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Research Article

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Extraction and Proximate Analysis of *Jatropha Curcas* seed oil from Gaanda Town, Gombi Local Government Area Adamawa State

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Abstract The analysis for proximate, elemental composition was done using standard methods. The result of the proximate analysis revealed that apart from carbohydrate, the Jatropha seed have high oil curcass of crude fibre, fat and oils, and ash content while its moisture and protein content are low. The results of the mineral analysis J. curcas seed show that sodium is the most abundant mineral, followed by iron, copper, manganese in decreasing order of concentration with molybdenum as the least abundant mineral in the leaves. The study therefore recommends that *Jatropha curcas* should be considered seriously in future researches and projects designed to produce lead compounds and biologically active molecule from this species and cultivation of the plant should be encouraged.

Keywords Extraction, Proximate Analysis, Jatropha Curcas, seed oil

Introduction

Jatropha curcas or physic nut, is a bush or small tree (up to 5 m height) and belongs to the euphorbia family. The genus Jatropha contains approximately 170 known species. The genus name Jatropha derives from the Greek jatrós (doctor), trophé (food), which implies medicinal uses. Curcas is the common name for physic nut in Malabar, India. The plant is planted as a hedge (living fence) by farmers all over the world, because it is not browsed by animals.

Varieties The Jatropha variety in Nicaragua has fewer, but larger fruits. The yield per ha seems to be the same. A non-toxic variety exists in Mexico, which is used for human consumption after roasting. It does not contain Phorbol esters. ("This non-toxic variety of Jatropha could be a potential source of oil for human consumption, and the seed cake can be a good protein source for humans as well as for livestock.", [1]).

Ecology

Jatropha curcas L. is not a weed. It is not self propagating. It has to be planted. It grows well with more than 600 mm of rainfall per year, and it withstands long drought periods. With less than 600 mm it cannot grow except in special conditions like on Cape Verde Islands, where the rainfall is only 250 mm, but the humidity of the air is very high (rain harvesting). It cannot stand frost. It survives a very light frost, but it loses all leaves. The production of seeds will probably go down sharply.

Figure 1: Aerial view of a Jatropha curcas, its fresh leaves, fresh fruits and the matured seed for extraction

Jatropha Curcas Plant is a medication base plant and have been employed since the dawn of civilization for prolonging the life of man and for combating various ailments. For decades the screening of medicinal plant materials for their therapeutic values has continue to represent potential sources of new effective medicines [2]. Using plants for the treatment and cure of diseases is as old as human species itself, with popular knowledge making a great contribution to the dissemination of the therapeutic virtues of these plants. This knowledge has represented a therapeutic resource for many communities and ethnic groups [3].

The name Jatropha is derived from the Greek words jatrós (doctor) and trophé (food) which implies medicinal use [4]. *Jatropha curcas* is a member of the *'Euphorbiacea'* family. It is popularly referred to as 'Hospital Too Far', 'Catholic Vegetable', *Iyana-Ipaja* or '*Lapalapa*' by the local folks in Yoruba language [5]. The Igbo people of South Eastern Nigeria call it '*Ugu-Oyibo'* and "*Cini da zugu*" in Hausa language. Other species of this plant are *Jatropha curcas, Jatropha gossypifolia, Jatropha padagrica, Jatropha glandulifolia, Jatropha multifida, Jatropha intergerrima* [6].

It is a traditionally used medicinal plant in South-Eastern Nigeria with many claims from local consumers that it possesses blood replenishing properties [7]. It has been reported that Jatropha leaves are rich in beta blockers, anti-cancer agents, anti-anaemic, anti-microbial activities, anti-plasmodial and anti-oxidant effects against oxidative stress induced by malaria parasite [8]. Although, studies have been carried out on *J. curcas*, none of such researches have addressed the antioxidant potentials of lyophilized aqueous extract of *Jatropha curcas seed*.

Vegetable Oil

These are chiefly present in seeds, and nuts of plants. They are stored in seeds to serve as nourishment for the germination of the embryo. There are few seeds and nuts which are rich in fats contents, thus, Soya beans, groundnut and palm cannel, pipe or mustered sesame seed, all are important source of edible oil. In the other hand, cotton seed, linseed, and caster seed gives a non-edible oil in various industries.

Storing and Keeping Vegetable Oil

Whether refined or not, all oils are sensitive to heat, light and exposure to oxygen. Rancid oil has an unpleasant aroma and acrid test, and its nutritional value is greatly diminished. To delay the development of rancid oil, a blanket of an inert gas, usually nitrogen is applied to the vapor space in the storage container immediately after production. This is referred to as tank blanketing. All vegetable oils should be kept in a cool, dry place. Oils may thicken, they will soon return to liquid if they stand at room temperature. To prevent negative effect of heat and light, oil should be removed from cold storage just long enough for use Extra-virgin and virgin olive oils kept at least 9 months after opening. More refined vegetable oil tends to have higher smoking points. Smoking oil indicate ask of combustion.

Uses of Vegetable Oil

Vegetable fats and oils may be edible or non edible. They are used as lubricants, paints, cosmetics, pharmaceuticals and other industrial purposes. Oil extracted from plants has been use in many cultures since ancient time. Many vegetable oil are consumed directly, or used directly as ingredients in food. A role that they share with some animal's food include butter and glucose. They are also use in; - Shortening:- To give pastry a crumbly texture - Texture to make other ingredients stick together. Flavor while less- flavor full oil command premium prices oil such as olive oil may be chosen specifically for the flavor they impart. Flavor base: Oils, can also carry flavors of other ingredients, since many flavors are present in chemicals that are soluble in oil. Oil can be heated, and used to cook other foods. Oil of this purpose should have high flashy point. Fats stored in animal adipose provide insulation against cold and protect body organisms. Fats are source of vitamin A and vitamin D as nourishment for the germinating embryo.

Negative Health Effects of Vegetable Oil

Heating an oil changes its characteristics. Oils that are healthy at room temperature can be unhealthy when heated above certain temperature. When choosing cooking oil, it is important to match the oils heat tolerance with the cooking method. Polyunsaturated oils like canola, sunflower and con oil degrades easily to be toxic when heated. Prolonged consumption of burnt oils leads to arteriosclerosis, inflammatory joint diseases and development of birth effects. Extraction of the Seed (Locally) The matured fruits which cannot be eaten are cut into pieces and kept in a closure for some weeks. The pieces are completely rotten, became soft, watery and a bad odour. The rotten pieces are properly washed several times to remove the rotten smelly flesh; the seeds are then properly rinsed. The seed is milky in color and small in size. The seeds are dried at a moderate temperature and then stored.

Principle and Method of Soxhlet Extraction

Normally, a solid material (sample) containing the desired compound was placed inside a thimble made from thick filter paper, which is loaded into the main chamber of the soxhlet extractor, which is placed into a flask containing the extraction solvent. The soxhlet extractor is equipped with a condenser. The solvent is heated to

reflux, the solvent vapour travels up a distillation arm and floats in to the chamber housing the thimble of solid (sample) the condenser ensure that all solvent vapor cools and drips back down the chamber housing the sample. The chamber, containing the sample slowly filled with warm solvent, some of the designed compounds will then dissolve to the warm solvent. When the soxhlet chamber is almost full, the chamber automatically, emptied by siphon side arm, with the solvent running down to the distillation flask. This cycle was allowed to repeat itself over hours during each cycle, a portion of the non- volatile compound dissolves in the solvent. After many cycles, the desired compound is concentrated in the distillation flask. After extraction the solvent is removed by means of rotary evaporator or a continuous heating on a water bath yielding the extracted compound. The nonsoluble portion of the extracted solid remain in the thumble and is discarded or be used for different purpose.

Processing and extraction of Plant materials

The fresh matured yellow seeds were air dried at room temperature and pulverize with an electric blender store in airtight container kept in refrigerator prior to analyses. The vegetable seed were wash with distill water. A portion were dice and dried at 50 °C while the remaining portion were blanche by pouring hot water on it any allowed it to stand for 10 minutes before the broth were decanted as describe by Awoyinka *et al* [9]. Both the raw and blanched forms were grinded into powder. The powder samples were placed in desiccators and store prior to analysis. Fresh sample were use for ascorbic acid assay.

Determination of Colour of the Oil Extract

The oil of Guna seed was physically observed to determine the colour. The colour was found to be dark brown.

Proximate

Proximate analysis were conducted according to the official AOAC methods (1984), and carbohydrates determined by difference [10].

Mineral:

Samples were digested as describe, [11]. Each sample (0.5 g) was weighed in triplicate into Kjeldahl flasks and 10 mL of cone. HNO_3 were added and allow to stand overnight. The samples will then heated carefully until the production of brown nitrogen (IV) oxide fume has ceased. The mineral contents were analyzed by ALPHA 4 Atomic absorption spectrophotometer (Fisons Chem-Tech, Analytical, UK).

Antinutritional factors

Tannin were determined by the modified Vanillin - HCI method using 1.0 mg/mL of Catcchin in 1% HC1 - MeOH as standard. The colour substituted product were measured at 500 ran. Phytate were determine by the anion exchange method as described by Falade *et al.*, [11].

Trypsin inhibitor were determine by the method of Kakade *et al.*, [12] as modified by Adewusi and Osuntogun [13]. A synthetic substrate (BAPNA) were subjected to hydrolysis by trypsin to produce yellow coloured p-nitroanilide. The degree of inhibition by the extract were measured at 410 nm using a UV-VIS Spectrophotometer.

Oxalate were determinetitrimetrically as described by Falade *et al.* [11] by being precipitate as calcium oxalate and titrate against standard potassium permanganate. The oxalate was calculated as sodium oxalate equivalent.

Ascorbic Acid

Ascorbic acid were determine colorimetrically as described by (Falade *et al.,* 2003), after the formation of the Osazone which were dissolve in 85 % H_2SO_4 to give an orange-red coloured solution which is measured at 540 nm using a UV-VTS Spectrophotometer.

Statistical Analysis

Results were express as mean and standard deviation of three determinations. Data were subject to unpaired t-test to determine the levels of significant difference and consider significant at $p < 0.05$.

Table 1: Proximate composition *Jatrophta curcas seed*

Proximate compositions	Quantities (%)
Ash	11.565 ± 0.13
Carbohydrate	51.734 ± 0.00
Crude fiber	12.172 ± 3.19
Fat	11.730 ± 1.03
Moisture	6.195 ± 0.02
Vit. C	1.361 ± 0.57

Values are mean ± standard deviation of triplicate determination (n=3).

Discussion of the Proximate Composition

The proximate composition recorded in this study showed that *J. curcas seeds* are nutritionally rich with high ash content that suggests its richness in mineral elements, thus, consumption of this plant leaves in right proportion could help in the prevention of micronutrient deficiency. The low moisture content in *J. curcas seed* indicates shows a long shelf life due to the ability of low moisture to delay microbial and biochemical activities leading to spoilage while the low protein content suggests that the leaves could be poor protein source unless amino acid analysis showed that it is rich in essential amino acids. The high level of crude fibre content indicates that the plant leaves are good source of the crude fibre which confers some health benefits such as healthy colon, anti-hypercholesterolemia, efficient digestion and rapid bowel movement in individuals who consume them. Although, carbohydrate is the major proximate constituent, individuals consuming this leaves may not obtain the required quantity and must consume other major carbohydrate sources to meet the energy need as leaves generally are not good sources of carbohydrate. The leaves also have high fats content which could be of economic importance if they are rich in essential oils.

Proximate compositions and ascorbic acid are presented in Table 1. The moisture content of *Jatropha curcas seed* was within the range of 79-89% reported for some Nigerian vegetables [11]. Aletor and Adeogun [14] have reported the crude protein on dry weight basis within the range of 15-30% for most green leafy vegetables. The crude protein (CP) content reported here compared favorably with the value of 26% reported for both *Amaranthus viridis* and *Celosia argentea* (green variety) but higher than 21 % reported for *Cochorusolitorius* [11].

Leafy vegetables are known to be poor sources of fat. The ether extract reported for the *Jatropha curcas seed* was the lowest among the proximate components. It was however, higher than the ether extract of 3% reported for green variety of amaranthus and agreed with 4.5% ether extract reported for green variety of *Celosia argentea* [11]. Leafy vegetables are important sources of fibre among all categories of Nigerians.

Fibre has been reported to impair mineral availability though the positive effect of the fibre include the reduction of blood cholesterol and the glycemic index of carbohydrate sources [15-16]. The crude fibre content compared favourably with 9.7% reported for both *Adansonia digitata* [17] and *Solarium macrocarpon* [11]. The ash content which is an indication of mineral content of sample was within the range of 5.0-13.0 % reported for some Nigerian vegetables [11] but lower than 17.8% reported for amaranthus [18]. However, the increase- in some of the nutrients composition on blanching may be due to the extraction of the water soluble components of the vegetable such as carbohydrates into the water used for the blanching hence concentration of other water insoluble components such as fat and some proteins. This is in agreement with earlier observation in some Nigerian vegetables [11,18]. Eating green leafy vegetables can protect the body against oxidative stress because of the present of antioxidant compounds such as ascorbic acid and plant polyphenols such as vegetable tannins [19]. Ascorbic acid is an important antioxidant for the skin [20]. It fights wrinkles and helps the body produce and maintain healthy collagen an important component of connective tissue.

Conclusion

Jatropha curcas plant has the potential to make significant nutritional contribution to Nigerian diets because of its high nutrient content and the low levels of its antinutritional factors. The plant been drought resistant makes it valuable vegetable most especially in areas with low precipitation with attendant shortage of green vegetables.

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