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The Proximate composition of jackfruit (*Artocarpus heterophyllus* Lam) and African breadfruit (*Treculia africana* Decne).

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ABSTRACT

The Proximate composition of jackfruit (*Artocarpus heterophyllus* Lam) and African breadfruit (*Treculia africana* Decne) was determined. The test samples, (the seeds, leaves, stem and root of *Treculia africana* and *Artocarpus heterophyllus*) were obtained from Umuoji, in Idemmili North Local Government Area of Anambra State, Nigeria. Chemicals and facilities used in the practical were obtained from the Yitzhak Rabin Laboratory Biotechnology Research Centre, Nnamdi Azikiwe University, Awka and Plant Science and Biotechnology Laboratory, University of Nigeria Nsukka, Nigeria. The result of the proximate compositions of the stem, root, seed and leaf of *A. heterophyllus* and *T. africana* revealed that for *A. heteropyllus*, its stem extract gave higher percentage composition of moisture (58.01±0.02 %), its root extract gave higher percentage composition of ash (13.23±0.21%), fibre (33.79±0.01%) and dry matter (55.58±0.02%), the seed extract gave higher percentage composition of carbohydrate (34.47±0.02%) and protein (6.36±0.01%) and the leaf extract gave the higher percentage composition of fat (2.17±0.01%). The proximate composition of *A. heterophyllus* and *Treculia africana* indicated the potential benefits of these species and could be the reason these plants are used in ethnomedicinal practices.

Keywords: Proximate, jackfruit, *Artocarpus heterophyllus* Lam, African breadfruit and *Treculia africana* Decne.

INTRODUCTION

T. africana is a tropical plant of desired economic value but which is rapidly disappearing [1,2,3,4]. Morphologically Jackfruit artocarpus species seem to be the closest alternative to the well known African breadfruit [5,6,7,8]. Within the genus is jackfruit (*A. heterophyllus*) which is one of the outstanding species. The fruit resembles that of African breadfruit [9]. It is therefore possible that this species may be the best alternative to African breadfruit. Jackfruit (*Artocarpus heterophyllus* Lam) is one of the most significant dicotyledonous trees in tropical homegardens and perhaps the most widespread and useful tree in the genus *Artocarpus* [10,11,12,14]. The generic name comes from the Greek words 'artos' (bread) and 'karpos' (fruit); the fruits are eaten and are commonly called 'African breadfruit' or 'Bread of the Tropics'. The specific name, 'heterophyllus', in Latin means, with leaves of different sizes and shapes and the word 'heteros' in Greek corresponds to the word 'different'. The word 'jackfruit' comes from Portuguese jaca, which in turn, is derived from the term 'chakka' in Malayalam language [15]. The ancient Indian Language Sanskrit refers this fruit as Atibruhatphala [16] and it is known in south east of Nigeria among the igbos as *ukwa bekee/ukwa oyibo* (white-man bread fruit) [17]. Jackfruit is both the name of the fruit and of the tree it grows on [18]. It is a perennial fruit tree crop, growing vigorously on both the branches and trunks of trees that can reach up to 8-25 meters in height and 2 meters in girth (Prakash *et al.,* 2009). Fully- riped Jackfruit will fall from the tree, so it is often harvested early to avoid having the large fruits fall on top of anyone [19]. These attribute are close to the features of *Treculia*. The aroma of a mature Jackfruit has been described as off-putting, similar to overripe fruit. Younger ripe fruit has a sweeter aroma. Jackfruit has a sweet taste and a flavor that is likened to bananas, pineapple and even bubblegum. As the fruit matures, the bulbs become a darker orange-yellow and the taste gets sweeter [20]. The succulent, aromatic, and

flavorful fruit is eaten fresh or preserved in myriad ways. The nutritious seeds are boiled or roasted and eaten like chestnuts, added to flour for baking, or cooked in dishes [21]. It is also known for its remarkable, durable timber, which ages to an orange or redbrown color. The leaves and fruit waste provide valuable fodder for cattle, pigs, and goats. Many parts of the plant including the bark, roots, leaves, and fruit are attributed with medicinal properties. Wood chips yield a dye used to give the famous orangered color to the robes of Buddish priest [22]. The tree can provide many environmental services. In homegardens, the dense jackfruit canopy can provide a visual screen and is very ornamental [23]. The fruit is known as the 'poor man's fruit' in eastern and southern parts of India because it is a major part of their diet as a vegetable and nutritious dish during the season [24]. The seeds are highly nutritious and constitute a cheap source of vitamins, minerals, carbohydrates, fats, fibre, vegetable oil and high quality protein in differentproportions [25] and can be recommended tothe aged, patients of diabetics, allegery and anemiabecauseof the high percentage content of digestible protein in thespecies seeds [8]. The seed is a rich protein source therefore among the plants consumed in the world; it is one of the richest in terms of its benefits [10]. It is also a good source of vegetable oil. This important plant unfortunately is fast disappearing due to development as the bulky fruit produced by the plant seems to suggest that it is a forest species. It is not planted around homes or open places where people gather for any form of activities even along roads. Technology had even reduced the height through micro propagation but the extreme weight of the fruit continues to create problem for the branches that may not carry the fruits [9]. Interestingly however, jackfruit has been reported to be the closest alternative, although detailed information to support the claim is still scanty. It is however known that jackfruit is highly nutritious.

Aim of the Study

The aim of this research was to acertain the Proximate composition of jackfruit (*Artocarpus heterophyllus* Lam) and African breadfruit (*Treculia africana* Decne).

MATERIALS AND METHODS

Source of Materials.

The test samples, (the seeds, leaves, stem and root of *Treculia africana* and *Artocarpus heterophyllus*) were obtained from Umuoji, in Idemmili North Local Government Area of Anambra State, Nigeria. Chemicals and facilities used in the practical were obtained from the Yitzhak Rabin Laboratory Biotechnology Research Centre, Nnamdi Azikiwe University, Awka and Plant Science and Biotechnology Laboratory, University of Nigeria Nsukka, Nigeria.

Identification of Materials

All plant materials used in this study were identified by Prof. C.U. Okeke, - a professor of Taxonomy in Botany Department, Nnamdi Azikiwe University, Awka.

Nutritional Analysis

This was carried out using the methods described by the Association of Official Analytical Chemist [2].

Statistical Analysis

Data collected was analysed using Analysis of Variance (ANOVA) and test of significance were processed using Duncan's Multiple Range Test [8] and Student's 't' test at 5% level of probability.

RESULTS

Proximate Constituents of the Parts of *A. heterophyllus* and *T. africana*

Result of the proximate compositions of the stem, root, seed and leaf of *A. heterophyllus*and *T. africana* is shown in Table 1. The Table 1 revealed that for *A. heteropyllus*, its stem extract gave higher percentage composition of moisture (58.01±0.02 %), its root extract gave higher percentage composition of ash (13.23±0.21%), fibre (33.79±0.01%) and dry matter (55.58±0.02%), the seed extract gave higher percentage composition of carbohydrate

(34.47±0.02%) and protein (6.36±0.01%) and the leaf extract gave the higher percentage composition of fat (2.17±0.01%). While for *T. africana* its stem extract gave higher composition of ash (23.43±0.06 %), its root extract gave higher composition of fibre (33.61±0.01 %), its seed extract gave higher composition of fat (6.32±0.01 %), carbohydrate (36.55±0.02%), protein (13.42±0.02%) and dry matter (60.82±0.02%) and its leaf extract gave the higher composition of moisture content (61.20±5.79%). Except for dry matter of *T. africana*, there was significant difference in all the proximate assayed between the stem, root, seed and leaf extracts of both plant ($p>0.05$)

Table 1: Comparative Proximate Constituents of *A. heterophyllus*and *T. africana*

Constituent	Specie	P-value	Plant Part				P-value for parts
			Stem	Root	Seed	Leaf	
Moisture (%)	*A.heterophyllus*		58.01±0.02^{a}	44.41±0.02^{b}	52.73±0.02^{c}	57.67 ±0.02^{d}	0.00
	T. africana		49.79±0.02^{a}	43.79±0.01^{a}	39.17±0.02^{b}	61.20±5.79^{c}	0.00
		p-value	0.00	0.00	0.00	0.35	
Fat (%)	*A.heterophyllus*		0.74±0.01^{a}	0.63±0.01^{b}	1.18±0.02^{c}	2.17±0.01^{d}	0.00
	T. africana		0.88±0.02^{a}	0.56±0.01^{b}	6.32±0.01^{c}	1.38±0.01^{d}	0.00
		P-value	0.00	0.00	0.00	0.00	
Ash (%)	*A.heterophyllus*		9.33±0.21^{a}	13.23±0.21^{b}	0.30±0.10^{c}	13.00±0.10^{c}	0.00
	T. africana		23.43±0.06^{a}	8.43±0.15^{b}	0.3±0.10^{c}	1.20±0.10^{d}	0.00
		P-value	0.00	0.00	0.10	0.00	
Fibre (%)	*A.heterophyllus*		24.68±0.01^{a}	33.79±0.01^{b}	4.88±0.02^{c}	4.23 ±0.02^{d}	0.00
	T. africana		29.90±0.01^{a}	33.61±0.01^{b}	4.12±0.02^{c}	9.51 ±0.01^{d}	0.00
		P-value	0.00	0.00	0.00	0.00	
Carbohydrate (%)	*A.heterophyllus*		3.67 ±0.15^{a}	4.85±0.02^{b}	34.47±0.02^{c}	18.66±0.01^{d}	0.00
	T. africana		9.15 ±0.02^{a}	9.13±0.15^{a}	36.55±0.02^{b}	17.17±0.02^{c}	0.00
		P-value	0.00	0.00	0.00	0.00	
Protein (%)	*A.heterophyllus*		3.47±0.02^{a}	3.11±0.01^{b}	6.36±0.01^{c}	4.28±0.02^{d}	0.00
	T. africana		5.31±0.01^{a}	4.55±0.01^{b}	13.42±0.02^{c}	6.21±0.02^{a}	0.00
		P-value	0.00	0.00	0.00	0.00	
Dry matter (%)	*A.heterophyllus*		41.99±26.01^{a}	55.58±0.02^{b}	47.28±0.02^{c}	42.34±0.02^{d}	0.00
	T. africana		50.21±26.00^{a}	56.21±0.02^{a}	60.82±0.02^{a}	38.80±0.02^{a}	0.08
		P-value	0.00	0.00	0.00	0.00	

For each parameter, columns sharing similar superscripts are not significantly different at P>0.05.. Results are in Mean ± Standard Deviation

DISCUSSION

The proximate analysis of *A. heterophyllus* and *Treculia africana* (Table 1) seem to have review the potential benefits of these species, the nutritional content of the species is in line with the report of [8,11,16] on these species containing digestible proteins, carbohydrates, fat and oil, magnesium, calcium, moisture etc. in different proportions. The high level of carbohydrate in the seeds of both plants correspond with the findings of [9,10] and the word of [19,20] on the plants being an efficient source of starch and industrial raw material and an alternative starchy staple food [21]. The protein content of these species falls within the protein recommended dietary allowance of 10-35% as the utilization recommendation [7] and are higher than those from high protein animal sources such as beef and marine fishes [6]. There is an appreciable high level of dietry fibre in the two species (Table 1), and this suggests that it is capable of promoting digestion as fibres are known to aid and speed up the excretion and defecation of wastes and toxin from the body, preventing them from sitting in the intestines or bowel for too long. This was in line with the findings of [4], on the presence of higher dietary fibres in jackfruit.

CONCLUSION

The proximate composition of *A. heterophyllus* and *Treculia africana* indicated the potential benefits of these species and could be the reason these plants are used in ethnomedicinal practices.

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