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# CONSUMPTION AND UTILIZATION OF FRUITS, LEAVES, AND SEEDS OF *Cola* (*pachycarpa and lepidota*) IN TWO SOUTH EASTERN STATES OF NIGERIA

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## ABSTRACT
**Background:** *Cola pachycarpa* and *Cola lepidota* are two varieties of a fruit known as Monkey cola. They are from the same plant family. The plant was predominantly found in the wild until recently. There is basic information on these leaves, seeds and fruits of this plant. However, there is paucity of empirical studies on their consumption and utilization pattern.
**Objective:** The study evaluated the consumption and utilization pattern of the leaves, fruits and seeds of these two varieties of Monkey Cola, *pachycarpa* and *lepidota* in two South Eastern States of Nigeria.
Materials and methods: The study adopted a cross-sectional survey. The survey employed a multi-stage random sampling technique to select 808 adults from different communities in Isiala Mbano local government area of Imo State and Isiala Ngwa South local government area of Abia State. A structured validated questionnaire was used to obtain information on consumption and utilization pattern of the fruits, leaves and seeds in the survey areas. Data was analysed statistically using IBM-SPSS (Special Package for Social Sciences) version 20 software.
**Results:** *Cola pachycarpa* was more popular (84.5%) and the fruits were consumed mainly raw (99.0%). The leaves and seeds are not eaten but used for medicinal purposes though the seeds ranked highest in this regard (48.3%).
**Conclusion:** The fruits particularly *Cola pachycarpa* were popular. They were consumed raw while the leaves and seeds were solely used in traditional medicine.

**Keywords**: *Monkey Cola, leaves, seeds, consumption, utilization pattern*

## INTRODUCTION
In 2003, the World Health Organization (WHO) convened a meeting to discuss how consumption of fruits and vegetables can help prevent disease and promote good health. One of the significant conclusions was the possibility of saving about 2.7 million people each year if they are able to eat enough vegetables and fruits in their diets (1). According to WHO (2), inability to consume enough fruits and vegetables has been identified as one of the first ten factors that enhance mortality globally (1). Thus, eating enough fruits and vegetables are vital to good nutrition. They are capable of preventing many diseases such as some types of cancers and cardiovascular disorders (3). Bloch and Thompson, (4) reported that one of the most overlooked cancer-fighting food groups is fruits.

Essien et al., (5) reported that there is need for identification, integration and domestication of various indigenous plants as a means of protection of biological diversity and provision of adequate food, especially to those in developing countries. Myers, (6) observed the shift in attention to exotic plant varieties which are not necessarily richer in micronutrients. Ogbu and Eke, (7) reported that the plant *Cola pachycarpa* K. Shum (family Sterculiaceae) is one of the underutilized but important indigenous fruit trees of south eastern Nigerian agro ecological zones. There have been very few studies on the quantity of *Cola pachycarpa* and *Cola lepidota* which people consume. They stated the need for further research works on *Cola pachycarpa* in the areas of its propagation, agronomy, taxonomic classification, selection screening and nutritional values. Ene-Obong et al., (8); Udousoro and Essien, (9) also reported that monkey cola (*Cola pachycarpa and Cola lepidota*) is an underexploited fruit whose functional properties have not been evaluated and information as well as research work on it is scanty. *Cola pachycarpa* falls within the group of plants that have been used by local people since long periods to treat diseases. When fruits and vegetables are taken adequately they have the ability to prevent people from becoming sick with many serious health conditions such as heart diseases and cancer. The opposite is true when people do not take enough fruits and vegetables in their diet. This is as a result of different beneficial antioxidants, phytonutrients and vitamins abundant in fruits and vegetables which help to fight disease by strengthening the immune system (10, 11).

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Researchers have demonstrated increasing interest in these lesser known fruits as a result of their nutrient and medical properties (12). Their medical properties are attributed to their ability to offer protection against the hazardous effects of free radicals on humans (13). Monkey Cola belongs to the undomesticated fruits in Nigeria. It belongs to the *sterculiaceae* family of drupes (14) with some varieties which are red, yellow and white (*Cola latertia*, *Cola pachycarpa* and *Cola lepidota* respectively), (15). White Monkey cola seed case has a cylindrical shape but the yellow specie seed case is round shaped. The local people in Southern Nigeria know Monkey cola by many names such as"achicha" or "ohiricha" (Igbo) and "ndiyah" (Efik). This fruit tree grows mainly within the tropics; with the fruits being common from June to November in Southern parts of Nigeria (16). Even though there is recent literature on the nutrient content and possible medical attributes of Monkey kola, information on its ability to prevent oxidation in metabolic processes is limited (17).

"Achicha" is the popular name for Monkey Cola in both Mbano and Isiala Ngwa. "Ayeya", "Oghiriha" (Nwangele), "achichara", "akika", "ochichoro", "achicha", "bread", "mango, "udara", "wonder kola", and wonderful kola are other names for this fruit in these communities. This could be attributed to the fruit characteristics such as different colours, smooth, rough, light or thick epicarp. Ogbu and Eke, (7) observed that there is still need to further re-examine its taxonomy.

Monkey cola fruits have not been investigated sufficiently and knowledge on this fruit is lacking. This also applies to the phytochemical content (8). This study was designed to assess the consumption pattern of *Cola pachycarpa* and *Cola lepidota* fruit, leaf and seed varieties in Isiala Mbano and Isiala Ngwa South Local Government Areas.

## MATERIALSANDMETHODS

### Survey Design

This study adopted a cross-sectional survey design.

### Study population

The study population consisted of 808 adults twenty years and above in communities within Isiala Mbano and Isiala Ngwa South Local Government Areas of Imo State and Abia States. Each of the two Local Government Areas contributed fifty percent (404) of the total sample size.

### Sampling Technique

This study employed a multi-stage sampling technique to select 808 adults in Isiala Mbano and Isiala Ngwa South Local Government Areas. Eight communities were selected randomly by balloting without replacement from the fourteen communities (Osu Owerre, Isiama, NneatoNweafor, Oka, Umuduru, Ugiri, Ibeme, Anara, Obollo, Amaraku, Umunkwo, Amauzari, Umuozu, Ogbor) in Isiala Mbano LGA to form part of the survey communities. These communities were Osu Owerre, Anara, Umuozu, Ogbor, Ibeme, Obollo, Amaraku and Amauzari. A minimum of fifty (50) respondents were selected from each of the eight communities. The subjects were purposively selected on the basis of interest, place of abode, availability and knowledge of the fruit. Eight communities contributed the following subjects; Obollo (50), OsuOwerre (51), Anara (52), Amauzari (50), Amaraku (51), Ogbor (50), UmuozuIsiala (50) and Ibeme (50).

Eight communities were randomly selected out of the eleven communities in Isiala Ngwa South LGA. These communities are Ovu Ngwu, Amaise, Mbutu, Okporo Ahaba, Alaoma, Alaukwu, Ovu Okwu and Osokwa Nvosi. Purposive sampling was applied to include respondents from all these communities based on interest, availability of the fruit trees in their homes and use of the fruits for economic purposes. This was aimed at eliciting more information on the Monkey cola fruits.The respondents from the communities were as follows: Amaise (33), Mbutu (20), Okporo Ahaba (40), Alaoma (54), Alaukwu (54), OvuOkwu (78), Osokwa Nvosi (34), and Ovu Ngwu (91).

### Preliminary visit

A letter introducing the researcher was collected from the Head of Department of Home Science, Nutrition and Dietetics, UNN. Preliminary visits were made to the Public Health Unit of the Local Government Areas and community leaders of the selected communities to obtain their permission for the survey and solicit their help to convince the villagers to participate in the study.

**Informed Consent:** Those who participated in the study were duly informed and their consent obtained before participation.

### Development of survey instrument and Data Collection

A questionnaire was developed, validated by lecturers in the Department of Home Science, Nutrition and Dietetics, UNN and tested for reliability before distributing to the indigenes of the

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communities in the study areas (Isiala Mbano and Isiala Ngwa South Local Government Areas). The questionnaire was prepared to obtain information on consumption pattern and utilization of *Cola pachycapa* and *Cola lepidota* fruits, leaves and seeds.

The final phase of the validated instrument which had twenty-seven (27) items was administered to thirty (30) respondents who were not from the study area. This was a trial testing or field testing of the instrument done in Owerri, Imo state. Responses collected were used to ascertain the reliability coefficient of the instrument through the Cronbach Alpha Approach. A reliability coefficient of 0.734 was obtained, indicating a high internal consistency, meaning that the instrument was suitable for the study and was used.

The questionnaire were personally distributed and collected with the aid of research assistants. In addition, oral interviews were also conducted in all the households that have these fruits or fruit trees in their homes. Communication was carried out in the local language of the people.

**Statistical Analysis**

Data was analysed statistically using IBM-SPSS (Special Package for Social Sciences) version 20 software. Data generated from questionnaire was presented using descriptive statistics.

## RESULTS

**Demographic Characteristics of the Respondents**

Table 1 shows the demographic characteristics of the respondents. A total of 808 adults responded to items in the questionnaire. Gender classification had 51.2% males and 48.8% were females. The age distribution of the respondents showed that age 20-40years contributed 54%, 41-60years was 32.9%, 61-80years was 10.3% and above 80 years of age had 2.8%. The results showed that 4.6% of the respondents had no formal education while13.9%, 49.6% and 7.5% had primary, secondary, other levels of education. The rest (24.4%) had university education.

**Table 1: Demographic characteristics of the respondents (n=808).**

| Variables | Frequency | % |
|---|---|---|
| **Sex** | | |
| Female | 394 | 48.8 |
| Male | 414 | 51.2 |
| Total | 808 | 100 |
| **Age (years)** | | |
| 20–40 | 436 | 54.0 |
| 41–60 | 266 | 32.9 |
| 61–80 | 83 | 10.3 |
| 80 and above | 23 | 2.8 |
| Total | 808 | 100 |
| **Level of education** | | |
| None | 37 | 4.6 |
| Primary school or its equivalent | 112 | 13.9 |
| Secondary school or its equivalent | 401 | 49.6 |
| OND, TC2 or its Equivalent | 61 | 7.5 |
| University or its equivalent. | 197 | 24.4 |
| Total | 808 | 100 |

**Information about *Cola pachycarpa* and *Cola lepidota* varieties**

Table 2 shows sources of information and knowledge about *Cola pachycarpa* and *Cola lepidota*. Most respondents (68.9%) obtained information about the Cola varieties from members of their immediate family, while 19.3% got information from friends/colleagues. Few (9.4%) had the information about Cola fruits from their community while few others (2.4%) did not disclose their source of information. Most respondents (63.5%) obtained the fruits from home gardens. Few (16.2%) obtained the

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fruits from farmlands and (15.6%) purchased the fruits from the market. Few respondents (4.7%) obtained the fruits from the forest. Most respondents (65.7%) said that the fruits were in abundance between the months of July and September yearly. Few of the respondents (18.6%) reported April – June while January – March was reported by 5.3%. Respondents who were not sure of the season when the fruits are in abundance were 10.4%. Majority of the respondents (99.0%) agreed that the fruits are normally consumed raw after purchase. Very few respondents (1.0%) indicated that it could be cooked prior to consumption.

Majority of the respondents (86.4%) reported that the seeds were not edible and a few (13.6%) reported that the seeds were edible. Most of the respondents (63.5%) reported that the seeds were for propagation of the tree. Few (16.1%) of the respondents reported that the seeds have medicinal values and others (20.4%) had no knowledge of what the seeds were used for. Majority of the respondents (90.7%) reported that the leaves were not edible. A few respondents (9.3%) confirmed that the leaves were edible. Other ways the leaves were used were as medicine (48.3%), preparation of traditional dishes (9.5%) and those who did not know how the leaves were used were (42.2 %). Majority of the respondents (76.7%) knew that the fruits were used as food. Few others (13.9%) knew that it could be used to treat illness and 9.4% of the respondents said that it could be used for entertainment. Majority of the respondents (84.5%) reported knowledge of only the yellow fruit variety (*Cola pachycarpa*).

**Frequency of consumption, general acceptability of *Cola pachycarpa* and *Cola lepidota* fruits and desire to cultivate the tree and drink their juices.**

Table 3 depicts the respondents' frequency of consumption of *Cola pachycarpa* and *Cola lepidota* fruits, the reasons and desire to cultivate the tree and drink their juices. Majority of the respondents (89.3%) ate the fruits occasionally when they are in season while 9.3% consumed them frequently. The reasons for low consumption of the fruits were unavailability (70.6%), high cost (13.6%) and palatability (15.8%). Majority (87.9%) of the respondents desired to plant the tree and drink juice prepared from its fruits (80.2%). However, 12.1% and 19.8% of the respondents did not want to plant the tree nor drink its fruit juice respectively. This table also shows the respondents' general acceptability for *Cola pachycarpa* and *Cola lepidota*. Majority of the subjects (81.6%) were willing to consume Cola fruits if it is available. Only few (18.4%) did not express the desire to consume these fruits. Some subjects reported that the high nutrient content of the fruit (50.7%) was the reason for accepting the fruit. Others (34.8%) liked the taste of the fruit and 7.5% reported it as a source of income for their families. A few (4.6%) liked the fruit because it is affordable. Only 2.4% of the respondents did not indicate their reason for acceptability.

**Respondents rating of how long the fresh fruits can last**

Table 4 shows the respondents rating of the stability of the fresh monkey cola fruits. Some of the respondents (48.6% and 44.2%) reported that the fresh fruits could last up to one or two weeks respectively. A few (7.2%) did not indicate knowledge of how long the fresh fruits could last. Most respondents (70.9%) rated the fruits to be fairly stable. Few (29.1%) reported that the fruits were not stable.

**Traditional uses of *Cola pachycarpa* and *Cola lepidota* varieties**.

Table 5 depicts the traditional uses of Monkey cola fruits, leaves and seeds as reported by oral interviews. The fruits are used for entertainment during festivities, while its leaves are utilized as fodder, for herbal medicine and in preparation of local dishes. Apart from tree propagation, the leaves are also used in the treatment of diseases. The fruits are also employed in traditional medicine to treat eye problems, heart diseases and stomach problems.

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**Table 2: General information on *Cola pachycarpa* and *Cola lepidota*.**

| Variables | Frequency | % |
|---|---|---|
| **Sources of information** | | |
| Members of immediate family | 557 | 68.9 |
| Friends/colleagues | 156 | 19.3 |
| Community | 76 | 9.4 |
| Undecided | 19 | 2.4 |
| Total | 808 | 100 |
| **Sources of Fruit Collections** | | |
| Farmland | 131 | 16.2 |
| Home garden | 513 | 63.5 |
| Market | 126 | 15.6 |
| Forests | 38 | 4.7 |
| Total | 808 | 100 |
| **When in Season** | | |
| Jan-March | 43 | 5.3 |
| April-June | 150 | 18.6 |
| July-September | 531 | 65.7 |
| Undecided | 84 | 10.4 |
| Total | 808 | 100 |
| **Method of Consumption** | | |
| Raw after purchase | 8 | 1.0 |
| Cooked prior to consumption | 800 | 99.0 |
| Total | 808 | 100 |
| **Purpose of using the Fruits** | | |
| Used as food | 620 | 76.7 |
| Treating illness | 112 | 13.9 |
| Entertainment | 76 | 9.4 |
| Total | 808 | 100 |
| **Knowledge of Different fruit varieties** | | |
| Yellow | 683 | 84.5 |
| White | 125 | 15.5 |
| Total | 808 | 100 |
| **Cola seeds are edible** | | |
| Yes | 110 | 13.6 |
| No | 698 | 86.4 |
| Total | 808 | 100 |
| **Other ways in which Cola seeds are used** | | |
| As medicine (Drugs) | 130 | 16.1 |
| For propagation of the tree | 513 | 63.5 |
| Undecided | 165 | 20.4 |
| Total | 808 | 100 |
| **Cola Leaves are edible** | | |
| Yes | 75 | 9.3 |
| No | 733 | 90.7 |
| Total | 808 | 100 |
| **Other ways in which cola leaves are used** | | |
| Preparation of traditional dishes | 77 | 9.5 |
| As medicine | 390 | 48.3 |
| Undecided | 341 | 42.2 |
| Total | 808 | 100 |

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**Table 3: Frequency of consumption, general acceptability of *Cola pachycarpa* and *Cola lepidota* fruits and desire to cultivate the tree and drink their juice**

| Variables | Frequency | % |
|---|---|---|
| **Frequency of eating the fruits** | | |
| Frequently | **75** | **9.3** |
| Occasionally | 722 | 89.3 |
| Undecided | 11 | 1.4 |
| Total | 808 | 100 |
| **Reasons for not eating it often** | | |
| Cost | 110 | 13.6 |
| Unavailability | 570 | 70.6 |
| Palatability | 128 | 15.8 |
| Total | 808 | 100 |
| **Desire to plant the tree** | | |
| Yes | 710 | 87.9 |
| No | 98 | 12.1 |
| Total | 808 | 100 |
| **Desire to drink its fruit juice** | | |
| **Yes** | 648 | 80.2 |
| No | 160 | 19.8 |
| Total | 808 | 100 |
| **General acceptability for consumption** | | |
| Yes | 659 | 81.6 |
| No | 149 | 18.4 |
| Total | 808 | 100 |
| **Reasons for acceptability** | | |
| Nutrition | 410 | 50.7 |
| Taste | 281 | 34.8 |
| Affordable | 37 | 4.6 |
| Source of income for family | 61 | 7.5 |
| Undecided | 19 | 2.4 |
| Total | 808 | 100 |

**Table 4: Respondents rating of how long the fresh fruits can last**

| Variables | Frequency | % |
|---|---|---|
| **The fresh fruit can last for** | | |
| Up to 1 week | 393 | 48.6 |
| Up to 2 weeks | 357 | 44.2 |
| Undecided | 58 | 7.2 |
| Total | 808 | 100 |
| **Rate fruit in terms of stability** | | |
| Fairly stable | 573 | 70.9 |
| Not stable | 235 | 29.1 |
| Total | 808 | 100 |

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**Table 5 Traditional uses of *Cola pachycarpa* and *Cola lepidota* varieties**

| Plant parts | Uses |
|---|---|
| **Fruits:** | (i) Entertainment during festivities. |
| **Leaves:** | (i) Wrapping traditional foods |
| | (a) Steamed beans(‘moimoi’) (b)Native-melon-cake |
| | (‘Mkpuru-usu’or ‘Agbara-ati’) |
| | (ii) Fodder for domestic animals |
| | (iii)Herbal traditional medicine to treat |
| | (a) Fibroid (b) Stomach problems (c) Spleenomegaly (‘apa-afo’). |
| **Seeds:** | (i) Herbal traditional medicine to treat |
| | (a) Eye problems (b) Heart disease (c) Stomach problems |
| | (ii) Tree propagation. |

## DISCUSSION

Slightly above half of the respondents in this study (51.2%) were males and the rest were females. This implied that disparity in terms of respondent gender was minimal as both males and females contributed actively in responding to items in the questionnaires. Brekke *et al*., (18) emphasized the beneficial effects of involving all family members during interactions on exchange of information and advice on health and nutrition. Many respondents’ age group fell between 20 to 40 years (54.0%). This suggests that many of the respondents fell within the youthful population. It was interesting to note that few of the aged, 80 years and above also contributed to provision of valuable information on monkey cola through their wealth of knowledge. Majority of the subjects in this study had a secondary education and above (81.5%).

Only very few respondents did not have any formal education. The improved educational attainment of the respondents enhanced their ability to provide useful information about the monkey cola varieties. It also explains why many of them indicated nutrition as their main reason for interest in *Cola pachycarpa* and *Cola lepidota* fruits. Onyechi and Nkwuaku, (19) have earlier reported that inadequateeducational achievements may restrict knowledge and degree of consciousness in terms of suitable choice of food.

Most people obtained information on Monkey Cola from members of their immediate families. Only very few respondents obtained information on the Cola varieties from their friends and colleagues or the community at large. Researchers have reported the power of oral traditions and folklores in obtaining information on the use of different plants and their infusion in traditional medicine (20). This type of knowledge is handed over to different generations through their immediate family members. The fruits are obtained from the home gardens by most respondents (63.5%) during the planting seasons between July and September. Few of the respondents reported that they obtain these fruits from the farmlands, rural or urban markets. Ogbu and Eke, (7) reported that even though these fruits were consumed annually in reasonable quantities, the home gardens are not able to provide enough for those who desire to consume these fruits. Information on method of the fruit consumption revealed that they were consumed fresh by majority of the respondents regardless of varietal colour differences, used in salad preparation and for entertainment. Kansci *et al*., (21) observed that if monkey cola fruits are eaten raw like most fruits and vegetables its consumption by the vulnerable groups will not be adequate. They suggested that monkey cola fruits could be made into more stable and easier- to- eat forms so as to increase its shelf life and encourage its consumption by those with poor dentition. In some countries like the Caribbean and the Pacific, there has been reduced spoilage of fruits and vegetables as a result of processing them into jams, juices and other profitable products (22).

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Majority (76.7%) of the respondents used the fruits as food. Okudu and Ene-Obong, (23) confirmed that the pulp of monkey cola fruits are eaten by people as well as animals like monkeys in Southern Nigeria and Cameroon. Few of the respondents added that it is used to treat illness and entertain visitors during special occasions (Table 5).

The propagation of the tree is based mostly on its seeds. While majority of the respondents reported that the seeds are not edible, few who stated otherwise noted that the seeds were used in traditional herbal medicine preparation. Even though many of the subjects stated that the leaves are not edible, some of the respondents were of the opinion that the leaves are edible since they are employed in herbal medicine and in the preparation and wrapping of certain traditional foods (Tables 2 & 5). Earlier report by Ogbu, (24) indicated that monkey cola fruits, leaves and seeds are utilized in treating various illnesses. Edeoga *et al*., (25) called this practice botanical medicine or herbalism. Emerging evidence from scientific research appears to give credence to the local uses of these plant parts in ethnomedicine (26; 27).

Laboratory analysis of monkey cola fruits, seeds, leaves and bark have indicated the presence of phytochemicals such as flavonoids, saponins and other bioactive substances capable of destroying free radicals, acting as antioxidants, preventing ill health and being used for disease therapy (28-31). These research efforts are however obviously inadequate as there is need to further exploit monkey cola species, improve and increase its production.

It was observed in this study that monkey cola fruits are not eaten regularly by a greater percentage of respondents. They attributed it mainly to its unavailability (70.6%). Thus, the consumption of monkey cola fruits in this study is mainly a function of availability. In a study on frequency of food consumption of fruits and vegetables by Ihensekhien, Nwabah and Salami, (32) the choice of fruits and vegetables depended mainly on availability, taste and appearance. Few respondents identified cost as a reason eating the fruits occasionally.

This is not encouraging as researchers have reported proper and adequate nutrition as well as fruit consumption pattern as having great influence on the growth and development of an individual (33). More consumption of Monkey Cola fruits could be achieved through planting of more Monkey Cola fruit trees since many respondents desired to plant the fruit trees (87.9%).

The cost constraint observed in the fruit consumption was earlier confirmed by Ogbu and Eke, (7) especially for the white mesocarp variety. In some studies carried out on fruit consumption pattern among students and adults (32, 34), the most frequently consumed fruits were cashew, banana, pear, velvet tamarind (icheku) and pawpaw and oranges. This confirms the fact that monkey cola fruits are among the lesser known fruits whose nutritional benefits can only be harnessed through nutrition education of the populace, enabling them choose from a wider variety of local fruits. Many researchers are exhibiting increasing interest in the lesser known fruits because of their nutrient and medicinal values (12). Increasing phytochemical intake which is beneficial to health is facilitated when people eat many types of fruits and vegetables (35).

The tree and its fruits are both sources of nutrients and income to family health and financial needs. Most respondents cultivated more yellow types in their homes and lesser white varieties. This makes the yellow variety popular, cheaper and consumed more than the white. Poor soil fertility militates against the white variety production. There is need to encourage more cultivation of monkey cola trees and provide information on their best cultivation practices to provide enough fruits and encourage its consumption. Unavailability of these fruits to the community is due to much dependence on few home gardens as major source which is not enough for consumers. The much more availability of the fruits between July and September is because there is no insect attack of the fruits during these periods.

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*Cola pachycarpa* and *Cola lepidota* fruits were generally acceptable by manyof the respondents (Table 3). Nutrition was the major reason (81.6%) given by the respondents for their acceptability of the monkey cola fruits. This is not surprising considering the fact that majority (95.4%) of these respondents had obtained some form of formal education. Ene-Obong, (36) has earlier reported that education has the benefits of creating nutritional awareness and facilitates selection of adequate diet, and the dearth of nutrition education leads to faulty food choices and habits. In a study of fruit consumption pattern among students (33), the reason ranking highest for eating fruits by most students was nutrition, their knowledge that fruits were sources of vitamins and minerals. In this study, some of the respondents marked taste as the next reason for acceptability of monkey cola fruits after nutrition. Taste was also identified as one of the major reasons why respondents chose to eat fruits and vegetables as reported by Ihensekhien *et al*., (32) among Nigerian adults.

Some of the respondents were of the opinion that the fresh fruits could last for up to one week without spoiling. The fruits are highly perishable, particularly when in contact with water. This is why majority of the respondents (70.9%) described the fruits as only fairly stable. Some other researchers (8) have attributed this to the high moisture content of the fruits. Some other researchers have identified the need to produce products from monkey cola fruits which are relatively consistent thereby increasing its consumption and preventing post harvest losses (21).

Traditional uses of monkey cola varieties as reported by the respondents revealed that different parts of the fruit trees like its leaves, fruits, seeds and bark are all employed in ethnomedicine. The leaves are medicine for certain illnesses such as stomach problems, fibroid and spleenomegaly. In Isiala-Ngwa, the boiled roots and leafs are employed traditionally to treat fibroid, stomach problems and spleenomegally ("apa-afo"). The leaves are edible because they are used for wrapping traditional foods such as steamed beans ("moi-moi") in Umuoke, Obowo and native melon cake in Umuezeala Nsu called "Mkpuru-Usu" or "Agbara-ati" and used as fodder for domestic animals (sheep and goats). The seeds are edible and could be used to prepare certain medications (Table 5). Beceanu, (37) observed the significance of knowledge of folk medicine from all countries that have documented the healing features of fruits and vegetables which are common among them and cultivated locally. Agbugba, Okechukwu and Solomon, (38) have linked the native knowledge of the health protecting properties of vegetables to their nutrient and phytochemical properties. Engel *et al*., (26) confirmed that the plant extracts exhibit some similarity with the claims of the traditional medicine uses. Palasz *et al*., (39) concluded that some of the plants being used traditionally as medicines exhibited remarkable anti-diabetic activity. These plants are still very important to people who are living in developing countries and can also lead to invention of new drugs. Falodun *et al*., (40) have identified plant preparations in the native systems of medicine in different countries as means of acquiring very effective drugs which have been used till date, and most of which have not been replaced by modern chemistry.

Osabor, Bassey and Ibe, (29) also reported the use of different parts of different Cola species in traditional medicine. The bark of *Cola gigamteam* is used to treat yaws while that of *Cola laterita* (red monkey cola) is very effective in the treatment of wounds. The bark of *Cola nitidia* is used in the management of excessive appetite and fracture. Ogbu and Eke, (7) reported that communication from rural female growers, especially farmers and herbalists revealed that the fruits are usually recommended for and relished by pregnant and nursing women for yet unidentified reasons. The leaves are useful for shade during both wet and dry seasons in southern Nigeria.

## CONCLUSION

*Cola pachycarpa* and *Cola lepidota* fruits are consumed raw and used with the leaves and seeds in traditional medicine. There is need to further investigate into proper identification of varieties of Monkey Cola fruits available in the Nigerian ecosystem and encourage planting of more home farm trees to increase the fruit consumption and enhance its economic growth.

**Conflicts of Interest**: There is no conflict of interest in this study.

**Authors Contribution:** NRI designed the study, conducted the survey, interpreted the data and wrote manuscript draft. CJN Supervised the study and reviewed the manuscript. MAN reviewed the manuscript and updated the references.

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