Production and Proximate Analysis of Jam (food spread) prepared from Cola Pachycarpa Fruit

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Abstract
Production of jam and proximate analysis of jam from cola pachycarpa was undertaken in this study. The jam was compared with the (control) orange jam for proximate composition. It was revealed that the moisture content of the cola jam was (90.8) lower than that of orange jam which was 96.3, while it had a higher carbohydrate of 5.86 than that of orange 3.00. Cola pachycarpa jam was well tolerated just as the orange jam in colour, flavour and texture.

Introduction
The feeding habits of the people of Abia State, Nigeria, are dominated by the starchy foods of root and tuber usually taken with soups of various vegetables, in addition to the bulky foods such as yam, cassava, cocoyam, and plantain. The people consume a wide range of fruits and seeds outside mealtimes such as during reception of visitors, opening ceremonies, making of vows and pledges at marriages, among others (Nmeregini, 2005). Many of these fruits are often harvested from wild or protected plants. Many are often packaged as special gifts to friends and relations resident in within and outside Nigerian (Keay, 1989). The demand for and consumption of these fruits and seeds cut across different age brackets, status and literacy levels. Thus, an account of the feeding habits of the people of Abia State will be incomplete without mention of these non-formal but vital food items like cola lepidota and cola pachycarpa of the family of sterculiacese, paper fruit star apple among others (Okigbo, 1985).

Cola pachycarpa is a fruit of the family of sterculiacae and belongs to a group called drupes cultivated generally through the tropical regions of the world and used fresh, cooked in pastries, or preserved by canning or drying (Pamplona-Roger, 2008). Cola pachycarpa trees are large and spreading with heart-shape, dark green leaves, and white flowers. The fruit is nearly smooth and generally
similar to the peach in shape when ripped (Quintana, 2007). Colas of the family of steruliacae are good source of vitamin A and high in natural sugar. Dry cola is also an excellent source of iron (Jill, 1996).

There are many species of cola grown throughout the region. These present great genetic diversity in the tree size, stress tolerance, bloom date and fruit quality. According to Quintana (2007), cola changes in varieties depending on the area of cultivation and climatic condition. Despite all these, the fruits are excellent sources of vitamins and minerals such as pro vitamins D, E and K which are fat soluble vitamins (Sponsor link, 2008).

Jams are food made by boiling fruit and sugar to a thick consistency and it is used in eating foods like bread, biscuits, pies etc (Merriam-Webster, 2000). Pamplona-Roger (2008) stated that jams are prepared by combining sugar, pectin, and citric or lemon juice with fruit and then heating the mixture till thick consistency is obtained. They are made from two main ingredients, fruit and sugar. The fruit has to contain plenty of pectin and acid for the jam to set properly. Pectin is a polysaccharide and its molecules consist of large number of simple sugar-like molecules connected to form a long thread like molecules. During gel formation the long molecules link closely together to form a three dimensional networking which gives the gel its stability. If the pectin molecules are too short, the gel may lack strength and so will be runny or soft. According to Jill (1999) and Amazonwu-Bello, (1989) jam obtained from ripped fruit is not as good as that obtained from unripe fruit because of their pectin content since unripe fruit is usually more acidic than ripped fruit. The fruit used for jam making should be fresh and are best when firmly ripped. It is at this stage that the fruits are best in pectin and acid content levels.

Cola fruits vary in variety in most regions, which make it unknown by so many people and also not been appreciated enough by people. Jam especially ones made from cola has not been given a pride of place in the diet of Abians and Nigerians as a whole, as a food spread on the breakfast tables (Nmeregini 2005). Cola pachycarpa has a very low shelf life, which makes it difficult to preserve during seasonal glut but when the fruit is processed into jam, the shelf life will be prolonged and wastages of the fruits will be drastically reduced.

In Nigeria food industries, cola pachycarpa jam has not been adequately processed. The country still imports foreign processed foods of which jam is one of them. Therefore, there is a need for research into the use of cola pachycarpa in jam production to save our foreign earnings, create employment for the youths, farmers and increase food availability.
Specific objectives of the study
The main objective of the study was the production and proximate analyses of jam from *cola pachycarpa*. Specifically the objectives were to:
- Prepare jam from *cola pachycarpa* fruit (*Achicha in Igbo*).
- Determine the proximate analysis of the jam.

Materials and methods:
The cola fruit, lemon, sterile jam jars, distilled water and granulated sugar were bought from the Umunahia main market.

Recipe for the *cola pachycarpa* fruit jam

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh ripe cola fruit</td>
<td>1kg/21bs403</td>
</tr>
<tr>
<td>Lemon fruit</td>
<td>2 balls</td>
</tr>
<tr>
<td>Water</td>
<td>6 table spoons</td>
</tr>
<tr>
<td>Granulated sugar</td>
<td>1kg/21ba</td>
</tr>
<tr>
<td>Sterile jar</td>
<td>2 jars</td>
</tr>
</tbody>
</table>

Procedure
- Wash the fruits
- Cut them into half and remove the stones cracking at least half of the seeds.
- Place the seeds into boiling water for a few minutes to tender
- Wrap them in a cloth and hit with a rolling pin
- Blanch the kernels, skin and split open.
- Squeeze the lemons reserve the juice and put the pips in a muslin bag into a preserving pan.
- Bring gently to boil, reduce the heat and simmer slowly until the fruit is soft.
- It may be necessary to add a little water if too dry.
- When the fruit is mushy and thickened, remove the muslin bag and add the kernels and warmed sugar.
- Stir gently over a low heat until the sugar has dissolved.
- Then bring to boil and continue boiling rapidly until the jam set.
- Skim and pour into the jar and seal the jam jar.

Chemical analysis of the *cola pachycarpa* fruit jam

**Crude Protein:** The Micro-Kjedahl method described by AOAC (1995) was used for the analysis. Exactly 1gm aliquot sample was weighed into a Micro-Kjedahl flask. A tablet of selenium catalyst and 5 ml of concentrated tetraoxisulphate VI acid ($\text{Conc, H}_2\text{SO}_4$) were added. Another 1g of sample was measured and the same treatment was given to it. The flasks were introduced into a digestion chamber. All the flasks digested at red hot temperature in a fume cupboard for 2 hours, the digest were transferred into a volumetric flask each. The digest were diluted to fifty (50 ml) with distilled water. 10ml aliquots of each, dilution were piped into “Markhem” apparatus with gradual introduction of 10ml mf 40% NaoH. Each mixture was distilled by steam powered heat and the distillate collected into 10ml of 4% boric acid
(H$_3$BO$_3$) solution containing 3 drops of mixed indicator, 50ml of distillate from each replicate was treated with 0.02N H$_2$SO$_4$ to a pink end point.

The percentage Nitrogen calculation in each was multiplied with a factor 6.25 to get the percentage protein.

**Moisture Content:** The gravimetric method by AOAC (1995) was used for this analysis. Exactly 2ml of the sample was measured each into 2 previously weighed moisture crucible. The crucibles and samples were allowed to dry in a hot air electric oven at 105°C for 2 hours at the end of the time; the crucibles were carefully removed and kept to cool in a desiccator. The crucibles and the samples were re-weighed and put back into the oven for further drying; cooling and weighting were done respectively until a constant was obtained.

**Fat Determination:** The method of solvent extraction in a Soxhlet reflux apparatus described by Pearson (1991) was adopted. Exactly 2g of the sample was wrapped in a porous material (Whatman filter paper) and placed in the reflux flask. Exactly 2g samples was measured again into another paper and placed in another soxhlet flask to form replicate. The flasks were mounted on weighed oil extraction flask containing 200ml of petroleum ether. All the parts of the soxhlet apparatus were coupled and heat applied through the electro-thermal heating mantle, the heated solvent vaporized and condensed into the reflux flask containing the sample M. Oil was extracted from the sample until the flask was removed from each set up after 4 hours and dried for 3 minutes in the oven at 60°C.

**Crude Fiber Determination:** Weende method described by Pearson (1996) was adopted for this analysis. Exactly 5g sample was measured each into two fold muslin cloth and boiled in 200ml of 1.25% H$_2$SO$_4$ for 30 minutes under reflux. Each cloth was washed thoroughly with boiling water. The cloths each was transferred back to boiling flasks containing 1.25% NaOH solution. Boiling was done for 3 minutes under reflux. The clothes were washed and transferred to an already weighed porcelain crucible (w$_1$) dried in the oven constant weight (w$_2$). Then the sample were taken to the furnace and reduced to ashed at 550°C they were cooled in a desiccators and the weight (w) noted.

**Ash Determination:** The method described by James (1995) was adopted, in determining the ash content. Exactly 2g was measured into two previously weighed porcelain crucibles the muffle furnace was heated to 550°C before the samples in the crucible were introduced into it. The samples burned at that holding temperature for 2 hours, ashing continued until all the samples became ash.

**Carbohydrate Determination:** This was determined by differences suggested by James (1995). It was done by summing up the percentage
protein, crude fiber, fats, total ash and moisture and subtracting the result from 100%.

**Results and Discussion:**

Table 1: The proximate composition of cola *pachycarpa* and commercial orange jam

<table>
<thead>
<tr>
<th>Proximate</th>
<th>Cola Pachycarpa</th>
<th>Commercial Orange Jam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture content</td>
<td>90.8</td>
<td>96.3</td>
</tr>
<tr>
<td>Fiber</td>
<td>0.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Protein</td>
<td>0.6</td>
<td>1.8</td>
</tr>
<tr>
<td>Fat</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>5.8</td>
<td>3.0</td>
</tr>
<tr>
<td>Ash</td>
<td>0.6</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Moisture:** Orange has the higher moisture content of 96.3 while cola *pachycarpa* has moisture of 90.8. This variation in the moisture content of cola P. jam and orange jam may be attributed to the stage of maturity of the fruit and weather, in terms of ripeness, acidity level and gelation capacity. This is in agreement with the findings of Pamplona-Roger (2008), who observed that water constitutes between 50% and 93% of most fruits. While Nmeregini (2005), said also that some cola *pachycarpa* has stopped fruiting probably due to changes in weather in the prevailing environmental climate and in some cases as a result of the stage of maturity of the tree. Where there are fruits, it also affects the quality of the fruits relatively. It was also observed that the state of maturity in fruits, results in the increase of the moisture content which may result in higher dry matter or lower dry matter as the case may be (Pamplona-Rogers, 2008, Anazonwu-Bello, 1989).

The fiber content of cola *pachycarpa* jam was relatively higher (0.3) than that of the orange jam 0.1. This finding is in agreement with Wardlaw and Kessel (2005), who stated that cola specie are high in fiber content and should be encouraged in the diets to aid prevent colon cancer. The findings also reveal that the difference in crude fiber may be due to both chemical and physical structure and particularly of certain substances in the cell walls of plants as they become mature, ripe and dominant. According to Kordyles (1991), the fiber content of cola *pachycarpa* which is high affects or reduces the digestibility of the product in the body. Orange has the highest crude protein content of 1.8 while the cola *pachycarpa* had 0.6 crude protein content. The difference could be as a result of maturity, ripeness, acidity and gelation capacity of the fruits (Nmeregini, 2005). The variations could also be attributed to the plant species, because in tropical areas where fruits mature rapidly,
crude fibers usually increase. Also comparing the fat content of orange jam to that of cola jam is 0.4 while cola pachycarpa has 0.3 could be attributed to the species of maturity of the fruits. Cola pachycarpa has the highest carbohydrate content of 5.8 while that of orange jam is 3.0. This is contrary to the observation of Pamplona-Roger (2000) who said that most fruits contain little or no starch, since it is converted to simple sugars (glucose and fructose) during maturation process. The ash content of the cola pachycarapa is 0.6 while the orange jam has the ash content of 0.1 which means that both are good for the digestive system.

Conclusion
The study has shown that cola pachycarpa could be used for the production of an acceptable jam which contains a good quantity of vitamins and minerals. The jam still had the characteristic colour of the cola pachycarapa fruit which increases the acceptability of the jam. However, the cola pachycarpa fruit jam competed well with the orange commercial jam, this will lead to its increased consumption. Sensitization of consumers about the nutrient content of this jam should be done in order to disseminate the importance of this fruit jam in our national diet.

Recommendation
From the findings of this study, cola pachycarpa could be recommended for use in the production of jam, if the texture, colour and flavour of the fruit jam can be improved by adding flavour and colour enhancers to the jam during production. The jam is recommended for everybody because of the high source of oil, vitamins and minerals from the stony seed of the fruit.

References


