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HANDBOOK OF PROCESSING OF TEJPATA

AATMANIRBHAR BHARAT

National Institute of Food Technology Entrepreneurship and Management

Ministry of Food Processing Industries
Plot No.97, Sector-56, HSIIDC, Industrial Estate, Kundli, Sonipat, Haryana-131028

Website: http://www.niftem.ac.in

Email: pmfmecell@niftem.ac.in
Call: 0130-2281089

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ABBREVIATIONS AND ACRONYMS

Sl: No.	Abbreviations &Acronyms	Full Forms
1.	ASTA	American Spice Traders
2.	FAO	Food and Agriculture Organization
3.	FLRS	Food Licensing and Registration System
4.	FPOs	Farmer Producer Organizations
5.	FSS	Food Safety and Standards
6.	FSSAI	Food Safety and Standards Authority of India
7.	FoSCos	Food Safety Compliance System
8.	HDPE	High-density polyethylene
9.	IISR	Indian Institute of Spice Research
10.	ICAR	Indian Council of Agricultural Research
11.	ISO	International Organizations for standardization
12.	MoFPI	Ministry of Food Processing Industries
13.	LDPE	Low-density polyethylene
14.	PA	Polyamide
15.	PET	Polyesters
16.	PFA	Prevention of Food Adulteration
17.	PVDC	Polyvinylidene chloride
18.	PVC	Poly Vinyl Chloride
19.	PP	Polypropylene
20.	SHGs	Self Help Groups
21.	USDA	United States Department of Agriculture

CHAPTER- 1
INTRODUCTION

TEJPAT (*Cinnamomum tamala*)

1.1 Overview of spice sector

India produces a wide range of spices and holds a prominent position in world spice production. Because of the varying climates - from tropical to sub-tropical to temperate- almost all spices grow well in India. In reality, almost all the states and union territories of India grow one or the other spice. India is the world's largest producer, consumer, and exporter of spices; the country produces nearly 75 of the total 109 spices listed by the International Organization for Standardization (ISO). The country also accounts for almost half of the global trade in spices. During 2020-21, spice crops were cultivated in 4.5 million hectares of land with an estimated spice output of 10.5 million tonnes.

India is known for its spices not only because of their production quantum and diverse range but also because of their rich aroma, taste, and texture. Indian spices are the most sought-after globally, given their exquisite aroma, texture, and taste. The spices from the country often command a premium price in the global markets. Spices are high-value low volume commodities that play an important role in the agricultural economy of the country. The area and production of spices have witnessed robust growth in the recent past. Spices are also an important component of the agricultural export basket of the country. During 2019-20 spice commodities worth 25651 crores were exported from India. Spices, as a commodity group, comes third after marine products and basmati rice in terms of export value. Spices from the country reach more than 180 countries across the globe through various trade channels.

One of the major strengths of the Indian spice economy is the robust domestic market for spices. Even though India is the largest exporter of spices, the country exports only 10-12 percent of its annual spice output. The domestic market for spices is well established and sustained consumer demand from the domestic growth is an attractive feature of the industry. The growth in disposable incomes, the increasing awareness about the nutraceutical and pharmaceutical properties of spices, and the growth of the wellness industry are expected to act as drivers of demand growth in spices at the global level. Additionally, the growth of functional foods, beverages, and the cosmetic industry will also drive demand for spice-based nutraceuticals.

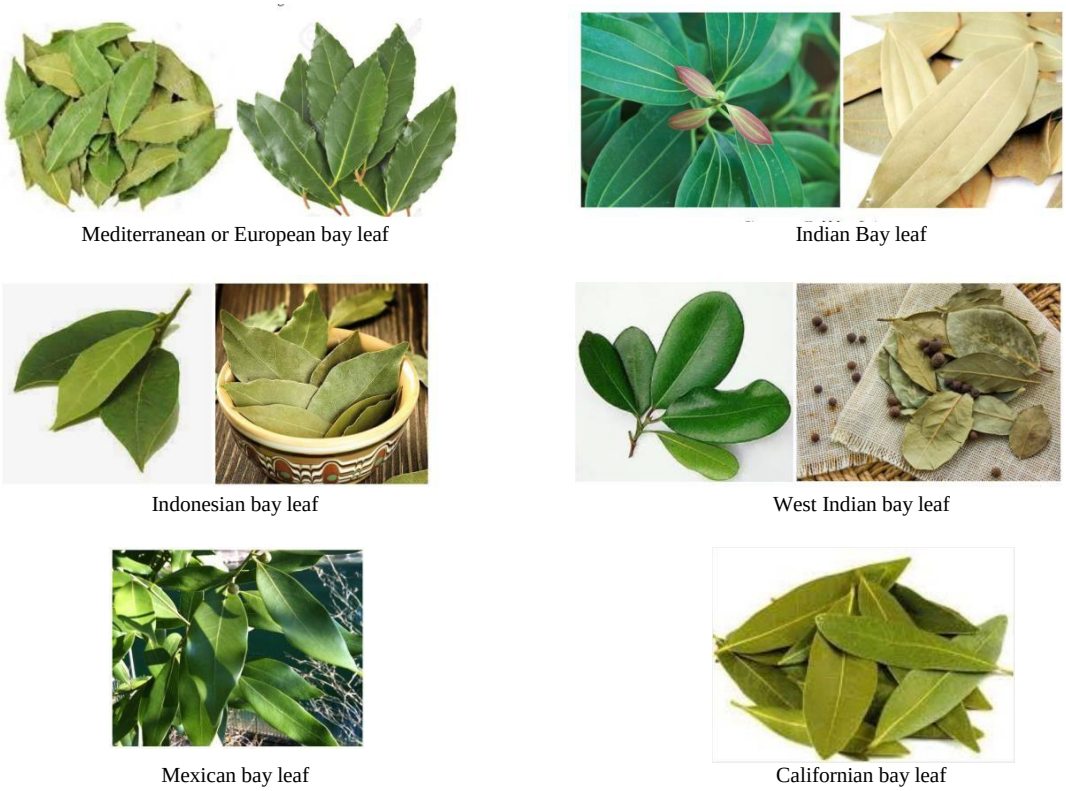
Trade

Spice trade has some of the most lengthy and complex value chains among all commodity groups. Cumin, chili, turmeric, cardamom, black pepper, and ginger are some of the major constituents of Indian spice exports. The essential oils and oleoresins from spices are also a major export component.

The marketing channel of tejpata is similar to most of the spice commodities. The produce is brought to the market either directly by the farmer producer or through village level intermediaries acting as agents of traders located in towns. From small-town traders, the produce is aggregated in major trade centers. The bulk of the tejpata produced in the country is consumed in the domestic market. Active wholesale markets for the commodity exist mainly in Meghalaya and West Bengal.

1.2 Types of bay leaves

The term bay leaves refer to leaves obtained from several plants. Based on the origin of the leaf it has been classified into three different types viz. Indian bay leaf, bay laurel, Indonesian bay leaf, West Indian bay leaf, California bay leaf, and Mexican bay leaf. Indian bay leaf or malabathrum is obtained from Cinnamomum *Tamala*, *Lauraceae*.



Source: https://chefs.ookul.co/

Fig. 1: Different types of bay leaves

Indian bay leaves are longer and wider, usually olive green in color, and have three veins running the length of the leaf. They have a fragrance and taste similar to cinnamon (cassia) bark, but milder. Bay laurel, Mediterranean or European bay leaf is obtained from *Laurus nobilis*, Lauraceae. Bay laurel leaves are shorter than Indian bay leaf and light- to medium-green in color with one large vein down the length of the leaf. The fresh bay laurel leaves are very mild and do not develop their full flavor until several weeks after picking and drying. California bay leaf is taken from California bay tree (*Umbellularia californica*, Lauraceae). Indonesian bay leaf or Indonesian laurel or more popularly, salam leaf is a bay leaf from the *Myrtaceae* family (*Syzygium polyanthum*). It is very uncommon outside Indonesia. West Indian bay leaf is nothing but the leaf of the West Indian bay tree (*Pimenta racemosa*, Myrtaceae) and is used culinarily (especially in Caribbean cuisine) and to produce the cologne called bay rum. Mexican bay leaf is obtained from Litsea glaucescens, Lauraceae. Mexican bay leaves are long and tapering with slightly fluted edges.

1.3 Product specification – Tejpat

Botanical Name	**:**	*Cinnamomum tamala*
Family	**:**	Lauraceae
Commercial part used	**:**	Leaf & bark

Indian Cassia or Indian bay leaf is commonly known as tejpata (*Cinnamomum Tamala*) is a small to moderately sized evergreen tree. The leaves of this tree are aromatic having a clove-like taste and a faint pepper-like odor. The leaves are used as a flavoring or seasoning in cooking and contain approximately 1.5 to 2% of volatile oil. Bay leaves in India are commonly known as tejpata and are quite different from the bay laurel leaf or the European bay leaf known as the Mediterranean bay leaf. Indian bay leaf or tejpata are larger, olive green in color, and have three prominent leaf veins as compared to the single prominent leaf vein present in European leaf

Fig. 2: Indian bay leaf- Tejpata

1.4 Origin and Distribution

Tejpata trees are native to Mediterranean countries and are mainly grown commercially in countries like Algeria, France, Italy, Mexico, Morocco, Portugal, Spain, Turkey & Central America, etc. It is also grown in the North-East mountain region of India, where the climate is suitable for the growth of the trees.

1.5 Cultivation of tejpata and its uses

In India, tejpata trees are mostly cultivated in the states like Kerala, Karnataka, and North Eastern states like the Meghalaya region especially, Gharo, Khasi, Jaintia & Nilgiri hills. It grows naturally or is cultivated at an altitude of 900-2500 m above mean sea level in the states like Sikkim, Assam & Mizoram. Tejpata leaf production is highest in Meghalaya and the productivity ranges from 30- 70 kg per tree per year.

Uses

The leaf is mainly used for flavoring food. It is widely used in pharmaceutical preparations because of its hypoglycemic, stimulant, and carminative properties. It is also used in the Indian system of traditional medicine. The leaves yield essential oil on distillation and are known as tejpata oil. Its medicinal properties include inter alia carminative, anti-flatulent, and diuretic properties. It has been reportedly used for the treatment of cardiac disorders also. Ayurveda describes the use of leaves of tejpata in the treatment of ailments such as anorexia, bladder disorders, dryness of mouth, coryza, diarrhea, and nausea. It has hypoglycemic and hypolipidemic properties as well. It is commonly used in the food industry, because of its special aroma. It also finds application in the flavoring industry where it is used in meat and fast food seasonings, sauces and pickles, baked goods, confectionery, soft drinks, tobacco flavors, and in dental and pharmaceutical preparations.

Indian bay leaves are closely related to cinnamon. The tough, three-veined leaves of tejpata are very popular in Northern India but are little known elsewhere. Owing to its high medicinal value and being an important ingredient of the spices the demand for *C. tamala* is increasing day by day. The leaf extracts are used as a clarifying agent in dyeing procedures. Traditionally green dye has been extracted from its leaves. With an evergreen canopy, tejpata is an important shade provider in its native range. It is used as food, fodder, medicine, and timber in the Uttarakhand Himalayan region. Besides its high economic importance, this species provides excellent habitat for a large number of frugivorous birds and small mammals, which facilitate its regeneration in turn.

CHAPTER-2
PROCESS & MACHINERY REQUIREMENT

2.1. Raw Material production

Tejpata trees can be planted at a spacing of 3 x 2 m in regular plantations. Seeds take 2-3 weeks for germination. Seeds lose their viability very fast and they should be sown fresh after removing the pulp. About 94% of germination is obtained by sowing seeds immediately after their harvest. Delayed sowing reduces germination percentage. Germination is reduced to 52% if seeds are sown two weeks after harvesting and complete loss of viability are observed in seeds sown after 40 days. Seeds are sown closely on prepared beds during the month of June-July. When seedlings are four months old or when they reach a height of 15 cm, they are transplanted into polythene bags of30x15 cm in size. After a further period of 10-12 months, they are sufficiently hardy and can be planted in the main field. Trees take six to nine years to attain the harvestable stage. Harvesting of the leaves is generally done when trees are 8-10 years old. The tree is perennial and repeated harvesting at yearly intervals is possible. The trees can be cultivated with limited management inputs.

Fig. 3: Canopy of fully grown tejpata trees

2.2. Harvesting and processing

The harvesting of tejpata leaf and bark is dependent on the age and growth pattern of the trees. The harvesting of leaves can begin as early as five years maturity depending on the canopy development. Tejpata is generally harvested in dry and mild weather from October to December and in some places, the collection is continued till March. Since rains can affect the aroma and quality of leaves, harvesting during monsoon months is not preferred. The leaves are usually collected once a year from young trees, and in alternate years from older trees. Tejpata leaves are harvested when the leaves are mature and contain maximum flavor and essential oil. Hand

plucking is the general practice followed for harvesting tejpata leaves.

At the time of harvest, the small branches are excised with the leaves and dried in the shade. Along with the harvest, pruning of the trees is also undertaken to avoid the rapid growth of branches. Any dead and diseased branches are also removed at this stage. These dried branches are then bundled for the market. The cultivation cost is modest as limited inputs are used. Leaves are collected (small branches with leaves are also tied into bundles), dried in the sun, and marketed. A single tree of average size yields about 10–20 kg of leaves every year. There is a high degree of correlation between the diameter of the tree at breast height and the yield of the fresh leaves (Lamichhane and Karna, 2010). The same study also reported that the minimum age and size (DBH) of the trees for leaf harvesting be five years and 16.2 cm respectively.

Fig. 4: Dorsal and ventral view of dried tejpata leaf

The cultivation of tejpata forms part of an agroforestry system in northeast India. Tejpata leaves are 10-15 cm long, opposite with three veins running from the base to the apex and lanceolate with short blunt points.

2.3. Processing

The mature fresh leaves after it is handpicked are allowed to dry on a wire mesh screen by spreading it in a thin layer. It is allowed to dry for at least two weeks in a warm area under shade but not in direct sunlight. Sun-drying has some disadvantages like losing of its natural color and

essential oil and may result in inferior quality of leaves with low market value. Hot air mechanical drying at 60°C is considered the best method for producing dry bay leaf.

Slow drying of leaves in a warmer area away from direct sunlight allows to temper the bitterness from fresh leaves as it tends to be slightly bitter when fresh. Freshly dried leaves will have a better deeper flavor and can be stored in an airtight jar or plastic bags away from direct sunlight. Dried bay leaves are very fragrant and hardly disintegrate during the cooking process and they are usually removed before eating. The moisture content of fully dried bay leaf should not be more than 9% as per FSSAI standards. The major defect that can be present in the tejpata leaves are sticks which may be as large as small its small branches.

2.4. Dry recovery

Studies on drying of tejpata leaves carried out at ICAR-IISR, Kozhikode revealed that the dry recovery was 34.71% and other important characteristics of dried leaves like its essential oil and oleoresin are detailed in Table 3.

Table 1: Dry recovery and other parameters of tejpata leaves

Parameter	Value
Dry recovery	34.71%
Moisture content	9.33 %
Essential oil Content	0.53 %
Oleoresin content	5.86 %

2.5. Yield and productivity

The harvesting of tejpata leaf and bark was dependent on the age and growth pattern of the trees. The average fresh weight of leaves obtained per tree for different trunk diameters ranged from 18 to 190 kg (Table 2) depending on the age of the tree.

Table 2: Tree size and leaf production

Tree trunk diameter (cm)	Average fresh weight of leaves (kg)
10-20	18
20-30	40
30-40	82
40-50	128
50-60	190

The older branches with the desired diameter are cut down, leaving the younger branches to mature. The transplanted bay leaf in the main field may take 5 to 8 years to get the first produce.

2.6. Nutritional composition

Table 3: Nutritional composition of *Cinnamomum tamala* per 100 g

Composition	USDA	ASTA
Carbohydrate (g)	74.96	75.40
Water (g)	5.44	4.50
Fat (g)	8.36	8.80
Protein (g)	7.61	7.50
Ash (g)	3.62	3.70
Calcium (g)	0.83	1.00
Potassium (mg)	529	600
Phosphorus (mg)	113	110
Iron (mg)	43	53.3
Sodium (mg)	23	20

Source: Tainter and Grenis (1993)

USDA- United States Department ofAgriculture

ASTA- American Spice Traders Association

Health benefits

- Used in the treatment of diabetes
- Aids digestion
- Relieves pain
- Anti-cancer properties
- Treatment of menstrual problems
- Clean teeth
- Treatment of kidney problems

- Treatment of cold and infection
- Induces sleep
- Treatment of nosebleed
- Cardiovascular benefits

Culinary uses

- It has aromatic leaves which are used for culinary and medicinal purposes.
- The bark is also sometimes used for cooking, although it is regarded as inferior to true cinnamon or cassia.
- Bay leaf is used as a spice to impart flavor to a variety of dishes of various cuisines around the world, both vegetarian and non-vegetarian.
- The leaf is used for flavoring stews, dishes that need a long time to cook, and soups.

Other Uses

- It is one of the constituents of the Indian Garam masala – a mixture of spices.
- Tejpata is also reported to have the property of repelling flies, moths, roaches, mice, etc.
- The flowers of this plant are also used in folk medicine.

Dosage

- A dosage of more than 1 gram per day may induce sweating and diuresis in some people.

2.7. Value Added Products

Important value-added products from *Cinnamom tamala* are spice powder and essential oil.

Tejpata powder

Spices are an important part of Indian cuisine. Food industry consumes spices in various forms viz. whole, powder, and blends. Powdered spices are easy to use and it saves time and physical effort for preparing different food items. Every commercial food service like hotels, restaurants, *etc*. uses powdered spices. Though tejpata is generally used as leaves, powdered form of tejpata is also available as its value-added product. Various operations involved in making tejpata powder are as follows:

Fig. 5: Tejpata leaf powder

i. Cleaning

This is the initial process for spice making in which the tejpata leaves are manually checked and cleaned by removing impurities like stone, dust, and dirt. Discolored leaves and leaves with visible signs of fungal infection or pest damage are discarded.

ii. Drying

The fresh tejpata leaves are generally dried under shade by spreading them on a mat. In case of rains, there is a need for an artificial tray dryer for the drying process. The leaves can be dried using electric driers at 55^0 C for 8 hours, which reduces the moisture content to desirable levels. Properly dried leaves can be stored in polythene-lined gunny bags without significant loss in quality.

Fig. 6: Tray dryer

iii. Grinding/ Pulverizing

A grinding machine is used for pulverizing the dried tejpata leaves into powder form. A small-scale manufacturing unit can process up to 100 kg of tejpata leaves into powder in a day using a simple pulverizing machine. An automatic grinding machine can produce 20 to 25 kg/h of tejpata leaf powder. The optimum particle size of the finished tejpata powder ranges from 60-80 µm.

iv. Sieving

The powdered spices are sieved to ensure that spice powder is having a uniform mesh size. The bigger particles can be reground using the pulverizer to attain the desired particle size.

v. Packaging

Once the spice is converted into powder form, spice powders are weighted as per packing requirements and then sealed. The processed powder is packed in laminated pouches (two or three-layered)and sealed with the help of a sealing machine.

A **b** **c**

Fig. 7: a. Pulverizer; b. Vibrating sieve and c. Packaging machine

Tejpata Essential oil

Essential oils are secondary metabolites found in plants. In the case of spices, these volatile compounds impart the typical aroma associated with the respective spice. The essential oils are trapped as oil glands inside the plant tissues. They are usually extracted through the process of hydro-distillation. The aromatic leaves are packed in a large container called 'still' and a sufficient quantity of water is added to it. The mixture is then brought to a boil. Alternatively, live steam is injected into the still. Due to the influence of hot water/steam, the essential oil is freed from the oil glands in the plant tissue. The vapor mixture of water and oil is condensed by indirect cooling with water. From the condenser, distillate flows into a separator, where the oil separates from the distillate water due to the difference in densities. There are three types of distillation methods for isolating essential oils from any plant materials:

i. Water distillation (hydro-distillation)
ii. Water and steam distillation
iii. Direct steam distillation

i. Water Distillation

In this method, the material is completely immersed in water, which is boiled by applying heat by direct fire, steam jacket, closed steam jacket, closed steam coil, or open steam coil. The main characteristic of this process is that there is direct contact between boiling water and plant material. When the still is heated by direct fire, adequate precautions are necessary to prevent the charge (plant material) from overheating. When a steam jacket or closed steam coil is used, there is less danger of overheating. With open steam coils, this danger is avoided. But with open steam, care must be taken to prevent the accumulation of condensed water within the still. Therefore, the still should be well

insulated. The plant material in the still must be agitated as the water boils, otherwise, agglomerations of dense material will settle at the bottom and become abnormally degraded. Generally, before any large-scale distillation is done, a small-scale water distillation in glassware should be performed to observe whether any changes take place during the distillation process. From this laboratory trial, the yield of oil from a known weight of the plant material can be determined. The laboratory apparatus recommended for trial distillations is called as Clevenger system.

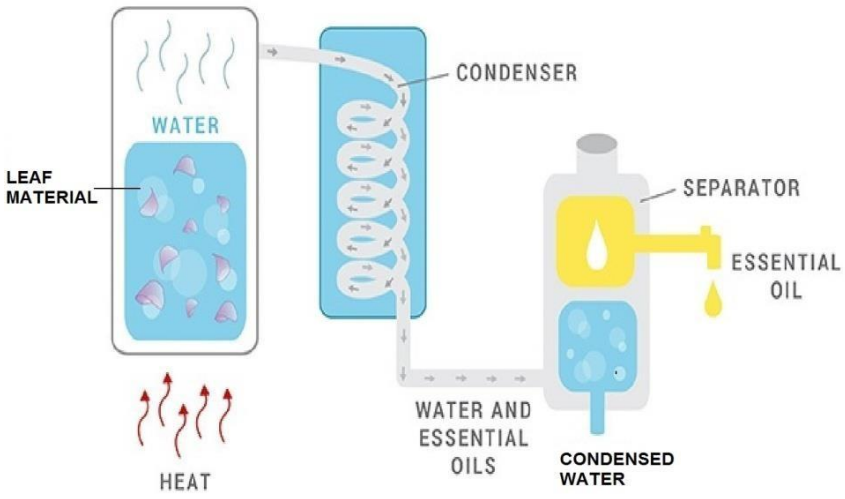


Fig. 8: Water distillation system

Disadvantages of Water Distillation

- Oil components like esters are sensitive to hydrolysis while others like acyclic monoterpene hydrocarbons and aldehydes are susceptible to polymerization (since the pH of water is often reduced during distillation, hydrolytic reactions are facilitated).
- Oxygenated components such as phenols tend to dissolve in the still water, so their complete removal by distillation is not possible.
- As water distillation tends to be a small operation (operated by one or two persons), it takes a long time to accumulate much oil,
- The chances of mixing between good quality oil with poor quality oil are higher in water distillation systems.
- Water distillation is a slower process than either water and steam distillation or direct steam distillation.

ii. Steam distillation

Steam Distillation is the most popular method used to extract and isolate essential oils from plants for use in natural products. This happens when the steam vaporizes the plant material's volatile

compounds, which eventually go through a condensation and collection process. The tejpata leaves are taken in a large container called ‘still’ which is usually made of stainless steel. The still is filled with the plant material (In our case, dried tejpata leaves) and the steam is injected into the still through a steam inlet. This helps to release the plant’s aromatic molecules and convert them into vapor. The vaporized plant compounds travel to the condensation flask or the c*ondenser*. Coldwater is circulated in the condenser and cools the water vapor containing the oil back into liquid form. Because water and oil do not mix, the essential oil floats on top of the water and is siphoned off.

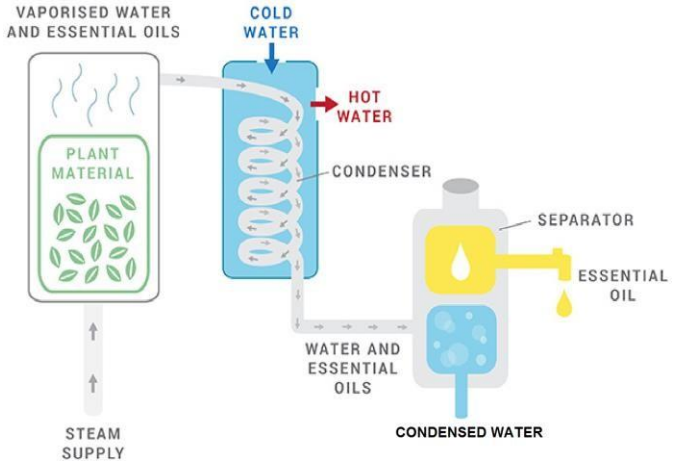


Fig.9: Steam distillation system

iii. Water and steam distillation

In water and steam distillation, the steam can be generated either in a separate boiler or within the still, although separated from the plant material. Like water distillation, water and steam distillation are widely used in rural areas. Moreover, it does not require a great deal more capital expenditure than water distillation. Also, the equipment used is generally similar to that used in water distillation, but the plant material is supported above the boiling water on a perforated grid. It is common that persons performing water distillation eventually adopt water and steam distillation.

2.8 Chemical Composition of essential oil of tejpata

Leaves and bark are mildly aromatic. On distillation, they yield 0.13- 2 % of essential oil. The oil resembles cinnamon leaf oil and contains cinnamaldehyde as its major component (Table 4). The composition of the essential oil is highly variable depending on many factors, the major one being a geographical region of growth. Many chemotypes of *C. tamala* exist.

Cinnamomum tamala leaves from North-East India contain eugenol as an important constituent of essential oil (34–94%). Besideseugenol, trans-Cinnamaldehyde, 5-(2-propenyl)-1,3-benzodioxole is also reported as the major constituent of *C. tamala* leaves essential oil. Based on the morphology of leaves, tejpata grown in the North-Eastern states has been classified into four

types. They were Type I, Type II, Type III, and Type IV. A comparative chemical study of the constituents of essential oil content of four types of *C tamala* is given in Table 5.

Table 4: Constituents of essential oil in different Chemo types of tejpata

Chemotype	**Constituents**
Eugenol type	Eugenol- 66–70%
Cinnamic aldehyde type (E)	Cinnamaldehyde- 79.4%
Linalool type	Linalool- 54.66%
Trans sabinene hydrate-*β*-ocimene type	trans-sabinene hydrate- 28.8%, *β*-ocimene- 17.9%

Table 5: Variation in composition of essential oil of tejpata

Category	**Oil content (%)**	**Eugenol (%)**	**Other components (% composition)**
Type I	1.0	77.5	α-pinene (1.65%), α-phellandrene (10.47%), p-cymene (2.23%) and caryophyllene oxide (1.20%)
Type II	1.3	68.1	α-pinene (2.25%), α-phellandrene (14.50%), p-cymene (4.00%), 1,8-cineole (2.35%), linalool (1.20%), α-terpineol (1.30%) and eugenylacetatete (1.60%)
Type III	0.7	57.9	α-phellandrene(5.45%), p-cymene (2.68%), 1,8-cineole (4.35%), terpinen-4-ol (2.25%), eugenylacetate (8.73%), α-farnesene (7.90%) and caryophyllene oxide (2.90%)
Type IV	1.5	82.5	α-phellandrene (6.38%), p-cymene (1.09%), caryophyllene (1.47%), and eugenyl acetate (4.36%)

CHAPTER- 3
PACKAGING OF TEJPATA LEAF & POWDER

3.1 Packaging requirements

To maintain the quality of the spices during handling, transportation, storage, and distribution, the packaging material to be used is to be selected with care, keeping in mind the functional as well as the marketing requirements. The packaging requirements for spices, in general, are listed below:

- To protect the product from spillage and spoilage.
- To protect atmospheric factors such as light, heat, humidity, and oxygen.
- The packaging material should have a high barrier property to prevent aroma/flavor losses and ingress of external odor.
- The volatile oil present in the spice product tends to react with the inner/ contact layer of the packaging material, at times leading to a greasy and messy package with smudging of the printed matter. The packaging material should therefore be grease and oil resistant and compatible with the product.
- Besides the above functional requirements, the packaging material should have good machinability, printability and it should be easily available and disposable. It is also desirable that the selected packaging materials should have high water vapor and oxygen barrier properties.

3.2 Packaging materials for spices

Bulk Packaging

The traditional method is to use gunny bags or jute bags for packaging whole spices, with capacities ranging from 10to 70kg. The jute bags may be provided with a loose liner bag of polyethylene or maybe without a liner. At times double gunny bags are also used, especially for long-distance transport. The double gunny bag is provided with an inner polyethylene liner. The quality of the jute fabric used concerning the grammage and the weave (ends/picks) varies from one trader to the other. There is no standardization on the type and quality of the fabric used. A variety of jute fabrics such as hessian, lightweight , A-twill, heavy Cee, etc. are used. Recently, some of the spice traders/packers use alternate bulk packaging media such as woven plastic bags which may be laminated or provided with a loose liner bag. The use of multiwall paper sacks with a plastic liner bag is also practiced. The plastic-based alternate packaging materials are used to overcome the contamination problems associated with jute. Moreover, the plastic bags/liners also help in retaining the quality of the spices packed inside for a longer time.

Consumer packages

The options available to the traders/exporters of spices in the selection of a consumer pack for the domestic and export market are quite wide. However, the selection/choice of the packaging material/ system depends upon several factors, which are broadly listed below:

- Shelf-life period i.e. the expected time from packing to final consumption
- The degree of protection required by the product against moisture pick-up, aroma retention, discoloration, *etc*. (this is more critical in the case of powdered spices)
- Climatic conditions during storage, transportation, and distribution
- Type/sector of the market
- Consumer preferences
- Printability and aesthetic appeal

The package types generally used as consumer packs are:

- Glass bottles of various sizes and shapes with labels and provided with metal or plastic caps. The plastic caps have added inbuilt features of tamper evidence, dispensing, grinding, etc.
- Printed tinplate container with/without dispensing systems
- Composite containers with dispensers
- Plastic containers with plugs and caps with dispensing and tamper evidence features
- Printed flexible pouches – pillow pouch, gusseted pouch, stand-up pouch.
- Lined cartons

The printed flexible pouches have recently become very popular due to their easy availability, excellent printability, lightweight, machinability, and cost-effectiveness. Depending upon the functional and marketing requirements, the laminate/film can be tailor-made to serve a specific need. The printed flexible pouches are generally laminates of various compositions. Some of the commonly used laminates are:

- Polyester/metalized polyester/LDPE
- BOPP/LDPE
- BOPP/metalized polyester/LDPE
- Polyester/Al foil/LDPE

Polyester and BOPP-based laminates are generally more popular for spice packaging due to certain advantageous characteristics of each of these two films. The polyester used for lamination is generally 10 or 12µm thick. The film is highly transparent with excellent clarity, gloss and

printability thus enhancing the sales appeal. The film has very low moisture and gas permeability and, therefore, ensures prolonged shelf-life of the contents with aroma, flavor, and taste retention. The very high mechanical strength (tear, puncture, burst, and flex) minimizes damage to the contents during handling and transportation. The film has good machinability as well as printability. The latest printing technologies help in improving sales promotions. The film is free from additives and, therefore, does not impart any odor or taint to the sensitive spice product that is packed. BOPP films may be heat sealable or non-heat sealable. The film has high yields, is stable under climatic changes, and has an excellent moisture barrier. This film is smooth, glossy, crystal clear, and has high mechanical strength and non-contamination properties for food contact applications. The sealant layer of LD – HD or LDPE can be replaced by LLDPE or cast PP. Co-extruded films can also be used. PVDC, EVOH, and EVAL-based flexible materials also need to be studied as they are now in the market and these materials have high barrier properties.

3.3 Labeling

Control of labeling is important to ensure that the correct label is applied to each product. The use of incorrect labels could mislead the consumer and could pose a potential health hazard to segments of the population with allergies. The manufacturers should have procedures in place to ensure that the correct label is applied to the correct product. Typical controls are listed below:

- Product types are effectively separated during changeovers (e.g. appropriate breaks between products, visual inspection to ensure products are not mixed before labeling).
- Different product labels or pre-labeled packaging should be effectively separated, and the number of product label types should be kept to a minimum.
- During storage, care is to be taken to prevent mixing of individual labels or bundles of labels (e.g. labels are stored in separate boxes, no labels are loose and unused labels are returned to the correct boxes).
- Procedures should be in place to ensure the product is supplied or added to the labeling operation corresponds to the labels in use (e.g. online checks to ensure that products are correctly labeled).

3.4. Mandatory labeling requirement

Minimum mandatory labeling of pre-packaged foods must have the following details (FSSAI regulations, 2011).

a. Name

b. Name of the product

c. Net weight

d. Name and address (manufacturer, packer, distributor, importer, exporter, or vendor)

e. Batch number

f. Date manufacturing /packing

g. Best before use date

h. Veg /non-Veg Logo

i. FSSAI registration number

j. Ingredient declaration

k. Nutritional value

CHAPTER-4
FOOD SAFETY REGULATIONS AND STANDARDS OF *TEJPAT*

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards, 2006 which consolidates various acts & orders that have hitherto handled food-related issues in various Departments. The FSSAI is responsible for setting standards for food so that there is one body to deal with and no confusion in the minds of consumers, traders, manufacturers, and investors. The Act aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi-level, multi-departmental control to a single line of command.

4.1 FSSAI standards for tejpata

"Tejpata " means the dried leaves of the tree *Cinnamomum tamala*, Nees, and Eberm of family Lauraceae, which shall have a characteristic aroma and shall be clean and free from musty odor, off-flavor, mold growth, insect infestation, rodent contamination, and other impurities except to the extent as per the requirements given below.

(2) It shall be free from admixture of leaves other than tejpata.

(3) The apex body also gave importance to off-flavor, mold growth, insect infestation, rodent contamination, and admixture of other leaves.

The characteristic requirements for other impurities are specified in these regulations for tejpata as below:

Table 6: Standards for tejpata

Characteristics	Requirements
Moisture content, percent by mass, on a dry basis (Maximum)	10.0
Extraneous matter, percent by mass, on a dry basis (Maximum)	1.0
Shriveled and dis-colored leaves, percent by mass, on a dry basis (Maximum)	10.0
Cut and broken leaves, percent by mass, on a dry basis (Maximum)	20.0
Insect bored and diseased leaves, percent by mass, on a dry basis (Maximum)	10.0
Twigs, leaf stalk, percent by mass, on dry basis (Maximum)	5.0
Volatile oil content, (ml/100g) on a dry basis (Minimum)	0.5
Uric acid, mg/kg, on a dry basis (Maximum)	100.0

4.2 Food Safety

Sanitary and Hygienic Requirements for Food Manufacturer/ Processor/Handler

The place where food is manufactured, processed, or handled shall comply with the following requirements:

1. The premises shall be located in a sanitary place and free from filthy surroundings and shall maintain an overall hygienic environment. All new units shall set up away from environmentally polluted areas.
2. The premises to conduct food business for manufacturing should have adequate space for manufacturing and storage to maintain an overall hygienic environment.
3. The premises shall be clean, adequately lighted and ventilated, and sufficient free space for movement.
4. Floors, ceilings, and walls must be maintained in sound condition. They should be smooth and easy to clean with no flaking paint or plaster.
5. The floor and skirted walls shall be washed as per the requirement with an effective disinfectant the premises shall be kept free from all insects. No spraying shall be done during the conduct of business, but instead, fly swats/ flaps should be used to kill spray flies getting into the premises. Windows, doors, and other openings shall be fitted with a net or screen, as appropriate to make the premise insect-free. The water used in the manufacturing shall be potable and if required chemical and bacteriological examination of the water shall be done at regular intervals at any recognized laboratory.
6. A continuous supply of potable water shall be ensured on the premises. In the case of intermittent water supply, adequate storage arrangements for water used in food or washing shall be made.
7. Equipment and machinery when employed shall be of such design which will permit easy cleaning. Arrangements for cleaning of containers, tables, working parts of machinery, etc. shall be provided.
8. No vessel, container, or other equipment, the use of which is likely to cause metallic contamination injurious to health shall be employed in the preparation, packing, or storage of food. (Copper or brass vessels shall have proper lining).
9. All equipment shall be kept clean, washed, dried, and stacked at the close of business to ensure freedom from the growth of mold/ fungi and infestation.
10. All equipment shall be placed well away from the walls to allow proper inspection.
11. There should be an efficient drainage system and there shall be adequate provisions for disposal of refuse.
12. The workers working in processing and preparation shall use clean aprons, hand gloves, and head wears.

13. Persons suffering from infectious diseases shall not be permitted to work. Any cuts or wounds shall remain covered at all times and the person should not be allowed to come in direct contact with food.
14. All food handlers shall keep their fingernails trimmed, clean, and wash their hands with soap, or detergent, and water before commencing work and every time after using the toilet. Scratching of body parts, hair shall be avoided during food handling processes.
15. All food handlers should avoid wearing, false nails or other items or loose jewelry that might fall into food and also avoid touching their face or hair.
16. Eating, chewing, smoking, spitting and nose blowing shall be prohibited within the premises especially while handling food.
17. All articles that are stored or are intended for sale shall be fit for consumption and have proper cover to avoid contamination.
18. The vehicles used to transport foods must be maintained in good repair and kept clean.
19. Foods while in transport in packaged form or containers shall maintain the required temperature.
20. Insecticides/disinfectants shall be kept and stored separately and `away from food manufacturing / storing/ handling areas.

4.3. Labelling Standards (Regulation 2.5 of FSS)

Labeling requirements for packaged food products as laid down in Part 2.4 of the Prevention of Food Adulteration (PFA) Rules, 1955, and the Standards of Weights and Measures (Packaged Commodities) Rules of 1977, require that the labels contain the following information:

1. Name, trade name, or description
2. Name of ingredients used in the product in descending order of their composition by weight or volume
3. Name and complete address of manufacturer/packer, importer, country of origin of the imported food (if the food article is manufactured outside India, but packed in India)
4. Nutritional Information
5. Information relating to food additives, colors, and flavors
6. Instructions for use
7. Veg or Non-Veg symbol
8. Net weight, number, or volume of contents
9. Distinctive batch, lot, or code number
10. Month and year of manufacture and packaging

11. Month and year by which the product is best consumed
12. Maximum retail price

Provided that — (i) the nutritional information may not be necessary, in case of foods such as raw agricultural commodities, like, wheat, rice, cereals, flour, spice mixes, herbs, condiments, table salt, sugar, jaggery, or non –nutritive products, like, soluble tea, coffee, soluble coffee, coffee-chicory mixture, packaged drinking water, packaged mineral water, alcoholic beverages or flour and vegetables, processed and pre-packaged assorted vegetables, flours, vegetables and products that comprise of a single ingredient, pickles, papad, or foods served for immediate consumption such as served in hospitals, hotels or by food services vendors or halwais, or food shipped in bulk which is not for sale in that form to consumers.

Wherever applicable, the product label also must contain the following

- The purpose of irradiation and license number in case of irradiated food.
- Extraneous addition of coloring material.
- Non-vegetarian food – any food which contains whole or part of any animal including birds, freshwater or marine animals, eggs or product of any animal origin as an ingredient, not including milk or milk products – must have a symbol of a brown color-filled circle inside a brown square outline prominently displayed on the package, contrasting against the background on the display label near the name or brand name of the food.
- Vegetarian food must have a similar symbol of the green color-filled circle inside a square with a green outline prominently displayed.
- All declarations may be: Printed in English or Hindi on a label securely affixed to the package, or Made on an additional wrapper containing the imported package, or Printed on the package itself, or Maybe made on a card or tape affixed firmly to the package and bearing the required information before customs clearance.
- Exporters should review Chapter 2 of the “FSS (Packaging and Labeling) Regulation 2011” and the Compendium of Food Safety and Standards (Packaging and Labeling) Regulation before designing labels for products to be exported to India. FSSAI revised the labeling Regulation and a draft notification to that effect was published on April 11, 2018, inviting comments from WTO member countries and the comments received are under review and the publication date remains unknown.
- According to the FSS Packaging and Labeling Regulation 2011, “prepackaged” or “pre-packed food” including multi-piece packages, should carry mandatory information on the label.

CHAPTER-5
OPPORTUNITIES FOR MICRO/UNORGANIZED ENTERPRISES

5.1. Opportunities in tejpata processing

The spice processing sector has a significant latent potential and tejpata processing is no exception. Innovative sourcing and marketing strategies in tejpata can add value to the final product. Opportunities for establishing a product demand base through developing some of the under-exploited value chains in the commodity need to be explored. Organic certified tejpata is one such avenue. Since most of the cultivation of tejpata is carried out in *de facto* organic modes, the process of conversion and establishing a secure organic supply chain could be easily accomplished through constructive partnerships with farmer collectives in the producing regions. Organic sourcing can also act as a Unique selling proposition in the export markets. Innovative business models which can integrate the primary producer and the consumer through efficient traceability systems can nurture firms involved in the processing of tejpata. Micro enterprises are uniquely positioned in this commodity as they have the flexibility to develop unique business models with a significant stake for the primary producers through effective contract production agreements. Several initiatives are focusing on providing support to the micro/unorganized enterprises which can be availed by prospective entrepreneurs. A short introduction to the PM-FME scheme is given below.

5.2. PM-FME Scheme

Ministry of Food Processing Industries (MoFPI), in partnership with the States, has launched an all India centrally sponsored "PM Formalization of Micro Food Processing Enterprises Scheme (PMFME Scheme) "for providing financial, technical, and business support for up-gradation of existing micro food processing enterprises. The objectives of the scheme are:

I. Support for capital investment for up-gradation and formalization with registration for GST, FSSAI hygiene standards, and Udyog Aadhar;

II. Capacity building through skill training, imparting technical knowledge on food safety, standards & hygiene, and quality improvement;

III. Handholding support for the preparation of DPR, availing bank loan and up-gradation;

IV. Support to Farmer Producer Organizations (FPOs), Self Help Groups (SHGs), producers cooperatives for capital investment, common infrastructure, and support branding and marketing.

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Annexure 1

Major equipment required for tejpata processing

Equipment name	Minimum cost (Rs lakhs)	Remarks
Tray Dryer	4.0	Electric driers of various capacities and make are available
Pulverizer	1.5	The efficiency of the pulverizer should match the desired processing capacity. Normally pulverizers capable of handling 10-30 kg raw material per hour is sufficient for small scale units
Vibratory sieve	2.0	The desired particle size ranges from 60-80 µm.
Packaging machine with doser	4.5	Various commercial models suitable for different packing materials and pack sizes are available

** For more information on customized machinery, you may contact ICAR Indian Institute of Spices Research, Kozhikode. (http://spices.res.in/)*