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Evaluation of sweet potato (*Ipomoea batatas* (L) Lam.) clones for root yield and processing qualities

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Abstract
The present investigation was carried out during the year 2010 -2013 to evaluate the sweetpotato clones for yield and processing qualities. The experiment was conducted with fifteen clones of sweet potato at the Department of Olericulture, Horticultural college and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The mean performance of the 15 clones for yield and processing characters were studied. Based on the mean performance for different characters, the clones CO2, CO3, CO2/315, CO2/74 and CO2/310 were identified as best for culinary purpose.

Keywords: Sweet potato, mean performance, yield characters, processing

Introduction
Sweet potato (*Ipomoea batatas* L. (Lam) is an important food crop of tropics, grown principally for its roots. The foliage is frequently used for feeding animals (Scott, 1991) or as vegetables. A number of characteristics' of the sweet potato, including its productivity, relatively low need for inputs and high nutrition value make sweet potato a highly attractive crop for sustainable agricultural development in many places in both developed and developing countries. Sweet potato is grown around the world. The root and foliage yield is more per unit area as compared to other root crops. But production trends in recent years have been uneven with production increasing markedly in some countries and remaining stable or declining in others. Change in overall production of sweet potato are usually related to demand for the crop in its traditional role as food security crop or staple for food human consumption. In a number of countries the demand for the crop as staple has declined, excess production has been used for feeding animals and for the starch industry. Apart from increase in the demand for the crop by way of new forms of utilization. Major constraints in sweet potato in the country are the lack of high yielding varieties with better processing qualities for making different products. Hence, investigation was carried out to evaluate the sweet potato clones for root yield and yield components' and to evaluate the clones for starch, carotene, reducing and non-reducing sugars. To identify the clones for culinary purposes.

Materials and Methods
The present investigation was carried out during the year 2010 -2013 to evaluate the performance of sweet potato clones for yield and processing qualities. The clones *viz.*, CO2, CO3, CO2/74, CO2/304, CO2/310, CO2/315, RSIII2, 90-704, 90-10-20, 795/1, 796/1 799/5812/6, 812/8 and 815/3 were selected for the study. The experiment was conducted in the Department of Olericulture, HC&RI, Tamil Nadu Agricultural University, Coimbatore which is located at 11.0152'N Latitude, 76.9326' E Longitude and at an Altitude of 750 m above Mean Sea Level. The mean annual rainfall of district is 860 mm. The average maximum and minimum temperature is 28.0 ^{o}C and 19 ^{o}C respectively. The average relative humidity is 75 percent. The experiment was laid out in a Randomized Block Design (RBD) replicated thrice. The sweet potato clones were raised in the field in the plot area of 3.6 X 2.4m accommodating twenty plants. All recommended cultural practices were followed in the research plot. In each replication five plants were selected for recording biometrics observations on length of vine (cm), Girth of vine (cm), Weight of foliage (g), Harvest index (%), Girth of root (cm), Length of root (cm), Number of roots per vine and yield of roots per vine(g). The qualitative characters viz., Starch (%), Total carotenoids (mg/100g), Total sugars (%) and Reducing sugars (%) were also analysed. Processing qualities of sweet potato roots *viz.*, cooking time (min), water uptake (ml), increase in weight (g) and increase in volume (ml) were also done. Porial was prepared from roots and organoleptic evaluation was carried out.

The data generated during the course of study was subjected to statistical analysis as prescribed by Panse and Sukhatme (2000) [7].

Results and Discussion

The mean performance of characters for fifteen clones were presented in Table 1 & 2. The clones 812/8 (327.00 cm), 812/6 (231.0cm and CIP-91-10-20 (223.00cm) showed increased length of vine. The girth of vine ranged from 0.3 cm in CO2/304 to 1.18 cm in 812/6.The weight of foliage varied from 581 g in CO2/310 to 1513g in CIP-90-10-20 with significant differences among them. The results on morphological characters of sweet potato were in agreement with the findings of Jansirani *et al*., 1988 [3, 4].

The harvest index ranged from 13.41 percent in 812/8 to 38.58 percent in CO2/304.The length of root differed significantly among the fifteen clones studied. The result was in conformity with the findings of Kamalam, 1990 [5].

The root length ranged from 2.0 cm in 812/6 to 7.20 cm in RSIII2 with a mean of 5.61 cm. The root girth varied from 10.2 cm in CIP-90-20-10 to 28.4 cm in RSIII-2.Significant differences noticed for number or roots per vine. It ranged from a minimum of 3.04 in 799/5 to a maximum of 8.96 in 796/1.The yield of roots among fifteen clones varied significantly from85.50 g in 815/3 to 160.09 in CO2/315.The clones CO2/74 and CO2 /3004 also recorded increased yield of 1585.50g and 1475.25g respectively. Similar results were recorded by Kamalam, 1990 [5] and Jansirani, 1988 [3, 4].

The starch content of root varied significantly from a 8.48 percent in 795/1 to 19.58 percent in CO3. The clones CO2/304, CO2 and 90/704 registered increases starch content of 19.38 and 17.66 percent respectively. The total carotenoids content in the root was higher in the clone 815/3(4.34mg/100g) and lower in the clone CO2/310 (1.79mg/100g).There were significant differences among the clones. The clones RSIII2 (4.26mg/100g), 796/1 (4.24mg/100g) also showed higher total carotenoids. The total sugars varied from 9.17 in RSIII 2 to 1.30 percent in 812/6. The reducing sugar content varied from 1.45 percent in CO2/310 to 1.72 percent in CO2/304.Similar results were reported by Chellammal and Prema, 1993 [2].

The cooking quality of clones is presented in Table. 3. Significant differences were observed among the clones for all the cooking qualities. The gain in weight generally ranged from 1.0-42.5mg while the gain in volume was 2.0-8.0ml. The cooking time ranged from 122.0-250.0ml. The clone 796/1 had shorter cooking time of 8.0 minutes followed by CO3, RSIII2, CIP-90-10-20, 90/704 and 812/8(10 minutes). The clones CO2/310,799/5 took 13.0 minutes to cook completely. The water uptake was maximum in CO1(250ml), followed by CO2/315(219ml) and CO3(215ml). Longer cooking time increased the water uptake. However, the increase in weight and volume were not proportionate to cooking time. The clones CIP-90-10-20 and CO2/304 were on par for increase in weight, but co2/304 exhibited maximum significant gain in weight. Similar results was reported by Aruna, 1996 [1].

In the present day situation of very fast life style, any food material to find a common place in the dietary should have good cooking quality attributes namely short cooking time, good increase in weight and adaptable for simple cooking techniques. The clone PO 796/1, CO3, RSIII, CIP90-10-20, 90/704 and 812/8 had recorded shorter cooking time. The gain weight generally ranged from 10-42mg.While the gain in volume was 2.0-8.0ml.The water uptake of roots ranged from 122.0-250.0ml. According to McDermott (1992) [6] sensory method in which palatability is evaluated by a panel of judges is essential to every standardization procedure, since they answer important questions of how the food tastes, smells, looks and feels. The organoleptic evaluation of porial prepared from sweet potato is presented in Table 4. The oranoleptic characters viz. colour and appearance, flavor, taste and texture. Among the fifteen clones, CO2, CO3, CO2/74 and CO2/315 recorded maximum overall acceptability. Cooking qualities and organoleptic evaluation of porial showed that CO2, CO3, CO2/315., CO2/74, CO2/310 and CO2/304 clones were most suitable for culinary purpose, since they performed well.

Table 1: Mean performance of fifteen clones of sweet potato for morphological characters

S. No.	Clones	Length of vine (cm)	Girth of vine (cm)	Weight of foliage (g)	Harvest index (%)	Girth of root (cm)	Length of root (cm)	Number of roots per vine	Yield of roots per vine (g)
1.	CO2	84.90	0.475	882.50	29.62	12.51	5.25	3.55	891.500
2.	CO3	165.10	0.510	1315.00	33.33	12.90	6.55	4.46	520.375
3.	CO2/74	214.95	0.400	805.50	33.08	27.95	3.55	7.30	1585.500
4.	CO2/304	168.15	0.350	725.00	33.57	22.80	6.75	7.15	1475.125
5.	CO2/310	124.00	0.425	583.00	27.85	23.35	6.75	6.85	1400.825
6.	CO2/315	184.00	0.580	1326.50	29.73	27.15	6.86	7.00	1660.250
7.	RSIII2	138.25	0.675	345.50	15.72	28.30	7.10	4.60	151.875
8.	90-704	106.70	0.725	706.00	18.64	24.15	5.70	4.40	480.500
9.	CI—90-10-20	223.00	1.000	1511.50	17.31	11.85	5.71	4.40	480.500
10.	795/1	331.00	0.580	745.50	15.19	19.30	5.05	5.85	462.000
11.	796/1	192.00	1.100	811.50	22.43	17.40	3.40	8.03	825.00
12.	799/5	189.95	0.835	660.50	17.88	19.90	5.80	3.27	233.500
13.	812/6	231.00	1.100	951.50	16.63	14.45	2.20	4.35	585.000
14.	812/8	327.00	0.075	843.50	14.82	26.50	6.80	6.55	373.625
15.	815/3	192.70	1.125	630.50	18.83	16.75	6.70	6.43	86.500
	SED	191.49	0.708	889.56	22.98	20.36	5.61	5.73	747.992
	CD(P=0.05)	4.19	0.044	3.433	2.79	3.495	0.173	0.818	165.520

Table 2: Mean performance of fifteen clones of sweet potato for qualitative characters

S. No.	Clones	Starch (%)	Total carotenoids (mg/100g)	Total sugars (%)	Reducing sugars(%)
1.	CO2	17.66	2.03	9.25	1.66
2.	CO3	19.54	3.89	9.22	1.68
3.	CO2/74	11.24	4.07	9.26	1.62
4.	CO2/304	17.38	3.54	9.21	1.72
5.	CO2/310	16.87	1.79	9.97	1.52
6.	CO2/315	9.67	3.37	9.41	1.64
7.	RSIII2	12.43	4.26	9.17	1.47
8.	90-704	17.66	2.75	10.20	1.53
9.	CI—90-10-20	13.47	4.16	9.19	1.56
10.	795/1	9.66	2.87	10.08	1.62
11.	796/1	10.60	4.24	9.41	1.59
12.	799/5	11.31	2.83	9.25	1.46
13.	812/6	10.22	2.43	10.25	1.62
14.	812/8	10.067	2.13	9.39	1.64
15.	815/3	13.63	4.34	9.19	1.53
	Mean	13.63	3.311	9.495	1.589
	CD(P=0.05)	0.908	0.745	0.072	0.041

Table 3: Cooking quality of 15 sweet potato roots

S. No.	Clones	Cooking time (min)	Water uptake (ml)	Increase in weight (g)	Increase in volume (ml)
1.	CO2	11.0	250.0	12.5	8
2.	CO3	10.0	215.0	15.0	4.5
3.	CO2/74	11.0	122.5	12.5	2.0
4.	CO2/304	12.0	135.0	35.0	7.5
5.	CO2/310	13.0	172.5	41.0	6.0
6.	CO2/315	12.0	219.0	21.5	2.5
7.	RSIII2	10.0	147.5	16.5	4.0
8.	90-704	10.0	140.	21.0	6.0
9.	CI—90-10-20	10.0	150.0	42.0	5.5
10.	795/1	12.0	172.5	22.5	4.0
11.	796/1	8.0	177.5	30.0	5.0
12.	799/5	13.0	190.0	12.5	3.0
13.	812/6	11.0	160.0	31.5	2.5
14.	812/8	10.0	175.0	11.0	6.0
15.	815/3	12.0	200.0	10.0	5.5
	SED	1.912	2.085	1.927	0.419
	CD(P=0.05)	2.555	4.472	4.133	0.900

Table 4: Organoleptic evaluation of the recipe porial with fresh sweet potato roots

S. No.	Clones	Colour and appearance	Flavour	Taste	Texture	Overall acceptability
1.	CO2	8.45	8.45	8.9	8.40	8.40
2.	CO3	8.75	8.75	7.0	8.50	8.85
3.	CO2/74	8.55	8.55	6.9	8.55	8.60
4.	CO2/304	7.80	7.85	7.5	8.40	7.80
5.	CO2/310	8.10	8.50	7.1	8.35	8.50
6.	CO2/315	8.30	8.35	7.8	8.20	8.35
7.	RSIII2	7.90	8.05	6.0	8.20	7.90
8.	90-704	7.30	6.35	5.1	8.25	7.30
9.	CI—90-10-20	5.55	6.40	8.1	6.45	5.55
10.	795/1	8.15	8.20	6.1	8.40	8.55
11.	796/1	7.80	7.80	7.1	8.65	7.80
12.	799/5	7.35	7.15	4.9	7.25	7.15
13.	812/6	5.20	5.50	5.5	5.35	5.20
14.	812/8	6.65	6.60	5.4	6.0	6.65
15.	815/3	5.75	5.65	5.1	5.80	5.65
	SED	0.650	0.381	0.92	0.162	0.657
	CD(P=0.05)	1.394	0.818	1.8	0.350	01.411

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