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Assessing consumer acceptance and willingness to pay for value added products prepared from orange fleshed sweet potato

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Abstract
Orange fleshed sweet potato is an important source of β-carotene and has considerable potential to contribute to the food based approach to tackle the problem of vitamin A deficiency. In this study, six commonly consumed products were formulated and standardized by incorporating orange fleshed sweet potato flour at 20 and 30 per cent level. Consumer acceptability of all value added developed products were assessed using nine point hedonic scales. A total 120 consumers were participated for this study. It was found that mean scores for overall acceptability of all six developed products were ranged from 7.50 to 8.43, this clearly indicated that all the developed value added products were "liked moderately" to "like very much" by the consumers. In conclusion, all developed Products had good consumer acceptability and 93.33 per cent consumers were willing to purchase OFSP flour incorporated value added products if available in the market.

Keywords: Consumer, acceptance, willingness, prepared, fleshed, potato

Introduction
Orange Fleshed Sweet Potato (OFSP) is an improved breed of sweet potato. It is cultivated in tropical and semi-tropical regions of the world for food and source of income, especially among the rural dwellers (Padmaja, 2009; Mitra, 2012 and Adebisi *et al*., 2015) [18, 15, 2]. OFSP has considerable potential to contribute to the food based approach to tackle the problem of vitamin A deficiency, a major public health concern of the poorer sections. These characteristics make OFSP an excellent food security crop (Padmaja *et al*., 2012) [19]. Hence, in the west, it is now being promoted as a "super food" for good health (Jacobi, 2013; Oliver, 2015 and Eating Well, 2016) [11, 17, 18]. OFSP is well suited for nutrient interventions, because they are a naturally rich source of β-carotene. Thus, promotion of OFSP tubers as a functional food in India will prove to be a successful strategy for eliminating vitamin A deficiency while meeting the cost effectiveness as well (Attaluri *et al*., 2011; Kurabachew, 2015 and Islam *et al*., 2016) [4, 13, 10].

In developing countries like India, sweet potato tubers are mostly consumed in boiled, steamed or fried forms at the household level. In addition to serving as a source of energy and nutrients like carbohydrates, β-carotene and minerals, sweet potato flour can also add natural sweetness, colour and flavour to different value added food products (Van Hal, 2000 and Truong and Avula, 2010) [23, 22]. These products can be made by substituting different percentage (10 to 100 per cent) of sweet potato flour with other flours. The OFSP flour has also the potential to be the most effective way for increasing the vitamin A content in OFSP enriched bakery products, which are highly acceptable among the African people (Hagenimana and Low, 2000; Sindi *et al*., 2013; Kidane *et al*., 2013 and Andrade *et al*., 2016) [9, 20, 12, 3]. People were well informed about the nutritional benefits and they were willing to pay 51 per cent more money for OFSP incorporated products in Mozambique (Naico and Lusk, 2010) [16] and 25 per cent more in Uganda (Chowdhury *et al*., 2011 and De Steur *et al*., 2017) [6, 7].

Since agriculture is becoming more market oriented, roots and tuber can be one of the several crops that farmers can produce to obtain cash income, in addition to the subsistence food security. OFSP may be used in combination with other food materials and new products may be developed resulting in enhanced nutritive value. A number of noble food products with functional value are being developed throughout the world. However, a large number of consumers are not aware about OFSP flour incorporated value added products. A consumer study would not only explore consumer preferences of methods of preparing and consuming OFSP for the modern-day palate.

It could also help to guide product development producers to utilize this local resource, and in turn, increase the likelihood of success. However, at the time of this study, no consumer study on acceptance and willingness to pay for value-added products made of OFSP has been conducted. Thus, there is a great possibility of this subsistence crop to be adopted as a regular diet in the consumer food chain, to supplement as an alternative nutritious food source for the resource poor farmers, in an era of extensive population growth and nutrition crisis. This crop can offer great opportunity for increasing contribution towards household food and nutrition security and welfare of the rural poor people. Keeping these points in view, the present investigation was undertaken to assess consumer acceptability and their willingness to pay for value added products made from orange fleshed sweet potato.

Methods

Selection and preparation of Products

Value added food products are raw agricultural crops that have been modified or enhanced to have better nutritional quality, higher market value and longer shelf life. In this study, six different value added products primarily composed of OFSP flour were prepared and categorized in three categories as given below:

a. Ready to eat : Biscuit and Chocolate
b. Ready to cook : Pasta and Papad
c. Instant mixes : Gulab jamun mix and Muffin mix

For this purpose, basic ingredients were replaced with OFSP flour at 20 per cent in ready to cook products and 30 per cent level in ready to eat and instant mixes for standardization and preparation of different value added product. Six OFSP flour incorporated biscuit, chocolate, pasta, papad, gulab jamun and muffin (from gulab jamun and muffin mixes) were prepared and evaluated for consumer acceptance.

Selection of consumer for consumer acceptability

Regarding consumer acceptability, firstly consumers were informed about purpose of this study and were voluntarily able to choose whether they wanted to participate in the study. All 120 consumers were randomly selected from Pratap fresh (Saras dairy outlet) of Maharana Pratap University of Agriculture and Technology campus, Udaipur, those who were willing for consuming these developed products.

The participants were asked to taste a small sample of the developed products and immediately fill out a questionnaire. The questions in the first part of questionnaire were to obtain general information regarding the name of participant, age, sex, educational qualification, marital status, type of family and their occupation. The second part of questionnaire was related to knowledge about OFSP and its nutritional benefits, its availability in the market and their acceptability. In third parts, questions regarding awareness and utility of OFSP flour incorporated value added products, sensory evaluation of products, consumer preference and reason for its consumption and willingness to purchase etc were present. Product acceptance was based on a nine point hedonic scale for rating of the sensory attributes for each product.

Results and Discussion

Consumer acceptability of food products is a process by which a person accepts or rejects the food. The responses of consumer towards food are not only related with the sensory attributes of the products but on their physiological status also. These responses are also related to some other factors, like past experience, any previous acquired information about the products, beliefs and attitudes of the consumer.

General Profile of consumers

A close look of data presented in Table 1 reveals the general profiles of the consumers. A total number of 120 consumers were selected for this study, out of which 83.33 per cent were female and 16.67 per cent were male. Among the selected consumers majority (66.67%) were of 15-30 years age group followed by 20 per cent in between 30-45 years of age group whereas 13.33 per cent falls between 45-60 years of age for this investigation. Regarding marital status of consumers 66.67 per cent were unmarried while 33.33 per cent were married.

Table 1: General profile of consumers n=120

S. No.	Particulars	Percentage (%)
1.	**Age (years)**	
a.	15-30	66.67
b.	30-45	20.00
c.	45-60	13.33
2.	**Sex**	
a.	Male	83.33
b.	Female	16.67
3.	**Marital status**	
a.	Unmarried	66.67
b.	Married	33.33
4.	**Educational qualification**	
a.	Matriculation	0.0
b.	Intermediate	3.33
c.	Graduate	36.66
d.	Post graduate	40.00
e.	Ph.D. or other	20.00
5.	**Type of family**	
a.	Nuclear	63.33
b.	Joint	36.67
6.	**Occupation**	
a.	Student	56.67
b.	Job	40.00
c.	Business	3.33

Where n= Total number of consumers

Data regarding educational qualification of consumer showed that only 3.33 per cent were having inter level of education, 36.66 per cent were graduate and most of them (40%) were post graduate, whereas, 20 per cent were highly educated (Ph.D). The results also showed that 63.33 per cent and 26.67 per cent consumers belong to nuclear and joint family respectively. The data also revealed that among all consumers, 56.67 per cent were student, 40 per cent were in service and 3.33 per cent were in business.

Knowledge of consumers regarding sweet potato

Table 2 presents the general awareness of consumer regarding sweet potato. It shows that all consumers were aware about sweet potato and 83.33 per cent consumers were consuming sweet potato in their diet. Among all the consumers 56.67 per cent were aware about nutrient content of sweet potato.

Table 2: Percentage distribution of consumers on the basis of knowledge regarding sweet potato n=120

S. No.	Particulars	Percentage (%)
1.	**Knowledge about sweet potato**	
a.	Yes	100.00
b.	No	0.0
2.	**Consume sweet potato**	
a.	Yes	83.33
b.	No	16.67
3.	**Knowledge about nutrients present in sweet potato**	
a.	Yes	56.67
b.	No	43.33
4.	**Nutrients present in sweet potato**	
a.	Carbohydrate	56.67
b.	Fibre	23.33
c.	Protein	3.33
d.	Sugar	6.67
e.	Vitamins	26.67
f	Mineral	10.00

Where n= Total number of consumers

Data regarding knowledge about nutrients present in sweet potato also reveals that more than half of the consumers (56.67%) were aware about its carbohydrate content followed by 26.67 per cent about vitamins, 23.33 per cent fibre, 10 per cent minerals, 6.67 per cent sugar and 3.33 per cent about protein content present in sweet potato.

Data regarding awareness about OFSP is presented in Table 3 indicates that 16.67 per cent consumer were aware about OFSP and only 3.33 per cent consumers were aware about nutrients content specially "β-carotene". Among all the consumers, 86.67 per cent were interested in consuming OFSP in their daily diet.

Table 3: Percentage distribution of consumers on the basis of awareness regarding OFSP n=120

S. No.	Particulars	Percentage (%)
1.	**Knowledge about OFSP**	
a.	Yes	16.67
b.	No	83.33
2.	**Knowledge about the nutrients present in OFSP**	
a.	Yes	3.33
b.	No	96.67
4.	**Please specify special nutrients present in OFSP**	
a.	β-carotene	3.33
b.	Not known	96.67
5.	**Want to consume OFSP**	
a.	Yes	86.67
b.	No	13.33
6.	**Reason for consuming OFSP**	
a.	Low in glycemic index	10.00
b.	Rich in β-carotene	16.67
c.	Good in dietary fibre	6.67
d.	Rich in antioxidant activity	6.67
e.	Better in taste and flavour	60.00

Where n= Total number of consumers

Data regarding reasons for consuming OFSP revealed that among all the consumers, 60 per cent of them wants to consume for better taste and flavour, 16.67 per cent for rich in β-carotene, 10 per cent for low in glycemic index, 6.67 per cent for rich in β-carotene and also 6.67 per cent for good in dietary fibre.

Knowledge of consumers regarding convenience food

Table 4 represents that 100 per cent people were familiar about convenience foods and all were consuming the same in their daily life. The results indicate that all consumers were consuming ready to eat food, whereas 83.33 per cent and 16.67 per cent were using ready to eat and instant mixes available in market.

Table 4: Percentage distribution of consumers on the basis of awareness regarding availability of convenience foods in the market n=120

S. No.	Particulars	Percentage (%)
1.	**Knowledge about convenience foods**	
a.	Yes	100.00
b.	No	0.00
2.	**Weather consuming convenience foods**	
a.	Yes	100.00
b.	No	0.00
4.	**Types of convenience foods consume**	
a.	Ready to Eat	100.00
b.	Ready to Cook	83.33
c.	Instant mixes	16.67
d.	All	33.33
5.	**Reason for consuming convenience foods**	
a.	Easily available	46.67
b.	Easy to cook	66.67
c.	Nutritious	3.33
d.	Good in taste and flavour	16.67
6.	**Reason for not consuming convenience foods**	
a.	Do not like	0.00
b.	Not available in nearby market	6.67
c.	Harmful/ health issues	10.00
d.	Expensive	83.33
7.	**Knowledge about any OFSP value added products available in market**	
a.	Yes	0.00
b.	No	100.00

Where n= Total number of consumers

The data also revealed that 33.33 per cent of consumers were using all the three types of convenience foods. Regarding the reason behind consuming the convenience food, majority (66.67%) of the consumers reported "easy to cook" as followed by 46.67 per cent claiming easily availability in the near market whereas, 16.67 per cent (well in taste and flavour) and 3.33 per cent (nutritious). It was also observed from Table 4 that 83.33 per cent consumers gave the reason for not consuming convenience foods is of "high price". It was also reported that 10.0 per cent consumers were gave the reason as they are "harmful" and 6.67 per cent were not consuming due to non availability of convenience foods in nearby market.

Organoleptic acceptability of value added products from OFSP flour by the consumers

Table 5 shows the results of sensory evaluation of OFSP flour incorporated value added products by consumers which were developed for this investigation.

Table 5: Mean acceptability scores of OFSP flour incorporated value added products by the consumers n=120

Developed Products	Colour	Flavour	Taste	Texture	Appearance	Overall Acceptability
Biscuit	8.27±0.58	8.17±0.75	8.23±0.86	8.37±0.67	8.33±0.61	8.43± 0.63
Chocolate	7.63+1.03	7.53+1.07	7.47+1.04	7.27+1.14	7.57+0.94	7.50+0.90
Pasta	8.30+0.65	8.17+0.75	8.40+0.77	8.33+0.61	8.30+0.60	8.23+0.63
Papad	8.30+0.79	8.17+0.87	8.43+0.73	8.40+0.72	8.37+0.61	8.27+0.69
Gulab Jamun	8.33+0.66	8.13+0.73	8.17+0.83	8.23+0.77	8.20+0.85	7.97+0.76
Muffin	8.23+0.73	7.80+1.00	7.70+1.06	8.37+0.76	8.40+0.67	8.03+0.85

Where n= Total number of consumers

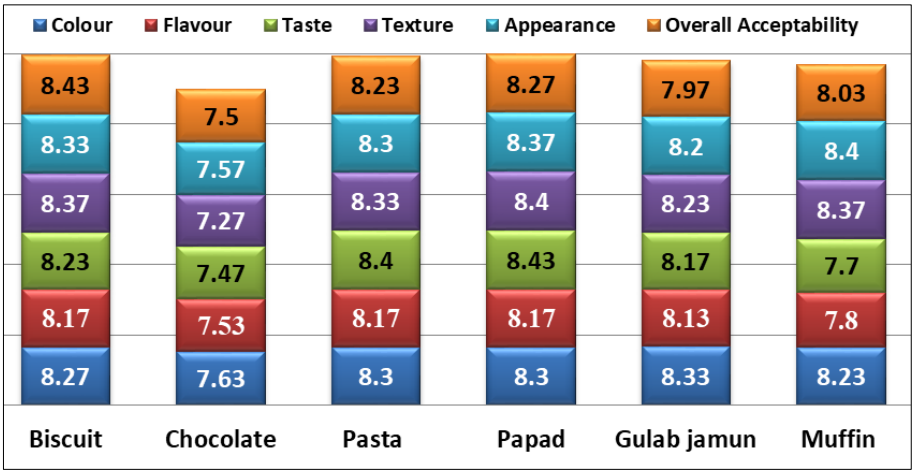

Fig 1: Consumers acceptability of OFSP flour incorporated value added products

It was observed from Figure 1 that mean scores for overall acceptability of all the developed products were ranged from 7.50 to 8.43, this clearly indicated that all the developed value added products were "liked moderately" to "like very much" by all the consumers. Among all the OFSP flour incorporated developed products, biscuits were obtained maximum scores for overall acceptability, followed by papad, pasta, muffin, gulab jamun and chocolate respectively.

Preference and willingness of consumers regarding value added OFSP flour incorporated products:

Data present in Table 6 depicts the per cent distribution of consumers regarding preferences of all the OFSP flour incorporated developed value added products. It was also observed that among all the OFSP flour incorporated developed products, 36.67 per cent consumers preferred biscuits for consumption followed by pasta (20%), papad (16.67%), gulab jamun (10%), chocolate (10%) and muffin (6.67%) respectively. Table 4.48 also revealed that 93.33 per cent consumers were showed their willingness to purchase these OFSP flour incorporated value added foods. The reason behind their willingness to purchase these OFSP flour incorporated products by the consumers might be due to its nutritional importance and acceptability of OFSP flour developed products.

Consumer acceptability of all OFSP flour incorporated developed products was observed good and biscuits were more preferred by consumers because people prefer ready to eat food products for consumption as compared to other type of food.

Table 6: Percentage distribution of consumers on the basis of preference and willingness to purchase OFSP flour incorporated value added product n=120

S. No.	Response of consumers		Percentage (%)
1.	**Best among all the OFSP incorporated value added product**		
a.	Ready to eat	Biscuit	36.67
		Chocolate	10.00
b.	Ready to cook	Pasta	20.00
		Papad	16.67
c.	Instant mixes	Gulab jamun Mix	10.00
		Muffin Mix	6.67
2.	**Willing to purchase OFSP incorporated value added products, If available in the market**		
	Yes		93.33
	No		6.67

Where n= Total number of consumers

The finding of the present study is in confirmation with the results of the study carried out by Sindi *et al.* (2012) [21] at Rwanda (Africa) revealed that there was great consumers preference towards the bread prepared with 30 per cent incorporation of OFSP puree than the bread prepared with wheat flour only. Bukania and Muzhingi (2017) [5] and low *et al.* (2017) [14] also reported that consumers of Kenya showed their willingness to pay more towards OFSP puree based bread because of its high nutritional value.

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