

Research Article

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Consumer Knowledge and Attitude Towards Orange-Fleshed Sweetpotato (OFSP) Puree Bread in Kenya

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Abstract: OFSP is being used as an ingredient of baked products and can be a source of pro-vitamin A. Information about OFSP puree bread consumer profile is limited. The current study investigates the consumer socio-demographics, knowledge, practices and attitude towards OFSP puree bread in Kenya.

A total of 1024 consumers were interviewed from Nairobi, Kiambu, Kajiado, Kisumu and

Kakamega counties. The OFSP bread is purchased by 60% female respondents above 30 years old, who have a university education (79%), formally employed (93%), therefore, middle to high-income earners. Before consumption, 42% of the consumers stored their bread in the refrigerator while 38% stored in the open, and 20% in cupboards. Consumers agree that the OFSP bread could be a good source of energy, vitamins, especially Vitamin A (94%). The acceptance ratings of OFSP bread ranged from 7.37 to 7.65 on a 9-score hedonic scale, hence "liked moderately." There was a significant relationship between socio-demographics, knowledge about the root, the bread

and the overall acceptance of the OFSP puree bread. Consumers were willing to pay more for the OFSP bread based on potential nutritional benefits. There was a significant relationship between consumer demographics and willingness to pay for OFSP puree bread.

Keywords: OFSP; bread; demographics; acceptance; preferences; consumers

1 Introduction

Sweetpotato is an important food security crop in Sub Saharan Africa. The root is considered as a climate-smart crop with a short growing cycle of three months. It requires minimal water and grows on marginal lands including saline environments. The orange-fleshed sweetpotato (OFSP) varieties are very high in provitamin A carotenoids and have been shown to be effective and sustainable source of vitamin A in humans (Low and van Jaarsveld, 2008; Wanjuu *et al.*, 2018). In the USA, OFSP is used as a versatile ingredient in food processing and culinary arts. In Kenya, the SUSTAIN (Scaling Up Sweetpotato Through Agriculture and Nutrition) project piloted the commercialization of baked products containing OFSP as a major ingredient. A variety of processed products that contain OFSP as the main ingredient such as bread and buns are commercially available. The successful commercialization of these OFSP-based products depends on how well the consumers accept them.

In Kenya, bread is consumed by millions of people of different socio-economic status. The quality of OFSP bread is defined by its characteristics that lead to consumer satisfaction and contentment. The attributes of OFSP bread encompasses nutritional values, functional aspects, sensory properties (appearance, texture, taste, and aroma), chemical constituents and mechanical properties. Various parameters can be used to determine the

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quality of commodities (Popper et al. 2004). The level of consumer acceptability is usually assessed by asking consumers to rate how much they like a product (Menon et al. 2015). A product may be proven to have health benefits but may not be accepted if it is unattractive to consumers or if its sensory properties do not meet consumers' expectations (Menrad 2003). A novel food product will be acceptable to consumers if it is appealing, safe, nutritious and meets the quality standards (Ahmed et al. 2010; House 2016). Consumer satisfaction is very crucial for repeat purchase of any product (Hayat et al. 2010). Therefore, studying consumer acceptance of a product plays a significant role in the food industry. Consumer perception is an essential aspect of defining food product quality and attributes (Nepote et al. 2009).

The successful commercialization of a novel product is determined by consumers' willingness to pay (WTP). WTP is estimated using open-ended question by requiring the respondents to state the maximum amount they would be ready to pay, or close-ended, by offering a specific amount (dichotomous choice) and asking the respondents if they would be willing to pay or not. The consumer should be well informed about the novel product and its characteristics if one intends to use the open-ended format of getting consumers WTP (Frew et al. 2003; Kwak et al. 2013). Insufficient or lack of information will result in less consideration and value attached to such goods so that the consumers may give an unrealistic price estimate. (De Groote and Kimenju 2008; Arrow et al. 2001). Close-ended questions are more realistic as they correspond with the real situation in the market and again, they are easier on the respondent. Consumers are offered a particular price on the product, and after some negotiation, they are faced with a decision to buy or not (Rosenbaum et al. 2015).

There have been reports of inefficiencies of the single-bounded method which requires the individual to respond to one bid. This method is strategic in the respondents' interest to say "yes" if their WTP is equal or greater than the price asked, and "no" if otherwise (De Groote and Kimenju, 2008). The single-bounded method should involve a large sample size; otherwise, there will be limitations in the statistical analysis (Cooper et al. 2002; Wertenbroch and Skiera 2002). The double-bounded contingent valuation (CV) method has replaced the single-bounded method to improve efficiency in WTP data collection. The respondent is offered a second bid, which is higher if they say "yes" or a lower price if they say "no". This method integrates more information about consumer's WTP, providing better price estimates for the product with tight confidence intervals (Cooper et al. 2002). The purpose of this study was to profile consumers of OFSP

puree bread, assessing their socio-demographic factors, knowledge, and practices about OFSP and OFSP bread, product acceptance through sensory evaluation and their willingness to pay.

2 Materials and Methods

2.1 Study Area

The study on consumer profiling for OFSP puree bread was carried out in the Tuskys chain of supermarkets in Nairobi, Kiambu, Kajiado, Kisumu and Kakamega counties where the bread is retailed. Nairobi is the largest city in East Africa and the capital of Kenya. The capital has around 3.1 million people and a 4% annual population growth rate (KNBS 2015).

Kiambu and Kajiado counties are centrally located and neighboring Nairobi. Kisumu and Kakamega are on the lakeside and Western regions of Kenya respectively.

2.2 Materials

A questionnaire was developed to assess the knowledge, attitudes towards food safety and quality, acceptance, and willingness to pay for OFSP puree bread. The Open Data Kit (ODK) set of tools was used to author and manage mobile data collection. The XLSForm, which is a standard form that simplifies the authoring of forms in an Excel sheet was created and loaded on a mobile device. The filled form was uploaded to the server for aggregation and analysis.

The questionnaire consisted of four sections: demographics, knowledge, and practices of OFSP and OFSP products, sensory evaluation and willingness to pay. Demographic questions included gender, age, place/region grown, the highest level of education attained, employment status and average monthly income. The knowledge section enquired if consumers were aware of the OFSP root, bread and nutritional benefits derived from the bread.

If the consumers had purchased the bread before, they were asked about their purchase and after-purchase practices including how often they made OFSP bread purchases, loaves per purchase, if they checked the expiry date, time of purchase, storage conditions and how long the bread remained in storage. For sensory evaluation, the OFSP puree bread was displayed, covered with a clear cling foil and offered to the consumers. The consumers

were asked to rate how much they liked the aroma, color, taste, texture, and after-taste of the OFSP bread on a nine-point hedonic scale where 1=dislike extremely and 9=like extremely. On willingness to pay, consumers were first asked whether they were willing to pay for OFSP bread at the current price. When they answered “yes”, they were offered a higher bid, a 10% premium of the current price. If the consumer agreed to pay, a higher bid of 30% and 50% was offered until the consumer responded “no”. Alternatively, if the consumer rejected the offer to pay for the OFSP bread at the current price, a discount of 10%, 30%, and 50% was offered until they said “yes”.

2.3 Sampling Method

The survey targeted all consumers walking into the supermarket, with special consideration given to those who had previously purchased the bread. Consumers were randomly but systematically selected, picking every third consumer to participate in the survey. A questionnaire was used to determine consumer demographics, knowledge, purchase and after purchase practices, sensory evaluation and willingness to pay for the OFSP bread. A list of twenty Tusksys retail stores where the OFSP puree bread is retailed was generated.

Approximately fifty consumers were targeted at each store.

2.4 Questionnaire Administration

The survey was conducted in August 2016 with assistance from two prior trained enumerators. The questionnaire was administered in either English or Swahili. The study employed a range of closed questions where the respondent agreed “yes” or disagreed “no” or ranked opinions on a scale for sensory evaluation section. Consumers were asked if they would like to take part in a survey and were informed on how to do the test. Information about ingredients used to make the OFSP bread was given to the consumers. A total of 1024 consumers were interviewed from Nairobi, Kiambu, Kajiado, Kisumu and Kakamega counties.

2.5 Data Analysis

Statistical analysis was conducted using STATA data analysis statistical software to assess the effect of demographic factors on knowledge, practices, sensory eval-

uation and willingness to pay. The effect of consumers’ socioeconomic characteristics and their knowledge and willingness to pay for OFSP bread was analyzed. The dependent variables of knowledge and WTP of OFSP bread were regressed on the Socioeconomic characteristics (independent variables) using a binary logistic model. Statistical analysis was conducted in IBM SPSS 20 to assess the effect of demographic factors on sensory attributes of OFSP bread.

Spearman’s correlation test was conducted to measure associations and differences in proportions between groups. Statistical significance was set at $p\text{-value} < 0.01$.

3 Results and Discussion

3.1 Consumer demographics

Consumer knowledge, attitude, and practices are influenced by various demographic factors such as background, age, gender, education, and income level. The OFSP puree bread is purchased by mostly female respondents (60%), consumers aged above 30 years 70%, having completed their university education (79%), formally employed (93%) and hence middle to higher income earners (< USD 500 per month), from Nairobi, Western and Central regions of Kenya as shown in Table 1.

The aspects of consumer knowledge and practices of OFSP root and bread are shown in Table 2. Female respondents were most informed about the root (61%), bread (60%), and Vitamin A (59%). Table 3 shows the factors influencing consumer knowledge about OFSP puree-wheat composite bread. Consumers from Western ($z=3.890$) and Nyanza ($z=4.300$) regions of Kenya were better informed of the OFSP root than the OFSP puree bread, and its benefits as a source of Vitamin A because most cultivation of the root takes place in these regions while the distribution of OFSP bread is mostly within Nairobi and the sub-urban regions. The level of education, age and gender have been had a significant effect on consumer’s knowledge of OFSP bread. (De Groote and Kimenju 2008).

Being educated significantly ($z=2.860$) influenced consumers’ knowledge on the OFSP root with 91% respondents with a university and secondary education knew about the root, and 94% knew about the bread. Studies have shown that duration or level of education is positively related to nutrition knowledge and those with high levels of education are more likely to demand quality products (Worsley *et al.* 2015). About 94% of those who

Table 1: Consumer demographics as percentage

Consumer Demographics	Total	Purchased
GENDER	N=1024	n=174
Female	58.40	60.34
Male	41.60	39.66
AGE		
<20 years	5.40	2.87
21-30	26.80	17.24
31-40	32.30	27.59
41-50	24.10	31.61
>50 years	11.400	20.69
PLACE GROWN		
Nairobi	21.10	20.69
Western Region	21.20	16.09
Eastern region	7.20	10.34
Central Region	15.90	20.69
Rift Valley	9.50	11.49
Coast	2.70	4.60
North Eastern	2.90	5.75
Nyanza	18.80	9.77
EMPLOYMENT		
Formal employment	83.30	93.10
Unemployed	16.70	6.90
EDUCATION		
Incomplete primary	0.90	0.57
Complete Primary	2.00	1.15
Incomplete Secondary	5.80	4.02
Complete Secondary	13.80	6.32
Incomplete College/University	12.00	8.05
Complete College/University	65.20	79.31
INCOME LEVEL		
USD 100 - USD 200	14.40	9.09
USD 200 - USD 300	17.20	21.59
USD 300 - USD 400	15.10	11.36
USD 400 - USD 500	22.70	26.14
>USD 500	27.70	31.82

knew about the OFSP root were also knowledgeable about Vitamin A. The level of income negatively related to the knowledge of OFSP root, the higher the income level of consumers, the less aware they were about the root and vice versa. However, the high-income earners were more knowledgeable about the OFSP puree bread, hence the value-added product can be successfully commercialized in the urbanized population.

Table 2: Consumers' knowledge and practices

Do you Give OFSP puree-wheat composite bread to children		
Yes	76	
No	24	
When do you usually eat OFSP puree-wheat flour composite bread		
Breakfast	95	
Snack	3	
Lunch	2	
Are you aware of the nutritional benefits derived from OFSP breed?		
Yes	70	
No	30	
Are you aware of the Nutritional benefits derived from OFSP bread		
Energy	60	
Minerals	57	
Vitamin A	94	
Have you heard about OFSP root / bread		
Male	39	40
Female	61	60
Educated	91	94
Storage of OFSP-puree wheat flour composite bread		
Open	42	
Refrigerator	38	
Cupboard	20	

3.2 Consumer After-Purchase Practices

Consumers (70%) mostly buy the bread in the evening after work. During this time the bread will have been on the shelves for two to four hours, therefore, still fresh.. Consumers are keen to check the expiry date of the OFSP puree bread regardless of their demographic profile. They purchased one to two loaves depending on their family size. About 76% of the respondents who had families gave their children the OFSP bread for breakfast or a snack. This assures that the children have a source of Vitamin A.

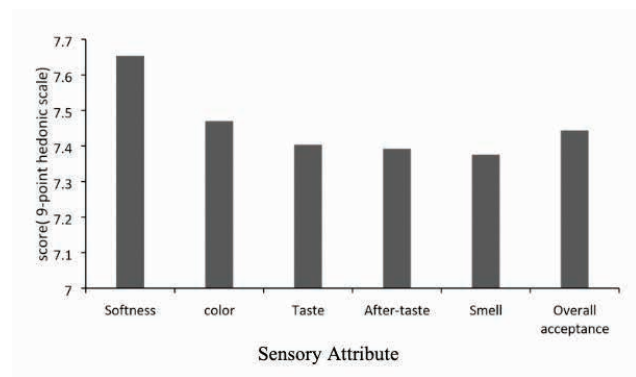
The consumers agree that the OFSP bread could be a source of energy, vitamins, especially Vitamin A (94%) and therefore, they were aware of the nutritional benefits from the bread. After purchase, 42% of the consumers stored their bread in the refrigerator while 38% stored in the open, the rest stored in cupboards. Storage of bread in the various conditions was dependent on availability and preference of the storage. Consumption of the bread happens mostly during breakfast, just less than a day after purchase.

Table 3: Factors that influence consumer knowledge and WTP for OFSP puree-wheat composite bread

Factors	Consumer Knowledge				Willingness to Pay			
	Coef.	Std. Err.	z	P> z	Coef.	Std. Err.	z	P> z
Education	0.273	0.096	2.86*	0.004	0.062	0.083	-0.750*	0.453
Age Group								
21-30	-0.686	0.646	-1.06	0.288	-0.159	0.399	-0.4	0.69
31-40	-0.493	0.637	-0.77	0.439	-0.514	0.401	-1.28	0.2
41-50	-0.314	0.64	-0.49	0.624	-0.082	0.41	-0.2	0.841
above 50 years	-0.012	0.667	-0.02	0.986	-0.059	0.43	-0.14	0.892
Region Grown								
Western Region	-1.131	0.29	-3.89*	0.004	-0.354	0.251	-1.41	0.159
Eastern Region	0.476	0.436	1.09	0.275	0.437	0.3	1.46	0.145
Central Region	0.567	0.339	1.67	0.095	0.131	0.24	0.55	0.586
Rift Valley	-0.002	0.375	-0.01	0.996	0.375	0.281	1.34	0.181
The Coast	0.017	0.571	0.03	0.977	0.195	0.462	0.42	0.674
The North Eastern	0.146	0.506	0.29	0.773	0.804	0.415	1.94	0.053
Nyanza	-1.327	0.309	-4.30*	0	-0.559	0.26	-2.15	0.031
Gender								
Male	-0.025	0.192	-0.13	0.897	0.05	0.156	0.32	0.748
Vitamin A knowledge								
1-Yes	-1.315	0.812	-1.62	0.105	-1.414	0.542	-2.61	0.009

3.3 Sensory Analysis

The addition of the orange-fleshed sweetpotato puree to bread baking significantly ($p < 0.01$) affected the quality of the bread as shown in Figure 1. Consumers commended the bread's soft texture which scored an average 7.65, the most highly scored parameter, implying that it was the most accepted quality attribute. The softness of the bread was significant and correlated positively with the highest level of education acquired. The color and taste of the OFSP puree bread scored 7.47 and 7.40 respectively. The aftertaste of the OFSP bread scored least with an average of 7.39 due to complaints of slight astringency. The flavor of the bread was moderately liked and hence acceptable with an average score of 7.37. Consumers approved the aroma of the sweetpotato in the bread. However, the flavor and aftertaste of the OFSP bread scored least on the quality attributes as consumers associated these with some astringency. The overall acceptability score of OFSP

**Figure 1:** Sensory acceptance of OFSP bread

puree bread was an average of 7.44 and therefore the bread was “moderately like” and acceptable by the consumers.

Table 4 summarizes the relationship between consumer's demographics, knowledge, practices, and WTP of the OFSP puree bread and their sensory acceptance for the bread. A negative correlation exists between gender and sensory attributes, that is, softness (-0.085), color

Table 4: Spearman's correlation values showing relationship between respondents' demographics and sensory attributes of OFSP bread

Demographic profile	Softness	Color	Taste	Aftertaste	Aroma	Overall
Gender	-0.085*	-0.060*	-0.043*	-0.051*	-0.034*	-0.032*
Age	0.009	0.024	0.028	0.019	0.022	0.071
Childhood	0.001	-0.003	-0.011	-0.004	0.049	0.014
Education	0.011	0.009	0.023	0.006	0.004	0.004
Monthly average Income	0.006	0.003	-0.014	-0.004	0.009	0.037
Knowledge - OFSP root	0.102*	0.096*	0.155*	0.117*	0.138*	0.130*
Knowledge -OFSP bread	0.058	0.007	0.048	0.056	-0.005	0.064
OFSP bread Purchase	0.193*	0.126*	0.191*	0.233*	0.180*	0.208*
Willingness to pay	0.181*	0.173*	0.190*	0.195*	0.170*	0.238*

*Correlation is significant at 0.01 level (two-tailed).

(-0.060), taste (-0.043), after-taste (-0.051), aroma (-0.034), and overall acceptability (0.032) of OFSP bread. There was a significant relationship between consumer demographics; age and education attainment, knowledge about the bread and root and acceptance of the puree bread as indicated by the positive correlation coefficient. It is an indication that these factors influence consumers' acceptance for the bread. There was a strong positive correlation coefficient between consumer acceptance of the sensory attributes of OFSP puree bread and their purchase practices as well as their willingness to pay. This implies that consumers were willing to pay more and make purchases of the OFSP puree bread based on the high preference of its sensory attributes. The OFSP bread was generally liked by 83% of respondents. The predominant sensory attributes for consumer's acceptance were softness, color, and taste which had the most impact on the acceptability of the product.

3.4 Willingness to Pay

From this study, ethnic background influenced consumer's decision on their willingness to pay (Table 4). Consumers from Nairobi, Kisumu and Kiambu counties were willing to pay more if the price was increased by 10%, while respondents from Kakamega and Kajiado preferred a 10% discount. The level of education negatively related ($z=-0.750$) to consumers' willingness to pay, with 66.3% respondents who had completed their university education being less willing to pay if the price of the bread was increased by 10%. The higher the income level, the less

Table 5: Consumers' willingness to pay for OFSP puree-wheat flour composite bread

Consumer WTP	WTP Ksh.50	WTP 10% Increase	WTP 10% Decrease
Yes	83%	61%	5%
No	17%	22%	12%

the consumers were willing to pay for the bread if there was a 10% increase on the price of the bread. Income and education have been shown to have a clear negative effect on price elasticity (De Groote and Kimenju 2008).

As in Table 5, consumers (83%) were willing to pay for the OFSP bread, and generally accepted the current price of the OFSP puree bread. More than half (61%) of the consumers who were willing to pay for the bread at the standard price were willing to pay if the price of the bread was increased by 10%. However, only 4.68% of these consumers were willing pay for the bread if its price was increased by 30%, with the condition that the bread is packaged better, and the nutritional benefits are well illustrated on the label. Consumers with lower incomes were more responsive to the discount while consumers with high acceptance and high income were more receptive to premiums on the bread with maximum acceptance at a 50% premium. Consumers reiterated that a higher discount on the bread would be questionable regarding the quality of the bread, so only 16.6% of the respondents were willing to pay for less than the standard price for the 400g loaf. Female respondents (58.1%) were more willing to pay even after an increase of 10% in the OFSP bread, than the

male respondents. Therefore, level of income, education, gender, and ethnic background have been shown to affect consumers' willingness to pay (De Groote and Kimenju 2008; Naanwaab *et al.* 2014).

4 Conclusion

Various demographic factors influence consumers' knowledge, attitude, and practices.

Age, gender, education, and income level, and consumers' willingness to pay for OFSP puree bread have a significant relationship with acceptance. The sensory attributes of the OFSP puree bread were "moderately liked" and hence generally acceptable to the respondents. Consumers were willing to pay more for the bread based on their knowledge of the potential health benefits derived from it. This indicates that consumers favor innovation in food processing and fortification, therefore very willing to try it. In conclusion, the consumer demographics, knowledge, willingness to pay, and the overall sensory attributes of OFSP bread influence the acceptance of the value-added product.

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Conflict of Interest: The authors declare that they have no conflict of interest.

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