orange except one which was yellow. Four types of flesh color was observed which cream-1, dark yellow-6, yellow-6, and light yellow-7. Ferriol et al., (2001) was also observed similar flesh color in pumpkin. Low-4, intermediate 10, high-6 type of leaf pubescence was found in dorsal and low and intermediate type leaf pubescence was observed equally in ventral side. Among the accessions, some accessions showed white-1, green-3, cream-12 and yellow-4 predominant fruit skin color. In case of secondary fruit skin color, no secondary skin color-2, green-12, cream-2 and dark green-4 were found. Different types of seed color such as white-3, cream-7 and off white-10 were recorded. Smooth-4 and wrinkled-16 for seed surface were noticed among the accessions.

Table 2. Number of pumpkin accession under different qualitative parameters

	Qualitative parameters	Type of parameters	Number of accessions
1	Leaf size	Small (2)	3
		Intermediate(5)	16
2	Leaf lobe	Shallow (3)	3
		Intermediate(5)	12
		Deep (7)	5
3	Leaf pubescence (dorsal)	Low (3)	4
		Intermediate(5)	10
		High (7)	6
4	Leaf Pubescence (ventral)	Low (3)	10
		Intermediate(5)	10
5	Flower color	Yellow (2)	1
		Orange (3)	19
6	Fruit shape	Globular (1)	8
		Flattened (2)	6
		Elliptical (5)	2
		Heart or Acorn (6)	3
		Elongate (9)	1
7	Stem end fruit shape	Depressed (1)	15
		Rounded (5)	4
		Pointed (7)	1
8	Blossom end fruit shape	Depressed (1)	13
		Flattened (3)	3
		Rounded (5)	2
		Pointed (7)	2
9	Fruit ribs	Superficial (3)	5
		Intermediate(5)	13
		Deep (7)	2
10	Predominant fruitskin color	White (1)	1
		Green (2)	1
		Cream(4)	12
		Yellow (5)	4
11	Secondary fruit skin color	No Secondary skin (0)	2
		Green (2)	12
		Cream (4)	2
		Dark Green (9)	4
12	Flesh color	Cream (2)	1
		Yellow (3)	6
		Dark yellow (6)	6
		Light yellow (7)	7
13	Seed color	White (1)	3
		Cream(2)	7
		Off white (3)	10
14	Seedsurface	Smooth (1)	4
		Wrinkled (2)	16

Quantitative Characters

Range, mean, standard deviation and co-efficient of variation were shown in Table 3. Days to opening of 1st male flower ranged was from 70.33 (BD-2222) to 76.0 (BD-232) among the accessions. On the other hand, opening of 1st female flower ranged from 68.66 (BD-2222) to 78.33 (BD-232) days. The accession BD-232 showed late flowering both for male (76 days) and female (78.33 days) flower. Highest number of primary branches per plant was observed in BD-2237 and lowest was found in BD-2222 and BD-7351. The highest length of main vine was 5.50 m in BD-7350. In case of number of fruits/ plant, 4.33 were observed in the accession of BD-2157, BD-2177, BD-2214 and BD-7351. Among all the accessions, fruit length ranged from 13.64 (BD-2222) to 30.58 cm (BD-7350) and for fruit breadth, it varied from 14.93 (BD-2236) to 23.50 cm (BD-2227). Maximum fruit weight (6.34kg) was found in BD-2205. On the other hand, flesh thickness and cavity diameter were ranged from 2.15 (BD-2205, BD-2242) to 3.53 cm (BD-2222) and 9.29 (BD-2236) to 17.03 cm (BD-2227), respectively. In case of 100-seed weight, highest seed wt. (18.33g) and highest number of seeds/ fruit (422.67) were observed in BD-2177 and BD-2237, respectively. The range of % of Brix was 7.00 (BD-2236) to 12 (BD-2227) among all the studied accessions of pumpkin.

Table 3. Range, mean, standard deviation and co-efficient of variation in pumpkin accessions

Sl. no.	Characters	Range	Mean	SD	CV(%)
1	1 st opening of male flower (days)	70.33-76.00	72.78	1.30	1.79
2	1 st opening of female flower (days)	68.66-78.33	73.06	2.36	3.23
3	No. of primary branches/plant	4.66-8.33	5.86	1.02	17.41
4	Length of the main vine (m)	3.58-5.50	4.66	0.58	12.45
5	No. of fruits/plant	2.00-4.33	3.55	0.67	18.87
6	Fruit length (cm)	13.64-30.58	18.64	4.24	22.75
7	Fruit breadth (cm)	14.93-23.50	19.75	2.42	12.25
8	Fruit weight (kg)	2.40-6.34	3.86	0.88	22.8
9	Flesh thickness (cm)	2.60-4.09	3.18	0.33	10.38
10	100 seed wt. (g)	8.67-18.33	12.91	2.18	16.89
11	Cavity diameter (cm)	9.29-17.03	13.4	2.08	15.52
12	Seeds per fruit	114.33-422.67	273.39	69.64	25.47
13	%Brix	7.00-12.00	9.22	1.09	11.82

Categorization of 20 Pumpkin Accessions

In the present study, twenty accessions were under investigation. These accessions were divided and subdivided into different category based on demandable fruit characters viz., fruit shape, flesh color, flesh thickness and skin color. The grouping has been showed in detailed in the Table 4.

Table 4. Categorization of 20 Pumpkin Accessions

Characters	Type	Accession (s)
Fruit shape	Flattened	BD-2227, BD-2222, BD-2150, BD-2177, BD-2242, BD-2205
	Globular	BD-2224, BD-2203, BD-2229, BD-7351, BD-232, BD-2183, BD-2237, BD-2214
	Heart	BD-2232, BD-2147, BD-2236
	Elliptical	BD-2157, BD-4589
Flesh color	Elongated	BD-7350
	Dark yellow	BD-2222, BD-2177, BD-2203, BD-2236, BD-2237, BD-2183,
	Yellow	BD-2157, BD-2214, BD-2224, BD-2229, BD-2232, BD-7351
	Light yellow	BD-232, BD-2147, BD-2150, BD-2205, BD-2242, BD-4589, BD-7350
	Cream	BD-2227
Flesh thickness	High	BD-2177, BD-2183, BD-2203, BD-2222, BD-2229
	Medium	BD-2147, BD-2157, BD-2214, BD-2224, BD-2227, BD-2232, BD-2237, BD-7351
	Low	BD-232, BD-2150, BD-2203, BD-2236, BD-2242, BD-4589, BD-7350
Skin color	Mosaic	BD-232, BD-2147, BD-2157, BD-2177, BD-2183, BD-2203, BD-2205, BD-2214, BD-2222, BD-2224, BD-2229, BD-2232, BD-2236, BD-2237, BD-2242, BD-4589, BD-7350, BD-7351
		Elongated yellow color spotted on dark green
		Elongated yellow color marked parallel on light green
		Yellow color spot printed scattered on green color
		Brown color mark printed on green color
		Cream color mark printed on green color
	Mono-color	BD-2227, BD-2150
		White
		Green

CONCLUSION

The PGRC pumpkin collection is a pool of genetic diversity and its long term preservation has been ensured. The characterization data documents the diversity, allows structuring the diversity and facilitates access to useful traits for crop improvement. Based on the study, the accessions having high thickness are mostly dark yellow flesh color but those of low thickness are light yellow flesh color. Flesh color of BD-2227 was cream at marketing stage but it transformed into dark yellow at mature stage. Accessions of BD-232, BD-2150, BD-2203, BD-2205 and BD-2227 are very good for desirable multi-dimensional traits & organoleptic test among the accessions. The pumpkin germplasm at PGRC is might be a reliable source for horticulturist and plant breeders for crop improvement with desirable traits.

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