

Tree seeds offer potential for sustainable biofuels

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Tree seeds, rather than biomass or fuel crop plants, could represent an abundant source of renewable energy, according to research published in the *International Journal of Automotive Technology and Management*. The study suggests that seeds from the Indian mahua and sal trees have almost as good a thermal efficiency as biodiesel but would produce lower emissions of carbon monoxide, waste hydrocarbons and NO_x (nitrogen oxides).

Sukumar Puhan of the GKM College of Engineering and Technology and colleagues N. Vedaraman and K.C. Velappan of the Central Leather Research Institute, in Chennai, India, explain how tree seeds represent a vast untapped biomass resource for the production of automotive fuels in India. The use of tree seed oils as a source could have several additional benefits over vegetable seed oils including lower viscosity and greater volatility, both of which would reduce injector fouling, [carbon deposits](#) and piston ring sticking, common issues with some biodiesel formulations.

The team points out that vast tonnages of seeds from the deciduous mahua (*Madhuca indica*) and semi-deciduous sal (*Shorea robusta*) trees are simply left to waste on the forest floor. The mahua kernel constitutes 70% of the seed and contains 50% oil, which can be extracted at levels of 34 to 37%. Sal can produce about 20% oil. The oil is chemically converted to biodiesel using the process of transesterification, which reacts the oily triglyceride content with alcohol using a catalyst. The team has now successfully tested this chemistry on seeds from the mahua

and sal trees. They also demonstrated efficacy with neem seed, although suggest the economics of using this species are prohibitive because the tree has greater value for its wood and also has a much longer maturation period than mahua at 25 years.

It is estimated that there are 64 million hectares of wasteland across India including 15 million hectares of degraded, notified [forestland](#) that could be converted to plantation to provide sal and mahua seed in a sustainable fashion as well as generating employment opportunities for a large number of people. This would amount to about 120 person-days work per hectares given an estimated productive lifespan of the mahua of 60 years. The mahua takes just ten years to reach seed-producing maturity.

"Biodiesel production from tree seeds in India will not only reduce the dependence on crude oil imports, but also reduce the environmental impact of transportation and increase employment opportunities," the team concludes.

More information: "Liquid biofuels from tree borne seed oils for automotive diesel engines" in Int. J. Automotive Technology and Management, 2012, 12, 223-231.

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