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### **Sassafras oil distillers help destroy Cambodian forest.**

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Illicit manufacturers of MDA, MDEA & MDMA (ecstasy) can utilise safrole from safrole-rich essential oils such as sassafras oil and “brown” camphor oil as starter materials (precursors). Therefore safrole & sassafras oils are designated as controlled substances in many countries, and safrole is listed as a Table 1 precursor under the United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances. Since sassafras trees (*Sassafras albidum* (Nutt.) Nees) grow wild in the Eastern parts of the US, the Drugs Enforcement Agency has made safrole a List 1 substance under the under the Chemical Diversion and Trafficking Act, and it is unlawful to trade safrole & safrole-rich substances for illicit drug-manufacturing purposes. There are legitimate uses for safrole however - these include the manufacture of the aroma chemical heliotropin (‘cherry pie’) and the knock-down insecticide piperonyl butoxide. Interestingly, there is a tradition of drinking sassafras tea, of using sassafras as an ingredient in sarsaparilla drinks, and making root beer from the inner bark of young sassafras tree roots. Dried ground sassafras leaves, in the form of aromatic filè powder (or ‘gumbo powder’), is also used in cooking, being stirred into traditional Southern dishes just before serving. The FDA made sassafras a prohibited ingredient for food & beverages in 1960, since it is a weak experimental animal carcinogen (rats, mice) – see Daimon *et al.* (1998) etc. It has to be said that there is some resistance amongst many US citizens in accepting that safrole is actually the human hepatocarcinogen it is made out to be. The latest ECHA Code of Practice for example lists safrole both as carcinogen category 2, and as a mutagen category 3. It is fair to say that the amount of evidence for safrole’s role in human carcinogenicity is scanty, even at this point in time, although there is limited evidence of the development of oral cancers from long-term safrole exposure via betel-leaf and areca-nut quid chewing practices (Chen *et al.* 1999) - this subject is explored in detail in Cropwatch’s *Safrole Bibliography & Safrole: Likelihood of Human Carcinogenicity Overstated?* (currently in preparation) in the *Cropwatch Files* section of the website. So the traditions of sassafras tea drinking (often made from the sassafras tree’s twigs & leaves) still persists in places, such as is still found within N. American Indian communities in Eastern parts of Canada. In the Eastern US, many citizens regard the right to use sassafras as part of their

cultural inheritance, although any commercial root beer listing sassafras as an ingredient is now made with safrole-free sassafras extract (as approved by the FDA).

N. American sassafras essential oil has a sweet-spicy peppery odour, with an underlying woodiness; the dry-out on a perfumers strip being invariably spicy and woody. Safrole has a cleaner, candy-like odour and its previous uses in perfumery included deployment in re-odourant formulae & soaps. In flavourings safrole was used as an ingredient to flavour medicinal products and confectionery. IFRA prohibits the addition of safrole to fragrances as such, and limits the safrole content of perfumes formulated with safrole-containing essential oils (basil, nutmeg, sassafras, cinnamon leaf etc.) to 0.01% for both skin contact & non-skin contact fragrances. This causes a potential problem for utilization of many safrole-containing fragrance ingredients, such as nutmeg oil, oleoresin & butter; safrole-free versions of various aromatic nutmeg qualities are commercially available, but often lack the spicy-sweetness and body of the authentic versions.

In South America, the safrole-rich chemotype of Brazilian sassafras tree *Ocotea pretiosa* (Nees) Mez. has been over-exploited as a safrole-source (there is also a methyl eugenol chemotype). As early as 1966 Mors and Rizzini (Mors & Rizzini 1966) noted that *O. pretiosa* was becoming scarce in Santa Catarina due to uncontrolled exploitation and the natural slow growth of the tree (the tree is listed as Vulnerable in the IUCN Red List 2008). And so Brazil went from being a major supplier of sassafras oil in the 'sixties, to being a minor supplier in the nineties. Vietnam took over the role of being the major supplier, felling the tree *Cinnamomum parthenoxylon* (Jack) Meisn. to distill the roots to produce hundreds of tons of sassafras oil Vietnamese annually. Cropwatch (2007) declared the tree as now being critically endangered in Northern & Central Vietnam, and the IUCN Red List 2008 also declares the tree as critically endangered (Vietnam). Other geographic sources of safrole include Yunnan, China, where *C. parthenoxylon*, *Sassafras tzumu* & fractions of *C. camphora* are utilized for domestic piperonyl butoxide & heliotropin manufacture; however to protect natural resources, the Chinese authorities moved against safrole production from *C. parthenoxylon* trees in 2007.

In S.W. Cambodia, sassafras trees ('Mreah Prew Phnom') *Cinnamomum parthenoxylon* are especially found amongst the 2 million ha. of forest within the Cardamom mountains. On-going investigations of illegal oil-producing activity were started in 2004 by the Flora & Fauna International Group. In a recent move, made together with help from the Ministry of the Environment, illegal distilleries were discovered within the Phnom Samkos Wildlife Sanctuary, run by Vietnamese syndicates, producing sassafras oil from the shredded roots & trunk of the Mreah Prew Phnom trees



Rangers from the Phnom Sankos Wildlife Sanctuary prepare to dismantle illicit sassafras oil still. Credit D. Bradfield – FFI.

Subsequent action by the Royal Cambodian Armed forces dismantled 2 factories and led to 2 arrests. Tim Wood, FFI Field Co-ordinator at the Phnom Samkos Sanctuary is quoted as expressing grave concern that the harvesting of these trees is destroying the fragile eco-system habitats within the sanctuary, The FFI press release describes the pollution of streams used for cooling water for the distillation, and mentions the abstraction of fuel wood to drive the distillation process. Local peoples fear that this rate of abstraction could push the forest & Mreah Prew Phnom trees to the brink of extinction within 5 years. As a mark of their success, the 25<sup>th</sup> Feb 2009 FFI press release also mentions the fact that in June 2008, 33 tons of illicitly produced sassafras oil was destroyed, and the 2009 FFI raids reported above have to be put in context – since previously in 2006 there were some 75 operating stills in the Western Cardamom Mountains. Now however, the FFI are apparently facing funding problems and need economic help to continue their work.

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