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COMPARISON OF ORGANOLEPTIC PROPERTIES OF MORINGA SOUP BLENDS PRODUCED WITH MARUGBO, COTTON SEED AND PEPPER SOUP SPICES.

[1]AMODU S. O.,*[1]ADEYEMO A. I and [1]EJIDIKE B.N.

Department of Ecotourism and Wildlife, Federal University of Technology, P.M.B 704, Akure, Ondo State, Nigeria.
***Corresponding author e-mail: amodu2010@gmail.com**

ABSTRACT

The organoleptic properties of Moringa (oleifera) soup blends produced with Marugbo(Clerodendrumvolubil)e, Cotton seed (Gossypium hirsutum) and Pepper soup spices were compared. Five soup blends were produced from Moringa (100; Control), Moringa: Pepper soup spices (40 :60), Moringa: Marugbo (40: 60), Moringa : Cotton seed (40 : 60), Moringa : Marugbo : Cotton seed (40 : 30 :30). Also, four soups blends were produced from Marugbo only (100:0), Cotton seed only (100 : 0), Marugbo: Cotton seed (50 : 50), Pepper soup only (100:0). A 7-point hedonic scale rating was used to test the soup blend. Data obtained were statistically analyzed. The control Moringa soup had the highest acceptability in terms of colour, taste, texture, and general acceptability.This was closely followed by the soup blend with Moringa: Marugbo:Cotton seed (40:30:30) and the Moringa: Pepper soup (40:60) was least accepted. In the Moringa group, the 100% pepper soup had the greatest acceptability, while the Marugbo : Cotton seed (50 :50) had the least acceptability. However, most of the respondents (60%) on realizing that Moringa leaf was included in the samples indicated their preference and higher rating for the Moringa soup blends. These studies show that a 40% or lower level of inclusion of Moringa leaves in traditional soup recipes is acceptable to consumers. Therefore, traditional soups can be used as vehicles or carriers of the nutritional/medicinal benefits.

Key words: *Soups, Moringa, Marugbo, Cotton seed.*

INTRODUCTION

Nigeria is a country that is multi-cultural in nature and endowed with assorted traditional vegetable soups which are indigenous to different ethnic groups and consumed along with traditional dietary staples, obtained from cassava, yam, cocoyam, sweet potatoes, plantain, millet, rice and maize (Ndulaka, Ekaiko, Onuh & Okoro, 2017). The soups are cooked utilizing varieties of indigenous vegetables which are not only known for their rich food nutrient content but are also health's promoting (Asaolu, Adefemi, Oyakilome,Ajibulu,&Asaolu, 2012). Utilization of dietary antioxidants from theseindigenous vegetables is beneficial in stoppingdiseases (Sumazian,Syahida, Hakiman, & Maziah, 2010, Huda-

Faujan, Noriham, Norrakiah&Babji, 2009). Apart from promoting good health, increased consumption of these indigenous spices will help to enhance crop diversity, alleviate poverty and promote food security (Barry, Jaenicke, Pichop& Virchow, 2009). Enormous attention has thus been directed to theseindigenous vegetables due to the increased knowledge of their health protecting properties and bioactive phytochemicals that have been linked to guard against cardiovascular and other degenerative diseases (Adefegha, 2013). All this soups which are rich naturally in micronutrient within different cultural groups decrease occurrences of some micronutrient deficiencies. Good quality nutrition is a basic human right in order to have a good healthy population that can advance development (Blumenthal, 2013). In advanced countries, one of the ways of achieve this is through the exploitation of available indigenous foods ingredient in the formation of nutritional sufficient diet which is incorporated within essential food groups.

Moringa (*oleifera)*belongs to the plant folks Moringaccae. In Nigeria, some of the popular name given to it are Ewe ile, Ewe igbal, or Idagbomonoye (the tree which grows crazily) in Yoruba*: Zogall, or Zogalla-gandi* in Hausa; and *Odudu Oyibo, Okochi egbu, Okwe Oyibo, Okugharaite, Uhe, Ikwebeke* in Ibo. Moringa (*oleifera)*, initiate almost in every area of the country has been useful in purifying water, treating malnutrition, boosting immunity,combating microbes, and cancers (Fry, 2009). According to Akinola (2012) Wolof community, always used Moringa for its high nutritional value, in juices, salads, soups and medicine (*oleifera)* seeds are now scientifically established to be useful in treating water for household and community consumptions which supplies all the 8 essential amino acids which sustain individual life. Even though, well known and used in the Northern part of Nigeria, accessible information has not publicized that this seemingly expensive plant is as well isalso used as food in Southwestern part of Nigeria and its acceptability to the central/southern Nigeria is not known.

(Clerodendrumvolubile), an understudied native plant, belongs to the folks(*LamiaceaeVerbenaceae)* and it is one of the generally distributed indigenous vegetables in the warm temperature and hot regions of the World. The plant is traditionally known as "Marugbo" or "Eweta" among the Ikale, Ilaje and Apoicitizens found in Southern-senatorial district of Ondo State, SouthWest Nigeria. "Obnettete", as the plant is recognizedin the middle of the Itsekiri and Urihobo tribes in Niger-Delta, is a green climbing shrub reported to have height of 3m and possesses various flowers. These are averagely about 1.5cm in length (Erukainure, Oke, Ajiboye & Okafor, 2011). The leaf of (*Clerodendrumvolubile)* is usually consumed as indigenous vegetables mostly blended with previous vegetables as spices with sweet aroma and taste. Locally, the leaves can be blended either fresh or dried and applied as spices in cooking (Adefegha& Oboh, 2011). It should be noted that the dried leaves produces the darker soup content. Normally referred to as "Eweta" by the Ikales', the leaves of (*Clerodendrumvolubile)* have immense nutritional significance as well as herbal and medicinal assessment.

This indigenous plant has been reported to contains very gigantic quantity of iron and zinc; elements which are significant

in many enzymes for their functions and for safeguarding of fresh skin. The existence of phenolic compounds and other phytochemicals has also been experimental (Erukainure,Oke, Owalabi& Adenekan, 2010). When consumed, the leaves are often well-known for inspiring lost appetite as well as replenishing strength for mothers of new born babies.

While, the plant is fundamentally grown as food, it has continued to be asignificant medicinal plant (Fred-Jaiyemisi& Adekoya, 2012). Its medicinal value has been the likely reason for itscurrent attention and improved consumption of the plant as well as itextends into new areas. Over the time, a broaddiversity of claims has been reportedly made for its efficacious medicinal properties as a management for many ailments ranging from its ability to relieve pain and swelling (Neeta & Tejas,2007) to general healing properties for clinical conditions such as oedema, rheumatism, dropsy, gout and arthritis (Neeta & Tejas,2007), thus its consumption will improve the health of the consumers.

(Gossypium hirsutum) – cotton seed, native to southern Africa and the Arabian Peninsula (less than 2% The two New World cotton species account for the vast majority of modern cotton production, but the two Old World species were widely used before the 1900s. Whereas cotton fibres occur physically in colours of white, brown, pink and green, fears of contaminating the inheritance of white cotton have led many cotton-growing locations to ban the growing of coloured varieties (Green, 2006).

Pepper soup is an additional Nigerian delicacy that is exceedingly medical with aromatic spices which can be eaten any time of year in particular during periods of healing, after illness, child birth and as real treat to invigorate the heart and soul (Goody, 1998).

The Nigerian pepper soup recipe frequently made with goat meat but in present times, people have been known to make pepper soup with chicken or fish.

It is such a resourceful recipe as it can be prepared with diverse types of meat and fish. Accordingly, there is chicken pepper soup as well as catfish pepper soup (generally known as Point and Kill because publicmore often than not point to choose the fish to be killed for the soup in the fish pond).

Others include goat meat pepper soup, cow leg pepper soup and assorted beef pepper soup. In Nigeria, people usually go to exclusive bars or restaurants to eat the pepper soup and together with palm Wine. This study therefore compares the organoleptic properties of each of *Moringa, Marugbo*, Cotton seed and pepper soup spices blends using a panel of spices selected from Ecotourism site in Oyo and Ekiti States, Nigeria.

Materials and methods

Materials: The materials for the organoleptic exercise of the study were obtained from different locations, some materials like Monriga, Cotton seeds*; Morugbo* was purchase from Emurelocal market in Owo, Ondo State. Other materials like palm oil, meat, fish, and snail pepper, locust bean, ginger, garlic scent leaf was purchase from Akoto local market in Oyo State.

Empirical Review

The soups are cooked utilizing varieties of indigenous vegetables which are not only known for their rich food nutrient content but are also health's promoting (Asaolu*et al*., 2012). Utilization of dietary antioxidants from theseindigenous vegetables is beneficial in stopping diseases (Sumazian*et al*., 2010, Huda *et al*., 2009).Apart from

promoting good health, increased consumption of these indigenous spices will help to enhance crop diversity, alleviate poverty and promote food security (Barry *et al*., 2009). Enormous attention has thus been directed to theseindigenous vegetables due to the increased knowledge of their health protecting properties and bioactive phytochemicals that have been linked to guard against cardiovascular and other degenerative diseases (Adefegha, 2013). All these soups which are rich naturally in micronutrient within different cultural groups decrease occurrences of some micronutrient deficiencies. Good quality nutrition is a basic human right in order to have a good healthy population that can advance development (Blumenthal, 2013).

This study therefore compares the organoleptic properties of each of *Moringa, Marugbo*, Cotton seed and pepper soup spices blends using a panel of spices selected from Ecotourism site in Oyo and Ekiti State, Nigeria.

Erukamure*et al*., (2010) reported that local soup improves the standard of health of living. According to Ruan *et al*., (2004) local soup helps in body growth. Kayode *et al.,* (2010) similarly showed similar result with his researches in other soups. The results also shows that natural / local soups have medicinal values than processed soup which is in agreement with Asaolu*et al.,* (2012), but there was an increase in sensory perceptions of tourists. The general acceptability of the tourist's perception on the use and consumption of soups were highly appreciated. Tourists prefer natural/ local soup because it is cheaper than processed soup, and local soups have impact in human life. The tourists also prefer to eat at local restaurants where they are sure they prepared local soup than processed soup.

Soups are sometimes linked with magic, religion and tradition believes. Historically, soups have over the years function successfully as preservatives, although sometimes they are used for various medical purposes. Medical functions include conferring protection against cardiovascular and neurodegenerative diseases, cancer and type 2 diabetes mellitus (Adebayo, 2018). Also, soups functions as antidotes for all poison e.g. dog and snake bites, asthma, coughs and some ailments (Akinola, 2012). They may stimulate digestion, regulate peristalsis, and increase the appetite and aid in the secretion of gastric juices. Soups are sometimes prescribed for reducing lust among teenagers and desire for alcoholic beverages (Blumenthal, 2013). Finally, local soup helps in immune booster (Smith and Eyzaguirre, 2007).

Akinola, (2012) argues that traditional soups can be used as vehicles or carriers of the nutritional/medicinal qualities of Moringa spices that are preserved during cooking, thereby circumventing negative psychological feeling of using medicines whilst gaining attendant benefits.The result also revealed clearly that the indigenous soups can equally meet the nutritional need of the people in this country. They are naturally cooked and are safer and healthier for consumers than the foreign soups which are often preserved with toxic chemicals.

METHODS FOR SOUP PREPARATION:

Formulation of composites blends.

Nine different composites soup blends were formulated as shown in Table 1:

Table 1 Soup blends from Moringa, Marugbo, Cotton seed and pepper soup spices.

Samples Codes		Blend ratio	Moringa	Pepper Spices	Marugbo	Cotton Seed
1	MO	100:0	500.00g	0.00g	0.00g	0.00g
2	MPs	40:60	200.00g	300.00g	0.00g	0.00g
3	MMr	40:60	200.00g	0.00g	300.00g	0.00g
4	MC	40:60	200.00g	0.00g	0.00g	300.00g
5	MMrC	40:30:30	200.00g	0.00g	150.00g	150.00g
6	MrO	100:0	0.00g	0.00g	500.00g	0.00g
7	CO	100:0	0.00g	0.00g	0.00g	500.00g
8	MrC	50:50	0.00g	0.00g	250.00g	250.00g
9	PsO	100:0	0.00g	500.0g	0.00g	0.00g

Key: MO = Moringa Only, MPs = Moringa Pepper Soup, MMr = Moringa, Marugbo, MC = Moringa Cotton, MMrC = Moringa Marugbo Cotton Seed, MrO = Marugbo Only, CO = Cotton Seed Only, MrC = Marugbo Cotton Seed, PsO = Pepper Soup Only.

Sensory Evaluation:
A panel of twenty (20) randomly selected untrained judges who were familiar with the use of spices in soups assessed the soup blends. Each of the products was evaluated on a 7-point hedonic scale where 7 represents like extremely and 1 represents dislike extremely. The soup blends were evaluated for quality characteristics of aroma, taste, texture, colour and overall acceptability (Poste, Mackie, Butler & Larmond, 1991). Statistical analysis: Data were analyzed using the general linear model (GLM) procedure with SPSS Statistical Package for the Social Sciences (16.0) Means ± (SD) were calculated, Analysis of variance (ANOVA) and Duncan's New Multiple Range Test (DNMRT) were used to test the significance of the difference among means.
Means, where significant, were removed by Least Significant Difference (LSD) test (Steel and Torrie, 1980). The null hypothesis was tested with a two-tailed t-test to test significance difference between samples fortified with moringa and those not fortified with moringa.

Results and discussion
Table 2 presents the mean sensory evaluation scores of the samples. It was observed that the soups from MO (Moringa only) (control) had the highest organoleptic or sensory attributes of colour, taste, texture, flavour and overall acceptability. (4.29, 4.10, 4.89, 4.13 and 4.90) respectively, on a 7 point hedonic scale than other test samples. While the MrC (Marugbo + Cotton) had the least sensory attribute in colour, flavour and overall acceptability (3.82, 3.81 and 3.79)

respectively, than the other products. The blend with MMrC (Moringa + Marugbo+ Cotton seed) had the best sensory attribute next to the control in taste, flavour and overall acceptability (4.09, 4.08 and 4.16) while MC (Moringa + Cotton seed) has high attributes next to MMrC in taste, texture and overall acceptability (4.08, 4.01,and 4.13) and was acceptable to all the assessors. Also, PsO (Pepper soup only) has high attributes next to MC in taste, texture and overall acceptability (4.04, 4.00 and 4.04) while, MMr (Moringa + *Marugbo*) has high attributes in taste, flavour and overall acceptability (4.00, 4.17 and 4.09). All the blends had sensory scores higher than that of the mean mark (3.80) for the attributes and were acceptable to the panellists except sample MrC (*Marugbo* + Cotton seed) that has least sensory score lower than the mean mark (3.80) in overall acceptability (3.79). The ANOVA result revealed a significant difference among the test samples on organoleptic attributes. ($P<0.05$).

Table 2: Mean Sensory Evaluation of Soup blends from moringa produce with *marugbo*, cotton seed and pepper soup spices.

Blends	Colour	Taste	Texture	Flavour	Overall Acceptability
MO	4.29±2.087[a]	4.10±2.057[a]	4.89±2.043[a]	4.13±1.880[a]	4.90±1.935[a]
MPs	4.09±1.990[a]	3.88±2.062[a]	4.12±1.959[a]	4.08±2.002[a]	3.97±2.037[a]
MMr	3.87±2.003[b]	4.00±2.017[a]	3.80±2.026[a]	4.17±1.869[a]	4.09±2.014[a]
MC	3.85±2.070[b]	4.08±1.988[a]	4.01±2.075[a]	3.92±2.037[a]	4.13±1.983[a]
MMrC	4.11±2.054[b]	4.07±1.951[a]	4.02±1.986[a]	4.08±2.003[a]	4.16±1.954[a]
MrO	3.92±1.988[b]	4.02±2.030[a]	4.03±2.058[a]	3.83±2.044[a]	4.00±2.127[a]
CO	3.94±2.019[b]	3.84±1.936[a]	4.16±2.022[a]	4.08±1.972[a]	3.93±1.943[a]
MrC	3.82±2.019[b]	4.10±2.017[a]	3.98±1.927[a]	3.81±1.922[a]	3.79±2.003[a]
PsO	3.94±1.951[b]	4.04±1.981[a]	4.00±2.102[a]	4.02±2.040[a]	4.04±1.991[a]

Mean±SD with different letter superscript in the same horizontal line are significantly different ($p<0.05$) while means with the same letter superscript in the same horizontal line are NOT significantly different ($p>0.05$.)
Blends : MO = Moringa Only, MPs = Moringa Pepper Soup, MMr = Moringa, Marugbo, MC = Moringa Cotton Seed, MMrC = Moringa Marugbo Cotton Seed, MrO = Marugbo Only, CO = Cotton Seed Only, MrC = Marugbo Cotton Seed, PsO = Pepper Soup Only.

Table 3: t-test analysis of significant difference between organoleptic properties of soup blends produced with *marugbo*, cotton seed and pepper soup spices fortified with moringa and those not fortified with moringa.

Group	N	X	SD	Df	cal t	P	t crit	Remark
With Moringa (Blends 1-5)	300	16.90	3.310	38	2.9378	0.006	1.96	S
Without Moringa (Blends 5-9)	300	14.30	2.170					

t-cal > 1.96 P < 0.05 Ho is rejected.

Table 3 reveals that the calculated t-value of (2.94) exceeds critical value of (1.96) (t-cal > 1.96) for a two-tailed test and the probability level of 0.006 less than 0.05 (P < 0.05). This therefore implies that there is significant difference between organoleptic properties of soup blends produced with *marugbo*, cotton seed and pepper soup spices fortified with moringa (samples 1-5) and those not fortified with moringa (samples 6-9) in aroma, colour, taste, texture, and overall acceptability. Consequently, the null hypothesis of no significant difference is rejected.

Discussion:

Although sensory attributes of test blends were lower than that of the control (Dolcas, 2008), all the blends were acceptable to the panelists except sample MrC (*Marugbo* + Cotton seed) that has least sensory score lower than the mean sensory score in colour, flavour and overall acceptability. The observation that the soups from MO (Moringa Only)(control) had the highest organoleptic attributes could be due to the fact that the panelists were familiar with it being one of the most popular soup among north central part of Nigerians (Okenyodo, 2012). Davert, (2012) and Onimawo, (2012) have also described moringa spices as an appetizing product used as spices substitute.

The fact that the MrC (Marugbo + Cotton seed) had the least sensory attribute in aroma, taste, texture, and overall acceptability may be due to its yet unpopular nature with the panellists reported by Adefegha and Oboh (2011). The blend with MMrC (Moringa + Marugbo + Cotton seed) had the best sensory attribute next to the control in taste, texture and overall acceptability and could therefore be recommended as the best since it had a balance nutrient content and acceptable to the assessors. MC (Moringa + Cotton seed) has high attributes next to MMrC in taste, texture and overall acceptability and was also acceptable to all the assessors reported by Blumenthal (2013). This could be as a result of its attractive taste and texture(Akinola, 2012). Rotapol and Hooker, (2006) reported that appearance of food evokes initial response, and that flavour determines the final acceptance or rejection by the consumer. There was a statistical significant difference between samples 1 2 3 4 5 and sample 6 7 8 9 in sensory evaluation value relative to the control (P<0.05). It therefore implies that there is significant difference between organoleptic properties of soup blends produced with Marugbo Cotton seed and pepper soup spices fortified with Moringa (samples 1-5) and those not fortified with Moringa (samples 6-9) in colour, taste, texture, flavour and overall acceptability. Sample MO, MMrC, MC, MMr, MrOandPsO had very high ratings in overall acceptability followed by MPs

and CO. Good taste quality of the blends may be due to the combination of Moringa and spices which has general higher retention of good taste(Okenyodo, 2012). However, most of the respondents (60%) on realizing that Moringaleaf was included in the samples indicated their preference and higher rating for the Moringa soup blends.

Conclusion

The present study indicates that a 40% or lower level of inclusion of Moringa spices in traditional soup recipes is acceptable to consumers irrespective of whether content of a soups is declared/indicated, and a higher level of inclusion is acceptable when "Moringa spices" is declared/revealed as a recipe ingredient. Therefore, traditional soups can be used as vehicles or carriers of the nutritional/medicinal qualities of Moringa spices that are preserved during cooking, thereby circumventing negative psychological feeling of using medicines whilst gaining attendant benefits.

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