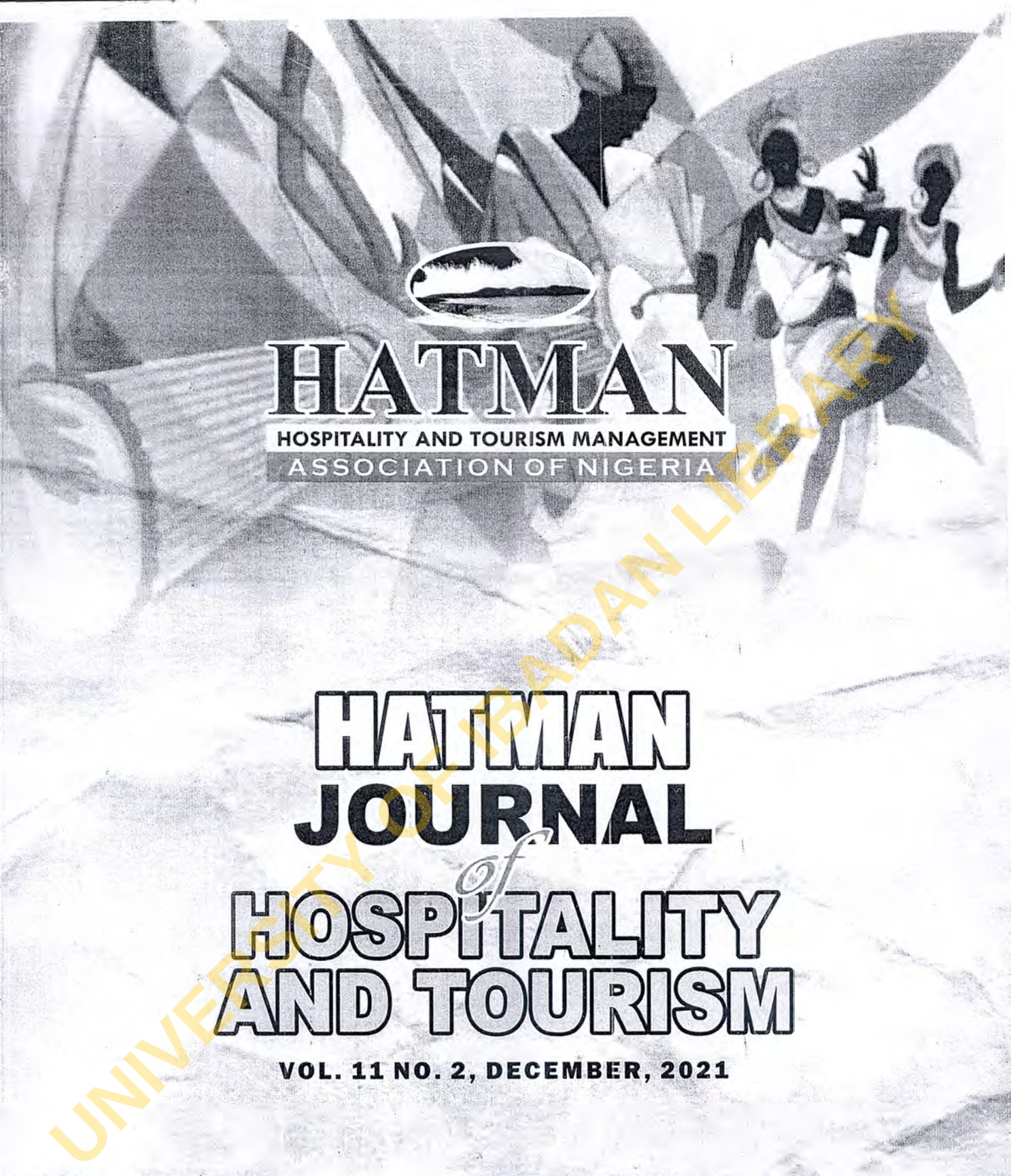

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# ACCEPTABILITY OF PROCESSED TIGER NUT (Cyperpus esculentus) MILK BY VISITORS IN AGODI GARDENS OF IBADAN, OYO STATE, NIGERIA

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## ABSTRACT

*The acceptability of processed tiger nut (Cyperpus esculentus) milk by visitors to Agodi Gardens, Ibadan was assessed. Tiger nut was mechanically processed into milk, packaged in plastic sample bottles and presented to 70 selected visitors in the garden. Data collected were analysed using descriptive statistics, multiple regression and Spearman correlation at α0.05. The results revealed that most respondents were female (54.3%), single (65.7%), and possessed tertiary education (86.6%). Majority (72.1%) were aware of tiger nut milk, out of which 55.7% have taken it before. The colour of the product was ranked highest (1.60±0.75). This was followed by the ranking of the packaging material (1.77±0.95) and taste (2.14±2.08). The least ranked characteristics were flavour (2.34±1.13) and aroma (2.36±0.95). The overall acceptability (1.86±0.80) of the product was high. Taste, flavour and aroma significantly (p<0.005) influenced overall acceptability. The taste, aroma and flavour of the beverage should be enhanced using fruits like Pineapple, Strawberry, Apple and Orange. Sweetener like Honey or Coconut milk can also be used to enhance the taste and flavour, in order to make it more appealing to the consumers.*

**Keywords:** *Acceptability, Agodi Gardens, Visitor, Tiger nut milk.*

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## INTRODUCTION

Healthy drinks have become an issue of interest as awareness is moving towards sugar free, additive free and more natural drink, given the recent trend in most soft drinks containing high sugar, high pesticide residue and their attendant health risk (Eke-Ejiofor and Beleya, 2018). Drinks obtained from plant origins have therefore become increasingly popular. One of such is tiger nut. Tiger nut belongs to the family, Cyperaceae and genus Paprus that is, an emerging grass like plant (Oguwike et al, 2017). Tiger nut has varieties which include black, brown and yellow, and the latter is the most common one (Oguwike et al, 2017). Tiger nut is also known as Zulu nut, yellow nut grass, Ground almond, Chafa, Edible rush. In Nigeria, the Hausa's call it Aya, Yorubas call it Imumu and Aki Hausa in Igbo (Omode et al, 1995). Tiger nut can be eaten raw, dried, roasted or grated and used as flour or vegetable milk (Ogbonna et al, 2013). It is pressed for its juice to make beverage called "Chufa" (Belewu and Belewu, 2007).

In North Africa, the tubers are consumed in their natural form or after being soaked in the water for some hours. In Spain, the tubers are consumed mainly as local drink call Horchata De Chafa (Allouh et al, 2015). Substantial amount of oil and milk are also found in Tiger nut (Asante et al, 2014).

Tiger nut milk is a very nutritive and energetic drink both for the old and young (Eke-Ejiofor and Beleya, 2018). It is cheap to obtain compared to animal milk (Udeozor, 2012). Tiger nut milk is rich in starch, glucose, protein, minerals like potassium, phosphorus and vitamins E and C, and has never been found to provide allergy (Belewu and Abodunrin, 2008). Bamishaiye and Bamishaiye, (2011) reported that tiger nut drink is a rich source of unsaturated fats and some enzymes which help in digestion, while Chevalier, (1996) reported that the drink contains more iron, magnesium and carbohydrate than the cow's milk. It can also be used as an ingredient in food and beverage industry because it is a source of natural antioxidants like phenolic compounds (Zapata et al, 2012).

The milk can be used specifically used in preparing biscuit and ice cream. Tiger nut milk is also known as 'Chafa De horchata' in Spain (where it originated from), 'Atadwe' in Ghana and 'KunnuAya' in Nigeria (Asante et al, 2014; Ogbonna et al, 2013). Tiger nut milk is very popular and of great economic value in Spain, and has been shown to have increased potential in other countries (Manga, 2016).

In Nigeria, tiger nut milk is mostly consumed in the northern part of the country, and has not been generally accepted in other parts of Nigeria. Perhaps, this may account for why it has low consumption and acceptability in those areas. Hence this food and drink remain an integral part of tourism, as tourists do not only participate in tourism activities but also explore the local foods and drinks available in such areas. Tourism destination attracts people of all ages and classes, thus provides a ready-made market to bring an under-utilized product to the attention of many in a tourism destination. This study therefore assessed the acceptability of tiger nut milk among tourists' visiting Agodi Gardens in Ibadan, Oyo State, Nigeria.

## METHODOLOGY

### Study area

This research was carried out at Agodi Gardens, Ibadan, Oyo State, which was established in the year 1967, has a land mass of 150 acres, and was then managed by the western region government. Agodi Gardens was formerly named Agodi Zoological and Botanical Garden (Obwekwe, 2017). This tourist site was established in 1977 (Obwekwe, 2017). Agodi Gardens is close to the University Teaching Hospital (UCH), Premier hotel, Oyo State Secretariat and the popular Bodija market in Ibadan. Attraction found within Agodi Gardens includes, a mini zoo not open to the public for now, restaurant, picnic spots, swimming pools and an amusement park for children (Obwekwe, 2017). Other activities that are being carried out within Agodi Gardens include, photo shots, picnics, garden parties, outdoor events, concerts and wedding.

### Preparation of Tiger nut milk

Cyperus esculentus was purchased at Ojoo market, Ibadan, Southwest Nigeria. Tiger nut milk was prepared in the Department of Wildlife and Ecotourism Management, University of Ibadan laboratory, by adopting the methods of Manga (2016). In this method, the tiger nuts were sorted, thoroughly washed, and soaked in water for about eight hours, after which they were finely grinded and allowed to settle for about ten minutes. The solution was then strained and pressed through a clean muslin to extract the tiger nut milk fluid. Then, the milk was packaged in a thermoplastic bottle which was labelled to give brief information about the product.

### Sensory evaluation

Sensory evaluation test was used to determine how well the sample was liked, using the Hedonic scale. A Five-point scale was used to rate the samples where judges were requested to rank samples according to their preference thus: 1-Like Extremely, 2-Like Slightly, 3-Neutral (Neither Like nor Dislike), 4-Dislike Slightly and 5- Dislike Extremely. Seventy (70) copies of questionnaire and sensory evaluation form were administered to the respondents using purposive sampling technique. The sensory evaluation was conducted using seventy panel of judges made of the tourist within Agodi gardens. The attributes that were evaluated are colour, aroma, taste, over all acceptability and packaging material.

### Data analysis

Using Statistical Package for Social Sciences version 21, data were subjected to descriptive statistics, Spearman correlation and multiple regression.

## RESULTS

### Socio-demographic Characteristics of respondents

This is presented on Table 1. Most respondents were between 18 – 23 (44.3%) and 24 – 28 (28.6%) age groups. Exactly 54.3% were female while 45.7% were male. The bulk of the respondents (94.3%) were Nigerians while 5.7% were foreigners. Most visitors were Christians (75.7%). Quite a large number of the respondents visited from Oyo (35.7%) and Osun (25.7%) states. The most dominant ethnic group was Yoruba (91.4%). Majority of the respondents were single (65.7%) while 34.3% were married. The respondents largely possessed tertiary education (68.6%) followed by those with secondary education (30%). Students constituted the bulk of the visitors in the garden (48.6%). This was followed by those that were self-employed (22.9%) and civil servants (18.6%). Half of the respondents (50%) earned not more than ₦50,000 while 21.4% earned between ₦51,000 and ₦100,000.

Table 1: Socio-demographic characteristics of visitors to Agodi Gardens

| Socio-demographics | Characters | Frequency | Percentage |
|---|---|---|---|
| Age | 18-23 | 31 | 44.3 |
| | 24-28 | 20 | 28.6 |
| | 29-33 | 10 | 14.3 |
| | 34-38 | 4 | 5.7 |
| | 39&above | 5 | 7.1 |
| Gender | Male | 32 | 45.7 |
| | Female | 38 | 54.3 |
| Nationality | Nigerian | 66 | 94.3 |
| | Foreigners | 4 | 5.7 |
| Religion | Islam | 17 | 24.3 |
| | Christianity | 53 | 75.7 |
| State visiting from | Oyo | 25 | 35.7 |
| | Osun | 18 | 25.7 |
| | Lagos | 9 | 12.9 |
| | Ogun | 8 | 11.4 |
| | Ondo | 5 | 7.1 |
| | Edo | 2 | 2.9 |
| | Ekiti | 2 | 2.9 |
| | Plateau | 1 | 1.4 |
| Ethnic group | Yoruba | 64 | 91.4 |
| | Igbo | 3 | 4.3 |
| | Hausa | 1 | 1.4 |
| | Benin | 2 | 2.9 |
| Marital status | Single | 46 | 65.7 |
| | Married | 24 | 34.3 |
| Educational level | Primary education | 1 | 1.4 |
| | Secondary education | 21 | 30.0 |
| | Tertiary education | 48 | 68.6 |
| Occupation | Student | 34 | 48.6 |
| | Civil servant | 13 | 18.6 |
| | Public servant | 4 | 5.7 |
| | Self employed | 16 | 22.9 |
| | Private employee | 1 | 1.4 |
| | Corp member | 1 | 1.4 |
| Monthly income | =50000 | 35 | 50.0 |
| | 51000-100000 | 15 | 21.4 |
| | 101000-150000 | 6 | 8.6 |
| | 151000-200000 | 5 | 7.1 |
| | >200000 | 4 | 5.7 |

## Visitors' awareness, knowledge and preference for tiger nut milk

Most respondents (72.1%) were aware of tiger nut milk, out of which 55.7% have taken it before. Thirty percent and 32.5% of the respondents noted that they consume it on a weekly and monthly basis respectively. Majority (75%) noted that there was no resulting allergic reaction from the consumption of the milk. However, 57.1% indicated that they do not prefer tiger nut milk to other milk types. The bulk of the respondents; 85.5% and 84.3% were not aware of the nutritional and health benefits of tiger nut milk.

**Table 2: Awareness and preference for tiger nut milk by visitors to Agodi Gardens**

| Statement | Characters | Frequency | Percentage |
|---|---|---|---|
| Awareness of tiger nut milk | Yes | 49 | 72.1 |
| | No | 19 | 27.9 |
| Prior consumption of tiger nut milk | Yes | 39 | 55.7 |
| | No | 31 | 44.3 |
| Frequency of consumption | Daily | 1 | 2.5 |
| | Weekly | 12 | 30.0 |
| | Monthly | 13 | 32.5 |
| | Bi-monthly | 9 | 22.5 |
| | Bi-annually | 5 | 12.5 |
| Any resulting case of allergic reactions to tiger nut milk | Yes | 2 | 5.0 |
| | No | 30 | 75.0 |
| | Not sure | 8 | 20.0 |
| Preference of tiger nut milk to other milk types | Yes | 11 | 15.7 |
| | No | 40 | 57.1 |
| | Indifferent | 19 | 27.1 |
| Knowledge of the nutritional benefits of tiger nut milk | Yes | 7 | 10.1 |
| | No | 59 | 85.5 |
| | Indifferent | 3 | 4.3 |
| Nutritional benefits | Gives energy | 6 | 8.6 |
| | Weight maintenance | 2 | 2.9 |
| Knowledge of the health benefits of tiger nut milk | Yes | 8 | 11.4 |
| | No | 59 | 84.3 |
| | Indifferent | 3 | 4.3 |
| Health benefits | Reduction in colon cancer | 2 | 2.9 |
| | Sexual stimulant | 3 | 4.3 |

## Organoleptic characteristics of tiger nut milk

The colour of the product was ranked highest (1.60±0.75). This was followed by the ranking of the packaging material (1.77±0.95) and taste (2.14±2.08). The least ranked characteristics were flavour (2.34±1.13) and aroma (2.36±0.95). The overall acceptability (1.86±0.80) of the product was high.

**Table 3: Organoleptic characteristics of tiger nut milk**

| Characteristics | Like extremely | Like slightly | Neither Like/ Dislike | Dislike slightly | Dislike extremely | Mean | Standard deviation | Rank |
|---|---|---|---|---|---|---|---|---|
| Colour | 54.3 | 32.9 | 11.4 | 1.4 | 0 | 1.60 | 0.75 | 1 |
| Taste | 31.4 | 37.1 | 22.9 | 2.9 | 5.7 | 2.14 | 1.08 | 3 |
| Flavour | 25.7 | 34.3 | 25.7 | 8.6 | 5.7 | 2.34 | 1.13 | 4 |
| Aroma | 17.1 | 44.3 | 25.7 | 11.4 | 1.4 | 2.36 | 0.95 | 5 |
| Packaging material | 48.6 | 34.3 | 10.0 | 5.7 | 1.4 | 1.77 | 0.95 | 2 |
| Overall acceptability | 37.1 | 42.9 | 17.1 | 2.9 | 0 | 1.86 | 0.80 | |

## Test of relationship between visitors' overall acceptability and colour, taste, flavour, aroma and packaging material

Using the Spearman Rank Correlations on the relationship between colour, taste, flavour, aroma and packaging material with overall acceptability Table 4 shows that an improvement in the taste, flavour and aroma of the tiger nut milk would result to increase in acceptability of the product, and that visitors' overall acceptability was not influenced by colour and packaging material.

**Table 4: Test of relationship between visitors' overall acceptability of tiger nut milk and other organoleptic characteristics**

| | Correlation coefficient | Sig (2-Tailed) |
|---|---|---|
| Colour | 0.213 | 0.076 |
| Taste | 0.357 | 0.002* |
| Flavour | 0.355 | 0.003* |
| Aroma | 0.419 | 0.000* |
| Packaging material | 0.146 | 0.229 |

(* - significant)

**Test of relationship between visitors' personal characteristics and overall acceptability of tiger nut milk**

Using the Multiple Linear Regression to find the relationship between visitors' socio-demographic characteristics and overall acceptability of tiger nut milk Table 5 shows that none of the ten variables of the visitors' personal characteristics (age, gender, nationality, religion, state of origin, ethnic group, marital status, educational level, occupation and monthly income) added statistically significantly to the prediction, $p>0.05$. In other words, the visitors' personal characteristics do not influence their overall acceptability of tiger nut milk (Table 5).

**Table 5: Test of relationship between visitors' personal characteristics and overall acceptability of tiger nut milk**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 1.572 | 0.984 | | 1.597 | 0.116 |
| Age | -0.123 | 0.126 | -0.190 | -0.974 | 0.334 |
| Gender | -0.036 | 0.233 | -0.023 | -0.156 | 0.876 |
| Nationality | 0.388 | 0.487 | 0.117 | 0.797 | 0.429 |
| Religion | -0.035 | 0.260 | -0.018 | -0.134 | 0.894 |
| State Of Origin | -0.014 | 0.075 | -0.030 | -0.194 | 0.847 |
| Ethnic Group | -0.293 | 0.216 | -0.220 | -1.358 | 0.180 |
| Marital Status | 0.193 | 0.300 | 0.116 | 0.642 | 0.523 |
| Educational Level | 0.124 | 0.214 | 0.082 | 0.580 | 0.564 |
| Occupation | -0.014 | 0.101 | -0.024 | -0.137 | 0.892 |
| Monthly Income | 0.039 | 0.111 | 0.062 | 0.352 | 0.726 |

## Discussion

Visitors to Agodi Gardens were mostly females (54.3%). The percentage was however close to that of the male respondents (45.7%), giving an almost equivalent representation of both genders in the Garden. Most visitors were between 18 –28 years of age. This population was youths, who according to Adefalu *et al.* (2014), are energetic individuals, who are full of live and have a great love for adventure. Moreso, there was also an observed decline in percentage representation as age increased. Majority of the respondents were single (65.7%). Arowosafe and Adebayo (2014) opined that single individuals have more liberty and less economic burden; hence they are likely higher in number than their married counterpart. Visitors with at least one form of education or the other has been observed to dominate most tourism destinations, with the highest representation being people with tertiary and secondary education (Ajayi *et al,* 2017). This was also reported in this study as respondents largely possessed tertiary education followed by those with secondary education. The bulk of the respondents (94.3%) were Nigerians while 5.7% were foreigners. While this reflected a low influx of international visitors to the garden, the findings align with the research works of Ajayi *et al,* (2017) which noted that domestic visitors constitute ready-made market for any tourism destination. Also, most visitors were from the Oyo state, where the Garden is located. Other visitors were form adjoining states such as Osun and Lagos States. This finding is consistent with Ryan and Saward (2004) which noted that visitors to biological gardens were mostly from the local catchment areas. Likewise, most visitors were Yoruba (91%), a default ethnic group of people in the southwestern part of Nigeria where the Garden is situated. Students constituted the highest number of visitors in the garden. Half of the respondents earned not more than ₦50,000 on a monthly basis. Given that the visitors were mostly students; this monthly income rate is highly unlikely. Tiger nut milk seems to be a well-known drink among the visitors as majority (72.1%) were aware of the drink, out of which 55.7% have consumed it before. On the frequency of consumption, most respondents noted that they take it on a weekly and monthly basis. Furthermore, most visitors also noted that there was no resulting allergic reaction from the consumption of the tiger nut milk. The preference for this milk when compared with other milk types was however very low at 15.7%. The result further revealed that the highest percentages of visitors were not aware of the nutritional and health benefits of tiger nut milk.

The organoleptic rating of tiger nut milk by visitors to the garden revealed that colour of the product was ranked highest. Colour has been proven to be a significant attribute of food and drink which is critically evaluated by consumers and often times form the basis for the acceptance or rejection of products (Mendoza *et al,* 2007). The prepared tiger nut milk was whitish in colour. The packaging material used was ranked second. Packaging is also another crucial aspect of product attribute that improves consumer's perception towards consumption, as it either attracts or repels the consumers. The product was packed in a small transparent plastic bottle like yoghurts, with label containing information on the contents.

Furthermore, the taste of the product ranked third. Meludu, (2010) opined that taste of any food and drink forms an influential reason in the choice of it. While a product may have an attractive colour and packaging which sustains attraction, the actual participation and continued experience of it depends on the taste. The least ranked attributes were flavour and aroma. This may be because no natural or artificial spice was added to it.

Tiger nut milk had a high overall acceptability among the visitors (80%) to Agodi Gardens. Overall acceptability of the product had a positive correlation with taste, flavour and aroma. In other words, an improvement in the taste, flavour and aroma of the tiger nut milk will translate to an increased acceptability of the product. On the other hand, colour and packaging materials which visitors were ranked highest amongst the organoleptic attributes do not have a significant correlation with overall acceptability. The influence of personal characteristics in influencing overall acceptability was also tested, and no significant association was found to exist. It can be inferred that whether young or old, male or female, married or single, Nigerian or foreigners, their perception of the overall acceptability of the product was similar.

## CONCLUSION

Visitors to Agodi Gardens had a high overall acceptability of tiger nut milk. The taste, flavour and aroma of the milk were found to correlate with the overall acceptability. An improvement in these attributes will lead to a greater acceptability of the product. It is recommended that the taste, aroma and flavour of the beverage should be enhanced using fruits like Pineapple, Strawberry, Apple, Orange and others. Sweetener like Honey, Coconut milk can also be used to enhance the taste and flavour, in order to make it more appealing to the consumers. In addition, Tiger nut milk must be made available in tourist site and must be accessible like other beverage types in order to increase its consumption by people. This will impress tourists and there will be an increase in patronage in the tourist site.

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