Jatropha curcas L.

Euphorbiaceae
Physic nut, Purging nut

Source: James A. Duke. 1983. Handbook of Energy Crops. unpublished.

Uses

According to Ochse (1980), "the young leaves may be safely eaten, steamed or stewed." They are favored for cooking with goat meat, said to counteract the peculiar smell. Though purgative, the nuts are sometimes roasted and dangerously eaten. In India, pounded leaves are applied near horses' eyes to repel flies. The oil has been used for illumination, soap, candles, adulteration of olive oil, and making Turkey red oil. Nuts can be strung on grass and burned like candlenuts (Watt and Breyer-Brandwijk, 1962). Mexicans grow the shrub as a host for the lac insect. Ashes of the burned root are used as a salt substitute (Morton, 1981). Agaceta et al. (1981) conclude that it has strong molluscicidal activity. Duke and Wain (1981) list it for homicide, piscicide, and raticide as well. The latex was strongly inhibitory to watermelon mosaic virus (Tewari and Shukla, 1982). Bark used as a fish poison (Watt and Breyer-Brandwijk, 1962). In South Sudan, the seed as well as the fruit is used as a contraceptive (List and Horhammer, 1969–1979). Sap stains linen and can be used for marking (Mitchell and Rook, 1979). Little, Woodbury, and Wadsworth (1974) list the species as a honey plant.

Folk Medicine

According to Hartwell, the extracts are used in folk remedies for cancer. Reported to be abortifacient, anodyne, antiseptic, cicatrizant, depurative, diuretic, emetic, hemostat, lactagogue, narcotic, purgative, rubefacient, styptic, vermifuge, and vulnerary, physic nut is a folk remedy for alopecia, anasorca, ascites, burns, carbuncles, convulsions, cough, dermatitis, diarrhea, dropsy, dysentery, dyspepsia, eczema, erysipelas, fever, gonorrhea, hernia, incontinence, inflammation, jaundice, neuralgia, paralysis, parturition, pleurisy, pneumonia, rash, rheumatism, scabies,

sciatica, sores, stomachache, syphilis, tetanus, thrush, tumors, ulcers, uterosis, whitlows, yaws, and yellow fever (Duke and Wain, 1981; List and Horhammer, 1969–1979). Latex applied topically to bee and wasp stings (Watt and Breyer-Brandwijk, 1962). Mauritians massage ascitic limbs with the oil. Cameroon natives apply the leaf decoction in arthritis (Watt and Breyer-Brandwijk, 1962). Colombians drink the leaf decoction for venereal disease (Morton, 1981). Bahamans drink the decoction for heartburn. Costa Ricans poultice leaves onto erysipelas and splenosis. Guatemalans place heated leaves on the breast as a lactagogue. Cubans apply the latex to toothache. Colombians and Costa Ricans apply the latex to burns, hemorrhoids, ringworm, and ulcers. Barbadians use the leaf tea for marasmus, Panamanians for jaundice. Venezuelans take the root decoction for dysentery (Morton, 1981). Seeds are used also for dropsy, gout, paralysis, and skin ailments (Watt and Breyer-Brandwijk, 1962). Leaves are regarded as antiparasitic, applied to scabies; rubefacient for paralysis, rheumatism; also applied to hard tumors (Hartwell, 1967–1971). Latex used to dress sores and ulcers and inflamed tongues (Perry, 1980). Seed is viewed as aperient; the seed oil emetic, laxative, purgative, for skin ailments. Root is used in decoction as a mouthwash for bleeding gums and toothache. Otherwise used for eczema, ringworm, and scabies (Perry, 1980; Duke and Ayensu, 1984). We received a letter from the Medicial Research Center of the University of the West Indies shortly after the death of Jamacian singer Robert Morley, "I just want you to know that this is not because of Bob Morley's illness, why I am revealing this ... my dream was: this old lady came to me in my sleep with a dish in her hands; she handed the dish to me filled with some nuts. I said to her, "What were those?" She did not answer. I said to her, "PHYSIC NUTS." She said to me, "This is the cure for cancer." We found this Jamaican dream rather interesting. Four antitumor compounds, including jatropham and jatrophone, are reported from other species of Jatropha (Duke and Ayensu, 1984). Homeopathically used for cold sweats, colic, collapse, cramps, cyanosis, diarrhea, leg cramps.

Chemistry

Per 100 g, the seed is reported to contain 6.6 g H_2O, 18.2 g protein, 38.0 g fat, 33.5 g total carbohydrate, 15.5 g fiber, and 4.5 g ash (Duke and Atchley, 1983). Leaves, which show antileukemic activity, contain α-amyrin, β-sitosterol, stigmasterol, and campesterol, 7-keto-β-sitosterol, stigmast-5-ene-3-β, 7-α-diol, and stigmast-5-ene-3 β, 7 β-diol (Morton, 1981). Leaves contain isovitexin and vitexin. From the drug (nut?) saccharose, raffinose, stachyose, glucose, fructose, galactose, protein, and an oil, largely of oleic- and linoleic-acids (List and Horhammer, 1969–1979), curcasin, arachidic-, linoleic-, myristic-, oleic-, palmitic-, and stearic-acids are also reported (Perry, 1980).

Toxicity

The poisoning is irritant, with acute abdominal pain and nausea about 1/2 hour following ingestion. Diarrhea and nausea continue but are not usually serious. Depression and collapse may occur, especially in children. Two seeds are strong purgative. Four to five seed are said to have caused death, but the roasted seed is said to be nearly innocuous. Bark, fruit, leaf, root, and wood are all reported to contain HCN (Watt and Breyer-Brandwijk, 1962). Seeds contain the dangerous toxalbumin curcin, rendering them potentially fatally toxic.

Description

Shrub or tree to 6 m, with spreading branches and stubby twigs, with a milky or yellowish rufescent exudate. Leaves deciduous, alternate but apically crowded, ovate, acute to acuminate, basally cordate, 3 to 5-lobed in outline, 6–40 cm long, 6–35 cm broad, the petioles 2.5–7.5 cm long. Flowers several to many in greenish cymes, yellowish, bell-shaped; sepals 5, broadly deltoid. Male flowers many with 10 stamens, 5 united at the base only, 5 united into a column. Female flowers borne singly, with elliptic 3-celled, triovulate ovary with 3 spreading bifurcate stigmata. Capsules, 2.5–4 cm long, finally drying and

splitting into 3 valves, all or two of which commonly have an oblong black seed, these ca 2 x 1 cm (Morton, 1977; Little et al., 1974).

Germplasm

Reported from the Central and South American Centers of Diversity, physic nut, or cvs thereof, is reported to tolerate Slope. There is an endemic species in Madagascars *J. mahafalensis*, with equal energetic promise. (2*n* = 22)

Distribution

Though native to America, the species is almost pantropical now, widely planted as a medicinal plant which soon tends to establish itself. It is listed, e.g., as a weed in Brazil, Fiji, Honduras, India, Jamaica, Panama, Puerto Rico, and Salvador (Holm et al, 1979).

Ecology

Ranging from Tropical Very Dry to Moist through Subtropical Thorn to Wet Forest Life Zones, physic nut is reported to tolerate annual precipitation of 4.8 to 23.8 dm (mean of 60 cases = 14.3) and annual temperature of 18.0 to 28.5°C (mean of 45 cases = 25.2).

Cultivation

Grows readily, from cuttings or seeds. Cuttings strike root so easily that the plant can be used as an energy-producing living fence post.

Harvesting

For medicinal purposes, the seeds are harvested as needed. For energy purposes, seeds might be harvested all at once, the active medicinal compounds might be extracted from the seed, before or after the oil, leaving the oil cake for biomass or manure.

Yields and Economics

According to Gaydou et al (1982), seed yields approach 6–8 MT/ha with ca 37% oil. They calculate that such yields could produce the equivalent of 2,100–2,800 liters fuel oil/ha (see table under Energy). In Madagascar, they have ca 10,000 ha of purging nut, each producing ca 24 hl oil/ha for a potential production of 240,000 hl (Gaydou, et al, 1982).

Energy

The clear oil expressed from the seed has been used for illumination and lubricating, and more recently has been suggested for energetic purposes, one ton of nuts yielding 70 kg refined petroleum, 40 kg "gasoil leger" (light fuel oil), 40 kg regular fuel oil, 34 kg dry tar/pitch/rosin, 270 kg coke-like char, and 200 kg ammoniacal water, natural gas, creosote, etc. In a startling study, Gaydou et al. (1982) compare several possible energy species with potential to grow in Malagasy. Oil palm was considered energetically most promising.

	Crop production MT/ha	Fuel production /ha	Energetic equivalent kwh/ha
Elaeis guineensis	18–20	3,600–4,000	33,900–37,700

Jatropha curcas	6–8	2,100–2,800	19,800–26,400
Aleurites fordii	4–6	1,800–2,700	17,000–25,500
Saccharum officinarum	35	2,450	16,000
Ricinus communis	3–5	1,200–2,000	11,300–18,900
Manihot eaculenta	6	1,020	6,600

Biotic Factors

Agriculture Handbook No. 165 lists the following as affecting *Jatropha curcas*: *Clitocybe tabescens* (root rot), *Colletotrichum gloeosporioides* (leaf spot), and *Phakopsora jatrophicola* (rust).

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Last update Wednesday, January 7, 1998 by aw