

***Jatropha curcas* Plant: A Review**

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Abstract

Jatropha is a genus of approximately 175 succulent plants, shrubs and trees (some are deciduous, like Jatropha curcas). Jatropha has varieties of uses such as bio-diesel and seed yields under cultivation can range from 1500 to 2,000 kg per hectare, corresponding to extractable oil yields of 540 to 680 litres per hectare (58 to 73 US gallons per acre). Jatropha oil is significantly cheaper than crude oil and environmental friendly as alternatives to fossil fuel. Other uses are the stems which are used for basket making. The seeds are also roasted as food, the roots in dye production, cultivated as ornamental plants, tanning of leather, and as house plant including fencing. Its cultivation is not capital intensive. Hence, these various uses of Jatropha would create job for the teeming population in Nigeria.

Keywords: Jatropha, Seed, Oil, biodiesel

Introduction

Jatropha is a genus in the family *Euphorbiaceae* consisting of approximately 175 species of succulent plants and trees some of which are deciduous like *Jatropha curcas*. (Anonymous, 2011) This name is derived from the Greek words 'iatros' (physician), and 'trophe' (nutrition), meaning "physician's nutrition". Mature plants being monoecious produce separate male and female flowers. As with many members of the family *Euphorbiaceae*, *Jatropha* contains compounds that are highly toxic (Anonymous, 2011)

In 2007 Goldman Sachs cited *Jatropha curcas* as one of the best candidates for future biodiesel production. It is resistant to drought and pests and produces seeds containing 27 – 40% oil averaging 34.4%. (Achten *et al.*, 2007). The remaining press cake of *Jatropha* seeds after oil extraction could also be considered for energy production. However, despite their abundance and use as oil and reclamation plants, none of the *Jatropha* species has been properly domesticated and as a result, their productivity is variable and the long-term impact of their large-scale use of soil quality and the environment is unknown (Anonymous, 2007). Igbinsola *et al.* (2009) demonstrated potential broad spectrum antimicrobial activity of *J. Curcas*.

Scientific Classification

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Malpighiales
Family:	Euphorbiaceae
Subfamily:	Crotonoideae

Tribe: *Jatropha*

Species: Approximately 175 including the following:

Jatropha acanthophylla Loefgr; *Jatropha bullockii*, E.J. Lott

Jatropha cathartica Teran and Berland; *J. chamelensis* Perez – Jimenez

J. costaricensis G.L. Webster & Poveda; *J. cinerea*; *J. cuneata*; *J. curcas*;

J. dioica; *J. elliptica*; *J. excise*; *J. goassypifolia*; *J. hermandiifolia*; *J. intergerrima*; *J. macrohiza*, *J. multifida*; *J. podagrica*; and *J. unicostata*.

Botanical Features

It is small tree or shrub with smooth gray bark, which exudes a whitish coloured latex, when cut normally, it grows between three and five meters in height, but can attain a height of up to eight or ten meters under favourable condition.

Leaves: It has large green to pale green leaves, alternate to sub opposite, three to five lobed with a spiral phyllotaxis, in winter all the leaves fall and the shrub is leafless. *Jatropha* leaves are used as food for tusser silk worm.

Flowers: The petiole length ranges between 6 – 22mm, the inflorescence is formed in the leaf axils, flowers are formed terminally, with female flowers usually slightly and occur in the hot seasons.

Fruits: Fruits are produced in winter when the shrub is leafless, or it may produce several fruits throughout the year if soil moisture is good and temperatures are sufficiently high. Each inflorescence yields a bunch of approximately 10 or more ovoid fruits. A three bi-valued cocci is formed after the seeds mature and the fleshy exocarp dries.

Seed: The seeds become mature when the capsule changes from green to yellow, after two to four months from fertilization. The blackish, thin shelled seeds are oblong and resemble small castor seed.

Flowering and Fruiting Habit

The trees are deciduous, shedding the leaves in the dry season (Anonymous, 2011). Flowering occurs during the wet season and the two flowering pears are often seen. In permanently humid regions, flowering occurs throughout the year. The seeds mature about three months after flowering. Early growth is fast with good rainfall conditions nursery plant may bear fruits after the first rainy season, direct sown plant fruits after the second rainy season (Anonymous, 2011). The flowers are pollinated by insects especially honey bees (Anonymous, 2011).

Chemical Composition

Chemical Analysis of the *Jatropha curcas* (%)

Moisture	6.20	Prot ein	18.00	Fa t	38.00
Carbohy drate	17.00	Fibr e	15.501	A sh	5.30

Anonymous, 2011.

Medicinal Plant: The latex of *Jatropha curcas* contains an alkaloid known as jatrophine, which is believed to have anti- cancerous properties (Anonymous, 2011).

It is also used as an external application for skin diseases and rheumatism and for sores on domestic livestock in addition the tender twigs of the plant are used for cleaning teeth, while the juice of the leaf is used as an external application for piles. Finally the roots are reported to be

used as an antidote for snakebites (Anonymous, 2011).

Raw Materials For Dye: The bark of *Jatropha curcas* yields a dark blue dye which is used for colouring cloth, fishing nets and lines.

Soil Enrichment: *Jatropha curcas* cake is rich in nitrogen, phosphorus and potassium and can be used as organic manure for plantations.

Insecticide/Pesticide: The seeds are considered anthelmintic in Brazil, and the leaves are used for fumigating houses against bed bugs. Also, the ether extract shows antibiotic activity against *Staphylococcus aureus* and *Escherichia coli*.

Holistic Approach of (Adiwasi) Model Aboriginal Development Initiative with A Sustainable Income.

Many NGOs which work for upliftment of tribes have found this model very effective which consist two schemes.

Scheme 1: The NGOs set up hand operated expellers (which do not require electrical power) in their centers. Tribes come to these centers with their bags containing any oil bearing seeds like *Jatropha*, *Neem* (non edible oil for lamps) *Pongamia*, *Mahua* (edible oils for cooking and crush the seeds themselves). The tribes carry the extracted oil home for burning these in oil in lamps and for cooking. The tribes leave the seed cake in these centers. The NGOs then process the seed cake to bio fertilizer in their center and sell it later. Tribes collect sufficient seeds, during harvesting period to last for a year but crush these to get oil as at when required

Scheme 2: The same NGOs buy the oil, extracted as above and sell it to temples, hotels, household for burning them in simple lamps as a social cause.

The NGOs also tie-up with soap manufacturers for buying oil from them at a specified rate. The profit from sale of oil is passed on to tribes at reasonably good price; there is a two step process to convert seed cake into bio fertilizer, in the first step the seed cake is fermented to biogas.

Uses

The stems of Haat (*Jatropha cuneata*) are used for basket making by the Seri people in Fonora, Mexico. The stems are roasted, split and soaked through an elaborate process. Spicy *Jatropha* (*J. integerrima*) is cultivated as an ornamental in the tropics for its continuously blooming crimson flowers. Buddha belly plant (*J. podagrica*) was used to tan leather and produce a red dye in Mexico and the Southwestern United States. It is also used as a house plant. Oil and biodiesel are derivable from the plant.

Medically it is used for disease like cancer, piles, snakebite, paralysis, dropsy etc. (Anonymous, 2011). *Jatropha* grows wild in many areas of India and even thrives on infertile soil. A good crop can be obtained with little effort depending on soil quality and rainfall, oil can be extracted from *Jatropha* nuts after two to five years (Anonymous, 2011). The annual nut yield ranges from 0.5 to 12 tons it is per hectare or acre. The kernels consist of oil to about 60 percent; this can be transformed into biodiesel fuel through esterification.

Oil and Biodiesel

Currently the oil from *Jatropha curcas* seeds is used for making biodiesel fuel in Philippines and in Brazil, where it grows naturally and in plantations in the Southeast, and the North/Northeast Brazil. Likewise, *Jatropha* oil is being promoted as an easily grown biofuel

crop in hundreds of projects throughout India and other developing countries (Anonymous, 2007). Large plantings and nurseries have been undertaken in India by many research institutions and by women's self-help groups who use a system of micro credit to ease poverty among semi-literate India women. The railway line between Mumbai and Delhi is powered with *Jatropha* biodiesel and it runs on 15-20% biodiesel (Fairless, 2007). In Africa, cultivation of *Jatropha* is being promoted and it is grown successfully in countries such as Mali (Polgreen, 2007)

Estimates of *Jatropha* seed yield vary widely, due to a lack of research data, the genetic diversity of the crop, the range of environments in which it is grown and *Jatropha* perennial life cycle. Seed yields under cultivation can range from 1,500 to 2,000kg per hectare, corresponding to extractable oil yields of 540 to 680 litres per hectare (58 to 73 US gallons per acre (Dar, 2007). Its potential was as much as 1,600 gallons of diesel fuel per acre per year. By 2011 there is arising some skepticism about the "miracle" properties of *Jatropha*. It does grow on marginal land, but if marginal land is used, marginal yield will be obtained. *Jatropha* can also be intercropped with other cash crops such as coffee, sugar, fruits and vegetables.

Toxicity

Much like other members of the family *Euphorbiaceae*, *Jatropha* plants contain several toxic compounds, including lectin, saponin, carcinogenic phorbol and a trypsin inhibitor. The seeds of this genus are also a source of the highly poisonous *texalbumin curcin*. Despite this, the seeds are occasionally eaten after roasting, which reduces some of the toxicity. Its sap is a skin irritant and ingesting as few as three untreated seeds can be fatal to humans. In 2005 Western Australia banned *Jatropha*

gossypifolia as invasive and highly toxic to people and animals (Macintyre, 2007).

In Nigeria Tribune of Tuesday, March, 2011, it was stressed that *Jatropha* would reduce employment problem. The plant is which popularly known as *Lapalapa* in Yoruba is of economic importance, by providing job for the youths and women. There is no rigour or stress in nourishing the plant to maturity because it is a drought resistant. It can also produce seed for more than 50 years and from the seeds one can extract diesel and other products of economic importance. Other benefits of *Jatropha* plant include using the plant to make organic fertilizer, production of glycerin and insecticides from the seeds, as well as using it to reclaim non-fertile land with other additional advantages like combating desert encroachment and soil erosion.

Recommendations and Conclusion

Since the importance of *Jatropha* plant has been realized as a wonder plant in all ramifications hence, parastatals and Government at Federal, State and Local Government levels are therefore implored to engage in the farming of this wonder plant so as to solve the problem of unemployment.

REFERENCES

- Achten WMJ, Mathijs E, Verchot I, Singh VP, Aerts R, Muys B (2007). *Jatropha* biodiesel fueling sustainability?. *Biofuels, Bioproducts and Biorefining* 1(4), 283-291. DOI: 10.1002/bbb.39 (<http://dx.doi.org/10.1002/bbb.39>)
- Anonymous (2007) "Genus: *Jatropha* L" Retrieved from <http://www.arsgrin.gov/oginbin/npgs/htm1/g> enus.pl?6189). Germplasm on 5/2/12
- Anonymous 2011, from wikipedia, the free encyclopedia. <http://en.wikipedia.org/wiki/Jatropha>
- Anonymous 2011, <http://www.jatrophaworld.org/jatropha> plant2htm.
- Anonymous 2011, <http://www.shele.com/jatrophaplant.htm>.
- Carlos Casado SA en el Chaco" <http://www.eleconomista.es/economia/noticias/518424/05/08/Econorma-Empresas-El-presidente-de-SanJose-asume-tambien-la-presidente-de-su-participada-argentina-Carlos-Casado.htm> (in Spanish). *El Economista*. 2 May 2008. <http://www.eleconomista.es/economia-noticias/518424/05/08/Econorma-Empresas-El-presidente-de-SanJose-asume-tambien-la-presidente-de-su-participada-argentina-Carlos-Casado.htm>
- Dar, William D. (2007). "Research needed to cut risks to biofuel farmers" (<http://www.scidev.net/content/opinions/eng/research-needed-to-cut-biofuel-farmers.cfm>).
- Fairless D. (2007). "Biofuel: The little shrub that could – maybe". *Nature* 449 (7163): 652-655. doi: 10.1038/449652a <http://dx.doi.org/10.1038/449652a>. PMID 17968401 (<http://www.ncbi.nlm.nih.gov/pubmed/17968401>).
- Goldsman, Sach (2007) *Jatropha* plant Gains Steam in Global Race for Biofuels

- ([http://online.wsj.com/article,](http://online.wsj.com/article/SB118788662080906716.html?googl=news-wsj/article)
2007./)
SB118788662080906716.html?=
googlenews-wsj/article 2007.
- Igbinosa, O.O., Tgbinosa, E.O and
Aiyeegoro, O.A. (2009).
Antimicrobial activity and
phytochemical screening of stem
bark extracts from *Jatropha*
curcas (Linn). African Journal of
Pharmacy and Pharmacology Vol.
3(2). Pp. 058-062.
- MacIntyre, Ben (2007-07-08). "Poison
plant could help to cure the
planet"
([http://www.timesonline.co.uk/to](http://www.timesonline.co.uk/tol/news/world/article2155351.ece)
[l/news/world/article2155351.ece](http://www.timesonline.co.uk/tol/news/world/article2155351.ece)).
London: The Times.
[http://www.timesonline.co.uk/tol/](http://www.timesonline.co.uk/tol/news/world/article2155351.ece)
[news/world/article2155351.ece](http://www.timesonline.co.uk/tol/news/world/article2155351.ece).
Retrieved 2008-06-09.
- Polgreen, Lydia (2007). "Mali's
Farmers Discover a Weed's
Potential Power"
(<http://www.nytimes.com/2007>
The Nigerian Tribune, Tuesday 8
March, 2011, 'Jatropha Would
Reduce Employment Problem –
Farmer', Pg. 15
Nigerian Tribune 2011, Jatropha will
reduce unemployment in Nigeria
Tuesday 8th March 2011 pg 15