

Programme- B.Sc (Agriculture)
Course - Production Technology of Spices, Medicinal and Aromatic Plants.
Course Code- BSCAG-313
Semester - Vth
Year- 2020-21
Unit- 2
Topic- Cultivation of Mentha crop
Sub-Topic- Introduction, Medicinal uses, Distribution, Climate, Cultivars, Seasons ,Preparation of Field, Propagation and Planting, Seed Rate, Manure and Fertilizer, Irrigation Application, Weed Control and Inter-culture Operation, Insect Control, Disease Control, Crop Rotation, Harvesting, Distillation of Oil, Yield,and Storage of Oil.
Faculty- Mr. Santosh Kumar
E-mail- sk721987@gmail.com

Cultivation of Mentha:

Botanical name : *Mentha arvensis* Var. *Piperascens* Holmes
English name : Mint, Indian name: Pudina (Tamil), Putiha (Sanskrit), Pudina (Hindi & Kanada),
Family : Lamiaceae (Labiatae)

Introduction:

Mentha is a genus of aromatic perennial herbs belonging to the family Lamiaceae, of over 200 genera distributed mostly in temperate and sub-temperate regions of the world. The number of taxonomically valid species in the genus remains a matter of speculation as members freely cross amongst themselves, producing many intermediary forms. Most of the commercially important mints are hybrids. *Mentha piperita*, the peppermint, is a sterile first generation hybrid between *M. spicata* and *M. aquatica*. The various species of mints which are commercially cultivated in different parts of the world are, Japanese mint or corn mint or field mint (*Mentha arvensis* subspecies *haplocalyx* Briquet var. *Piperscens* Holmes var. *Javanica*), peppermint spearmint or garden mint or lamb mint and bergamot mint or orange mint. Japanese mint is a primary source of menthol. The fresh leaves contain 0.4-6.0% oil. The main constituents of the oil are menthol (65-75%), **menthone** (7-10%) and **menthyl acetate** (12-15%) and **terpenes** (pipene, limonene and camphene). The fresh herb contains essential oils ranging from 0.4 to 0.6%. The constituents of peppermint oil are almost similar to Japanese mint oil. However, the menthol content is lower in peppermint oil and varies between 35-50%. The other constituents are **menthyl acetate** (14-15%), **menthone** (925%) **menthoufuran** and **terpenes** like **pinene** and **limonene**. **Linalool** and **linalyl acetate** are the main constituents of Bergamot mint Mentha is an important essential oil bearing plant rich in Menthol and being widely used in pharmaceutical industries. Mentha has been known from the immemorial time as kitchen herbs and also as the medicinal herb of the ancient human civilization. Mentha is a primary source of menthol and several **Terpinoids** such as **phellandrene**, **limonene**, **L-pinene** and **cinelole**. The oil is used mostly as a flavouring in toothpastes and as food flavoring in pickles and spices, chewing gum and confectionery, soaps and sauces. The oil is used directly in perfumes. Cosmetic preparations like scents, soaps, after-shave lotions and colognes also contain this oil. The principal constituent of spearmint oil is **carvone** (57.71%) and the other minor constituents are

phellandrene, limonene, L-pinene and cineole. The oil is used mostly as a flavoring in toothpastes and as food flavoring in pickles and spices, chewing gum and confectionery, soaps and sauces.

Medicinal uses:

- Infusion of its leaves is used in rheumatic pains.
- Infusion of its leaves is also used in indigestion.
- Menthol has cooling and gastro-stimulant properties.
- Used for food flavor.
- Used in pharmaceuticals.
- Used in cosmetics.
- Used in beverages and related industries.

Distribution:

Mint is believed to have originated in the Mediterranean basin and, from there, spread to the rest of the world by both natural and artificial means. Among the mints, Japanese mint is cultivated on a large scale in Brazil, Paraguay, China, Argentina, Japan, Thailand, Angola and India. Peppermint is grown in the USA, Morocco, Argentina, Australia, France, USSR, Bulgaria, Czechoslovakia, Hungary, Italy, and Switzerland and on a small scale in many Europe countries. USA is the major producer of peppermint and spearmint. The total area under mint cultivation, which is mostly confined to Uttar Pradesh and the Punjab, is around 10,000 ha.

Climate:

Japanese mint can be grown in all tropical and subtropical areas under irrigation. However, it does not tolerate damp winters which cause root-rot. A temperature of 20-25°C promotes vegetative growth, but the essential oil and menthol are reported to increase at a higher temperature of 30°C under Indian conditions. Peppermint and spearmint cannot be grown profitably in tropical and sun tropical areas, especially those areas with very high summer temperatures (40°C) and the ideal yield is obtained only in humid and temperate conditions like in Kashmir and the hills of Uttar Pradesh and Himachal Pradesh. Open, sunny situations without excessive rains during the growing period are congenial for the good growth and development of the oil. Bergamot mint can be grown both in temperate as well as subtropical area. However, the yield is higher in temperate climates.

Cultivars:

A number of improved cultivars-

(A) **Japanese mint Himalaya (MAS-1)**: It is a selection released by the CIMAP Lucknow which contains 0.8 to 1.0% oil with 81% menthol content and a low congealing point.

Shiwalik: It was introduced from China and released by the CIMAP, Lucknow.

Ec-41911: This is a progeny selection of an interspecific cross between *M. arvensis* and *M. piperita*.

Gomti, and **Kosi** are grown, producing high oil yield. However, shiwalik is most popular cultivar 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%-80%). The newly bred, cultivar Kosi yield more oil and menthol content than Himalaya and Shiwalik.

Kalka (Hybrid 77): Evolved by the CIMAP and has been released for commercial cultivation. It can produce up to 350 kg of essential oil per ha/year and oil content about 81.5% menthol.

RRL 118/3: Evolved by the Regional Research Laboratory Jammu and has been released for commercial cultivation, which produces higher herbage and oil yield coupled with higher content of menthol (80-90%).

(B) **Peppermint Kukrail:** This is a high yielding variety developed and released by the CIMAP.

(C) **Spearmint MSS-1:** This is a selection from the spearmint cultivars introduced from USA. This variety was released by the CIMAP.

MESS-5: It is a selection from MSS-1 this variety was released by the CIMAP.

Punjab spearmint-1: This variety is a clonal selection and Arka, Neera are the recently released varieties from CIMAP.

Seasons:

In the plains, planting is done during the winter months, whereas in temperate climates, planting is done in autumn or spring from the last week of December to the first week of March or from the first week of January to the third week of February. Late planting always gives poor yields.

Preparation of Field:

Medium to fertile deep soil, rich in humus is ideal for the cultivation of mint. The soil should have a good water-holding capacity but water-logging should be avoided. A pH range of 6.5-8.5 is best. Mints require thoroughly ploughed, harrowed, fine soil. All the stubble of weeds should be removed before the crop is planted. At the final ploughing, **Endrin dust** (5%) must be applied @ 50 kg/ha. to safeguard crop against any soil borne pests. Mints are planted on flat land or ridges. Hence, flat beds of convenient sizes or ridges are made according to the spacing recommended.

Propagation and Planting:

Mints are propagated through the creeping stolons or suckers. In the case of peppermint and bergamot mint, even runners are planted. The best time for obtaining stolons is during the months of December and January. The creeping stolons or suckers are planted in shallow furrows about 8-10 cm deep with a row-to-row distance of 45-60 cm. While planting on ridges, the stolons are planted half-way down on the inner sides of the ridges. The plot is irrigated immediately after planting. In low temperature areas, the plants become dormant in **November**. In order to give a perennial crop (of 3 years only) in peppermint, re-cultivation is done either in autumn (**November-December**) or in spring (**March-April**). When peppermint is grown as a perennial crop, the first year crop is called 'Row mint', while the second and third year crop is called 'Meadow mint'. This practice is not followed in other mints which are to be planted every year.

Seed Rate:

About 400 kg creeping stolons or suckers are required for planting one hectare of land. A hectare of well-established mint, on an average, provides enough planting material for ten hectares creeping stolons or suckers. The stolons are obtained from the previous year's planting.

Manure and Fertilizer Application:

Manuring may be done at the time of land preparation by adding FYM @ 25 to 30 tonne/ha. Green manuring may also be done before the mint is planted. Sun-hemp is an ideal green manure crop. Mint crop requires high amount of nitrogenous fertilizers because they increase the herbage yield. Generally nitrogenous fertilizers @ 80-120 kg, P 50 kg/ha P₂O₅ and K 40 kg/ha K₂O/ha is required for a good crop yield. However, in *M. arvensis* an increase of up to 160 kg N/ha in *M. piperate*, 125 kg N/ha has given increased fresh herbage and essential oil-yield. An amount of 100-120 kg N/ha is

recommended for producing the optimum herb and oil-yield in *M. citrata* under irrigated conditions. Nitrogen may be applied in three split doses at 1, 2 and 3 months after planting and the third dose after the first harvest of the crop. Visual symptoms have been documented for some cultivars of Japanese mint towards S and Zn deficiencies. With respect to Sulphur and Zn in the crop response was maximum at 20 kg/ha applied at planting time. Sulphur also plays an important role in synthesis of certain vitamins and proteins in the formation of flavoured compounds. Sulphur requirement have been worked out by the several workers on Agricultural crops. Among the different sources of Sulphur, calcium sulphate was best followed by ammonium sulphate and elemental sulphur. Boron deficiency reduces both the yield of green herb and the essential oil in peppermint. Increased yields of herb, menthol content and essential oil content in peppermint have been obtained by using a combination of boron and zinc fertilizers.

Irrigation:

The water requirement of mint crop is very high and also depending upon the soil and climatic conditions, the crop is irrigated 6-9 times before the first monsoon. The crop requires three irrigations after the monsoons during **September, October** and **November**. Sometimes irrigation is required during winter, if the plant is dormant and there are no winter rains to encourage proper growth of the underground stems. When mints are grown in temperate climates, only 2-3 irrigation during the period from **July** to **October** are required. Experiments conducted at Pantnagar have revealed that 15 irrigation are required to get the maximum herb and oil-yield in Japanese mint.

Weed Control and Inter-culture Operation:

The mints crops require weeding and hoeing at regular intervals in the early stages of crop growth. Weeding is one of the important intercultural operations since yield of oil depends largely on the extent of its freeness from weeds. Usually 3 weeding are given before harvest. The expenditure can be reduced by using wheel hoe or bullock driven hoes in between the rows in the first crop but high soil moisture makes it unworkable during rainy season.

Pre-emergent application of **Terbacil** or **Diuron** @ 2 kg in 100 liters of water or 2.5 kg of **Delapone** or **Gramoxone** could be give in between rows evenly to control weeds. However, these are contact herbicides and farmers need much more attention in choosing efficiency spray machine and its fine nozzle.

Insect Control:

Cabbage semilooper (*Thysanoplusia orichlcea*) : This pest is active throughout the year. Eggs are laid singly on lower surface of leaves. Larvae feed voraciously on leaves and cause about 60% defoliation.

Spraying of **Methyl Parathion** @ 0.05% controls the pest.

Leaf webber (*Syngamia abruptalis*). Eggs are laid on tender foliage. Larval web the leaves together and feed on them. They pupate inside the leaf fold. Damaged leaves become skeletonized and dry. Infestation is serving from **August-October**.

The following measures may be adopted for controlling the pest:

- Clip and destroyed affected portions.
- Spraying of **Monocrotophos** 0.05% gives effective control.

Gram caterpillar (*Helicoverpa armigera*). Eggs are laid singly on tender foliage. Larvae feed on leaves and cause defoliation.

Spray **Endosulfan** 0.07% gives effective control.

Aphid (*Aphis affinis*). Colonies of nymphs and adults are found on tender shoots and lower surface of leaves and suck the sap. Attacked leaves fade, curl up and fall. Tender shoots dry-black shoots mould is seen on infested parts due to secretion of honey dew. The pest is active during

March-April.

Spraying of **Monocrotophos** @ 0.05% provides good control.

Disease Control:

Powdery mildew: It is caused by *Erysiphe cicgoracearum*. The disease appears as small chlorotic spots on the ventral surface of the leaves. Brownish discolouration is on the corresponding dorsal surface. Later on, a powdery mass appears leading to formation of powdery patches on upper leaves which turn to purplish blacks and numerous perithecia are produced. Banded symptoms appear on stem and branches.

Spray **Karkathene** @ 0.05% at 15 days interval.

Leaf spot: It is caused by *Curvularia lunata*. Initially, minute, dirty brown spots scattered all over the leaves appear. As the disease advances, these develop in size and turn into big spherical or finally wither away.

The following measures may be adopted for controlling the disease:

- Use disease free stock.
- Treat planting material with hot water.
- Spray **Mancozeb** 0.2% at the initial stage.

Wilt: It is caused by *Verticillium albo-atrum*. Many symptoms are dwarfing, unilateral development of the branches besides causing etiolation of the leaves. This results in wilting and ultimately death of the plant. The disease spreads through infested stolons when used as seed material.

The following measures may be adopted for controlling the disease:

- Deep summer ploughing and well-drained field conditions help minimize its incidence.
- Always use disease free stolons for fresh planting.

Crop Rotation:

Crop rotations help to maintain a reasonable control on weed growth, preserve the fertility of the soil and to obtain higher returns from the land. The important crop rotations followed in Uttar Pradesh are: Mint-maize-potato, mint-early paddy and potato and mint-late paddy and sweet pea. Whereas, in Punjab mint-maize and rape seed/mustard and mint-maize and potato or mint and paddy rotation. The recommendation for the Teri region of Uttar Pradesh is a 2-year rotation of mint-summer fallowing or millet (fodder) followed by mint on poor fertility lands and mint-wheat-paddy and mint on medium fertile lands.

Harvesting:

The mint should be harvested when the field is dry and weather is bright and sunny. First harvesting commences about 120 days from planting. This coincides with the stage when the plants will be nearly in the full bloom stage. Care should be taken that crop is harvested in sunshine at a height of 4-8 cm from the ground level. Rainy days during harvesting period result in reduced oil yield and its quality. Therefore, it is better to avoid maturity time, to coincide with the monsoon period. Planting of suckers is hence recommended by the end of **February** under North Indian Plains so that the first cutting is over by middle of **June**, second cutting is taken from the beginning of **September** (before the monsoon season) and third cutting is also possible by **November**. The crop then enters dormancy during winter months.

Distillation of Oil:

Stem distillation is good for extraction of mentha oil. To obtain the distillation oil of mint, the fresh or semi-dried herbage is packed in distillation still uniformly. The herbage should be allowed to wither for 12-24 hours before distillation. The steam that comes out of the tank is then passed through a condenser receiving the steam, carrying the oil extracted from the herbage in the tank is kept constantly cool by circulating cold water. The condensed oil and water mixture is collected in a receiver. Since the water and oil have different densities, oil floats off and is collected. 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. Any remnant moisture in the oil is removed by treating anhydrous sodium sulphate and decanting. The whole process is highly critical in the realization of the potential yield of the crop.

Yield:

Different cultivar herbage yield, oil yield and menthol percent content are given in table-

S. No.	Cultivar	Herbage yield (Q. /ha.)	Oil yield kg/ha.	Menthol % content
1.	Himalaya	275-300	200-225	73-75
2.	Kosi	300-325	225-250	75-80
3.	Shasham	300-325	225-250	75-80
4.	Kushal	305-330	175-200	77-82

On an average, 25-30 kg oil can be obtained in the first year and 20-25 kg in the second year. Higher yields are obtained from a well-managed plantation. The oil is dried of adhering moisture and stored in aluminium or mild steel containers, filled up to the brim and stored in a dry cool godown.

Storage of Oil:

Mint oil is a light and golden-coloured, motile liquid and it should be completely free from moisture before storage. It is stored in large steel, galvanized steel or aluminum containers, filled up to the brim to protect against any air remaining inside and placed in a cool storage godown, away from light and humidity.

Reference Books		
1.	Aushadhiya Paudhe	S.K. Jain. NBT New Delhi
2.	Medicinal plants of India & Pakistan	Dr.Kirti Garg.
3.	Plantation crops	K. V. Peter
4.	Major Spices of India, Crop Management – Post Harvest Technology	Pruthi.J.S.