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PROXIMATE COMPOSITION AND SUGAR CONTENT OF *ARTOCARPUS HETEROPHYLLUS* PULPS

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ABSTRACT

This research investigated the proximate and sugar compositions of *Artocarpus heterophyllus* pulps using standard methods. The percentage proximate composition recorded moisture, carbohydrate, ash, protein, fiber and fat as 85.65±0.00, 6.90±0.02, 3.31±0.01, 2.03±0.00, 1.64±0.01 and 0.47±0.01 respectively with corresponding concentrations (mg/100g) of fructose, sucrose, glucose, dextrose, lactose as 5.41±0.01, 4.03±0.00, 3.54±0.01, 0.02±0.01, 0.04±0.00 and 0.04±0.00. The results revealed that *Artocarpus heterophyllus* pulps contained high moisture and other constituents in the order of magnitude as glucose > fructose > sucrose > fat. Fructose, sucrose and glucose were relatively higher than other sugars estimated.

Keywords: Proximate composition, Sugar and *Artocarpus heterophyllus* pulps.

INTRODUCTION

The term, medicinal plants, includes various types of plants used as herbs with medicinal activities. These medicinal plants are considered as rich sources of ingredients which can be used in drug development and synthesis [1]. A herb is a plant or plant part valued for its medicinal,

aromatic or savory qualities. It contains a variety of chemical substances that can act upon the body. Plants have the ability to synthesize a wide range of chemical compounds that are used to perform important biological functions. Herbal medicine is the oldest form of healthcare throughout history [2]. It was an integral part of the development of modern civilization. Plants from different botanical sources have been used by many traditional medicinal practitioners in Nigeria for the treatment and cure of numerous diseases that are locally endemic. Many drugs commonly used today are of herbal origin. Indeed, about 25% of the prescription drugs dispensed in United States contain at least one active ingredient derived from plant material. Some are made from plant extracts [3].

The tree of *Artocarpus heterophyllus* commonly known as jacktree, or sometimes simply jack is a species of trees that belongs to the mulberry and fig family (Moraceae). *Artocarpus heterophyllus* is among the foreign fruits introduced into Nigeria from India which has adapted so well in Nigeria. It is known in the south east of Nigeria among the Igbo's as "Ukwabekee"/"Ukwaoyibo" (white-man bread fruit). It is an exotic tree originally native to the Western Ghats of India [4]. It is native to parts of Southeast Asia, and is believed to have originated from southwestern rain forests of India, in present day Goa, Kerala, Odisha, Tamil Nadu, Sri Lanka coastal Karnataka, and Maharashtra. It is often planted in central and eastern Africa [4]. The *Artocarpus heterophyllus* tree is well suited to tropical lowlands, and its fruit is the largest tree-borne fruit, reaching as much as 35 kg in weight, 90 cm in length, and 50 cm in diameter. Elevation and Manner (2006), [5], stated that ripe *Artocarpus heterophyllus* pulp has a sweet- aromatic soft tissue and is a good source of moisture, fructose and vitamins. It is mainly eaten fresh or preserved in syrup. The heart wood is a very durable timber and is used in the preparation of furniture. The bark, roots, leaves and fruits are attributed with diverse medicinal properties and

are used in various traditional and folk system of medicine to treat a range of ailments [4].

Proximate analysis of food is the determination of the major components of food which includes protein, carbohydrate, fat, moisture, fiber, ash [6]. Proximate analysis is a system of analysis of nutrients also called “conventional analysis” in which the gross component (protein, fat, carbohydrate, ash, fiber, moisture) of the food materials rather than individual nutrients (amino acid, fatty acid, monosaccharides, minerals) are determined [6]. Nutrients are chemical components of food that supply nourishment to the body. They are required by the body in the right amount and they must be taken regularly to perform a specific function [7].

Sugar is a class of edible substances. It is also the generalized name for sweet, short chain soluble carbohydrate which may be used and found in food. It is a carbohydrate composed of carbon, hydrogen and oxygen [8]. There are various types of sugar derived from different sources. Simple sugars are called monosaccharides and include fructose, glucose and galactose. The table or granulated sugar most customarily used as food is sucrose, a disaccharide. Other disaccharides include maltose and lactose. Few chains of sugars are called oligosaccharides. Some of these sugars can act as reducing agents and contain an aldehyde functional group which can be used as the basis for the analysis of reducing sugars [9].

In most developing countries like Nigeria, food shortages become evident as a result of population growth, competition for fertile land and poverty. In addition to these, restriction on the importation of certain foods has led to up-surge in prices of available staples, lack of agricultural inputs; poor loan scheme and incentive are responsible for food shortage. The diet of many rural and urban dwellers is deficient in protein and high in carbohydrates, the implication is high incidence of malnutrition and increase in dietary

disease, a situation in which children and especially pregnant and lactating women are most vulnerable. While every measure is being taken by various levels of government to boost food production by conventional agriculture, a lot of interest is currently being focused on the possibilities of exploiting the vast numbers of less familiar plant resources of the wild for treatment of diseases [10 and 11]. Many of such plants have been identified, but lack of data on their chemical composition has limited the prospect of their utilization. Many reports on some lesser known seeds and fruits indicate that they could be good sources of nutrients for both man and livestock and could be used as a medicinal plant [12]. In order to contribute to the growth, health and knowledge, the present study analyzed the *Artocarpus heterophyllus* pulps for their proximate composition and sugar contents.



Figure 1: *Artocarpus heterophyllus* pulp [13].

MATERIALS AND METHODS

Materials

The pulps of *Artocarpus heterophyllus* were collected from Aguluzigbo in Anaocha L.G.A., Anambra State, Nigeria. The chemicals and reagents were of analytical grade.

Methods

The fat, protein and fibre contents were determined using the method of Nielsen (2003), [14], while the moisture and ash contents were determined using the method of [15]. The carbohydrate, glucose and sucrose compositions were determined using the method of Hodge and Davis (2012), [16], and the fructose was done by the method of [17]. The concentrations of dextrose, lactose and maltose were determined by the methods of [18].

RESULTS

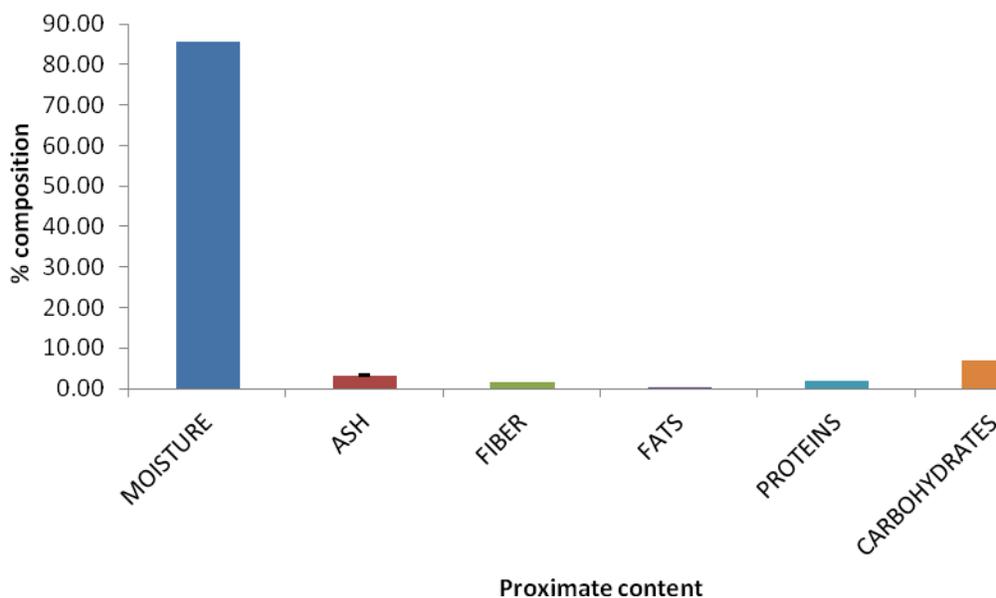


Figure 2: Bar chart representing the proximate compositions of *Artocarpus heterophyllus* pulps.

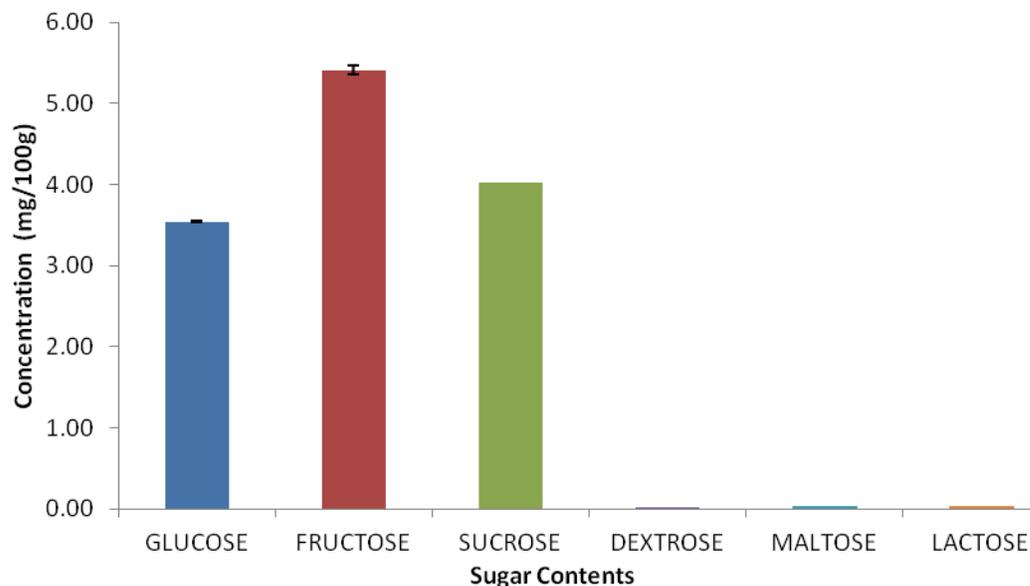


Figure 3: Bar chart of the sugar composition of *Artocarpus heterophyllus* pulps.

DISCUSSION AND CONCLUSION

The proximate analysis showed that the pulps of *Artocarpus heterophyllus* contained moisture which had the highest concentration followed by carbohydrate, ash, protein, fiber while fats had the least. The ash, protein and fat recorded 3.31%, 2.03% and 0.47% respectively (Fig. 2). Bobbio *et al.* (2000), [19], stated its ash, protein and fat content to be 10.03%, 3.50% and 2.05%. According to Bobbio *et al.* (2000), [19], the differences in the results of proximate compositions may be attributed to the nature of the pulps and different environmental conditions. Asaolu *et al.* (2009), [20], reported the concentrations as moisture (11.05%), ash (9.01%), fiber (4.02%) and fat (3.81%) with high concentration of protein (66.60%) in their report on proximate composition of dry leaves of *Gongronema latifolium*. The leaves of *Terminalia catappa* recorded high levels of carbohydrate, low levels of protein and ash while *Gmelina arborea* leaves showed high carbohydrate, protein, moisture, fiber, ash and low fat content [21]. However, the

differences observed in these results may be attributed to different drying techniques used during the processing of these samples [22].

Sugar analysis of *Artocarpus heterophyllus* pulp revealed varying amount of sugars. Fructose had the highest value followed by sucrose, glucose, maltose, lactose and dextrose (Fig. 3). Chowdhury *et al.* (2007), [23], reported the concentrations (g/100g) of fructose, glucose and sucrose in *Artocarpus heterophyllus* as 4.53, 2.06 and 1.49 respectively. The differences may be attributed to seasonal variation and environment [24]. Zafar *et al.* (2008), [25], reported the concentrations (g/100g) of dextrose, maltose and lactose as 3.05 ± 0.29 , 2.90 ± 0.99 and 3.00 ± 0.02 respectively. The fructose content of the honey samples analyzed by Khalil *et al.* (2001), [26], was reported as 38.94 ± 0.4 g/100g. Janne *et al.* (2012), [9], also reported that the variations in the concentrations could be due to the nature of the pulps, difference in species of trees, variety differences in maturation of the fruits, environmental conditions, seasonal variation and climatic differences.

In conclusion, the proximate composition revealed that moisture content is the highest followed by carbohydrate with least value of fat. The sugar content evaluated showed appreciable concentrations of fructose, sucrose and glucose with low levels (g/100g) of dextrose, maltose and lactose.

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