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## TARC Note

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### Characteristics of Physic Nut, *Jatropha curcas* L. as a New Biomass Crop in the Tropics

Physic nut, *Jatropha curcas* L. (Euphorbiaceae), originated in South America, is widespread in the tropics. This shrubby plant is grown popularly as the hedge of farmhouses because it is drought tolerant and not eaten by livestock due to its toxicity. The seed oil called "curcas oil" is utilized for purgative or fuel in rural areas.<sup>1)</sup>

Takeda<sup>2)</sup> proposed that the seed oil can substitute for diesel oil and also be used as fuel mixture for gasoline engine, based on a series of chemical analyses and engine operation tests. As the plant seems to be able to offer fuel resources in Thailand lacking petroleum resources, and because of its adaptability to the climate of northeast Thailand, the plant can be regarded as an additional promising cash crop other than cassava, sugar cane, kenaf, etc.

However, the seed oil productivity is very low at present because this plant has never been improved for an oil crop and basic knowledge for domestication

is quite limited. Therefore the authors carried out preliminary studies at the Agricultural Development Research Center (ADRC)\* and Khon Kaen Field Crops Research Center (FCRC) in northeast Thailand from 1984. As a result, the following characteristics were made clear.

Physic nut (named Sabu dam in Thai) is a perennial plant and is propagated by either seeding or cutting. When the seed was sown in early May 1985 at ADRC, stem length reached 1 m and flower buds were formed at the terminal of the stem in early October; the number of leaves reached 60–70 including 30–40 living leaves; 1 or 2 branches sprouted from the basal part of some vigorous individuals at that time (Fig. 1). The matured leaf was 15 cm in diameter and petiole length was 20 cm approximately; the leaf had 5 to 7 lobes; arranged in spiral phyllotaxis (3/11); leaf emergence interval was 2 to 4 days; life duration of a single leaf was 60–75 days.

Morphology of reproductive organs was as follows: A flower cluster forms cyme inflorescence; usually with more than 100 flowers in a inflorescence. The plant is monoecism. The rate of female flower is 2–8%, arrangement is gynecandrus (Fig. 2). Morphology of flowers is shown in Fig. 3.

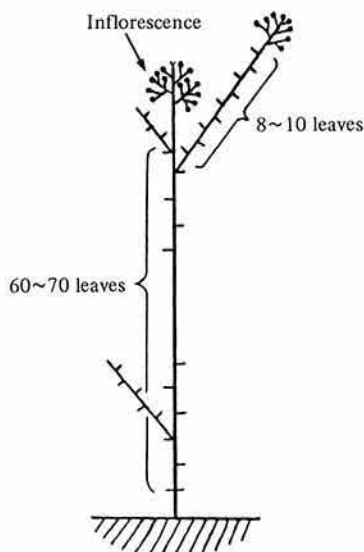


Fig. 1. Diagram of flowering habit

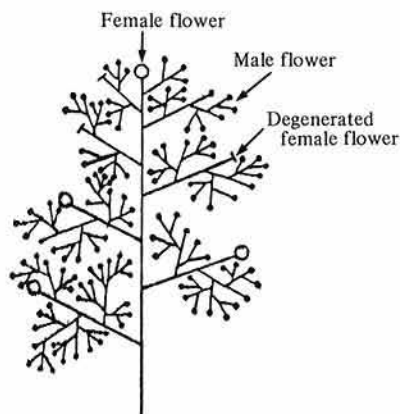


Fig. 2. Diagram of inflorescence

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\* Agricultural Development Research Center in Northeast Thailand (ADRC) established in Khon Kaen in March 1985 with the assistance of Japan.

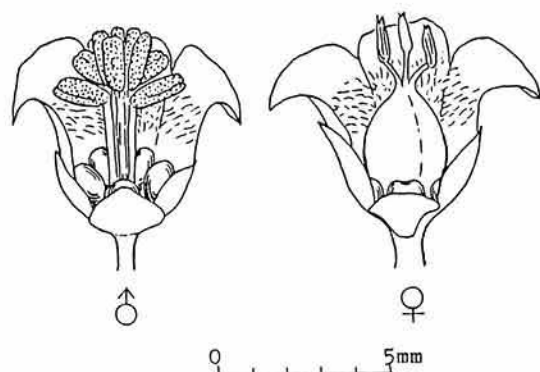


Fig. 3. Morphology of flower

Female flower: 8 mm in diameter, 5 calyxes, 5 corollas, 5 nectaries, 1 tricarpellary pistil, stigma split in three, flowering duration is 3–4 days.

Male flower: 7 mm in diameter, 5 calyxes, 5 corollas, 5 nectaries, 10 stamens, flowering duration is 1–2 days.

Flowering duration of inflorescence ranges from 10 to 15 days.

A globular fruit which is 3 cm in diameter matures 40–50 days after fertilization; color changes from green to yellow. Afterwards it forms a dark brown capsule containing 3 black seeds. The dehiscent habit is slight. Size of seed is 20×12×9 mm, and 100 grain weight is 65 g in average. Dormancy is not observed.

The first peak of flowering occurred in November and the second one in April to May 1986. These 2 peaks of flowering coincided to the end and the beginning of rainy season in northeast Thailand respectively. Elongation of stems was retarded remarkably during dry season and most leaves were shed in March, the end of dry season. Such periodicity of growth phase tended to be irregular with plants of 2 or more years of age.

According to yield trials<sup>3)</sup> at the Roi-et Field Crops Experiment Station (northeast Thailand) in 1984, weight of dried seeds was 638 kg/ha in average of 12 clonal lines under a condition of 1 m×1 m spacing without fertilizer application.

To investigate intraspecific variability, 42 clonal lines collected from several places in Thailand were planted at the Khon Kaen Field Crops Research Center. No morphological differences were observed among them.

*Jatropha gossypifolia* L., *J. multifida* L. and *J. podagrica* Hook are typical allied species. These species are domesticated as ornamental or hedge plants. *J. gossypifolia* is popularly found as an escaped plant at roadside or wasteland in northeast Thailand. Studies are in progress on such allied species.

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- 2) Takeda, Y.: An on-going study of *Jatropha curcas* oil as a substitute for diesel engine fuel in Thailand. *ASSET*, 4 (9) (1982).
- 3) Dept. Agriculture, MOAC: Annual Report of Research Activity (1984) [In Thai].

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