SENSORY ATTRIBUTES AND CONSUMPTION OF MELON-SOYBEAN SOUP BLENDS WITH INDIAN SPINACH VEGETABLES IN ILORIN, KWARA STATE NIGERIA

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ABSTRACT
The study investigated the sensory attributes of melon-soybean soup with Indian spinach vegetables which was observed to be poorly accepted in consumption. Descriptive research design and sensory evaluation was used. The study population comprised three hundred and fifty students from 100-500 level with a sample size of 40 respondents that were randomly selected from each level. Ratios of melon and soya beans 20:80, 40: 60, 60: 40, 100:0 50:50, and 80:20 was used for the sensory evaluation .The samples were given to the panelist and the results were analyzed using 9-point hedonic scale. A well-structured questionnaire was also used to assess the level of acceptability and consumption of the soups; the data were statistically analyzed using Analysis of variance (ANOVA) at ($p<0.05$) level.
The findings revealed that the control, melon 100% soup had the highest acceptability in terms of colour, aroma, texture and general acceptability. The use of melon and soya bean soup blend is acceptable up to 60% inclusion level. The result obtained shows that there are no setbacks in the acceptability and consumption of melon-soybean soup with Indian spinach vegetables in Nigeria. It is recommended that Soya beans products should be included in the melon and soya beans soup blend to improve acceptability *and consumption in Nigeria.*

Keyword: Assessment, Soybeans, Sensory Qualities, Vegetable, Nutrition, Acceptability

INTRODUCTION
Nutrition is nourishment or energy that is obtained from food consumed or the process of consuming the proper amount of nourishment and energy. In a broader sense, nutrition is defined as the combination of process by which the living organism receives and utilizes the materials necessary for the maintenance, functions for growth and renewal of its components (Begum 2007). Food and Nutrition is a major area of Home Economics which comprises of the principles of nutrition-meal management. There have been many calls for nutrition

education for acquisition of knowledge, skills and competencies which family members require to prevent obesity and overweight and satisfactorily improve family living. (Adebisi *et al,* 2016)

Soups eaten with the staples are an essential component of the diet and may contain a variety of seeds, nuts, pulses, and leaves (Campbell-Platt, 1980). Soups are the main sources of proteins and minerals in our diet. One of the ways to improve the diet is to enrich the nutrient content of soups. The demand for safer and more natural food has been increasing since consumers have become more concerned with chemical residues in foods (Adetunji *et al.,* 2013). It is therefore important to enrich soups with crops that have high protein content like soybean to increase its nutritional content and promote its acceptability among consumers (Balogun, *et al*, 2012).

Soybean (Glycine max) is a farm crop that belongs to the family of legumes. The plant is classified as an oilseed rather than a pulse by the Food and Agricultural Organization (FAO). Soybeans according to Matthew-Njoku (2005) are products important in the household nutrition programme because of their high protein content and their affordability. It is a healthy food because of its rich nutrient content and contains vegetable protein, oligosaccharides, dietary fiber, photochemical (especially isoflavones) and minerals (Balogun, *et al,*2012). The average protein content of soya beans is 40%, it is low in sulphur and amino acids but contains sufficient lysine which is deficient in most of the cereals (Matthew-Njoku, 2005). Balogun, *et al,* (2012), described soybean as one that can be processed to a variety of products such as soy flour, soy milk, soy yoghurt, soy cake, soy meal, etc. Soya beans must be cooked with 'wet' heat to destroy the trypsin inhibitors (serine protease inhibitor). They are considered by many agencies to be a source of complete protein (Babayeju, *et al,* 2014). A complete protein is one that contains significant amount of all essential amino acids that must be provided to the human body because of the body's inability to synthesis them. For this reason soya is a good source of protein, amongst many others, for vegetarians and vegans or for people who want to reduce the amount of meat they eat. According to the United State Food and Drug Administration (2003), soy protein products can be good substitutes for animal products because, unlike some other beans, soy offers a 'complete' protein profile. Soy protein products can replace animal based foods which also have complete protein but tend to contain more fats, especially saturated fat, without requiring major adjustment elsewhere in the diet (Henkel, 2000). Michelfelder (2009) described soybeans as an important source of the minerals copper, manganese, molybdenum, phosphorus, and potassium; the B vitamin, riboflavin; and omega-3 fatty acids (in the form of alpha-linolenic acid). Replacing

meat and dairy with soy would also lower total cholesterol intake by about 125 milligrams per day and saturated fat by about 2.4 grams per day. These nutritional changes, in turn, would lower risk of several chronic diseases, including cardiovascular diseases (Balogun, et al, 2012).

Melon seeds (Yoruba, Egusi) called *Colocynthis citrullus,* is a wild member of the gourd family named *Cucurbitaceous*. They are mostly cultivated in the Southern part of Nigeria and usually interplant with yam or cassava where it serves as cover crop. It is often referred to as the miracle melon. It contains 50% oil and 30% protein and can be supplemented for meat or dairy product. The seeds contain alpha tocopherol (Vitamin E component) that helps to maintain young and smooth skin (Shava, 2000). Melon is slightly laxative because of their fiber content and is therefore useful to fight the sedentary life and help the lazier intestine. It is also high tonic for the circulation. This implies that a little consumption of it could control blood pressure and this is due to the high percentage of mineral matters such as iron phosphorus, sodium and calcium, but potassium permits the control more than other minerals salts. The consumption of whole melon each day could help to keep fluid in the blood formation of grumes. Melon seeds are also rich in vitamin A. Dry seeds are often eaten as a snack, many processed form of melon seeds are available in the market and have made their way to common recipes, it is widely used to thicken stews and soups, sometime the roasted seeds are used to make a paste for spreading on bread like pea-nut butter. These seeds are used to make very healthy cholesterol free oil; these seeds can also be a good substitute for baby food. At times, the seeds are blend with honey and water that produces a kind of liquid, which can be used for feeding children where breast milk is not available. In many parts of Africa, where farmers lack the access of dairy products or meat, these seeds are used as a substitute that provides them a lot of nutrition. This melon is highly accepted and cherished as a special accompaniment dish to our staple dish from tubers, grains and cereals. (Shava, 2000)

Vegetable can be defined as a plant raised for some edible part of it, such as the leaves, roots, fruits or flowers, but excluding any plant considered to be a fruit, grain or spice in the culinary sense. It is also the edible seeds or roots or stems or leaves or bulbs or tubers of any of the numerous herbaceous plants. Vegetables are the best sources for calcium, iron, sodium, chlorine, cobalt, copper, magnesium, manganese, phosphorous and potassium. Carotenes, precursors of vitamin A and ascorbic acid are present in abundant quantities in leafy, yellow and green vegetables. Vegetables are poor sources of calories except in case of

roots and tubers. Indian spinach *Basellaalba* from the Family Basellaceae, also known in English as Malabar Spinach. This vegetable is an Afro-Asian plant. Locally, it is known as "*amunututu*" in Yoruba language which literally means "stomach coolant" and also called '*Toromoganna*", which means 'a wall climber". The leaves are succulent with high water content. It is both an annual and/or short lived perennial. The flavour profile is mild and the texture is mucilaginous (similar to Aloe Vera). This vegetable is high in calcium and iron and a good source of vitamins A, B and C; Rich in protein and a good source of soluble fiber. The differences in nutrient contents of melon and Soybeans in terms of methionine and lysine necessitated the blend of these local seeds to produce traditional soup with Indian spinach to give a more balanced nutrient. This work was aimed at substituting melon with various proportions of Soybeans and evaluating the effect of substitution on the sensory qualities and consumption of the soup produced from the blends.

Different factors may be responsible for the consumption of soybeans' and melon soup among University of Ilorin students. It is this supposition that warranted this study. This study will be of benefit to all the home makers to help to provide variety of more delicious soups which will provide more nutrients and a complete diet to the family. The consumption of it will also lower cholesterol level because soya beans foods seem to lessen insulin resistance by increasing the synthesis of insulin receptors. The blending of soybeans with melon and the introduction of the nutritious Indian spinach may influence the acceptance of soybeans'. It is therefore imperative to establish the possibilities that, sensory qualities of melon and soybeans' soup blends produced with vegetable will enlighten and improve the nutritional value of people.

Research Question: One research question was raised to guide this study:

What is the level of acceptability and consumption of melon-soybean soup with Indian spinach vegetables?

Purpose

The purpose of the study is to evaluate the sensory attributes of melon-soybean soup with Indian spinach vegetables

Specifically, the study is to:

- Formulate blends of melon and soybeans' in different ratio.
- determine the acceptability and sensory qualities of melon and soybeans' soup blend

- determine the level of acceptability and consumption of melon-soybean soup with indian spinach vegetables.

MATERIALS AND METHODS

Research Design: Descriptive research design was used for this study.
Population for the study: The population comprised forty panelist and three hundred and forty five students that were chosen from 100-500 level.
Sample and Sampling Techniques: Eighty students were randomly selected as the sample size for this study.
Materials for the soup blend

- Melon (*Colocynthis Citrullus*) were procured from a local market in Ilorin, Kwara State
- Soya beans (*Glycine max*) was procured from a local market in Ilorin Kwara State.The melon and the soy beans were sorted out, washed and ground into meal using a manual grinder
- Ingredient and Indian Spinach was procured from a local market in Ilorin, Kwara State Nigeria

  Instrument for Data Collection: Structure Questionnaire was constructed in two sections. Section A comprised demographic information while section B was based on the research question raised. Four point scales of strongly agreed (4), agreed (3), disagreed (2) and strongly disagreed (1) was sued with a decision point of 2.5

Sensory Evaluation
The soup blends was evaluated for flavour, colour, taste, texture, smell and general acceptability according to the 9-point Hedonic scale by (Dias et al., 2007), by a 40-member panel, 20 males and 20 females who are familiar with melon soup consumption. The soups were served in labeled soup bowls; table water is placed on table for rinsing of mouth after each evaluation of a sample. The soup blend was evaluation and rated using nine point Hedonic scale parameters. Where 9 = Like extremely, 8 = Like very much, 7 = Like moderately, 6 = Like slightly, 5 = neither like nor dislike, 4 = Dislike Slightly, 3 = Dislike moderately, 2 = Dislike very much, and 1 = Dislike extremely.
Formulation Table of the Soup Blends
The mean value and standard deviation was carried out on the sensory evaluation results. The data was analyzed by one-way analysis of variance (ANOVA) at 0.05 level of significant.

Table 1: Formulation Table

SAMPLES	MELON (%)	SOYA – BEANS (%)	INDIAN SPINACH (g)	SALT (tsp.) (g)	BOULLION CUBE (cube)	WATER (ml)
MSO1	100	_	200	5	1	10
MSO2	20	80	200	5	1	10
MS03	40	60	200	5	1	10
MS04	50	50	200	5	1	10
MS05	60	40	200	5	1	10
MS06	80	20	200	5	1	10

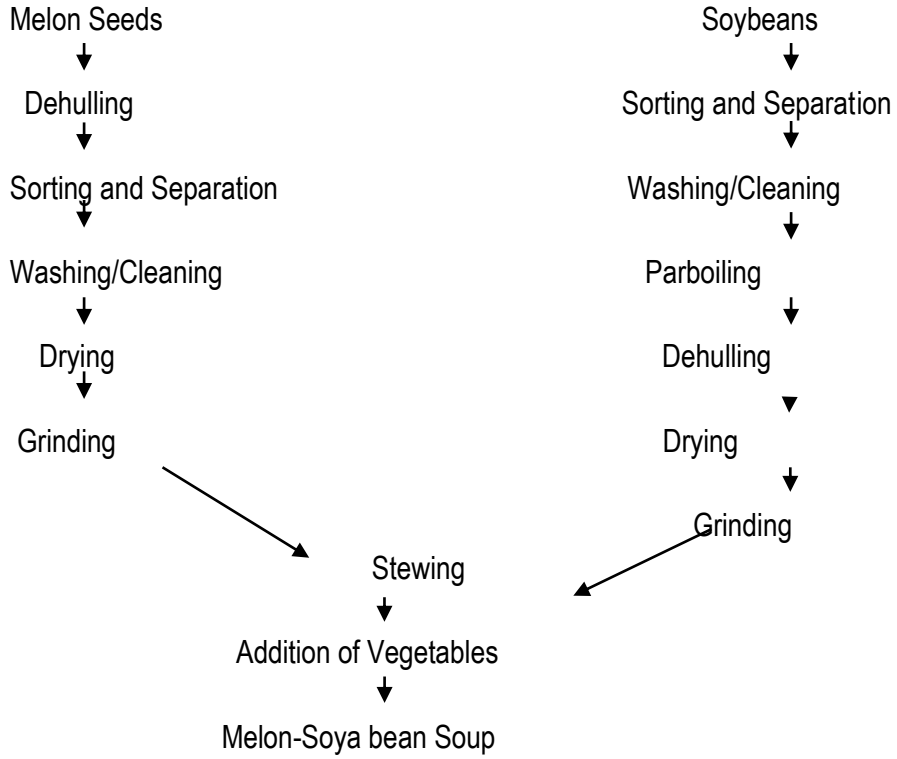

Fig.1: Flow Chart for the production of Melon-Soya beans Soup Blends

RESULT AND DISCUSSION

Sensory Evaluation Result

Table 2: Sensory Scores of the Soup Blends

Sample	Colour	Taste	Aroma	Overall Acceptability
MSO1	8.10^{c}	7.40^{c}	7.48^{c}	7.86^{c}
MSO2	5.06^{a}	4.80^{a}	5.19^{a}	5.48^{a}
MSO3	6.71^{ab}	6.00^{bc}	6.14^{ab}	6.29^{ab}
MSO4	6.71^{ab}	6.71^{bc}	6.48^{bc}	6.38^{ab}.
MSO5	6.90^{b}	6.90^{b}	6.43^{bc}	6.67^{b}
MSO6	6.86^{b}	6.86^{b}	7.05^{bc}	7.29^{bc}

MSO1= control 100% melon
MSO2= 20% melon and 80% soy beans
MSO3= 40% melon and 60% soy beans
MSO4= 50% melon and 50% soy beans
MSO5= 60% melon and 40% soy beans
MSO6=80% melon and 20% soy beans

Table 2 shows the result of the sensory evaluation for melon and soy beans soup blends rating for all the sensory parameters tested. There was a significant difference ($p < 0.05$) between the control and the other soup blends. The appearance by physical examination examinations ranged from 5.06 – 8.10 with sample MSO2 scoring the lowest and sample MS01 having the highest score. This finding is in agreement with that obtained by Babayeju *et al* (2014) that appearances of food evokes initial response, flavour and also determines the final acceptation of the food.

Taste is the sensation of flavour perceived in the mouth and the throat on contact with substrate and it is one of the most important attribute watched out for in a product. The taste of the product could be affected by the type and quantity of ingredients added such as spices and seasoning. Therefore variation in taste depends on the composition of the raw material (i.e. soy beans and melon) used in the preparation of the samples (Ogundele *et al* 2015). The result ranged from 4.80 – 7.40; sample MS01 which is the control with 100% melon has the

highest taste score while the lowest score was obtained from sample MSO4, according with Onimawo (2012) who described melon seed meal as an appetizing product. The lowest score which is sample MS04 which consist of melon 20% and soya beans 80% that is, it has higher percentage of soyabeans which is also in agreement with Babayeju *et al*. (2014) who reported that the "beany" flavour of soy beans is hardly evident in the raw whole beans but develop after breakdown of the cell structure and is very much still evident after cooking.

The mean scores for aroma ranged from 5.19 – 7.48 for all the samples, sample MS01 had the highest and MS02 the lowest. There is no significant difference ($p < 0.05$) between sample MS03, MS05 and MS06 which indicates the three samples were perceived as the same by the panelist and are generally accepted next to sample MSO1 which has the highest score of 7.48. MSO1 has the best aroma and MSO2 has the least. This result is similar with the result obtained by Babayeju *et al* ((2014) that the odour of Soybeans drives some homemakers away from utilizing it because some do not like the odour as it has a beany odour and flavour.

Overall acceptability refers to the general acceptance of the product with reference to all the discriminating sensory attributes of the samples. Overall acceptability ranges between7.86 and 5.48 for samples. SampleMSO1 had the highest score, while sample MSO2 has the least score of 5.48. There is no significant difference ($P < 0.05$) between sample MS03 and MS04 with mean scores of 6.38 and 6.24 respectively, which means the two samples are similar to each other. Sample MS01 has the highest score of 7.86 which indicates that it was generally well accepted. This is similar to the work of Olatunji *et al.* (2012) which reported that there were constrains or factors which have discouraged many families from consumption and the utilization of soyabeans.

Therefore there is still a great setback in the acceptability and consumption of soyabean over melon in Nigeria despite the fact that it contains higher nutritive values and more health benefits than melon.

Table 3: Mean Rating and Standard deviation of Respondents on Assessment and Consumption of Soya beans N=40

S/N	Statement	Agree	Disagree	Mean (X)	SD	Remark
1	Soya beans is used on daily basis	-	40(100%)	1.50	0.51	Disagree
2	Soya beans is used on regular basis	8(20%)	32(80%)	2.05	0.06	Disagree
3	Soya beans is often prepared for family meals	18(45%)	22(55%)	2.40	0.59	Disagree
4	Soya beans is used because of the aroma	--	40(100%)	1.85	0.37	Disagree
5	Soya beans is used based on flavor	4(10%)	36(90%)	1.90	0.55	Disagree
6	Soya beans is used based on the taste	20(50%)	20(100%)	2.45	0.60	Disagree
7	Soya beans is used based on the long processing method	--	40(100%)	1.85	0.37	Disagree
8	Soya beans is preferred to melon	18(45%)	22(55%)	2.35	0.93	Disagree
9	Melon is preferred to soya beans	26(65%)	14(35%)	2.80	0.95	Agree
10	Soya beans taste better when combined with melon	22(55%)	18(45%)	2.65	0.67	Agree
11	Soya beans is used because it is cheap	22(55%)	18(45%)	2.70	1.17	Agree
12	Soya beans is used because it is readily available	18(45%)	22(55%)	2.60	0.75	Agree
13	Soya beans is used because of the nutritional value	40(100%)	--	3.85	0.37	Agree
14	Soya beans is used because of the health benefits	40(100%)	--	3.85	0.37	Agree

Source: Field Work (2017)

Table 3 presents the frequency of the responses and the mean scores per item on the level of acceptability and consumption of soya beans, the mean of 2.50 was the decision point was used for the decision. Any item by the respondent that is equal or above 2.50 was taken as accepted while any mean rating below 2.50 was taken as disagreed. The respondents disagreed with items 1,2,3,4,5,6,7 and 8 which imply that the students do not consume Soybeans on a regular base and not often prepared for the family. They disagreed that Soybeans is preferred to melon because of the aroma, flavor, the processing method and taste. Although the respondents agreed that Soybeans is used because it is readily available, cheap, have health benefits and nutritional values.

The result reveals that larger percentage of the respondents do not consume Soybeans on daily bases, time consuming processing, aroma and taste which is in agreement with the findings of Ugwu and Nwoke (2011) that lack of processing facilities and non availability of storage facilities are constraints that discourage people from the consumption of Soybeans. High percentage of discouragement was shown in question 2 and 5 which show the dislike for the flavor also. The result also revealed that the respondents agreed to the use of melon to Soybeans which implies that Soybeans is still not generally accepted. It was also deduced that Soybeans is consumed because of the nutritional value which is in agreement with the findings of Morrion (1996) that Soybeans contain 20% of oil weight and 40% of protein and that it contains more protein than beef and more calcium than egg.

Therefore from the findings melon is been consumed more than Soybeans in this study area and soybean is consumed because of the awareness of its nutritional value.

CONCLUSION

This works has revealed that the use of melon and soybean soup blends is generally accepted even up to 60% inclusion level. The overall acceptability of the soup blends revealed that the acceptance level is very high with 20% Soybeans and 80% melon. A great number of people accepted to consume soybeans due to the high nutritional values and the health benefits.

RECOMMENDATIONS

- Melon-soybean soup with Indian spinach vegetables have the potential of providing balance diet if included in meals, therefore every household can integrate them into their daily consumption meals.

- Soybeans products should be properly processed to improve the taste and aroma and avoid constipation and other side effects which are harmful to the health.
- Food specialist and extension workers should be sent to rural areas to educate the populace on how to process soybeans products which include soybean oil, soybean cake, cheese, tofu, locust bean, milk, soybean meal among others.

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