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Performance of Sweet Potato (*Ipomoea batatas* L.) Cultivars in Different Seasons in Assam

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Abstract

Seven sweet potato cultivars were evaluated at Horticultural Research Station, Kahikuchi, Assam, during 2008 and 2009, both in *kharif* and *rabi* seasons under rainfed conditions. The shoot growth, tuber yield and tuber quality parameters were evaluated in both the seasons. The growth parameters viz., vine length, branch numbers and petiole length were greater in *kharif* as compared to *rabi* season, whereas tuber yield was greater in *rabi* season than *kharif* in all the cultivars. The cultivar Kothal Kuhia (local) exhibited better growth performance in both the seasons and produced the maximum tuber yield (26.17 t ha^{-1}) during the *rabi* season than in *kharif*. The tuber yield of HRS-1 (24.91 t ha^{-1}) and 440074 (24.09 t ha^{-1}) were on par with Kothal Kuhia. The starch content of tubers of all the sweet potato cultivars tested was also found to be greater in *rabi* than in *kharif* season. Starch content of fresh tubers was maximum in Kothal Kuhia during *rabi* season (24.99%), whereas, it was minimum in IB-97-615 (18.24%). The cultivars Kothal Kuhia and 440047 proved to be superior with respect to growth, yield and starch content of tuber in both *kharif* and *rabi* seasons. Both these cultivars can be recommended for cultivation under the agro-climatic conditions of Assam.

Key words: Sweet potato, *kharif, rabi*, shoot growth, tuber yield, starch

Introduction

Sweet potato (*Ipomoea batatas* L.) is grown in diverse environments and ranks seventh in the world after rice, wheat, maize, Irish potato, barley and cassava (FAO, 2002). It gains importance as a supplementary staple food in eastern and southern parts of the African continent (Tumwegamire et al., 2004). This crop has great potentiality to alleviate wide spread malnutrition and poverty problems in developing countries. It is a rich source of starch and vitamin A. Fresh sweet potatoes provide about 50% more calories than Irish potato (Woolfe, 1992). Sweet potato is a source of food, feed as well as processed products. India produces about 1.1 m t and ranks seventh in the world i.e. 102.7 m t. In India, Orissa ranks first, producing about 4,10,000 t and Assam is in the fifth position producing 35,000 t. In India, sweet potato is cultivated both in rainy (k*harif*) as well as in winter season (*rabi*). The growth and tuber yield of sweet potato cultivars varies with the growing season. Since, growth, tuber yield and quality are the factors affecting production; the present study was conducted to find out the adaptability of sweet potato cultivars in different seasons (*kharif* and *rabi*) so as to meet the growing demand of the crop throughout the year.

Materials and Methods

Seven cultivars of sweet potato viz., IB-97-215, Dergaon White, HRS-1, Kothal Kuhia (local), 440074, CIPSWA-2 and IB-97-615 were grown in the experimental field of Horticultural Research Station (HRS), Kahikuchi, Guwahati, Assam. The experimental site comprised moderately fine loamy over fine loamy mixed

hyperthermic Typic Dystrochrept soil. The characteristics of the top soil (35 cm depth) was organic C: 1.14-1.86 %; pH: 4.7-5.0; available N: 344.96 kg ha^{-1}; available P: 32.84 kg $ha^{-1}$and available K: 154.56 kg ha^{-1}. The mean summer and winter temperature of the area were 28.44 ºC and 19.19 ºC with an annual rainfall of about 2000 mm. The crop was grown in two different seasons i.e., *kharif* and *rabi* during 2008-2009 and 2009-2010. The experiment was laid out in randomized block design with three replications. Planting was done on ridges using stem cutting having at least three nodes. *Kharif* planting was done during the first week of May and *rabi* planting during first week of September. The *kharif* season crop was raised under rainfed conditions. However, life saving irrigation was given to the *rabi* season crop. Other recommended package of practices were followed during the period of experimentation. Weather parameters during the crop growth period are given in Table 1. The observation on growth characters was recorded 90 days after planting in both *kharif* and *rabi* seasons. After harvesting, yield and yield attributes were recorded i.e., length and diameter of tuber, weight of tuber, number and weight of tubers per plant and yield per hectare. Similarly, quality parameter viz., starch content of tuber was estimated by following the method of A.O.A.C. (Horwitz et al., 1965).

Results and Discussion

Environment plays an important role on the growth and yield attributes of sweet potato. There was significant difference in vine length between the two seasons with better performance in *kharif* than in *rabi* season. The greater number of rainy days (57.50), total rainfall (968.70 mm) and average maximum (33.38 ºC) and minimum temperature (25.34 ºC) received during *kharif* might have promoted growth characters during the *kharif* season (Table 1). Night temperature higher than 25 ºC suppresses tuber formation and promotes shoot growth as reported by Kim (1961) and Chatterjee and Mandal (1976). The maximum vine length of 245.67 cm and 230.49 cm were observed in Kothal Kuhia (local) during *kharif* and *rabi* seasons respectively (Table 2). Similar trend was observed with respect to number of primary branches in all the different cultivars. The maximum number of primary branches per plant was observed in *kharif* (19.00) over *rabi* (18.00) in Kothal Kuhia (local). The maximum petiole length of 10.18 cm was noticed in the cultivar, Dergaon White during *kharif*, over *rabi* season (9.04 cm). The results are in conformity with the findings of Biswas (1981).

Among the yield attributes viz., tuber length and tuber diameter were found to be greater in *rabi* than in *kharif* (Table 3). Sweet potato cultivars yield maximum in seasons having night temperature between 14-22ºC (Singh and Mandal, 1976; Nawale and Salvi, 1983; Ravi et al., 2009). The local cultivar, Kothal Kuhia had maximum tuber length (15.41 cm) during *rabi* season, which was on par with 440074 (14.39 cm) and Dergaon White (13.63 cm). The diameter of tuber was maximum in the cultivar Dergaon White (5.46 cm), followed by HRS-1 (5.29 cm). Significant differences were observed

Table 1. Meteorological data during the crop growth period (*kharif* and *rabi*) (mean of two years)

Month	Number of rainy days	Rainfall (mm)	Mean temperature (ºC)		Humidity (%)		Sunshine hours
			Maximum	Minimum	Fore noon	After noon	
May	10.00	127.65	33.25	23.35	75.50	66.00	6.62
June	14.00	218.50	33.40	25.50	80.00	76.50	4.33
July	17.00	330.65	33.80	26.30	82.50	79.50	2.56
August	17.00	291.90	33.05	26.20	85.50	81.50	4.87
Total	58.00	968.70	-	-	-	-	-
Average (*kharif*)	14.00	242.18	33.38	25.34	80.88	75.88	4.60
September	9.00	141.30	33.70	25.65	81.00	78.50	5.34
October	4.00	123.75	32.00	22.90	80.00	80.00	7.11
November	1.00	7.65	28.80	17.10	82.50	76.00	6.71
December	1.00	5.95	25.70	14.20	89.50	80.50	3.98
Total	15.00	278.65	-	-	-	-	-
Average (*rabi*)	4.00	69.66	30.05	19.96	83.25	78.75	5.79

Table 2. Growth characters of sweet potato cultivars (mean of two years)

Cultivars	Vine length (cm)		Number of primary branches per plant		Petiole length (cm)	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
IB-97-215	150.52	140.21	8.00	6.00	9.30	7.43
Dergaon White	102.31	85.32	5.00	4.00	10.18	9.04
HRS-1	226.99	215.22	9.00	7.00	8.98	7.03
Kothal Kuhia	245.67	230.49	19.00	18.00	9.43	7.74
440074	112.36	107.94	11.00	9.00	6.66	4.71
CIPSWA-2	161.67	190.51	10.00	8.00	9.29	7.96
IB-97-615	178.33	179.59	10.00	8.00	8.92	6.71
CD (0.05)	0.47	0.68	1.00	1.00	0.93	1.00

in respect of number of tubers and tuber yield per plant (g) during both the seasons. The maximum number of tubers per plant was observed in Kothal Kuhia (5.0 and 6.0) followed by 440078 (4.0 and 5.0), HRS-1 (4.0 and 5.0) in *kharif* and *rabi* seasons respectively. Similarly, the maximum yield per plant (g) i.e. 429.35 g and 717.80 g was produced by Kothal Kuhia, which was ultimately reflected in tuber yield per hectare (t ha^{-1}) during both the years i.e. 16.67 t ha^{-1} in *kharif* and 26.17 t ha^{-1} in *rabi* respectively. The tuber yield is always associated with individual tuber weight, rate of bulking and partitioning of dry matter to the tuber.

The results are in conformity with the findings of Ashokan et al. (1982), Naskar (1987) and Karnik et al. (2000). The tuber yield per plant is directly related to tuber diameter and individual tuber weight in agreement with Thamburaj and Muthukrishnan (1976). Therefore, in the present study, local cultivar Kothal Kuhia was found to be a suitable cultivar for obtaining higher yield. The highest starch content of 24.99% was observed in Kothal Kuhia followed by 440047 (23.30%) and Dergaon White (22.10%) in *rabi* season.

Conclusion

It is clear from the present investigation that sweet potato cultivars, Kothal Kuhia and 440047 performed well with respect to growth, yield and quality characters during both *kharif* and *rabi* seasons. Since, both these cultivars were found suitable under the agro-climatic conditions of Assam, they can be recommended for commercial cultivation during *kharif* and *rabi* seasons.

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Table 3. Yield and quality parameters of sweet potato cultivars (pooled mean of two years)

Cultivars	Tuber length (cm)		Tuber diameter (cm)		Number of tubers per plant		Tuber yield (g $plant^{-1}$)		Tuber yield (t ha^{-1})		Starch content (% FW basis)	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
IB-97-215	5.92	8.95	4.01	4.53	2.0	3.0	197.48	231.93	8.89	16.01	15.32	20.19
Dergaon White	10.24	13.63	5.04	5.46	3.0	4.0	96.89	184.45	10.89	16.40	16.69	22.10
HRS-1	7.26	9.78	4.85	5.29	4.0	5.0	192.32	326.18	14.27	24.91	15.72	21.96
Kothal Kuhia	12.28	15.41	3.14	3.54	5.0	6.0	429.35	717.80	16.67	26.17	19.22	24.99
440074	11.39	14.39	2.95	3.23	4.0	5.0	298.41	499.49	15.73	24.09	18.36	23.30
CIPSWA-2	8.08	10.68	4.03	4.25	3.0	4.0	102.94	256.36	7.67	13.60	15.31	20.76
IB-97-615	8.10	12.03	2.94	3.22	3.0	4.0	199.79	337.48	13.94	23.70	12.65	18.24
CD (0.05)	0.62	1.44	0.26	0.42	0.8	0.9	1.02	1.12	2.00	1.56	0.37	0.51

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