



CONSUMER ACCEPTABILITY OF OKRA (*Abelmoschus esculentus*) CALYX FLOUR SOUP

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Abstract The study investigated the consumer acceptability of okra calyx flour soup. Four okra calyx flour samples were used to prepare soups and its sensory acceptability was evaluated. The result showed that values of difference test of the soups ranged from 5.45 – 5.80, 5.20 – 5.61, 6.05 – 6.83 and 5.45 – 5.90 for sliminess, aroma, colour and taste respectively. The results showed that the sliminess, aroma and taste of okra calyx soups prepared from all the varieties were rated as “equal to” the sliminess, aroma and taste of okra soup while the colour of all okra calyx flour soups was slightly deeper than the colour of okra soup. The result of preference test of okra calyx soups showed that there were significant differences ($p < 0.05$) in the values obtained for sliminess, aroma, colour, taste and overall acceptability with mean sensory score ranged from 6.74 – 7.90, 6.90 – 7.72, 6.26 – 7.60, 6.80 – 7.76 and 6.76 – 7.58 for sliminess, aroma, colour, taste and overall acceptability respectively. The results showed that the sliminess, aroma and overall acceptability of okra calyx flour soups prepared from *Ex-kwadon*, *Solar* and *Syria* varieties were rated ‘like moderately’ while the colour of soups prepared from *Ex-kwadon* and *Syria* varieties were rated ‘like moderately’. Also, taste of okra calyx flour soups prepared from *Ex-kwadon*, *Chalawa* and *Syria* varieties were rated ‘like moderately’. The study showed that all attributes of okra calyx flour soups were acceptable by the consumers and utilization of okra calyx flour in the preparation of soup is practically possible.

Keywords: okra pod, calyx, flour, consumer, sensory acceptability

Introduction

Okra (*Abelmoschus esculentus* L.), which belongs to the family of Malvaceae is an annual vegetable plant cultivated for its edible fruits (Ogbuehi *et al.*, 2017; Li *et al.*, 2019). Okra is identified by several local names in numerous parts of the continents (Gemedede *et al.*, 2015). Okra is known as “ila” by Yoruba people in south-western and “kubewa” by Hausa people in northern part of Nigeria. Okra is commonly utilized crop and grown in both tropical and sub-tropical nations (Eze and Akubor, 2012). It is among the oldest grown crops and easily available in various nations in the world (Chanchal *et al.*, 2018). Harvesting of okra fruits could take place 2-3 months of planting and about one week after flowering with respect to variety cultivated (Adétuyi *et al.*, 2011). Okra is regarded as a plant with multiple uses since its fruits, seeds and leaves are used (Das *et al.*, 2019). Okra is esteemed for its tasty and healthy pods in all parts of the continents (Sonka *et al.*, 2015). Okra pod is abundant in protein, vitamins, potassium and mineral contents (Chanchal *et al.*, 2018; Pandre *et al.*, 2018). Okra pods contained plenty dietary fibres which are helpful in treatment of diabetic problem and in reducing high level of cholesterol (Das *et al.*, 2019). Okra is mainly utilized fresh in preparation of soups or sauces which give

mucilaginous solution (Ahiakpa *et al.*, 2014; Gemedede *et al.*, 2015). Okra mucilage is fit for industrial and medical purposes (Eze and Akubor, 2012). The mucilaginous content in okra pods aids in stabilizing the sugar contents in blood by restraining the amount of sugar used up by intestinal tract (Sonka *et al.*, 2015). Okra is a popular trade commodity in almost all African markets and utilized mostly every day (Ahiakpa *et al.*, 2014). Okra pods could be utilized fresh or processed by drying to extend the shelf life for future use (Eze and Akubor, 2012). Fruits and vegetables are significant nutritional crops for human in various countries in the world because they are cheap and commonly obtainable (Ekwumemgbo *et al.*, 2014). During processing of okra pods, calyx is usually cut off and considered as a waste. That is, the pulp and seed of the okra pods are normally utilized as a food. In literature, numerous works on okra soup has been reported by several authors, but there is dearth of information on okra calyx soup. However, Omoniyi *et al.* (2020) reported that okra calyx flour contains high amount of ash, crude protein and crude fibre contents with appreciable quantity of potassium, magnesium and vitamin C contents. Also, there is scanty information about the domestic and industrial utilization of the okra calyx. Thus, there is need to

investigate the domestic utilization of the calyx since okra pod is cheap and usually available throughout the year. Therefore, this study is aimed to prepare okra calyx flour soups and evaluate the consumer acceptability of the soup.

Materials and Methods

Materials

Four varieties (*Chalawa*, *Ex-kwadon*, *Solar* and *Syria*) of okra pods was purchase in Gombe, Gombe state, Nigeria. The varieties of okra pods were identified by the Staff in the Department of Agronomy, Federal University, Gashua, Nigeria.

Preparation of okra calyx flour

Okra pods were sorted, washed with portable water and calyx were removed from the pods. The calyces (figure 1) were cut into smaller sizes (2-4mm thick), sun-dried for four days, milled, sieved and packaged in air-tight packaging material (figure 2).

Recipe and preparation of okra calyx flour soup

The formulated recipe used for the preparation of okra soup and okra calyx flour soups is shown in Table 1. The beef was washed thoroughly. Maggi® cube, Dangote iodized salt, ground onion, and curry powder was added to the beef and boiled for 15 minutes. ‘Iru’, palm oil, ground pepper and crayfish was added and allowed to boil for 10 minutes. The okra calyx flour was added and blended together to achieve consistency soup solution. The soup was then allowed to boil for about 5 minutes.

Sensory evaluation of soup

The four okra calyx flour soups were coded and presented to Panelists who are regular consumers of okra soup. They are requested to assess the difference test and preference test of the soup samples using questionnaires. Twenty consumers (Panelists) of okra soup were asked to compare each coded sample of okra calyx flour soup with the Reference sample (R = okra soup) using the sensory attributes: sliminess, aroma, taste and colour on a scale of 1 to 9 (extremely less than R = 1, much less than R = 2, moderately less than R = 3, slightly less than R = 4, no difference between sample and R = 5, slightly more than R = 6, moderately more than R = 7, much more than R = 8, extremely more than R = 9) as described by Iwe (2002). Also, for the preference test of the soups, coded four okra calyx flour soups were presented to fifty (50) consumers and asked to indicate their preference for sliminess, aroma, colour, taste and overall acceptability of the samples using 9-point hedonic scale (dislike extremely = 1, dislike very much = 2, dislike moderately = 3, dislike slightly = 4, neither like nor dislike = 5, like slightly = 6, like moderately = 7, like very much = 8, like extremely = 9) as described by Iwe (2002).

Statistical analysis

All the data (responses) from panelists were analyzed using Analysis of variance (ANOVA) and where there is significant difference, means were separated using Duncan’s multiple range test. Statistical analysis was carried out using SPSS version 21.0 software.

Results and discussion

Table 2 shows the sensory qualities (difference test) of okra calyx flour soup. There are significant differences ($p < 0.05$) in the values of colour. The values of difference test for the soup ranged from 5.45 – 5.80, 5.20 – 5.61, 6.05 – 6.83 and 5.45 – 5.90 for sliminess, aroma, colour and taste respectively. The results showed that the sliminess, aroma and taste of okra calyx soup prepared from all the varieties were rated as “equal to” the sliminess, aroma and taste of okra soup while the colour of all okra calyx flour soup was slightly deeper than the colour of okra soup. This result showed that the colour of okra calyx flour soups were brighter than the colour of okra soup. However, colour is the first sensory attribute to be perceived by the panelists and this is line with Sharif *et al.* (2017) who revealed that appearance is first feature perceived by human senses which contributed major part in identification and selection of food products. The results showed that okra calyx flour soup prepared from *Ex-kwadon* variety was rated highest in all sensory qualities while okra calyx flour soup prepared from *Solar* variety was rated lowest in terms of sliminess, aroma and colour. However, the soup prepared from *Chalawa* variety was rated lowest in terms of taste. The result of difference test of the soups showed that all the attributes (sliminess, aroma, colour and taste) were highly comparative to the attributes of okra soup. Table 3 shows the sensory qualities (Preference test) of okra calyx flour soups. There are significant differences ($p < 0.05$) in the values obtained for sliminess, aroma, colour, taste and overall acceptability of the okra calyx flour soups. The values obtained were ranged from 6.74 – 7.90, 6.90 – 7.72, 6.26 – 7.60, 6.80 – 7.76 and 6.76 – 7.58 for sliminess, aroma, colour, taste and overall acceptability respectively. The results showed that okra calyx flour soup prepared from *Syria* variety was rated highest in term of sliminess while okra calyx flour soup prepared from *Ex-kwadon* variety was rated highest in aroma, colour, taste and overall acceptability. However, the okra calyx flour soup prepared from *Chalawa* variety was rated lowest in terms of sliminess, aroma, colour and overall acceptability while the okra calyx flour soup prepared from *Solar* variety was rated lowest in term of taste. Also, the results showed that the sliminess, aroma and overall acceptability of okra calyx flour soups prepared from *Ex-kwadon*, *Solar* and *Syria* varieties were rated ‘like moderately’ while okra calyx flour soup prepared from *Chalawa* variety was

rated 'like slightly'. The colour of okra calyx flour soups prepared from *Ex-kwadon* and *Syria* varieties were rated 'like moderately' while the colour of okra calyx flour soups prepared from *Solar* and *Chalawa* varieties were rated 'like slightly'. The taste of okra calyx flour soups prepared from *Ex-kwadon*, *Chalawa* and *Syria* varieties were rated 'like moderately' while the taste of okra calyx flour soup prepared from *Solar* variety was rated 'like slightly'. Thus, the results showed that all the attributes of the okra calyx flour soups were acceptable by the panelists.

Conclusion

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Figure 1: Okra calyces

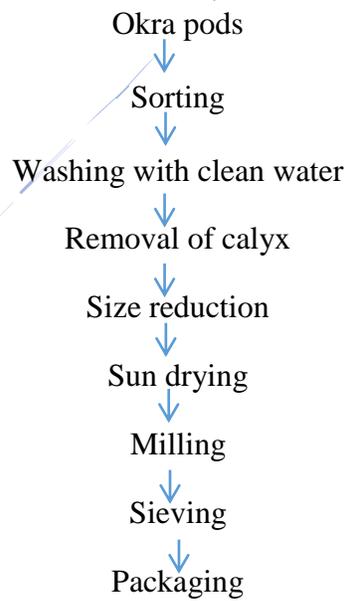


Figure 2: Flow chart showing the production of okra calyx flour

Table 1: Formulated recipe for the preparation of okra calyx flour soup

| Ingredient | Quantity |
|----------------------|----------|
| Okra calyx flour | 30g |
| Cray fish | 6g |
| Beef | 350g |
| Palm oil | 175ml |
| Maggi® cube | 20g |
| Dangote iodized salt | 6g |
| Ground onion | 20g |
| Ground pepper | 17g |
| “Iru” | 5g |
| Water | 80ml |
| Curry powder | 2g |

Table 2: Sensory qualities (difference test) of okra calyx soup

| Soup sample | Sliminess | Aroma | Colour | Taste |
|------------------|-------------------|-------------------|--------------------|-------------------|
| <i>Ex-kwadon</i> | 5.80 ^a | 5.61 ^a | 6.85 ^a | 5.90 ^a |
| <i>Solar</i> | 5.45 ^a | 5.20 ^a | 6.05 ^b | 5.55 ^a |
| <i>Chalawa</i> | 5.50 ^a | 5.60 ^a | 6.35 ^{ab} | 5.45 ^a |
| <i>Syria</i> | 5.65 ^a | 5.45 ^a | 6.45 ^{ab} | 5.75 ^a |

Mean values with different superscript within the same column are significantly different ($p < 0.05$)

Table 3: Sensory qualities (preference test) of okra calyx soup

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| Soup sample | Sliminess | Aroma | Colour | Taste | Overall acceptability |
|------------------|--------------------|--------------------|-------------------|--------------------|-----------------------|
| <i>Ex-kwadon</i> | 7.74 ^a | 7.72 ^a | 7.60 ^a | 7.76 ^a | 7.58 ^a |
| <i>Solar</i> | 7.24 ^{ab} | 7.32 ^{ab} | 6.54 ^b | 6.82 ^c | 7.14 ^{ab} |
| <i>Chalawa</i> | 6.74 ^b | 6.90 ^b | 6.26 ^b | 7.08 ^{bc} | 6.76 ^b |
| <i>Syria</i> | 7.90 ^a | 7.16 ^{ab} | 7.30 ^a | 7.56 ^{ab} | 7.36 ^{ab} |

Mean values with different superscript within the same column are significantly different ($p < 0.05$)