MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

NIFTEM
KNOWLEDGE • INNOVATION • OUTREACH

BETEL VINE -PROCESSING

AATMANIRBHAR BHARAT

PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)

CONTENTS

INTRODUCTION

- Betelvine - Plant description
- The betelvine (*Piper betel L*.; Family: Piperaceae) is the leaf of a vine which includes pepper and kava. In India, it is known as ‘pan’.
- Betelvine is a perennial, dioecious, evergreen climber that is grown in tropics and subtropics for its leaves that are used as a chewing stimulant.
- It is a spreading vine, rooting readily where trailing stems touch the ground. The betel plant is an evergreen and perennial creeper, with glossy heart-shaped leaves and white catkin.

INTRODUCTION

- The leaves are alternate, entire, 5 to 10 cm long and 3 to 6 cm across. The flowers are small, produced on pendulous spikes 4 to 8 cm long at the leaf nodes, the spikes lengthening up to 7 to 15 cm as the fruit matures.
- Betelvine leaves and stem have pungent aromatic flavour. Betel leaves chewing is considered as source of diatery calcium. Betel oil has several medicinal uses.

BETELVINE MARKET

- Betel vine market in terms of production, consumption, covers Indian States of Bihar,Utter Pradesh ,Madhya Pradesh. Maharashtra. Jharkhand, Orissa. Andhra Pradesh and Gujarat.
- It is widely used in food industry and has aromatic and medicinal use as well.

As per the information collected from the sample growers it was identified that growers were using three important channels through which they used to dispose off their produce. These channels are:

1. *Grower/Producer Local Trader Wholesaler Retailer Consumer*

2. *Grower/Producer Wholesaler Retailer Consumer*

3. *Grower/Producer Retailer Consumer*

VARIETIES OF BETELVINE

SCIENTIFIC CLASSIFICATION

Kingdom: Plantae
Class: Angiospermae
Subclass: Magnoliidae
Order: Piperales
Family: Piperaceae
Genus: *Piper*
Species: ***P. betle***

Botany

- Woody climber with adventitious roots at swollen nodes.
- Leaf simple, alternate, cordate, 8-12 cm wide, 12-16 cm long, with Description odor and spicy taste.
- Inflorescence in axillary spike; flowers unisexual, white.
- Fruit globose berry.

kot Kapuri

Maghai

Karapaku Kapuri

Ghanagate Bangla

HARVESTING AND POST HARVEST MANAGEMENT

As vines reach to a certain height, leaves are harvested from the lower portion of the stem. Harvesting is done during March–April in Uttar Pradesh, Madhya Pradesh and Bihar, during May–June in Andhra Pradesh; during January–February or April–May in Tamil Nadu.

Mature leaves are plucked along with a portion of petiole. They are plucked by hand . After plucking, they are washed thoroughly and made into bundles according to the prevailing custom of the area. On an average, 60–80 lakh leaves are harvested annually from one hectare plantation.

After Harvesting Betel vine preparing for marketing

HARVESTING AND POST HARVEST MANAGEMENT

- Harvested leaves are washed, cleaned and graded according to their size and quality. Then they are packed after cutting a portion of the petiole and rejecting the damaged leaves.

- The picked leaves are sorted into different grades according to size, colour, texture and maturity. After that, they are arranged in numbers for packing. For packing mostly bamboo baskets are used and in many places straw, fresh or dried banana leaves, wet cloth etc. are used for inner lining.

Usually betel leaves are used for chewing as fresh unprocessed. But in certain areas, leaves are subjected to processing known as bleaching or curing. There is a good, demand for such leaves which fetch higher prices in the markets. Bleaching is done by successive heat treatments at 60°–70°C for 6–8hr.

METHODS FOR MINIMIZING POST-HARVEST LOSSES OF BETEL LEAVES

1. Depetiolation :

✓ Depetiolation is removal of the petioles from the leaves. It reduces about 10-25% weight of leaves due to 10-40% reduction in length of leaves. It helps in delaying senescence.

✓ Depetiolated condition was always better than petiolated condition for enhancing storage life.They reported that Chlorophyll degradation was found minimum in petiolated condition either in packing with banana leaves or in treatment with Benzylaminopurine (BA) @ 30 ppm compared to depetiolated condition.

✓Ascorbic acid content was more in sterilized paddy straw packing and in hessian cloth lined with mustard seed and ice pieces compared to other treatments.

METHODS FOR MINIMIZING POST-HARVEST LOSSES OF BETEL LEAVES

✓ Winter season (December-January) was the best for longer storage of betel leaves in any form. Among method of storage, zero energy cool chamber was the best for longest period of storage followed by packing with banana leaves in bamboo basket.

2. Dehydration :

It is an essential method of processing of betel leaf that can avoid spoilage and facilitate preservation. Dehydration means removal of moisture from any substance. Drying is preservation process of any product by reducing the amount of moisture content in the materials. Drying may be of different types (i) solar drying, (ii) shade drying, (iii) mechanical drying and (iv) microwave drying or hot air drying.

Methods for minimizing post-harvest losses of betel leaves

✓ Shade drying of betel leaves in dark rooms is a time consuming process, resulting into a product with inferior quality. Sun drying is widely practiced, but prolonged direct exposure to solar radiation leads to adverse changes in colour, texture and flavor, contamination with sand, soil and foreign matter .

✓ Hence, modern drying (microwave drying) should be promoted for beneficiary outcomes (Balasubramanian *et al*., 2010) because in this method, there was substantial losses of volatile oil which is responsible for improving organoleptic qualities of the leaves.

3. Bleaching and curing :

✓Generally bleaching and curing procedure of leaves is done in a bhatti or closed room. It can be made up of mud, cement, brick or any other locally available suitable material. The curing process for betel leaves was probably first invented at Varanasi, India where the techniques were traditionally used for making *Banarasi paan.*

Methods for minimizing post-harvest losses of betel leaves

✓ The basic principle in curing process of betel leaf is that the green leaves are treated with smoke, high temperature and pressure in a bhatti or closed room with little or no ventilation so as to regulate the temperature inside the room for improving organoleptic qualities and ultimately the green leaves are converted to white or yellowish white colour leaves.

✓ Actually it is alternate heating of 6 hours at 50-60 °C and cooling of 12 hours, two to three times followed by aeration of leaves by turning and stored under dark condition. It took 15-20 days for making complete white or yellowish from green betel leaves. In this process, the shelf life of betel leaves is extended up to one month and the superior quality bleached leaves being very soft and coloured a uniform green yellow .

Methods for minimizing post-harvest losses of betel leaves

✓ This process heightens flavour, which is due to the presence of volatile oils. The chief of these is eugenol, an unsaturated aromatic phenol, usually very pale yellow in colour, which has a strong pungent odour reminiscent of cloves, and a pungent spicy taste. This substance has antiseptic and local anaesthetic properties.

4. Chemical Treatments :

✓ The storage of the betel leaves could be extended by including a mixture of sodium bicarbonate and tartaric acid in the packaging. Before packaging, the packing material could be disinfected with sodium hypochlorite as it reduces the spore load and development of yellow colour. Ventilation was found to be most important as no aeration leads to moist dis- colouration and fermentation and too much aeration leads to dry dis colouration.

Methods for minimizing post-harvest losses of betel leaves

✓ Post-harvest dipping of betelvine leaves for 6 hours in solutions of 25 ppm benzyladenine (BA) and 50 ppm kinetin and packed in vented polythene bags stored under refrigerated conditions prolonged the shelf life of the leaves. Leaves packed in baskets and stored at room temperature could keep up to 40 days.

5. Combined treatment of de-petiolation, de-midribbing and chemicals:

✓ A combined treatment of de-petiolation, de- midribbing and dipping in 25 ppm of BA for 6h resulted in the further increase of shelf life by about 10 days. In these treatments, spoilage due to yellowing was negligible. From a commercial point of view, matured harvested leaves, after de-petiolation, treated with 5 mg/ l of BA for 6 hours and stored in conventional packing was observed to be best suited to prolong the shelf life of betelvine leaves Thus, de-petiolation and de-midribbing increased the shelf life of leave

DIFFERENT PRODUCTS MANUFACTURED FROM BETEL LEAVES.

Products manufactured from betel leaves on industrial scale	
Tooth -pastes	Cold Drink
Skin emollients	Chocolates
Tooth Powder	Appetizers
Pan Masala	Digestive Agents
Deodorants	Tonics and medicines
Mouth freshness	Beauty and Cosmeties
Facial Creams	Beatal leaf essential oil
Anti-septic lotions	Ice-cream

PROCESSING OF BETEL LEAVES (CURED BETEL LEAF)

- The curing process for betel leaves was probably first invented at Varanasi, India where the techniques were traditionally used for making Banarasi paan (cured betel leaf).

- The method of curing the betel leaves are alternate heating of 6 hours at 50-60°C and cooling of 12 hours, two to three time following aeration of leaves by turning and stored under dark condition. It took 15-20 days for making complete white or yellowish from green betel leaves. In this process, the shelf life of betel leaves is extended up to one month and curing imparts softness and sweet taste in betel leaves.

- After completion of the curing process, the leaves are graded, spoiled leaves are discarded, cured leaves are taken out and the uncured green leaves are cured again for 8-24 hrs depending upon the colour of the leaves.

- Changes occurred in sweetness of leaves after curing leads to earn more money (0.50 per leaf in the local market) by the farmers. The processed leaf also imparts a sweet taste, making it a favourite among connoisseurs due to its high quality

PROPERTIES OF LEAVES

Fat	0.12 g
Carbohydrate	1.37g
Protein	0.24g
Energy	7 K cal
Vitamins	B1,B2,B3,B6 and B9
Minerals	Iron ,Calcium, selenium, Manganese, Potassium, Phosphorus, Zinc, Copper

MEDICINAL PROPERTIES

✓ In India, betel is used from time immemorial to cure worms. According to traditional Ayurvedic medicine, chewing areca nut and betel leaf is a remedy for bad breath. They are also said to have aphrodisiac properties.

✓ In Malaysia they are used to treat headaches, arthritis and joint pain.

✓ In the Philippines, they are used specifically as a stimulant and was believed to strengthen the teeth and gums. In Indonesia they are drunk as an infusion and used as an antibiotic.

✓ They are also used in an infusion to cure indigestion, as a topical cure for constipation, as a decongestant and as an aid to lactation. In Indonesia, betel is also used to cure nosebleeds. Many Indonesian women use the leaves in bath water after giving birth to shrink vaginal canal. It also counters unpleasant smells.

ESSENTIAL OIL EXTRACTION

- The essential oil extracted with this apparatus clearly revealed that the Meetha, Bangala and Sanch varieties of betel leaves contained about 2.0%, 1.7% and 0.8% essential oil respectively, on dry weight basis. Essential oil of Bangala variety contained a mixture of about twenty- one different compounds of which eugenol (29.5%) was chief ingredients

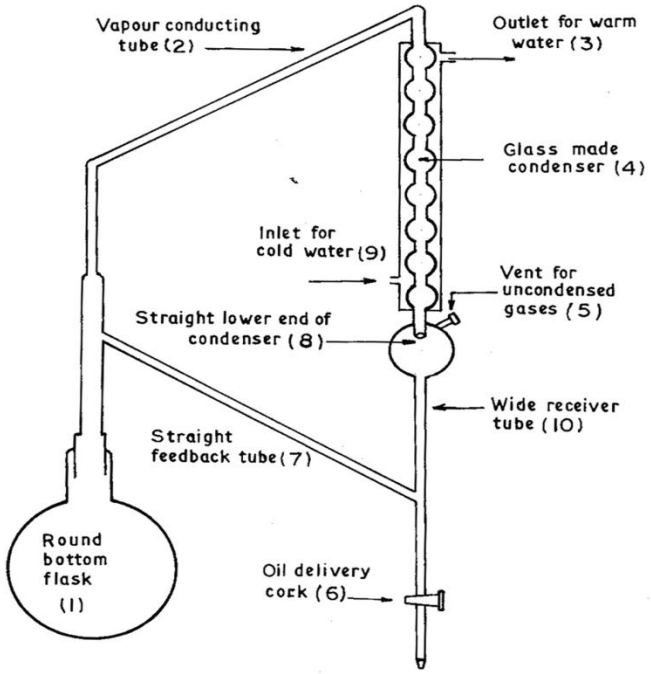
- It is very useful in pharmaceutical industry as a cough medicine, antiseptic, and laxative and as an addictive substance in various types of cuisine, bakery, confectionery, pharmaceuticals, and cosmetics.

- . As a raw material, it can be used for the manufacturing of tooth- pastes, skin emollients, tooth-powders, paan masala, de-odorants, mouth fresheners, facial creams, antiseptic lotions, cold-drinks, chocolates, appetizers, carminative mixtures, digestive agents, tonics, medicines

BETEL VINE ESSENTIAL OIL EXTRACTION Conti…

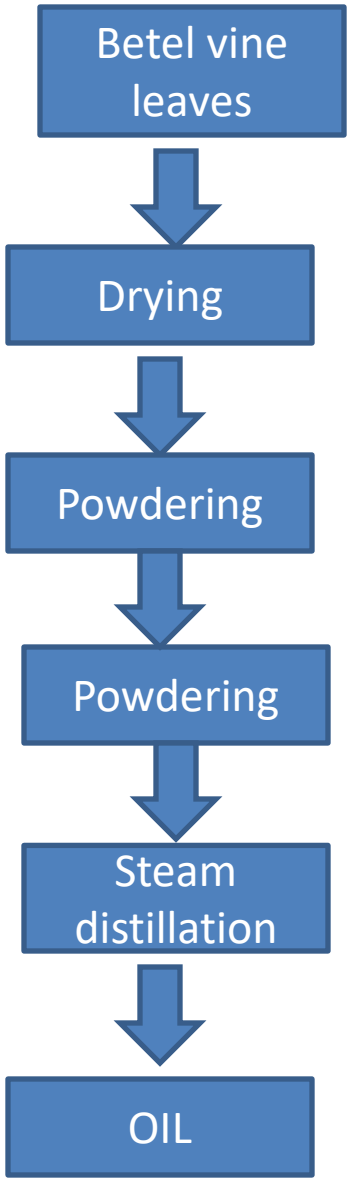
The recovery process of essential oil

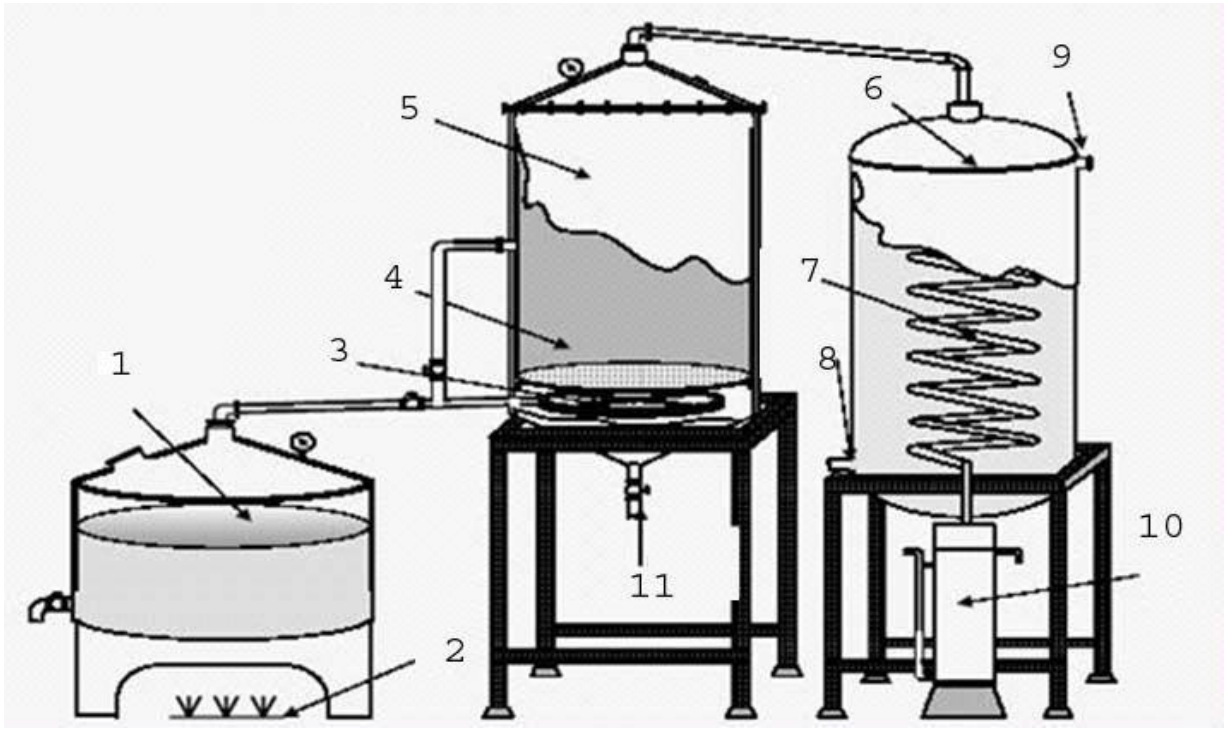
- supercritical extraction
- Pressing, extraction with solvent extraction.
- Extraction with fat.
- and distillation (distillation).



The steam distillation process (direct) is a steam distillation using steam. It flows through a circular pipe which is located below the porous material and the vapor moves upward through the material that is located on the top sieve.

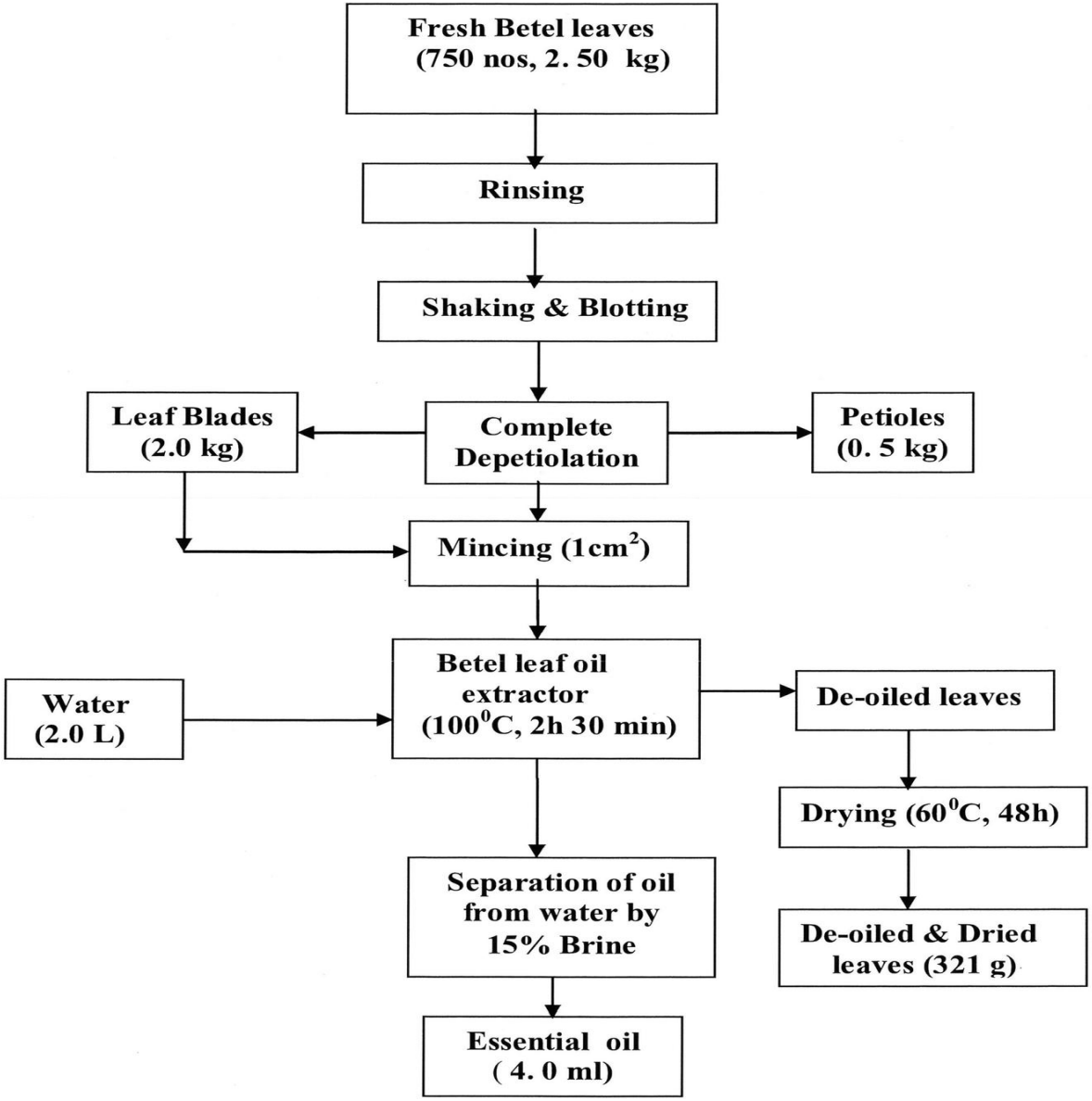
BETELVINE ESSENTIAL OIL EXTRACTION Conti…





1. Boiler, 2. Fire, 3. Steam distributor, 4. Boiler materials with a perforated sieve, 5. Distillation kettle, 6. Condenser, 7. Coil, 8. Water in, 9. Water out, 10. Separator tank.

BETELVINE ESSENTIAL OIL EXTRACTION



BETEL VINE POWDER

- Betelvine powder is used in many food items such as bakery items and Ayurvedic/Unani mediciene
- The Betelvine powder should be devoid of any foreign odour, mouldiness and rancidity.
- There should be no presence of mould, insects in dead or live form, rodent contamination.
- It should also be free of added colours and any harmful substance.
- The fennel powder should have conformity with the following standards

FENNEL OLEORESIN

- The major constituent of Fennel Oleoresin are volatile oil, α-pinene and myrcene
- Fennel oleoresin is known for its antiseptic, expectorant, Carminative, laxative, diuretic, stimulant and stomach qualities.
- It is widely used in food processing industries as spice

Quality requirements

Botanical name	Active component	Volatile Oil Content (VOC in ml/100g of oleoresin) (Not less than)
Foeniculumvulgare Mill.	Anethole	1.3.0

QUALITY ANALYSIS

As per the required standards specified by FSSAI for fennel seeds, the following characteristics should be analysed:

Characteristics	Method of Test
Moisture content	9 of IS 1797
Total ash	7 of IS 1797
Acid insoluble ash	8 of IS 1797
Volatile oil	15 of IS 1797
Salmonella	IS 5887 (Part 3)
Edible seeds other than fennel	Physical separation and weighing
Insect damaged seeds	Physical separation and weighing
Extraneous matter	4 of IS 1797
Defective seeds	Physical separation and

QUALITY ANALYSIS Conti…

Extraneous matter (for seeds)

- 100 to 200g of thoroughly mixed sample is taken and any foreign materials are separated from the fennel seeds.
- Transfer the materials on a tarred watch glass and weigh it.
- The watch glass should also be weighed separately.
- The difference between these two weights gives the amount of extraneous matter.
- It is the divided by total weight to get the proportion of extraneous matter in the sample which when multiplied by 100 gives the percentage.

QUALITY ANALYSIS Conti…

Preparation of sample for chemical analysis

- The sample is ground to make it pass through IS Sieve of size 1mm.
- The sample after grinding is transferred to an already dried container and should be immediately closed.

Total Ash

- The portion obtained after complete combustion of the sample.
- It indicates the amount of essential minerals (acid soluble) and acid insoluble portion (sand and silica).

QUALITY ANALYSIS Conti…

Acid insoluble ash

It represents the amount of sand and silica in the sample that is insoluble in acid.

Moisture content

The water content of the sample is analysed by distilling it by an organic liquid, followed by the collection of the distillate.

Volatile oil

Clevenger-type with joints is used for determining volatile oil

LABEL TO BE AFFIXED IN EACH BOX MEANT FOR EXPORTS OF BETEL LEAVES

Name of Produce	Betel Leaves
Date of harvest	dd/mm/yy
Date of packing	dd/mm/yy
Unique Identification Code	AAAPHL000F123

Label to be affixed in each box meant for exports of Betel Leaves

(To be affixed by the exporter/recognized pack house)

AAA: Three alphabet code name of exporter to be given by APEDA

PHL: Three alphabet pack house location code to be given by APEDA

000: Three numeric pack house approval number code to be given by APEDA

F123: Four Alphanumeric Farmer registration code to be given by exporter

HARVESTING AND POST HARVEST PRACTICES

List of recommended insecticides against different insect pests of betel leaf (without label claim)

Name of the insect pest	Common name of pest	Dosage	Recommended by
Malathion 50 EC	Scale insect	1 ml/lit	TNAU*, Coimbatore
Chlorpyriphos 20 EC	Scale insect Mealy bugs	2 ml/lit	TNAU*, Coimbatore
Dimethoate 30 EC	Mealy bugs	2ml/lit	TNAU*, Coimbatore

- Harvested leaves to be washed cleaned and graded according to their size and quality. Then they are packed after cutting a portion of the petiole and rejecting the damaged leaves.
- For cleaning and washing clean & microbial free water is to be used. Handling workers to sanitize their hands follow proper personnel hygiene.

GUIDELINES ON METHOD OF SAMPLING FOR DETERMINATION OF *SALMONELLA* SPP. FOR EXPORTS OF BETEL LEAVES

Sampling and analysis of Betel Leaves shall be carried out in accordance with Article 4 C implementing Regulation (EC) No 2017/186 dated 2nd February 2017 laying down specific conditions applicable to the introduction into the Union of consignments from third countries due to microbiological contamination and amending Regulation (EC) No. 669/2009.

The sampling shall be carried out either at APEDA recognized pack houses/establishments or at registered farms

Commodity classification	**Nature of primary sample to be taken**	**Minimum size of each laboratory Sample**
Betel Leaves		
(Units generally < 5g	Whole units	400 g (around 10 g from 40 primary sampling locations)

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