Utilization Pattern and Phytochemical Properties of Jatropha Curcas (L.) in Yewa South Local Government Area, Ogun State, Nigeria

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Abstract

This study investigated the utilization pattern of *Jatropha curcas* plant and phytochemical properties of *Jatropha curcas* (L) from Yewa South Local Government Area, Ogun State, Nigeria. A purposive sampling technique was used in selecting120 respondents and data were collected from them through questionnaires. Data analyses were carried out and result presented using descriptive statistics. Information were sought on level of awareness about *Jatropha curcas* and level of utilization of its derivatives. Findings revealed that the respondents are vast in the use of *Jatropha curcas* for traditional medicine. The study also showed that *Jatropha curcas* has an average oil yield of 32% hence, it is efficient for use as bio-fuel. The highest phytochemical detected was alkaloids (8.1%). Biofuel has been regarded as potential alternative for fuel for partial substitution of bio-fuel. *Jatropha curcas*, which is one of the sources of bio-diesel, is readily available in tropical and sub-tropical areas. Awareness of *Jatropha curcas* plant usefulness but not that of its product is very high in Yewa south local government area. Deliberate promotion of the plant products and the establishment of Jatropha System for sustainable production among the populace is therefore recommended.

Key Words: *Jatropha curcas*, Biofuel, phytochemical, utilization, awareness

Introduction

Jatropha curcas L. belongs to the family Euphorbiaceae and the genus Jatropha. It is considered to have originated from Central America, most probably Mexico, where it is found extensively in different regions of the country (Enzo, 2007). Jatropha plants that occurred in various climate regions and sometimes from the same climate zone shows morphological differences particularly with regards to their shape, size of seeds, protein and lipid content (Jorge *et al*., 2010). *J. curcas* is a deciduous shrub that grows up to a height of 3.5 meters and with a production life of 50 years (Azza and Ferial, 2010) The genus Jatropha includes a large number of species (170) that are distributed over the world in habitats ranging from the tropical to the temperate zone (Enzo, 2007).

It is fast growing plant and produces seeds after approximately 1-3 years, (Jorge *et al*., 2010). depending on rainfall conditions and how the plant is propagated. Jatropha grows on well-drained soil with good aeration and is well adapted to marginal soil with low nutrient content (Azza and Ferial, 2010). It occurs mainly at lower altitudes (0-500m) in areas with average annual temperatures well above 20°C but can grow at higher altitudes and tolerates slight frost (Augustus *et. al*., 2002).

The Arabs have been using this plant for medicinal purpose (Enzo, 2007). Today it is found in almost all the tropical and sub-tropical regions of the world (Jorge *et al*., 2010). There are more than 200 different names as a result of its great significance to man and the various possibilities of its use. A botanist, Carl Von Linne, who first classified the plants in 1753, gave it the botanical name "*Jatropha curcas*" from the Greek word "Jatros" meaning a "Doctor" and "trophe" meaning "nutrition" (Augustus *et. al*., 2002). Even Linne had realized the potential of this plant for medicinal purposes (Gubitz *et al*., 1999). The plant is regarded as a shrubs/small tree with height generally ranging from 3-5 meter (m). It has been estimated that the life of the plant is up to 50 years. Different varieties of the plant can be found which are generally Cape Verde,

Nicaragua, Ife-Nigeria, non-toxic Mexico (The Biomass Project, 2000).

Jatropha is a valuable multipurpose crop that alleviates soil degradation, desertification and deforestation which can be used for bio-energy to replace petro-diesel, soap production and climate amelioration protection (CJP 2007). Jatropha It is a small tree with smooth gray bark, which exudes whitish coloured watery latex cut and its stain is difficult to remove (Enzo, 2007).

Normally it grows between (3-5m) in height, but can attain a height of up to (8-10m) with diameter up to 20cm under favorable conditions (Henning, 2000).

The recent interest as alternative sources of energy placed *J. curcas* in the fore front of discussions on bio-fuel production. Apart from biofuel, it also produces wood (though of poor quality) for cooking, animal feeds and is used for rehabilitation of marginal lands (Heller, 1996). These characteristics coupled with the hoax towards energy independence placed *J. curcas* in a strategic position for developing countries, especially Nigeria, where the demand for fossil fuel is not marched by a corresponding increase in the supply infrastructure. Therefore, this study aimed to access the utilization pattern and phytochemical properties of *J.curcas* seed and the oil.

MATERIALS AND METHOD

The study was carried out in Yewa South Local Government area of Ogun State, Nigeria. It lies on (6°48'N 2°57'E) and has land mass of 163,720 square hectares and a population of 168,850 according to 2006 census (Wikipedia, 2008a).

Sampling Method

A purposive sampling method was adopted in selecting Ilaro, Idogo, Oke-odan, Ajilete and Ilobi areas of Yewa south local Government area of Ogun state, Nigeria, due to the abundance of *J. curcas* in the area. A well-structured questionnaire was administered to 24 respondents in each the selected areas and *J. curcas* seeds were also collected for oil extraction and phytochemical analyses.

Method of *Jatropha curcas* oil extraction

The matured seeds of *J.curcas* were collected from free areas within Ilaro in Yewa south local Government area, Ogun State, Nigeria. The seed was de-hulled manually and separated by winnowing, it was grinded into smaller pieces using a grinding stone and dried under room temperature. The oil was extracted at the Nigerian Institute of Science Laboratory Technology (NISLT, Ibadan) using a soxihet extractor and normal-hexane as the reagent or solvent, the soxlhet extractor has three main parts which is the thimble, round bottom flask and the condenser. The thimble was loaded with the sample (grinded *Jatropha curcas* seed), the rounded bottom flask was loaded with the reagent/solvent which is normal-hexane and heated (70°C) which aids in syphoning oil content from the sample and the condenser has an enlarged uptake tube to improve condensing capacity after about 6 hours the round bottom flask contain both the solvent and oil extracts forming a solution. Then, it was taken to the oven where it was heated at the boiling point of the solvent used (normal-hexane) 69°C leaving concentrated oil extract, the phytochemical properties analysis of the oil was then carried out.

Measurement of oil yield

The total seeds collected from the area weighed 372g while the quantity of oil extracted was 120g

$$\text{Oil yield (\%)} = \frac{quantity\ of\ oil\ extract}{Quantity\ of\ seed}\ x\ 100$$

$$\text{Hence, oil yield} = \frac{120}{372}\ x\ 100 = 32\%$$

Results and Discussion

Table 1 showed the socio-economic characteristics of the respondents. From the result, 43.3% of the respondent were above 45 years, 27.5% were between 26 - 35 years, 25% were between 36 - 45 years and 4.2% were below 26 years. Since majority of the respondent are adults, this could positively affect their vastness in the knowledge of *J. curcas* plant and its derivatives. The result also revealed that 56.7% were male while 43.3% were female. Marital status indicated that 52.5% were married, 19.2% are singles and 28.3% are others (Widowed).

In Table 2, majority of the respondents (95%) in the study areas had knowledge of the species utilization. The level of its utilization among the respondents is also shown in Table 2. It can be deduced that 71.7% uses parts of *Jatropha curcas* plant, only 23.3% do not use the plant parts. From the sampled-respondents, it was revealed that 24.4% uses the leaf for curing of diseases like gonorrhea, staphylococcus and it is also used in bathing infants so as to avoid sickness, 18.6% uses the root for curing malaria and fever, 10.5% uses the seed for inducing child birth in women by curing vaginal infection and it is also used as fuel in company with its abortificient potential, and majority uses the stem (46.5%) mainly for chewing stick. It also reveals that 1.2% use it as a fuel source, 1.2% uses it as condiments and majority (87.6%) of the respondents utilizes it for medicinal purposes and treatment of ailments.

Table 1- Socio-Economic Characteristics of the Respondents

Variables	Frequency	Percentage (%)
Age		
Below 26	5	4.2
26-35	30	25
36-45	33	27.5
Above 45	52	43.3
Total	**120**	**100**
Gender		
Male	68	56.7
Female	52	43.3
Total	**120**	**100**
Marital status		
Single	23	19.2
Married	63	52.5
Others	34	28.3
Total	**120**	**100**
Occupation		
Farming	43	35.8
Civil servant	35	29.2
Trading	31	25.8
Others	11	9.2
Total	**120**	**100**

Table 2: Percentage distribution on awareness and utilization of *J. curcas* plant and its derivatives

Variables	Frequency	Percentage (%)
Awareness of *Jatropha curcas* plant		
Yes	114	95
No	6	5
Total		
Awareness on the use of any part of the plant?		
Yes	86	71.7
No	34	28.3
Total	120	100
Part of the plant been used		
Leaves	21	24.4
Root	16	18.6
Seeds	9	10.5
Stem	40	46.5
Total	86	100
Leaves		
Gonorrhea	6	28.6
Staphylococcus	6	28.6
Bathing infant to avoid sickness	9	42.9
Root		
Malaria/fever	16	100.0
Seed		
Inducing child bearing	9	100.0
Stem		
Chewing stick		
Other uses of *J. curcas*		
Fuel	1	1.2
Condiment	1	1.2
Medicine/curing diseases	84	97.6
Total		
Awareness of oil in the seed?		
Yes	8	88.9
No	1	11.1
Total	9	100
Extracted oil from the seed before		
Yes	3	33.7
No	6	66.3
Total	9	100
Method used in extracting the oil		
Local	2	33.7
Modern	1	66.3
Total	3	100
Uses of the oil extracted		
Fuel	1	33.7
Medicinal purpose	2	66.3
Total	3	100

The results further showed that a larger population (88.9%) of the respondents that utilizes the seed of *Jatropha curcas* were aware that it contains oil, while 11.1% were not. Only 33.3% of respondents know how the oil is extracted from its seeds and 66.7% has never extracted the oil from the seed. However, local method (66.7%) by boiling with water for hours after which it is further subjected to purification (33.7%) methods were adopted in the extraction of oil from the seed. Essentially, respondents that extracted the oil showed that extracted oil from the seeds is used for medicinal purposes (66.7%) and 33.7% of the respondents claimed its' use for fuel. The research discovered that the oil yield of *Jatropha curcas* was 32% which is fairly average compared to 20-40% reported by Augustus *et. al.,* 2002.

Table 3- Phytochemical properties of *J. curcas* seed oil

Phytochemicals	Values from seed oil
Flavanoid	1.3%
Alkaloids	8.1%
Oxalate	0.181mg/g
Phytic acid	1.01%
Tannin	0.17%
Saponin	0.01%
Phenol	0.75%

Low concentration of flavonoids (1.3%), alkaloids (8.1%) which is very high compared to 1.01% seed oil recorded by (Ijei and Omodairo, 2006), and tannin concentration of (0.17%) were observed in *J. curcas* seed oil (Table 3), tannin has anti-inflammatory effect which help control all indication of gastritis, esophagitis, enteritis and irritating bowel disorder (Dhannananda, 2001), tannins are also responsible for antidiarrheal activity (Enzo, 2007). These values are low and may be considered as of no nutritional significance. The phytic acid content of *Jatropha curcas* seed was 1.01 %. This value is close compared with 1.5% for soybean reported by Gubitz*et al*., (1999). Phytates have also been implicated in protein digestibility as it decreases this by forming complexes and also by interacting with enzymes such as trypsin and pepsin (Reddy and Pierson, 1994). Saponins concentration in *J. curcas* was lower than other anti-nutritional factors under study, saponin are used as dietry supplements, expectorant and anti-inflammatory agent (Enzo, 2007). Phenolic compound in *Jatropha curcas* seed oil have antiseptic properties which could explain the use of this oil for the treatment of various diseases (Azza and Ferial, 2010). The anti-microbial activities of phytochemicals are further evidences by their active role in plant disease resistance (Ijeh&Omodairo, 2006) and antioxidant activity. The plant is widely used as an application to bruises and wounds in herbal medicine in western Nigeria (Gubitz *et. al*., 1999). The exudates of *Jatropha curcas* effectively arrested bleeding from fresh wounds, inhibited microbial growth of known wound contaminants and accelerates wound healing process (Gubitz *et. al*., 1999).

Conclusion and Recommendations

Potential use of *J. curcas* as an energy crops, medicinal plant, agro-forestry crops, soil conservation measures and industrial application are the attractive factors to cultivate the plant in the unused and barren land. However, awareness of the utilization of its products and the opportunities it offers in terms of income and employment generation is very low. Planting of *J. curcas* by the respondents is not as a result of their awareness about biodiesel, but because it is an age long activity for boundaries marking.

Multiple benefits of *J. curcas* plants and oil expelled from its seeds are not only useful in saving the environmental pollution but supports for employment generation and entrepreneurship developments. The results of this investigation suggest that *Jatropha curcas* seed oils have great potentials in the prevention and treatment of many aliments and also shows presence of some toxic substance hence cannot be digested by human hence it should be subjected to further purification if it is needed to be used for cooking.

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