

solutions; internally, rarely used as an expectorant. Dried fruits are sold in Guatemala for itch. An alcohol infusion is rubbed on in Cuba to alleviate headache and rheumatism. The resin is used for asthma, catarrh, rheumatism, gonorrhoea, and to heal cuts and wounds. The balsam is used to treat venereal sores. Blended with castor oil or prepared as a tincture, it is used for chilblains, pediculosis, ringworm, and scabies. In suppositories, it is used for hemorrhoids and anal pruritis. Once used internally for amenorrhoea, bronchitis, diarrhoea, dysentery, dysmenorrhoea, laryngitis, and leucorrhoea. It is no longer used internally, at least in the U.S. Alcoholic extracts inhibit *Mycobacterium tuberculosis*.⁴⁰ Yucatan natives take an alcoholic extract of pulverized fruits for amenorrhoea and dysmenorrhoea using the resin for osteomyelitis, wounds, and ulcers.⁴² Mexicans use the balsam for asthma, catarrh, and rheumatism. Choco apply the resin on the cheek for toothache. Choco Indians use it for the umbilical cord and uterine hemorrhage.⁴²

Peruvian balsam contains about 60% cinnamein, a volatile oil, consisting mainly of benzyl cinnamate with some benzyl benzoate, resin esters (30 to 38%), vanillin, free cinnamic acid, and peruvial. Once the balsam is removed, the spent wood yields an essential oil containing 68 to 70% nerolidol. The seeds yield a "balsam" composed of 67.7% resin, 14.8% wax, 11.9% acid resin, 0.4% coumarin, 0.4% tannin, and 4.6% water.⁴⁰ A few years ago Wahlberg et al. examined a hydrocarbon fraction containing: alpha-pinene, styrene, *cis*-ocimene, *p*-cymene, alpha-bourbonene, alpha-copaene, beta-bourbonene, beta-elemene, carophyllene, alpha-curcumene, gamma-murolene, alpha-murolene, beta-selinene, δ -cadinene, alpha-cadinene, calamenene, and alpha-calacorene; a minor polar fraction containing cadalene, and 1,2-diaphenylethane and an oxygenated fraction containing benzylaldehyde, benzyl alcohol, ethyl benzoate, cinnamaldehyde, cinnamyl alcohol, methyl cinnamate, ethyl cinnamate, benzyl benzoate, benzyl cinnamate, cinnamyl benzoate, and triterpenoid constituents. Analysis of a weak acid fraction revealed eugenol, vanillin, benzyl ferulate, and a number of triterpene acids. The only two compounds present in a strong acid fraction were benzoic and cinnamic acids. The latter compound, which was found to be the predominant compound in tolu balsam, was considered to be an important flavor constituent.^{31 208}

Toxicity — Early writers described systemic toxicity from absorption of the balsam, which has been applied to the nipples of a nursing mother and for scabies. Of 103 cases, 27 reacted to patch tests with cinnamic acid, 19 with benzyl cinnamate, 15 with vanillin, 12 with benzyl benzoate, 10 with benzoic acid. Fifty-four of the 103 reacted to one or more, while 49 were negative to all. Coumarin has been cited as a carcinogen.