

An Analysis of Organoleptic Qualities of a Three-Course Menu from Moringa Leaves in Mubi, Adamawa State Nigeria

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Abstract—*Moringa oleifera* is mainly used as herbal medicine in most homes in Northern Nigeria. The plant is easy to grow and thrives very well regardless the type of soil. Use of moringa leaves in food production can yield attractive varieties on menu. This paper evaluates the acceptability of dishes produced with fresh moringa leaves with a view to promoting it in popular restaurants. A three course menu consisting of cream of moringa soup as the starter, mixed meat moringa sauce with semovita as the main dish and moringa roll as sweet was produced and served to a 60-member taste panel made of three groups of 20 each. Respondents were asked to rate the organoleptic qualities of the samples on a 10-point bipolar scale ranging from 1 (Dislike extremely) – 10 (Like extremely). Data collected were treated to one sample t-test and One Way ANOVA. Results show that the panelists extremely like the moringa products. It is recommended that *Moringa oleifera* should be incorporated into meals which is more readily acceptable than medicine.

Keywords—*Moringa oleifera*, food production, menu planning, healthy living.

I. INTRODUCTION

MORINGA plant is widely cultivated and used for health reason in Northern Nigeria. Acclaimed as a miracle plant capable of healing over 300 diseases, its leaves, seeds, roots and barks are used for their medicinal properties. However, to the knowledge of the researcher, little evidence exists that there are researches into the use of moringa in food production and for meal planning in notable restaurants in Nigeria. Hence, in view of its cheap availability and potentials for healthy living which is the main goal of the hospitality industry, a research into establishing possibility for menu formulation from moringa, in which ever form, is justifiable. Caterers have the skill and knowledge to make healthier food options more appetising and inspiring. There is an increasing demand for healthier meals and the response by the catering industry has been highly imaginative. Thus, a research into production of meals from Zogale is one of such responses Do people like and accept moringa food preparations for their colour, taste, aroma and texture? Is there any statistically significant interaction between moringa dishes? These are the questions that have been addressed by the objectives of this research. Also, it was hypothesized as follows:

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H1. There is no statistically significant evidence that people like dishes prepared from or with moringa.

H2. There is no statistically significant interaction between moringa dishes.

II. LITERATURE REVIEW

Over the past few years, there has been rapid increase in the interest surrounding Moringa. Considerable new researches have been done into its cultivation, extraction of its oil, use in agro-forestry system, water purification properties, medical and nutritional benefits, [1], [2] *Moringa oleifera* which belongs to morganatic family of shrubs and trees *Moringaceae* is popularly grown in India, Pakistan, Bangladesh, and Afghanistan [3]. It is also grown in the tropics. It thrives very well in almost all parts of Nigeria. It is grown in the majority of households in the North-east.

Moringa leaves, bark, flowers, fruit, seeds, and root are used to make medicine. The leaves contain very high concentration of vitamins; A, β , and C, iron, calcium, protein, zinc, selenium and 10 essential human amino acids which are rare plant phenomenal [1], [4]. As major role players in maintaining the nation's health, caterers can exploit the rich food value offered by moringa to plan meals and formulate acceptable menus from it. Reference [5] see this as an option for boosting healthy eating and controlling how much fat, sugar, fibre and salt we consume.

Moringa is said to treat over 300 diseases, including anemia, arthritis, rheumatism, asthma, cancer, constipation, diabetes, diarrhea, epilepsy, stomach pain, stomach and intestinal ulcers; intestinal spasms; headache; heart problems, skin diseases, etc. [3], [6]. Therefore, its uses in food preparation are a step to preventing numerous health problems [7]. Prevention is better than cure. Therefore, eating healthy food is a better precaution against infections and infirmities.

Moringa is consumed in various forms. The immature green pods are prepared like green beans, the seeds are cooked like peas or roasted like nuts, the leaves are cooked and used like spinach, and they are also dried and powdered for use as a condiment, seeds are processed into oil for cooking [8]. These are but just a few. Some forms of food preparations from moringa include moringa leaves gulyay, drumstick curry with onions, drumstick with rice and coconut, drumsticks cutlets, drumstick sabzi with gramflour, vegetable delight and drumstick flower chutney [9].

III. METHODOLOGY

A three-course menu was produced from moringa leaves. It includes cream of moringa soup as the starter, mixed meat moringa with semovita as the main dish and moringa roll as the sweet. It was served to 60 taste panelists made of three groups of 20 each. The respondents were required to assess the colour, taste, aroma, consistency and texture of the dishes on a 10-point bipolar scale ranging from 1 (dislike extremely) to 10 (like extremely). The respondents were drawn from among the hospitality instructors and practitioners who regularly patronize restaurants. Data collected were analyzed with the aid of SPSS 22. A one Sample test was performed to validate the hypothesis that patrons do not like moringa dishes while a One-way ANOVA was employed to determine whether there was statistically significant interaction among the various samples produced from moringa leaves.

A. Recipes and Methods

Twenty covers of each of the three courses were produced.

B. Cream of Moringa Soup

The food commodities used include 2 full de-feathered chickens, 10 cubes of Maggi, 20g margarine, 20g moringa leaves and seasonings.

For the production, butter was placed in a stock pot and heated slightly; onion and pounded fresh moringa leaves were added and sauté until slightly tender; flour was added and cooked for five minutes; hot chicken stock was added whipping vigorously with a wire whip until slightly thick and smooth and allowed to simmer for few minutes. The mixture was strained through a fine sieve, poured into a stock pot, returned to heat and the seasonings corrected. It was garnished with croutons.

C. Mixed Meat Moringa Sauce

This was prepared from two large sized cat fish, 500g offal, 250g lamb, 100g moringa leaves, potash as desired, 5g milled pepper, 2 medium sized onions, 15 cubes of Maggi, 150g groundnut paste and salt to taste.

The cooking procedure includes putting fish into a seasoned little water and allowing cooking for some minutes; adding shredded moringa leaves and a little potash, cooking for 5 minutes; addition of groundnut paste cooking for 5 minutes; and correcting the seasonings as may be necessary.

D. Moringa Roll

Materials used include 200g moringa leaves, 200g minced meat, 1 medium sized onion, 2 medium sized green pepper, 500g margarine, 200g flour, baking powder and seasonings.

To produce, blanch moringa leaves with salt/vinegar and shred. Sauté minced meat with the moringa leaves. Season to taste and cook for 2 minutes. Make a dough. Roll flat and fill with the already prepared moringa fillings (like meat pie). Heat oven and bake for 30 – 40 minutes.

IV. RESULTS

Descriptive statistics (Table I) shows a mean likeness of **9.35, SD = 0.93** for the cream of Moringa soup. This means that they 'Like much' the sample. From Table II, twelve (12) respondents (60%) 'extremely like' the soup. Commenting, the respondents described the colour, flavor, taste and consistency of the product as 'very good'.

To validate Hypothesis 1 in this study that: 'Dishes made from *Moringa olifera* are not liked by patrons', a One Sample Test was conducted (See Table V) at $\alpha = 0.05$, Test Value = 5 and the result was statistically significant at $p = .000$ (i. e. $<.0005$). Hence, the null hypothesis is rejected and the alternate upheld because there is enough evidence to suggest that people like cream of moringa soup.

For the Mixed Meat Moringa Sauce, there is a mean likeness of **9.65 (SD = 0.61)** [See Table I]. This means 'Like Extremely'. The low standard deviation is an evidence that the respondents were closely related in their judgment. From Table III, 15 respondents (75%) 'extremely like' the sauce.

A One Sample Test conducted (See Table V) at $\alpha = 0.05$ with Test Value 5 shows that the result was statistically significant at $p = .000$ (i.e. $<.0005$). Hence, the null hypothesis is rejected and the alternate upheld because there is enough evidence to suggest that people like mixed meat moringa sauce.

There is a mean likeness of **9.35 (SD = 0.86)** for moringa roll. This means 'Like Much'. From Table IV, 11 respondents (55%) 'extremely like' the roll while 7 respondents (35%) like it 'much'. The respondents did not differ much on their assessment.

A One Sample Test (See Table V) at $\alpha = 0.05$ with Test Value 5 shows the result was statistically significant at $p = .000$ (i. e. $<.0005$). Hence, the null hypothesis is rejected and the alternate upheld because there is enough evidence to suggest that people much like moringa roll.

A One-Way Analysis of Variance was performed at $\alpha = 0.05$ to evaluate the statistical mean difference between cream of moringa soup, mixed meat moringa sauce and moringa roll (See Tables VI and VII). There was no statistically significant interaction among the mean likeness of cream of moringa soup, mixed meat moringa sauce and moringa roll, $F(2, 48) = 0.743$, $p = .481$ [See Table VII]. In other words, the null hypothesis is upheld because there is significant evidence to suggest that the three moringa products were equally accepted. Their colour, taste, flavor and consistency were rated 'very good'.

V. DISCUSSIONS

Moringa, in addition to being used as medicine, can be a very good source of food commodity for menu items. As a good source of proteins, vitamins and minerals, its leaves, seeds and oil can play significant role in menu planning in families and restaurants. The high level of likeness for cream of moringa soup, mixed meat moringa sauce and moringa roll in Tables I and V, resulting from the one sample t-tests, is an indication that dishes prepared from moringa in different

forms may be acceptable to many persons as an alternative to using it as drugs. Also, it opens opportunity for restaurant operators to add variety to their menu items; more especially that moringa is a desired name because of its acclaimed record to have agility of curing over three hundred diseases. This lends support to [8] who recommends food preparations from the various parts of the plant. Not to say the least, the leaves offer the most opportunity for menu planning as they can be used in various forms, whether fresh or dry.

From Tables VI and VII, there is no statistically significant mean difference in the likeness of cream of moringa soup, mixed meat moringa sauce and moringa roll. Their colour, flavor, taste and consistency were considered 'very good'. This translates into saying that dishes from *Moringa oleifera* prepared to some specifications can be comparably liked. Chefs in notable hotel establishments can make do with *Moringa oleifera* seeds, leaves and oils to create or develop interesting menus. Those on diet controlled food who avoid sugar and cholesterol may find moringa dishes as better alternatives as opined by [5].

VI. CONCLUSION AND RECOMMENDATION

Moringa plant can provide valuable food commodity for menu items in the restaurants and families. Menu may be formulated from its leaves, roots, barks, seeds or oils. Moringa is a very rich source of proteins, vitamins and minerals. Dishes prepared from moringa are widely acceptable for their colour, flavor, taste and consistency.

Moringa plant grows very well in almost all parts of Nigeria. It is cheap to buy. The high demand for the plant, coupled with its cheapness, affords the caterer the opportunity to make better profit from its use in meals.

Therefore, caterers should seize the opportunity of the cheap availability of moringa plant and its health value to formulate menu from it. It is attractive to many markets. People should support the use of moringa products in meals as better alternative to administering it as herbal medicine.

APPENDIX

TABLE I
DESCRIPTIVE STATISTICS

	N	Mean	Std. Deviation
Cream of moringa soup	20	9.3529	.93148
Mixed meat moringa sauce	20	9.6471	.60634
Moringa roll	20	9.3529	.86177
Valid N (listwise)	20		

TABLE II
CREAM OF MORINGA SOUP

	Frequency	Percent	Valid Percent	Cumulative Percent
Like	1	5.0	5.0	5.0
Like moderately	2	10.0	10.0	15.0
Valid Like much	4	20.0	20.0	35.0
Like extremely	12	60.0	60.0	100.0
Total	20	100.0	100.0	

TABLE III
MIXED MEAT MORINGA SAUCE

	Frequency	Percent	Valid Percent	Cumulative Percent
Like moderately	1	5.0	5.0	5.0
Valid Like much	4	20.0	20.0	25.0
Like extremely	15	75.0	75.0	100.0
Total	20	100.0	100.0	

TABLE IV
MORINGA ROLL

	Frequency	Percent	Valid Percent	Cumulative Percent
Like	1	5.0	5.0	5.0
Like moderately	1	5.0	5.0	10.0
Valid Like much	7	35.0	35.0	45.0
Like extremely	11	55.0	55.0	100.0
Total	20	100.0	100.0	

TABLE V
ONE-SAMPLE TEST

	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
					Test Value = 5	
Cream of moringa soup	19.268	19	.000	4.35294	3.8740	4.8319
Mixed meat moringa sauce	31.600	19	.000	4.64706	4.3353	4.9588
Moringa roll	20.826	19	.000	4.35294	3.9099	4.7960

TABLE VI
ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.980	2	.490	.743	.481
Within Groups	31.647	48	.659		
Total	32.627	50			

Dependent Variable: LIKENESS

TABLE VII
MULTIPLE COMPARISONS

(I) Sample	(J) Sample	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Cream of moringa soup	Mixed meat moringa sauce	-.29412	.27851	.546	-.9677	.3794
	Moringa roll	.00000	.27851	1.000	-.6736	.6736
Mixed meat moringa sauce	Cream of moringa soup	.29412	.27851	.546	-.3794	.9677
	Moringa roll	.29412	.27851	.546	-.3794	.9677
Moringa roll	Cream of moringa soup	.00000	.27851	1.000	-.6736	.6736
	Mixed meat moringa sauce	-.29412	.27851	.546	-.9677	.3794

Dependent Variable: LIKENESS, Tukey HSD

REFERENCES

- [1] Fuglie, L. J. (2001). The Miracle Tree: Moringa Oleifera: natural nutrition for the tropics, (Church World Service, Dakar, 1999). pp: 68.
- [2] Mahajan S., Mehta A. (2009). Curative effect of hydroalcoholic extract of leaves of *Moringa oleifera* lam. against adjuvant induced established arthritis in rats. Niger. J. Nat. Prod. Med. 13, 13–22.
- [3] Anwar F., Latif S., Ashraf M., Gilani A. H. (2007). *Moringa oleifera*: a food plant with multiple medicinal uses. Phytother. Res. 21, 17–25.
- [4] Kumar, H. D. (2004). Cooper, Edwin L.; Yamaguchi, Nobuo, eds. Management of Nutritional and Health Needs of Malnourished and

- Vegetarian People in India. *Advances in Experimental Medicine and Biology*. Springer US. pp. 311–321.
- [5] Drummond, K. E. & Brefere, L. M. 2007. *Nutrition for foodservice and culinary professionals*. 6th ed ed. New Jersey: John Wiley & Sons, Inc.
- [6] Amaglo N. K., Bennett R. N., Lo Curto R. B., Rosa E. A. S., Lo Turco V., Giuffrid A., Lo Curto A., Crea F., Timpo G. M. (2010). Profiling selected phytochemicals and nutrients in different tissues of the multipurpose tree *Moringa oleifera* L., grown in Ghana. *Food Chem.* 122, 1047–1054.10.1016/j.foodchem.2010.03.073.
- [7] Dieye A. M., Sarr A., Diop S. N., Ndiaye M., Sy G. Y., Diarra M., Rajraji Gaffary I., Ndiaye Sy A., Faye B. (2008). Medicinal plants and the treatment of diabetes in Senegal: survey with patients. *Fundam. Clin. Pharmacol.* 22, 211–216.10.1111/j.1472-8206.2007.00563.
- [8] Maroyi, A. 2006. The utilization of *Moringa oleifera* in Zimbabwe: A Sustainable Livelihood Approach. *Journal of Sustainable Development in Africa*,8(3).
- [9] Moringa Recipes - 1001 ways to eat and cook. Available at (http://miracletrees.org/moringa_recipes.html). Retrieved December 20, 2015.