

Developing Orange-Fleshed Sweet Potato Drinks (As Vitamin A Alternative) From Locally Grown Sweet Potatoes for Household Consumption.

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ABSTRACT

Sweet potato (*Ipomea batata*) is a dicotyledonous plant that belongs to the family Convolvulaceae. This edible tuberous root is long and tapered with a smooth skin within colours ranging from yellow, orange, red, brown and purple. Its flesh also ranges from white, red, pink, yellow, orange and purple.

In Sierra Leone, sweet potato, the third most important energy food next to rice and cassava, is grown throughout the country as food and cash crop.

Sweet Potato comes in many varieties and the variety with darker orange flesh, pack more nutrients especially the beta-carotene than potatoes with lighter /white flesh. Over the years, there is low production level and scarcity of orange – fleshed sweet potatoes because of the scarcity of planting materials and market demand for the tubers due to their high moisture-fleshed contents.

However, beta-carotene, a cheaper source of Vitamin A found in orange –fleshed sweet potatoes are powerful antioxidants protecting body cells from damaging by free radicals and maintenance of epithelial tissues which cover the external body surfaces and line internal cavities.

Vitamin A deficiency has become rampant in the world and Sierra Leone in particular. Its deficiency has led to poor maintenance of the epithelial tissues and lack of mucus which have built up keratin in the eyes. Keratin in the eyes

have led to dryness and opening of cornea-xerophthma, and kerotomalacia/night blindness.

Vitamin A deficiency, however, can be prevented and controlled if appropriate and sustainable nutrition interventions are implemented. Notwithstanding, many resources have been used in Sierra Leone for providing Vitamin A capsules to vulnerable groups at household levels to address this problem.

This research was therefore to process and develop orange-fleshed sweet potato (a beta-carotene rich food) drinks that will be used as an alternative to Vitamin A capsules for household consumption so as to promote its cultivation.

BACKGROUND INFORMATION

TAXONOMY AND MORPHOLOGY OF SWEET POTATO

Sweet potato (*Ipomoea batata*) is a dicotyledonous plant that belongs to the family Convolvulaceae. It is a root tuber, rich in carbohydrate, sweet – tasting and an important root vegetable (Purselore, 1999). According to Wolfe (1999), the young leaves and shorts are sometimes eaten as greens.

The plants are an herbaceous perennial vine with alternative heart –shaped or palmately lobed leaves and medium –sized sympetalous flowers. The edible tuberous root so long and tapered with a smooth skin with colour ranging between yellow, orange, red, brown, purple and beige. The colour of the flesh also ranges from white, red, pink, yellow flesh is less sweet and moist than those with red, pink or orange flesh (Gad Loebenstein, et al 2009).

ORIGIN AND DISTRIBUTION OF SWEET POTATOES

Sweet potatoes are believed to have originated from tropical America. It is believed to have been first distributed throughout the tropics including Africa, West Indies, Mexico and Oceania by migrating people and throughout the world by traders. (Ottair 1999) further stated that the hard test/seeds may have floated in rivers or been carried by birds to Polynesia where it is an ancient crop. Zhang et al (2000) also added that sweet potatoes were carried to Africa and Asia by Portuguese traders in the 15th and 16th Centuries. It is now found in most humid tropical countries.

Sweet potatoes were introduced to Africa after Dutch Colonization in 1652. It is now widely found in African countries such as South Africa, Kenya, Sierra Leone and some others. They are now cultivated throughout the tropical and warm temperate regions whenever there is sufficient water to support their growth. The plants do not tolerate frost and grow best at an average temperature of 24.0c (75oF), abundant sunshine, a rainfall between 750-1000mm.

PRODUCTION LEVEL AND IMPORTANCE

According to U.S. Department of Agriculture, about 20,000 tonnes (20,000,000 kg) of sweet potatoes are produced annually in New Zealand. In the U.S. North Carolina provided 38.5 % in 2007, California produced 23%, Louisiana 15% and Mississippi 19%. Sweet potato is the seventh food crop in the world. According to FAO, Annual Report (2011), the planting area and output were 7,730,000 and 117,340,000 tons respectively. Africa and Asia are the largest producers of sweet potatoes. They produce over 92% of the world's production added by International Institute of Tropical Agriculture (2002).

In Sierra Leone, sweet potatoes are grown throughout the country as food and cash crop. According to George (2005), sweet potatoes are the third most important energy food crop next to rice and cassava. However, farmers in Sierra Leone realized little benefit from growing sweet potatoes since the crop is highly perishable.

The unprocessed product is very low in terms of cost. The tubers can be processed into many products ranging from bread flour starch, flakes, chips, biscuits, drinks, jams, candles and so on. Sweet potato has a higher potential of achieving higher cost because the processed products could be obtained from the crops as already stated above.

The young leaves and vine types of sweet potatoes are widely consumed as vegetables in West Africa countries like Sierra Leone, Guinea, Liberia as well as North Eastern Uganda and the East Africa (Abidin, 2004). According to Nutrient Data Laboratory, United States Department of Agriculture, sweet potato leaves and shoots are a good source of Vitamin A, C and B₂ (riboflavin)

In Rwanda, the nutritive value of the orange –fleshed sweet potatoes have attracted Non – Governmental (NGOs) working with people living with HIV/AIDS that urged their clients to grow and consume orange –fleshed sweet potatoes. Uganda is the second world largest producers of orange- fleshed sweet potatoes after China. The Uganda Government use orange –fleshed sweet- potatoes to feed its children in the flour's confectioners (Chips) for breakfast as a school snack. Though the primary nutrient in the sweet potatoes is carbohydrate, they are also good sources of fiber, beta –carotene (Vitamin A), Vitamin C and Vitamin B⁶. Apart from being rich primarily in carbohydrate, some other studies have shown that, sweet potatoes can help stabilize blood sugar levels and lower insulin resistance.

Research has also shown that phyto-nutrients in sweet potatoes may help lower the potential health risk posed by heavy metals and free radicals. This is helpful, not only for digestive tract problems like irritable bowel syndrome and ulcerative colitis. It is also good for

anyone who wants to reduce the potential risk posed by heavy metal residues like mercury, in their diets.

ORANGE –FLESHED SWEET POTATO VARIETY

Sweet potatoes come in many varieties. In general, the variety with darker orange –flesh pack more nutrients especially beta-carotene than potatoes with lighter or white – flesh. The beta – carotene in the orange –fleshed vegetables is more readily released than that in dark green vegetables (National) Academy Press, 2001).

The production of orange –fleshed sweet potatoes has really not improved because it has not attracted the market value. Due to its nutritive value, the Association for strengthening Agricultural Research in Eastern and Central Africa (ASARECA) instituted a three-year project to develop two varieties and a number and a number of technologies that range from those which are appropriate and preferred for processing on value addition. For this reason, the project have been searching for technologies to preserve the vines of orange – fleshed sweet potatoes for continuity of its production so as to replenish Vitamin A.

In Kenya, orange –fleshed sweet potatoes production increased from 500kg per month in 2008 to 2 metric tons per month (ASARECA Records). This too has also impelled the number of farmers engaged in growing orange – flesh potatoes and therefore there is an increased acreage in random with demands for orange –fleshed sweet potato flour in Kenya.

IMPORTANCE OF BETA-CAROTENE IN ORANGE –FLESHED SWEET POTATO TO VITAMIN A DEFICIENCY

Vitamin A is found in performed and in precursor /pro-vitamin form in the diet. Performed Vitamin A compounds are retinoid whilst precursor/pro-vitamin forms are the carotenoids.

According to Grovenor et al (2004), the orange pigments called carotenoids are precursor forms Vitamin A. She further added that about 50 of the 600 brocarotenoids that have identified provide Vitamin A activity. Food and Nutrition Board (2001) suggested that carotenoids are less well absorbed than retinoids, so more of this form in our diets must be consumed to meet the needs. Beta –carotene is the most potent precursor. It is plentiful in carrots, orange –fleshed sweet potatoes precursor. It is plentiful in carrots, orange –fleshed sweet potatoes, squash and other red, yellow vegetables and fruits as well as leafy greens in which the yellow/orange pigments are marked by chlorophyll. Beta – carotene has been found to be a powerful antioxidant protecting body cells from damaging from the radicals. Free radicals are unpaired elections formed when oxygen reacts with molecules in the body. They react with the body cells causing damaged to the skin and a variety of diseases which are normally incurable.

The orange –fleshed sweet potatoes which are important sources of beta-carotene, carbohydrates, fiber are the cheaper source of Vitamin A for children and breast-feeding mothers. Studies therefore showed that just about 250 grams of the orange-fleshed sweet potatoes can provide the recommended daily requirements for Vitamin A. This aspects about orange –fleshed sweet potatoes is particularly important in Sub Saharan, Asia and Africa in particular, where Vitamin A deficiency is a cause of blindness and premature death among children under five years and pregnant women. It is necessary for the healthy skin of pregnant women, the teeth, the mucus lining of the mouth, the digestive and respiratory tracts. Vitamin A deficiency is world health problem responsible for growth failure, blindness increased susceptibilities to infections and death and its deficiency is a threat to the health, sight and lives of millions of children in the 10 million children worldwide have exerophthlmia and 250,000 to 500,000 go blind annually die to vitamin A deficiency. Ember, (2005) added that Vitamin A deficiency in children is more likely to die in childhood than their peers.

According to Ross (1999), Vitamin A is also involved in the perception of light in the eye sight and the retinal form, of the vitamin combines with the protein opsin to form the visual pigment. Rhodopsin. Rhodopsin helps transforms the energy from light into a nerve impulse that sent to the brain. The nerve impulse allows us to see. But when Vitamin A is deficient, there is a delay in the regenerated of Rhodopsin which cause difficult in adapting the light after experiencing bright light in the condition called Night Blindness, which is one of the first and more easily reversible symptoms of Vitamin A deficiency.

Vitamin A is also necessary for maintenance of epithelial tissue. This type of tissue covers the external body surfaces and lines the internal cavities and tubes. It includes the skin and lining of the eyes, intestine, lungs, vagina and bladder. He added that when Vitamin A is deficient, epithelial cells especially the new ones do not differentiate properly and instead become cells that produce a protein keratin which makes up hair and finger nails.

All epithelial tissues are affected by Vitamin A deficiency and the eye is particularly susceptible to damage. The mucus in the eyes normally provides lubrication, washes much dirt and other particulars and also contains a protein which helps destroy bacteria. When Vitamin A is deficient, the lack of mucus and the buildup of keratin such as xerophthalmia (King, 2004). In the early stages of xerophthalmia can be treated by increasing Vitamin A, if untreated, it can result in the softening of the cornea called Keratomalacia.

In recent years, the following research by International Potato Center (CIP) concluded that the beta recent years, the following research by International Potato Centre (CIP) concluded that beta-carotene found in orange-fleshed sweet potatoes have been found to be potential anti-cancer and anti-aging compounds. In fact, carotenoids including the beta-carotene compounds in these potatoes have shown the ability to stimulate cell to cell communication and poor communication between cells have been believed to be one of the primary causes of over-growth of cells, a condition which eventually led to cancer.

It is believed that beta-carotene may participate in female reproduction. Although its exact time in female reproduction has not yet been identified, as it is known that the corpus luteum has the higher concentration of beta-carotene and that the nutrient plays an important role in reproduction processes. So, these are numerous reasons for consuming orange-fleshed potatoes (nutritious varieties) which provide a longer and healthy life.

STATEMENT OF THE PROBLEM

Vitamin A deficiency (VAO) as reported by Ross (1999) is a world health problem responsible for growth failure, blindness, increased susceptibility to infection and death. He further added that Vitamin A is a threat to health, sight and lives of millions of children in the developing world.

Moreover, Food and Nutrition Board (2001) estimated that 3 to 10 million children worldwide have xerophthalmia and 250,000 to 500,000 go blind annually due to Vitamin A deficiency. Also, Vitamin supplement during pregnancy can have teratogen when taken in high doses or prolong time. There was significant evidence to conclude that food-based approaches using provitamin. A source can adequately control and deficiency and other nutritional deficient such as iron and protein.

To combat the situation, (MI 2005 and UNICEF, 2006) generated worldwide country Vitamin A deficiency prevalence campaign which led to the creation of policy and attention to control VAO in countries where survey data of the deficiency was not available.

As a result, there was an increase in the supply of Vitamin A supplement in all parts of the world. Although the impact of the supplement can be measured using biochemical indicators, yet there is

also need to prepare and process local foods and especially orange fleshed sweet potatoes and that readily available and affordable to complement Vitamin A supplement and ensure continuity even when there is inadequate supply or when programmes is phased out.

Generally, sweet potatoes are grown and consumed in most homes in Sierra Leone but their vitality in the diet is not realized especially when they are not served as snacks and main meal but not as drinks. Today, many artificial colorants are used by different food industries to give colour, improve taste and to preserve drinks in promotion of the products. This have been understood to have some effect on the health of consumers (Mackinney et al, 1999).

Not long ago, sweet potatoes especially orange flesh is grown in many areas in Sierra Leone. But being that shifting cultivation coupled with inadequate use of chemical fertilizers to replenish soil nutrients depicted from the land and increase in demand of land due to population growth has now pushed decrease in its cultivation.

With shifting cultivation, farmers' farm sizes are normally at subsistence level. As a result of the farm size, farmers' ability about the affordability, availability and use of fertilizers have been a serious problem with crop yield. These generally have resulted to poor yields especially the orange –fleshed variety. There have also been serious constraints in sweet potato cultivation (especially orange – fleshed variety) because of the crop is relatively perishable and highly underutilized and no preservation for future use. In most instances, research have been focused only on yield of the cropping, neglecting the quality aspect.

In addition to the above, the low yielding, long duration, disease susceptible varieties and poor agronomic practices all largely account for low yield of sweet potatoes especially orange-fleshed variety. In Sierra Leone, some of the limiting factors for the production of orange –fleshed sweet potato is the scarcity of the planting materials, market demand for the tubers due to high moisture flesh –content and pests, importantly the moisture flesh contents of the tubers.

By developing orange-fleshed sweet potato drinks from locally grown sweet potatoes and its consumptions can promote and sustain to its cultivation thus minimizing Vitamin A deficiency for different households.

AIMS AND OBJECTIVES OF STUDY`

THE AIM OF THE STUDY

The main purpose of the study is to develop orange-fleshed sweet potato drinks (as Vitamin A alternative) from locally grown sweet potatoes for household consumptions.

SPECIFIC OBJECTIVES OF THE STUDY

Specifically, this study is intended to:

- Process and develop orange-fleshed sweet potato drinks from locally grown sweet potatoes
- Formulate and develop a standard recipe for orange –fleshed sweet potato drink.
- Evaluate the organoleptic quality of the drinks using a 9 (nine) – point hedonic ranking scale.
- Suggest relevant recommendations for the promotion and continuity of the production of the drinks

JUSTIFICATION OF THE STUDY

Sierra Leone is known as an under developed nation in the world. Many households are therefore vulnerable to Vitamin A even though Vitamin A campaigns and supplement in the forms of capsules are being implemented. It is essential that adequate beta- carotene rich orange-fleshed sweet potato drinks (food based) should be consumed to help prevent Vitamin A deficiency. This therefore stimulates the interest of the researcher to undertake this study by

developing orange –fleshed sweet potato drinks from locally grown sweet potatoes to prevent Vitamin A deficiency among the households, which is a leading cause.

There is an existing Non-Governmental Organizations (NGOs) known as Helen Kelller International in Sierra Leone which supplies Vitamin A supplements in the form of capsules to vulnerable groups in households through clinics and Health Centres in order to combat Vitamin A deficiency. National Research Council and other agencies in Sierra Leone working on Vitamin A supplements recommended that people should not take (DRI) for adults, especially pregnant women because of the teratogenic effect and advice that they should obtain their Vitamin A from local foods. The Vitamin A supplement (capsules) may not be effectively distributed to most of the vulnerable groups in different households because they cannot reach these vulnerable groups easily.

The Ministry of Agriculture should budget financial allocations to farmers in order to promote sweet potato cultivation especially the orange-fleshed sweet potato rich in beta- carotene to minimize Vitamin A deficiency amongst the households in Njala in particular and Sierra Leone at large.

Moreover, this study formulated and developed recipe for orange-fleshed sweet potato drinks (local food rich in Vitamin A). This can create public awareness of this local food in order to enhance productivity especially in Njala Community. It can gear towards funding a sustainable way of improving the health status of each household through dietary consumption of orange-fleshed sweet drinks (Vitamin A rich local food) that will help built up their immune system, thus preventing cancer, diabetes, exerophthalmia, keralomalacia which can lead to blindness and participate in female reproduction. The recipe will be beneficial to members of the families in the households, health officials and Non-Governmental Organisations (NGOs) who promote Vitamin A supplementation.

The study will serve a baseline to academicians especially the NAD and NFT students who are pursuing courses and researches in food sciences and field workers who will be interested in carrying and further experiments in related disciplines. It will be a guide to Nutritionists/Dieticians to give advice to vulnerable groups as a way to alleviate Vitamin A deficiency through the consumptions of local foods – orange fleshed sweet potato drinks.

LIMITATIONS OF THE STUDY

This study was limited to the following:

- Unavailability of orange-fleshed sweet potato farms in the study area as a result, the study was limited to process and develop drinks from orange, white, yellow-fleshed sweet potatoes grown at SLARI Research and Demonstration site, Foya
- Access to computers and internet facilities. The researcher had no computer. Therefore, arrangements were made to access computer and internet which consumed a lot of time and finance.
- Frequent power –cut –off by Bo-Kenema Power Services. This urged the researcher to hire a stand –by generator so that consumptions will be done on time to meet the deadline for submission.
- Inadequate kitchen equipments in the Institute of Home Sciences was another major setback encountered during the research work. Personal kitchen equipments were therefore used.
- The constraints. Limited time for the research work could not therefore permit a wide coverage. Search for the specific variety of sweet potatoes (orange – flesh) was time consuming. Long ago, people used to abundantly grow orange –fleshed sweet potatoes. But presently due to

their high moisture content, there is decrease in cultivation thus leading to a decrease in production and market value.

- Lack of chemical reagents and other facilities. There were no chemical reagents and food testing Laboratories in the country to carry out the beta-carotene tests of the orange - fleshed sweet potato drinks.

RESEARCH METHODOLOGY

DESCRIPTION OF RESEARCH AREA

The research was conducted at the Institute of Home Sciences Food Preparation Laboratory, Njala University Campus. The institute offers a range of courses such as Nutrition and Dietetics at both undergraduate and post graduate levels, Nutrition and Food Technology, Home Economics Community Studies/Education.

The institute of Home Sciences Njala Campus is located at Mokonde. It is situated at about 125 miles east of Freetown east of Freetown, 7 miles south-east of Taiama, Chiefdom, Headquarter of Moyamba District, 8 miles North –West of Mano, Chiefdom headquarter of the neighboring Dasse Chiefdom.

The people of Njala/Makonde are predominantly Kpaa-Mende, although there are other ethnic groups. Most of the inhabitants in Njal and its environs were engaged in growing sweet potatoes of many varieties. But over the years, the orange-fleshed sweet potatoes have become scarce. However, the Sierra Leone Agricultural Research Institute, Njala University is cultivating many sweet potato varieties including the white, orange, yellow flesh at the Research and Demonstration site for research purposes.

SAMPLE SELECTION AND SIZE

The study area was selected because sweet potatoes were widely grown and consumed by people in the area. They were not used effectively as drinks to accompany their meals but boiled, fried and surpluses being sold/wasted. Furthermore, most people do not know the essence of sweet potatoes especially, orange-fleshed sweet potatoes in terms of its nutritive value and food security.

SAMPLE PROCEDURE

Fifteen (15) panelists were selected randomly from different Njala/Makonde households to get a wide coverage.

SAMPLING AND EXPERIMENTAL PROCEDURES

DEVELOPING WHITE/YELLOW/ORANGE-FLESHED SWEET POTATO DRINKS

Fresh tubers of white, orange and yellow-fleshed sweet potatoes. Granulated sugar and local flavorings including grated Nut Meg and ground cloves were used in the processing and developing of the sweet potato drinks. Samples of fresh white, orange and yellow –fleshed sweet potatoes were collected at the Sierra Leone Agricultural and Research Institute, Research and Demonstration site at Foya.

The granulated sugar and the local flavouring were purchased from the Bo Town Market Southern part of Sierra Leone and conveyed to the Institute of Home Sciences Laboratory. Fresh medium –size sweet potato tubers of each sweet potato variety were selected, trimmed, scrubbed and washed to remove the soil particles and other foreign materials. The sweet potatoes were boiled in their jackets and peel manually. The peeled tubers were mashed with a masher and weighed on a measuring scale. Table spoon full of granulated sugar, grated. Nut Meg and

ground cloves were again weighed on the measuring scale. The volume of the boiled cleaned water was measured in the standard measuring points.

The boiled cleaned water was added to each mashed sweet potato variety. Each mixture was thoroughly stirred and sieved in muslin. The sift mixture was allowed to sediment, strained, flavored and sweetened with granulated sugar. The finished products (drinks) processed and developed in 2 hours, were bottled and chilled. The developed chilled sweet potato drinks were used to carry out the sensory evaluation.

SENSORY ANALYSIS

Four processed and developed samples of white –fleshed sweet potato drinks coded WFSP 1, WFSP2, WFSP 3, WFSP 4 were served to (15) semi-untrained panelists who were formally invited to sensory evaluate the flavor, taste/mouth feel, colour and general acceptability, one after the other using a set of prepared evaluation sheets based on 9 (nine) point hedonic ranking scale.

On the 9 (nine) – Point hedonic ranking scale.

- 1 = like extremely
- 2 = like very much
- 3 = like moderately
- 4 = neither like nor dislike
- 5 = dislike extremely

The sample coded WFSP 1 contained a white – fleshed sweet potato (SLIPOT 4) drink without the local flavorings. WFSP 2 contained white – fleshed sweet potato drink and grated Nut Meg flavoring. WFSP 3 was made up of white – fleshed sweet potato drink and ground cloves flavoring and WFSP 4 contained white –fleshed drink and both flavorings (grated Nut Meg and ground cloves) were chilled and served to the panelists.

Four processed, developed and chilled samples of orange – fleshed sweet potato (ZU/NUI) drinks coded OFSP1, OFSP 2, OFSP 3 and OFSP 4 were again served respectively to these fifteen (15) un-trained panelists for sensory evaluation using another set of prepared evaluation sheets.

Sample coded OFSP 1 contained orange-fleshed sweet potato drink without the local flavorings, sample OFSP 2 contained orange-fleshed sweet potato drink and grated Nut Meg flavoring. OFSP3 contained orange-fleshed sweet potato drink and ground cloves flavoring. OFSP 4 contained orange – fleshed sweet potato drink and both flavoring. OFSP 4 contained orange-fleshed sweet potato drink and both flavorings, (grated Nut Meg and ground cloves). The sample products were chilled and served to the same panelists for sensory evaluation using another set of prepared evaluation sheets.

Finally, the sample codes YFSP 1 contained yellow –fleshed sweet potato (SLIPOT 3) drink without the local flavorings, sample YFSP 1 contained yellow –fleshed sweet potato drink with grated Nut Meg flavoring. YFSP 3 contained yellow –fleshed sweet potato drink with ground cloves flavoring and sample YFSP 4 contained yellow –fleshed sweet potato drink with both flavoring (grated Nut Meg and ground cloves). They were also chilled and served to the panelists for evaluating using the last set of evaluation sheets.

RECIPE FORMULATED FROM DEVELOPING WHITE/YELLOW/ORANGE – FLESHED SWEET DRINKS

TABLE 3.1: BASIC INGREDIENTS AND THEIR QUANTITIES

INGREDIENT	QUANTITY PER SERVING	
	LOCAL MEASURE	METRIC MEASURE (GRAMS/DECILITRE)
Mashed white/yellow/orange –fleshed sweet potato	1 Medium	105 _g
Granulated sugar	1½ table spoon full	25 _g
Local flavourings (grated Nut Meg/ ground cloves)	1 tie	0.1 _g
Boiled water	¾ pint	250d/1

SOURCE: Author’s field Data 2012

METHOD OF PROCEDURE

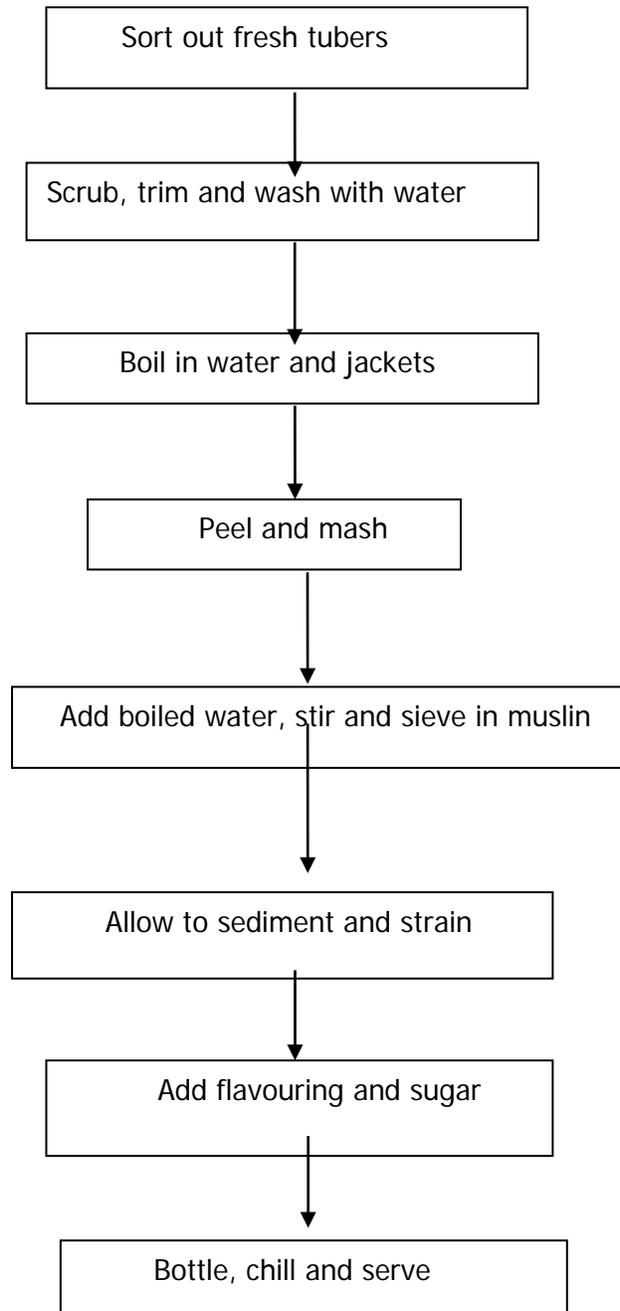
1. Sort out flesh tubers
2. Scrub, trim and wash with water
3. Boiled in the jackets
4. Peel and mash
5. Add boiled water, stir and sieve in a muslin
6. Allow to sediment and strain
7. Add flavouring and sugar while stirring
8. Chill and serve

CONTROL OF ERROR

Precautions were taken to prevent carry over flavor during the tasting. So, panelists were ensured to rinse their mouths with water of each stage of the sensory evaluation of each sample.

DATA AND STATISTICAL PRESENTATION, ANALYSIS AND INTERPRETATION

Data collected from the Laboratory analysis of the sweet potato drinks using the 9- point hedonic ranking scale were presented using statistical tools (percentages and frequencies). The result was presented and interpreted in simple tables and graphs



SOURCE: Authors Field Data 2012

FIGURE 3.1: A flow Chart showing the processing and development of white/orange/yellow-fleshed sweet potato drinks.

RESULT AND DISCUSSION

This section involves the analysis and discussion of the results obtained from the field data.

TABLE 4.0.0: RESPONDENTS’ SENSORY EVALUATION OF THE COLOUR OF SAMPLE PRODUCTS WITHOUT LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 1		YFSP 1		OFSP 1	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	11	73.0	9	60.0	15	100.0
Neither like more dislike	3	20.0	3	20.0	0	0.0
Dislike extremely	1	6.7	3	20.0	0	0.0
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR’S FIELD DATA, 2012

From table 4.0 figure 4.0.0, the sensory evaluation made on the colour of sample products of sweet potato drinks without local flavorings by respondents indicated that higher percentages of these samples products like extremely/very much/moderately (WFSP1 73%, YFSP 2 60% and OFSP1 100% respectively). Among these samples’ products, OFSP 1 appeared to be like most; while YFSP 1 is disliked by most respondents (20%).

FIGURE 4.0.0: Respondent’s sensory evaluation of the colour of sample products without local flavouring

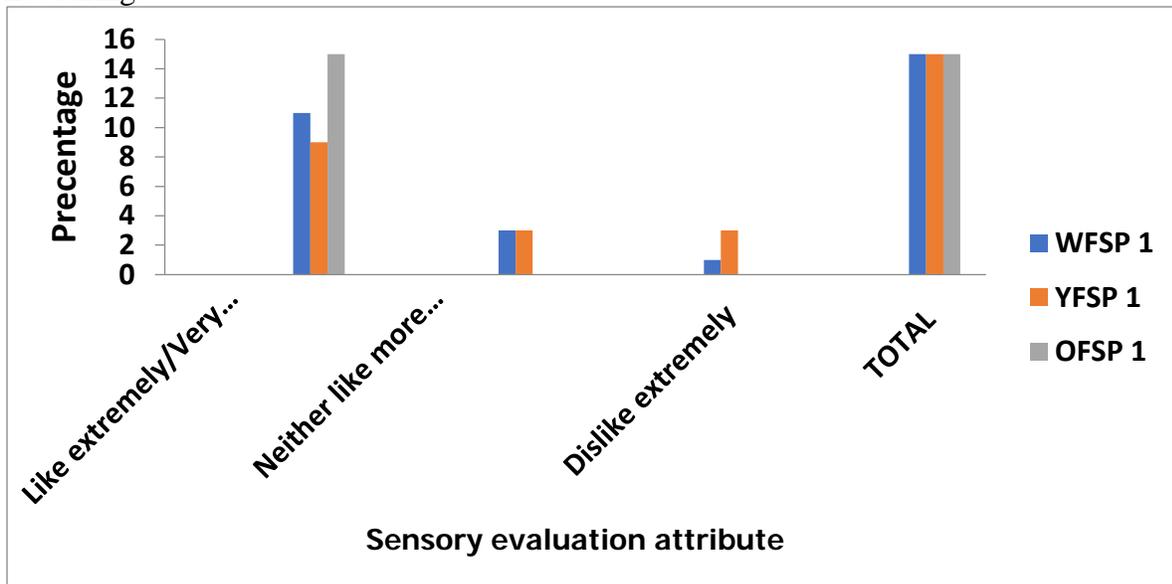


TABLE 4.0.1: RESPONDENTS’ SENSORY EVALUATION OF THE COLOUR OF SAMPLE PRODUCTS FLAVOURED WITH GRADED NUT MEG LOCAL FLAVOURING.

Sensory evaluation attribute	WFSP 2		YFSP 2		OFSP 2	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	12	80.0	10	66.7	14	93.3
Neither like more dislike	2	13.3	3	20.0	1	6.7
Dislike extremely	1	6.7	2	13.3	0	0.0
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR’S FIELD DATA, 2012

In the second sample products were grated Nut Meg was added to the sweet potato drinks as flavoring, the colour obtained was liked extremely/very much/moderately by majority of the respondents. However, with regards to the various sweet potato sample products. The orange – fleshed sweet potato drink (OFSP2) was extremely/very much/moderately (93.3%) of respondents, followed by white –fleshed (WFSP2) and yellow –fleshed sweet potato drink (YFSP2) (80% and 66.7% of respondents. Few of the respondents neither like nor dislike the colour (13.3%, 20% and 6.7% of the respectively. Fewer percentage extremely dislike the colour for only the white –fleshed (WFSP2 and yellow –fleshed (YFSP2), (6.7% and 13.3% of the respondents).

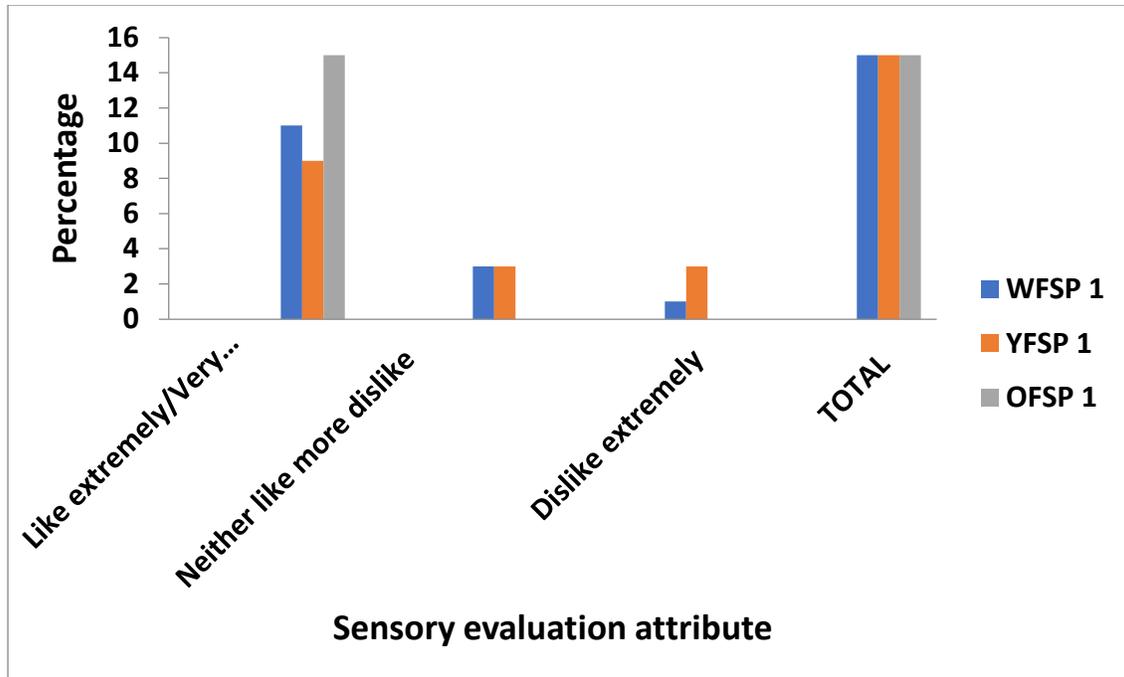


Figure 4.0.1: Respondents’ sensory evaluation of the colour of sample products flavored with grated Nut Meg local flavoring.

TABLE 4.0.2: RESPONDENTS’ SENSORY EVALUATION OF THE COLOUR OF SAMPLE PRODUCTS FLAVOURED WITH GROUND CLOVES LOCAL FLAVOURING.

Sensory evaluation attribute	WFSP 3		YFSP 3		OFSP 3	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	11	73.3	9	60.0	15	100.0
Neither like more dislike	3	20.0	4	26.7	0	0.0
Dislike extremely	1	6.7	2	13.3	0	0.0
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR’S FIELD DATA, 2012

In these products, the evaluation results showed that the orange – fleshed sweet potato drink flavored with ground cloves was extremely/very much/moderately liked, followed by the white and yellow –fleshed sweet potato drinks (100%, 73.3% and 60% of the respondents

respectively). Those who neither like nor dislike were 26.7% for yellow –fleshed sweet potato drinks and 20% for white –fleshed sweet potato drink, none neither like nor dislike the orange –fleshed. Only 13% extremely dislike the yellow –fleshed sweet potato drink while 6.7 % extremely dislike the white –fleshed sweet potato drink (table and figure 4.0.2)

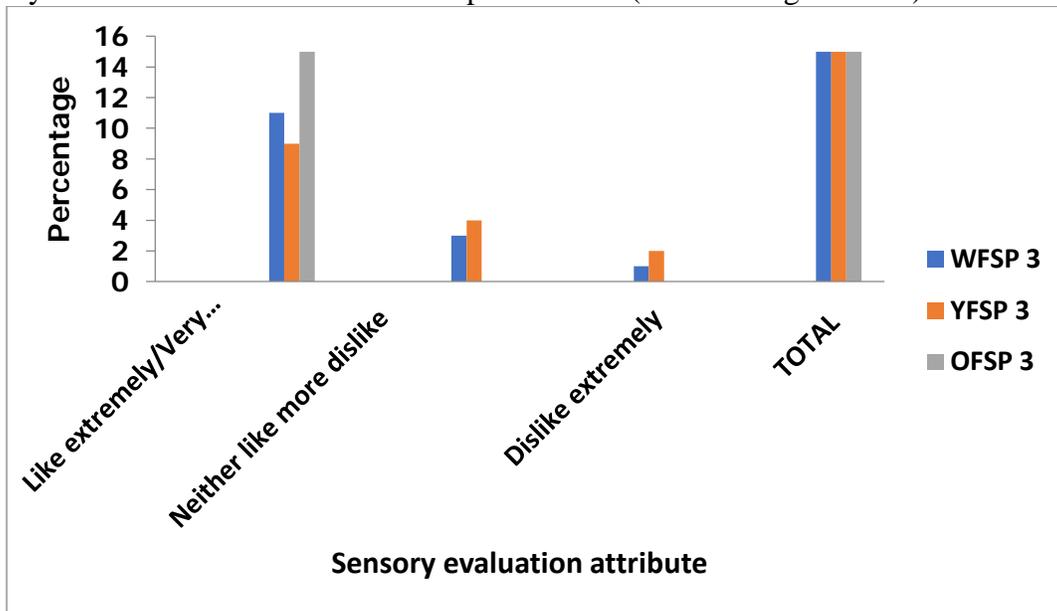


Figure 4.0.2: Respondents' sensory evaluation of the colour of sample products flavoured with ground cloves local flavourings.

TABLE 4.0.3: RESPONDENTS' SENSORY EVALUATION OF THE COLOUR OF SAMPLE PRODUCTS FLAVOURED WITH GRATED NUT MEG AND GROUND CLOVES LOCAL FLAVOURINGS.

Sensory evaluation attribute	WFSP 4		YFSP 4		OFSP 4	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	12	80.0	9	60.0	12	80.0
Neither like more dislike	1	6.7	4	26.7	3	20.0
Dislike extremely	2	13.3	2	13.3	0	0.0
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

The evaluation for these samples' products were similar for the white and orange-fleshed sweet potato drinks for respondents who extremely /very much/moderately like them (80%

respectively), while 60% of the yellow –fleshed sweet potato drink with ground cloves. The percentages that neither like nor dislike were as low and varied. White –fleshed sweet potato drink flavored with both local flavorings had the lowest percentage (6.7% of the respondents) orange –fleshed (20% of respondents) and yellow –fleshed (26.7% of respondents). Those who dislike extremely were similar to both. None of the respondents dislike extremely the orange –fleshed sweet potato drink flavored with both local flavorings (table and figure 4.0.3)

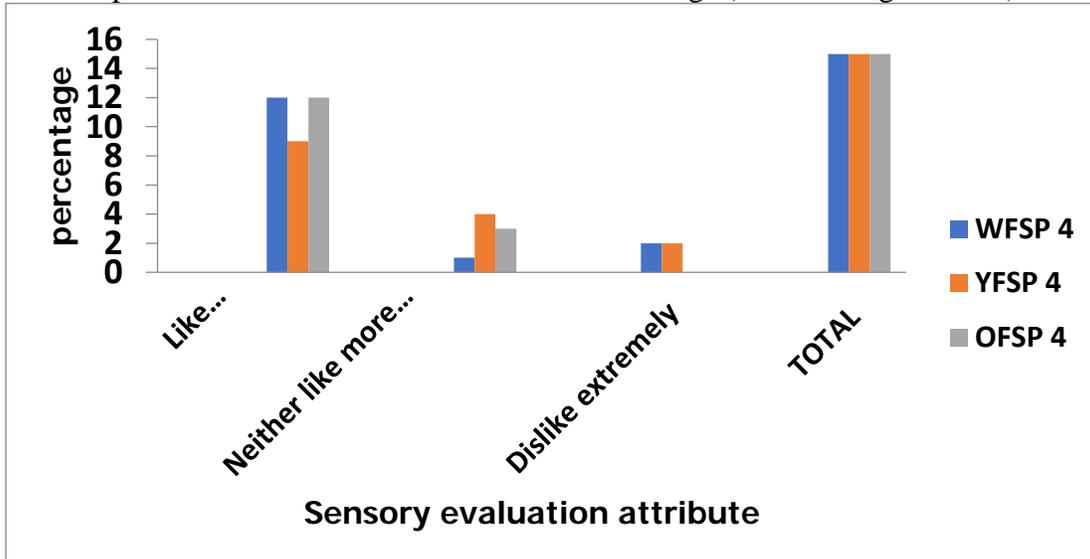


Figure 4.0.3: Respondent's sensory evaluation of the colour of sample flavored with grated Nut Meg and ground cloves local flavorings.

TABLE 4.1.0: RESPONDENTS SENSORY EVALUATION OF THE FLAVOUR OF SAMPLES

PRODUCTS WITHOUT LOCAL FLAVOURINGS

Sensory evaluation attribute	WFSP 1		YFSP 1		OFSP 1	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	8	53.3	6	40.0	8	53.3
Neither like more dislike	5	33.4	6	40.0	5	33.4
Dislike extremely	2	13.3	3	20.0	2	13.3
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

Evaluation of the three sweet potato drinks flavored with no local flavorings showed similarity in white and yellow –fleshed sweet potato drinks also not flavored. 53.3% respectively like them extremely/very much/moderately. For the yellow –fleshed sweet potato drink 40% like it

extremely/very much moderately. Those who neither like nor dislike were similar for white and orange –fleshed drinks (33.4% respectively) but a much greater percentage for yellow-fleshed sweet potato neither like nor dislike it (40% of the respondents). The same trend was observed for those who extremely dislike and drinks without local flavorings for the three samples (table and figure 4.1.0 respectively).

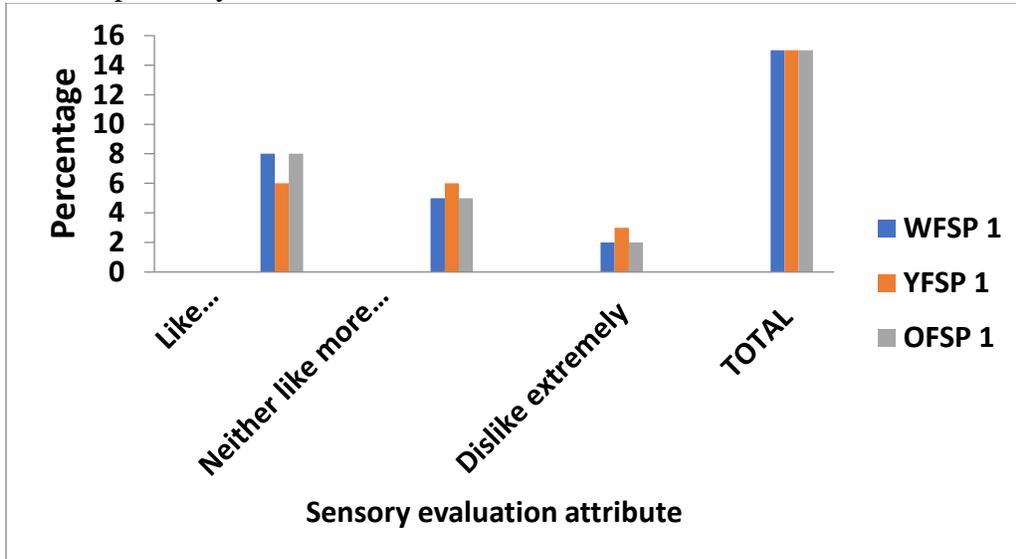


Figure 4.1.0: Respondents’ sensory evaluation of the flour of sample products without local flavorings.

TABLE 4.1.1: RESPONDENTS’ SENSORY EVALUATION OF FLAVOUR OF SAMPLE PRODUCTS FLAVOURED WITH GRATED NUT MEG LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 2		YFSP 2		OFSP 2	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	8	53.3	13	86.7	14	93.3
Neither like more dislike	5	33.4	2	13.3	1	6.7
Dislike extremely	2	13.3	0	0.0	0	0.0
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR’S FIELD DATA, 2012

In these sample products, the orange, yellow and white-fleshed sweet potato drinks flavored with grated Nut Meg were extremely/very much/moderately like in this order (93%, 86.7% and 53.3% respectively). Similar higher percentage for neither like nor dislike of the white-fleshed sweet potato drink flavored with grated Nut Meg (33.4% of respondents) as compared to 13.3% and 6.7%

for yellow and orange – fleshed sweet potato drinks flavored with grated Nut Meg. Only the white –fleshed drink with grated Nut Meg was extremely disliked (13.3% of respondents) Table and Figure 4.1.1

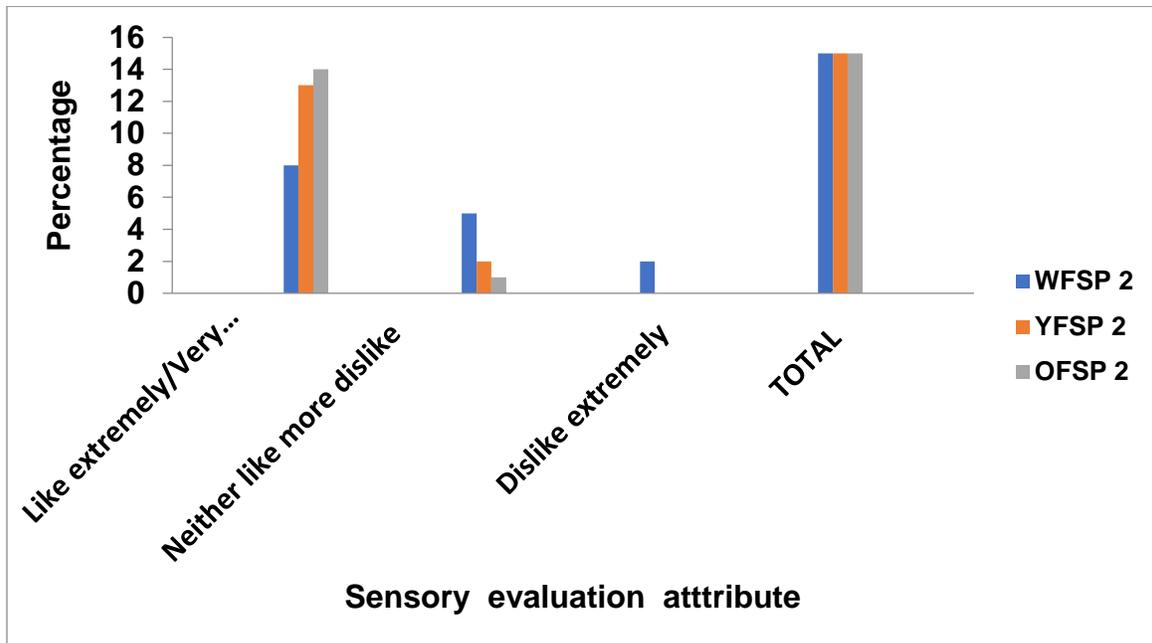


Figure 4.1.1: Respondents' sensory evaluation of the flavor of sample products flavored with grated Nut Meg local flavoring

TABLE 4.1.2: RESPONDENTS' SENSORY EVALUATION OF FLAVOUR OF SAMPLE PRODUCTS FLAVOURED WITH GROUND CLOVES LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 3		YFSP 3		OFSP 3	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	12	80.0	10	66.7	13	86.6
Neither like more dislike	1	6.7	3	13.3	1	6.7
Dislike extremely	2	13.3	2	0.0	1	6.7
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

Almost similar percentages of respondents like extremely/very much/moderately orange and white –fleshed sweet potato drinks flavored with ground cloves (86.6% and 80% respectively); and 66.7% like yellow –fleshed sweet potato drinks flavored with ground cloves extremely/very

much/moderately. Yellow-fleshed sweet potato drink was neither like or dislike by 13.3% of respondents while similar percentage (6.7%) neither like nor dislike flavors for both white and orange –fleshed sweet potato drinks. Varied percentages of respondents extremely disliked the three samples. (Table and figure 4.1.2 respectively).

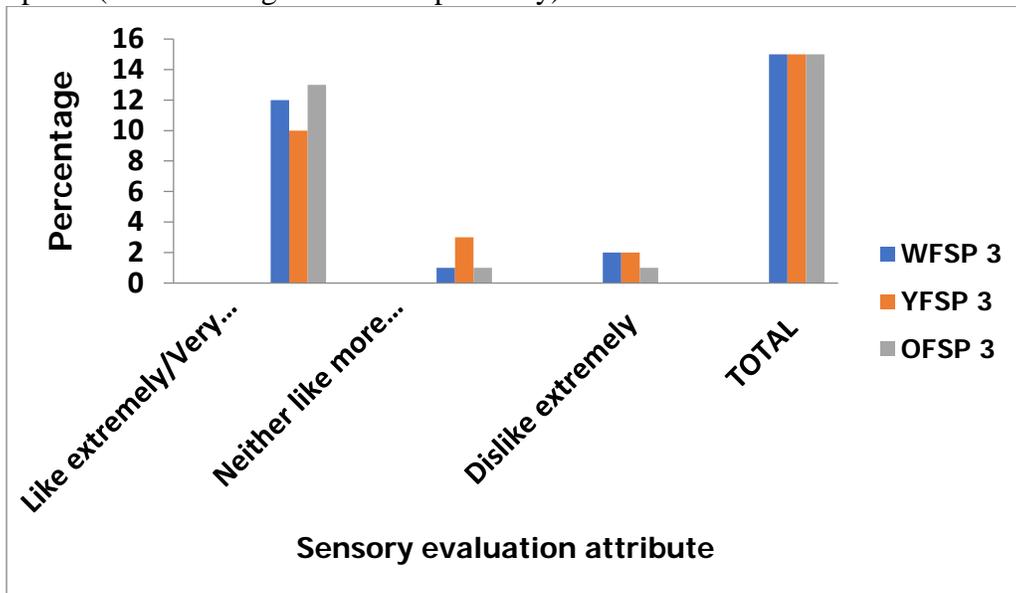


Figure 4.1.2: Respondents' sensory evaluation of the flavor of sample products flavored with ground cloves local flavoring

TABLE 4.1.3: RESPONDENTS' SENSORY EVALUATION OF FLAVOUR OF SAMPLE PRODUCTS FLAVOURED WITH GRATED NUT MEG AND GROUND CLOVES LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 4		YFSP 4		OFSP 4	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	8	53.3	8	53.3	8	53.3
Neither like more dislike	2	13.3	2	13.3	2	13.3
Dislike extremely	5	33.4	5	33.4	5	33.4
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

30.

There was no difference observed among the views of respondents who extremely/very much/moderately like the flavor of the sweet potato drinks flavored with grated Nut Meg and ground cloves samples (53.3 respectively), also the same applies to those who neither like nor

dislike the drinks and those who extremely dislike the drinks (33.4% and 13.3% respectively). (Table and figure 4.1.3)

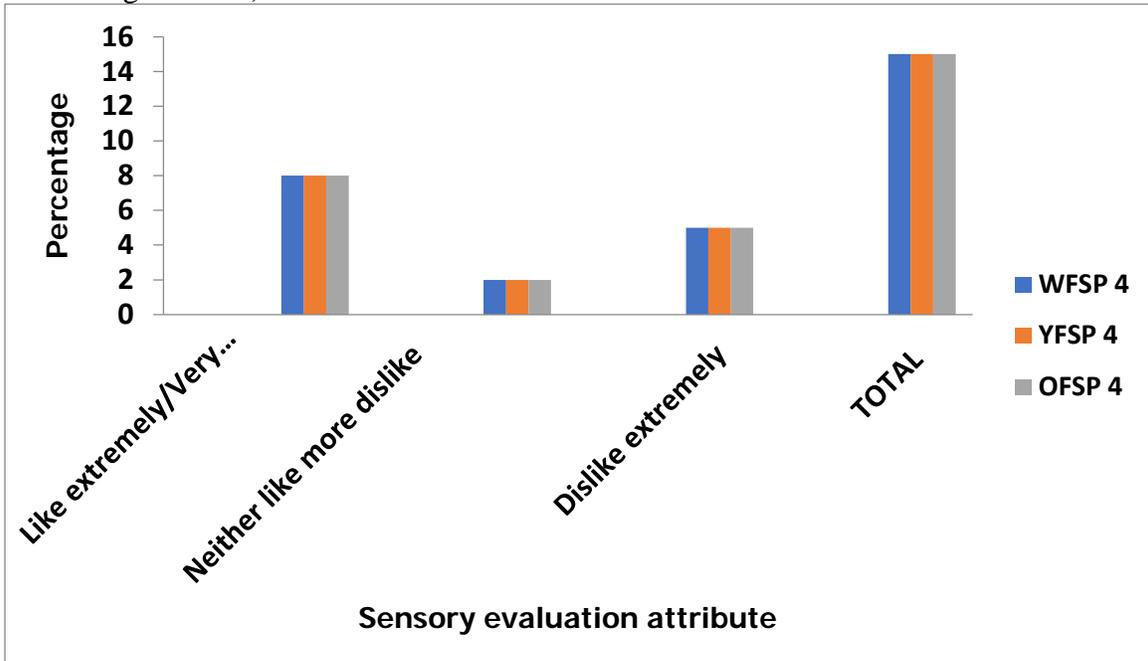


Figure 4.1.3: Respondents' sensory evaluation of the flavor of sample products flavored with grated Nut Meg and ground cloves local flavorings.

TABLE 4.2.0: RESPONDENTS' SENSORY EVALUATION OF FLAVOUR OF SAMPLE

PRODUCTS FLAVOURED WITH LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 3		YFSP 3		OFSP 3	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	9	60.0	10	66.7	14	93.3
Neither like more dislike	3	20.0	2	13.3	1	6.7
Dislike extremely	3	20.0	3	20.0	0	0.0
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

Higher percentage of respondents extremely/very much/moderately liked the orange –fleshed sweet potato drink with local flavorings (93.3%), while those for the yellow –fleshed sweet potato drink and the white –fleshed sweet potato drink without local flavorings were 66.6% and 60%. Similar percentages neither like nor dislike and those that dislike extremely for the white –fleshed drink (20% respectively), for the yellow –fleshed sweet potato drink, 13.3 neither like nor dislike

while 20% dislike extremely. However, few respondents neither like nor dislike the orange – flushed sweet potato drink (6.7%) and none dislike is extremely. (Table and figure 4.2.0).

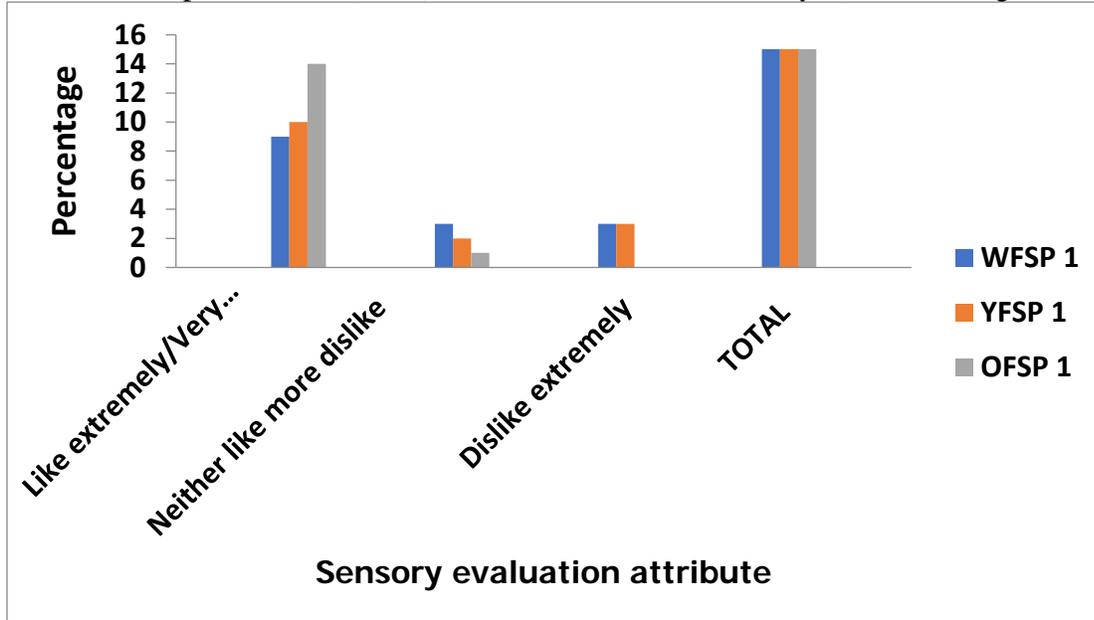


Figure 4.2.0: Respondents' sensory evaluation of the taste of sample products with local Flavorings

TABLE 4.2.1: RESPONDENTS' SENSORY EVALUATION OF THE TASTE OF SAMPLE PRODUCTS FLAVOURED WITH GRATED NUT MEG LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 2		YFSP 2		OFSP 2	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	11	73.3	11	73.3	12	80.0
Neither like more dislike	1	6.7	3	20.0	2	13.3
Dislike extremely	3	20.0	1	6.7	1	6.7
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

33.

From table and figure 4.2.1, the orange –flushed sweet potato drink when flavored with grated Nut Meg local flavoring was extremely/very much/moderately liked (80 respondents), while both

yellow and white –fleshed sweet potato drinks flavored with grated Nut Meg had similar result (73.3% respectively). Those who neither like nor dislike the taste of the drinks were low for all three sample products. The lowest percentage who extremely dislike the taste was observed for the orange –fleshed sweet potato drink with Nut Meg local flavoring.

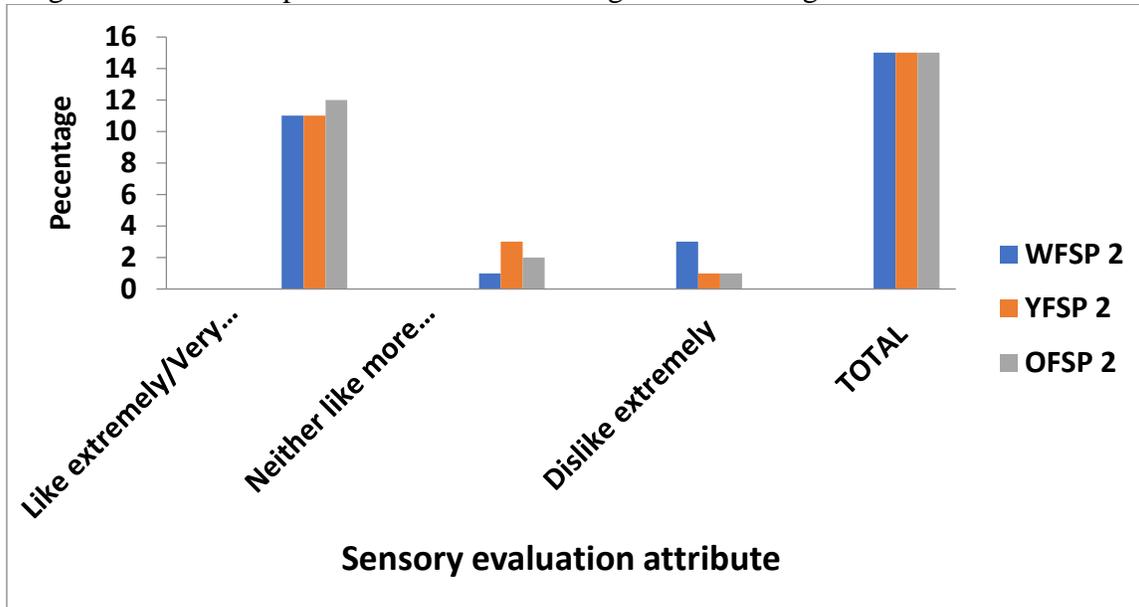


Figure 4.2.1: Respondents sensory evaluation of the taste of sample products with grated Nut Meg local flavoring.

TABLE 4.2.2: RESPONDENTS’ SENSORY EVALUATION OF THE TASTE OF SAMPLE PRODUCTS FLAVOURED THE GROUND CLOVES LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 3		YFSP 3		OFSP 3	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	11	73.3	11	73.3	11	73.3
Neither like more dislike	3	20.0	3	20.0	3	20.0
Dislike extremely	1	6.7	1	6.7	1	6.7
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR’S FIELD DATA, 2012

In the drinks flavored with ground cloves local flavorings, all the three samples were liked extremely/ very much /moderately (73.3%) respectively Table 4.2.2. However, the percentages

who neither like nor dislike were also similar (20% respectively). Those who dislike the drinks extremely were also the same (6.7%) respectively figure 4.2.2.

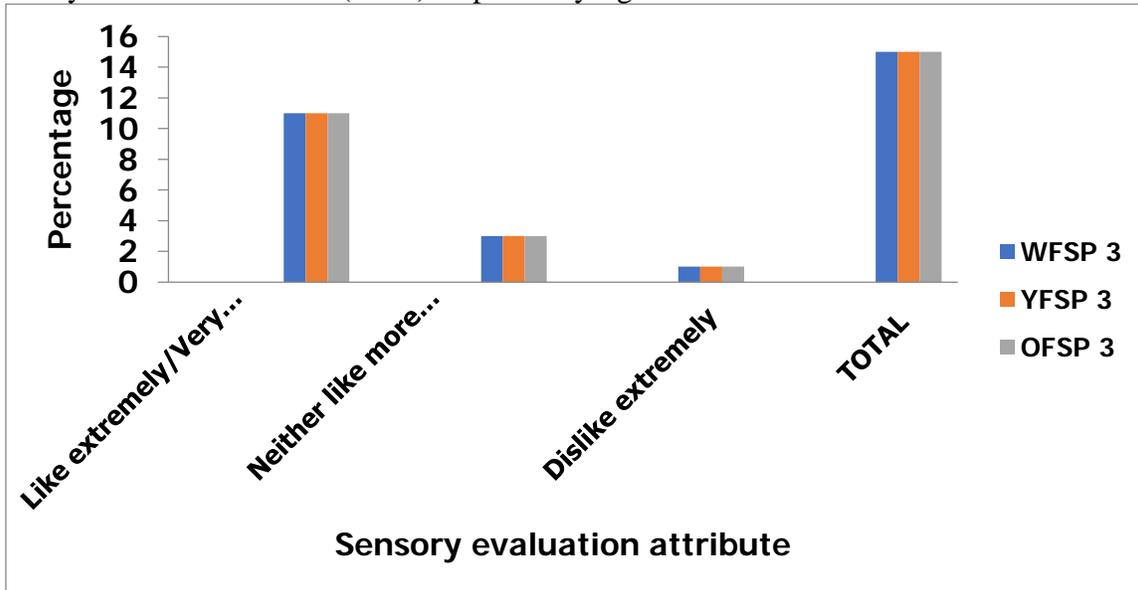


Figure 4.2.2: Respondents' evaluation of the taste of the sample products flavored with ground cloves local flavoring.

TABLE 4.2.3: RESPONDENTS' SENSORY EVALUATION OF THE TASTE OF SAMPLE PRODUCTS FLAVOURED THE GRATED NUT MEG AND GROUND CLOVES

LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 4		YFSP 4		OFSP 4	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	10	66.7	10	66.7	10	66.7
Neither like more dislike	3	20.0	2	13.3	3	20.0
Dislike extremely	2	13.3	3	20.0	2	13.3
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

When the three sample products were flavored with grated Nut Meg and ground cloves combine, result were observed for those who like extremely/ very much/moderately the taste (66.7% respectively). Table 4.2.3. However, percentages who neither like or dislike the yellow-fleshed sweet potato drink (20% respondents), while the white-fleshed and the orange –fleshed sweet

potato drinks had similar result for those that dislike the drinks extremely (11.3% respectively, when flavored with both local flavorings (figure 4.2.3).

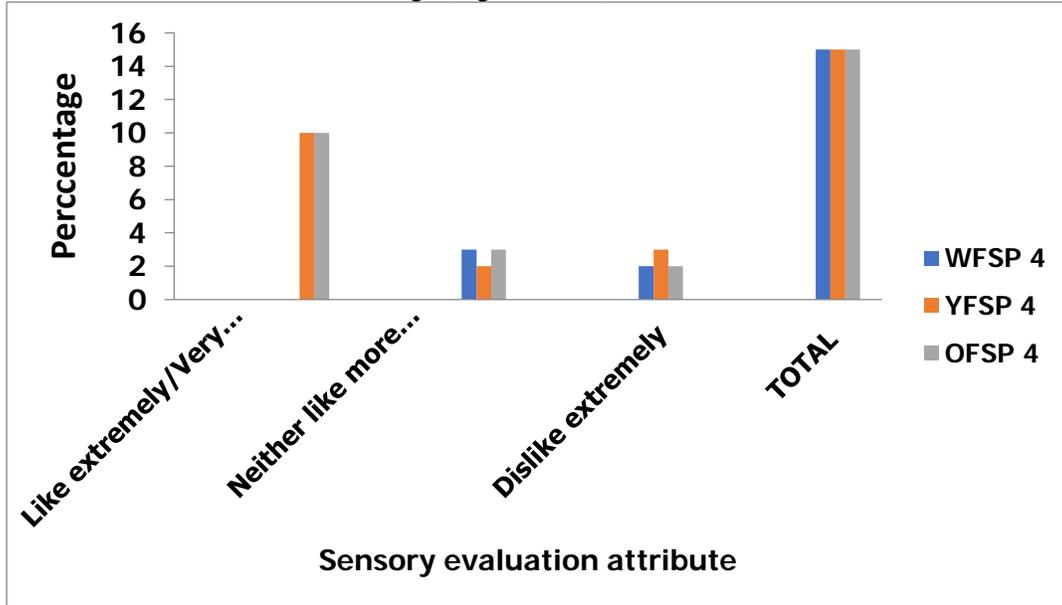


Figure 4.2.3: Respondents' sensory evaluation of the taste of sample products flavored with grated Nut Meg and ground cloves local flavorings.

TABLE 4.3.0: RESPONDENTS' SENSORY EVALUATION OF THE GENERAL ACCEPTABILITY

OF SAMPLE PRODUCTS WITHOUT LOCAL FLAVOURINGS

Sensory evaluation attribute	WFSP 1		YFSP 1		OFSP 1	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	8	53.3	10	66.7	10	73.3
Neither like more dislike	4	26.7	2	13.3	3	6.7
Dislike extremely	3	20.0	3	20.0	2	20.0
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

The general acceptability of the three sample products without local flavorings varied for those who like it extremely/very much/moderately. Orange –fleshed sweet potato drink was liked extremely/very much/moderately (73.3%), yellow –fleshed sweet potato drink. (66.7% and white –fleshed sweet potato drink (53.3%), yellow –fleshed sweet potato drink (53.3%). For those who

neither like or dislike, (26.7%) for white –fleshed drink and (6.7%) for orange –fleshed. The most extremely dislike drink was the yellow –fleshed drink (13.3 %) table and figure 4.3.0.

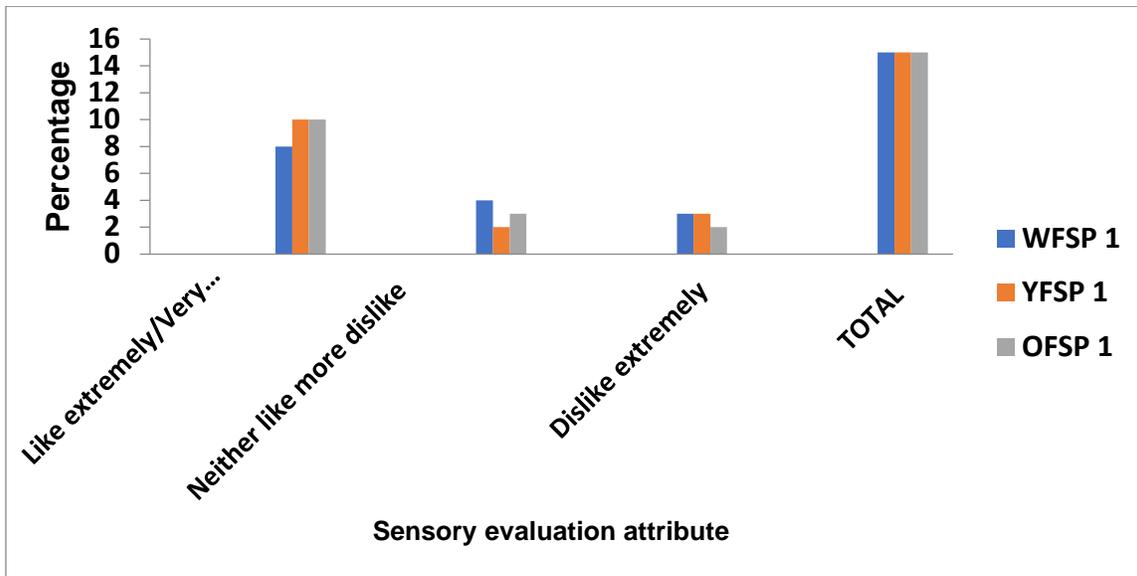


Figure 4.3.0: Respondents' sensory evaluation of the general acceptability of sample products without local flavorings.

TABLE 4.3.1: RESPONDENTS' SENSORY EVALUATION OF THE GENERAL ACCEPTABILITY OF SAMPLE PRODUCTS FLAVOURED WITH GRATED NUT MEG LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 2		YFSP 2		OFSP 2	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	7	46.9	9	60.0	10	66.7
Neither like more dislike	2	13.3	2	13.3	3	20.0
Dislike extremely	6	40.0	4	26.7	2	13.3
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR'S FIELD DATA, 2012

Although the result of adding grated Nut Meg to the drinks gave variations in the general acceptability of the drinks, there was not much differences between the orange –fleshed sweet potato drink and the yellow-fleshed sweet potato drink. (66.7% and 60% of respondents

respectively), like them extremely/very much/moderately. The white-fleshed drink and the yellow-fleshed drink had similar result for those who neither like nor dislike the drink (13.3% respectively). However, higher percentage (20%) neither like nor dislike the orange-fleshed sweet potato drink. The orange-fleshed drink was least disliked extremely by respondents (table and figure 4.3.1)

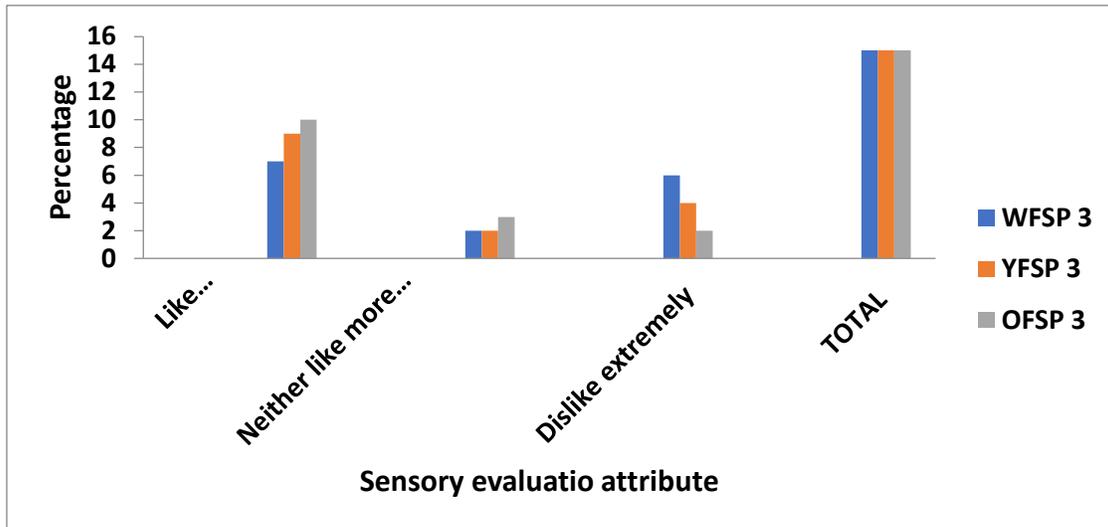


Figure 4.3.1: Respondents’ sensory evaluation of the general acceptability of sample products flavored with grated Nut Meg local flavoring.

TABLE 4.3.2: RESPONDENTS’ SENSORY EVALUATION OF THE GENERAL ACCEPTABILITY OF SAMPLE PRODUCTS FLAVOURED WITH GROUND LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 3		YFSP 3		OFSP 3	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	12	80.0	13	86.6	15	100.0
Neither like more dislike	2	13.3	1	6.7	0	0.0
Dislike extremely	1	6.7	1	6.7	0	0.0
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR’S FIELD DATA, 2012

The general acceptance of cloves was 100% compared to the yellow-fleshed drink (86.6%) and white-fleshed drink (80%). None of the respondents neither like nor dislike the orange-fleshed sweet potato drink flavored with ground cloves, but almost similar results were observed for the

yellow and white –fleshed sweet potato drinks by respondents who dislike extremely the drinks flavored with ground cloves (table and figure 4.3.2).

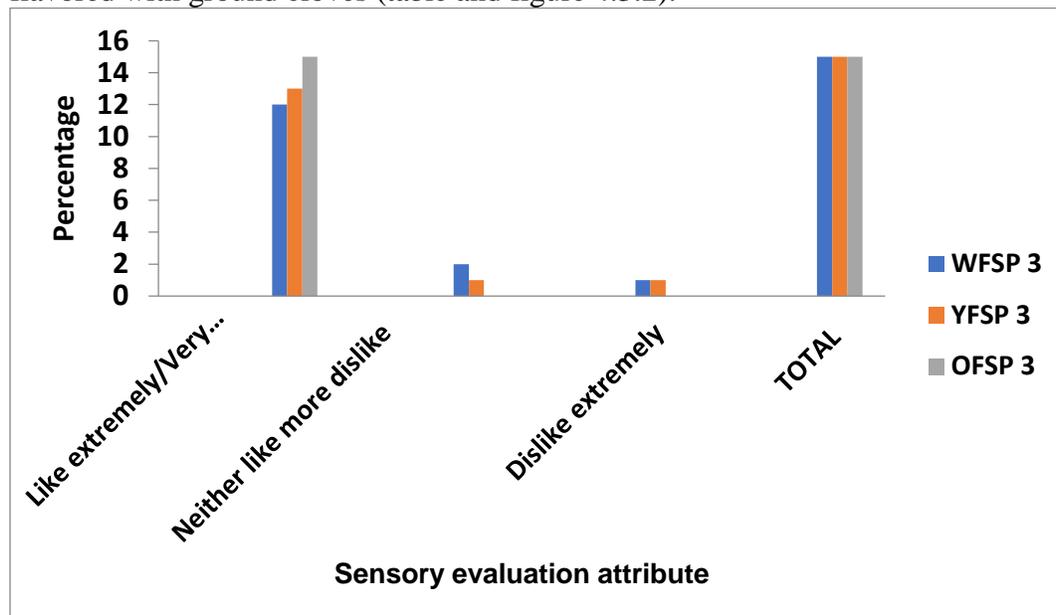


Figure 4.3.2: Respondents sensory evaluation of the general acceptability of sample products flavored with ground cloves local flavorings.

TABLE 4.3.3: RESPONDENTS’ SENSORY EVALUATION OF THE GENERAL ACCEPTABILITY OF SAMPLE PRODUCTS FLAVOURED WITH GRATED NUT MEG AND GROUND CLOVES LOCAL FLAVOURING

Sensory evaluation attribute	WFSP 4		YFSP 4		OFSP 4	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Like extremely/Very much/moderately	8	53.3	8	53.3	8	53.3
Neither like more dislike	2	13.3	3	20.0	3	20.0
Dislike extremely	5	33.4	4	26.7	4	26.7
TOTAL	15	100%	15	100%	15	100%

SOURCE: AUTHOR’S FIELD DATA 2012

Similarity of the three sample products were also observed when the two local flavorings (grated Nut Meg and ground cloves) were added to the sample products. All of them had 53.3% acceptability for those who like the drinks extremely/very much/moderately. Those that neither

like nor dislike/dislike extremely were higher for the white –fleshed drink (13.3% and 33.4% respectively). The yellow and orange –fleshed drinks has similar results for those that neither like nor dislike the drinks (20% and 26.7% respectively). Table and figure 4.3.3.

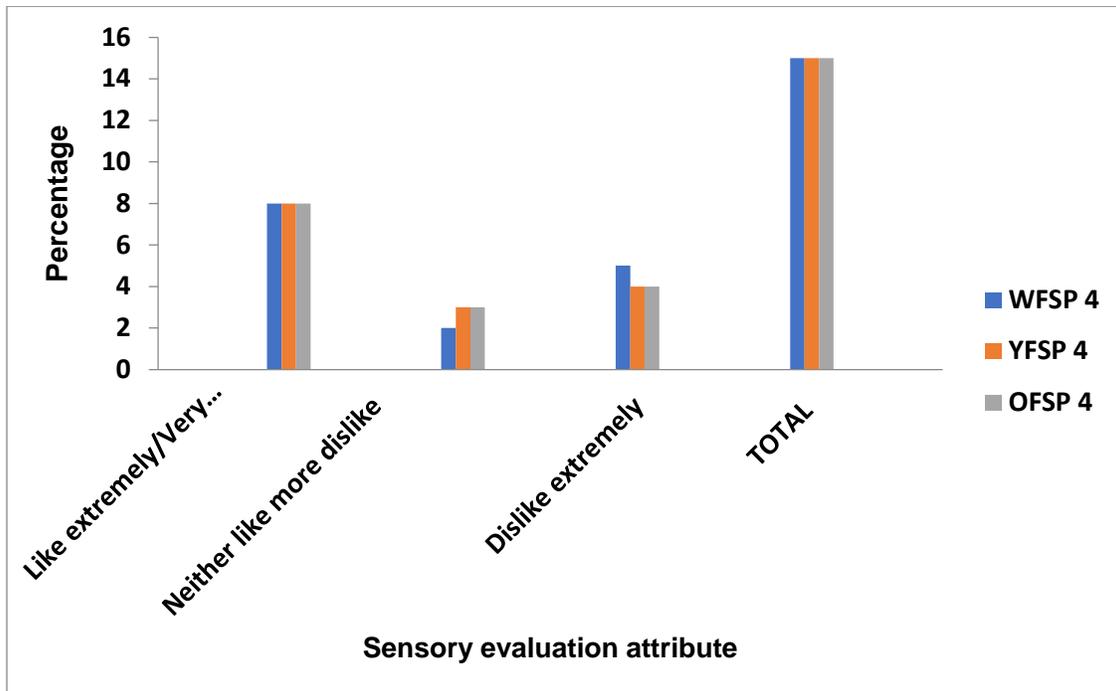


Figure 4.3.3: Respondents’ sensory evaluation of the general acceptability of sample products flavored with grated Nut Meg and ground cloves local flavorings.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

SUMMARY

The local flavorings were added to three sample products of sweet potato drinks (white –fleshed sweet potato drink, yellow –fleshed sweet potato drink and orange –fleshed sweet potato drink). To these, grated Nut Meg and ground cloves were added with a check/control without flavorings. Sensory evaluation using the nine (9) point hedonic ranking scale was done for all the sample products.

COLOUR

For the results:

- The orange –fleshed sweet potato drink without local flavoring was extremely/very much/moderately liked for its colour without disliking it extremely.
- The orange –fleshed sweet potato drink flavored with grated Nut Meg local flavoring was extremely/very much/moderately liked followed by the white –fleshed sweet potato drink, with few who neither like nor dislike it and none disliking it extremely.
- 100% of respondents like extremely /very much/moderately the orange-fleshed sweet potato drink flavored with ground cloves local flavoring and 73% like the white – fleshed sweet potato drink while none of the respondents dislike the orange –fleshed drink.
- Similar percentage like extremely/ very much/moderately the orange –fleshed and white –fleshed sweet potato drinks flavored with both local flavorings but few dislike extremely the white –fleshed drink while none dislike the orange-fleshed drink extremely.

FLAVOUR

- The flavor was similar for both orange and white-fleshed sweet potato drink when they were not flavored with local flavorings.
- Orange- fleshed sweet potato drinks were like extremely/very much/moderately and none dislike it extremely. But the yellow –fleshed sweet potato drink was also extremely/very much. /Moderately liked with none disliking it.
- Orange –fleshed sweet potato drink was extremely/very much/moderately liked when flavored with ground cloves local flavoring followed by the white –fleshed drink.
- All three drinks were extremely/very much/moderately liked when flavored with both local flavorings.

TASTE

- The taste of the orange –fleshed sweet potato drink without local flavoring was extremely/very much/moderately liked followed by the yellow –fleshed drink.
- Orange –fleshed sweet potato drink with grated Nut Meg was extremely/very much/moderately liked followed by white and yellow.
- All of the three sample products were extremely liked when ground cloves were added as flavorings.
- All of the three drinks had similar taste and were liked extremely/very much/moderately by higher percentage of respondents.

ACCEPTABILITY

- The orange –fleshed sweet potato drink not added with local flavorings was liked extremely, followed by the yellow.
- When grated Nut Meg was added, the acceptability was almost similar for the orange-fleshed and yellow –fleshed sweet potato drinks.
- 100% accepted the orange-fleshed sweet potato drink when ground cloves were added as flavoring followed by the yellow and white –fleshed drinks.
- When the two local flavorings were added, the acceptability were the same for the three sample products.

CONCLUSION

The colour of the sweet potato appears to have so many influences on the sensory evaluation attributes evaluated. Sweet potato (orange-fleshed) has so components of beta –carotene which is a precursor for Vitamin A. The addition of the flavorings increased the like hood of the colour, flavor, taste, and acceptability of the sample products.

However, it was observed that ground cloves alone increased the level of acceptance of the orange –fleshed sweet potato drink than others. Nevertheless, when both flavorings were added, the other two sweet potato drinks were equally accepted. This shows that ground cloves had more influence than grated Nut Meg in terms of local flavoring and therefore the consumption of the orange-fleshed ‘sweet potato drink can increase Vitamin A thus preventing its deficiency.

RECOMMENDATIONS

Although Sierra Leone is rich in natural resources including vegetables and fruits, yet many household communities where these foods are grown do suffer from nutritional diseases such as xerophthalmia/xerosis/keratomalacia` and night blindness (Vitamin A deficiency).

The Government of Sierra Leone and Non-Governmental Organizations have really committed themselves to provide Vitamin A capsules at household levels using the country's resources. However, the following recommendations were made.

POLICY MAKER

To minimize the use of the country's resources on providing Vitamin A capsules, there is a need for policy makers in Sierra Leone to specifically include Vitamin A food –base project such as the orange –fleshed sweet potato drinks flavored with ground cloves within the Health Sector in order to improve and sustain Vitamin A status of the households. They should also institute food industries in all the district in the country so as to fast track the development and the use of orange –fleshed sweet potato drink.

MINISTRY OF AGRICULTURE, FORESTRY AND FOOD SECURITY

The Sierra Leone should allocate and disburse more money to this Ministry to help increase and promote the agronomic practices of orange-fleshed sweet potatoes and cloves. The farmers in particular should be given incentives and empowered with tools, fertile land, vines, cloves, seeds and the like, to increase their production and sustainability.

MINISTRY OF HEALTH AND SANITATION

Workshops and seminars should be originated by health workers and nutritionist on the demonstrations of processing and developing local foods especially the orange-fleshed sweet potato drink flavored with ground cloves local flavoring in order to promote and incorporate it at different households. These households should be adequately be informed through nutrition education, the essence of beta- carotene in such products and its roles in preventing Vitamin A deficiency so that they will be encouraged for its consumption.

NJALA UNIVERSITY

The School of Agriculture and Sierra Leone Agricultural Research Institute should embark on increase cultivation of the orange- fleshed sweet potato variety. The harvested tubers can then be processed into flour, package and sold, ready for the drink development.

OTHER RESEARCHERS

Further researches should be done on the following especially by Nutrition and Dietetics students.

- Determining the beta-carotene content of the orange –fleshed sweet potato drinks
- Consumer's general acceptability of four products of orange –fleshed sweet potatoes
- Solar drying of orange-fleshed sweet potatoes into flour.
- Fortification of white –fleshed sweet potato drinks.

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