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ICAR - Krishi Vigyan Kendra**



PRODUCTION AND POTENTIALS OF CLOVE CULTIVATION IN KANYAKUMARI DISTRICT

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THIRUPATHISARAM - 629 901
KANYAKUMARI DISTRICT**

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Clove is one of the important tree spice crops grown in India. The commercial part of clove is the aromatic, dry, fully grown, but unopened flower buds of the clove tree (*Syzygium aromaticum*) (Family: Myrtaceae). The term 'clove' is derived from the French word 'cloy' and the English word 'clout' meaning nail.

History & Origin

Clove is one of the most ancient and valuable spices of the orient, with its origin as old as the first century, before Christ.. The ancient Chinese Han dynasty lasting from 207 B.C. to 220 A.D. gives us our first clue to the use of fragrant clove. The use of clove as a spice reached Europe around the 4th century A.D., when commercial trading really started with the Arabs, who in turn acquired these dried and fragrant buds from the cultures to the East in Asia. For over 2,000 years, both Indian and Chinese traditional medicine made extensive use of clove flowers and clove oil.

The plant is indigenous to North Molucca Islands of Indonesia and was introduced to India around 1800 A.D. by the East Indian Company in their spice garden in Courtallam, Tamil Nadu. The major producers of this spice today are Indonesia, Zanzibar and Madagascar. World production is estimated to be 63,700 tonnes. Indonesia alone accounts for 66 % of the world production. The important clove growing regions in India now are the Nilgiris, Tenkasi and Kanyakumari districts of Tamil Nadu, Calicut, Kottayam, Quilon and Trivandrum districts of Kerala and South Kanara district of Karnataka.

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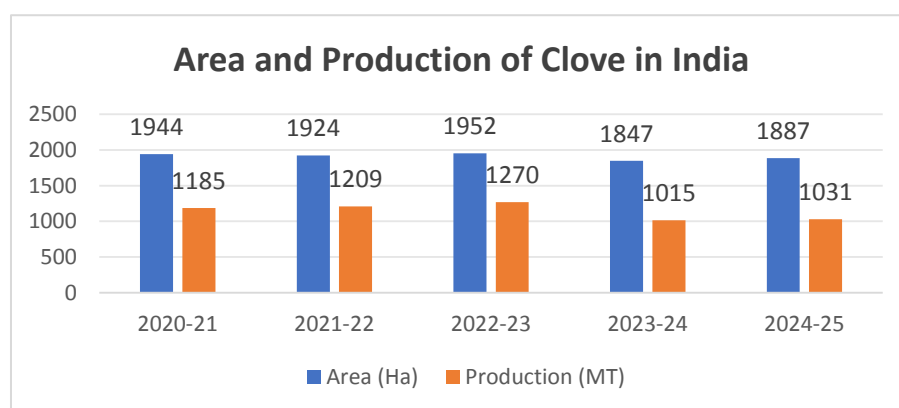
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Trend in clove cultivation

Clove plantations in India are reported to have originated from a few seedlings obtained originally from Mauritius. The major producers of clove in the world are the islands of Zanzibar, Pemba (now part of Tanzania), Penang, Caribbean Islands, Srilanka, Indonesia and India.

Area & Production of Clove in India

In India, clove is mostly grown in the hilly tracts of Tamil Nadu, Kerala and Karnataka. The area under Clove is gradually diminishing due to various factors. Climatic variations encroachments and crop diversifications are some of the factors for reduction in area. Clove being a rainfed crop failure of rainfall in 2022 has reduced the area and production to a larger extend.



Source: State Agri/Hort. Departments/DASD Kozhikkode

State-wise Area, Production and Productivity of Clove

Tamil Nadu produces more than 80% of India's cloves. The Kanyakumari district alone contributes around 65% of the nation's output.

State/Union Territory	Area Developed (Ha)	Area under (Ha)	Production (MT)	Productivity (MT/Ha)
Andhra Pradesh	84951	36123	159083	4.4
Goa	340	31	63	2.03
Gujarat	2371	2359	9393	3.98
Kerala	14875	12917	5175	0.4
Karnataka	1945	394	664	1.69
Maharashtra	1330	1486	3513	2.36

Odisha	13400	6302	14532	2.31
Tamil Nadu & Puducherry	6248	7804	25815	3.31
West Bengal	50405	48410	52581	1.09
Total	175865	115826	270819	2.34

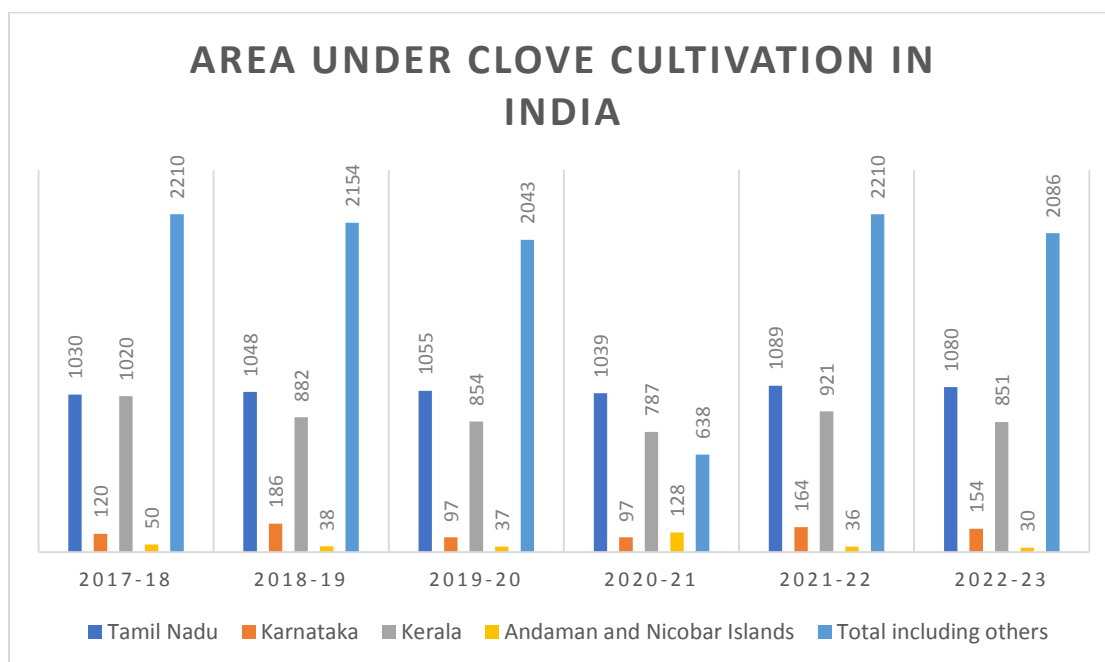
Source: https://www.data.gov.in/search?title=Area&type=resources&sortby=_score

There are no named varieties in clove. Local cultivars are usually planted. But in trade they use penang, Zanzibar and Amboyna. The large, plump and bright reddish 'Penang Cloves' are considered the best in appearance, followed by the Zanzibar and Madagascar types. There are two distinct bud variants identified namely King type- bolder flower buds- KC-1 & KC -2 and Normal clove-Lilliput clove/ mini clove- LC-1. From India, Burliar-1 is one of the two high yielding progenies selected in Tamil Nadu, the other is from Odetham estate. One of the cultivars is also recognised by the name Amboyan clove'.



Different types of clove (A) Penang; (B) Zanzibar; (C) Ripe fruit of clove plant

The trend in clove cultivation during the past five years is depicted below



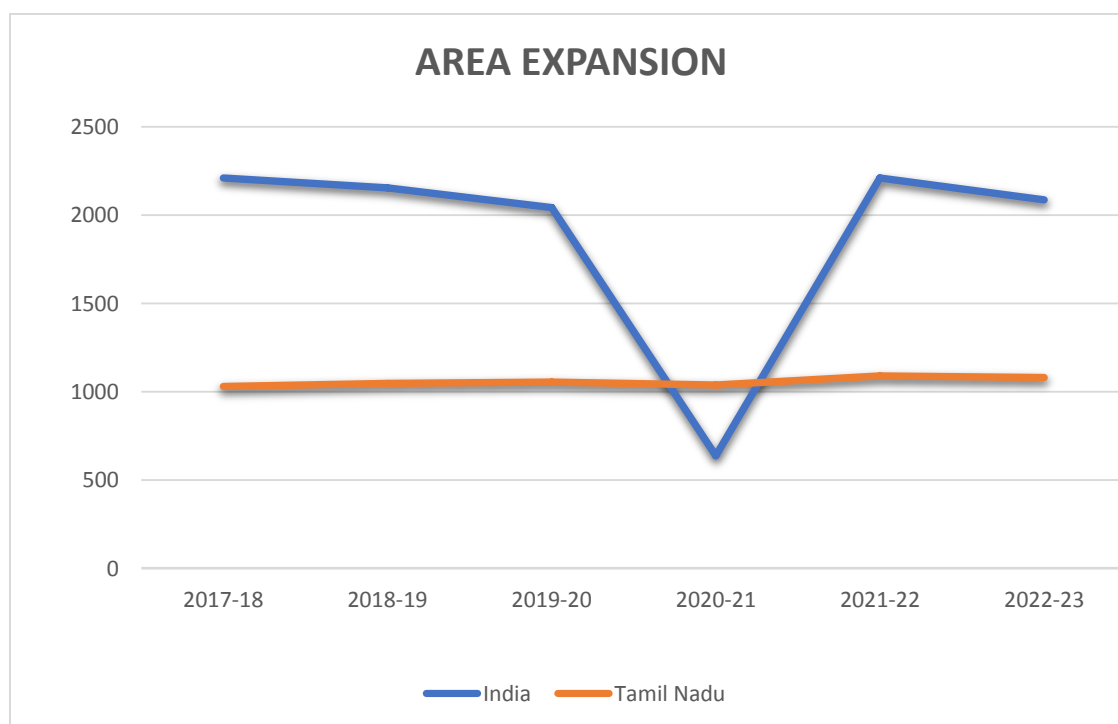
Source : State Agri/Horti Departments/DASD Kozhikkode

State	2018-19		2019-20		2020-21		2021-22		2022-23		2023-24	
	A (ha)	P (MT)	A (ha)	P (MT)	A (ha)	P (MT)	A (ha)	P (MT)	A (ha)	P (MT)	A (ha)	P (MT)
TN	1048	1015	1055	978	1039	1008	1089	1059	774	700	760. 78	700

A- Area: P-Production

Source: Season and Crop Report of Tamilnadu for Fasli 1432 (2022-23)

In India, clove is mostly grown in the hilly tracts of Tamil Nadu, Kerala and Karnataka. Tamil Nadu produced the largest volume of cloves in India in fiscal year 2022. This was an estimated 1,059 metric tons over an area of 1,089 hectares. The country produced over 1,335 metric tons of cloves that year. It is cultivated at an elevation of 400 to 900 metre above the sea level in the Western Ghats of Kanyakumari district. The hilly region is blessed with both good rains and the sea mist, coupled with adequate sun rays. These factors are considered the reasons for the distinctive smell and taste of the clove. The Kanyakumari clove that accounts for nearly 65% of the country's production, grown in 80 estates that have holdings a few acres each.



Source : 1) Other spices - State Agri/Horti Departments/ DASD Kozhikodu

Tamil Nadu ranks first in clove cultivation followed by Kerala, Karnataka and Andaman islands are other regions. As the Indian cloves are best in quality, they are in high demand in the market.

The Kanyakumari clove has already received the Geographical Indication (GI) tag. In Kanyakumari district clove is cultivated in 1160 ha in the form of 1000 small farm holdings and in 80 bigger estates. The dense wooded areas of Maramalai, Karumparai and Vellimalai in the Western Ghats of the Veerapuli Reserve Forest and Mahendragiri in Kanyakumari district produce nearly 80 percent of the total production of clove in India. The average yield of clove in tamil Nadu is as follows

Average Yield of Cloves (in kg/ha) in growing districts of Tamil Nadu

S.No	District	Average Yield of Cloves (in kg/ha)
1	Salem	1438
2	Namakkal	1286
3	Theni	720
4	Dindigul	1000
5	Virudhunagar	750
6	Tirunelveli	1263
7	The Nilgiris	933
8	Kanniyakumari	883
	State	969

Source: State Department of Horticulture (2023)

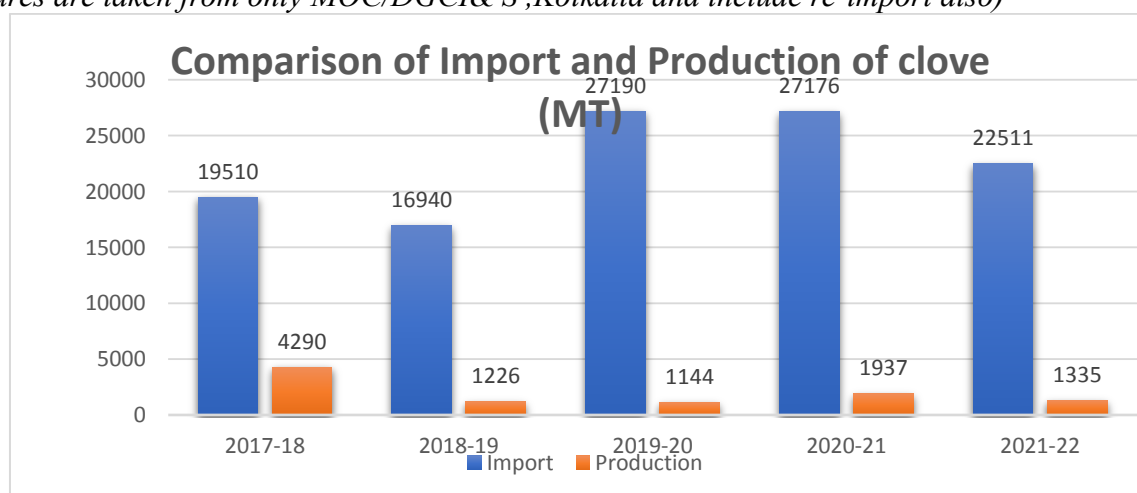
As per the primary data collected from farmers it has been estimated to have 1490 ha under clove cultivation with a yield of 980 kg/ ha. The estimated production is 1460 tonnes during 2022-23. Karnataka has a cultivated over 191 hectares with yield 890 kgs / hectare and production 70 tonnes. Kerala has 1,039 hectares with yield potential of 67 kgs / hectare and production is 20 tonnes. Andaman and Nicobar cultivated over 48 hectares. Yield was 416 kgs / hectare and production 1270 tonnes. The all-India data shows a cultivated area of 2,300 hectares. Yield is 543 kgs / hectare. The yield potential of clove in Tamil Nadu with an average yield of 969 kg/ha which is higher than the average yield in India. In production side the estimated production for current year is 1460 tonnes with a value of Rs 1.6 lakhs. The import value during the previous year was Rs 105079.3 as depicted in table.

Trend in clove production and import

Import of Clove Into India (VALUE IN Rs. LAKHS)

Year	2019-20	2020-21	2021-22	2022-23	202324
Quantity (Tonnes)	27190	27176	22511	17986	23689
Import value	112866.5	98852.33	105079.3	83828.46	135176.51

Source: DGCI&S,CULCATT/DLI FROM CUSTOMS UPTO 2019-20 AND 2020-21 onwards figures are taken from only MOC/DGCI& S,Kolkatta and include re-import also)



Though 22000 tonnes is needed for domestic market, the average production per year is earmarked as 1200 tonnes. About 90% of the demand is hence met through import largely from Srilanka.

Commercial value of clove

The most commercial part of clove is the dried unopened flower buds of the evergreen tree. It is an important spices noted for its flavour and medicinal values. Cloves from Kanyakumari are known for having a remarkably high volatile oil content (21% as opposed to the typical 18%). This results in a highly fragrant experience with a potent flavour profile because of the high eugenol acetate content. Food processing industry uses both whole and ground form of cloves in various preparations. Clove oil is used in perfumeries, pharmaceuticals and flavouring industries.

Clove oleoresin is also increasingly used in the food processing industry. In Indonesia, the major part is absorbed for making KRETEK cigarette industry. The clove is an evergreen tree often reaching a height of 7 to 15 metres. Leaves posses plenty of oil glands on the lower surface.

The marketable products of clove are

- Clove- Dried fully grown unopened flower buds
- Clove oil- Obtained from distillation of flower buds
- Clove leaf oil- obtained from distillation of leaves



Production of Clove

Climate and Soil

Clove is strictly a tropical plant and requires a warm humid climate having a temperature of 20°C to 30°C. Humid atmospheric condition and a well distributed annual rainfall of 150 to 250 cm are essential. It thrives well in all situations ranging from sea level upto an altitude of 1000m-1500m and also in places proximal to and away from sea. Deep black loam soil with high humus content found in the forest region is best suited for clove cultivation. It grows satisfactorily on laterite soils, clay loams and rich black soils having good drainage. Sandy soil is not suitable. The soil pH should range from 4.0 to 5.6 (Nair, 1970; Pillai, 1972; Pruthi, 2001).

Season

June – December is found to be optimum. Slopes facing South and West should be avoided. North and North-Eastern slope is preferred.

Propagation

Clove is propagated through seed, which is called mother clove. The seeds become available from June to October. Fruits are allowed to ripe on the tree itself and drop down naturally. Such fruit are collected from the ground and sown directly in nursery or soaked in water overnight and the pericarp removed before sowing. They lose their viability within one week after harvest under normal conditions and hence they must be sown immediately after collection from a tree. The second method gives quicker and higher germination. Big sized seeds generally give higher percent of germination.

Nursery practices

Beds for sowing seeds are of 15 to 20 cm height, one metre width and a convenient length. The beds should be made of loose soils and over which a layer of sand may be spread

(about 5-8cm thick). Seeds are sown at 2 to 3 cm spacing and a depth of about 2cm. The seedbeds have to be protected from direct sunlight. The germination commences in about 10 to 15 days and may last for about 40 days. In higher elevations, germination is delayed considerably, often requires 60 days. The germinated seedlings are transplanted in polythene bags 30cm x 15 cm) containing a mixture of good soil, sand and well decomposed cowdung (in the ratio of about 3:3:1). The seedlings are ready for transplanting in the field when they are 18 to 24 months old. The nurseries are usually shaded and irrigated daily to ensure uniform stand.

Land Preparation and Planting

Eastern and north-eastern hill slopes, well drained valleys and river banks are ideal for clove. The area selected for raising clove plantations is cleared of scrub growth before monsoon and pits of 60 to 75 cm ³ are dug at a spacing of 6 to 7 meters. The pits are partially filled with topsoil. The seedlings are transplanted in the main field during the beginning of rainy seasons, in June-July, and in low lying areas, towards the end of the monsoon, in September-October. Cloves prefer partial shade. Two year old seedlings are planted in pits of 30 cm x 30 cm x 30 cm size filled with soil and FYM 10 kg/pit at a spacing of 6 m either way. Apply 50 g/pit Azospirillum before planting. Provide shade for seedlings. Mulch the basins with dried leaves. Weed the basins as and when necessary. Small temporary pandals may be provided for partial shade during initial establishment.

Manuring

Clove trees are to be manured regularly and judiciously for their proper growth and flowering. as given below:

Age of the plant	Cattle manure or compost (kg)	Urea	Super Phosphate	Muriate of Potash
		g/tree		
First year	15	-	-	-
Second year	20	80	220	160
Annual increase per year	5	40	110	80
Tree of 15 and above	50	600	1560	1250

The entire quantity of organic manures and half the quantity of fertilizers may be applied during May-June and the remaining quantity of fertilizers is applied in October-November in shallow trenches dug around the plant normally about 1 to 1.5m away from the tree base.

Irrigation

Irrigation is necessary in the initial stages. In places where pronounced drought is normally experienced, pot watering is recommended to save the plants in the initial two or three years. Subsoil irrigation using 20cm length mud tubes or bamboo tubes with the help of to save the plants during acute summer. Although the trees can survive without irrigation, it is advantageous to irrigate the grown up trees for proper growth and yield. Frequent watering is essential in the initial stages in the absence of rains. Irrigation should be given during summer months. Applying 8 litres of water either through drip or through basin during the months of January - May is beneficial.

Plant Protection

Diseases	Symptoms	Control Measure
Leaf rot (<i>Cylindrocladium quinqueseptatum</i>)	Dark patches are seen in leaves of mature trees seedlings, which often result in rotting of whole leaves or tips alone causing severe defoliation.	The foliage of affected trees should be sprayed with Carbendazim 0.1 % or a prophylactic spray with Bordeaux mixture 1 % also prevents the disease.
Stem borer	The pest bores into the main stem, causing death of the plant.	1) Smear the surface of the stem and branches with Carbaryl 50 WP @ 2 g/lit of water. 2) Pour Quinalphos 25 EC @ 1 ml/lit in to the bore hole and plug it. 3) Apply Phorate 60g/tree in the soil
Quick wilt	Affected trees suddenly wilt and dried off. Prolonged drought and water stagnation affects the root growth.	(1) Drenching of Carbendazim or Mancozeb 1 g/lit of water in the root zone (2) Wilting plants should be provided with shade and irrigated immediately (3) In sloppy areas drip irrigation is recommended (4) Dried leaves should be spread to conserve the moisture (5) Growing of wind barriers to avoid the damages to the trees.

Scale insects	Infestation is seen on leaves and tender shoots, more often in the nursery.	Spray 0.05 % Dimethoate or quinolphos 0.025%.
Pest	Symptoms	Control Measure
Chilli thrips: <i>Scirtothrips dorsalis</i>	- The affected leaves show a pinkish discolouration. - Flower shedding is also noticed	Management of sucking pests: - Removal of affected leaves and branches will prevent the spread. - Spray dimethoate or methyl demeton 2ml/lit.

HARVESTING AND YIELD

Clove is a medium-sized tree which grows up to a height of 10 – 20 m and can live for 100 years or more. Though clove trees flower from 4-6 years of their planting, the trees generally start bearing an economic yield 18-20 years from the time of planting and the production continues for 80 years or more. Average yield is 2 - 3 kg dried buds/tree. The buds are harvested before they open up when the base of the calyx turns green to pink. The farmers say that the stage and time of harvest of the flower buds determines the quality of the final dried product.

The bearing between the years varies quite a lot and a bumper crop can only be expected about once every 4 years, being influenced by the weather and the previous crop load. The flowering season varies from September-October in the plains to December-January at high altitudes.

Harvesting should be done carefully to prevent breakage of branches. An average 15 to 20 year old tree yields 3 to 4 kg of dried clove buds. Optimum time for harvesting clove seeds is 75-90 days after fruit set. After harvesting, clove buds are separated from their stalks by hand and spread on mats for drying. Drying may take 4 to 5 days. Well dried buds are hard, crisp and dark brown, having moisture content (<12%), which can be stored for 1 to 2 years in gunny bags. Approximately, 15-20% volatile oil can be produced from dried buds .

Plucking of Clove flowers



Cloves, which are the unopened flower buds, are produced on the terminal shoots of the twigs. The buds are collected when they are dull red or pink in colour and less than 2 cm long. The inflorescence is harvested without damaging the branches when the buds have reached their full size, but before they open, so that the petals together with the stamens inside form the head of the dried clove. Delayed picking, i.e., after the opening of the buds, will devalue the spice.

The yield of cloves is found to vary from year to year. The average yield at Burliar is 2 kg per tree (500 kg/ha) per year. But, there are individual trees which are reported to give 8-10 kg in some years. In comparison, the average yield in Zanzibar from a well-grown bearing tree is reported to be very high (40 kg/year). Yields upto 80 kg/tree/ year have also been recorded.

Traditional manual practices are used to pluck the clove stems with flower buds. The stems need to be carefully removed in such a manner as to not cause any damage to the branches. Generally, rope stilts are used by the farmers to start plucking from the top of the tree and gradually work their way down.

Buds are removed from the stem by hand and the clove buds and stems are segregated in separate piles for drying. It is necessary to sort out the buds to remove overripe cloves and flowers. Drying is done soon after the buds are separated from the clusters to avoid fermentation and a white shrivelled appearance that the dry clove may gain.

About 11,000-15,000 dried cloves weigh one kilogram. Cloves are normally packed in double jet sacks of 50-60 kg capacity each.

PROCESSING, GRADING AND VALUE-ADDITION

Processing

The appearance, size, content and aromatic characteristics of its volatile oil are the factors which decide the quality of the dried spice. Also, they should be free of mustiness and mould. The best prices are obtained for whole dried cloves of a good bold size with a bright, uniform, reddish-brown colour. The features mentioned above are, in turn, influenced to a great extent by the care taken in the harvesting, drying, cleaning and sorting operations, and the storage conditions.

Sorting of clove buds



Prior to drying, the buds are removed from the stems and then piled in separate heaps for later individual drying, during which, over-ripe cloves and gleanings of fallen flowers are sorted out. Drying is undertaken as soon as possible, after the buds have separated from the clusters. If the buds are left too long in heaps they will ferment and the dried spice will have a whitish, shrivelled appearance (Khoker cloves). In sunny weather, drying may take four to five days to produce a brightly-coloured dried spice of attractive appearance.

The correct stage of drying is reached when the base of the bud is dark brown, and the rest of the bud lighter brown in colour. On drying, the cloves retain about two-thirds of their original fresh green weight. Then another sorting is done to separate 'mother-of-cloves' and 'khoker cloves'. A final thorough cleaning, sorting and grading is carried out by the exporting firms prior to packing.

Grading

Whole cloves are graded as special (Hand-picked), Grade-2, Grade-3, Ground (powdered) cloves, while the defective cloves are named as Khoker cloves, Headless cloves, Mother cloves, Extraneous matter, etc.

Headless Cloves: A Clove consisting of only the receptacle and sepals and which has lost the dome shaped head.

Khoker Cloves: A Clove which has undergone fermentation as a result of incomplete drying as evidenced by its pale brown colour whitish mealy appearance and other wrinkled surface.

Mother Cloves: A fruit in the form of an ovoid brown berry surmounted by four incurved sepals.

CLOVES GRADING AND MARKING RULES

Grade designation and definition of quality of Cloves whole (Laung) (% by mass)

Grade designation	Special requirements						
	Organic extraneous matter	Inorganic extraneous matter	Headless cloves	Immature and Kokker cloves	Insect damaged cloves	Moisture content	Volatile oil content on dry basis ml/100 gm
Grade I	0.5	0.1	3.0	1.0	0.1	10.0	20.0
Grade II	1.0	0.3	5.0	3.0	0.5	10.0	18.5
Grade III	1.0	0.5	10.0	5.0	1.0	10.0	17.5

“Insect damaged cloves” means the cloves that the partially or wholly bored by the insects. “Inorganic extraneous matter” means dust, dirt, stones and lumps of earth. “Organic extraneous matter” includes vegetative parts of cloves plant, other than cloves, such as tendrils, peduncles, clove stems, mother cloves etc.

Cloves, whole (Laung) shall:-

- (a) be the dried fully grown but unopened floral bud of cloves tree, *Syzygium aromaticum* (L) Merrill et pery syn.. [*Eugenia coryophyllus* (C : Sprengel) Bullock et-Harrison;]
- (b) be of a reddish brown to blackish brown colour ;
- (c) have a strong aromatic, spicy odour and characteristic flavour;

- (d) be free from off-flavour, rancid taste, mustiness, mould growth, insect infestation, rodent contamination and added coloring matter;
- (e) comply with the restrictions in regard to aflatoxin, metallic and other naturally occurring toxic substance contamination, insecticide residues and other provisions prescribed under the Prevention of Food Adulteration Rules, 1955 as amended from time to time.

Grade designation and definition of quality of cloves powder

Grade designation	Special requirements				
	Moisture content by mass	Total ash content %	Acid insoluble ash %	Crude fibre %	Insect damaged cloves
Grade I	10.0	7.0	0.5	10.0	0.1
Grade II	10.0	7.0	0.5	12.0	0.5

Cloves powder shall :-

- (a) be the powder obtained by grinding clean and sound cloves ;
- (b) be brown colour with strong spicy flavour and characteristic taste; (c) be free from any off-flavour, rancid taste or mustiness;
- (d) be free from added coloring matter, preservative or foreign starch;
- (e) be free from dirt, mould growth and insect infestation;
- (f) comply with the restrictions in regard to aflatoxin, metallic and other naturally occurring toxic substances contamination, insecticide residues and other provision prescribed under the Prevention of Food Adulteration Rules 1955 as amended from time to time.

Note : Principal rules were published in the Gazette of India, Part II, Section 3, sub-section (i) dated 31-5-1997 vide G.S.R. 243. Dated 30-04-1997.

SUN DRYING OF CLOVE AND GOLDEN COLOUR APPEARANCE OF CLOVE UNDER SUN DRYING

Clove, valued for its culinary use. The harvested flower buds are separated from the clusters by hand and spread in the drying yard for drying. The cloves are spread out in mats and dried in the sun. The green buds are spread out in a thin layer on a drying floor and raked regularly to ensure even drying, development of a uniform colour and to prevent mold formation. It takes normally 4 to 5 days for drying. The correct stage of drying is reached when

the stem of the bud is dark brown and the rest of the bud lighter brown in colour. Well dried cloves will be only about one-third of the weight of the original. On being dried for two and a half days under the sun and for half day in the shade it loses two thirds of its weight and gets the unique golden brown colour. The dried cloves are sorted to remove mother cloves headless cloves and khoker cloves. About 11,000 to 15,000 dried cloves make one kilogram. the GI tag would give them global recognition and a premium price.

Chemical Properties of Kanyakumari Clove bud oil

Volatile oil: 21%	Caryophyllene: 9.1%
Eugenol: 81.57% Eugenol acetate: 1.1%	Gallic acid 3.31%

Sun drying of clove buds

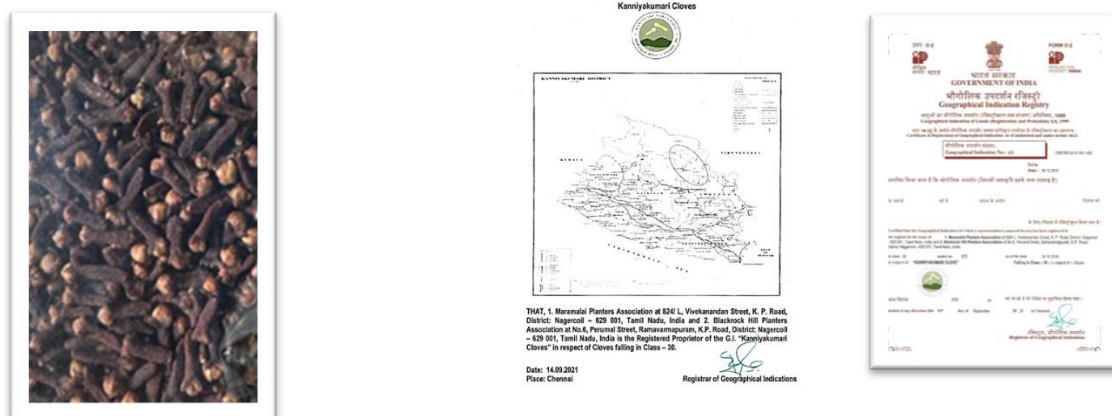


As drying happens at high altitudes and at a temperature of 20 – 35 °C, concentration by weight of essential oils increases making Kanyakumari cloves the preferred choice in Ayurvedic preparations and perfumery. The Kanyakumari cloves have a higher percentage of essential oils in the range of 19 – 21 percent and this volatile oil concentration increases the content of Eugenol and Eugenol Acetate which lends it a distinctive aroma, flavour and quality. The dried flower buds has a strong heady aroma.

Therapeutic benefits

Cloves are used in Ayurveda to treat respiratory and digestive ailments as well as toothache and dental decay. It is used either in whole or as a powder for culinary purposes. Clove oil is used as an antibacterial, antifungal and antiseptic. It is widely used in aromatherapy and in the perfumery industry. It is now being extensively used as a biopesticide. medicinal properties.

GI Tag obtained in 30.10.2019



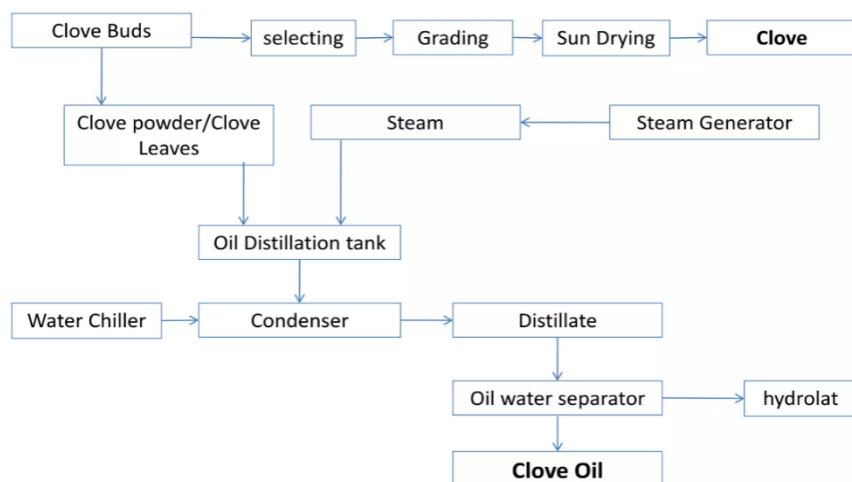
Value-added products

Clove oil, ground clove, oleoresins, clove-stem oil, clove-leaf oil, oil of mother of cloves and clove-root oil are some of the value-added products of clove.

Clove oil

The stems remaining after the separation of the buds from the freshly-harvested clusters are dried similarly and are used to distil clove oil by the steam distillation method. The duration of distillation ranges from 8-25 hours depending upon the size of the still, the nature and volume of steam and the condition of the cloves. The leaves and small twigs yield clove-leaf oil. Clove-stem oil is obtained from the stems attached to the buds and flowers, and bud oil from the buds. The essential oil yield is 17- 19% from clove buds, 6% from the clove stems and 2-3% from the leaves.

Flow chart of Manufacturing

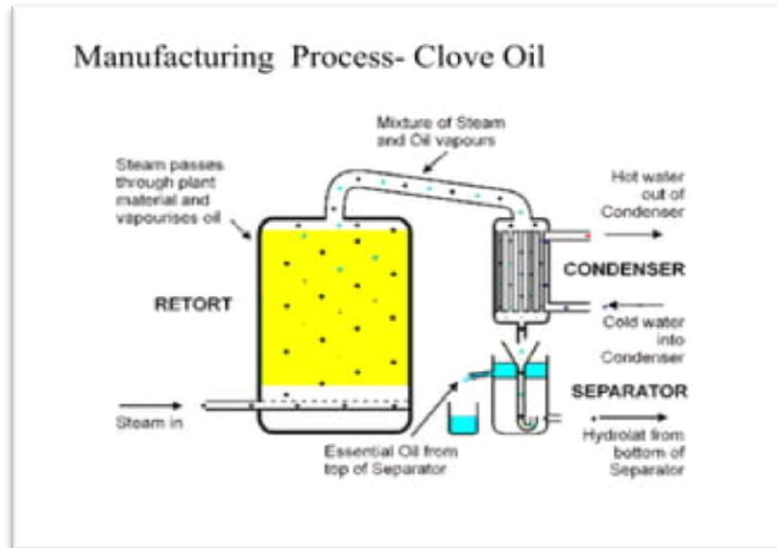


Processing of clove oil

The stems remaining after the separation of the buds from the freshly-harvested clusters are dried similarly and are used to distil clove oil by the steam distillation method. The duration of distillation ranges from 8-25 hours depending upon the size of the still, the nature and volume of steam and the condition of the cloves. The leaves and small twigs yield clove-leaf oil. Clove-stem oil is obtained from the stems attached to the buds and flowers, and bud oil from the buds. The essential oil yield is 17- 19% from clove buds, 6% from the clove stems and 2-3% from the leaves.

CLOVE LEAF OIL EXTRACTION

The process is the same for extraction of clove leaf oil also.



Diagrammatic representation of clove oil extraction by distillation process

Government of Tamil Nadu has established a processing unit for spices with drying yard facilities and a distillation unit. At present the unit is hired by the spices planters association for processing and value addition of spices.



STEPS FOLLOWED IN THE PROCESSING UNIT



Dried clove leaves



Oil Distillation Unit



Steam Generator



Water Chiller



Condensor



Oil Separator



Condensed liquid+ oil collection & Separation



Separated water collected can be utilised by mouth wash producing units

Other value added products in clove

Clove is used in a type of cigarette. Due to the bioactive chemicals of clove, the spice maybe used as an ant repellent. They can be used to make fragrance pomander when combined with an orange. Pomander as gift indicated “warmth of feeling”.



Clove cigarette



Pomander

Adulterants

Cloves are sometimes adulterated with headless cloves and clove stems. They may also be adulterated with Khoker cloves or mother cloves and other extraneous matter like dust, dirt, stones, clay particles and pieces of wood. The adulterants of clove-bud oil are stem oil, and clove-leaf oil. Another form of adulteration is the addition of clove terpenes, synthetic terpineol, dibenzyl or dibenzylether and acetins in clove-bud oil.

Profit and Cost of Clove Cultivation Per Acre

Expense/Cost of Cultivation	Amount (in Indian Rupees)
Land Preparation	50,000
Purchase of Clove Saplings	10,000 (for 100 saplings)
Labor Cost (Planting, Pruning, Harvesting, etc.)	30,000
Fertilizers and Nutrients	20,000
Irrigation	15,000
Pest and Disease Management	10,000
Miscellaneous Expenses	5,000
Total Expense/Cost of Cultivation	140,000

Profit from Clove Cultivation	Amount (in Indian Rupees)
Total Yield of Cloves (in kg)	600
Market Price of Cloves (per kg)	300
Total Revenue (Total Yield x Market Price)	180,000
Total Expense/Cost of Cultivation	140,000
Profit (Total Revenue – Total Expense)	40,000

BACKGROUND OF THE PAPER

This paper examined the achievements of clove farmers in Kanyakumari district and documented the accomplishments of the Blackrock Hill Planters Association, with an emphasis on their generated income and the support provided to association members. Additionally, data pertaining to clove production and resulting revenue in the district was gathered. These findings offer valuable insights for policymakers to concentrate their efforts on fostering the advancement of this sector.



Interaction with progressive clove farmers in Kanyakumari district

SUCCESS STORY

Mr. Subramanian, a 45-year-old agricultural graduate, is deeply engaged in the realm of agriculture as his primary pursuit. With a three-decade history in farming, Subramanian possesses an impressive 30-year track record specifically dedicated to clove cultivation. His operational domain encompasses a substantial expanse of 25 acres, all dedicated to the growth of locally adapted clove varieties.

Mr. Subramanian's adeptness in clove farming materializes in considerable annual earnings. Facilitated by the guidance of the Spices Board and Krishi Vigyan Kendra (KVK) and bolstered by governmental backing encompassing training and subsidies, he realizes an annual income totaling Rs. 12,375,000. This noteworthy financial outcome culminates in a net profit of Rs. 7,875,000.

Mr. Subramanian's narrative underscores the fundamental significance of expert counsel and governmental assistance in driving progress within the agricultural sphere. With his extensive

experience and continuous support, he stands as a testament to the promising economic potential rooted within the realm of clove cultivation.

Mr Arthur Simpson, a 42-year-old graduate, and the President of Black Rock Planters Association, has devoted his primary occupation to farming. With a remarkable 40 years immersed in clove cultivation, Arthur manages a 10-acre plot of land tailored for this endeavor. His cultivation efforts extend to both indigenous clove varieties and compact, dwarf clove variants.

Notably, Arthur's adeptness in clove farming results in a substantial annual revenue. He garners an annual income of Rs. 4,950,000. This financial achievement culminates in a net profit amounting to Rs. 3,150,000.

Arthur's journey underscores the pivotal role of expert guidance and governmental support in propelling the agricultural sector forward. With his extensive experience and sustained assistance, he exemplifies the promising economic potential embedded within the realm of clove cultivation.

Mr Lalaji, a seasoned professional, holds a degree in agriculture and has dedicated his life to farming as his primary occupation. With an impressive four decades of farming experience, he has honed his expertise specifically in clove cultivation over the same period. Managing an expansive land area of 20 acres, Lalaji focuses his efforts on cultivating local varieties of clove.

Arul Dhas, a dedicated agriculturist, has centered his livelihood around farming. With an extensive 40-year background in agriculture and an equal duration exclusively devoted to clove cultivation, Arul Dhas manages a substantial land expanse of 24 acres. His focus remains on nurturing locally adapted varieties of clove plants.

Impressively, Arul Dhas' expertise in clove farming translates into a significant financial outcome. Benefiting from the guidance of the Krishi Vigyan Kendra (KVK) and bolstered by governmental assistance in the form of training and subsidies, he attains an annual income of Rs. 11,880,000. This financial achievement culminates in a net profit of Rs. 7,560,000.

Arul Dhas' narrative underscores the pivotal role played by expert guidance and governmental initiatives in driving forward the agricultural domain. His extensive experience, coupled with sustained support, serves as a testament to the substantial economic potential inherent in clove cultivation.

Remarkably, Lalaji's proficiency in clove farming has translated into substantial financial gains. Through his dedicated efforts and with the guidance provided by the Krishi Vigyan Kendra (KVK) and the supportive measures extended by the government, such as training sessions and subsidies, he has achieved an annual income of Rs. 9,900,000. This impressive revenue has resulted in a net return of Rs. 6,300,000.

Lalaji's success story underscores the significance of expert guidance and government initiatives in propelling the agricultural sector forward. With his vast experience and continuous support, he exemplifies the potential for substantial financial growth within the realm of clove cultivation.



Clove Planters Association

The Blackrock Hill Planters Association formed in 2008 engages in production of clove in 1200 acres and Maramalai Planters Association formed in 2013 is procuring clove in 1200 acres. Both the associations are involved in value-added activities concerning clove, encompassing bud oil, leaf oil, and clove stem oil.

Value addition in clove significantly contributes to a twofold increase in the farmers' earnings. The Blackrock Hill Planters Association reports an annual revenue of Rs. 742,500,000, yielding a net profit of Rs. 472,500,000.



Essential oils marketed by the Blackrock Hill Planters Association

On an individual basis, farmers abstain from performing value addition tasks due to the risks involved in marketing. Instead, they entrust their produce for value addition by sun drying at the drying yard infra structure on hire basis. Traders directly approach the farmers individually and procure the sun-dried produce. Through this collaborative effort, the association hires the infrastructure and facilitates the process of value addition, resulting in the doubling of the farmers' income. At the district level, the recorded annual revenue amounts to Rs. 1,336,500,000, accompanied by a net profit of Rs. 850,500,000. This achievement is rooted in a production yield of 1215 metric tons/ year. The advantage in clove production is that there is assured market for clove.



Challenges faced by clove producers

The opportunities for members of the association for immediate sale of produce is high compared to the small and marginal mostly the *Kani* tribes in the hilly regions. The price of the

product in the area is determined by the traders who act as lenders for other goods which is compensated by the forest products including clove. Hence the price of most of the forest produces is determined by these traders who are the major actors in price determination. The producers opine that the demand for clove in the international market is very high but the supply is meagre. Moreover the produce from the district is of high quality due to its high oleoresin content which is around 18%. Hence there is vast scope for area expansion. At present production is concentrated in Blackrock, Maramalai, Arukani and Pathukani hilly regions. There is more scope for area expansion in other hilly regions of the district. But the farmers face problems like non availability of fertile land and Clove cultivation is highly labour intensive. The labour requirement constitutes more than 40% of the total cost, non-availability of labour and the consequent increasing wage rate is a major issue apart from inadequacy and non-availability of healthy seed material in production of clove. The support from Government is crucial for expansion of area as it involves the hills with minimum road access.

The quantum of raw material for production of essential oil from the clove leaves and clove stem are not adequate to effectively run the distillation unit hired by them in a cost-effective manner since the cost of the available raw material for oil extraction is also very high. The only value addition process involved by most of the producers is sun drying. Even grading is followed by only a few farmers. Hence the scale of economies is not practiced and can be made operative only by the concerted effort of Government to bring the small and marginal farmers together.

Marketing of clove is still unorganized, and the farmers sell to local dealers at low price. The farmers are also not aware of grading and the standards of value-added product for certification and export. There are no competitors involve in marketing which is one of the major issues faced by the actual producers. Since the wages for labourers is high in the district and no machineries can be used in the forest region, big farmers engage labourers from other district who are ready to work at a lower wage. Since many producers are leased farmers, involvement is poor and is focused only on immediate benefits rather than long term compensations. Varietal development in clove is required to address the low genetic variability through new varieties and through use of new generation crop breeding strategies. Special support programme for replacing senile plantations need to be implemented in major clove growing regions. Introduction of clove producer collectives with trading and processing capabilities. The above-mentioned hindrances in clove production are put to the notice of the policy makers for better

solutions in development of clove cultivation and its value addition in the area which has more suitable micro climate for its production.

CONCLUSION

The clove sector stands as a significant player in various domains, ranging from culinary and medicinal applications to economic and cultural significance. Its aromatic and flavorful qualities have made it an essential ingredient in cuisines worldwide, enhancing the taste of dishes and adding depth to flavors. Beyond its culinary role, cloves have demonstrated potent medicinal properties, from dental health to digestive benefits, contributing to the holistic well-being of individuals. Economically, the clove sector holds substantial importance for both producing and consuming countries. For producing nations, clove cultivation offers a source of income and employment, contributing to rural livelihoods and economic development. On the consumption side, the global demand for cloves creates trade opportunities, fostering international relationships and economic interdependence. Furthermore, the cultural significance of cloves cannot be overlooked. They have been woven into the tapestry of traditions, rituals, and practices in many societies. From ancient medicinal practices to religious ceremonies, cloves have left an indelible mark on various cultural expressions.

Challenges such as fluctuating market prices, environmental sustainability concerns, and maintaining equitable trade relationships need to be addressed to ensure the continued growth and relevance of the clove sector. Embracing sustainable cultivation practices, promoting fair trade policies, and investing in research for improved crop yield and quality can help mitigate these challenges. In essence, the clove sector's importance extends far beyond its aromatic appeal. Its impact on culinary experiences, health and wellness, economies, and cultures makes it a versatile and crucial player in our interconnected global landscape. As we move forward, a balanced approach that respects both the historical significance and the evolving demands of the modern world will be essential in harnessing the full potential of the clove sector.

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