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Agronomic Evaluation of Sweet Potato (*Ipomoea batatas* L.) Germplasm

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A B S T R A C T

Present investigation entitled "Agronomic Evaluation of Sweet Potato (*Ipomoea batatas* L.) Germplasm' was carried out in the Department of Horticulture, Rajasthan College of Agriculture, Udaipur to evaluate yield and other related agronomic variation in sweet potato (*Ipomoea batatas* L.) germplasm". In this research, sixteen diversified sweet potato germplasm were evaluated under randomized block design with three replications. The result reveled maximum tuber length (25.11cm) in 'Sree Nandini', maximum tuber diameter (75.33 mm) in 'Sree Vardhini', maximum tuber number per vine (10.13) in 'ST-10', maximum tuber weight (223.60 g) in 'H-109-2', maximum tuber yield per vine (733.25 g/vine) in CO-3-4 and maximum tuber yield per ha (40.73 t ha^{-1}) in CO-3-4. However, Overall with respect to agronomic character i.e. 'CO-3-4' found to be superior over other genotypes.

Introduction

Sweet potato (*Ipomoe batata* L.), which originated in tropical America, has become a very important crop in the Asian tropical and temperate countries (Bharathi *et al.*, 2005). Its economic importance is next to the major starch producing food crop such as wheat, rice, barley, potato and cassava. About 90% of sweet potato in the world is grown in Asia, mostly in the East and to some extent in the Southeast Asia (Villareal, 1982). With its wide adaptability, high yielding ability and tolerance to enviornmental stress, sweet potato plays an important role in many developing countries for food supplementation, vegetable use and starch processing (Bourke, 1982). Tuber production of sweet potato depends greatly on cultivar, time of planting, local climatic condition and cultural techniques followed. Sweet potato is a highly heterozygous and cross pollinated crop in which many of the traits show continuous variation. Since it is highly heterozygous, there is extensive variability within the species. Conservation of genetic diversity within a crop species is the basis of all variety improvement (Tsegaye *et al.*, 2007). However, if the improved variety replaces 'traditional farmers' variety as it often does, the result

may still be genetic erosion. Therefore, collecting and conserving germplasm is an essential activity as equal to improving and disseminating new varieties. However, extensive agrnomic attributes has not been carried out to identify which germplasm attributed what and potentially used for which purpose. This necessitates studying the agronomic attribute of these germplasm. Therefore this research was initiated with the objective of characterization, evaluation and documenting of agronomic attributes of sweet potato germplasm.

Materials and Methods

Materials and agronomic practices

The experiment was laid out at the AICRP Tuber Crops field, Department of Horticulture, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur during October 2011 to January 2012. The experimental material comprises with sixteen diversified sweet potato germplasm which were collected from different research centers and evaluated under randomized block design with three replications. Tuber length, tuber diameter, tuber number per vine, tuber weight, tuber yield per vine and tuber yield per ha was calculated at the end of harvest. Crop was raised as per standard practices according to the package of practices for the region. The primary nursery was raised at the field of AICRP on Tuber Crops in the month of July-August. Cuttings taken from primary nursery and secondary nursery were also raised. Cuttings were taken from secondary nursery for experiment purpose. Five hundred kg FYM was applied at the time of preparation of the nursery. The vines were planted at a spacing of 30 cm on ridges formed 60 cm apart. Only the middle of vine with nodes was buried to 5-10 cm depth keeping both ends exposed. The crop was fertilized with FYM @ 10 tons ha^{-1} as basal dose, nitrogen, phosphorus and potassium as per recommended dose which is 100:50:50 kg NPK ha^{-1}, respectively. Half dose of nitrogen and full dose of phosphorus and potassium were applied at the time of planting while remaining half dose of nitrogen was applied one month after planting along with first weeding and earthing up.

To maintain sufficient moisture for proper establishment of the crop, a light irrigation after transplanting was applied. Sweet potato is tolerant to drought but continuous long phase of drought reduces the tuber yield. So irrigation was given 15-20 days interval. After proper establishment, sweet potato starts growing vigorously. Therefore vines were lifted at nodes 30 days after planting to prevent rooting and to facilitate better tuber development at the basal end. First hoeing and weeding was done after 30 days of transplanting and second after 40 days of first weeding to keep plots weed free. In order to protect the vines against incidence of sweet potato weevil (*Cylas formicarius*) which cause serious damage to tubers, sprays with Feninthrion (0.05%) at monthly intervals was done. The crop was harvested manually 120 days after planting. Proper care was taken to minimize the losses during harvesting. Light irrigation 2-3 days before harvesting of tubers was given for easier digging.

Tuber weight (g)

Five tubers were selected randomly from each plot and average weight of tuber was calculated.

Tuber length (cm)

Tuber length was recorded in five randomly selected tubers from each plot. Length of tuber was measured in centimeter from base of tuber to the tip of tuber.

Tuber diameter (mm)

Tuber diameter was measured with the help of "Verneer Calipers" in centimeter from three places of tuber and averaged

Tuber yield per vine (g vine^{-1})

This observation was recorded by weighing tubers of individual five vines from each plot and averaged.

Tuber yield per ha (tonns ha^{-1})

This observation was recorded by weighing tubers of whole area and calculated per hectare.

Results and Discussion

Root yield is one of the most important traits that drive the adoption of new varieies by farmer. Therefore, many crop breeders have always considered the development of high yielding varieties first before the improvement of other traits. Usually, selection for high yield is done by indirectly selecting for improvement root yield component (Yahaya *et al.*, 2015). The root yield and yield component of sweet potato studied in this field trial indicated significant genotype differences for tuber length, tuber diameter, tuber number per vine, tuber weight, tuber yield per vine and tuber yield per hectare. The variation of growth characters among different germplasm might be due to genetic character. The higher yield may be due to more number of tubers per plant and higher mean tuber weight. The association of tuber yield with the size of the tubers in sweet potato has also been observed by Vimla and Lakshmi (1991). Nedunchezhiyan and Byju (2005) recorded variation in tuber yield and tubers per plant. Varietal differences in tuber length were also reported by several workers (Goswami, 1990; Sarkar *et al.*, 1992; Kakaty *et al.*, 1992; Chattopadhyay *et al.*, 2000). Varietal differences with respect to tuber weight and yield were also reported (Kakaty *et al.*, 1992; Bhattacharya 2001) (Table 1 and 2).

Table.1 Detail of germplasm and their source

S. No.	Name	Source
1	CIPSWA-2	World Potato Regional Centre, New Delhi
2	CO-3-4	CTCRI, Thiruvananthapuram
3	Gauri	CTCRI Regional Centre, Bhubaneshwar
4	Gautam	CTCRI Regional Centre, Bhubaneshwar
5	H-109-2	Navsari Agricultural University, Navsari
6	Navsari Local	Navsari Agricultural University, Navsari
7	Pol-19-8-10	CARI, Port Blair
8	Samrat	CTCRI, Thiruvananthapuram
9	SI-1	Navsari Agricultural University, Navsari
10	Sree Arun	CTCRI, Thiruvananthapuram
11	Sree Nandini	CTCRI, Thiruvananthapuram
12	Sree Ratna	CTCRI, Thiruvananthapuram
13	Sree Vardhini	CTCRI, Thiruvananthapuram
14	ST-10	CTCRI, Thiruvananthapuram
15	ST-14	CTCRI, Thiruvananthapuram
16	SV-71	BCKV, Kalyani

Table.2 Yield attributes and yield of sweet potato germplasm

Genotype	Tuber length (cm)	Tuber diameter (mm)	Tuber No. vine^{-1}	Tuber wt. (g)	Tuber yield (g vine^{-1})	Tuber yield (t ha^{-1})
CIPSWA-2	12.10	73.13	3.09	110.30	340.82	18.93
CO-3-4	14.09	74.26	6.07	120.80	733.25	40.73
Gauri	20.05	51.11	7.08	60.30	426.92	23.71
Gautam	11.99	47.93	2.04	190.60	388.82	21.60
H-109-2	8.48	45.13	3.04	223.60	679.74	37.76
Navsari Local	15.08	33.06	3.04	80.50	244.72	13.59
POL-19-8-10	14.07	56.19	5.05	130.40	658.52	36.58
Samrat	16.05	41.08	2.10	125.55	263.65	14.65
SI-1	18.05	57.08	10.07	65.60	660.59	36.70
Sree Arun	15.13	51.09	5.08	120.30	611.12	33.95
Sree Nandini	25.11	50.05	3.16	150.34	475.07	26.39
Sree Ratna	15.12	51.08	5.08	130.20	661.41	36.74
Sree Vardhini	17.11	75.33	2.08	125.30	260.62	14.48
ST-10	10.08	42.95	10.13	68.50	693.90	38.54
ST-14	11.97	48.05	5.04	110.40	556.41	30.91
SV-71	13.12	55.04	3.07	82.70	253.88	14.10
Mean	14.78	53.19	4.70	118.46	495.88	27.55
Range	8.48-25.11	33.06-75.33	2.04-10.13	60.30-223.60	244.72-733.25	13.59-40.73
SEm±	0.52	2.03	0.23	5.26	42.78	2.38
CD (P=0.05)	1.51	5.88	0.66	15.21	123.56	6.87
CV (%)	6.10	6.61	8.46	7.70	14.94	14.94

Significant variation in marketable tuber yield was also reported under West Bengal condition (Nath *et al.*, 2007).

Most of the germplasm has different source size and roots source activity (photosynthetic rates), the difference in their storage root yield is also attributed to the difference in their sink capacity also (storage root number and size), which in turn influenced their transportation potential and storage root yield.

Thus, growing sweet potato germpalsm with high sink capacity in high humid environments may be of advantageous for maximizing productivity. Reason behind more tuber number per vine, length, diameter, weight might be more number of sub vines, leaves and leaf area in particular germplasm (Haldavankar *et al.*, 2009).

Increase in gross yield of tuber per hectare could be attributed to increase in weight of tubers during growth and development, which can be related with increase in size of cell with accumulation of metabolites and moisture in intercellular spaces (Shirke *et al.*, 2002). Increase in tuber yield was also observed by Ramanujam and Indira (1979) in sweet potato.

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