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QUALITY EVALUATION OF HERBAL TEA FROM *Moringa olifera* AND *Hibiscus sabdariffa* IN NIGERIA.

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Abstract
In recent times, there is renewed interest in tea because of growing consumer awareness of health benefits derived from tea consumption. The main objective of the study was to explore alternative uses for Moringa oleifera and Hibiscus sabdariffa by blending the two herbs to produce a herb tea with acceptable sensory properties. The herbs were mixed in varying proportions to obtain different formulations (Table 1). The proportions were obtained using Design Expert (2007). Two-gram samples of each formulation were bagged in rectangular infusion tea bags (5cm×4cm) using an automatic tea bagging machine (Telesonic ST-101). Commercial Moringa herb tea (Newman Farms Ltd) was used as control. The panelists were instructed to score their acceptance for 6 attributes of the infusions: colour, aroma, flavor, aftertaste, astringency and overall acceptability. Four blends with the least proportions of Roselle and Lemon grass (A, B, C and D) were also the least preferred in aroma. Product G (7.3) was preferable to F (6.2) because the former contains higher Roselle (70%) than the latter (60% Roselle). From the trend, products with low proportions of Roselle were least preferable in astringency. For example, products containing 20% Roselle or below – B (3.3), A (2.3) and the A (control) (2.2) – had the lowest scores in astringency. On the other hand, products with high proportions of Roselle such as G (7.8), F 6.9) and H (4.1) had corresponding high scores for astringency. The control had the lowest score for astringency. The herbal teas produced in this study have recorded significant nutrient contents. However, further studies can be done on the reduction of the astringency and bitterness of the tea produced to increase its market potential in the tea market.

Keywords: Quality Evaluation; Herbal Tea, Moringa *olifera, Hibiscus sabdariffa*

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1.0 INTRODUCTION

Tea is currently the most widely consumed beverage in the world (Schmidt *et al.*, 2005) and therefore ranks as an important world food product. The product is generally consumed for its attractive aroma and taste. In recent times, there is renewed interest in tea because of growing consumer awareness of the health benefits derived from tea consumption (McKay and Blumberg, 2002). Green tea consumption in female rats for instance has been shown to have anti-obesity effects as well as lower levels of cholesterol, triglycerides and leptin (Sayama *et al.*, 1999).

Tea has been found to protect against neurological alterations that are induced by toxins present in the environment (Cho *et al.*, 2008) and occasional consumption of tea can also protect against mutations in humans resulting from ultraviolet radiation (Malhomme *et al.*, 2010). Tea also contains theanine and catechins whose antioxidant properties exhibit neuro-protective and free radical scavenging abilities respectively (Kakuda, 2002; Xu *et al.*, 2010). The utilization of plants and plant extracts in tea production has led to tea variants generally called "herbal tea" which are not produced from Camellia sinensis leaves. Herbal tea is produced from brewing mixtures of herbs, fruits, seeds, leaves or plant extracts of various plants (Ravikumar, 2014).

According to (Abbey, 1999), indigenous herbs are in general heavily under-exploited in spite of their huge dietary potential. It is therefore imperative to explore the potential of indigenous plant materials in the development of new herb teas. Three examples of indigenous plants are *Moringa oleifera* (Moringa), *Hibiscus sabdariffa* (Roselle) and *Cymbopogon citratus* (lemon grass).

Currently, there is growing interest in the use of Moringa leaf as an ingredient in the preparation of herb tea. However, according to (Elkhalifa *et al.*, 2007) herb tea made solely from Moringa is poor in sensory appeal. This may be due to the absence of distinctive flavour properties. It may therefore be necessary to combine Moringa with other herbs in developing herb teas as a way of improving its sensory appeal. This is important because consumers are generally unwilling to buy food with poor sensory appeal, irrespective of health or nutritional benefits (Geel *et al.* 2005).

Moringa is a nutraceutical that pharmacologically serves as an anti-inflammatory, hepatoprotective, neuroprotective, antidiabetic, and antihyperlipidemic agent. *Moringa oleifera* is an excellent source of macro and micronutrients rich in antioxidant compounds (Sahay *et al.*, 2017). Because of the high nutritional values and pharmacological benefits, it has the potential to be developed into functional food (Saini *et al.*, 2016) like herbal tea. According to Sugahara (2018), moringa can be processed into herbal teas that contain abundant antioxidants to prevent free radical-induced interferences in the body (Sugahara *et al.*, 2018). Roselle, on the other hand is an aromatic, astringent herb which is known to impart a characteristic reddish colour and sour taste which consumers find appealing in beverages (Blench, 2007). Lemon grass has also been reported to have excellent aromatic properties (Dagupen *et al.*, 2009).

The main objective of the study was to explore alternative uses for *Moringa oleifera* and *Hibiscus sabdariffa* by blending the two herbs to produce a herb tea with acceptable sensory properties.

2.0 MATERIALS AND METHODS

Source of raw materials

Fresh Moringa was harvested from the botany garden of the department of Science Laboratory Technology, Benue State Polytechnic Ugbokolo. Leaves and petioles of moringa sample were and dried. Dried Rosselle samples were purchased from the open market in Ugbokolo Benue State, Nigeria.

Sample preparation

The plant materials were carefully inspected and all foreign materials removed. They were gently rinsed in tap water. Moringa and Rosselle were cut into pieces, and the leaf stalks of Moringa were not removed. The samples were spread thinly on paper and dried in a solar drier for five days at peak temperature of 62°C. After drying the samples were milled using an electronic Binatone Blender (China, Model BLG401). Milling was performed for about 15 minutes for each sample. The milled material was sieved through an Aluminum sieve (2mm).

The herbs were mixed in varying proportions to obtain different formulations (Table 1). The proportions were obtained using Design Expert (2007). Two gram samples of each formulation were bagged in rectangular infusion tea bags (5cm×4cm) using an automatic tea bagging machine (Telesonic ST-101). Commercial Moringa herb tea (Newman Farms Ltd) was used as control. All bagged samples were stored in glass jars at between 28°C and 34°C away from sunlight. They were labeled accordingly for sensory analyses.

Preparation of infusions

Infusions (tea) were prepared from all bagged samples including the control. Ten (10) bags of each sample were placed in a glass jar and boiling water (1.5l) was poured into the jar. The formulations were allowed to infuse for 5 minutes.

Table 1: Proportion of Moringa Leaves and Roselle Calyces in Blended Product

Product code	Moringa leaves (%)	Roselle Calyces (%)
A	**90**	**10**
B	**80**	**20**
C	**70**	**30**
D	**60**	**40**
E	**50**	**50**
F	**40**	**60**
G	**30**	**70**
H	**20**	**80**
I	**10**	**90**
Control	**100**	**0**

Selection of panelists

Fifty (15) untrained panelists (9 female; 6male) were recruited from Benue state polytechnic campus for the acceptance tests. Panelists were mostly students aged between 18 and 24 years with few university staff. They were chosen on the basis of their availability, willingness and commitment to partake in the sensory evaluation.

Sample infusions were three-digit coded and served randomly to panelists. About 30 ml of each infusion was served in a 50 ml transparent cup. One sample was served at a time. Panelists were free to analyze the samples in any order of their choice. The sample infusions were approximately 60°C to 70°C at the time of tasting. Panelists were required to rinse their

mouths with warm water (about 60°C) before the commencement of tasting. To minimize possible carry-over effects. Panelists were also required to rinse their mouths thoroughly with warm water (about 60°C) after each tasting and wait 90 seconds before tasting the next sample. Panelists were not required to swallow all 30 ml of each sample; however they were asked to hold about 10 ml sample in the mouth for 5 seconds and swallow small quantities in order to appreciate the full sensory character of the beverage. Panelists were allowed to repeat tasting where necessary.

Scoring of samples

The panelists were instructed to score their acceptance for 6 attributes of the infusions: colour, aroma, flavor, aftertaste, astringency and overall acceptability. Where a panelist did not clearly understand the meaning of a particular attribute, explanation was provided. The panelists scored their acceptance of the attributes on the scale 1 to 10.

3.0 RESULTS

Acceptance tests

Table 2: Assessment of Colour Quality of Blended Product by panelist

Product code	Moringa leaves (%)	Roselle Calyces (%)	Mean score for Colour (%)
A	**90**	**10**	**0.9**
B	**80**	**20**	**1.5**
C	**70**	**30**	**3.5**
D	**60**	**40**	**4.3**
E	**50**	**50**	**4.4**
F	**40**	**60**	**6.4**
G	**30**	**70**	**7.1**
H	**20**	**80**	**8.3**
I	**10**	**90**	**7.6**
Control	**100**	**0**	**1.4**

Product G, H and I has the highest mean score of 7.1, 8.3 and 7.6 respectively. From the trend the three most preferred products (G, H and I) contained high proportions of Roselle (70%, 80% and 90%) respectively. Conversely, the three least preferred products (the control, A and B) contained the least proportion of Roselle (0%, 10% and 20%). This indicates that products with higher proportions of Roselle brewed infusions with a more appealing colour.

Table 3: Assessment of Aroma Quality of Blended Product by panelist

Product code	Moringa leaves (%)	Roselle Calyces (%)	Mean score for Aroma (%)
A	**90**	**10**	**2.4**
B	**80**	**20**	**2.9**
C	**70**	**30**	**3.3**
D	**60**	**40**	**4.2**
E	**50**	**50**	**5.6**
F	**40**	**60**	**8.3**
G	**30**	**70**	**7.3**
H	**20**	**80**	**5.8**
I	**10**	**90**	**5.5**
Control	**100**	**0**	**1.7**

Panelists showed the highest preference for the aroma of product F (8.3), followed by G (7.3), H (5.8), E (5.6) and 1 (5.5) in that order (Table 3). Four blends with the least proportions of Roselle and Lemon grass (A, B, C and D) were also the least preferred in aroma.

Table 4: Assessment of flavour Quality of Blended Product by panelist

Product code	Moringa leaves (%)	Roselle Calyces (%)	Mean score for Flavour (%)
A	**90**	**10**	**3.3**
B	**80**	**20**	**3.4**
C	**70**	**30**	**3.7**
D	**60**	**40**	**4.4**
E	**50**	**50**	**4.9**
F	**40**	**60**	**6.2**
G	**30**	**70**	**7.3**
H	**20**	**80**	**5.1**
I	**10**	**90**	**2.7**
Control	**100**	**0**	**3.1**

The product which brewed infusions with the most preferred flavour was G (7.3) followed by F (6.2), H (5.1), E (4.9) and D (4.4) in that order (Table 4). Infusions from control recorded the lowest score in flavor (3.1). Thus product G (7.3) was preferable to F (6.2) because the former contains higher Roselle (70%) than the latter (60% Roselle).

Table 5: Assessment of Aftertaste Quality of Blended Product by panelist

Product code	Moringa leaves (%)	Roselle Calyces (%)	Mean score for Aftertaste (%)
A	**90**	**10**	**0.9**
B	**80**	**20**	**2.3**
C	**70**	**30**	**3.6**
D	**60**	**40**	**4.1**
E	**50**	**50**	**4.7**
F	**40**	**60**	**6.1**
G	**30**	**70**	**7.7**
H	**20**	**80**	**4.6**
I	**10**	**90**	**3.4**
Control	**100**	**0**	**0.4**

Product control was however the most preferred product (7.9) followed by G (7.7), F (6.1) and E (4.7) (Table 5).

Table 6: Assessment of Astringency Quality of Blended Product by panelist

Product code	Moringa leaves (%)	Roselle Calyces (%)	Mean score for Astringency (%)
A	**90**	**10**	**2.3**
B	**80**	**20**	**3.3**
C	**70**	**30**	**3.6**
D	**60**	**40**	**3.8**
E	**50**	**50**	**4.6**
F	**40**	**60**	**6.9**
G	**30**	**70**	**7.8**
H	**20**	**80**	**4.1**
I	**10**	**90**	**3.0**
Control	**100**	**0**	**2.2**

Astringency is generally recognized as a feeling of extreme dryness or puckeriness that is not confined to a particular region of the mouth or tongue, but is experienced invariably as a diffuse stimulus (Haslam *et al.*, 1988). Product G (7.8) was the most preferred in astringency followed by F (6.9), E (4.6) and H (4.1) in that order (Table 6).

From the trend, products with low proportions of Roselle were least preferable in astringency. For example, products containing 20% Roselle or below – B (3.3), A (2.3) and the A (control) (2.2) – had the lowest scores in astringency. On the other hand, products with high proportions of Roselle such as G (7.8), F 6.9) and H (4.1) had corresponding high scores for astringency. The control had the lowest score for astringency.

Table 7: Assessment of Overall acceptability Quality of Blended Product by panelist

Product code	Moringa leaves (%)	Roselle Calyces (%)	Mean score for Overall acceptability (%)
A	**90**	**10**	**1.96**
B	**80**	**20**	**2.68**
C	**70**	**30**	**3.54**
D	**60**	**40**	**4.16**
E	**50**	**50**	**4.84**
F	**40**	**60**	**6.78**
G	**30**	**70**	**7.44**
H	**20**	**80**	**5.58**
I	**10**	**90**	**4.44**
Control	**100**	**0**	**1.76**

Product G had the highest mean score in over-all acceptability (7.44) (Table 7). This was expected as it was the most preferred product in colour (7.1) and flavour (7.3), aroma (7.3) and astringency (7.8). Conversely, the control was the least preferred product in overall acceptability (1.76). It scored the lowest preference for colour (1.4), aroma (1.7) and flavour (3.1).

DISCUSSION

Production of herbal tea from Moringa leaves, lemon peel powder and their blends is not only cost effective but can also serve nutritional and therapeutic purposes due to the chemical and phytochemical constituents of the product. The use of lemon peel powder in tea production

has added value to a material which ordinarily would have been disposed as waste. However, the astringency and bitterness of tea produced from both raw materials can be a downside in its full commercialization.

RECOMMENDATION

The herbal teas produced in this study have recorded significant nutrient contents. However, further studies can be done on the reduction of the astringency and bitterness of the tea produced in order to increase its market potential in the tea market.

Reference

Cho, H. S., Kim, S., Lee, S.Y., Park, J. A., Kim, S. J., & Chun, H. S. (2008). Protective effect of the green tea component, Ltheanine on environmental toxins-induced neuronal cell death. Neurotoxicology, 29(4), 656-662.

Geel L., Kinnear M. and De Kock H. (2005) Relating consumer preferences to sensory attributes of instant coffee. *Food Quality and Preference* 16, 237-244.

Kakuda, T. (2002). Neuroprotective Effects of the Green Tea components theanine and catechins. Biological and Pharmaceutical Bulletin, 25(12), 1513-1518.

Malhomme de la, R., Seagrove, S., Mehta, A., Divekar, P., Campbell, S., & Curnow, A. (2010). Using natural dietary sources of antioxidants to protect against ultraviolent and visible radiation- induced DNA damage: An investigation of human green tea ingestion. Journal of Photochemistry and Photobiology, 101, 169-173.

McKay D.L. and Blumberg J.B. (2002) The role of tea in human health: an update. *Journal of the American College of Nutrition* 21, 1-13.

Sayama K., Lin S., Zheng G. and Oguni I. (1999) Effects of green tea on growth, food utilization and lipid metabolism in mice. *In vivo (Athens, Greece)* 14, 481-484.

Schmidt M., Schmitz H.-J., Baumgart A., Gue-don D., Netsch M., Kreuter M.-H., Schmid-lin C. and Schrenk D. (2005) Toxicity of green tea extracts and their constituents in rat hepatocytes in primary culture. *Food and Chemical Toxicology* 43, 307-314.

Ravikumar, C. (2014). Review on Herbal Teas. Journal of Pharmaceutical Sciences and Research, 6(5), 236-238.

Xu, P., Bao, J., Gao, J., & Zhang, F. F. (2010). Optimization of extraction of phenolicantioxidants from tea (Camellia senensis L.) fruit peel biomass using response surface methodology. BioResources, 7(2),2431-2443.