



## Scientific Cultivation of Monarda (Lemon Bee Balm)

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*Monarda citrodora*, commonly known as lemon bee balm or lemon mint, is a herbaceous perennial plant native to North America. It is a member of the mint family (Lamiaceae) and is known for its lemony fragrance and flavor. *Monarda citrodora* is used in culinary and medicinal applications. Pleasant *Trachyspermum ammi* (ajwain) like fragrance when crushed.

### ➤ About Plant/Morphology

1. It is a short-lived perennial, often grown as an annual or biennial.
2. It grows 12-30 inches tall.
3. The leaves are narrow, lance-shaped, and have a lemony scent when crushed.
4. The flowers are tubular, lavender to pink, and are borne in whorls on the stem.
5. The flowers attract bees, butterflies, and hummingbirds.

### ➤ Chemical constituents

1. Thymole(62-75%)
2. r-Terpinene(14-20%)
3. p-Cymene(12-20%)
4. Carvacrol(2-6%)

### ➤ Uses:

1. The essential oil can be used in aromatherapy to relieve stress, anxiety, and headaches.
2. The plant has anti-inflammatory and antibacterial properties.
3. It can be used to treat colds, flu, and sore throats.
4. It can also be used to repel insects.
5. The leaves can be used to flavor food, such as salads, teas, and desserts.

### ➤ Climate:

1. Being a rabi crop it is transplanted from nursery to field in November-December when ambient temperature is around 20-25 °C.
2. Lemon bee balm thrives in full sun to partial shade. Aim for at least six hours of direct sunlight each day.
3. It prefers well-draining soil with a pH between 6.0 and 7.5.
4. *Monarda citrodora* thrives in warm climates.

➤ **Soil:** The plant prefers well-draining soil with a pH level between 6.0 and 7.5. It can tolerate a wide range of soil types, including sandy or loamy soil.

➤ **Variety:** IIIM(J.) MC-02 ( developed by CSIR-IIIM, Jammu in 1999)

➤ **Seed Rate:** 200-300g/ha (propagation by seed)

➤ **Nursery/Plantation:** The seeds can be sown in nursery beds during 1<sup>st</sup> week of October and then transplanted during 3<sup>rd</sup> week of November or 1<sup>st</sup> week of december at the spacing of 30 cm x 30 cm line to line and plant to plant. Plant the seeds in a seed-starting mix, keeping them lightly covered. Transplant the seedlings outdoors after the danger of frost has passed and the soil has warmed up.

➤ **Spacing:**

- Plant to plant 30x30 cm
- Row to row 30-40 cm
- 45,000 plants per acre

➤ **Fertilizers:** *Monarda citrodora* doesn't require heavy fertilization. However, you can apply a balanced, slow-release fertilizer in spring to promote healthy growth. Recommended rates include:

- 10 ton/ha FYM
- 100 kg/ha nitrogen (as urea)
- 50 kg/ha Phosphorus (murate of potash)
- 50 kg/ha Potassium (SSP)

Nitrogen is applied in three to four split doses.

➤ **Irrigation:** 8 to 10 irrigations are typically sufficient For good crop production.

➤ **Pests and Diseases:** Lemon balm is generally resistant to pests and diseases. However, keep an eye out for common garden pests like aphids or powdery mildew. If necessary, treat pest or disease issues with appropriate organic or chemical solutions.

➤ **Harvesting:** Harvest should be done in the month of april-may at full blooming stage. Rainy periods should be avoided for harvesting. You can harvest the leaves and flowers of *Monarda citrodora* for culinary or aromatic purposes. The leaves can be picked at any time during the growing season, but the flavor is most potent before the plant flowers. Cut the stems just above a set of leaves to encourage branching and continued growth for oil distillation cut the plant stem from 10-15 cm above the soil surface and tied in bundles for oil distillation.

➤ **Oil Extraction:** There are mainly two types of oil distillation

1. Hydro-distillation
2. Steam-distillation

For the large area crop oil extraction, oil is extracted by large oil distillation unit.

1. **Hydro-distillation: (Commonly used method):** To extract essential oils by hydro distillation, the aromatic plant material is packed in a still container and enough water is added and brought to a boil. Otherwise, live steam is injected into the power plant load. Due to the influence of warm water and steam, the essential oil is released from the oil gland in the plant tissue. The water vapour/oil mixture is condensed by indirect cooling to water. From the condenser, the distillate flows into a separator, in which the oil separates automatically from the distilled water. Complete process takes 3 to 3.5 hours to once oil extraction. Maximum quantity of oil is obtained in the first two hours and quality oil is obtained in the last hour.

➤ **Yield:**

- Average 170 to 225 quintals of herbage per hectare.
- Oil recovery percentage from fresh herbage ranges from 0.5% to 1.2%.
- On an average 80 -150 kg/ha per year of essential oil can be obtained.

➤ **Economic Return:**

- Essential oil of monarda sells approximately Rs. 1500 to Rs. 2000 Per liter.
- Net profit ranges from Rs. 1,00,000 to Rs. 1,50, 000 per hactare per year.

