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Effect of different sweet potato {*Ipomoea batatas* (L.) Lam} verities and pretreatment on flour yield and dehydration ratio

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Abstract
The present investigation to study the effect of different sweet potato {*Ipomoea batatas* (L.) Lam} verities on flour yield and dehydration ratio the excrement was conducted in the department of post-harvest technology, ASPEE college of horticulture and forestry, Navsari Agricultural University, Navsari-396450, Gujarat (INDIA) during 2016-17. Significant differences were observed in flour yield among the different varieties. The maximum flour yield was recorded under "Gauri" (V_1) and minimum in "Kamala Sundari" (V_4). The result of study indicated that among the different varieties *viz.* "Gauri", "ST-14", "CIP-440038" and "Kamala Sundari" grand mean (V) dehydration ratio of flour ranged between 4.86 and 5.74, with minimum dehydration ratio in variety "Gauri" (V_1), followed by "ST-14" (4.86) and maximum in "Kamala Sundari" (V_4).

Keywords: sweet potato, yield and flour and dehydration ratio

1. Introduction
Among different vegetables; tuber crops are the most important food crops after cereals and grain legumes. It serves as staple food for millions of people in tropical, subtropical and temperate regions. These crops are known for their high calorific value and capacity to withstand adverse soil and climatic conditions (Saravaiya and Patel, 2005) [7]. The main feature of tuber crops is that these crops have high production per unit area and time. They are tolerant to drought and can be grown even on undulated and unfertile soil. Tuber crops include sweet potato, taro, cassava, elephant foot yam, greater yam and tannia. Underground portion of the tuber crops (tuber/corm) is the edible portion. These tuber crops play a major role in the socio-economic condition of small and marginal farmers in context of food and nutritional security particularly tribal area. The popularity of these crops is on the rise not only for its food value but also as an important raw material in starch based industry. These tuber crops are chief source of energy and fulfil the starch requirement in the absence of food grains. Tuber crops are known from ancient times to saving mankind particularly during famine times. Besides this, tuber crops are being used as animal feed and also useful to various agro-based industries.

Sweet potato is one of the seventh most important crops in the world and produces over 105 hundred million metric tonnes of edible food products in the world annually. Sweet potatoes are known to be rich in carbohydrates, starch, fibers, carotenes, thiamine, riboflavin, niacin, potassium, zinc, calcium, iron, vitamins A and C and high quality protein (Anon., 2009) [2]. The foods are considered as a highly functional having anti-diabetic effects and effective against cardiovascular diseases. The total area under sweet potato in the world is estimated to be about 16 million hectares with a production of 12.5 million tonnes. China and India are the leading sweet potato growing countries in the world. Sweet potato tubers are bulky and perishable unless cured. The inadequacies of handling, storage, transportation and marketing pose a greater problem during glut season resulting heavy post-harvest loss (Rees *et al*. 2003) [6]. The "dehydration" can become one of the economical and feasible methods of preservation of surplus produce and to minimize post-harvest losses. In the tropics, the major portion of the sweet potato tuber is eaten as a vegetable after boiling, baking or frying. The sweet potato tubers are sometimes sliced and dried in the sun to produce chips and flour (Swarup, 2012) [8].

Ali *et al.* (2012) recorded moisture contents of different varieties of sweet potatoes *viz.* Black Vine, Big Red and Lovers Name to the extent of 72.1%, 69.1% and 68.1% respectively. They also indicated that differences in moisture contents of sweet potato cultivars are due to such factors *viz.* cultivar, location, climate, and soil type, incidence of pests and diseases, and cultivation practices. Tubers of Lover Name with lower moisture content resulted low moisture content in flour (8.9%).

2. Methodology
The present investigation entitled "Effect of different sweet potato {*Ipomoea batatas* (L.) Lam} verities on flour yield and dehydration ratio" was conducted in the department of post-harvest technology, ASPEE College of horticulture and forestry, Navsari Agricultural University, Navsari-396450, Gujarat (INDIA) during 2016-17. The Navsari Agricultural University is located three kilometers away in the South-West direction from Navsari railway station (22°-57' North latitude and 72°-54' East longitude at an altitude of 10 meters above the mean sea level) and12 kilometers away in the East from the Arabian sea-shore and the historic place 'Dandi'.The climate of this area is typically tropical, characterized by fairly

hot and humid summer, warm monsoon with high humidity and moderately cold winter.

Methodology used for dehydration potato flour

Fresh sweet potato tubers were analyzed for physico-chemical characteristics and used further for dehydration in to flour. Sweet potato tubers immediately after harvesting were prepared for dehydration into flour. The defective as well as undesirable tubers were removed while sorting. Then tubers were thoroughly washed to remove any adhering dust and dirt particles. After washing, the tubers were peeled to remove peel and trimmed to remove undesirable portions with stainless steel (SS) knife. Then peeled tubers were cutinto 2-3mm slice with the help of slicer. The prepared slices were dehydrated into flour as per treatments. A total of 24 treatments were used for dehydration into flour using combinations of different sweet potato varieties as Factor-1 ["Gauri" (V_1), "ST-14" (V_2), "CIP-440038" (V_3) and "Kamala Sundari" (V_4)] in (Table.1)

Table 1: Detail of treatment combinations used to dehydrate sweet potatoes into flour

Treatment No	Treatment combinations	Treatment No	Treatment combinations
T_1	$V_1B_1K_1$	T_{13}	$V_3B_1K_1$
T_2	$V_1B_1K_2$	T_{14}	$V_3B_1K_2$
T_3	$V_1B_1K_3$	T_{15}	$V_3B_1K_3$
T_4	$V_1B_2K_1$	T_{16}	$V_3B_2K_1$
T_5	$V_1B_2K_2$	T_{17}	$V3B_2K_2$
T_6	$V_1B_2K_3$	T_{18}	$V_3B_2K_3$
T_7	$V_2B_1K_1$	T_{19}	$V_4B_1K_1$
T_8	$V_2B_1K_2$	T_{20}	$V_4B_1K_2$
T_9	$V_2B_1K_3$	T_{21}	$V_4B_1K_3$
T_{10}	$V_2B_2K_1$	T_{22}	$V_4B_2K_1$
T_{11}	$V_2B_2K_2$	T_{23}	$V_4B_2K_2$
T_{12}	$V_2B_2K_3$	T_{24}	$V_4B_2K_3$

- Number of Treatments- 24
- Number of Repetition- 3
- Design- CRD (with factorial concept)
- Sample size-50g
- Storage Period- 0,2,4,6 months
- Packing materials – PP bags (50 g capacity)

Selection of sweet potatoes
↓
Trimming and Peeling
↓
Slicing
↓
Blanching and Sulphitation (as per treatments)
↓
Dehydration (Dehydration using three stage dehydration temperatures- 75ºC for 2 hours, 68ºC for 4 hours and 60ºC till drying apprx11-12 hours)
↓
Flour preparation and Packaging (Polypropylene bag 200 gauge)
↓
Storage (ambient storage) and analysis

3. Result and discussion

The prepared sweet potato flour was evaluated for physical, chemical, sensory and microbial characteristics to study the effect of different varieties and treatments on quality of flour.

3.1 Physico-chemical Characteristics

The data pertaining to the effect of different varieties and treatments on physico-chemical characteristics of sweet potato flour has been presented in Table.2 and discussed under following heads:

3.1.1 Flour Yield

Perusal of data presented pertaining to effect of different varieties and treatments on flour yield have been given in (Table.2).

3.1.2 Effect of varieties

Data shows that among different varieties *viz.* "Gauri", "ST-14", "CIP-440038" and "Kamala Sundari" grand mean yield (V) of flour ranged between 17.42% and 20.95%, with maximum yield in variety "Gauri" (V_1), closely followed by "ST-14" (20.59%) and minimum in "Kamala Sundari" (V_4). Significant differences were observed in flour yield among different varieties. Hagenimana and Owori (2000) [3] reported 27% flour yield of sweet potato in variety Tanzania. The variation in yield of flour may be due to variation in dry matter content as well as peeling and trimming losses among different cultivars. Raj (2004) [5] reported yield of potato flour among different potato cultivars varied from 13.23 to 20.73 per cent, with maximum yield in Kufri Chipsona-2 followed by Kufri Chipsona-1 (20.63%) and Kufri Chandramukhi (18.53%) and minimum in Kufri Jyoti followed by Kufri Badshah (14.70%).

3.1.3 Effect of Blanching

It was observed that mean yield (B) of the flour varied significantly from 17.16% to 21.65% when sweet potato flour was prepared by following different blanching treatments prior to dehydration, with maximum yield (21.65%) of the flour prepared without blanching treatment (B_1) and minimum yield in flour when prepared with blanching treatment (B_2). Leeratanarak *et al.* (2006) [4] reported that blanching help to increase the dehydration ratio of the product which represents the decrease in the yield of the dehydrated product. The increase in dehydration ratio of the flour in blanching treatment might be attributed to leaching losses of the nutrients and solids.

3.1.4 Effect of Sulphitation

Data shows that among different sulphitation treatment, the yield of flour varied non-significantly between 19.20% and 20.55%, with maximum yield in flour which was prepared by giving sulphitation pre-treatment (KMS @ 2000 ppm) and minimum in control (without sulphitation).

3.1.5 Effect of treatment interactions

Among interaction of varieties and blanching, data depicted

that flour of different sweet potato variety prepared by giving different blanching treatment (VxB) resulted variation in the flour yield from 15.18% to 23.69%, with minimum flour yield in variety "Kamala Sundari" when prepared by following pre-treatment of blanching at 85ºC for 3 min (V_4B_2) and maximum in variety "Gauri" when prepared by without blanching pre-treatment. Interactions of VxK, BxK and VxBxK were found to have non-significant effect on yield.

3.2 Dehydration ratio

Perusal of data presented pertaining to effect of different varieties and pre-treatments on dehydration ratio of sweet potato flour have been presented in (Table.2).

3.2.1 Effect of varieties

Data shows that among different varieties *viz.* "Gauri", "ST-14", "CIP-440038" and "Kamala Sundari" grand mean (V) dehydration ratio of flour ranged between 4.86 and 5.74, with minimum dehydration ratio in variety "Gauri" (V_1), followed by "ST-14" (4.86) and maximum in "Kamala Sundari" (V_4). Significant differences were observed in flour yield among different varieties. Varieties with minimum dehydration ratio seem to be good with respect to yield of the finished product. The variations among varieties in dehydration ratio were due to the variation in the dry matter content of the tubers.

3.2.2 Effect of Blanching

Further, it was observed that mean dehydration ratio (B) of the flour varied significantly from 4.62 to 5.83 when sweet potato flour was prepared by giving different blanching treatments prior to dehydration; with minimum dehydration ratio (4.62) prepared without blanching treatment (B_1) and maximum dehydration ratio was when prepared with blanching treatment (B_2). Leeratanarak *et al.* (2006) [4] reported that blanching reduced the shrinkage of the product which helps to increase the dehydration ratio of the product. The increase in dehydration ratio of the flour in blanching treatment might be attributed to leaching losses of the nutrients and solids.

3.2.3 Effect of Sulphitation

Among different sulphitation treatment, the dehydration ratio of flour varied between 5.11 and 5.21, with minimum dehydration ratio in flour which was prepared by giving sulphitation pre-treatment (KMS @ 2000 ppm) and maximum in control (without sulphitation). However, the differences were non-significant. Truong and Avula (2010) [9] reported the dehydration ratio of sweet potatoes in the range of 3: I to 5: I when pretreated with sulphur dioxide. Among interaction of varieties and blanching, data depicted that flour of different sweet potato variety prepared by giving different blanching treatment (VxB) resulted variation in the dehydration ratio from 4.22 to 6.60, with maximum dehydration ratio of flour in variety "Kamala Sundari" when prepared by giving pre-treatment of blanching at 85ºC for 3 min (V_4B_2) and minimum in variety "Gauri" when prepared by without blanching pre-treatment (V_1B_1). Interactions of VxK, BxK and VxBxK were found to have non-significant effect on dehydration ratio content.

4. Conclusion

From the result and discussion it can be concluded that the Gauri" (V1) variety of sweet potato recorded significantly maximum yield and minimum dehydration ratio.

Table 2: Effect of different varieties and pre-treatments on flour yield and dehydration ratio of sweet potato during preparation of flo

Parameter		Blanching (B)										
		Control: Without blanching (B_1)					Blanching at 85ºC for 3 min (B_2)					Grand Mean (K)
		Varieties (V)*					Varieties (V)*					
		V_1	V_2	V_3	V_4	Mean	V_1	V_2	V_3	V_4	Mean	
Flour yield (%)	Control (K_1)	24.00	23.65	20.36	20.15	22.04	17.75	17.00	16.45	14.25	16.36	19.20
	KMS_{1000} (K_2)	23.45	23.20	19.65	19.40	21.43	18.30	18.20	17.88	15.64	17.51	19.47
	KMS_{2000} (K_3)	23.62	23.25	19.70	19.42	21.50	18.60	18.22	17.95	15.65	17.61	19.56
	Mean	23.69	23.37	19.90	19.66	21.65	18.22	17.81	17.43	15.18	17.16	
Grand Mean		20.95	20.59	18.67	17.42							
		$CD_{0.05}$	SEM±			$CD_{0.05}$	SEM					
	Varieties (V)	0.403	0.140		VxB	0.570	0.199					
	Blanching (B)	0.285	0.099		VXK	NS	0.243					
	Sulphitation (K)	NS	0.122		BxK	0.494	0.172					
					VxBxK	NS	0.344					
Dehydration ratio	Control (K_1)	4.17	4.23	4.91	4.96	4.54	5.63	5.88	6.08	7.02	6.11	5.21
	KMS_{1000} (K_2)	4.26	4.31	5.09	5.15	4.67	5.46	5.49	5.59	6.39	5.71	5.14
	KMS_{2000} (K_3)	4.23	4.30	5.08	5.15	4.65	5.38	5.49	5.57	6.39	5.68	5.11
	Mean	4.22	4.28	5.02	5.09	4.62	5.49	5.62	5.74	6.59	5.83	
Grand Mean		4.77	4.86	5.36	5.74							
		$CD_{0.05}$	SEM±			$CD_{0.05}$	SEM.±					
	Varieties (V)	0.403	0.140		VxB	0.570	0.199					
	Blanching (B)	0.285	0.099		VXK	NS	0.243					
	Sulphitation (K)	NS	0.122		BxK	0.494	0.172					
					VxBxK	NS	0.344					

*V_1: Gauri, V_2: ST-14, V_3: CIP- 440038, V_4: Kamala Sundari

5. Reference

1. Ali N, Kolawole OF, John OA. Effect of cultivar on quality attributes of sweet potato fries and crisps. Food Nutrition Sciences. 2012; 3:224-232.
2. Anonymous. USDA National Nutrient Database for Standard Reference, Release, 2009, 22.
3. Hagenimana V, Owori C. Quality evaluation of sweet potato flour processed in different agro-ecological sites using small scale processing technologies. African Potato Association Conference Proceedings. 2000; 5:483-490.
4. Leeratanarak N, Devahastin S, Chiewchan N. Drying kinetics and quality of potato chips undergoing different drying techniques. Journal of Food Engineering. 2006; 77 (3):635-643.
5. Raj D. Screening of Potato (*Solanum tuberosum* L.) cultivars for processing and value addition. *Ph.D. Thesis.* Dr. Y.S. Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh (India). 2004.
6. Rees D, Van Oirschot QEA, Kapinga RE, Mtunda K, Chilosa D, Mbilinyi LB. *et al.* Extending root shelf-life during marketing by cultivar selection. Sweet Potato postharvest assessment. Experiences from East Africa. London: University of Greenwich, 2003, 51-66.
7. Saravaiya SN, Patel MB. Diamond Back Moth. The most notorious pest of cauliflower and its management strategies. Agrobios Newsletter, 2005; 3(9):23-24.
8. Swarup V.Vegetable Science and Technology in India, Kalyani Publishers, New Delhi, 2012, 614-619.
9. Truong VD, Avula RY. Sweet potato purees and dehydrated powders for functional food ingredients, Sweet potato. Post harvest aspects in food, 2010, 117-161.