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The Indian Vetivert Oil Industry and Its Economic Possibilities

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(a) **Historical:** (*Vetiveria Zizanioides*, Nash) formerly called *Andropogon squarrosus* Hack is perhaps one of the most important among the Indian essential-oil bearing plants. Its medicinal and perfumery values have been known in India from time immemorial as evidenced by various references in the ancient Ayurvedic treatises. Its economic importance was realised at least as early as the 12th century A. D as seen from the copper plate inscriptions dated 1103 and 1174 A. D. found near Etawah, wherein vetivert is mentioned as one of the articles on which the King of Kanauj levied import duty.

(b) **Occurrence:** This plant is found growing wild in parts of the East and West coasts of India, on the wastelands at Cuttack, in the forests of Central India especially in Bharathpur and in the Punjab ascending into Kumaon up to 2000 feet in elevation.

Cultivation: Apart from utilising the natural growths found in some parts of the country like Bharathpur and some sort of indifferent cultivation for production of roots for hot weather thatties and fans in Ponnani Taluk of the Malabar district no attempt seems to have been made either for its cultivation on a field scale or for any scientific study of this crop up to 1943 when the first serious attempt was made for its cultivation and study by the Kerala Soap Institute, Kozhikode. The demand for vetivert oil which forms an essential ingredient in all highclass soap perfumes has been growing steadily in India. This increasing demand for vetivert oil was being met by increasing imports from foreign countries like Java, Reunion and Haiti islands until these imports came to a sudden stop with the occupation of Java and Reunion Islands by the Japanese during the Second World War. As vetivert oil happened to be an indispensable ingredient as a perfume fixer for all high class soaps, the soap industry throughout India was faced with the problem of finding an alternate source of supply for this essential commodity.

It was under these conditions that the Kerala Soap Institute which was the pioneer in building up the modern soap industry in India came forward with a scheme for the large-scale cultivation and study of Indian vetivert and other important essential oil bearing plants. It was also thought, with the knowledge then available that the sandy soils of the

coastal belt would the ideal soil for its cultivation. It was therefore proposed in the scheme to confine the cultivation to the available vacant Government lands attached to the various fish-curing yards of the West Coast.

In July 1943, the author of this note was deputed to work the scheme under the guidance of the Superintendent, Kerala Soap Institute. This study went on for three years and the area increased from 7 acres in 1943 to over 30 acres in 1946, and covered also other essential oil bearing plants like lemongrass, sweet basil, geranium, pepermint, cinnamon, artemesia, etc. A great deal of knowledge about the cultivation and distillation of the oil was gathered, on the best type of soil, maturity, season of harvest and the effect of manuring on the yield of raw material and the oil content. The information so gathered was published in the form of a paper in the American Perfumer and Essential Oil Review of August 1949 under the joint authorship of Dr. K. S. Murti, Oil Technologist, Kerala Soap and the present author. As the present note is intended more for the practical farmer than for the research worker it is proposed to give only a summary of the conclusions arrived at the large number of experiments conducted.

1. *Soil:* The nature of the soil plays an important part in altering the oil content of the roots. The white sandy soil which was considered best for vetivert at the beginning proved to be the poorest in regard to the oil content of the roots, while laterite loam gave roots of highest oil content, the range of variation being so wide as between 0·18% for white sandy soil to 1·02% for laterite loam.

2. *Maturity:* The optimum maturity of the crop under West Coast conditions was found to be 15 to 18 months, i.e., when planting is done at the beginning of the South-West monsoon in one year, the crop is ready for harvest by the end of the North-East monsoon of the next year and the oil content increases up to the beginning of the next South-West monsoon and then declines. The actual variation from the crop in the same soil ranged from 0·10% for ten months to 0·79% for 17 months. Regular field experiments are in progress at Pattambi and Ambalavayal Farms to determine the optimum maturity.

3. *Season of harvest:* Roots should not be harvested either during heavy rains or immediately after the rainy season since these give a lower yield of oil, partly due to the high proportion of immature roots containing very little oil and partly due to leaching out of a portion of the oil even from mature roots during the heavy rains. The higher proportion of immature roots during the rainy season is due to the fact that the crop which has been subjected to a long period of droughty conditions puts forth numerous fresh roots after the rains.

4. *Effect of Manuring:* From the preliminary trials conducted there are indications to show that manuring with ammonium sulphate, groundnut cake or brine manure (residue left in the brine in which fish is cured) would increase the yield of roots as well as the oil content, but the optimum dose of these are yet to be worked out. This aspect is now being investigated by the Agricultural Department at the Research Stations at Pattambi and Ambalavayal under the guidance of the Government Lecturing and Systematic Botanist, Coimbatore.

Further work on vetivert at Nilambur: Based on the practical results obtained at the Kerala Soap Institute, a few persons ventured on the cultivation of this crop at Nilambur (South Malabar) in a 40 acre block of laterite loamy soil in 1948. The results of this venture have added much to our knowledge about this industry and has also shown that the vetivert industry has immense scope for development on the waste lands and dry *Modan* lands on the West Coast. They have been able to produce on an average about 12 lb. of oil per acre from a crop of 15 to 18 months, the value of which at Rs. 130/- per pound at the present market rate accounts to Rs. 1560/-. Though the cultivator has to toil hard for nearly a year and a half to reap the harvest, the result when it is achieved is well worth the labour, as no other crop grown on this type of land is capable of giving such handsome profit and engaging such a large number of labourers. The details of cultivation and distillation methods employed at Nilambur are furnished below.

Preparatory Cultivation: The area which is first cleared of scrub jungle is dug deep with mammuties and laid out in long ridges 2¼ feet wide, 1 foot high and 1½ feet apart. In an acre of land usually about 4,800 running koles (Kole—2¼ feet) of ridges are formed.

Planting: Slips separated from the uprooted clumps with their rhizome portion intact but without the fibrous roots and having 6" to 8" of shoot portion are planted on these ridges 9" apart in two rows on each ridge. Three to four slips are planted in each hole when slips are readily available on the spot to provide for failures and to obtain a thick stand. In the case of first planting when slips have to be purchased and transported over long distances only 1 or 2 slips are planted in each hole.

Illustration No. 1 shows the ridges immediately after planting.

An acre will require about 28,000 clumps of 2 to 3 slips each Planting is usually done from June to September when the rainfall is highest and most regular on the West Coast.

After Cultivation: This consists in weeding the area once in October—November just before the weeds begin to set seed.

Harvesting: The crop is usually harvested 15 to 18 months after planting and it is done between the months of November and May, except when slips are required for replanting, in which case harvesting is done during the rainy season itself even at the risk of reduced oil yields. About 300 kolcs of ridges give about 280 to 300 lb. of fresh clean roots which makes one charge for an ordinary still and yields 12 to 13 oz. of oil on distillation which is continued for 28 hours. It is found that highest percentage of oil is obtained when roots are harvested and distilled quite fresh, between the months of November and February. Drying and storing of roots before distillation leads to loss of nearly 25% of the oil content, which incidentally refutes the accepted notion that roots should be well dried before distillation. Illustration No. 2 shows the vegetative portion of the full-grown crop being cut prior to harvesting of roots and illustration No. 3 shows the harvesting in progress with digging forks.

Distillation: The cleaned roots are chopped into bits 1" to 2" long and directly charged into the still barrel (A) for distillation. Thirty-six gallons of water is poured into the still along with charging of the roots, over and above 12 gallons always retained in the still below the false bottom. Distillation actually starts 4 hours after starting the fire at the base of the still and is allowed to continue for another 24 hours without break. The oil vapour which comes along with steam is condensed in a copper coil immersed in a column of cold water and falls into a series of three receivers. The water that comes out is also measured and poured into a tub and when 36 gallons come out another 36 gallons are added and distillation continued till the whole of this quantity also comes out. It is found that about 8 oz. of oil comes out along with the 1st charge of water and 4 to 6 oz. along with the second charge. One complete distillation which takes nearly 28 hours in all consumes on an average half a ton of fuel which costs at present Rs. 12—S—0 at Nilambur. Illustration No. 4 shows the village smiths at work for fitting up the still. The circular sheet with a number of holes on it is the false bottom of the still barrel.

Illustration No. 5 shows the distillation in progress as also the filtration of the oil with the aid of a double-walled funnel. The labourers are pouring cold water into the cooling tanks in which the condensing coils are immersed. The cooling tanks of a set of three stills are seen in a row. Illustration No. 6 shows one still with the cooling tanks and filtering system complete.

The Working of the Still: When the water in the still barrel begins to boil the roots get cooked and the oil globules come out along with steam. The mixture of steam and oil vapour now rises to the still head and comes out through the copper coil which is immersed in a column of

cold water contained in a cooling barrel. In the coil the oil and water vapours condense into oil and water which drip down through the spouted end of the coil into a series of receivers with bent spouts connected at the bottom to carry the excess water to the next receiver. As the oil that comes out at different stages vary slightly in density a thin muslin cloth is allowed to float over each receiver to catch even oil which sinks in water. As the oil accumulates over the muslin pieces over the receivers it is carefully taken out with spoons and poured into separating funnels. To make even denser portions of the oil float and thereby facilitate easy separation, common salt is put into the water in the separating funnel and shaken. This increases the density of the water in the funnel and makes even oil of higher density float. The water column is then drawn off as much as possible and the oil is poured into a clean tinned vessel and heated over a water bath. To remove even the last traces of water from the oil, anhydrous sodium sulphate is added to the oil at 1 tola per pound of oil and stirred well. This oil is finally filtered using a double-walled funnel with hot water circulating between the two walls which arrangement heats the oil and enables it to filter down easily. Vetivert oil at ordinary temperature will be too thick to pass through the filter paper easily. For convenience circulation of hot water can be arranged from the top portion. The filtered oil is now ready for the market and has a golden yellow colour.

Economics: Cost of cultivation and distillation for one acre.

	Rs.	As.	Ps.
1. *Preparatory Cultivation;*			
Digging with Mammuty 40 men @ Rs. 1—8—0 per day ...	60	0	0
Making ridges on contract @ Rs. 1—8—0 per 100 Koles (1 Kole = 27″) – 4,800 koles per acre ...	72	0	0
2. *Seeds and Sowing:*			
Preparing slips, carrying to the field and planting 20 women @ 12 as. ...	15	0	0
Cost of 75,000 slips at a nominal cost of Rs. 2/- per 1,000 (the need for purchasing slips will arise only for the 1st planting) and hence only a nominal cost is charged for this ...	150	0	0
After Cultivation:			
Weeding once in October—November, 125 to 135 women at 12 as. ...	100	0	0
Harvesting:			
Digging roots and shaking off the earth, 64 men @ Rs. 1—8—0 ...	96	0	0

	Rs.	As.	Ps.
Transporting cleaning, washing and chopping of roots for distillation, 320 women @ 12 as (20 women for each charge of the still and 16 charges for one acre) ...	240	0	0
Cost of 8 tons of fuel for distilling 16 charges ...	200	0	0
Attendance at the still-firing, charging water etc. men @ Rs. 1—8—0 and 32 women @ 12 as. ...	72	0	0
Cost of supervising staff, interest on capital outlay ...	225	0	0
Total ...	1,230	0	0
Cost of 12 lb. of oil @ Rs. 130/- per lb. (Foreign oils are now quoted @ Rs. 150/- per lb. and hence the rate of Rs. 130/- adopted for this calculation is on the safe side) ...	1,560	0	0
Net Profit per acre ...	330	0	0

As the crop remains in the field for 15 to 16 months it will be possible to take only two crops in three years and the annual profit per acre will be only 2/3 of the amount given above. But even this is a fairly good return from the average dry lands of the West Coast. Provided the quality of the produce is scrupulously maintained marketing of the oil will not be a problem for a long time to come, as India is not producing even 5% of her requirements of vetivert oil at present. All the major soap factories in the country would be requiring this oil and they will be only too glad to purchase local produce provided the quality compares favourably with the imported stuff. This industry also enjoys 31¼% protective duty on the imported oils. The organisers of the "Ramachathottam" at Nilambur would be glad to help people who are interested in starting this cultivation. The author is indebted to the proprietors of "The Ramachathottam" at Nilambur, for the data and other details supplied by them.

SUMMARY

1. Vetivert can be successfully cultivated under rainfed conditions in most regions, provided the soil is fairly well-drained and loamy and the rainfall is not less than 40" to 50 inches.

2. The optimum maturity of the crop is 15 to 18 months.

3. To get the maximum quantity of oil the roots must be harvested during dry weather (November to May) and distilled fresh.

4. Application of organic and chemical manures increases the yield of roots as well as their oil content as seen from preliminary trials.

5. With the present price of oil, the crop is capable of yielding a much higher profit per acre than most other crops now grown under similar soil and climatic conditions and is at the same time capable of providing employment for a much larger number of people.

6. As the country is not producing even 5% of its requirements of vetivert oil there is bound to be a ready demand for genuine oil for a long time to come. The home-made oil also enjoys a protective duty of 31¼% on the imported stuff.

Exploratory Trials of Virginia Tobacco Cultivation at Nandyal (Kurnool District)

By

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Introduction: In Guntur district more than 80,000 acres are cultivated with Virginia tobacco The cultivation of this variety has spread over 12,000 acres in East Godavari, 19,000 acres in West Godavari and 15,000 acres in Kistna, which form the coastal districts north of Guntur. In order to explore the possibilities of extending its cultivation to other areas of the Madras State, a scheme was sanctioned in 1948 with financial aid from the Indian Central Tobacco Committee, for an initial period of two years, with five centres of work at Yellamanchili, Nandyal, Salem, Eliyarampannai and Cuddalore. This article deals with the work at Nandyal Exploratory Station, where the scheme was worked for one year more than the initial period of two years.

Soils and Climate: Nandyal represents clayey soils of medium fertility. The tract receives an annual rainfall of about 28 inches of which 18 inches are received in the South-West Monsoon period, 6 inches in the North-East Monsoon and 4 inches in the Hot-Weather period. The soils and rainfall therefore do not substantially differ from those