

(SHORT COMMUNICATION)



Kolanut curing, storage and trade: Panacea for increased kolanut production in Nigeria

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Abstract

The article examined kolanut curing, storage and trade. Kolanut thrives well in Africa, the Americas, Brazil and the West Indies. It is the fruit of the kola tree originating from the *Cola* genus. A desk research was employed using various published literatures on kolanut. It was unveiled that most farmers use chemical insecticides such as gammalin 20 and phostoxin in preventing kolanut from insect pests attack before storage, which is hazardous to the human body. Also, the methods used in extracting kolanuts from the pod, the methods used in curing and storage significantly determine the quality of the nuts. Furthermore, kolanut farmers can make more profits through exportation of the nuts rather than through domestic sales. Hence, efforts should be geared towards provision of better kolanut curing and storage methods and more awareness should be created about the benefits of exporting kolanuts to other countries.

Keywords: Kolanut; Curing; Storage; Quality; Trade; Exportation

1. Introduction

Kola trees grow in the tropics of Africa and the Americas [1]. They can also be found in Brazil and the West Indies, where slaves passed the nuts from West Africa in the late 1500s during the transatlantic slave trade [2]. The kola tree is a species of evergreen trees originating from the *Cola* genus. Circular purplish, white or red nuts are obtained from yellow star-shaped fruit with a white pod inside [3]. Mature kola trees may grow as tall as 12 to meters (40 to 65 feet). The seeds taste bitter, though after aging become aromatic [4]. The kola tree can be found at altitudes of up to 300 meters (980 feet) Above Sea Level (ASL), in areas with deep rich soils and evenly distributed rainfall despite being a lowland tree. It can thrive well in sandy, loamy or clay soils but does best in well-drained soil [5]. Seven species of kolanut are suitable for consumption out of over fifty species. However, *Cola nitida* and *Cola acuminata* have been widely used. These species, more especially the *Cola nitida*, which has wide economic value, have for a long time been important item of trade [6].

Kolanut extract is used in the western world in producing energy drinks, beverage drinks, sweets, chewing gums, cosmetics like beauty soaps and creams [7]. In Africa, the nut's original use extended further than the medicinal. The kolanut was often used as a form of currency, to strengthen social contract or in religious ceremonies [8]. In West Africa, the kolanut is regarded as a cultural object [1]. It seems to have ancient beginnings, with many West Africa cultures chewing the nut in individual and social settings [9]. The use of kolanut is very common in gatherings for important life functions like weddings, naming ceremonies, funerals and memorials [2]. Also, they hold great value in the spiritual settings of countries such as Niger, Sierra Leone, Liberia and Nigeria [9].

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Kolanut is very important in the religious, social and cultural life of the Nigerian people. It is said that kolanut was in deliberation when the nation's founding fathers needed a common symbol acceptable to all Nigerians that would serve as a national icon on the country's coat of arms [10]. Also, kolanut has been widely used as a symbol by all ethnic groups in Nigeria, most especially amongst the Yoruba, Igbo and Hausa tribes [2]. The greatest consumers of kolanuts are the Hausas of Northern Nigeria. They knew the qualities of kolanut about eight hundred years ago [11]. It is a common saying that during religious celebrations in the North like *sallah*, people will ask for *sallah kola*, rather than *sallah* meat or food [10]. The demand for kola was so much that it was believed that some northern Muslims would spend their last coins to procure a lobe to chew [11]. In addition, it is said that an average Hausa man's coloured teeth is as a result of excessive kolanut chewing [10].

Cola nitida and *Cola acuminata* both have particularly great cultural importance to the easterners of Nigeria. Kolanut is used to offer prayers to God. Some traditional healers and soothsayers also use the broken pieces to predict the future. Moreover, it is a big offence for women to break kolanuts in the presence of men [12].

Today, Nigeria produces 70% of the world's kolanut [13]. According to record, a large quantity of the kolanut produced in Nigeria is consumed internally [6]. The appreciation accorded kolanut and the way it is seen by Nigerians make it something much more bigger than that large quantity of agricultural crop grown, harvested and stored in large hand-woven baskets by Yoruba farmers or the simple red and yellow nuts hawked around in trays and sold in small kiosks in the village markets and major cities by Hausa traders [10].

The objective of this study was to examine whether kolanut curing and storage methods used in present times are adequate for maximization of profit through trade by farmers.

2. Methodology

This article adopted desk research using findings from various past-published literatures on kolanut to assess the curing, storage and trade of kolanut.

2.1. Kolanut harvesting

Dropping fruit is suggestive of kola pods maturity and hence commencement of harvesting. Mass harvest is mainly carried out by the farmers [14]. Ideally, harvesting should be carried out before the pods begin to split open and this could be done once or twice in a month, usually between October and December, at the peak season [15]. Kola fruits usually mature in 4 to 5 months after pollination. It is ripe for picking when the brown colour changes from deep green to a paler tint [16]. Kolanut can be harvested manually or mechanically by plucking the pod containing fruits [7]. It can be harvested directly with hand from the tree branch, using machete [15]. Also, in the South Eastern states of Nigeria, harvesting of kolanut is normally done by plucking ripe pods with *Go-To-Hell*, (a curved metal tool with pointed and sharp tip), which is usually tied to a long bamboo stick [17]. Kola pods that are high in the branches could also be harvested using special equipment like the mistle-toe pruner [15].

In Lavun area of Niger State, Northern Nigeria, all the pods on the tree are harvested once by plucking, due to fear of pilfering [14]. Under growth beneath the kola tree is pulled out during harvesting so as to allow for easy collection of harvested and fallen fruits [16]. According to Ndagi *et al.* [14], in Lavun, some of the farmers prefer to harvest all the pods before it is fully matured so as to prevent attack by insects and germination while in storage. The harvested fruits are heaped under the tree from which they are harvested and are later collected and taken to a central spot where the pods are carefully cut open and the seeds taken out. They are then conveyed in baskets to the village for the removal of their coverings [16]. An average farmer in Lavun for instance, can harvest up to 1500 kg of pods per season [14].

2.2. Post-harvest treatment of kolanut

Post-harvest treatment of kolanut commences by careful check and sorting of diseased, deformed and weevil infested pods from the healthy pods [18]. The treatment can either be conventional or non-conventional. While the non-conventional method involves skinned nuts being placed in unlined baskets and the top covered with banana leaves to drain the water from the nuts, the conventional method involves drying of peeled nuts in oven at constant temperature of 32°C to remove the moisture from the nuts [15].

2.2.1. Curing

Curing refers to the treatment performed to increase the shelf life of nuts after pods are broken [15]. The farmers cut open the pods to remove the nuts after harvest. In other to aid fermentation, the nuts, which are still covered in skin or

coat, are soaked in water for 24 hours. Softness of the skin marks the completion of fermentation. The soft skin is then removed by hand, washed and drained [14]. The washed nuts are collected in unlined baskets, covered lightly with banana leaves and left for about 5 days to cure. During curing, the nut 'sweats', (a process, which helps to reduce the moisture content of the nuts). The nuts are later placed in leaf-lined baskets and lightly covered with leaves [16]. Also, during the curing process, defective and infested nuts are taken out [18]. The banana leaf-lined baskets are stirred intermittently to avoid excessive heat buildup during the curing process, which lasts for about 3 *et al.*, weeks [15]. The nuts are then graded into sizes and placed in big sized baskets for proper preservation [18]. Another curing method requires the removal of the testa around the nuts, which are then placed under direct sunlight in wooden trays for 4 weeks at ambient day temperature of 32°C [15].

2.2.2. Storage

Cured kolanuts can be stored in baskets lined with fresh leaves or thin black nylon [16]. Also, they could be stored on mats or trays in a cool dry place [15]. In Lavun, farmers use polythene nylon instead of baskets to store the nuts before sale [14]. Furthermore, nuts of *Cola acuminata* could be stored in baskets that are first lined with thin transparent nylon, followed by a layer of *Newbouldia Laevis* leaves. The ventral surface of the leaves, are placed down-wards in the basket while the dorsal surface of the leaves are placed upwards, on which the nuts are carefully placed layer after layer. *Parkia Biglobosa* leaves are spread evenly on top of each layer of nuts. Afterwards, the whole basket is sealed with polythene sheet and stored under normal room temperature and relative humidity. *Cola nitida* nuts on the other hand are stored in baskets lined with polythene sheets, followed by sheets of paper and a layer of fresh leaves of *Tectonia Grandis* or *Marantochola spp.* or *Terminalia Catapa* (India almond). The nuts could also be stored in jute bags lined with transparent polythene sheet, then layer of paper and fresh leaves [17].

Farmers follow a number of methods in order to preserve kolanuts from insect attack. In Mokwa area of Niger State in Northern Nigeria, some farmers use a little quantity of gammalin 20 that is diluted in water to wash the nuts just before storage. Also, some farmers cut open some quantities of lime, which are placed on the baskets containing the nuts before final coverage with dried banana or plantain leaves. In Lavun, the farmers do not put gammalin 20 directly on the nuts but instead apply it in a circular form on the floor around the polythene nylon containing the kolanuts [14]. The nuts are inspected every 8 days during the first 2 to 3 months after which the inspection could be extended to 2 to 3 weeks depending on the condition and quality of the nuts in the previous inspection [17].

According to Facheux *et al.* [19], kolanuts in storage baskets are spread with layers of locally available plant materials such as dried vertiver grass roots, dried eucalyptus leaves, or dried tobacco leaves. These are used as repellent by some farmers in Cameroon. Some farmers also bury un-skinned nuts in anthills while others use chemical insecticides. In addition, Adeleye *et al.* [20] reported that as a result of a shortfall of storage facilities and transport problems, farmers usually sell all their produce immediately after harvesting.

2.3. Kolanut product quality

According to Mokwunye and Oluyole [21], the primary purpose of preserving kolanut is to prevent spoilage and reduce the bitter taste by storing for a long period of time. The market value of kolanut is determined by colour, flavours and size [20]. Also, kolanuts are kept airtight and preserving the nuts in leaf and nylon prevents spoilage. Moreover, unlike leaf, which has to be changed regularly because it dries up quickly, nylon has the advantage that it does not dry up quickly and thus, does not need changing for the period the kolanut is in storage [21]. However, a study by Eze *et al.* [22] showed that storing kolanut under modified atmosphere using botanical leaves, remarkably improved the post-harvest and culinary qualities of the nuts when compared with those stored in polyethylene, which acts as the modern storage method.

The weevils-*Balanogastriis Kola*e and *Sophrorhinus spp.* are kolanut insect pests of economic importance. They are field-to-store pests and cause about 100% kola loss if left uncontrolled in storage [23]. Also, weevil infested nuts are made susceptible to secondary invasion by other microorganisms, particularly fungi, which finally results in the nuts' total destruction and lowering of the market value [24]. In addition, the quality of kolanut is greatly reduced through mechanical damage to the nuts mostly during extraction of the nuts with machetes [20]. Fermenting of skinned kolanuts before peeling is encouraged because it eases peeling and enhances long term storage [21]. Consequently, storage of kolanut is usually arduous because the freshness of the nuts needs to be retained for several months [24]. The use of gammalin 20 and phostoxin for protection of kolanut against pests' invasion is highly discouraged because of its negative effect on the human's body [21]. The methods used in extracting the kolanuts from the pod, in curing, in cleaning and storage significantly determine the quality of the nuts [20].

2.4. Kolanut trade

In Nigeria and other parts of Africa, kolanut has been an important commodity of trade [25]. Also, it is an international trade commodity [12]. The demand for kolanut is high both locally and internationally and the international market can be easily accessed [26]. In the United States of America (USA), the kolanut is more likely to be found in the form of an extract [1]. Kolanut is a cash crop of great importance to the poor rural farmers. Many people chew them for a daily amount of caffeine. Every market, bus depot and corner shop throughout West Africa has kolanut in small piles for sale [27].

In the past, kolanut would leave for Saudi Arabia through Sudan. It was a large convoy of merchants and there were resting points along the way. Nigerian communities rapidly sprang up along the route and at a point; merchants would arrive the town and buy huge quantities of kolanuts, which were flown in plane loads to Saudi Arabia [11]. Similarly, kolanut is exported in large amounts from Nigeria to other African countries, Europe and America [28]. Kolanut created countless millionaires during the golden age when, trailer loads of kolanut would leave for northern Nigeria several times a week from the South West. It also created markets, middlemen and kolanut traders in many parts of the South West. Hausa traders and clerics were drawn to Sagamu in South West Nigeria because of the kola trade. Kolanut merchants built numerous houses in Sagamu and were able to send their children abroad to study [11]. In Nigeria, kolanuts can be purchased in substantial quantities from Osun State. The markets where kolanuts are sold in commercial quantities are Owena, Ikirun, Faforiji, Garage Olode (Ife East), Sabo market in Ile-Ife, Ijebu 'Jesa, Esa-Oke, Odo-Ijesa, Iperindo, Ise Ijesa, Ogbese, Owo, Ore in Ondo State; Oje and Shasha markets in Ibadan, Oyo State [29]. In Northern Nigeria, there are local markets where kolanuts are gathered for traders to make their purchases. Some of the major markets in Niger State are in Enagi, Bida and Mokwa. Similarly, in Lavun, traders make reservations prior to harvest; this is an advantage to the farmers because they do not have to transport the kolanuts to the market. Kolanut merchants come from adjoining states and cities in the north such as Zaria, Kaduna, and Sokoto to purchase kolanuts [14].

The internal kolanut market in Nigeria is estimated to worth about thirty million naira [28]. Kolanut export is one of the least known means of making money in some parts of Nigeria. Also, the Federal Government of Nigeria is yet to accord a full export status to kolanut. This is probably as a result of the non-availability of kolanut all year round and its attack by storage pests during storage [22]. Kolanut is highly sought after because of its many usages in pharmaceuticals and soft drinks production [7]. In the international market, kolanut sells for about \$1,600 per cubic meter; it is offered between \$10,000 and \$16,000 per container [29]. The prices of kolanuts vary in Nigeria markets, but when exported, more profit is made. The price for a basket of kolanut in Ondo State for instance, is quite different from that of Mile 12 market in Lagos State. In fact, the differences may be ₦60, 000.00 as against ₦12, 000.00 for the same quantity of 75kg of kolanuts in local markets [7].

3. Conclusion

The study revealed that kolanut is ripe for harvesting when the brown colour changes from deep green to a paler tint and can be done with the use of machete, go-to-hell or mistle-toe pruner. The treatment performed on kolanut can be either conventional or non-conventional. The conventional method involves placing skinned nuts in unlined baskets with top covered with banana leaves while the non-conventional method involves drying peeled nuts in oven. The quality of kolanut is greatly reduced through mechanical damage to the nuts during extraction. Also, the study revealed that kolanut can be stored in baskets lined with fresh leaves, polythene nylon or jute bags lined with transparent polythene sheet, paper and fresh leaves. In addition, the study showed that the use of nylon in storing kolanut has the advantage of not requiring regular change unlike, leaves, however, storing kolanut in leaves improved the post-harvest and culinary quality of the nuts. Better techniques should be adopted in harvesting and extraction of kolanuts so that minimal damage is done to the nuts.

Balanogastriis kolae and *Sophrorhinus spp.* are major field to store insect pest of kolanuts and if not properly checked could cause up to 100% kolanut loss. Also, it was revealed that majority of farmers use chemical insecticides like gammalin 20, and phostoxin to protect kolanut against pest infestation. These chemicals are dangerous to the human body. In addition, many farmers are not aware that much more profit can be made from exportation than domestic sales of kolanut, as such it is recommended that more awareness is created on the profitability of kolanut export. Also, kolanut should be officially enlisted as one of Nigeria's exportable crops. This will encourage increased production and trade of kolanut in the country. More appropriate storage methods that will ensure that kolanuts do not deteriorate in storage and are available all year round should be provided. Furthermore, it is recommended that kolanut processors use more environmentally friendly methods for the preservation of the nuts rather than the use of chemicals and other synthetic materials.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors have no conflict of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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