Indian J. Plant Genet. Resour. 32(3): 314-317 (2019)
DOI 10.5958/0976-1926.2019.00033.0

REVIEW ARTICLE

Characterization of Farmers' Varieties of Potato (*Solanum tuberosum* L.) of Cooch Behar District of West Bengal

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(Received: 16 August 2016; Revised: 29 June 2017; Accepted:13 August 2018)

Three Farmers' Varieties of potato from Cooch Behar district of West Bengal viz., Pakri alu, Badami alu and Cooch Behar Local-1 have been identified. They are being cultivated by the local farmers since long. For registration under Protection of Plant Varieties and Farmers' Right Authority (PPV&FRA), New Delhi, these varieties were characterized following the "Guidelines for Conduct of Test for Distinctiveness, Uniformity and Stability on Potato (*Solanum tuberosum* L.)" published by PPV&FRA (2009). Twenty seven qualitative and eleven quantitative characters have been used to compare the distinctiveness of these cultivars. Significant variability was observed for plant height, number of matured tubers per plant, tuber length, tuber diameter, tuber weight and tuber yield. However, days to emergence, number of branches per plant, leaf length and leaf width showed insignificant differences among the Farmers' Varieties. The plant height ranged from 29.92 cm to 63.90 cm. Maturity of tuber was earliest (92.34 days) in Pakri alu followed by Badami alu (94.58 days) and Cooch Behar Local-1 (95.50 days). Highest yield was recorded in Cooch Behar Local-1 (16.57 t/ha) followed by Badami alu (15.85 t/ha) and Pakri alu (15.03 t/ha).

Key Words: Distinctiveness, Farmers' Varieties, Potato, PPV&FRA

Potato (*Solanum tuberosum* L.) is one of the most important food crops of India as well as of many other countries of the world. It produces more calories and protein per unit area with minimum time and water than most of the major food crops (Upadhya, 1995). West Bengal ranks second in potato production after Uttar Pradesh. The total production of potato in West Bengal was 13391240 MT (Food Processing Industries Survey, West Bengal–Potato, 2012-13) in the year 2010-11. It is estimated that 61.47% of the total potato production is used for table purpose, 21% as seed, 0.5% processed and only about 0.03% are exported while about 17% are lost during post harvest handling, marketing and storage. The quality is the most important for export of potato. The Farmers' Varieties (FVs), namely Badami alu, Pakri alu and Cooch Behar Local-1 (popularly known as *Deshi Alu*) of West Bengal satisfy the export quality. Besides export, these local cultivars fetch much higher price, about 2.0-2.5 fold higher in the local market as compared to the improved varieties.

Potato cultivars are easily distinguished on the basis of morphological traits. Phenotypic characterization in potato is done by assessing morphological variations in the flower, leaf and tuber characteristics (Huaman, 1991). Morphological characterization has been used for various purposes including identification of duplicates, studies of genetic diversity pattern and correlation with characteristics of agronomic importance (CIAT, 1993). The unique diversity in FVs of potato from West Bengal is well recognized for significant traits like taste, size and colour. Distinct characters of the farmers' varieties have ample importance during registration under PPV&FR Act (2001). Considering the importance of these facts, three farmers' varieties of Cooch Behar district have been characterized following the "Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability on Potato (*Solanum tuberosum* L.)" of PPV&FRA (2009).

The material consists of three FVs of potato, namely Badami alu (PPV&FRA Reg. No. 2015/1744), Pakri alu (PPV&FRA Reg. No. 2015/1745) and Cooch Behar Local-1 (REG/2016/911). Multi-location experiments were conducted in the farmers' fields at Kayakhata (Salsalabari, Alipurduar district), Salmari (Hatiduara, Cooch Behar district) and Petlanepra (Sitalkuchi, Cooch

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Behar district) during *Rabi* 2014-15 and 2015-16. Sprouted tubers of each genotype were planted in rows with five rows for each genotype in each replication in randomized block design with eight replications. Standard agronomic practices compatible to the humid sub-tropic of Terai Zone (Roy, 2015) were adopted to ensure good crop growth. Data on different morphological characters were recorded on individual plant basis from 10 randomly selected plants in each replication for each genotype. Statistical analyses of data were conducted with absolute values, using cultivar as variables. The data were subjected to standard statistical methods of analysis of variance (ANOVA) using AgRes Statistical Software, (c) 1994 Pascal Intl Software Solutions, Version 3.01 and significant differences were compared by LSD.

Badami Alu

It is the most popular Farmers' Variety (FV) of potato in the northern part of West Bengal. The shape of the tuber is reniform and colour is reddish purple. The shape mimics the shape of ground nut (Fig. 1A), so locally it is known as *Badami Alu*. Predominant colour of the light sprout is pink and the shape is cylindrical (Fig. 1A). Foliage structure of the plant is semi-compact with hollow and angular cross section of the stem. Predominant stem colour is purple. Flesh colour of tuber is creamy with a predominant dark pink coloured ring along the cross section of tuber (Fig. 1B). Other salient features of this FV as per the descriptor as outlined by (PPV&FRA, 2009) has been given in Table 1.

Pakri Alu

Pakri alu also a popular FV of Cooch Behar, Jalpaiguri and Alipurduar districts of West Bengal. However, the area of production is much less than Badami alu and Cooch Behar Local-1. Cultivation of this FV is mainly concentrated in Sitalkuchi Sub-Division of Cooch Behar District. The shape of the tuber is round (Fig. 1C) and colour is whitish cream. The skin colour is not uniform, patches of dark and light whitish cream on the skin surface, so it is locally known as *Pakri*. Predominant colour of the light sprout is pink (Fig. 1C), shape is cylindrical. Foliage structure of the plant is semi-compact with hollow and round cross section of the stem. Predominant stem colour is purple. The flesh colour of tuber is creamy (Fig. 1D). Other details of this FV as per the descriptor as outlined by (PPV&FRA, 2009) has been given in Table 1.

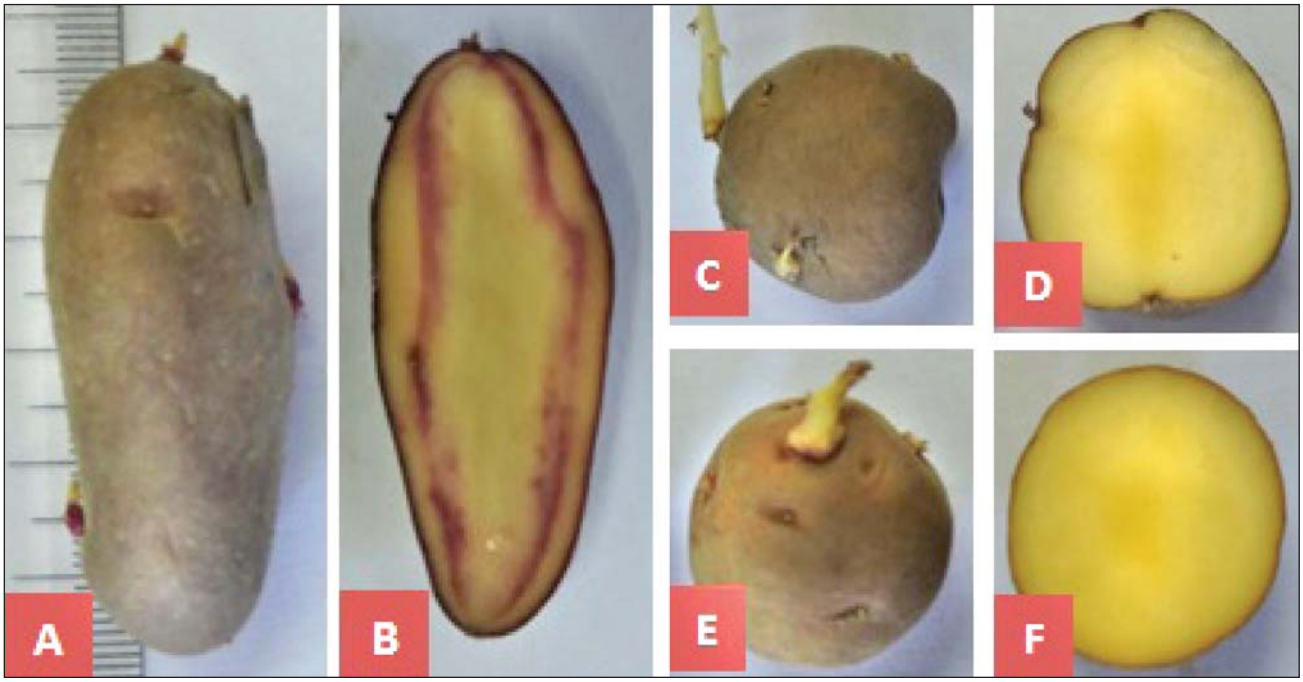

Fig. 1. Different qualitative characters of FVs of potato. A) Sprouting tubers of Badami alu; B) Cross section of tubers of Badami alu; C) Sprouting tubers of Cooch Behar Local-1 alu; D) Cross section of tubers of Cooch Behar Local-1 alu; E) Sprouting tubers of Pakri alu; F) Cross section of tubers of Pakri alu.

Table 1. Qualitative characteristics of Famers' Varieties of potato of Cooch Behar district of West Bengal based on the "Guidelines for

Conduct of Test for Distinctiveness, Uniformity and Stability on Potato (*Solanum tuberosum* L.)" published by PPV&FRA (2009)

Characteristics	Farmers' Varieties		
	Badami alu	Pakri alu	Cooch Behar Local-1
Light sprout: Predominant colour	Pink	Pink	Pink
Light sprout: Shape	Cylindrical	Cylindrical	Cylindrical
Light sprout: Intensity of anthocyanin colouration at base of sprout	Medium	Light	Light
Light sprout: Intensity of anthocyanin colouration at sprout tip	Medium	Medium	Medium
Light sprout: Pubescence base	Absence	Absent	Absent
Plant: Foliage structure	Semi-compact	Semi-compact	Semi-compact
Stem: Solidity	Hollow	Hollow	Solid
Stem: Cross section	Angular	Round	Angular
Stem: Predominant colour	Purple	Purple	Purple
Stem: Secondary colouration	Purple	Purple	Purple
Stem: Distribution of secondary colour	Through lightly scattered	Through lightly scattered	Through lightly scattered
Leaf: Structure	Intermediate	Intermediate	Intermediate
Leaf: Anthocyanin colouration of rachis	Absent	Absent	Present
Leaf: Anthocyanin colouration of midrib	Absent	Absent	Absent
Leaf: Leaflet (lateral) shape	Ovate	Ovate	Ovate
Leaflet: Waviness of margin	Weak	Weak	Weak
Leaflet: Glossiness of upper side	Weak	Weak	Weak
Leaflet: Pubescence of blade at apical rosette	Present	Present	Present
Flower: Anthocyanin colouration of bud	*	*	*
Tuber: Predominant skin color	Reddish purple	Whitish cream#	Pink
Tuber: Secondary skin colour	Red	Purple	Whitish cream
Tuber: Skin type	Smooth	Smooth	Smooth
Tuber: Shape	Reniform	Round	Round
Tuber: Depth of eye	Medium deep	Medium deep	Medium deep
Tuber: Predominant colour of flesh	Creamy	Creamy	Creamy
Tube: Secondary colour of flesh	Reddish purple	Creamy	Creamy
Tuber: Distribution of secondary colour of flesh	Vascular ring	Vascular ring	Vascular ring

*Till date, no flowering has been observed by the farmers

Whitish cream colour is not uniform, it is scattered with whitish cream and pink

Cooch Behar Local-1

This is also another popular FV of potato of northern part of West Bengal. This cultivar is also known as *Deshi Alu* (PPV&FRA Registration No. REG/2016/911). The size of the tubers of this cultivar is larger than the Pakri alu. It is being cultivated evenly in Cooch Behar, Alipurduar and Jalpaiguri districts. The taste of this FV variety is unique, so it fetches higher price in local market as compared to the modern high yielding varieties. The shape of the tuber is round (Fig. 1E) and colour is pink. Predominant colour of the light sprout is pink and the shape is cylindrical (Fig. 1E). Foliage structure of the plant is semi-compact with solid and angular cross section of the stem. Predominant stem colour is purple. The flesh colour of tuber is creamy (Fig. 1F). Other details of this FV as per the descriptor as outlined by (PPV&FRA, 2009) has been given in Table 1.

Plant height, number of matured tubers per plant, days to maturity, tuber length, tuber diameter, tuber weight and tuber yield showed significant variation among the varieties (Table 2). However, days to emergence, number of branches per plant, leaf length and leaf width exhibited insignificant variation among the cultivars. The number of tubers varied from 36.00 to 42.45 per plant. Highest number of tuber per plant was reported for Badami alu and minimum number of tubers per plant was observed for Pakri alu. However, the tuber weight was highest in Pakri (125.77 g) which is at par with the tuber weight of Cooch Behar Local-1 (125.37 g). Lowest tuber weight was for Badami alu (9.47 g). However, the tuber yield of Badami alu (15.85 t/ha) is higher than the Pakri alu (15.03) which may be due to higher number of tubers per plant in Badami alu (42.45) as compared to Pakri alu (36.00). Tuber yield is a complex character associated with many interrelated

Table 2. Mean values of quantitative characteristics of Famers' Varieties of potato of Cooch Behar district of West Bengal

Characters/varieties	Badami alu			Pakri alu			Cooch Behar Local-1		
	Mean values		State*	Mean values		State*	Mean values		State*
Days to emergence	20.77	a	-	20.34	a		20.50	a	-
Plant height (cm)	33.53	b	Small	29.92	c	Small	63.90	a	Medium
No. of branches/plant	8.93	a	-	9.13	a		9.14	a	-
Leaf length (cm)	4.40	a	Small	4.25	a	Small	4.36	a	Small
Leaf width (cm)	2.80	a	Narrow	2.82	a	Narrow	2.95	a	Narrow
Number of matured tubers/plant	42.45	a	-	36.00	c		38.96	b	-
Days to maturity	94.58	b	Medium	92.34	a	Medium	95.50	c	Medium
Tuber length (cm)	40.95	a	-	20.00	c	-	23.13	b	-
Tuber diameter (cm)	15.69	b	-	28.84	a	-	29.01	a	-
Tuber weight (g)	9.47	b	-	125.77	a	-	125.37	a	-
Tuber yield (t/ha)	15.85	b	-	15.03	c	-	16.57	a	-

Values bearing same letter in the row are not significantly different at P = 0.01 of LSD

*As per the Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability on potato ((*Solanum tuberosum* L.), published by Protection of Plant Varieties and Farmers' Right Authority (2009), New Delhi.

components. Highest tuber yield was recorded for Cooch Behar Local-1 (16.57 t/ha). High yield with good quality is the most important objective in potato breeding (Fekadu *et al*., 2013). Farmers' varieties of potato are promising sources of desirable agricultural traits (Bamberg and del Rio, 2005). Primitive forms of cultivated potato and their wild relatives provide a rich, unique, and diverse source of genetic variation, which could be a source of variation for potato breeding (Bamberg and del Rio, 2005; D'hoop *et al*., 2008; Jansky, 2010).

References

Bamberg, JB and A del Rio (2005) Conservation of potato genetic resources. In: Razdan, MK and AK Mattoo (eds.) *Genetic Improvement of Solanaceous Crops*. Volume I: Potato. Science Publishers, Inc. Plymouth, p. 476.

CIAT (1993) Biotechnology Research Unit. *Annual Report*, Cali, Colombia.

D'hoop BB, MJ Paulo, RA Mank, HJ van Eck and FA van Eeuwijk (2008) Association mapping of quality traits in potato (*Solanum tuberosum* L.). *Euphytica* **161:** 47-60.

Fekadu A, Yohannes Petros and Habtamu Zelleke (2013) Genetic variability and association between agronomic characters in some potato (*Solanum tuberosum* L.) genotypes in SNNPRS, Ethiopia. *Inter. J. Biodiversity Conservation* **5(8):** 523-528.

Huaman Z (1991) Descriptor for sweet potato. IBPGR, Rome, Italy.

Jansky S (2010) Breeding for Disease Resistance in Potato, In: Janick J (ed.) *Plant Breeding Reviews*, Vol. 19, John Wiley & Sons, Inc., Oxford.

PPV&FR (2001) Protection of Plant Varieties and Farmers' Right Act (2001), New Delhi.

PPV&FRA (2009) Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability on Potato ((*Solanum tuberosum* L.), Protection of Plant Varieties and Farmers' Right Authority, New Delhi.

Roy B (2015) *Khetriya Phsaler Beej Utpadaner Adhunic Paddhati* (Quality Seed Production Technology of Field Crops). Publ. Director of Farm, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal, pp. 95-105.

Upadhya MD (1995) Potato seed technology for increased potato production in Bangladesh. PNWNPTP (TPS), BARC, Dhaka, pp. 5.