

SENSORY EVALUATION OF JOLLOF RICE USING DIFFERENT TYPES OF RICE

By

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Abstract

The sensory evaluation of jollof rice cooked with different types of rice was carried out using students and staff of Hospitality Management Department, Federal Polytechnic Ilaro . It is an empirical study whose major source of data was based on primary source obtained in a cross-sectional survey of 30 panelists . The study employed usage of descriptive statistics to analysed the data generated through the sensory evaluation sheet .in term of appearance, jollof rice cooked with basmati rice has the highest appearance score, followed by jollof rice cooked with short grain rice, next to this is jollof rice cooked with ofada rice while jollof rice cooked with long grain rice has the lowest appearance score. In term of the appearance, majority of the panelists extremely like the appearance of jollof rice cooked using basmati rice, In terms of the overall acceptability, majority of the panelists scored the overall acceptability of jollof rice cooked using basmati rice as being extremely like, However, in terms of texture, a significant difference was observed between jollof rice cooked with long grain rice compare to that cooked with basmati rice and short grain rice. For taste, there was significant difference between the jollof rice cooked with basmati rice and that cooked with long grain rice, short grain rice and that of ofada rice respectively. The result indicated a significant difference between the flavour of jollof rice cooked with basmati rice and the one cooked with short grain rice. In terms of overall acceptability, the result revealed that there is a significant relationship between the jollof rice cooked with basmati rice and that cooked with short grain rice. The study therefore recommended the use of basmati rice for better sensory quality of jollof rice. In a situation where basmati rice is not readily available, short grain rice can be used as a substitute due to its closed level of acceptability and sensory quality to basmati rice.

Keywords: Acceptability, Appearance, Evaluation, Sensory, Rice

INTRODUCTION

Rice is a common staple food in Africa; a rich and cheap source of carbohydrate to both man and animals. Going by the National Population Commission NPC (2016) figure, the Nigerian population figure is over 140 million with a domestic economy predominantly dominated by agriculture, which accounts for about 40% of the Gross Domestic Product (GDP) and two third of the labour force. Rice has served as a major staple cushioning the effect of under-nutrition and severe hunger among many Nigerian households as it is commonly eaten in many localities, processed into different forms. The preferred forms among the Yoruba include jollof, fried rice and white rice. It is milled into flour and then cooked in boiling water and turned into a thick paste called Tuwo in Northern part of Nigeria.

Rice is one of the most important cereals of the world. It is widely consumed and cultivated in most countries. It is the staple food for over three billion people, constituting over half of the world's population (Central & Reeves, 2014). There are two important varieties namely, *Oryza sativa* (Asian rice) and *Oryzaglaberrima* (African rice).

Nigeria produces rice in virtually all the ecological zones of the country and is the largest producer in West Africa. Before Nigeria's independence in 1960, rice was a luxury eaten only during festivals and anniversaries but rice consumption dramatically increased in the 1970s creating a substantial increase in demand, which outstripped local supply. Besides the demand from households, which keeps rising, there is increase in the number of fast food joints that is also growing with increasing urbanization. More products like spaghetti, rice crisps and other industrial uses are constantly being developed for rice or are being expected and these will also drive up the demand for rice.

"Ofada" rice, a peculiar *Oryza sativa* species (Ebuehi & Oyewole, 2017) was first grown in Ofada town, Ogun-State, South Western Nigeria and has since become very popular in the Western part of the country. It plays very important role in the diet of many Nigerians and is utilised mostly in households where it is consumed in many forms such as boiled, jollof, fried or "tuwoshinkafi" (local rice paste). Industrially, it is important in the production of local beverages such as "kunu", "pito" and cereal gruels.

Basmati rice is a kind of long-grain rice. It is known for its fragrance and its flavour. The biggest producers of Basmati rice are India and Pakistan, it is mainly grown in Punjab. Basmati rice is also considered useful to make biriyani in most Asian countries and also to make yellow rice. Basmati in the Indian subcontinent is a variety of long, slender-grained aromatic rice which is traditionally from the Indian subcontinent (FAO, 2015).

As of 2014, India exported 65 per cent of the overseas basmati rice market, while Pakistan accounted for the remainder, according to the Indian state-run Agricultural and Processed Food Products Export Development Authority (Bloomberg, 2016). However, many countries use domestically grown basmati rice crops (Bloomberg, 2016).

Long grain rice is available in different varieties, such as aromatic, white and brown. Rice can be steamed or baked and is used in salads, main dishes or casseroles, and side dishes of rice.

Short grain rice is usually very starchy and the grains have a tendency to stick together after being cooked. It cooks up tender and soft and is most often used for sushi, risottos, stir-fry recipes, and desserts. Short grain rice is very popular in Asian countries.

Jollof rice is one of the most common dishes in Western Africa, consumed throughout the region including Senegal, Gambia, Nigeria, Sierra Leone, Liberia, Togo, Cameroon, Mali and Ghana.

The name Jollof rice derives from the name of the Wolof people, though now called theiboudienn or benachin. In French-speaking areas, it is called rizaugras. Despite the variations, the dish is “mutually intelligible” across the region, and has spread along with the diaspora to become the best known African dish outside the continent. Jollof rice is typically seen as a culturally sensitive issue between Nigerians and Ghanaians. Based on its name, the origins of Jollof rice can be traced to the Senegambian region that was ruled by the Jolof Empire.

One often hears that Jollof Rice (or Jolof Rice, Djolof Rice) is a Nigerian dish; indeed it is often made by Nigerians. However, it has its origins among the Wolof people of Senegal and Gambia who make a rice and fish dish they call Ceebu Jen. Since Nigeria has the largest population of any African country, it is safe to say that most of the people who make and eat Jollof Rice are probably Nigerian.

Statement of the Problem

Jollof is one of our favourite meal in the country and tends to be the reason why most party crashers crash at party. Party jollof rice is so called because without special knowledge it is difficult to cook the same as other delicious dishes as those that we can find at parties. The use of too much tomatoes and tomato puree first, in attempting to make a Jollof rice rich, will make Jollof rice meshed together and after sometimes become watery and it loses its taste. Sometimes only paste is quite enough. The main thing to watch is not to eclipse the taste of bell pepper. If you lose your sense of proportion, the rice will have a sharp, damp, somewhat sour tomato taste. Also, do not add too much water/stew. Start with a minimum amount. It is always easier to add than to extract the ingredients back. When you realize that you have added too much, it may be late. This error can spoil your

mood and purchased products. The preparation of jollof rice should always take place in a calm and joyful atmosphere. It is therefore important to know the sensory evaluation of jollof rice cooked with different rice grains.

LITERATURE REVIEW

Rice is the grain with the second highest worldwide production after maize (Boumas, 2014). The domesticated rice comprises two species of food crop in the Poaceae ("true grass") family: *Oryzasativa* and *Oryzaglaberrima* (Linscombe, 2016). These plants are native to Tropical and Subtropical Southern Asia and Southeastern Africa, respectively (Linares, 2015).

Rice is grown as a monocarpic annual plant, although in the tropical areas it can survive as a perennial and can produce a ratoon crop and survive for up to 20 years (Boumas, 2014). It is also an important crop in subtropical and temperate zones, the yield being higher in temperate areas than in the tropics (Boumas, 2014). It can grow up to 1-1.8m tall, or more depending on the variety and soil fertility. As a member of the grass family, rice has long, slender leaves between 50-100cm long and 2-2.5cm broad.

The small wind-pollinated flowers are produced in a branched arching to the pendulous inflorescence 30-50cm long. The edible part of the rice plant is the rice grain which is a caryopsis, 5-12mm long and 2-3mm thick, and which includes glumes, endosperm, and embryo (Boumas, 2014). Some varieties even have awns at the tips of the grain. The awn is sometimes very long on certain varieties, so that special machines are required to break off and remove the awns prior to the de-husking of the paddy (Belsnio, 2015). Li (2013) described rice grain as rough rice or paddy, consisting of brown rice (or caryopsis) and the hull.

Origin of Jollof Rice

Jollof rice is one of the most common dishes in Western Africa, consumed throughout the regions of Nigeria, Senegal, Ghana, Sierra Leone, Gambia, Togo, Liberia, Mali, Ivory Coast and Southern Cameroons. In Cameroon it is a common favorite at ceremonies such as weddings, graduations and birthdays and is sometimes cooked with "ndole", a local vegetable. There are several regional variations in name and ingredients (Ayto & John, 2014). In Mali it is called zaamè in Bamanankan, and is a typical Sunday lunchtime favorite in urban, middle-class families. The name Jollof derives from the name of the Wolof people (Osseo-Asare & Fran, 2015), though in Senegal and Gambia the dish is referred to in Wolof as ceebujën or benachin. In French-speaking areas, it is called riz au gras. Despite the variations, the dish is "mutually intelligible" across the region, and has

spread along with the diaspora to become the best known African dish outside the continent (McCann & James, 2015);Davidson & Alan, 2014).

Based on its name, the origins of jollof rice can be traced to the Senegambian region that was ruled by the Jolof Empire.

Jollof rice is a favourite meal in the West African region and very popular amongst Nigerians and Ghanaians alike. I do not know a social function in Lagos or Accra where Jollof rice is not served or at least listed in the menu. The origin of Jollof Rice is traceable to the Jollof tribe in the Senegambia region of West Africa. Jollof rice is also called benachin which means theiboudienne in the Wolof language. The traditional ingredients are rice, fresh tomatoes, tomato paste, onion, salt, and chili pepper. Other ingredients such as fish, vegetables, meats, ginger and other spices can be added to enhance the taste. Today Jollof rice can be prepared in different ways by the various peoples that savor it but the basic ingredients remain the same.

Food and agriculture historian James C. McCann considers this claim plausible given the popularity of rice in the upper Niger valley, but considers it unlikely that the dish could have spread from Senegal to its current range since such a diffusion is not seen in "linguistic, historical or political patterns". Instead he proposes that the dish spread with the Mali empire, especially the Djula trades people who dispersed widely to the regional commercial and urban centers, taking with them economic arts of "blacksmithing, small-scale marketing, and rice agronomy" as well as the religion of Islam(McCann & James, 2015). Marc Dufumier, Emeritus Professor of Agronomy proposes a more recent origin for the dish, which may only have appeared as a consequence of the colonial promotion of intensive peanut cropping in central Senegal for the French oil industry, and where commensurate reduction in the planted area of traditional millet and sorghum staples was compensated by forced imports of broken rice from Indochina. It may then have spread throughout the region through the historical commercial, cultural and religious channels linking Senegal with Ghana, Nigeria and beyond, many of which continue to thrive today, such as the Tijāniyyah Sufi brotherhood bringing thousands of West African pilgrims to Senegal annually.

Types of Rice

Long Grain Rice

Long grain rice has long slender kernels which remain firm, separate and retain their shape after cooking. Regular long grain rice expands both in length and width when cooked will typically be used as a side dish or in those dishes where it is preferable for rice to remain firm, such as kedgeriee or biryani (Johnson, 2015).

Regular long grain rice is one of the most popular types of rice because it has a subtle flavour which perfectly complements both rich and delicate sauces. It is milled to remove the husk and bran layer and the remaining kernel is slim and 4-5 times as long as it is wide. On cooking the grains separate to give an attractive fluffy effect. This rice is extremely versatile and is used for countless international savoury dishes, especially in Chinese cuisine (Reid, 2012).

Long grain rice kernels are three times longer than they are wide what means that are more than 6 mm. When cooked, this grain is light and separates easily. There are as well gelatinous long grain rice in Thailand which are native. It contains much less niacin, thiamin, magnesium, zinc, iron and fiber than the brown rice. White rice may be covered with magnesium silicate or with a mixture consisting of talc and glucose which is also known as talc-coated rice. It is indispensable in Hindu cooking, and has a light and dry texture and an aromatic taste. This type of rice is cultivated in India and Pakistan. Long-grain rice has the most amylose and the smallest amount of amylopectin, so it has a propensity to be the fluffiest and least sticky. Amylose also hardens more when is fresh, combination strongly together and forming crystals that melt when the rice is reheated. Rice that is high in amylose has a lower Glycerin index number. Amylopectin is a highly divided molecule that makes the rice humid when it's released from the grain during cooking (Fletcher, 2014).

Easy cooked (or Parboiled) Long Grain Rice

This rice has a slightly fuller flavour than regular white rice. It differs in that, unlike regular white rice, which is milled direct from the field, easy cook rice is steamed under pressure before milling. This process hardens the grain, reducing the possibility of over-cooking. It also helps to retain much of the natural vitamin and mineral content present in the milled layers (Grinspoon, 2015).

When raw the rice has a golden colour, but turns white upon cooking. Can be used in the same dishes as regular long grain, and is especially good in rice salads.

Brown (or Wholegrain) long grain rice

This rice has a distinctly nutty flavour. Brown Rice undergoes only minimal milling, which removes the husk but retains the bran layer. Due to this the rice retains more vitamin, mineral and fibre content than regular or easy cook white rice. The grains remain separate when cooked, like long grain white, but take longer to soften. The cooked grains have a chewy texture, which many people enjoy. It is also available in easy-cook form (Ware, 2014).

Short Grain Rice

Short grain rice tends to be almost round and is typically moist when cooked, giving sticky rice which is perfect for desserts and puddings. Short grain rice is also typically used in the preparation of sushi and paella.

Short grain rice isn't a specific rice. It is a group of rice that shared similar short grained characteristics. Generally speaking, short grain rice is short and stubby. When cooked, it will be chewier and stickier than its longer grained counterparts.

Short grain rice is usually very starchy and the grains have a tendency to stick together after being cooked. It cooks up tender and soft and is most often used for sushi, risottos, stir-fry recipes, and desserts. Short grain rice is very popular in Asian countries (Ito, S., & Ishikawa, Y., 2014).

Basmati Rice

A very long, slender grained aromatic rice grown mainly in the foothills of the Himalayas in India and Pakistan. Sometimes described as the 'Prince of Rice'. It has a fragrant flavour and aroma and is the rice used in Indian dishes. The grains are separate and fluffy when cooked. In Indian recipes it is often cooked with spices to enhance the grain's aromatic properties. Easy cook basmati and brown rice basmati are also available. Brown basmati rice has a higher fibre content and an even stronger aroma than white basmati.

Basmati Rice means the rice varieties possessing aroma and gives pleasant flavour after cooking. In India Basmati rice is characterized by extra-long, superfine slender grains having a length to breadth ratio of more than 3.5, sweet taste, soft texture, delicate curvature and an extra elongation with least breadth-wise swelling on cooking. The Basmati rice is also stated to be the Pearl of Rice. These superfine best quality of Basmati rice are most preferred specially for Biryani and Pulao preparation on special occasion and also meant for high premium value in the national and international market (Mediatama, 2011).

Basmati rice is mostly grown in the traditional areas of north and north western part of Indian subcontinent for many centuries. The super-fine best quality of Basmati rice is produced on either side of Indus valley in India. Its different varieties are mostly cultivated in the districts of Karnal, Panipat, Kurukshetra, Kaithal, Amritsar, Fatehgarh, Gurudaspur, Hoshiarpur, Jalandhar, Patiala, Ropar and Sangrur in Punjab; Kangra, Solan, Una, Mandi and Sirmour in Himachal Pradesh; Bundi in Rajasthan and in several districts of Uttar Pradesh. Some important districts of Uttar Pradesh are Saharanpur, Muzaffar Nagar, Pilibhit, Bareilly, Bijnour, Moradabad, Jyotibaphule

Nagar, Rampur, Raibareilly, Sitapur and Udham Singh Nagar; Haridwar and Dehradun in Uttaranchal. Also, Basmati rice is grown to limited extent in Jammu and Kashmir.

Ofada Rice

Ofada rice is a name for heritage varieties of rice grown in south-west Nigeria. It is used in a variety of dishes. Ofada rices are mostly blends, and some of the rice varieties in the blends are not indigenous to Africa; however, they usually also contain African rice. It is grown almost exclusively in Ogun State (Adebowale, Sanni, Karim, & Ojoawo, 2010.), a state in Southwestern Nigeria. It is named after the town Ofada in Ogun State.

Ofada rice grain quality has assumed much greater importance as its demand for local and export consumption are on the increase and consumers are placing much emphasis on the quality of the milled rice (Sandeep, 2013). The need to improve quality of locally processed rice in Nigeria to make it more competitive with imported rice cannot be over emphasized.

Several factors ranging from poor production and post-harvest practices, poor physical and cooking qualities, presence foreign materials in milled rice has been attributed to the variable quality in locally processed rice.

Nutritional Value of Jollof Rice

- i. Jollof rice basic ingredient is Rice (carbohydrates) and tomatoes, which in itself contain zero saturated fat or no cholesterol.
- ii. Vegetable oil provides, the right quantity of saturated fat.
- iii. Accompanying side dishes like beef, eggs, chicken or fish provides, a rich source of protein.

Nutrients in Jollof rice

- i. Rice – 90% Carbohydrate. Also rich in magnesium, phosphorus, iron and folic acid
- ii. Tomato – Vitamin C, K, A and calcium
- iii. Red Bell Pepper – Vitamin C, B6, and Folate
- iv. Scotch bonnet pepper – Vitamin C, A, B and iron
- v. Onion – Vitamin C, B6, and Potassium
- vi. Chicken gravy – Potassium

- vii. Beef gravy — Sodium
- viii. Oil – Fat and Vitamin E, K

Benefits of Jollof rice:

- i. Jollof Rice makes you happy. It may be related to the release of oxytocin in the brain as our eyes register the pleasure that is in a steaming heap of sinfully orange rice.
- ii. Jollof Rice is prepared with tomatoes, peppers, and onions. Tomatoes are good for you. They help prevent cancer. Peppers are good for you. They contain lots of vitamins. Onions are good for you. They reduce inflammation and heal infections.
- iii. Jollof Rice contains rice. Rice is a well-known source of energy and fiber.
- iv. Jollof Rice strengthens family and friendship bonds. See number 1 above.
- v. Jollof Rice strengthens national bonds. Nigerians unite in solidarity against the Ghanaians over who makes superior Jollof Rice.
- vi. Jollof Rice brings back good memories, very key to good mental health.
- vii. Jollof Rice goes well with red wine, which is good for your heart.
- viii. Jollof Rice (when done properly) burns your pots. Scrubbing those pots is a workout for getting toned arms.

Sensory evaluation of Jollof Rice

Sensory evaluation is defined by the Institute of Food Technologists as “a scientific discipline used to evoke, measure, analyse, and interpret reactions to those characteristics of foods and materials as they are perceived by the senses of smell, taste, sight, touch and hearing” (Dethmers *et al.* 2011). Scientific ideologies that are taken from food science, physiology, psychology and statistics are considered to elicit objective responses to the properties of foods (Piggott *et al.* 2014). Sensory assessment is more concerned with accuracy, precision, sensitivity and the avoidance of fake results (Lawless & Heymann 2014). Two major classifications of sensory tests are developed according to their prime purpose and most effective use: analytical tests and affective tests. The analytical tests are classified as discriminative tests and descriptive tests. The use of these tests is to show the differences/similarities and to identify and quantify the sensory properties respectively. The affective tests

assess the preference and acceptance of a product. There are a number of variations of discrimination tests including the Paired-comparison, Duo-Trio, Triangle, Ranking and Rating difference (Dethmers *et al.*, 2011), A-not A, 3 Alternative Forced Choice (directional difference), and Two-out-of-Five test (Meilgaard *et al.*, 2017). Different tests are designed to measure difference, not the sameness. If the frequency of correct solutions is higher than that expected by chance, then a difference is declared.

RESEARCH METHODOLOGY

MATERIALS AND METHOD

List of equipment used

Cooking pot

Knives

Chopping board

Mixing bowl

Colander

Blender

Cooking spoon

Toothpick

Disposable plates

Recipe for each rice Samples: 750g long grain rice, 2-3 cups of tomato stew, chicken, pepper and salt (to taste), 2 medium onions, 2 knor cubes, 2 teaspoon thyme, 2 teaspoon curry powder.

Recipes and Method for Long Grain Rice

Recipe for Long Grain Rice

750g short grain rice

2-3 cups of tomato stew

Stock

Pepper & Salt (to taste)

2 medium onions

2 knorr cubes

2 teaspoon thyme

2 teaspoon curry powder

Method of Preparation

I boiled the meat with onions, seasoning, salt, thyme then I removed the meat from water and fry in a hot oil till it brown.

I grind some quantity of onions, tomatoes, and pepper together boil the rice for three minutes and drain from water.

I heat oil on fire very well and add the grinding mixture, tin tomatoes, and seasoning then I allowed to boil for about 25 minutes then I add rice, thyme, curry and salt to taste, stir the rice in the pot and simmer with a low heat till dry then I displayed it for sensory evaluation.

Recipe for Short Grain rice

750g short grain rice

2-3 cups of tomato stew

Stock.

Pepper & Salt (to taste)

2 medium onions

2 knorr cubes

2 teaspoon thyme

2 teaspoon curry powder

Method of Preparation

I boiled the meat with onions, seasoning, salt, thyme then I removed the meat from water and fry in a hot oil till it brown.

I grind some quantity of onions, tomatoes, and pepper together boil the rice for three minutes and drain from water.

I heat oil on fire very well and add the grinding mixture, tin tomatoes, and seasoning then I allowed to boil for about 25 minutes then I add rice, thyme, curry and salt to taste, stir the rice in the pot and simmer with a low heat till dry then I displayed it for sensory evaluation.

Recipes and Method for Basmati Rice

Recipe for Basmati Rice

750g Basmati rice

2-3 cups of tomato stew

Stock.

Pepper & Salt (to taste)

2 medium onions

2 knorr cubes

2 teaspoon thyme

2 teaspoon curry powder

Method of Preparation

I boiled the meat with onions, seasoning, salt, thyme then I removed the meat from water and fry in a hot oil till it brown.

I grind some quantity of onions, tomatoes, and pepper together boil the rice for three minutes and drain from water.

I heat oil on fire very well and add the grinding mixture, tin tomatoes, and seasoning then I allowed to boil for about 25 minutes then I add rice, thyme, curry and salt to taste, stir the rice in the pot and simmer with a low heat till dry then I displayed it for sensory evaluation.

Recipes and Method for Ofada Rice

Recipe for Ofada Rice

750g Ofada rice

2-3 cups of tomato stew

Stock.

Pepper & Salt (to taste)

2 medium onions

2 knorr cubes

2 teaspoon thyme

2 teaspoon curry powder

Method of Preparation

I boiled the meat with onions, seasoning, salt, thyme then I removed the meat from water and fry in a hot oil till it brown.

I grind some quantity of onions, tomatoes, and pepper together boil the rice for three minutes and drain from water.

I heat oil on fire very well and add the grinding mixture, tin tomatoes, and seasoning then I allowed to boil for about 25 minutes then I add rice, thyme, curry and salt to taste, stir the rice in the pot and simmer with a low heat till dry then I displayed it for sensory evaluation.

Study Area

This study was carried out at the hospitality management laboratory of federal polytechnic Ilaro, Ogun State.

Research Population

The population of this study consist of 30 panelists which comprises the students and staff of Hospitality Management Department, Federal Polytechnic Ilaro.

Study design

The study was cross sectional and descriptive in nature and involved students and staff of Hospitality Management Department, Federal Polytechnic Ilaro.

Sampling size and techniques

30 panelists were purposively selected for this research work.

Data collection

Data was obtained through the use of sensory evaluation sheet to gather necessary details about different method of preparing Jollof rice from different types of rice in the study area. 30 panelist were subjected to the sensory evaluation and record their view on the sensory evaluations sheet that was provided by the researcher

Research Instrument

Data was collected through primary data. A hedonic scale ranging in a descending order was used i.e. [9,8,7,6,5,4,3,2,1] to collect the necessary data about different method of preparing Jollof rice from different types of rice e.g. Basmati rice, long and short grain rice and Ofada rice in the study area and to ascertain the best method so far. Some of these attributes includes taste, colour, texture, appearance and overall acceptability.

The nine (9) points hedonic are;

1. Dislike extremely
2. Dislike very much
3. Dislike moderately
4. Dislike slightly
5. Neither like nor dislike
6. Like slightly
7. Like moderately
8. Like very much
9. Like extremely

Data analysis

Correlation analysis was used in interpreting all the data obtained including tables. The correlation analysis was used to analyze the primary and secondary data obtained which focused on the different types of rice used in the preparation of Jollof rice.

RESULTS AND DISCUSSION

The results of the analysis below showed the different scores obtained from a list of 30 panels that were used for the experiment. The scores range from 9-1. In terms of appearance, a majority of the panelists (46.2%) extremely like the appearance of jollof rice cooked using basmati rice, 50.0% like the appearance of jollof rice cooked with long grain rice very much, about 53.8% like the appearance of jollof rice cooked with short grain rice very much while 38.5% and 30.8% of the panelists like the appearance of the jollof rice cooked with ofada rice very much and extremely respectively. In all jollof rice cooked, Basmati rice has the highest appearance score, followed by jollof rice cooked with short grain rice, next to this is jollof rice cooked ofada rice while jollof rice cooked with long grain rice has the lowest appearance score.

Table 1: Showing the scores for the Appearance

Measurements	SCALE									
	Like extremely	Like very much	Like moderately	Like slightly	Neither like nor dislike	Dislike slightly	Dislike moderately	Dislike very much	Dislike extremely	Mean
Appearance (A)	12 (46.2)	9 (34.6)	3 (11.5)	2 (7.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8.19
Appearance (B)	4 (15.4)	13 (50.0)	7 (26.9)	1 (3.8)	0 (0.0)	0 (0.0)	1 (3.8)	0 (0.0)	0 (0.0)	7.62
Appearance (C)	6 (23.1)	14 (53.8)	5(19.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.8)	7.77
Appearance (D)	8 (30.8)	10 (38.5)	4 (15.4)	3 (11.5)	1 (3.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7.81

A = Jollof rice cooked with Basmati rice,

B = Jollof rice cooked with long grain rice

C = Jollof rice cooked with short grain

D = Jollof rice cooked with Ofada rice

The results of the analysis below showed the different scores obtained from a list of 30 panels that were use for the experiment. The scores range from 9-1. In term of the overall acceptability, majority of the panelists (61.5%) scored the overall acceptability of jollof rice cooked using basmati rice as being extremely like, 42.3% scored the overall acceptability of jollof rice cooked using long grain rice as being like very much, about 38.5% scored the overall acceptability of jollof rice cooked using short grain rice as being like very much while 38.5% of the panelists scored the overall acceptability of jollof rice cooked with ofada rice as being extremely like,. In all jollof rice cooked with Basmati rice has the highest overall acceptability score, followed by jollof rice cooked with short grain rice, next to this is jollof rice cooked ofada rice while jollof rice cooked with long grain rice has the lowest overall acceptability score. The implication of this result is that long grain rice consumption in the study area is not being consumed by majority of the people in the study area.

Table 2: Showing the scores for the Overall acceptability

Measurements	SCALE										
	Like extremely	Like much	very	Like moderately	Like slightly	Neither like nor dislike	Dislike slightly	Dislike moderately	Dislike very much	Dislike extremely	Mean
Overall acceptability (A)	16(61.5)	7(26.9)		3(11.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8.50
Overall acceptability (B)	7(26.9)	11(42..3)		6 (23.1)	0 (0.0)	2(7.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7.81
Overall acceptability (C)	8(30.8)	10 (38.5)		6(23.1)	0 (0.0)	1(3.8)	0 (0.0)	0 (0.0)	0 (0.0)	1(3.8)	7.69
Overall acceptability (D)	10(38.5)	7(26.9)		6(23.1)	2(7.7)	1(3.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7.88

A = Jollof rice cooked with Basmati rice,

B = Jollof rice cooked with long grain rice

C = Jollof rice cooked with short grain

D = Jollof rice cooked with Ofada rice

Table 3: Showing the sensory evaluation of jollof rice cooked with different rice

	Appearance	Colour	Texture	Taste	Flavour	Overall acceptability
Sample						
A	8.19 ^a	8.04 ^a	7.92 ^b	8.42 ^b	8.15 ^b	8.50 ^b
B	7.62 ^a	7.67 ^a	6.92 ^a	7.50 ^a	7.69	7.81
C	7.78 ^a	7.81 ^a	7.73 ^b	7.42 ^a	7.38 ^a	7.69 ^a
D	7.81 ^a	7.54 ^a	7.65	7.62 ^a	7.54	7.88

Mean scores in columns with same letters are not significantly different ($p < 0.05$).

A = Jollof rice cooked with Basmati rice,

B = Jollof rice cooked with long grain rice

C = Jollof rice cooked with short grain

D = Jollof rice cooked with Ofada rice

From the results of the sensory evaluation in table 3 above, the result indicated that in term of appearance, there was no significant difference between the jollof rice cooked with Basmati rice and that cooked with long grain rice, short grain rice and ofada rice. As far as the colour is concerned, there was also no significance difference between the four samples of the jollof rice. However, in term of texture, a significant difference was observed between jollof rice cooked with long grain rice compare to that cooked with basmati rice and short grain rice. In term of taste there was significant difference between the jollof rice cooked with basmati rice and that cooked with long grain rice, short grain rice and that of ofada rice respectively. The result also indicated a significant difference between the flavor of jollof rice cooked with basmati rice and the one cooked with short grain rice. In terms of overall acceptability, there was a significant relationship between the jollof rice cooked with basmati rice and that cooked with short grain rice.

SUMMARY

In term of appearance, jollof rice cooked with Basmati rice has the highest appearance score, followed by jollof rice cooked with short grain rice, next to this is jollof rice cooked ofada rice while jollof rice cooked with long grain rice has the lowest appearance score. In term of the appearance, majority of the panelists (46.2%) extremely like the appearance of jollof rice cooked using basmati rice, 50.0% like the appearance of jollof rice cooked with long grain rice very much, about 53.8% like the appearance of jollof rice cooked with short grain rice very much while 38.5% and 30.8% of the panelists like the appearance of the jollof rice cooked with ofada rice very much and extremely respectively.

In term of the overall acceptability, majority of the panelists (61.5%) scored the overall acceptability of jollof rice cooked using basmati rice as being extremely like, 42.3% scored the overall acceptability of jollof rice cooked using long grain rice as being like very much, about 38.5% scored the overall acceptability of jollof rice cooked using short grain rice as being like very much while 38.5% of the panelists scored the overall acceptability of jollof rice cooked with ofada rice as being extremely like.

5.2 CONCLUSION

Based on the study findings, it is concluded that sensory evaluation of the jollof rice cooked with Basmati rice and short grain rice were slightly different from that of jollof rice cooked with long grain rice and that of ofada, it has been found that jollof rice cooked with long grain rice was significantly different in most sensory attributes, appearance and acceptability and showed low means score to all the attributes. There was a tendency for jollof rice cooked with Basmati rice to be rated higher than the other especially in taste, flavour and general acceptability and preference to buy. These results showed that jollof rice cooked with Basmati rice could be a viable alternative to achieve the desired sensory taste.

RECOMMENDATION

Arising from the study conclusion the following recommendation are made;

The use of Basmati rice is recommended for better sensory quality of jollof rice as a result of its high level of acceptability and sensory quality. In a situation where Basmati rice is not readily available, short grain rice can be used as a substitute due to its closed level of acceptability and sensory quality to Basmati rice.

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