

## CHAPTER 6

### CONSUMER TASTE PREFERENCES FOR SWEET POTATO

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In this chapter the style and layout, as prescribed by the Journal in which the article will be published namely, Development Southern Africa, has been followed.

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#### ABSTRACT

*The objective of this study was to report on the consumer taste preference for sweet potato. The intrinsic characteristics, as related to the sensory attributes of white-fleshed sweet potato (WFSP) are known, but that of orange-fleshed sweet potato (OFSP) is still relatively unknown. OFSP contains high levels of beta-carotene as opposed to WFSP, and has the potential to alleviate vitamin A deficiency in individuals at risk. OFSP is grown in home gardens as a food-based approach to address vitamin A deficiency. Consumer preference (n=180) for OFSP and WFSP was measured by means of a paired preference test. Focus group interviews were used to verify the results. The paired preference test was analysed by applying chi-square to test the hypothesis of frequencies or occurrences. A preference for OFSP was found as, overall, 85 % of respondents preferred the taste of OFSP, 53 % liked the orange colour a lot as opposed to 24 % that liked the colour a little. The majority of the consumers indicated a willingness to purchase OFSP, if not available in home gardens.*

## 1. INTRODUCTION

The introduction and acceptance of beta-carotene rich OFSP as an alternative to white-fleshed sweet potato (WFSP), plays an important role in improving the intake of vitamin A by communities at risk of vitamin A deficiencies and related diseases (Faber Laurie & Venter, 2006:13). Vitamin A deficiency has been shown as a most serious health problem in South Africa and sub-Saharan Africa (Black, Morris & Bryce, 2003:2227). Different strategies have been applied to improve vitamin A intake of communities at risk of vitamin A deficiency (Vitamin A Global Initiative, 1998:8). These strategies include supplementation whereby children under the age of five years and lactating mothers are provided with vitamin A capsules; the fortification of commonly consumed staple foods in South Africa such as bread and maize flour; biofortification, which is a relatively new strategy and involves breeding of staple crops with increased vitamin A content (still in a developmental phase) and lastly, food diversification to encourage increased vitamin A consumption of foods naturally high in beta-carotene. Food diversification as a means to address vitamin A deficiency, refers to improving the availability, access and consumption of vitamin A rich foods which could be achieved through home gardens where vitamin A rich vegetables are planted (Faber, et al. 2006:14).

Home gardens is a food-based approach to address vitamin A deficiency by increasing the availability of thereof through the planting of fruit and vegetables that are rich in pro-vitamin A beta-carotene such as mango, pumpkin, carrot, OFSP and green leafy vegetables. Vegetable home gardens provide households with direct access to a variety of vitamin A-rich foods as well as other important nutrients (Savage King & Burgess, 2003:37). Although the best sources of vitamin A are from animal origin, they are expensive and often out of reach of families of poor communities to consume on a regular basis (Faber et al. 2006:37).

An important function of the introduction of new products into the market place is the ability to understand the needs of the present and future consumers in order to identify products with attributes that are desired by the targeted consumers. In most sub-Saharan African countries, only WFSP is available, which has a light creamy coloured flesh and contains very little or no beta-carotene (Laurie in Niederwieser, 2004:59). Sweet potato originally comes from the Central or South American lowlands and was known as *batatas*. It was introduced into Africa by the Portuguese from the Atlantic coast regions of mid-latitude America (Woolfe, 1992:2). OFSP is rich in beta-carotene, but is still relatively unknown. According to Mukhala (2000:9), scientists have spent

more than 10 years selecting OFSP cultivars that could meet the taste preferences of African consumers, as well as nutrient and energy requirements of African and sub-Saharan African people.

As WFSP is frequently consumed and grown by many women (Mukhala, 2000:9), consumers are familiar with the intrinsic characteristic of sweet potato which refers to the physical and sensory characteristics of the product (Van Trijp & Schifferstein 1994: 130). In Kenya, women grow sweet potatoes on small plots of land of which most are harvested for home consumption and surplus sweet potatoes are sold for income (Hagenimana, Low, Anyango, Kurz, Gichuki & Kabira, 2001:377). The success of OFSP lies in the acceptability of the taste by consumers of sweet potato. In a study conducted in 1956 by Van Riter (Randall & Sanjur, 1981:155), the acceptability of a selection of vegetables was measured by 'plate-waste' i.e. the amount left over on the plate after consumption. It was found that the acceptability of the vegetables was closely associated with the familiarity with the vegetables.

In food consumption and food choice, the characteristics of the individual who is making the decisions, need to be considered. Differences in food preferences exist between male and female, and females have been found to have a greater acuity in detecting the four basic tastes i.e. sweet, sour, salt and bitter. Women also seem to be familiar with a greater variety of different foods, which could be due to more frequent interaction with family and friends and exchange of recipes and foods, all which may influence preferences and choices of foods (Randall & Sanjur, 1981:151).

Consumers often have limited vocabulary when it comes to describing a product and their perceptions of the product. By including a scale as part of the evaluation, they are guided with the evaluation process (Greenhoff & MacFie in MacFie and Thompson, 1994: 137). Paired preference tests have been found to be reliable when used with illiterate and semi-illiterate consumers. In a paired preference test, respondents receive two coded samples and are requested to identify the sample that is preferred (Lawless & Heymann, 1998:430). The test forces a choice to be made between the two products (Meilgaard, Civille & Carr, 1991:210).

In addition to quantitative consumer research, focus group interviews, which is a qualitative method of investigation, makes a valuable contribution towards understanding the attitudes and behaviour of consumers (Jenkins & Harrison, 1992:34). A focus group interview is a carefully planned session with 6-15 individuals and is designed to obtain

perceptions in a defined area of interest in a permissive, non-threatening environment (Casey & Krueger in MacFie and Thompson, 1994). A skilled moderator conducts the interview and the discussions are relaxed and enjoyable for the participants. Focus group discussions are aimed at providing insights into how a product, service or opportunity is perceived. The moderator should encourage participation by all the participants (Casey & Krueger in MacFie and Thompson, 1994; Jenkins & Harrison, 1992:77).

Caution should be taken to generalise the findings of focus-group interviews to the population at large as, although respondents are recruited based on regular use of the product, it is not possible to ensure a representative sample of the public on all relevant demographic variables (Jenkins & Harrison, 1992:34:35). Limitations of focus group interviews include the influence of dominant participants, limited exposure and use of the product by all the participants (Lawless & Heymann, 1998:521). Data is often difficult to analyse and, although the group may provide rich dynamics, these may be difficult to interpret and, therefore, analysis takes time and thought. At least three focus groups should be conducted to balance idiosyncrasies amongst groups. Groups are often difficult to assemble and recruitment is time consuming (Casey & Krueger in MacFie and Thompson, 1994:77). However, as markets become more complex and segmentation more important for success in the marketplace, focus group interviews will continue to dominate qualitative research (Jenkins & Harrison, 1992:34).

The aim of the study was to establish, by means of consumer preference testing, whether consumers of sweet potato would accept OFSP and, if so, prefer it to WFSP, in order that it could become part of the food based strategy to increase the availability of OFSP and subsequently the consumption of vitamin A in communities at risk of vitamin A deficiency.

## **2. MATERIALS AND METHODS**

### **2.1 Sample selection**

Resisto cultivar OFSP and Blesbok cultivar WFSP were used for the consumer preference test. Resisto cultivar OFSP was selected for the study because it was the only cultivar available from the ARC at the time of the test. The Resisto has a purple skin and dark orange flesh colour. Blesbok cultivar WFSP was included as it is one of

the most commonly consumed WFSP that is freely available on the South African market. Blesbok has a cream flesh colour with a purple skin (Laurie in Niederwieser 2004:60). The sweet potatoes were harvested on the same day from the ARC-Roodeplaat and transported to the sensory laboratory of the ARC-Irene where they were stored in a cool room. Sweet potatoes were harvested at the end of the growing season in June 2005. All the samples received the same treatment for storage and cooking throughout the project.

## 2.2 Consumer selection for paired preference test

The target population for this study was black, white, coloured and Indian male and female adults who lived in the Pretoria\* area and consumed sweet potato (refer table 1). The selection of the number of respondents per population group was based on the population criteria for South Africa. Income of the household was used as an indicator of different socio-economic groups of the respondents.

\* Pretoria is part of the City of Tshwane which is 3200<sup>2</sup> km in size; population of 2.2 million; situated in the province of Gauteng, South Africa.

**TABLE 1: SOUTH AFRICAN AND GAUTENG POPULATION CRITERIA RELEVANT TO THE RESPONDENTS USED FOR THIS STUDY (Census in Brief / Statistics South Africa, 2003:6.8.10)**

	Black	Coloured	Indian	White	Total
Total population in South Africa: 44.8M	35.4m	3.98m	1.12m	4.3m	
Total population Gauteng: 8.8M	6 522 792m	337 974m	218 015m	1 758 398m	
Total population: Gauteng %	74 %	3.7	2.2	20	
<b>Number of respondents included in the study</b>	144	2	2	34	n = 182 (100%)
Female	88	1	1	33	n = 123 (68%)
Male	56	1	1	1	n = 59 (32%)
Actual % of each population group included in the study	79	1.1	1.1	19	

Men were included in the population sample as generally they are part of the family and play an important role in the acceptance of food (OFSP). The percentage consumers selected from different population groups was based on the demographics of the population of South Africa. In order to get a representative sample, the respondents

were recruited from various farms, institutions and companies around Pretoria including cleaners, farm-workers and management staff. As limited funds were available, a convenient sampling approach was followed.

### 2.3 Consumer selection for focus group interviews

Three focus group interviews were conducted in order to validate results obtained from the quantitative consumer test. The participants of two focus groups consisted of black urban African consumers of sweet potato and the third group consisted of white urban females who consumed sweet potato on a regular basis (Table 2). No focus group discussions were conducted with coloured or Indian consumers as they were not available and only made up a small percentage of the selected respondents.

Prior to evaluating the test samples, consumers were requested to provide demographical information i.e. their name, age, area where they lived as well as indicate their income. All this served as an indication of each respondent's socio-economic status.

**TABLE 2: SUMMARY OF PARTICIPANTS IN DIFFERENT FOCUS GROUP INTERVIEWS**

Participants in focus group	Number	Age	Demographics
Black male and female	15	24+	4 <sup>th</sup> year part time students at the University of Pretoria and working in Pretoria.
Black females	11	40+	Teachers in peri-urban communities in greater Pretoria area and were part-time students at UNISA.
White females	12	35+	All married with children. Some had a part-time job and all lived in the Centurion area.

### 2.4 Consumer questionnaire

The paired preference test questionnaire was developed according to the guidelines in Lawless & Heymann (1998:430). A 5-point hedonic scale with smiling faces was used to evaluate the colour acceptability of the sweet potatoes as the some of the respondents had limited vocabulary skills, specifically the farm-workers (refer addendum B).

A prompt list was developed by the researcher / moderator and used as a guideline for discussion during the focus group discussions. Each focus group followed after a sweet

potato tasting session. The discussions lasted approximately 60 minutes and were conducted by the researcher (as moderator) and two assistants (colleagues) who took notes during each discussion, which was then transcribed by the researcher. Participants were informed that the subject of the discussion was sweet potatoes but not specifically OFSP.

## **2.5. Sample preparation and serving procedures**

The sweet potatoes were prepared at the sensory laboratory of the ARC-Irene. Sweet potatoes were washed to remove any soil or dirt present, placed into 2 litre stainless saucepans and boiled in their skin in 500 ml boiling water for approximately 45 minutes. The water was replenished when required to ensure that it covered the sweet potatoes. Sweet potatoes were cooked until soft and a core temperature of 94° C was reached, which was tested by inserting a hand held digital stainless steel probe (Kane May C9003), equipped with a J-type thermocouple to record the internal temperature at the geometrical centre of the sweet potato. Sweet potatoes were removed from the saucepan and allowed to cool slightly before being used for evaluation.

A portion of the sweet potato, in the skin, was served to the consumers for evaluation. Sweet potatoes were sliced into 30 mm slices and halved to form small half circle portions weighing approximately 50 g each. Each portion was wrapped in aluminium foil with the shiny side in, and coded with a three-digit code. Samples were placed in foil containers and kept warm in insulated cooler bags during transport to different venues. The serving temperature was approximately 40 °C.

Each respondent was presented with a small polystyrene tray that held two coded samples. Care was taken to ensure uniformity of each sample (volume served and serving temperature) for every respondent. All samples were randomised to exclude any bias due to the position effect. Water at room temperature was served in cups as palate cleansers before each taste session.

Groups of up to 10 respondents participated in each evaluation session. Groups were interviewed at their place of work e.g. farm or office where a separate room was prepared for respondents to feel relaxed and comfortable. The researcher explained the evaluation procedures to the respondents and an interpreter was provided if required. Each research assistant was appointed to three respondents at a time to ensure that the

respondents understood the questionnaire and were able to complete it correctly. After completion of the questionnaire, respondents were rewarded with 1 kg sweet potatoes WFSP and OFSP.

## **2.6. Statistical analysis**

### **Consumer paired preference test**

The paired preference test was analysed by applying chi-square to test the hypothesis of frequencies or occurrences (to determine the interaction between the taste and colour preferences) (O'Mahony, 1986:91). In a paired preference test, the probability of the selection of one specific product is one chance in two. The null hypothesis states that, in the long run, when the underlying population does not have a preference for one product over another, each product will be picked an equal number of times – therefore the null hypothesis probability = 0.5 (O'Mahony, 1986:92). Row by column (2x2)  $\chi^2$  was performed on the consumer preferences data. Yates's correction for 2x2 tables was applied (O'Mahony, 1986:92).

Chi-square uses nominal data, which means numbers in the scale represent nothing more than names. Certain conditions must apply when using a chi-square test such as each cell must be independent from the other and the expected frequencies should not be too small, for example 5 is too small, which means that frequencies in the cell cannot be normal (O'Mahony, 1986:99). In this study the expected frequencies were < 5 (colour preference) for the responses in the categories 'neither like nor dislike; dislike a little; dislike a lot, on the scale and were therefore grouped together (refer table 3).

### **Focus group discussions**

The focus group were transcribed from the notes taken during the discussions and were summarised. Comments made by participants were included in each summary to give an accurate reflection of the attitudes and opinions expressed. In order to use the information from the discussions to verify the consumer quantitative data, comments that related to the consumer tests were highlighted i.e. comments on colour preference, taste preference and purchase intent. No particular statistical technique was applied to analyse the data.

### 3. RESULTS

Table 3 summarises the results obtained from the chi-square test which showed the observed frequencies of the colour and taste preferences (e.g. how many respondents liked OFSP as well as the orange colour).

#### 3.1. Taste preference

One hundred and eighty respondents indicated their preference for the taste of sweet potatoes. The results showed that 85 % respondents preferred the taste of OFSP to that of WFSP, which was preferred by 15 % respondents (refer table 3).

**TABLE 3: OBSERVED FREQUENCIES OF CONSUMERS' (n=180) TASTE PREFERENCE AND COLOUR ACCEPTANCE**

Preference of orange colour	Preferred taste of OFSP	Preferred taste of WFSP	Total of colour preference
Like it a lot	91 (95 %)	5 (5 %)	<b>96 (53 %)</b>
Like it a little	33 (75 %)	11 (25 %)	<b>44 (24 %)</b>
*Neither like nor dislike; dislike a little; dislike a lot.	29 (73 %)	11(27 %)	<b>40 (22 %)</b>
<b>Total of taste preference</b>	<b>153 (85 %)</b>	<b>27 (15 %)</b>	<b>180 (100 %)</b>

Row by column (2x2)  $\chi^2$  was performed on the consumer preferences and whether they preferred the orange colour of OFSP. Yates's correction for 2x2 tables was applied (O'Mahony, 1986:92)

#### 3.2. Colour preferences: Interaction between product preference (taste) and colour acceptance

A total of 96 consumers liked the colour a lot, of which 95 % respondents also preferred the taste of OFSP and 5 % the taste of WFSP. Frequencies were significantly different. Of the respondents, 44 liked the colour of OFSP 'a little', of which 75 % preferred the taste of the OFSP and 25 % the taste of WFSP. Forty respondents fell into the third category i.e. 'neither liked' or 'disliked the colour', 'disliked the colour a little to a lot', (refer addendum B). However, 72.5 % preferred the taste of the OFSP and 27.5 % the taste of WFSP.

### 3.3. Product preference and purchase intent

In order to find out if respondents would be willing to buy OFSP if available at the local market, the consumer evaluation form included a question accordingly. Table 4 summarises the results obtained from the chi-square performed on consumer preference for sweet potato and willingness to buy. The majority of the consumers (86 %) indicated that they will be willing to buy OFSP (refer table 4). From these results it can be concluded that the taste and colour of OFSP are acceptable by consumers of sweet potato and that it has potential to be successful in the marketplace.

**TABLE 4: SUMMARY OF CONSUMER PREFERENCE FOR SWEET POTATO AND WILLINGNESS TO BUY OFSP (n=182)**

Willingness to buy OFSP	Preferred taste of OFSP	Preferred taste of WFSP	Total (will buy)
Will buy OFSP	150 (95 %)	7 (4.5 %)	157 (86.3 %)
Will not buy OFSP	1 (10 %)	9 (90 %)	10 (5.5 %)
Might buy OFSP.	4 (27 %)	11 (73 %)	15 (8.2 %)
<b>Total (taste preference)</b>	<b>155 (85 %)</b>	<b>27 (15 %)</b>	<b>182 (100 %)</b>

Row by column (2x2)  $\chi^2$  was performed on the consumer preferences and whether they would buy OFSP. Yates's correction for 2x2 tables was applied (O'Mahony 1986:101)

### 3.4. Focus Group Discussions

The focus group discussions were transcribed from notes taken during the discussions. Black participants were more likely to consume sweet potato 1-2 times per week when in season. Respondents indicated that all the members of the family consumed sweet potato, although the men did not enjoy it as often as the women. Where garden space was available, the women liked to grow their own sweet potatoes. Sweet potatoes were also bought from the market, local supermarkets or street vendors. Family members in rural areas grew sweet potato to sell to others or to give to friends and family when visiting one another. In cases where sweet potatoes were grown at home, they were kept for up to one week after harvesting, before cooking. According to some of the respondents, sweet potatoes were sweeter if kept for a short period after harvesting.

Respondents reported that in some cases sweet potatoes (which were WFSP) were boiled in the skin or placed into hot coals. When cooled, the skin was removed and the sweet potato was eaten whole or mashed. The mashed sweet potato was eaten warm but in many cases the sweet potato was eaten cold, or eaten the following day with tea or milk. Some respondents said they preferred to eat sweet potatoes cold, as when

eaten hot or immediately after being cooked, it was perceived to cause flatulence, a perception more common among men.

The white participants, who were of a higher socio-economic group, viewed OFSP as a new vegetable that could add variety to the diet. They were keen to develop recipes or different uses for OFSP as opposed to seeing it as an important source of vitamin A, energy and an opportunity to grow it in their own garden. The health benefits of the OFSP were of interest to them.

The majority of respondents had not been exposed to OFSP prior to participating in the taste test that preceded the interview, although one respondent had seen OFSP in the Mpumalanga area. All the respondents liked the sweet flavour and smooth texture of Resisto cultivar OFSP and found the colour attractive. Although the orange colour was favoured, concerns were raised about the deep orange colour of Resisto cultivar OFSP and a few participants thought it may be genetically modified, in which case they would be less willing to buy OFSP.

According to most respondents, sweet potatoes were perceived as being good for you while also being cost effective, a good source of energy and a vegetable that could be produced on a small piece of land. It was explained to the respondents that OFSP was rich in beta-carotene and the benefits of consuming beta-carotene was highlighted. When told that Resisto cultivar OFSP had high beta-carotene content and WFSP contained almost no beta-carotene, the respondents indicated that they would purchase OFSP if it was available at their local shops or market. Some of the respondents were concerned as to whether they would be able to identify OFSP from WFSP by the colour of the skin and others about the cost / price of the OFSP. Most respondents were prepared to pay a little more as it was more nutritious. Some respondents indicated that they would like to grow their own OFSP.

#### **4. DISCUSSION**

Literature states that flavour and taste are predictive characteristics of food that could influence consumption, while factors such as satiety and price, are less important (Conner, 1992:28). Resisto cultivar OFSP was readily accepted in taste and colour by the majority of consumers who participated in the study. These findings agree with the findings of Van Jaarsveld, Faber, Tanumihardjo, Nestel, Lombard & Benade (2005:1084)

in a study where Resisto cultivar OFSP was fed to children between the ages of 5-10 years for 53 days as part of a nutrition intervention programme and the participants reported that they liked the taste of the OFSP.

Taste is not the only characteristic that determines the success of a product. Other factors such as smell, appearance, marketing messages by media (e.g. nutritional education on beta-carotene) and even origin of country i.e. culture, could influence the acceptability of OFSP among different target consumers (Wright, Nancarrow & Kwok, 2001: 348,355). Consumer belief that consumption of a specific food could lead to a positive outcome (Conner, 1992:28), could infer that consumers who are aware of the health benefits of OFSP, may purchase it more willingly, which was confirmed by the findings of the focus group interviews. Consumers largely base their choice behaviour on their product preferences and factors such as availability and price may interfere with the relation between preference and choice (Van Trijp & Schifferstein, 1994:129).

## **5. CONCLUSION**

OFSP was preferred by the majority of the respondents and therefore it can be concluded that OFSP has potential to be readily accepted on taste and colour. The focus group discussions verified the findings of the consumer taste test in that participants expressed a positive attitude towards the colour and taste of OFSP. However, the perception that emerged from the focus group discussions, that the dark orange colour of Resisto OFSP could be due to genetic modification, is a concern that should be taken cognisance of when marketing and educating OFSP to the target market. Although genetic engineering (GM) in the field of food production is both beneficial and advantageous, public concerns about the safety of consumption as well as environmental concerns are steadily increasing (Arvanitoyannis & Krystallis 2005:343).

## **6. RECOMMENDATION**

Although OFSP is relatively unknown to the South African consumer, familiarity with a specific vegetable influences consumption as was found by Van Riter in 1956 (Randall & Sanjur, 1981: 155). With adequate education and awareness making by retailers, OFSP has the potential to be successful in the market place providing the price is acceptable and affordable to those communities that are most in need of vitamin A in their diet.

WFSP has been commonly known for many years as a vegetable that is freely available, cheap and frequently consumed by many consumers. Therefore, in marketing terms, the introduction of OFSP could be seen as an 'extension to a range' of an existing vegetable. Furthermore, through interaction with family and friends, the message that OFSP is more nutritious, may influence consumer attitude and consumption of OFSP.

Investigating the consumption of sweet potato among men is recommended for a follow-up study. This study focussed largely on women who were found to be positive about OFSP and keen to grow it for home consumption. The preference for the dry matter content of OFSP among different cultural groups varies and is further recommended for another study. In a study that determined the selection criteria for eating quality in steamed sweet potatoes, it was found that the acceptability ranking of sweet potato roots varied according to the nationality of the sensory panel member. Therefore the potential of OFSP lies in the selection of cultivars that are acceptable to different cultural groups. Different OFSP cultivar should be evaluated for eating quality in the country or region where it will be introduced. The method of preparation of OFSP specific to the culture, could be used for the organoleptic evaluation (Villareal, Tsou, Lai & Chiu,1979:32), which then identifies true acceptance of the product. Health messages on OFSP should be part of the communication campaign, when OFSP is launched into the market place.

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