

Linaloe Industry in India

by

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Linaloe oil is an essential oil which is extracted mainly from wood in Mexico, berries in Mysore and to a small extent from the seeds and leaves of the plant *Bursera delpechiana* Poiss ex Engl. and some of its allied species. The genus *Bursera*, a native of Tropical America includes between 40 and 50 species, many of which provide valuable resins and essential oils. According to Holmes (1910), Mexican linaloe oil is distilled chiefly from the wood and to a small extent from fruits (seeds) of closely related species of the genus *Bursera*, primarily *B. delpechiana* Poiss. and to a certain extent *B. aloexylon* (Schiede) Engl., *B. glabrifolia* (H. B. K.) Engl. and *B. fagaroides* Engl. var. *ventricosa*. Mexican producers call these trees as linaloe or in vernacular 'Copal limon'. Albert R. Hill states that the Mexican species viz, *Bursera penicillata* and *B. glabrifoliae* Cayenne linaloe or *bois-de-rose* is derived from *Aniba panurensis* of Guianas, while Brazillian *bois-de-rose* is obtained from *Aniba rosaeodora* var. *amazonia*, a tree of lower Amazon basins.

The Mysore linaloe oil or Indian lavender oil (terms used in trade) is exclusively distilled from the berries and the outer husks of the fruits of *Bursera delpechiana* which was introduced into India in 1920 by an Englishman Anderson, R. J. by means of seed collected from Mexico.

In Mysore State there is plantation of about 400 acres of linaloe in Tataguni, eleven miles away from Bangalore, owned by Dr. Roerich. Besides, there are six trees at Lal-Bagh Gardens, Bangalore. The Forest Department of the Mysore State cultivated linaloe initially in an area of five acres in 1958, which was systematically expanded to 125 acres under rainfed conditions near Bangalore.

It is now programmed to bring 4000 acres under linaloe. Twenty four trees planted in September 1956 in the Forest Research laboratory, Malleswarsm, Bangalore now forms the nucleus for multiplication.

The Central Indian Medicinal Plants Organisation, Bangalore has taken up the cultivation of linaloe recently with plant materials obtained mainly from the oldest tree of 35-40 years age at the Forest Research

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Laboratory, Bangalore. The organisation owns two nurseries, one at the Forest Research Laboratory, Malleswaram, Bangalore and the other at Kodimanchanahalli which is 25 miles away from Bangalore on the Mysore—Kolar road. At Kodimanchanahalli farm linaloe was planted in 1958 in an area of 13 acres and the trees are coming up well. From these nurseries rooted cuttings have been supplied to Poona and to 'CIMPO', Lucknow, and recently to the Madras Agricultural Department for planting under a scheme for research on linaloe.

In Madras State there are 15 trees in the Coffee Plantation of Arcadia Estate, Umaiyambiga Plantations, Nagalur in Salem district and it is understood that the plants were obtained from Roy Chowdary Estate, Bangalore. The plants are about 20 years old and found to grow well at the conditions prevailing there. The Forest Department of Madras State, have introduced linaloe in 1945 at the Forest Research Garden, Denkanikota, Salem district. At present there are three male trees of about 15 years old. A dozen air-layered cuttings obtained from these trees and planted at Thadikarankonam, Kanyakumari district during 1960, have established well. However, it is reported that attempts made earlier to propagate by air-layering during 1951—'52 by the Forest Department of Madras State was not successful.

Attempts made to introduce linaloe during the years 1953—'55 by planting stem cuttings at Ootacamund, Coonoor, Burliar and Kallar by the Madras Agricultural Department failed. In 1953, Madras Cinchona Department planted fourteen cuttings on Anamallais (3,500 feet above M. S. L.) and 12 cuttings at Naduvattam (6,000 feet) and 12 at Cherangode (3,000 feet) on the Nilgiris. The cuttings were obtained from the Forest Research Officer, Denkanikota. But all of them died within a few months after planting in the nurseries. In August, 1953, twenty three cuttings obtained from Arcadia Estate, Nagalur, and planted on the Anamallais also failed to root. The main reason for the failure of all the batches of cuttings was that the proper type of wood had not been selected for propagation.

Under the scheme for research on linaloe, initiated during November, 1962 by the Agricultural Department of Madras State, trials are being conducted at four centres *viz* Kallar, Burliar, Coonoor and Ootacamund representing different elevations of 1,200', 2,500', 5,500' and 7,500' above M. S. L. respectively. The studies envisage collection of different types and varieties of linaloe, isolation of promising types, standardisation of methods of propagation and evolving a suitable extraction technique. Stem cuttings obtained from Yercaud and Denkanikota and rooted cuttings obtained from 'CIMPO', Bangalore have been planted for trial.

Guenther (1950) states that linaloe trees grow wildly in the Mexican forests and no efforts have been made to domesticate the species in the form of plantations. He says that linaloe also propagates itself either from dropped fruits or from young shoots developing on the extensive root system of the mother tree. The linaloe plants are moderate sized trees with alternate pinnate leaves and numerous small flowers. The mature fruits of the linaloe tree consist of fleshy berries of the size of spanish peas, greenish red on the surface and red inside. The outer husk of the berries is rich in oil.

The tree flourishes well on poor and gravelly soil at altitudes of about 2500'. It is the experience that places receiving an annual rainfall of 40" and below will be suitable for successful cultivation of linaloe. Very hot weather during the dry season and abundant showers during rainy season favour a high yield of oil. It is successfully cultivated on a large scale near Bangalore in deep red soils receiving an annual rainfall of about 30" at an elevation of 3000' above sea level.

Linaloe can be raised from both seeds and rooted stem cuttings. However, in view of the very low viability and poor percentage of germination of seeds, it is propagated primarily by stem cuttings. Cuttings taken from older trees between middle of February and middle of March are planted in pots filled with pot mixture made up of red earth, sand and manure in the ratio of 3 : 2 : 1. A good cutting should be about one metre in length and one to three centimetres in diameter. After three weeks of planting, the cuttings start sprouting. It takes about another four weeks for proper formation of root system. After a period of 12-16 weeks the rooted cuttings are ready for setting out in the main field.

Before planting in the main field, pits of three feet cube are dug out three months in advance of planting and the pits are allowed to weather. The pits are filled with farm yard manure, green manure and soil. The rooted cuttings are set out in the centre of the pits during the rainy season (July-September) and each plant is supported by a stake. The plants are watered regularly till they establish. The field is kept free from weeds. Fresh growth will be observed only from next May (*i. e.* 8 months after planting). The plants shed their leaves during the winter months.

The trees start flowering in June-July and the berries will be ready for harvest during August-September. It is reported that plants raised from seeds start flowering during the fourth year after planting, while those raised from stem cuttings produce flowers even from the first year. However, the first full harvest can be obtained from the tenth year onwards. Since

the branches of the trees are brittle, it is usual to collect tree drop fruits only. The berries are dried in the shade in bamboo mats and stored in perforated racks. Ample rainfall during the period of fruit development favours production of sound fruit and an abundant crop, whereas a dry spell causes the fruit to shrivel up and drop off prematurely.

The oil is best distilled from the wood of 40-60 year old trees. The yield of oil from the wood in Mexico is reported to be 2.5 to 3.0 per cent. The lower yield in Mexico is due to the crude method of distillation. The wood from older stem is stated to yield seven to nine per cent oil and some times ten to twelve per cent. In the case of young trees, attempt is made sometimes to increase the yield by wounding the stem parallel or diagonal to the axis of the stem. The increased yield of oil obtained is to be regarded as a pathological phenomenon.

The yield of oil from the husk of the berries is reported to be as high as 18 per cent in Mysore, while it is only three per cent in Mexico. The Mexicans subject the berries to a process of fermentation to increase the yield of oil, to remove its herbaceous odour and to improve its keeping quality. The leaves on steam distillation give 0.15 to 0.25 per cent of oil. Since the yield of oil is very low from leaves, it is considered uneconomical for extraction.

The Mysore linaloe oil is considered superior as it contains a higher percentage of linalyl acetate and a lower percentage of alcohol than the Mexican oil. The Mexican seed oil is considered to be inferior than the wood oil of Mexico.

The oils from the wood and berries are similar in composition and odour but show variations in optical rotation (Wehmer). The properties of the oil are influenced by the plant origin, geographical location and climatic conditions. The oil obtained from *B. delpechiana* and *B. aloexylon* are considered superior to the oil from the other species. It is reported that oil obtained from the plants grown in elevated dry sections of Mexico are laevorotatory, whereas the oil obtained from the moist tropical coastal areas are dextrorotatory.

The oil is a colourless to pale yellow liquid of characteristic pleasant odour. The Mysore linaloe oil is a light coloured mobile liquid with lilytone. It resembles *bois-de-rose femelle* oil from French Guiana and *shu oil* of Japan. It has considerable depth and body and shows superior staying powers.

The oil is a well established and highly valued aromatic substance widely used in perfumery soaps and cosmetics as a raw material. It is also employed for flavouring foods and beverages. The oil blends well with lilac, jasmine and most of the other floral bouquets.

The production of Mexican linaloe oil declined after the World war I due to heavy adulteration with inferior oil as a result of which the buyers lost confidence in the Mexican product. It was only with the outbreak of World War II, due to difficulties in shipping from Brazil and lack of labour in the Amazon Basin, the Mexican linaloe wood oil came again into demand. The total production of Mexican oil is 12,000 to 15,000 lb per annum. It is reported that the Tatagunni Estate, which is the only estate in whole of India extracting the oil on a commercial basis, produces 6,000 to 7,000 lb annually, of which about 1,000 lb are sold in the Indian Market and the rest exported chiefly to U. K. The oil fetched a price of about Rs. 12/- per lb in 1941 and the rate in 1965 was about Rs. 50/- per lb.

As linaloe requires little attention except for some initial care and comes up well even in poor rocky or gravelly soil, places with suitable climatic conditions can be successfully brought under linaloe. As a raw material for soaps, perfumes and cosmetics, it plays a significant role in the creation and uplift of many industries in our country. Hence, places like Shevoroy, Lower Palani Hills, lower elevations of the Nilgiris receiving a rainfall of 40-50" per annum, Hosur taluk of Salem district and Coimbatore with cooler climate may prove suitable for the successful and profitable cultivation of linaloe in Madras State.

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