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Growth Characters and Performance of BARI SP-10 and BARI SP-11: The Newly Released High Yielding Sweet Potato Varieties in Bangladesh

H.C. Mohanta[1], M.Hossain[2], B.K. Goswami[1], S. Noor[3] and S. Attaluri[4]

[1]Tuber Crops Research Centre, BARI, Gazipur, Bangladesh

[2]International Potato Center, USAID Horticulture Project, Dhaka & BARI, Gazipur, Bangladesh

[3]Support Service Wing, BARI, Gazipur, Bangladesh

[4]International Potato Centre, SWCA, Bhubaneswar, Odisha, India

Corresponding author: M. Hossain; e-mail: hossainbd60@yahoo.co.uk

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Abstract

Yield performance of two sweet potato genotypes viz., BARI SP-10 ('H_8'-a clonal hybrid developed from open cross with BARI SP-6, BARI SP-7, BARI SP-9) and 'BARI SP-11 (SP-613'-a clonal hybrid developed from open cross with BARI SP-7, BARI SP-8, BARI SP-9) released by the National Seed Board (NSB) of Ministry of Agriculture (MOA), Bangladesh was tested at farmers field. The leaf of BARI SP-10 is green, complete and non-serrated, edge of leaf, leaf vine, petiole and stem slightly pinkish. Tuber is large sized with light brown skin and light yellow flesh. The leaf of BARI SP-11 is light green, non-serrated, heart shaped, leaf vein, petiole and stem clearly pink colored. Tuber is medium to large sized with reddish-pink skin and flesh creamy-yellow. The tuber yield potential of two varieties varied between 35 to 40 t ha^{-1} and was better to previously released varieties in Bangladesh. Dry matter (%) of BARI SP-10 and BARI SP-11 were 28.11 % and 35.44 % respectively. These two varieties also contain 400-500 IU/100g beta carotene.

Key words: Sweet potato variety, dry matter content, Bangladesh

Introduction

Sweet potato (*Ipomoea batatus* L.) is a tuber crop which is rich in carbohydrate, dietary fiber, phytonutrient specially beta-carotene that is pro-vitamin-A and minerals. In Bangladesh sweet potato is mainly cultivated by the marginal and subsistence farmers in a sporadic way in different river belts, char lands, deltas and seasonally inundated flood plains with minimum labor, irrigation and chemical fertilizers (Ahmed *et al*., 1990). Sweet potato covers 56,000 hectares of land, producing 7.0 lakh tones annually with an average yield of 12.5 t ha^{-1} (BBS, 2011). The average tuber yield in Bangladesh is very low as compared to many tropical and subtropical countries (Verma *et al*., 1994) due to cultivation of local and poor quality indigenous sweet potato varieties. The present yield could be doubled by using improved, high yielding varieties. On the other way, malnutrition caused by vitamin A deficiency is widespread among the rural people. Sweet potato is a rich source of carbohydrate, sugar and vitamin A (Nedunchezhiyan *et al.*, 2007). To overcome these problems efforts were made to develop high yielding varieties with medium sized tuber with moderate carotene content. Hybridization is the technique to create variability over the existing ones to develop high yielding and beta-carotene rich variety. In view of these facts Tuber Crops Research Centre (TCRC) under the Bangladesh Agricultural Research Institute developed 9 high yielding varieties of sweet potato since 1985 through introduction, selection and hybridization (Bhuiyan et al., 1996). Furthermore, TCRC has developed 17 clonal hybrids of

sweet potato through open cross with BARI SP-6, BARI SP-7, BARI SP-8 and BARI SP-9. After several years of trials with these clonal hybrid genotypes viz., H_8 and SP-613 were identified with high yield potential and some desirable qualities. These two genotypes have been released by the National Seed Board of Bangladesh as varieties BARI SP-10 and BARI SP-11 respectively in 2013. This paper reports the yield potential and some desirable characters of these two recently released sweetpotato varieties in Bangladesh.

Materials and Methods

The selected six advance clones H_2, H_8, H_{24}, SP-609, SP-613 and SP-623 derived from hybridization were tested at five diverse locations of Bangladesh namely, Joydebpur, Jessore, Bogra, Jamalpur and Pahartali during 2008-09 to 2010-11. BARI SP-6 was used as check. The experiment was laid out in randomized complete block design with three replications. The unit plot size was 3.0 x 3.0 m each accommodating 50 plants in five rows at 60 x 30 cm spacing. The crops were planted on mid-November and harvested on the 2nd week of April in both the seasons. The crop was fertilized at the rate of 10 tons of FYM, 140 kg of urea, 80 kg of triple super phosphate and 150 kg of MP per hectare. These genotypes were also evaluated in four on-farm trials at different locations viz. Jamalpur, Bogra, Jessore and Comilla through farmer's participation. Data were recorded from 10 randomly selected plants from each plot. Organoleptic test was performed by a panel, considering taste, sweetness, softness and physical appearance after boiling. Data were analyzed statistically using MSTAT C program.

Results and Discussion

Performance at regional yield trial

The tuber yield of the six genotypes and the check variety differed at five locations (Table 1). At Joydebpur, Jamalpur and Pahartali higher tuber yield (38.40, 44.56, 37.57 t ha^{-1} respectively) was obtained from H_8. In case of SP-613, higher tuber yield was obtained at Joydebpur, Bogra, and Pahartali (36.52, 38.52 and 36.49 t ha^{-1} respectively). The mean tuber yield over the five locations revealed that H_8 to be the highest yielder (38.01 t ha^{-1}) and the second being SP-613 (37.32 t ha^{-1}) and two genotypes were superior to the check variety BARI SP-6 (30.71 t ha^{-1}) and the yield of this and other varieties reported previously (25.0 -35.9 t ha^{-1}) (Golder et al., 2007).

Tuber yield of seven sweet potato genotypes (Year wise)

Year wise tuber yield of six genotypes and the check variety significantly differed at five locations (Table 2). During 2008-09 the highest tuber yield was recorded in SP-613 (38.21 t ha^{-1}) and the second being H_8 (36.84 t ha^{-1}). These two genotypes produced greater yield than that of check variety. During 2010-11, the tuber yield of six genotypes followed the same trend. During 2009-10, the highest tuber yield was recorded in H_8 (38.43 t ha^{-1}) and it was the second highest in SP-613 (37.51 t ha^{-1}). The mean tuber yield was highest in SP-613 (37.32 t ha^{-1}) and it was the second highest in H_8 (36.86 t ha^{-1}). This result is also in agreement with Bhuiyan et al.(2009).

Performance at farmer's field

Tuber yield of six genotypes and the check variety significantly differed in the farmer's field at four locations

Table 1. Tuber yield in regional yield trail of seven sweet potato genotypes (Mean of 2008-09, 2009-10 and 2010-11 data)

Genotype	Location-wise tuber yield (t ha^{-1})					Mean
	Joydebpur	Jessore	Bogra	Jamalpur	Pahartali	
H_2	33.62 b	33.77 b	32.07 bc	39.46 b	30.83 c	33.95
H_8 (BARI SP-10)	38.40 a	35.01 a	34.28 b	44.56 a	37.57 a	38.01
H_{24}	35.03 ab	34.12 ab	33.99 bc	34.36 c	32.80 b	34.06
SP-609	29.87 d	28.79 d	31.90 c	30.36 d	31.56 bc	30.49
SP-613 (BARI SP-11)	36.52 a	35.46 a	38.52 a	39.60 b	36.49 a	37.32
SP-623	31.27 c	31.36 c	29.86 d	32.46 cd	30.64 c	31.11
BARI SP-6 (Check)	31.57 c	29.45 d	30.58 c	33.18 cd	28.79 d	30.71

Means followed by the same letter(s) do not differ significantly at 5% level by DMRT

Table 2. Year wise tuber yield of seven sweet potato genotypes

Genotype	Year-wise tuber yield (t ha^{-1})			Mean
	2008-09	2009-10	2010-11	
H_2	34.73 b	28.37 d	28.97 c	30.69
H_8 (BARI SP-10)	36.84 ab	38.43 a	35.31 a	36.86
H_{24}	31.58 c	33.66 b	28.58 c	31.27
SP-609	31.51 c	30.72 c	28.79 c	30.34
SP-613 (BARI SP-11)	38.21 a	37.51 a	36.26 a	37.32
SP-623	29.06 d	30.54 c	30.58 b	30.06
BARI SP-6 (Check)	29.82 d	30.18 c	28.53 c	29.51

Means followed by the same letter(s) do not differ significantly at 5% level by DMRT

Table 3. Tuber yield of seven sweet potato genotypes at farmer's field (Mean of 2008-09, 2009-10 and 2010-11 data)

Genotype	Location-wise tuber yield (t ha^{-1})				Mean
	Jamalpur	Bogra	Jessore	Comilla	
H_2	37.16 b	33.17 b	32.78 c	31.68 cd	33.69
H_8 (BARI SP-10)	41.68 a	33.82 b	36.10 a	36.75 b	37.08
H_{24}	33.63 c	32.97 bc	34.12 b	33.08 c	33.45
SP-609	31.87 c	30.57 c	29.86 d	32.26 c	31.14
SP-613 (BARI SP-11)	40.52 a	38.43 a	36.49 a	39.43 a	38.71
SP-623	32.56 c	31.63 c	32.14 c	31.69 cd	32.01
BARI SP-6 (Check)	32.81 c	30.86 c	28.54 d	28.97 d	30.29

Means followed by the same letter(s) do not differ significantly at 5% level by DMRT

(Table 3). At Jamalpur and Jessore H_8 produced the highest yield (41.68 and 36.10 t ha^{-1} respectively) whereas at Jamalpur, Bogra, Jessore and Comilla SP-613 produced the highest yield (40.52, 38.43, 36.49 and 39.43 t ha^{-1} respectively). The mean highest tuber yield obtained from farmer's field was from SP-613 (38.71 t ha^{-1}) and the second highest was in H_8 (37.08 t ha^{-1}) and these two genotypes were superior to the check variety BARI SP-6 (30.29 t ha^{-1}) and the yield of this and other varieties reported previously (23.4 -35.9 t ha^{-1}) (Bhuiyan et al., 1996; Golder et al., 2007).

Pest and disease infestation

Weevil infestation varied from 2.71 to 5.12 % which was remarkable (Table 4). Sweet potato feathery mottle virus was lowest in H_8 which was followed by SP-613. Mosaic or mild mottle virus was also lower in these two genotypes. Leaf curl virus was not observed in two genotypes (Table 5).

Morphological and other characters of tuber

BARI SP-10

The variety has medium sized tubers with brown skin and creamy flesh color (Fig.1). The dry matter percentage is higher (28.11 %) compared to existing improved varieties. It contains about 400 IU of Beta-carotene per 100 g edible portion of tuber. It has good cooking quality and free from discoloration after cooking.

Table 4. Length, diameter and weevil infestation of seven sweet potato genotypes

Genotype	Length of tuber (cm)	Diameter of tuber (cm)	Weevil infestation (%)
H_2	11.53 c	4.89 b	4.52 b
H_8 (BARI SP-10)	13.69 a	5.48 a	2.71 c
H_{24}	11.16 c	4.76 b	4.16 b
SP-609	10.84 c	4.83 b	4.83 b
SP-613 (BARI SP-11)	13.95 a	5.69 a	2.82 c
SP-623	11.06 c	4.38 b	5.12 a
BARI SP-6 (Check)	12.26 b	4.89 b	4.73 b

Means followed by the same letter(s) do not differ significantly at 5% level by DMRT

Table 5. Reaction of seven sweet potato genotypes to different virus diseases at Joydebpur (Mean of 2008-09, 2009-10 and 2010-11 data)

Genotype	Virus infection (%)		
	SPFMV	Mosaic/ Mild mottle virus	Leaf curl
H_2	8.78 c	5.55 b	1.68 c
H_8 (BARI SP-10)	5.12 d	2.21 d	0.67 d
H_{24}	14.25 a	6.87 a	5.24 b
SP-609	8.78 c	4.55 b	1.25 c
SP-613 (BARI SP-11)	5.15 d	2.21 d	0.54 d
SP-623	11.25 b	6.81 a	6.24 a
BARI SP-6 (Check)	11.87 b	3.54 c	0.0 d

Means followed by the same letter(s) do not differ significantly at 5% level by DMRT

*SPFMV=*Sweet potato feathery mottle virus*

BARI SP-11

Tuber is medium sized with red skin and cream color flesh (Fig. 2). The dry matter percentage is higher (35.44 %) compared to the existing improved varieties. It contains about 500 IU Beta-carotene per 100 g edible portion of tuber. It has good cooking quality and free from discoloration after cooking.

The organoleptic characteristics of tubers of BARI SP-10 and BARI SP-11 as compared to other genotypes are indicated in Table 6. It was observed that BARI SP-10 & 11 was good in all parameters of organoleptic test.

Fig.1. Tubers and leaves of BARI SP-10

Fig.2. Tubers and leaves of BARI SP-11

Note: Score on the basis of 0-10, 10 representing the maximum for each character; 0-4 poor, 4-6 medium and above 6 superior, 5 acceptable.

Conclusion

Considering the tuber yield and other parameters, like dry matter content, disease reaction and organoleptic test,

Table 6. Organoleptic characters of tubers of seven sweet potato genotypes

Genotype	Sweetness	Dryness	Fiber	General appearance	Mean boiling index
H_2	6.2 b	6.8 b	5.9 b	4.6 c	5.8
H_8 (BARI SP-10)	7.5 a	7.6 a	6.8 a	6.9 a	7.2
H_{24}	4.7 c	5.7 c	5.6 c	4.3 c	5.1
SP-609	5.2 bc	6.4 b	6.1 b	4.8 c	5.6
SP-613 (BARI SP-11)	7.4 a	8.1 a	7.1 a	7.1 a	7.4
SP-623	4.7 c	5.5 c	5.4 c	4.6 c	5.1
BARI SP-6 (Check)	7.0 a	7.1 b	7.1 a	6.0 b	6.8

Means followed by the same letter(s) do not differ significantly at 5% level by DMRT

two hybrid genotypes viz., H_8 and SP-613 were released in the name of BARI SP-10 and BARI SP-11 respectively by the National Seed Board (NSB) of the Ministry of Agriculture (MOA), Bangladesh in 2013 for commercial cultivation.

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