Ministry of Food Processing Industries
Government of India

सत्यमेव जयते

NIFTEM
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Processing of Mint & Mint Products

AATMANIRBHAR BHARAT

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

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INTRODUCTION

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Indian Spices:

➢Spices are high value export oriented crops extensively used for flavouring food and beverages, medicines, cosmetics, perfumery etc.

➢Spices constitute a significant and indispensable segment of culinary art and essentially add flavour, colour and taste to the food preparations.

➢India is the largest producer, consumer and exporter of spices in the world. India produces more than 65 spices out of the total 109 spices

➢India produces around 5.8 million tonnes of spices annually (2012-13), of this about 10% of the total produce is exported to over 150 countries.

➢The USA, Europe, Australia, Japan, the Middle East and Oceanic countries are the major importers of Indian spices.

➢Estimated world trade in spices is 1.05 million tonnes valued at 2750 million US $, India has a significant share of 48% in quantity and 43% in value.

MINT

▪Mint is an aromatic perennial herb, popularly known as “Pudina” in India and scientifically known as “Mentha”. Mint is an energizing herb that can add flavour to many dishes. Mint is used in cooking as a flavouring agent and mint oil used for flavouring mouth washes, tooth pastes etc.

▪Mints belong to the genus Mentha, in the family Labiatae (Lamiaceae) which includes other commonly grown essential oil-yielding plants such as basil, sage, rosemary, marjoram, lavender, pennyroyal and thyme.

Local Names for Mint in India:

Pudina Patta (Hindi), Puthina/Pudhinaa (Tamil), Pudina (Telugu), Pudina (Kannada), Pudina (Marathi),Hara Pudina (Punjabi), Fudino / Phodina (Gujarati),Putiyina/Pudhinaa (Malayalam),Pudyanu (Kashmiri).

NUTRIENT COMPOSITION OF MINT

NUTRITION INFORMATION

Amounts per 2 tbsp (3g)

Calorie Information

Amounts Per Selected Serving		%DV
Calories	2.1 (8.8 kJ)	0%
From Carbohydrate	1.6 (6.7 kJ)	
From Fat	0.2 (0.8 kJ)	
From Protein	0.3 (1.3 kJ)	
From Alcohol	~ (0.0 kJ)	

Carbohydrates

Amounts Per Selected Serving		%DV
Total Carbohydrate	0.4 g	0%
Dietary Fiber	0.2 g	1%
Starch	~	
Sugars	~	

More details

Fats & Fatty Acids

Amounts Per Selected Serving		%DV
Total Fat	0.0 g	0%
Saturated Fat	0.0 g	0%
Monounsaturated Fat	0.0 g	
Polyunsaturated Fat	0.0 g	
Total trans fatty acids	~	
Total trans-monoenoic fatty acids	~	
Total trans-polyenoic fatty acids	~	
Total Omega-3 fatty acids	13.0 mg	
Total Omega-6 fatty acids	2.1 mg	

Learn more about these fatty acids and their equivalent names

More details

Protein & Amino Acids

Amounts Per Selected Serving		%DV
Protein	0.1 g	0%

More details

Vitamins

Amounts Per Selected Serving		%DV
Vitamin A	127 IU	3%
Vitamin C	1.0 mg	2%
Vitamin D	~	~
Vitamin E (Alpha Tocopherol)	~	~
Vitamin K	~	~
Thiamin	0.0 mg	0%
Riboflavin	0.0 mg	0%
Niacin	0.1 mg	0%
Vitamin B6	0.0 mg	0%
Folate	3.4 mcg	1%
Vitamin B12	0.0 mcg	0%
Pantothenic Acid	0.0 mg	0%
Choline	~	
Betaine	~	

More details

Minerals

Amounts Per Selected Serving		%DV
Calcium	7.3 mg	1%
Iron	0.2 mg	1%
Magnesium	2.4 mg	1%
Phosphorus	2.2 mg	0%
Potassium	17.1 mg	0%
Sodium	0.9 mg	0%
Zinc	0.0 mg	0%
Copper	0.0 mg	0%
Manganese	0.0 mg	2%
Selenium	~	~
Fluoride	~	

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COMMON VARIETIES

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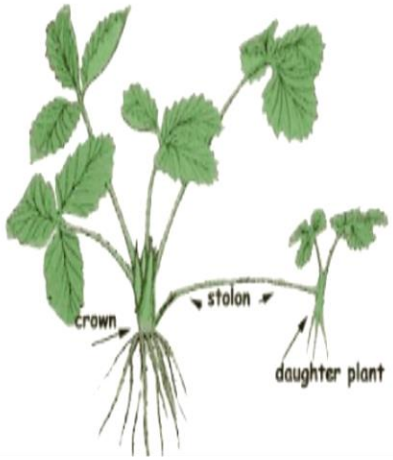
- Ø Japanese Mint/Menthol Mint (*M.arvensis*)
- Ø Peppermint (*M.piperita*)
- Ø Spearmint (*M. spicata*)
- Ø Bergamot mint (*M. citrata*)

Improved Varieties

- MAS 1, Hybrid 77, EC 41911, Kalka, Gomti, Himalaya and Kosi are grown, producing high oil yields.
- Shiwalik is most popular variety amongst farmers, covering nearly total area in our country. It produces compact bushy growth with thick leathery leaves, producing high oil yield. The oil has high menthol content (75-85%).
- The newly bred culture, Kosi, has the greatest yield. The oil has high menthol content than Himalaya and Shiwalik.

BOTANICAL DESCRIPTION

- All species are herbaceous plants, readily sending out runners (rainy season) and Stolons (winter), which develop new roots and shoots at the nodes and form plants.



- The entire aerial shoots together with foliage is a source of essential oil rich in menthol, Carvone, Linalool and Linanyl acetate having use in pharmaceutical preparations and flavour industry.

- ✓ Mint is a perennial ascending herb growing about 60-80 cm. in height and under favourable conditions may attain a height upto 100 cm.
- ✓ It is propagated mainly by its stolons. Leaves are lanceolate-oblong, sharply toothed; petiole is small about 5mm. in length.
- ✓ The leaf lamina varies from 5 to 15 cm. The leaf surfaces mainly lower side is covered with dense hairy growth of glandular trichomes.
- ✓ Flowers are borne in axillary and terminal verticillaster , abundant in number , purplish in colour.
- ✓ The flowers are small with corolla measuring 4-5mm., calyx 2-3mm., narrowly deltoid and acuminate.
- ✓ It does not produce seed and propagation is through vegetative means only.

BOTANICAL DESCRIPTION OF VARIETIES

JAPANESE MINT (*Mentha arvensis*)

- ✓ Highly branched and grow upto 1 meter tall
- ✓ Oil content -0.5 -1%
- ✓ Broad ovate leaves
- ✓ Presence of glandular hairs on leaves, stem and calyx

PEPPER MINT (*Mentha piperita*)

- ✓ Height of 45 -80 cm tall
- ✓ Oil content is 0.3-0.7 %

SPEAR MINT (*Mentha spicata*)

- ✓Perennial herb
- ✓Height of 90 cm tall
- ✓ Oil content 0.6 %
- ✓ High carvone content

BERGAMOT MINT (*Mentha citrata*)

- ✓Branching, perennial herb
- ✓ 60 cm tall
- ✓ oil content 0.4-0.5%
- ✓ oil emits lemon like smell

ECONOMIC IMPORTANCE

•Japanese Mint (*Mentha arvensis var piperascense*) - over-ground herb (foliage) on distillation yields an essential oil, containing high (75 – 80z) menthol content.

•The oil has a bitter cooling taste, harsh odour and is the principal source of menthol. Used in combating cold, an ingredient in cough drops and related pharmaceuticals, dentifrices, cosmetics, mouth washes, scenting of tobacco products and flavouring of beverages, food and flavour industry.

•Indian production of arvensis rose rapidly to close to 50,000 tons. India dominates global production with around 80% of global supply, followed by China and Japan. India exports around 25 to 30,000 tons in a range of forms (menthol crystals and powder, dementholised mint oil, arvensis oil etc.).

•Being a labour-intensive crop mentha provides various employment opportunities in cultivation, distillation, processing field particularly in rural areas.

•The large-scale commercial cultivation of mentha is done in Indo Gangetic plains - Uttar Pradesh, Punjab and Haryana. About 95 per cent of the crop is grown in Uttar Pradesh and in terms of area and production with 1.30 lakh ha acreage and an annual production of 20,000 tonnes of oil.

•Major mentha producing districts are Barabanki, Rampur, Moradabad, Bijnor, Jyotiba Phule Nagar, Pilibhit, Bareilly, Badaun, Shahjahanpur, Sitapur, Hardoi, Unnao, Faizabad, etc.a

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AGRO-CLIMATIC CONDITIONS REQUIRED FOR MINT FARMING

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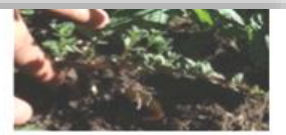
- Mint can be cultivated both in tropical and sub-tropical areas.
- The mean temperature between 20-40^0 C during major part of the growing period and rainfall between 100-110 cm. (light showers at planting stage and ample sunshine at the time of harvesting) is ideal for its cultivation.
- Well drained loam or sandy loam soils rich in organic matter having pH between 6 and 8.2 are ideally suited for its cultivation.
- It can also be cultivated on both red and black soil. In case of acidic soil having pH less than 5.5, liming is recommended.

Propagation



- Mint can be propagated vegetatively through stolons and runners.
- by planting live juicy 8 to 10 cm.
- long stolons (underground stems) during early spring season.
- The seed rate: 400-450 kg. of stolons per ha.

Production of Stolons

- The plot should preferably be the best piece of land. It should be given high level of FYM during land preparation.
- Around 200 sq.m. plot is required to produce stolons for 1 hectare.
- The nursery for the stolons is planted in August.

- Stolons are produced in autumn and are ready for use during the months of January to March. To obtain the stolons , the soil is opened manually or mechanically.
- These stolons can be used immediately or within a fortnight or so.

PLANTING

• In the plains, planting is done during winter months, whereas in temperate climate, planting is done in autumn or spring from last week of December to 1st week of March or from 1st week of January to 3rd week of February.

• Late planting always gives poor yield.

• Mints require thoroughly ploughed, harrowed fine soil. All the stubbles of weeds should be removed before the crop is planted.

• The stolons are cut into small pieces (7-10 cm) and planted in shallow furrows of about 7-10 cm deep at a distance of 45-60 cm from row to row manually or mechanically.

• Stolons are planted half way down on inner side of the ridges

IRRIGATION AND INTERCULTURE

• Water requirement of mints is very high. Depending on soil and climatic conditions the crop is irrigated 6-9 times before the first monsoon.

• The crop requires three irrigations after monsoon.

• Japanese mints require fifteen irrigations require getting maximum yield.

• Weed growth causes about 60 per cent reduction in herb and oil yield. Hence, mints require weeding at regular intervals in the early stages of crop growth.

• Sinbar is effective as a post-emergence weedicide. Spray @ 1 kg per hectare.

• Organic mulch with combination of 0.5 kg oxyfluorfen herbicide per hectare and weeding or Pendimethion herbicide at 1 kg per hectare and weeding has been found to give excellent weed control throughout the crop growth

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CROP ROTATION

- ✓ The rotation of mint crop with other food crops is found to be a good way of controlling weeds. Continuous cropping of any of the mints is not advisable.
- ✓ The best rotation is Mint : Rice and Mint : Potatoes and Mint : Vegetables : Peas etc. depending upon cropping system followed in the region

HARVEST & YIELD

Generally the crop are harvested 100-120 days after planting when the lower leaves start turning yellow. Further, harvesting should be done in bright sunny weather.

- ✓ Harvesting consists of cutting the green herb by means of sickle 2-3 cm above the ground.
- ✓ A second harvest is obtained 80 days after the first harvest and the third after about another 80 days.
- ✓ The first crop is ready by the end of June and the second in September or October.

The average fresh yield from three cuttings is 20 to 25 t/ha
Essential oil yield about 125-250 kg/ha.

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POSTHARVEST MANAGEMENT

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Storage of Herbage

- Mint herbage should be shade dried for about a day before it is distilled.
- Care should be taken so that decomposition of the herbage does not initiate during the drying process.
- There would be some reduction in oil yield if wilted herbage crop is stored for a longer period of 2-3 days.
- As such, storage of herbage for a longer period is not recommended.

Distillation

- The recovery of oil from the herb is 0.5-0.8%. Oil is obtained through steam distillation. The oil is of golden yellow colour, containing not less than 75% menthol. The duration of steam distillation is 2-2.5 hours for complete recovery of the oil. About 80% of the oil is received in the receiver in about one hour's time. The oil that is received later is richer in menthol.

- The fresh or semi dried herbage is placed in a tank and treated with passing steam under pressure. The steam that comes out of the tank is then passed through a condenser. The condenser receiving the steam, carrying the oil extracted from the herbage in the tank is kept constantly cool by circulating cold-water over/around it. The condensed oil and water mixture is collected in a receiver. Since the water and oil have different densities, oil floats on the surface of the water in the receiver. The oil is skimmed off and collected.

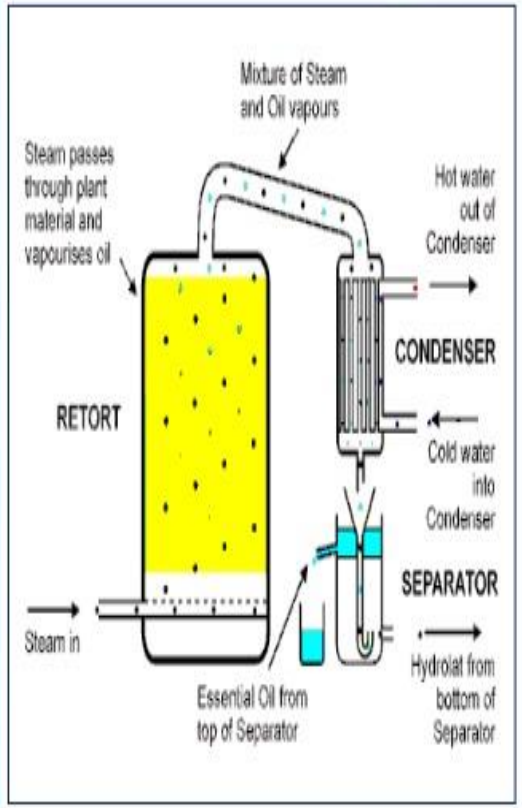
POSTHARVEST MANAGEMENT CONTD.

Extraction of Peppermint oil

Peppermint oil is extracted from the whole plant above ground just before flowering.

The oil is extracted commercially by **steam distillation**

- Fresh or partly dried plant herb
- Yield is 0.1 - 1.0 %.



Purification of Oil

The oil that is skimmed off must be cleaned of traces of water that it may carry. For this purpose, a separator funnel is used. Treating with anhydrous sodium sulphate and decanting removes any remnant moisture in the oil. The whole process is highly critical. Steam rectification process may be applied in case the colour of the oil changes due to rusting.

Storage and Packing of Oil

PVC drums of good quality (20-200l capacity) and galvanized iron (GI) drums or aluminium containers are suitable for short- and long-term storage respectively.

The containers should be kept in cool and dark place.

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PROCESSING OF MINT AND MINT PRODUCTS

PEPPERMINT (*MENTHA PIPERITA L.)*

❖**Peppermint tea**, brewed from the plant leaves, and the essential oil of peppermint are used in traditional medicines.

❖One of the most widely consumed single ingredient **herbal teas, or tisanes**.

❖The phenolic constituents of the leaves include **rosmarinic acid and several flavonoids**, primarily **eriocitrin, luteolin and hesperidin**.

❖The main volatile components of the essential oil are **menthol and menthone**.

BENEFITS OF PEPPERMINT (*MENTHA PIPERITA L.)*

✓In vitro, peppermint has significant **antimicrobial and antiviral activities, strong antioxidant and antitumor actions, and some antiallergenic potential**.

✓Animal model studies demonstrate a relaxation **effect on gastrointestinal (GI) tissue, analgesic and anaesthetic effects in the central and peripheral nervous system, immunomodulation actions and chemo preventive potential**.

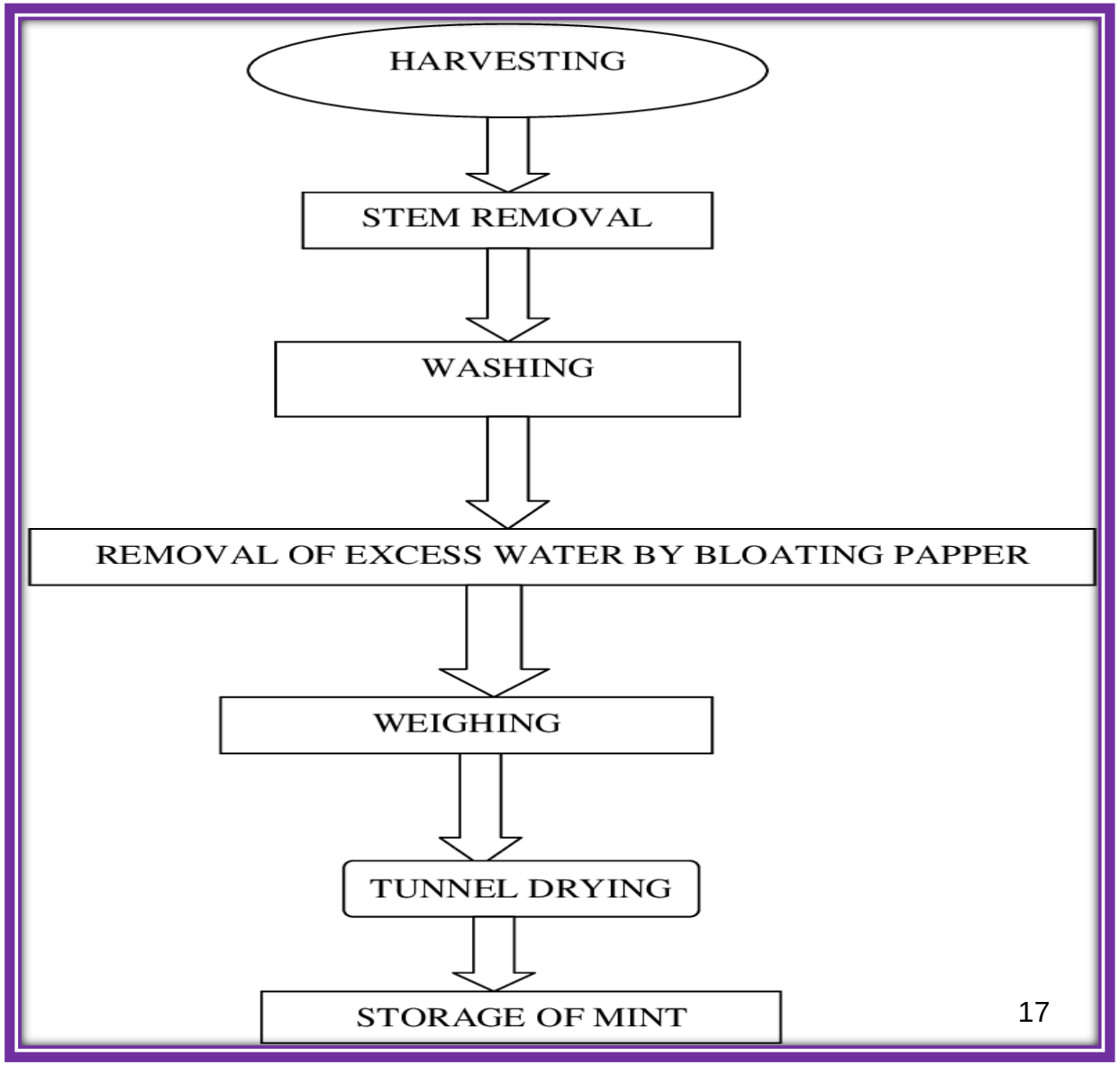
✓Human studies on the **GI, respiratory tract and analgesic effects** of peppermint oil and its constituents have been reported.

✓Several clinical trials - effects of peppermint oil on **irritable bowel syndrome (IBS) symptoms** have been conducted.

✓Adverse reactions to peppermint tea have not been reported, although caution has been urged for peppermint oil therapy in patients with GI reflux, hiatal hernia or kidney stones.

STORAGE OF FRESH MINT

- Wrap the mint leaves gently in a dampened paper towel.
- Place the mint in a plastic bag, not sealing all the way so that air can circulate.
- Do not wrap tightly; trapped moisture will cause the herbs to mould.



DRYING OF MINT

Cut the mint about 1/3 down the main stem, including the side branches.

Dehydrator	• Wash lightly in cold running water. Drain thoroughly on absorbent towels or hang plants upside down until the water evaporates. Strip leaves off the stalks and remove blossoms. Follow directions for your dehydrator.
Natural Air Drying	• Dry in the dark by hanging bunches upside down in paper bags. Choose a well-ventilated, dust-free area (although the bags will help keep out dust and other surprises). Leaves are ready when they are dry and crumbly, in about 1-2 weeks.
Oven Drying	• Use low heat (less than 180 degrees). Spread leaves on a cookie sheet for 2 to 4 hours. Leaves are ready when they are dry and crumbly.

MICROWAVE DRYING

- Place the leaves on a paper towel and microwave for 1 to 2 minutes (check after 1 minute and microwave in additional 10 second increments as needed).
- When completely dry, leaves may be crushed or stored whole in airtight containers (canning jars, for example).
- Check daily for moisture – if any, repeat the drying process.
- Herbs will mold quickly if exposed to moisture.
- Store the mint in a cool, dry place, away from light.

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SHADE DRYING

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Before Drying

After Drying

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FROZEN MINT

Ice Cube Method

Pick through the fresh mint, removing damaged leaves and tough stems and rinse. Gently spin dry or pat dry between two kitchen or paper towels.

Chop the mint leaves (remove stems) and place 1-2 teaspoons into each compartment of an ice cube tray, filling about halfway.

Top off with water and freeze. Once the cubes have frozen, remove and store in an airtight freezer bag or container in your freezer, up to 3 months. Don't forget to label and date.

Baking Sheet Method

- Follow step one from Ice Cube Method
- Place leaves on a baking sheet and freeze 2-3 hours
- Place mint into freezer bags, label, date and store in freezer up to 3 months

Vacuum Sealer Method

- Follow step one from Ice Cube Method
- Make a bag from the roll material large enough to hole the sprigs of mint and allow space between the herb and final seal. Seal one end.
- Label bag with contents and date
- Place herb sprigs in bag
- Place bag end into the sealer and vacuum seal, following manufacturer's directions

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MINT PRODUCTS AND ITS USES

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- The oil is used to flavor a variety of foods such as gum or candy and is also used in **perfumes, cosmetics and health care products.**
- The leaves are also harvested and either dried or used fresh - for teas, flavoring and/or decorating food.
- In cosmetics and personal care products, these ingredients are used in the formulation of dentrifices, mouthwashes and breathe fresheners, skin care products, bath products, and makeup- impart a distinct odor or flavor to products.
- In cosmetic and personal care products, function as skin conditioning agents. Eg: Mint flavoured tea powder, mint oil, cosmetic mint creams soap, conditioners, sanitizers etc.

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MINT PRODUCTS AND ITS USES

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❑Mint **essential oil and menthol** are extensively used as flavourings in breath fresheners, drinks, antiseptic mouth rinses, toothpaste, chewing gum, desserts, and candies, such as mint (candy) and mint chocolate.

❑Approximately 45% of the mint oil produced in the USA is used for flavouring chewing gum with another 45% used to flavour dentifrices (tooth paste, mouth wash, etc). The remaining 10% is used for flavour in the **confectionery, pharmaceutical, liqueur, and aroma therapy industries**.

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MENTHOL CRYSTALS

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Menthol is a monocyclic, saturated secondary terpence alcohol. In nature it occurs as l - menthol, but the former has commercial application. When placed on the tongue the material imparts a biting sensation and slightly bitter taste followed by a pleasant feeling of cold. It finds application in various pharmaceutical formulations and in condiment industry.

Menthol crystals which are mainly used by tobacco, pan masala, and pharmaceutical industries - prepared by the two methods.

Convectional Method

This method practice into the deep freezer which is at -45°C about 48 hours - the freezed oil is transferred into basket centrifuge in which the menthol crystals are separated in the form of flakes also known as DMO (dementholised oil).

Improved Method:

Basically used for the separation of undesirable products like monoterpenes & menthone. The oil which is remaining is further rectified and known as terpeneless oil

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MENTHOL CRYSTALS - PRODUCTION

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Menthol is generally obtained by chilling mint oil and subsequent centrifuging to separate out the menthol crystals. The process may be divided into **two steps**, firstly menthol flakes are produced by chilling mint oil and secondly menthol flakes mixed with mint oil again chilled to produce bold crystals of menthol. The total recovery of menthol in the first step is around 70%. The time cycle for first step is around 6-7 days. In the second step, menthol flakes mixed with certain proportion of mint oil kept under temperature control for about 25 days. The mother liquor (conc. mint oil) is a bye product and can be used again till decolourisation of oil occurs. **Total recovery of bold menthol crystals is about 50%.**

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PEPPERMINT OIL EXTRACTION METHOD

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mint stem and leaf are crushed into powder

obtained mint powder is added into HCl

pH value of an obtained solution is adjusted to 1 - 3

immersion is carried out for 4 to 6h

solution delivered distillation tower made of stainless steel or glass fiber

reinforced plastic for steam distillation;

organic phase collected - subjected to dewatering and pressure reduction separation to obtain oil

an effluent is collected, subjected to extraction with benzene for 2 times so that peppermint oil enters into an organic phase

the extraction agent is recycled.

TABLETED OR COMPRESSED MINTS

Tableted candies and mints are an offshoot of the pharmaceutical industry that makes pills.

The ingredients for tableted mints are in powder form - granulated in a mixing and bonding method - flow through a tablet press. The process involves

- pulverizing (pounding) them to a fine consistency,
- mixing (most often in a dry process, although wet mixing can be used),
- compacting the ingredients,
- sizing the finished grains (sorting out the coarse particles),
- mixing the ingredients, and
- flowing them into the tableting machine.

Moisture content is controlled throughout the process (whether it is wet or dry), and the granules are dried on **bed dryers (flat systems) or rotary dryers**.

Mixing—one of the last steps—is the process in which flavours and active ingredients like breath fresheners are added for the most uniform distribution.

Lubricants are mixed last so they coat all the other ingredients well.

MACHINERIES FOR SPICE PROCESSING

Drying
Dehydration is the most common method used to lower moisture content and hence the water activity to a safe limit which prolongs shelf life of spice. Hot Air tray dryers are also used for drying. Tray type dryer is most suitable.

Hot Air tray dryers

Capacity: 300kg/hour
Material: MS
Motor: 2 of 1 Hp/3ph
Operating Temperature: 50°C to 250° C
Price: 60,000/-

Grinding/ Pulverising: Spices are grinded in dry form in the pulveriser.

Pulveriser with Motor and Accessories
Motor : 3 HP
Width : 4 inch
Seives : 4 Nos
Beaters : 4 Nos
Material : C I & MS
Price: 46,200/-

MACHINERIES FOR SPICE PROCESSING

Mixing: After all the above operations, various spices for different purposes are mixed together. Disintegrator machine is used for mixing.

Disintegrator with Motor
Capacity: 100kg/hour
Material: MS
Power: 7.5 Hp Motor
Price: 63,000/-

Sieving: Sieving is done to remove unwanted material or for characterizing the particle size distribution of Spice. Sieving Machine can be used for this purpose.

Sieving Machine
Voltage: 440 V
Material: SS
Motor: Single Phase
Price: 36,000/-

MACHINERIES FOR SPICE PROCESSING

Packaging: At the end, spices powder are packaged in automatic form fill and sealing machine.

Automatic Form Fill Seal Machine
Maximum Output: 1000-2000 /hour
Pouch Capacity: 200-400 grams
Motor : 3Hp
Price: 1.50 Lakh

Supercritical fluid extraction (SFE)

It was performed by I. Gainar *et al.* and was compared with that of peppermint oil isolated by hydro distillation and found SFE is better.

PM FORMALISATION OF MICRO FOOD PROCESSING ENTERPRISES SCHEME (PMFME)

TOTAL OUTLAY: RS.10,000 CRORE

- **2,00,000** FPOs/SHGs/Cooperatives and working micro enterprises to be directly benefitted
- Expected to generate **9 lakh** skilled and semi-skilled jobs
- To be implemented over a **5-yr period from 2020-21 to 2024-25**
- Cluster approach
- Focus on Perishables.

Helpline Number
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