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RESEARCH PAPER

Evaluation of sweet potato genotypes for growth and yield under north transition zone of Karnataka

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Abstract: Sweet potato [*Ipomoea batatas* (L.) Lam.] is one of the important tuber crops of tropical and sub-tropical regions of the world. Studies on mean performances of 51 sweet potato genotypes was carried out at Shalmala Vegetable Research Centre, Regional Horticultural Research and Extension Centre (RHREC), Dharwad (University of Horticultural Sciences, Bagalkot) during *rabi*, 2019-20 and 2020-21. The evaluation study indicated that sufficient amount of variation existed among the genotypes for growth and yield. Among the sweet potato genotypes, maximum tuber length was recorded in BSP-39 (18.11 cm), tuber diameter in NBS-4 (9.35 cm), mean weight of tuber in BSP-28 (269.85 g), for number of tubers per vine (5.45), tuber yield per vine (859.69 g), tuber yield per plot (42.98 kg) and tuber yield per hectare (47.76 t) was noticed in BSP-1 genotype. Significant variation in growth and yield parameters among different genotypes of sweet potato may be due to the inherent genetic makeup of the genotype and influence of environmental conditions.

Key words: Genotypes, Growth, Sweet potato, Yield

Introduction

Sweet potato (*Ipomoea batatas* (L.) Lam.) is one of the important tuber crop of tropical and sub-tropical regions of the world and it forms the sixth most important food crop after rice, wheat, potato, maize and cassava. It is native to South America and belongs to family *Convolvulaceae.* The family includes 55 genera and contains more than 1000 species (Watson and Dallwitz, 2000). It is popularly known as *'white potato'* or *'Irish potato'* in southern part of United Statesof America, while in India it is commonly called as *sakarkand*.

The total area of sweet potato in the world is about 77 lakh hectares with a production of 918 lakh tonnes and productivity of 11.92 t/ha . China is leading producer of sweet potato in the world followed by Nigeria and Uganda and India ranks 9th position in production (Anon., 2019a). In India, it is being cultivated in an area of 1.16 lakh hectares with a production of 11.86 lakh tonnes. The major cultivating states in India are Orissa, West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh, Maharashtra and Karnataka. Orissa being the leading state in area and production followed by West Bengal and Uttar Pradesh, while Andhra Pradesh recorded highest productivity (Anon., 2019b). In Karnataka state sweet potato is grown in an area of about 2,730 hectares with production of 32,866 tonnes and productivity of 12.04 t/ha (Anon., 2019c).

Sweet potato is a rich source of carbohydrate, vitamin A (β-carotene), vitamin B-6, vitamin C, vitamin E and protein. Beside it also contains essential minerals and trace elements such as iron, potassium, calcium, zinc, sodium, magnesium and manganese (Srivastava *et al*., 2012). It forms the staple food of tribal population due to its hardiness and adaptability into diversified farming system. In developing countries it can be a potential crop in terms of economic, social, staple and nutritional food supplier.

Sweet potato tubers are usedas a staple food after boiling or steaming, baking or frying, sometimes are candied with syrup or sugar and used in preparation of pie filling, *salted chips, puree, holige, bhajji, mirchi, upama, noodles, halwa, thalipatti, pedha, curry thickner powder, pickles, chakkali, sandige, happala etc*. Further, tubers chips dried and grounded into flour and used as a supplement to cereal flour for preparation of chapattis and puddings products in some parts of India. Even sweet potato starch forms an important ingredient in the products of confectionary and baking industries. Besides the tubers, vines are also used as a cattle feed.

Looking into it's nutritive value and industrial importance, there is an increase demand for cultivation of sweet potato in India in general and in particular to Karnataka state. Very little attention has been given for crop improvement of sweet potato so far. To meet out the demand for tubers there is a need to evaluate suitable genotypes for Karnataka region for its commercial cultivation.Considering the above facts present study on evaluation of sweet potato genotypes for growth and yield was conducted.

Material and methods

The current study was under taken in Shalmala Vegetable Research Centre, Regional Horticultural Research and Extension Centre (RHREC), Dharwad (University of Horticultural Sciences, Bagalkot) during rabi, 2019-20 and 2020-21. Totally 51 genotypes were collected from different sources and evaluated for morphological characters. Geographical site of experimental fields is located in the Northern Transitional Zone (Zone VIII) of Karnataka state situated at 150 26' North latitude, 750 07' East longitude with an altitude of 678 m above the mean sea level. The experiment was laid out in a randomized block design (RBD) 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 3 m × 3 m plot size at 60 cm × 20 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 quantitative traits *viz*., vine length (cm), number of branches, number of leaves per vine, inter-nodal length (cm), leaf area (cm^2) number of tubers per vine, tuber length (cm), tuber girth (cm), tuber weight (g), total tuber yield per vine (kg), The year wise data were subjected to statistical analysis and pooled data were presented in Table 1 and 2.

Results and discussion

Pooled data on vine length of genotype diverse from 96.41 to 246.70 cm. Among the genotypes studied, genotype BSP-48 noted longest vine length (246.70 cm). The genotype BSP-27 showed minimum vine lengths (96.41 cm). Whereas, genotype Sree Bhadra (National check) recorded 133.24 cm of vine length (Table 1). Number of branches per vine ranged in pooled data from 4.73 to 8.84. Among the genotypes, genotype BSP-10 recorded significantly maximum number of branches per vine (8.84) which on par with national check genotype Sree Bhadra (8.28). Minimum number of branches per vine was recorded in BSP-21 (4.73) (Table 1). Number of leaves per plant ranged from 110.00 to 410.59. Among the sweet potato genotypes evaluated, BSP-29 recorded the significantly maximum number of leaves per plant (410.59). Minimum number of leaves per plant of 110.00 was recorded in NBS-1 genotype. While, genotype Sree Bhadra (National check) recorded 224.98 numbers of leaves per plant (Table 1). Leaf area of genotypes ranged from 19.67 to 93.38 cm^2. The maximum leaf area of 93.38 cm^2 was recorded in Sree Bhadra (National check) genotype. While, least leaf area was recorded in BSP-50 genotype (19.67 cm^2). Inter-nodal length of genotypes ranged from 2.74 to 7.56 cm. The genotype BSP-18 produced maximum inter-nodal length (7.56 cm). Minimum inter-nodal length of 2.74 was recorded in BSP-40 genotype. While, genotype Sree Bhadra (National check) recorded 7.05 cm of inter-nodal length (Table 1).

In present study sweet potato genotypes showed significant variation in vegetative growth habits and these variations were purely genetic in nature. Each and every genotypes showed differential growth habits. Among the genotypes, maximum vine length was observed in BSP-48 (246.70 cm), number of branches per vine in BSP-10 (8.84), number of leaves per vine (410.59) in BSP-29, leaf area (93.38 cm^2) in Sree Bhadra and inter-nodal length (7.56 cm) in BSP-18. The observed maximum vine length and inter-nodal length of genotype is due to their luxuriant growth habit. While, genotypes having bushy growth habit recorded more number of branches per vine. Similar observations were also made by earlier researchers Bhadariya *et al.* (2018), Gurmu *et al.* (2018) and Nedunchezhiyan *et al.* (2007) in sweet potato.

Sweet potato genotypes varied significantly with tuber length. Tuber length of genotypes varies from 4.95 to 18.11 cm. Significantly longest tuber length of 18.11 was recorded in genotype BSP-39. Minimum tuber length was recorded in genotype BSP-17 (4.95 cm).While, genotype Sree Bhadra (National check) recorded 6.65 cm of tuber length (Table 2). Tuber diameter of genotype ranged from 2.52 to 9.35 cm. Significantly maximum tuber diameter was recorded in genotype NBS-4 (9.35 cm) and minimum tuber diameter was observed in genotype BSP-24 (2.52 cm). While, genotype Sree Bhadra (National check) recorded 5.25 cm of tuber diameter (Table 2). The data on number of tubers per vine in different genotypes ranged from 2.90 to 5.46. Among the genotypes, genotype BSP-1 registered maximum number of tubers per vine (5.46). While, minimum number of tubers per vine was noticed in Sree Bhadra(National check) genotype (2.90)(Table 2).

Mean weight of tubers per vine ranged from 55.94 to 269.85 g. From the data it was observed that, BSP-28 genotype had maximum mean weight of tubers per vine (269.85 g) followed by CIP-2 (232.68 g). The minimum mean weight of tubers per vine was recorded in BSP-19 genotype (55.94 g). While, genotype Sree Bhadra (National check) recorded 135.45 g of mean weight of tuber per vine (Table 2). The tuber yield per vine ranged from 164.53 to 859.69 gram. Among the sweet potato genotypes, significantly highest tuber yield per vine was recorded in genotype BSP-1(859.69 g/vine). While lowest tuber yield per vine was recorded in genotype BSP-19 (164.53 g/vine).While genotype Sree Bhadra (National check) recorded 391.90 g of tuber yield per vine (Table 2). Tuber yield per plot ranged from 8.23 to 42.98 kg/plot. Among the genotypes, highest tuber yield per plot was recorded in genotype BSP-1 (42.98 kg/plot). While, lowest tuber yield per plot was registered in genotype BSP-19 (8.23 kg/plot).While, genotype Sree Bhadra (National check) recorded 19.60 kg of tuber yield per plot (Table 2). The tuber yield per hectare ranged from 9.14 to 47.76 t/ha. The genotype BSP-1 recorded highest tuber yield per hectare (47.76 t/ha), whereas genotype BSP-19 registered lowest tuber yield per hectare (9.14 t/ha).While, genotype Sree Bhadra (National check) recorded 21.77 ton of tuber yield per hectare (Table 2). The values on harvest index of genotypes ranged from 32.94 to 77.46 per cent. The genotype BSP-46 recorded highest harvest index of 77.46 per cent. Minimum harvest index of 32.94 was recorded in BSP-42 genotype. While, genotype Sree Bhadra (National check) recorded 60.07 per cent of harvest index (Table 2).

Among the sweet potato genotypes, maximum tuber length was recorded in BSP-39 (18.11 cm), tuber diameter in NBS-4 (9.35 cm), mean weight of tuber in BSP-28 (269.85 g); for number of tubers per vine (5.45), tuber yield per vine (859.69 g), tuber yield per plot (42.98 kg) and tuber yield per hectare (47.76 t) was noticed in BSP-1 genotype. The observed higher tuber yield in BSP-1 genotype is due to longer tuber length with better tuber diameter and highest number of tubers per vine. Hence tuber length tuber diameter, number of tubers and tuber yield per vine are important criteria's for higher yield in selection of genotypes. These findings were in compliance with the studies of Vimala *et al*. (2011), Fongod *et al*. (2012), Mhaskar *et al*. (2013), Placid *et al*. (2015) and Hayati and Anhar (2020) in sweet potato.

Table 1. Mean performance of sweet potato genotypes for growth parameters (Pooled)

Sl. No.	Genotype	Vine length (cm)	No. of branches per vine	No. of leaves per plant	Leaf area (cm^2)	Inter-nodal length (cm)
1	BSP-1	155.10	7.10	164.79	38.06	5.44
2	BSP-4	170.74	6.61	289.21	93.35	7.17
3	BSP-6	206.78	8.40	128.75	51.80	5.28
4	BSP-8	132.77	8.67	222.15	21.82	3.38
5	BSP-10	174.56	8.84	209.49	40.90	4.85
6	BSP-15	178.06	6.64	164.25	29.08	4.67
7	BSP-17	210.10	6.66	199.01	34.80	6.94
8	BSP-18	133.87	7.29	255.88	35.78	7.56
9	BSP-19	117.25	7.63	142.70	39.08	3.77
10	BSP-20	118.50	5.73	274.03	24.36	5.51
11	BSP-21	118.11	4.73	207.75	22.84	4.44
12	BSP-22	161.33	5.92	331.79	40.06	4.98
13	BSP-23	223.07	6.18	240.08	42.07	7.10
14	BSP-24	124.42	6.66	229.24	27.91	3.67
15	BSP-25	194.79	6.25	294.17	40.30	5.57
16	BSP-26	123.94	6.05	319.43	24.87	3.37
17	BSP-27	96.41	7.66	114.84	36.96	3.60
18	BSP-28	151.01	6.67	150.30	26.39	3.48
19	BSP-29	99.84	7.86	410.59	24.36	3.03
20	BSP-30	144.45	6.45	211.28	59.82	5.25
21	BSP-31	97.02	7.72	118.78	38.06	3.42
22	BSP-32	120.43	6.96	137.08	47.20	3.72
23	BSP-33	130.03	8.03	352.04	43.38	6.46
24	BSP-34	115.62	8.22	134.88	20.30	3.30
25	BSP-35	140.76	5.91	225.94	40.16	4.89
26	BSP-36	134.66	5.29	122.00	59.99	3.29
27	BSP-37	156.36	6.03	126.93	29.59	3.93
28	BSP-38	146.53	7.89	127.54	36.54	2.95
29	BSP-39	107.39	7.32	318.80	24.87	4.03
30	BSP-40	119.61	5.93	227.65	23.35	2.74
31	BSP-41	131.57	7.89	201.99	58.08	4.31
32	BSP-42	158.24	5.97	307.37	57.63	5.56
33	BSP-43	177.32	6.97	216.54	48.96	4.38
34	BSP-44	174.24	7.53	306.57	37.56	5.40
35	BSP-45	178.52	5.79	198.04	26.39	3.49
36	BSP-46	121.85	6.67	322.21	32.99	4.52
37	BSP-47	201.90	7.65	194.99	39.59	4.74
38	BSP-48	246.70	6.25	162.45	45.86	6.90
39	BSP-49	136.87	7.04	213.32	26.14	4.32
40	BSP-50	114.60	8.12	367.16	19.67	3.91
41	BSP-51	122.53	6.81	329.92	26.90	3.13
42	BSP-52	148.26	6.90	152.55	58.32	4.65
43	ST-14	202.50	5.73	131.86	53.80	3.66
44	Khanapur local	146.09	6.46	209.34	22.19	3.61
45	NBS-1	206.97	7.78	110.00	31.97	4.31
46	NBS-2	150.87	6.64	303.88	67.57	5.59
47	NBS-3	118.60	6.91	344.96	52.27	4.90
48	NBS-4	169.12	6.32	315.19	59.43	5.33
49	CIP-1	151.31	8.29	216.30	33.50	3.22
50	CIP-2	139.05	6.75	324.95	53.15	3.65
51	Sree Bhadra(National check)	133.24	8.28	224.98	93.38	7.05
	Mean	149.68	6.94	227.57	40.46	4.60
	S.Em ±	4.50	0.23	5.18	1.48	0.14
	C.D. @ 5 %	12.80	0.65	14.74	4.16	0.39

Table 2. Mean performance of sweet potato genotypes for yield parameters (Pooled)

Sl. No.	Genotypes	Tuber length (cm)	Tuber diameter (cm)	No. of tubers per vine	Mean weight of tuber per vine (g)	Tuber yield per vine (g)	Tuber yield per plot (kg/plot)	Tuber yield (t/ha)	Harvest index (%)
1	BSP-1	18.00	4.24	5.45	188.09	859.69	42.98	47.76	60.55
2	BSP-4	7.83	4.08	3.12	148.91	466.38	23.32	25.91	47.78
3	BSP-6	5.78	6.74	3.21	145.29	467.30	23.37	25.96	54.54
4	BSP-8	14.40	2.94	3.56	97.96	352.48	17.62	19.58	44.71
5	BSP-10	8.15	5.52	3.21	174.47	562.77	28.14	31.27	55.37
6	BSP-15	5.86	3.93	3.60	66.48	239.92	12.00	13.33	45.82
7	BSP-17	4.95	6.49	3.98	70.86	283.12	14.16	15.73	54.90
8	BSP-18	14.67	6.38	4.08	159.16	649.46	32.47	36.08	74.49
9	BSP-19	13.06	5.11	3.06	55.94	164.53	8.23	9.14	37.33
10	BSP-20	9.91	4.64	4.72	106.36	503.95	25.20	28.00	65.27
11	BSP-21	13.05	4.68	4.31	161.38	698.39	34.92	38.80	61.33
12	BSP-22	7.33	3.70	3.18	87.24	282.33	14.12	15.69	51.27
13	BSP-23	6.28	4.23	3.88	72.05	279.24	13.96	15.51	44.67
14	BSP-24	14.71	2.52	5.18	86.24	448.29	22.41	24.90	57.30
15	BSP-25	9.20	5.02	3.72	204.03	759.86	37.99	42.21	68.74
16	BSP-26	14.54	6.86	4.20	193.77	816.00	40.80	45.33	74.73
17	BSP-27	15.51	7.07	4.12	189.91	785.04	39.25	43.61	68.47
18	BSP-28	15.64	7.77	2.53	269.85	682.79	34.14	37.93	59.09
19	BSP-29	16.57	7.53	4.58	162.34	740.42	37.02	41.13	65.98
20	BSP-30	15.07	6.75	3.02	194.32	587.03	29.35	32.61	54.38
21	BSP-31	17.07	6.08	4.01	146.13	588.95	29.45	32.72	61.13
22	BSP-32	17.84	6.34	4.22	183.31	775.97	38.80	43.11	67.42
23	BSP-33	8.57	7.02	3.12	199.84	625.36	31.27	34.74	57.45
24	BSP-34	17.02	5.95	4.11	178.87	736.49	36.82	40.92	66.87
25	BSP-35	9.55	5.09	4.30	104.17	449.72	22.49	24.98	57.17
26	BSP-36	9.00	5.93	3.60	133.01	479.07	23.95	26.61	69.50
27	BSP-37	15.62	5.09	3.99	132.84	532.33	26.62	29.57	67.40
28	BSP-38	17.23	5.42	4.98	86.97	434.56	21.73	24.14	54.64
29	BSP-39	18.11	4.19	4.99	118.44	593.40	29.67	32.97	58.33
30	BSP-40	15.81	5.57	3.75	124.99	469.69	23.48	26.09	59.14
31	BSP-41	14.36	6.68	4.57	158.57	726.20	36.31	40.34	66.50
32	BSP-42	12.80	4.40	3.45	61.66	217.34	10.87	12.07	32.94
33	BSP-43	9.49	7.09	3.95	169.05	670.56	33.53	37.25	61.25
34	BSP-44	8.93	5.27	4.16	154.87	646.15	32.31	35.90	54.46
35	BSP-45	10.91	5.48	2.93	138.18	405.37	20.27	22.52	55.83
36	BSP-46	17.11	6.62	4.03	187.56	758.68	37.93	42.15	77.46
37	BSP-47	16.76	5.73	3.03	119.37	362.73	18.14	20.15	52.18
38	BSP-48	6.49	6.17	3.34	123.26	412.60	20.63	22.92	47.60
39	BSP-49	11.84	5.16	4.43	118.31	523.93	26.20	29.11	61.79
40	BSP-50	14.32	5.11	4.78	147.95	708.66	35.43	39.37	62.16
41	BSP-51	13.98	5.99	3.96	176.51	699.98	35.00	38.89	68.70
42	BSP-52	7.58	8.85	3.69	193.20	712.37	35.62	39.58	57.48
43	ST-14	11.51	5.27	3.75	67.82	255.03	12.75	14.17	53.65
44	Khanapur local	9.64	5.10	4.98	126.17	630.58	31.53	35.03	66.52
45	NBS-1	13.46	8.74	4.66	157.98	738.60	36.93	41.03	76.37
46	NBS-2	6.37	6.68	3.03	198.91	604.34	30.22	33.57	46.78
47	NBS-3	6.15	7.46	3.39	204.22	693.08	34.65	38.50	68.08
48	NBS-4	7.40	9.35	3.86	186.17	717.49	35.87	39.86	65.48
49	CIP-1	13.56	4.42	4.56	135.25	737.00	36.85	40.94	71.24
50	CIP-2	7.85	7.97	2.93	232.68	682.82	34.14	37.93	70.75
51	Sree Bhadra(National check)	6.65	5.25	2.89	135.45	391.90	19.60	21.77	60.07
Mean	11.83	5.80	3.90	145.81	560.98	28.05	31.17	59.67	
S.Em ±		0.34	0.16	0.08	4.17	7.93	0.40	0.44	0.78
C.D. @ 5%		0.96	0.45	0.24	11.70	22.26	1.11	1.23	2.20

Conclusion

The yield traits revealed the significant differences among the sweet potato genotypes. Longest tuber length (18.11 cm) was recorded in genotype BSP-39, maximum tuber diameter (9.35 cm) was found in genotype NBS-4, more number of tubers per vine (5.45), highest tuber yield per vine (859.69 g),tuber yield per plot (42.98 kg) and tuber yield per hectare (47.76 t) was recorded in BSP-1, maximum mean weight of tubers per vine was found in BSP-28 (269.85 g) and maximum harvest index was noted in BSP-46 (77.46 %).

Based on the evaluation for tuber yield among 51 sweet potato genotypes, in comparison with national check genotype Sree Bhadra, the top 10 genotypes *viz.*, BSP-1, BSP-26, BSP-27, BSP-32, BSP-25, BSP-46, BSP-29, NBS-1, CIP-1 and BSP-34 were enumerated as high potential yielders with high attributing parameters.

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