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Evaluation of sweet potato (*Ipomoea batatas* (L.) Lam) genotypes under hill zone of Karnataka

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Abstract
An experiment was undertaken to evaluate 30 different genotypes of sweet potato under hill zone of Karnataka. The evaluation study indicated that sufficient amount of variation existed among the genotypes for growth, yield, beta-carotene and titratable acidity. Genotype BSP-29 followed by BSP-18 were found superior for growth and yield parameters. Whereas BSP-23 and BSP-10 showed better performance for beta-carotene and titratable acidity, respectively. Significant variation in growth, yield parameters, beta-carotene and titratable acidity content among different genotypes of sweet potato may be due to the inherent genetic makeup of the genotype and influence of environmental conditions.

Keywords: growth, yield, beta-carotene, titratable acidity and genetic makeup

Introduction

Sweet potato (*Ipomoea batatas* (L.) Lam.) ranks fifth economically after rice, wheat, maize, and cassava, sixth in dry matter production, seventh in digestible energy production and ninth in protein production in the developing countries [1, 2]. Sweet potato is adaptable to a broad range of agro-ecological conditions and fits into low-input agriculture. It is highly productive even under adverse farming conditions. Sweet potato is drought tolerant and can be grown successfully in drought prone areas [3]. This crop could be grown successfully at a salinity level up to EC 2.37 dS/m. Sweet potato is positioned as the seventh most major food crop in the world, fourth in tropical countries and fifth most essential food crop on a fresh weight basis in developing countries after rice, wheat, maize and potato [4] with annual production of 141.54 million tonnes [5]. According to FAO, sweet potatoes are grown in 111 countries, of which 101 are classified as 'developing nations'. Among the world's root crops, sweet potato ranks second only to potato in economic importance. Though it is cultivated in all the states of India, the major area under this crop is confined to the states of Orissa, Bihar, Uttar Pradesh and Madhya Pradesh. In India, it covers an area of 0.105 million ha producing 1.87 million tonnes of tubers with the productivity of 10.3 million tonnes per ha. Presently in Karnataka, the production of sweet potato is around 3.42 lakh tonnes with an area of about 23,000ha having the productivity of 14.8 million tonnes per ha [6].

In any crop improvement programme, evaluation of germplasm to assess the existing variability is a preliminary step. Since environment has great influence on many quantitative characters, it is necessary to separate the variability into heritable and non-heritable components. Genotypes exhibiting high variability for desirable characters that contribute to the yield are to be selected in such a programme of evaluation. Sweet potato is a cross-pollinated and highly heterozygous crop resulting in large variability. Presence of variability is prerequisite to the plant breeder for planning an effective breeding programme. This is useful for selecting, identifying promising variants for developing hybrids or varieties directly or through recombinant breeding.

The area and production of sweet potato in Karnataka state is very less compared to other states in India, which is mainly due to the non-availability of suitable varieties of the crop to the farmers. Although it is an important tuber crop in India as well as in Karnataka, very little attention has been given so far for improvement of this crop. Germplasm can be utilized for the development of new varieties suitable for the different region. Development of high yielding cultivar is a continuous process and there is an urgent need to select the best genotype/variety. Therefore, present study was conducted to evaluate 30 genotypes of sweet potato for growth and yield parameters under hill zone of Karnataka.

Material and Methods

The present investigation was carried out at the Department of Vegetable Science, College of Horticulture, Mudigere, University of Agricultural and Horticultural Sciences. Shivamogga during the *Rabi* 2017- 18. Thirty genotypes of sweet potatoes were procured from AICRP on Tuber crops, Dharwad, UHS, Bagalkot have been taken for investigation (Table 1). The experiment was laid out in a randomized complete block design (RCBD) with two replications. The treatments in each replication were allotted randomly by using random number table. Sweet potato cuttings which have 2-3 buds were planted in each replication with 3m × 2m plot size at 60cm × 3 cm spacing. The crop was raised by following the recommended package of practices of University of Horticultural Sciences, Bagalkot.

Observations were recorded on five randomly selected plants in each replication for twelve quantitative traits *viz*., vine length at 90 DAP (cm), vine girth at 90 DAP (cm), number of axillary branches at 90 DAP, number of leaves per vine at 90 DAP, internodal length at 90 DAP (cm), number of tubers per vine, tuber length (cm), tuber girth (cm), tuber weight (g), total tuber yield per vine (kg), dry weight of vine at 90 DAP(g), marketable yield per hectare (t/ha), beta-carotene (mg/100g) and titratable acidity (%). The data were subjected to statistical analysis.

Table 1: List of sweet potato genotypes used for the study

No	Name of the genotype	No	Name of the genotype	No	Name of the genotype
1	BSP-1	11	BSP-13	21	BSP-23
2	BSP-2	12	BSP-14	22	BSP-24
3	BSP-3	13	BSP-15	23	BSP-25
4	BSP-6	14	BSP-16	24	BSP-26
5	BSP-7	15	BSP-17	25	BSP-27
6	BSP-8	16	BSP-18	26	BSP-28
7	BSP-9	17	BSP-19	27	BSP-29
8	BSP-10	18	BSP-20	28	BSP-30
9	BSP-11	19	BSP-21	29	Vikram
10	BSP-12	20	BSP-22	30	Sree Bhadra

Result and Discussion

With respect to vine length is concerned significantly maximum vine length at 90 DAP of 215.25 cm was noticed in genotype BSP-17 followed by BSP-14 (188.80 cm). Whereas genotype BSP-21 (121.10 cm) were found to be minimum. Significantly maximum number of axillary branches at 90 DAP were recorded BSP-16 (4.90) followed by BSP-29 (4.65) and minimum was recorded in BSP-25 (3.50). The maximum number of leaves at 90 DAP were observed in BSP-29 (212.25) followed by BSP-18 (206.40) and BSP-26 (104.43) showed minimum number of leaves. Internodal length at 90 DAP was found to be maximum in BSP-29 (4.70 cm) and BSP-30 (2.14 cm) showed minimum internodal length. Significantly maximum vine girth at 90 DAP was recorded in BSP-29 (4.65 cm) followed by BSP-18 (4.08 cm) and minimum was recorded in BSP-9 (2.14 cm). Significantly maximum chlorophyll content at 45 DAP was observed in BSP-29 and BSP-18 (2.20 mg/g each) and minimum was recorded in BSP- 26 (1.14 mg/g). Genotype BSP-29 (3328.16 cm^2) showed significantly maximum leaf area at 45 DAP followed by BSP-18 (2217.01 cm^2), whereas minimum was recorded in BSP-28 (523.33 cm^2). Significantly maximum fresh weight at 90 DAP was observed in genotype BSP-29 (171.15 g) followed by BSP-3 (142.64 g) and BSP-9 (100.97 g) showed minimum fresh weight of vine. Significant variations in growth parameters among different genotypes of sweet potato may be due to the inherent genetic makeup of the genotype and influence of environmental conditions. The similar studies were conducted by earlier scientists [7, 8, 9, 10] in sweet potato (Table 2).

All the genotypes of sweet potato varied significantly for yield attributes. Maximum number of tubers per vine was recorded in BSP- 29 (3.8) followed by BSP-18 (3.65) and minimum was recorded in BSP-15 (2.25). BSP-21 (14.83 cm) showed maximum tuber length followed by BSP-29 (14.68 cm), whereas minimum was observed in BSP-17 (7.12 cm). Maximum tuber girth was recorded in BSP-29 (22.49 cm) and minimum was recorded in Sree Bhadra (12.56 cm). Significantly maximum tuber weight was found in BSP-29 (315.28 cm) followed by BSP-18 (285.07 cm) and minimum was recorded in BSP-7 (129.35 cm). Dry weight of vine at 90 DAP was recorded highest in BSP-29 (53.29 g) and Sree Bhadra (15.01 g) showed minimum dry weight of vine. Maximum total tuber yield per vine, total tuber yield per plot and marketable yield per hectare was recorded in BSP-29 (0.84 kg, 19.99 kg and 33.32 t, respectively) followed by BSP-20 (0.74 kg, 19.41 kg and 32.35 t, respectively) whereas minimum was observed in case of BSP-17 (0.18 kg, 4.63 kg and 7.71 t, respectively) (Table 3). The variation among the genotypes for yield attributes might be due genetic constitution of the genotypes and influence of prevailing weather conditions. These results were in accordance with the findings reported by [11, 7] in sweet potato and [12] in potato.

Beta-carotene content was varied significantly among the sweet potato genotypes. Maximum beta-carotene was found in genotype BSP-23 (0.92%) followed by BSP 7 (0.88%) and it was minimum in BSP-21 (0.11%) (Figure 1). Whereas, maximum titratable acidity was observed in BSP-10 (1.15%) followed by BSP-26 (0.29%) and it was minimum in Sree Bhadra (0.10%) (Figure 2). Significant variations in beta-carotene content and titratable acidity among different genotypes of sweet potato may be due to the inherent genetic makeup of the genotype and influence of environmental conditions. These results are in conformity with the findings of [11, 13] in sweet potato.

Table 2: Mean performance of sweet potato genotypes for growth parameters

Sl. No	Genotypes	1	2	3	4	5	6	7	8
1	BSP-1	132.20	4.65	133.15	3.39	3.42	1.30	691.01	107.98
2	BSP-2	185.15	4.75	147.90	3.61	3.64	1.35	594.50	115.35
3	BSP-3	131.25	4.40	127.70	3.70	3.30	1.45	1422.59	142.64
4	BSP-6	142.80	3.65	134.10	4.30	3.60	1.86	1173.01	114.55
5	BSP-7	133.30	4.55	135.45	3.04	3.05	1.73	840.23	126.21
6	BSP-8	141.25	3.60	171.90	2.15	2.18	1.79	1107.24	110.50
7	BSP-9	141.25	4.90	132.00	2.14	2.14	1.81	677.31	100.97
8	BSP-10	132.50	4.30	131.20	2.64	2.52	1.54	765.00	125.30
9	BSP-11	146.20	4.50	149.05	3.24	3.74	1.79	853.03	114.33
10	BSP-12	130.50	4.80	154.00	2.54	3.78	1.39	824.61	115.63
11	BSP-13	154.25	4.60	136.05	3.92	3.62	1.61	915.74	105.36
12	BSP-14	188.80	4.55	142.05	3.20	3.33	1.47	966.16	120.36
13	BSP-15	131.20	3.90	113.25	3.89	3.67	1.55	1695.12	120.58
14	BSP-16	149.40	4.90	164.25	3.64	3.97	1.94	1448.80	115.98
15	BSP-17	215.25	4.55	158.05	2.59	2.67	1.65	848.26	122.61
16	BSP-18	136.50	4.35	206.40	3.32	4.35	2.20	2217.01	153.78
17	BSP-19	144.45	4.55	168.80	3.58	4.08	1.97	1728.11	130.19
18	BSP-20	163.00	4.55	135.40	3.60	3.71	1.35	1264.95	126.10
19	BSP-21	121.10	4.45	133.75	3.89	3.74	1.53	909.16	131.25
20	BSP-22	130.00	4.50	133.05	3.67	3.55	1.77	700.87	121.65
21	BSP-23	159.00	3.70	153.49	3.57	3.90	1.92	1380.73	127.08
22	BSP-24	152.50	3.95	121.35	3.06	3.07	1.69	715.92	127.31
23	BSP-25	156.15	3.50	137.15	3.46	3.61	1.73	1474.58	129.75
24	BSP-26	127.50	4.55	104.43	3.45	3.15	1.14	578.22	127.31
25	BSP-27	140.15	3.55	126.70	3.75	3.39	1.24	1020.38	110.34
26	BSP-28	154.50	4.70	129.45	3.91	3.67	1.15	523.33	115.77
27	BSP-29	140.65	4.65	212.25	4.70	4.65	2.20	3328.16	171.15
28	BSP-30	152.90	4.15	159.15	2.14	2.15	1.23	1728.12	131.60
29	Vikram	130.90	4.40	137.80	4.10	3.05	1.53	1066.46	114.90
30	Sree Bhadra	154.65	4.20	130.45	2.94	2.54	1.67	611.94	114.90
Mean		149.22	4.35	143.99	3.36	3.37	1.62	1135.68	123.04
S.Em±		10.53	0.22	11.05	0.30	0.19	0.04	140.84	5.21
C.D @ 5%		30.48	0.63	31.97	0.87	0.56	0.12	407.37	15.07

1. Vine length (cm) at 90 DAP
2. Number of axillary branches at 90 DAP
3. Number of leaves per vine at 90 DAP
4. Inter nodal length (cm) at 90 DAP
5. Vine girth (cm) at 90 DAP
6. Chlorophyll content (mg/g) at 45 DAP
7. Leaf area (cm^2) at 45 DAP
8. Fresh weight of vine (g) at 90 DAP

Table 3: Mean performance of sweet potato genotypes for yield parameters

Sl. No	Genotypes	1	2	3	4	5	6	7	8
1	BSP-1	3.00	14.20	19.10	228.85	19.05	0.48	11.03	18.38
2	BSP-2	3.25	10.35	15.23	154.28	15.91	0.29	6.70	11.17
3	BSP-3	2.65	11.20	19.96	239.00	19.00	0.49	11.75	19.58
4	BSP-6	2.70	10.91	19.44	237.56	20.27	0.55	12.60	21.01
5	BSP-7	3.40	10.94	14.56	129.35	18.43	0.39	8.66	14.43
6	BSP-8	2.75	13.71	20.50	218.65	25.04	0.42	8.35	13.92
7	BSP-9	2.65	10.12	19.84	164.32	25.27	0.36	7.52	12.53
8	BSP-10	2.25	9.85	19.52	166.88	19.51	0.29	6.41	10.69
9	BSP-11	2.50	9.13	20.58	252.91	23.31	0.54	12.45	20.76
10	BSP-12	3.20	11.50	19.55	177.30	20.64	0.54	11.98	19.97
11	BSP-13	3.35	11.66	19.43	240.79	24.22	0.50	12.08	20.14
12	BSP-14	3.25	11.61	21.63	228.04	23.35	0.31	8.01	13.35
13	BSP-15	2.25	8.50	20.74	227.54	21.53	0.47	11.23	18.72
14	BSP-16	3.40	13.16	21.60	256.79	22.48	0.62	12.94	21.56
15	BSP-17	2.50	7.12	14.06	165.35	20.35	0.18	4.63	7.71
16	BSP-18	3.65	12.86	22.52	285.07	32.57	0.65	16.23	27.04
17	BSP-19	3.50	12.76	21.63	285.03	34.07	0.62	14.19	23.65
18	BSP-20	3.25	8.11	13.47	212.49	19.53	0.74	19.41	32.35
19	BSP-21	3.10	14.83	13.40	162.19	24.20	0.40	9.49	15.82
20	BSP-22	2.90	10.78	14.32	141.62	24.50	0.28	6.35	10.58
21	BSP-23	3.45	11.00	21.11	242.68	28.67	0.59	12.97	21.62
22	BSP-24	2.65	11.31	20.83	171.64	16.30	0.38	7.95	13.25
23	BSP-25	3.00	10.33	21.14	185.05	18.44	0.43	8.56	14.27
24	BSP-26	2.75	14.34	17.80	246.03	35.29	0.48	10.64	17.73
25	BSP-27	2.25	9.88	12.94	155.3	21.04	0.44	9.18	15.30
26	BSP-28	2.50	14.52	18.63	243.67	20.62	0.45	9.45	15.75

27	BSP-29	3.80	14.68	22.49	315.28	53.29	0.84	19.99	33.32
28	BSP-30	3.30	14.70	20.23	234.63	23.36	0.48	11.09	18.48
29	Vikram	3.25	10.35	17.655	181.32	16.93	0.29	5.81	9.68
30	Sree Bhadra	2.75	13.19	12.86	205.34	15.01	0.48	11.45	19.08
Mean		2.97	11.69	18.46	208.06	23.40	0.47	10.63	17.72
S.Em±		0.26	0.93	1.06	7.98	0.89	0.03	0.579	0.97
C.D @ 5%		0.75	2.45	3.08	45.26	2.57	0.07	1.67	2.79

1. Number of tubers per vine
2. Tuber length (cm)
3. Tuber girth (cm)
4. Tuber weight (g)
5. Dry weight of vine (g) at 90 DAP
6. Total tuber yield per vine (kg)
7. Total tuber yield per plot (kg)
8. Marketable yield per hectare (t)

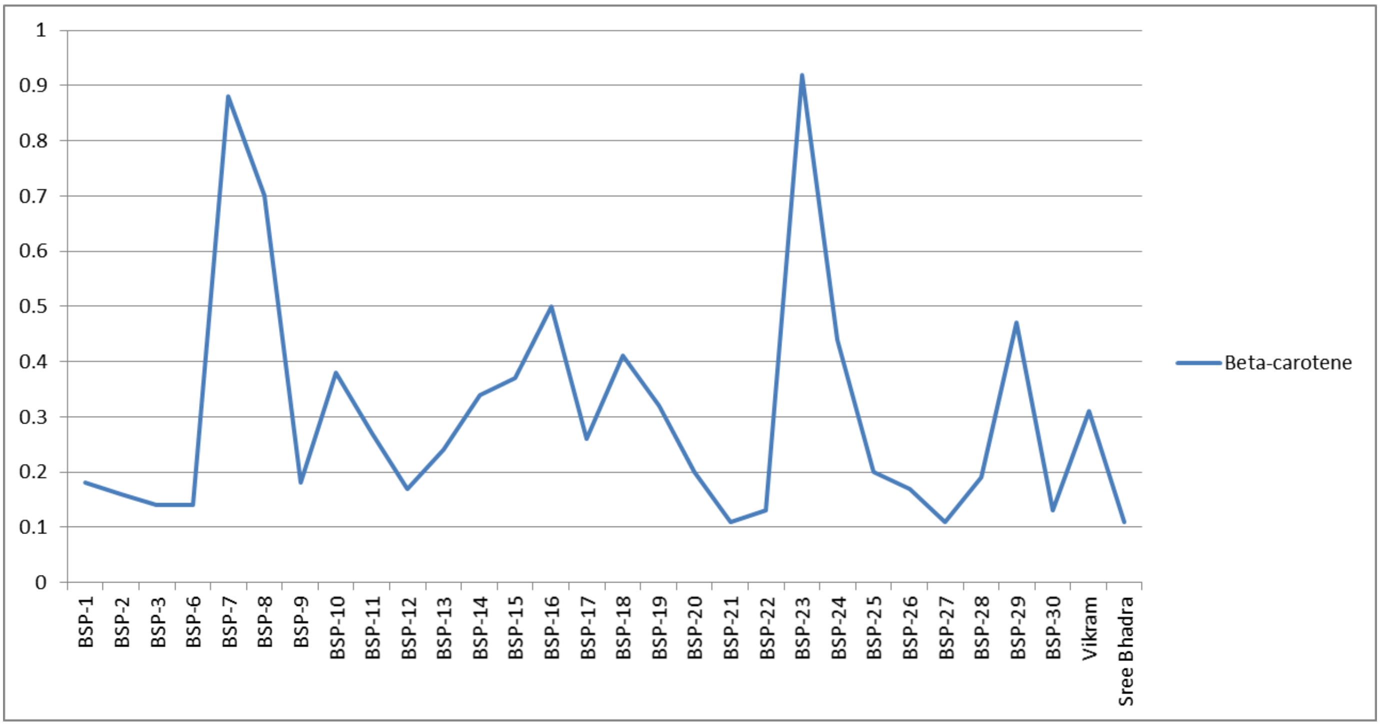

Fig 1: Performance of sweet potato genotypes for beta- carotene content

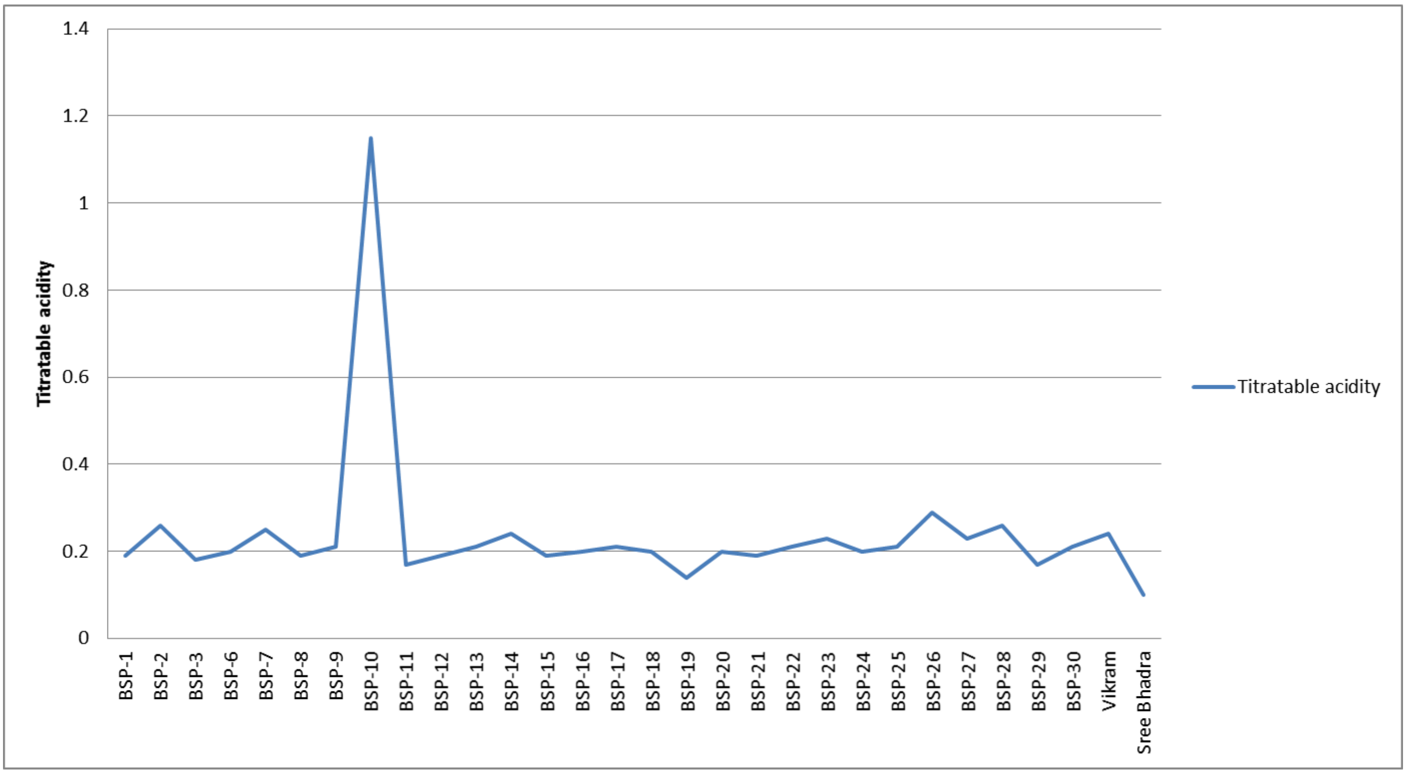

Fig 2: Performance of sweet potato genotypes for titratable acidity

Conclusion

The present investigation revealed that considerable degree of variability exists among the different genotypes of sweet potato for growth, yield, beta-carotene content and titratable acidity traits. The genotype BSP-29 followed by BSP-18 were found superior over other genotypes with respect to growth and yield parameters. Whereas, BSP-23 and BSP-10 showed maximum beta-carotene content and titratable acidity, respectively. Thus from the study, considering the better performance in terms of growth, yield and quality of sweet potato genotypes, BSP-29, BSP-23 and BSP-18 were best for cultivation under hill zone of Karnataka.

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