Lemon balm production

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Part I: General aspects

1. CLASSIFICATION

Scientific name: *Melissa officinalis*

Common names: Balm mint, sweet Melissa, lemon balm, sweet Mary, dropsy plant

Family: Labiatae
2. ORIGIN AND DISTRIBUTION

Lemon balm belongs to the mint family and is indigenous to Southern Europe, the Mediterranean region, Western Asia, and North Africa. Lemon balm is now cultivated worldwide.

Melissa refers to honey or the honeybee because the plant is so attractive to bees, and officinalis means a plant that is officially used in medicine.

The Greeks called it “melisophyllon” with “meliso” meaning “bee” and “phyllon”, denoting “leaf.” The Romans referred to the plant as “apiastrum” from “apias”, to mean simply “bee”. Sixteenth-century gardeners rubbed the leaves on beehives in order to promote the production of honey from within.

3. PRODUCTION LEVELS AND YIELDS

South Africa

Yield

Lemon balm yields 10 to 25 metric tons of plant material per ha. It has a low oil recovery rate of approximately 0.03 % or 3 to 7.5 kg/ha. The oil content of fresh leaves averages 0.1 % or less with a large range between 0.01 and 0.13 %. Dried lemon balm yields 5 metric tons/ha.

4. MAJOR PRODUCTION AREAS IN SOUTH AFRICA

Lemon balm is grown on a small scale in the Lowveld of the Mpumalanga, Kwa-Zulu-Natal, Gauteng and the Eastern and Western Cape provinces.

5. DESCRIPTION OF THE PLANT

The plant has a distinct fragrant lemon scent and taste.

Roots

Lemon balm is a spreading herb with a short rootstock. The top of the plant dies down in winter, but the root is perennial.
**Stem**

Lemon balm has square branching stems that grow from 30 to 60 cm tall.

**Leaves**

Lemon balm has pairs of broadly ovate or heart-shaped crenated or toothed leaves at each node. The leaves are 30 to 50 mm long, shiny on top, wrinkled and deeply veined.

**Flower**

Lemon balm has small, white or yellowish to pale blue flowers in loose, small bunches emerging from the axils of the leaves, that appear in late spring to midsummer.

**Essential part**

The fresh and dried plant is used for essential oil extraction. The dried plant is also used for extraction of medicinal compounds as well as for health tea.
6. CULTIVARS

There are no cultivars registered in South Africa. Plant material and seed should be sourced from certified nurseries.

7. CLIMATIC REQUIREMENTS

Temperature

Lemon balm flourishes in full sun and grows best in moderate temperatures. It should be cultivated in temperate and subtropic regions. It can survive moderate frost.

Rainfall

Rainfall of 300 to 1 300 mm per annum is necessary, but the plants should be watered regularly if rainfall is not sufficient as the crop does well in moist soils.

8. SOIL REQUIREMENTS

Lemon balm grows best in fertile, deep, and well-drained soils with a pH of 5 to 7.5. The plant can be grown in clay and clay-loam soils. Lemon balm grows best in alluvial soil.

Part II: Cultivation practices

1. PROPAGATION

Lemon balm is easy to grow from seed sown in the spring or early autumn. Direct seeding can be done at 7 to 9 kg/ha. Direct seeding is a practice only followed
where weed control is efficient and specialised planters can be used. Lemon balm is usually grown from seeds sown in a greenhouse and then transplanted into the land. Seedlings are very sensitive to damping-off and therefore it is better to allow the seeds to germinate uncovered.

Stolons are the faster and easier way to establish lemon balm. Stolons should contain three to four buds each. If heavy frost is expected in winter, mulching will assist to protect the plants. Whenever there is a possibility of soil-borne disease or pests that can contaminate new land, it is safer to use seedlings grown from seed.

2.  **SOIL PREPARATION**

Herbal and essential oil crops grown on natural soils yield products that are of high quality and in demand globally.
General soil preparation guidelines

Soil sampling and analysis

- Take soil samples according to correct guidelines.
- Have the soil analysed at a laboratory that will be able to check for mineral deficiencies and excesses, organic status and carbon ratios.
- A soil analysis will guide the producer in correcting the nutritional status of the soil in order to provide the crop with optimum growing conditions such as a balanced mineral status and correct pH.
- Soil fertility levels have to be within acceptable ranges before a soil-building programme is started.
- Correct the soil pH according to analysis and soil type.
- Fertiliser use has to be planned according to whether the crop will be grown inorganically or organically.
- Soil preparation has to be done according to good cultivation practices.
- Apply suitable soil preparation practices according to the farming operation. (rip, plough, disc, harrow, contour, etc.)
- If mechanical harvesting and weed control is envisaged, prepare row widths adapted to the machinery to be used.

Producers who treat their soil correctly will have the benefit of producing crops of high value with less input in terms of weed, pest and disease control.

3. PLANTING

Planting density/spacing

The planting density should be 45 000 to 100 000 plants/ha from seed, seedlings, or rooted stolons. Suggested spacing is 20 to 30 cm apart in the row, and 50 to 75 cm between the rows. Closer spacing will allow plants to cover the area sooner and will result in the highest yields with fewer weed problems. The plants have a lifespan of 10 years but are usually replaced every 5 years with crop rotation with a legume crop to rejuvenate the soil.
Lemon balm plants can be planted in high densities, so it may be possible to establish the crop on a broad scale. Alternatively, the crop can be planted in beds approximately 1,2 m wide to allow for tractor and implements operation. Width of beds should be designed so that vehicles can straddle the crop without damage during mechanical weed control and harvesting.

**Planting date**

The stolons should be planted early in autumn, for the plants to become established before the first frost. Seed should also be sown in the spring or early autumn.

**Planting depth**

Lemon balm seeds are very small and should therefore be sown shallowly, i.e. be covered with only a fine layer of soil.

*Lemon balm spreads rapidly*

*(Photos: W.G. Alberts)*
4. FERTILISATION

Although specific recommendations are not available for fertilisation of lemon balm, yield and oil content may be increased with nitrogen application several times during the growing season. Lemon balm responds well to additional applications of nitrogen during the growing season, usually applied after harvest to promote new shoot growth. Potassium applications at this time may also be beneficial. A basal fertiliser application containing nitrogen, phosphorus, sulphur and potassium should be applied annually. An analysis of organic compost will assist to establish correct application rates. Organically grown lemon balm is in great demand.

5. IRRIGATION

The crop has a high water demand. A regular water supply should be provided by means of overhead sprinkler irrigation. Always avoid excess water as it is harmful, while yields diminish in light and dry soils.

6. WEED CONTROL

Currently there are no herbicides cleared for use on lemon balm as the plant is mostly used for medicinal purposes and toxic elements have to be eliminated as far as possible. Weed control programmes must be maintained strictly as weeds compete with the crop for available nutrients and thereby reduce yields. This is especially important in the early stages when plants have not covered the soil yet.

Some weeds may contain volatile compounds that are extracted along with the mint oil during the distillation process. It can contribute to off-flavours, resulting in lowered oil or extract quality. Certain weed species are more harmful and can reduce the marketability of the crop. *Amaranthus* spp. (pigweed) and *Datura* spp. (thorn apple) can contaminate the crop severely, reducing the quality. Hand removal of weeds has to be done. Always remove these weeds in time before they form seed.
Weed control guidelines

- Do not allow weeds to form seed in the land.
- No-till practices result in fewer weeds.
- Shade out weeds by plant canopy, high plant density, closer row width, if moisture content of soil and crop specification allow for it.
- Use manual or mechanical control.
- Organic control measures such as flame weeding and UV radiation can be used where applicable and if the crop can tolerate the method.
- Some seeds germinate when exposed to sunlight. Use night ploughing as an option for fewer weeds.

7. PEST CONTROL

Whitefly, spider mites and thrips are pests that occur on lemon balm.

- Whitefly has piercing/sucking mouthparts which they use to suck sap from the leaves of plants. They also excrete large quantities of honeydew that serves as a growth medium for sooty mould.
- Spider mites feed preferentially on the lower stem, and then move on to the upper section of the plant and on leaves. Leaves may later turn yellow and drop. Silk webbing may be present when the infestation is severe.
- Thrips feed on leaves with their piercing and sucking mouthparts and damage the plants, causing browning and drop of leaves. They can also be vectors of other diseases.

Extension officers from the Department of Agriculture and researchers from agricultural institutes should be contacted for further information on the identification of insects and for recommended controls.

Use the publication* A guide for the control of plant pests – 2002, compiled by Annette Nel, Mareli Krause, Neervana Ramautar & Kathy van Zyl.

* Obtainable from the Resource Centre, Directorate Communication Services, Private Bag X144, Pretoria, 0001. Tel: 012 319 7141/7085. Fax: 012 319 7260
8. DISEASE CONTROL

Lemon balm is susceptible to powdery mildew, which appears as a dusty-white to grey coating over leaf surfaces or other plant parts. It begins as discrete, usually circular, powdery white spots, and as these expand they will combine, producing a continuous mat of mildew.

Several practices will reduce or prevent powdery mildews. Do not plant in low, shady locations.

Once the disease becomes a problem:

- Avoid late-summer applications of nitrogen fertiliser to limit the production of succulent tissue, which is more susceptible to infection.
- Avoid overhead watering to assist in reducing the relative humidity.
- Remove and destroy all infected plant parts if the area is not too large. Do not use decomposed infected plant debris (e.g. compost). Temperatures often are not high enough to kill the fungus.
- Chemical:

  If cultivation controls fail to prevent disease buildup or if the disease pressure is too great, an application of a fungicide may be necessary, e.g.:

  - sulphur
  - neem oil
  - potassium bicarbonate.

Apply fungicides at 7 to 14-day intervals to provide continuous protection throughout the growing season. Follow the instructions on the fungicide label for use on specific plant species, varieties, rates to be used, timing of applications, and waiting periods before harvest.

Use the publication* A guide for the control of plant diseases – 2003, compiled by Annette Nel, Mareli Krause, Neervana Ramaatar & Kathy van Zyl.

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9. OTHER CULTIVATION PRACTICES

Mulching

Plastic or organic mulches should be used to prevent weed growth and to conserve soil moisture.

10. HARVESTING

Maturing time and methods

The aerial parts are harvested from early summer onward, but are best just before the flowers open when the concentration of volatile oil is at its highest. Harvesting is done by hand on a clear, warm day, as quality will be reduced if the leaves turn brown. Foliage can also be cut with a mechanical cutter.

Part III: Post-harvest handling

1. SORTING AND DISTILLATION

Lemon balm is cut and then dried in the shade to preserve the chemical composition of the plant. Too much direct sunlight will cause volatile oils to disappear. The volatile oil is obtained by steam distillation of the dried herb. The chemical properties of the dried plant material are also extracted by different methods. The crop can be steam distilled immediately after harvest.

2. GRADING

Colour, moisture content and absence of mould are properties that will ensure a good price for the dried herb. The main components of Melissa essential oil are citral, β-caryophyllene, germacrene D, citronellal, eugenol acetate and geraniol.
3. PACKAGING

The dried herb can be placed in bags that allow air flow. Plastic bags can cause fungous growth if too much moisture is present. Essential oils can be packaged in bulk or smaller quantities. Smaller quantities are usually more expensive as extra handling and packaging materials are needed. Ceramic, dark-coloured glass, fluorinated plastic and epoxy-coated aluminum containers are used. Essential oils are volatile and as such have to be handled with care.

4. STORAGE

The oil is subject to oxidation, and as a result, it should be stored in filled, sealed containers, out of light and kept cool. Keep it air tight and do not expose it to heat or heavy metals.

5. MARKETING

Lemon balm is mostly marketed for medicinal purposes as a dried product. The end producer will market it as medicinal extracts or as health herbal tea bags. Fresh lemon balm is marketed as culinary herb on the fresh produce markets or supermarkets. Essential oils are sold in bulk to wholesalers, where it is packaged in smaller quantities, which are marketed to the aromatherapy industry.

Part IV: Production schedules

When scheduling production, the important factor to bear in mind is to have sufficient knowledge of the crop that you are farming with
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Part V: Utilisation

Lemon balm is one of the most expensive of the essential oils, but the hydrosol is most affordable. The hydrosol has powerful and positive uses for any skin-care product. It is antifungal, relieves skin infection and can cure herpes. The hydrosol is considered useful in tonic drinks for ‘attention deficit disorder’ and dietary uses. The essential oil properties are antihypertensive, calming, sedative and anti-inflammatory. Melissa oil is used for insomnia, hysteria and irritability. It can relieve a cold sore if applied externally.

1. COSMETIC

The herb has potent uses in skin and body care. Lemon balm hydrosol is added to clay masks for skin healing.

2. PHARMACEUTICAL AND THERAPEUTIC

Indicated for headaches, indigestion, nausea, depression, sedative, eczema allergy and insect bites. Infusions of fresh leaves of lemon balm are used medicinally to calm heart spasms, headache, soothe a nervous stomach, nervous exhaustion and the early stages of colds or flu.

Lemon balm has mild sedative properties and has been used to relieve gas, reduce fever, and increase perspiration. Both essential oil and hot water extracts of the leaves have been shown to possess strong antibacterial and antiviral qualities. One of the main uses at present is preventing the production of a thyroid-stimulating hormone, which makes it useful in treating certain hyper-thyroid disorders.

3. CULINARY

Fresh leaves add a delicate flavour to many dishes, oils, vinegars and liqueurs. Fresh or dried leaves make a refreshing tea, either iced or hot. The fresh leaves
and flowers complement all vegetable and fruit salads, stuffings, bean dishes, and marinades for meat and fish.

4. **INDUSTRIAL**

- Used in health tea and other tea blends.
- Dried leaves are used as an ingredient in potpourris.
- The oil is used in perfume.
- The leaves and flowers are also used in wine-making and liqueurs.
- Lemon balm is a traditional ingredient in Chartreuse and Benedictine.

5. **OTHER**

- Lemon balm attracts bees, and if it is rubbed on inside of empty beehives it will attract new bee swarms.
- It also attracts beneficial insects such as parasitic wasps and tachinid flies that prey on many common garden insect pests.

6. **SAFETY DATA**

Nontoxic. Sensitisation and dermal irritation can occur if essential oil is not diluted well. Use in very low dilutions or in hydrolat form.

**REFERENCES**


* Further information on references could be obtained from members of SAEOPA and KARWYL Consultancy.


