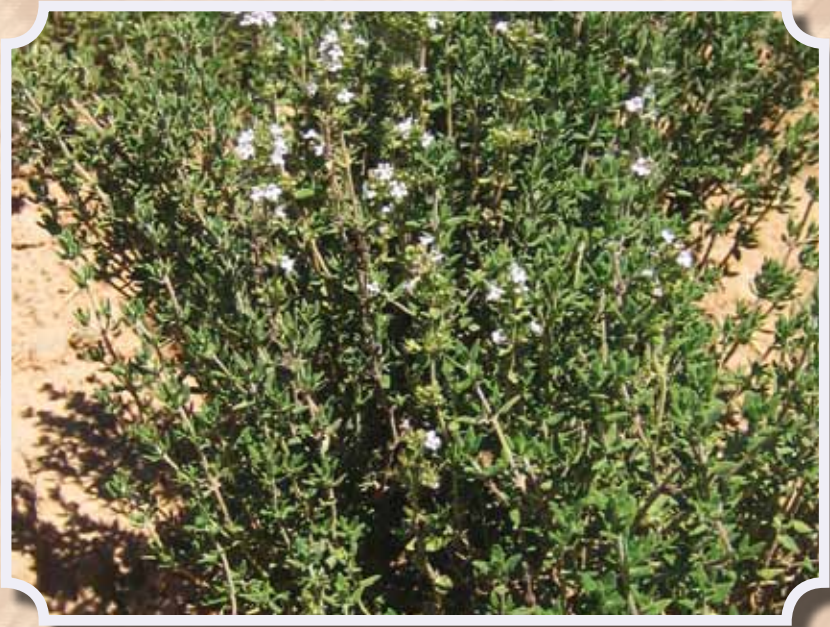


Thyme production



**agriculture,
forestry & fisheries**

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Thyme production



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DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES
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Thymus vulgaris
(Photo: W.S. Mokgobu)

Part I: General aspects

1. CLASSIFICATION

Scientific name: *Thymus vulgaris*

Common names: Wild thyme, common thyme, garden thyme, creeping thyme and mountain thyme

Family: Lamiaceae

2. ORIGIN AND DISTRIBUTION

Thyme is the general name for the many herb varieties of the *Thymus* species, all of which are native to Europe and Asia. Common or garden thyme is considered the principal type, and is utilised commercially for flowering and ornamental purposes. Thyme is native to the Western Mediterranean region, extending to south-eastern Italy.

The name thyme, in its Greek form, was first given to the plant by the Greeks as a derivative of a word which meant 'to fumigate,' either because they used it as incense, for its balsamic odour, or because it was taken as a type of all sweet-smelling herbs. Others derive the name from the Greek words *thyo*, meaning perfume or *thumus*, signifying courage, the plant being held in ancient and medieval days to be a great source of invigoration, its pleasant qualities inspiring courage. Another source quotes its use by the Sumerians as long ago as 3 500 BC and to the ancient Egyptians who called it *tham*.

3. PRODUCTION LEVELS

South Africa

Few producers in South Africa are distilling thyme for essential oil production. Most of the thyme produced is for the fresh and dried market. Yields of *T. vulgaris* for fresh herb production can be 5 to 6 t/ha and for dry herb production 2 t/ha.

Under irrigation, thyme will yield about 15 tons of plant material per hectare per annum, at an oil recovery rate of 0,5 to 1 % or 75 to 150 kg/ha per annum. Under dryland conditions the yields will vary considerably.

Internationally

Thyme is produced from cultivated and wild harvested plants in most European countries, including France, Switzerland, Spain, Italy, Bulgaria, Portugal and Greece. Yield and quality of essential oil varies according to the genetic make-up of plant material, crop maturity at harvest, environment and distillation practice. Some 90 % of the thyme oil of world trade is produced in Spain. Southern European herb growers benefit from the longer growing season owing to climate advantages. Therefore, most of the thyme produced in Europe comes from there.

Cultivation of the traded herb is primarily in Spain, France, Italy and Bulgaria. Essential oil yields of 1,0 % (10 ml oil/kg fresh thyme) is expected from wild thyme in hot summer conditions. Yields may decrease to 0,10 % in winter. Yields from cultivated material range from 0,05 to 0,50 %, depending on variety. However, herbage yields under cultivation far exceed production in the wild, so more oil would be produced per hectare in cultivated crops. In Switzerland, selected cultivars are yielding 3 % essential oil from fresh herbage of more than 15 t/ha.

4. MAJOR PRODUCTION AREAS IN SOUTH AFRICA

Thyme can be grown in most provinces of South Africa. Major production areas have not been established as most commercial growers are cultivating on a small scale. Some larger producers are usually also cultivating other essential oil crops. The Western Cape is climatically the closest to the Mediterranean area where thyme grows naturally in the wild. The plant is very adaptable and is therefore performing well in other climatic zones, e.g. KwaZulu-Natal, Mpumalanga and Gauteng. It does well in the drier parts such as the Karoo, provided it receives irrigation when needed.

5. DESCRIPTION OF THE PLANT

Stem

Thyme is a small perennial subshrub, a semi-evergreen groundcover that rarely grows more than 40 cm tall. It has both horizontal and upright habits. The stems become woody with age.

Leaves

Thyme leaves are very small, usually 2,5 to 5 mm in length and vary considerably in shape and hair covering, depending on the cultivar, with each species having a slightly different scent. *T. vulgaris* leaves are



(Photo: Provided by members of SAEOPA and KARWIL Consultancy)



T. vulgaris leaves
(Photo: K.M. Swanepoel)



Thyme in the flowering stage
(Photo: K.M. Swanepoel)

oval to oblong in shape and somewhat fleshy. Leaves are almost stalkless with margins curved inwards and highly aromatic. The fragrance of its leaves is the result of an essential oil, which gives it its flavouring value for culinary purposes, and is the source of its medicinal properties.

Flowers

The flowers terminate the branches in whorls. The calyx is tubular, striated, closed at the mouth with small hairs and divided into two lips, the uppermost cut into three teeth and the lower into two. The corolla consists of a tube about the length of the calyx, spreading at the top into two lips of a pale purple colour, the upper lip erect or turned back and notched at the end, the under lip longer and divided into three segments.

Seeds

The seeds are round and very small and retain their germinating power for 3 years.



(Photo: Provided by members of SAEOPA and KARWIL Consultancy)

Essential part

Aerial parts are used for essential oil production, mostly by steam distillation.

The fresh and dried herb market uses it for culinary purposes.

6. CULTIVARS

The genus *Thymus* has about 215 species and numerous hybrids as well. Three principal varieties are usually grown for use, the broad-leaved, narrow-leaved and variegated.

The narrow-leaved type, with small, grey-green leaves, is more aromatic than the broad-leaved, and is also known as winter or German thyme. The fragrant lemon thyme, has a lemon flavour and rather broader leaves than the ordinary garden thyme, is not curved at the margins, and ranks as a variety of *T. serpyllum*, the wild thyme. The silver thyme is the hardiest of all and has the strongest flavour.

Listed below are the most cultivated thymes used for culinary and essential oil extraction. As the plant hybridises easily there are many different types available:

- ◆ ***T. vulgaris***, common thyme, prostrate form, yellow, silver and variegated foliage available, used in cooking.
- ◆ ***T. zygis*** is like the above, mostly distilled for essential oil.
- ◆ ***T. x. citriodorus***, lemon thyme – upright form, golden and variegated silver foliage available, strong lemon scent.
- ◆ **Varico**, a robust cultivar, has an upright growth form with greyish-blue foliage and excellent herbage yield. It produces thymol levels of 50 % and higher as well as more than 3 % essential oil yield. It also has a good resistance to frost. It can be propagated with seed.
- ◆ Other promising new cultivars are currently developed in various countries.
- ◆ Various species and hybrids have been selected for the colour of the leaves and flowers and are mainly used as ornamental shrubs.

7. CLIMATIC REQUIREMENTS

Temperature

Thyme grows well in a temperate to warm, dry, sunny climate, and where the plants are not shaded. It needs full sun to grow to its best potential.

Rainfall

Thyme does not like excessive moisture because of its susceptibility to rot diseases. Rainfall in the Mediterranean region where thyme is cultivated most is 500 to 1 000 mm per year, mainly in winter.

8. SOIL REQUIREMENTS

Thyme prefers light, well-drained soils with a pH of 5,0 to 8,0. Thyme species do best in coarse, rough soils that would be unsuitable for many other plants. Although thyme grows easily, especially in calcareous light, dry, stony soils, it can be cultivated in heavy wet soils, but it becomes less aromatic.

Part II: Cultivation practices

1. PROPAGATION

Thyme is propagated from seeds, stem cuttings, and layering. Plantations may also be increased by dividing the plants at their roots. Sow seeds in spring to a depth of 6 mm or less. Seeds germinate in about 2 weeks. When planted in seed trays it will take 6 to 8 weeks to reach transplant readiness. Transplant the seedlings out of doors after the danger of frost has passed. If established and growing well before winter, the small plants can withstand frost.

The source of thyme seed has to be known as there are possibilities of hybridisation. To have homogeneous plants it is advisable to make cuttings. Thyme grows easily from 5 to 10-cm cuttings taken in spring. Root-promoting hormones may be beneficial. Take care not to use this method if any detrimental soil organisms are present.

2. SOIL PREPARATION

Thyme can be planted successfully in soil that is very shallow and where other crops cannot survive.

Herbal and essential oil crops grown on natural soils yield products that are of high quality and in global demand.

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 nutrient 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.
- ◆ Organic soil preparation practices are encouraged to ensure that the soil microorganisms and organic matter are present.
- ◆ 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.

3. PLANTING

Planting density/spacing

The recommended spacing for plants is 15 to 30 cm apart in the row with a row width of 60 cm. A row spacing of 20 to 30 cm between plants in beds is recommended. Transplants or seedlings and cuttings can be established in beds approximately 1,2 m wide, with 3 rows on each bed. Ideally, beds should be designed for machinery to be used for the crop.

Take care not to squash thyme as it will break the woody stem at soil level and the plants may die off. Thyme can also be planted with a special planter that can plant small seed. There are 3 300 to 4 000 seeds per gramme. Seed can also be raised in a nursery in plant trays to be transplanted when ready. Plant density can be adapted according to the size of mature plants and moisture availability.



Thyme on research trials in North West
(Photo: W.S. Mokgobu)

Planting season

The best times to sow or plant seed and transplant cuttings, is in spring. In some cases sowing is done before winter. Small seedlings can be more frost resistant than mature plants.

4. FERTILISATION

Thyme should not be fertilised heavily because overfertilised plants tend to show tall, spindly, and weak growth. A basal fertiliser application containing nitrogen, phosphorus, potassium and sulphur should be applied annually according to the soil analysis results. Thyme responds well to additional applications of nitrogen, usually given after each harvest to promote new shoot growth during the growing season.

Do not give excessive nitrogen because the quality of the oil may be affected. An analysis of organic compost will assist to provide correct application rates. Organically cultivated thyme is produced globally on a larger scale than the dried herb and the oil realises better prices.

5. IRRIGATION

Drip and overhead irrigation are suitable, but do not over-irrigate.

6. WEED CONTROL

Thyme has been established successfully without herbicides by planting the crop in a land covered with weed-suppressing plastic mulch. Organic mulches and hand-weeding are also used. The crop has to be kept weed free so as to avoid contamination of the end product.

7. PEST CONTROL

Pests on thyme are not very frequent because the volatile oils of the plants have pest repellent properties. However, whitefly, scale and spider mites may infest the plants.

For prospective producers of herbal and essential oil crops, the following pest control guidelines are recommended.

Pest control guidelines

- ◆ Natural pest control measures should be used as first choice.
- ◆ Follow a pest management programme.
- ◆ Regular scouting of the crop is needed.
- ◆ Early detection and management of pest problems can prevent major problems.
- ◆ Correct identification of pests and natural beneficial predators is essential.
- ◆ Introduce and use biological controls, natural predators, parasites, nematodes, fungi, bacteria, and beneficial microorganisms. Avoid using chemicals that kill such organisms.

- ◆ Other organic methods such as reflective mulches, insecticidal soaps, plant extracts, traps and handpicking of pests, water sprays and vacuum, can be used.
- ◆ Use effective controls that target specific taxonomic groups, eating habits, or life stages: insecticidal soaps, horticultural oils, pheromones, and growth-regulating natural substances such as neem oil.
- ◆ The knowledge of certain herbs that repel or attract insects can be used in companion plantings for pest control.
- ◆ If organic practices will be used, make sure that products are certified for use.

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.

8. DISEASE CONTROL

Thyme plants get few diseases; however, in wetter environments with imperfect soil drainage, *Rhizoctonia* root rot can cause problems. Rust, alternaria blight and botrytis can also be a problem.

Disease control guidelines

- ◆ Follow a disease management programme.
- ◆ Regular scouting of the crop is needed.
- ◆ Early detection and management of diseases can prevent major problems.
- ◆ The correct identification of diseases is needed.
- ◆ Natural organic disease control measures should be used as first choice.
- ◆ Use clean seed and plant material from a reputable supplier.

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

- ◆ Ensure that no diseased material infests export shipments.

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

9. HARVESTING

Maturing time and methods

For essential oil, thyme is harvested once per annum, during late summer when flowering begins. In certain conditions two harvests per year are possible.

For dried produce, harvest stems and leaves just as flowering begins, cutting the entire plant back to about 10 to 15 cm above the ground. For fresh produce, harvest only the tips of the branches so the plants are strong enough to produce enough young shoots.

Harvest management of a thyme crop is critical. If the crop is left too long between harvests or is cut too low down, plant death can occur, particularly in wetter environments. Disease infection may contribute to plant deaths in crops weakened by heavy cutting. Therefore cutting must always be done with sharp implements to prevent splitting of stems. Harvesting should therefore be frequent, and cutting height adjusted to leave some green herbage on the plants after cutting.

Part III: Post-harvest handling

1. SORTING AND DISTILLATION

The dried product should be processed to remove the leaves from the stems, and then sieved to remove dirt and to produce a uniform product. Several methods exist from sun to sophisticated driers. The use of sun-drying methods results in

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poor quality of the essential oil. Artificial drying methods allow better control of product quality. A forced air-flow drier is a suitable system to dry better-quality leaves.

Thyme should be dried at temperatures lower than 40 °C to reduce loss of flavour through volatilisation of essential oil, and to maintain a good green colour. After drying, the leaves should be separated further from the stems, sieved and graded.

Fresh produce has to be clean of foreign material and looking fresh and crispy with a good colour and flavour.

2. GRADING

There is an International Standard (ISO 6754:1996), prescribing quality requirements for dried thyme. The standard prescribes certain requirements of the finished product. The essential oil content of the dried herb is an important factor contributing to the flavour intensity. Whole thyme leaves should contain a minimum of 0,5 % essential oil, which equals 5 m//kg dried herb, and ground thyme should contain at least 0,2 % essential oil to meet the requirements.

For essential oil production there is a diverse range of chemotypes occurring in thyme. There are at least six different chemotypes of importance of which thymol, carvacrol, linalol, geraniol, thuyan-4-ol, and α -terpinyl acetate are the most important.

The most frequent are thymol and carvacrol, which are generally extracted from plants growing near the sea at low altitude, and linalool, which is generally extracted from plants occurring at higher altitudes. The geraniol, thuyan-4-ol and α -terpinyl acetate chemotypes are rare and found mixed with the first three chemotypes.

There is a current recovery in the demand for thymol used in the pharmaceutical industry, owing to the powerful properties as disinfectant.

3. PACKAGING

Essential oils can be packaged in bulk or smaller quantities. Smaller quantities usually have higher prices owing to extra handling and packaging materials needed. Essential oils are volatile and as such need to be handled with care.

Fresh thyme is packaged in crates for bulk handling or in clear cellophane sachets that can be marketed directly in shops and supermarkets.

Dried thyme is usually sold in either cardboard boxes or in glass or plastic containers. Moisture, heat, oxygen and light destroy the oils. Dark glass is preferred for preservation. Storing under 18 °C will extend shelf-life.

4. STORAGE

Thyme essential oil should be stored in a cool, dry area until it is used. Keep it in dark, air-tight glass bottles and do not expose it to heat or heavy metals. Once opened, refrigeration and tightly closing the cap will prolong its shelf-life. Deterioration begins if the liquid is much darker or more viscous than normal.

5. MARKETING

Essential oils market

The major market in the world for essential oils is the United States, followed by Japan and Europe. Production continues to be concentrated in Europe, with seven of the world's largest essential oil-processing firms. In the United States, the major users of essential oils are the soft drink companies. Japan accounts for 10 % of the world demand. The Canadian market is dominated by the United States perfume and flavouring industry.

France is dominating the world perfumery market, and Switzerland is one of the leaders in the pharmaceutical field. Britain and India are known to feature strongly in the flavouring sector.

Most countries import all their dried thyme mainly from Spain and Morocco, the major world producers. Most bulk dried herbs are produced in countries with low labour costs, so the challenge to producers in South Africa is to produce crops of superior quality at a competitive price.

Part IV: Production schedules

As farming enterprises are so diverse, a very basic schedule is proposed. Producers have to adapt the schedule to their own needs.

General crop schedule – thyme												
Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Field preparation												
Rip and plough												
Disking												
Prepare seedbed												
Planting, cultivation and harvesting												
Plant and transplant												
Weed control												
Pest control												
Disease control												
Irrigate												
Harvest												

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



Part V: Utilisation

The essential oil component, thymol, has a wide range of uses in the manufacturing of liqueurs, perfumes, pharmaceutical products and toilet articles (De Rougemont, 1989).

1. INDUSTRIAL

The essential oil of thyme is used to preserve processed meat and butter, and in making chewing gum, ice cream, candy, and the liqueur Benedictine.

2. MEDICINAL PROPERTIES

The main component of the essential oil of thyme, thymol, is active against *Salmonella* and *Staphylococcus* bacteria. The antiseptic and tonic properties of thyme make it a useful tonic for the immune system in chronic, especially fungal, infections as well as an effective remedy for chest infections such as bronchitis, whooping cough, and pleurisy.

Thyme and thyme oil have been used as fumigants, antiseptics, disinfectants, and mouthwashes. The pleasant-tasting infusion can be taken for minor throat and chest infections, and the fresh leaves may be chewed to relieve sore throats. Thyme is prescribed with other herbs for asthma, hayfever, and is often used to treat worms in children.

3. COSMETIC

It is used for skin problems such as oily skin, sciatica, acne, dermatitis, eczema and insect bites.

4. PHARMACEUTICAL AND THERAPEUTICAL

In aromatherapy, the distinct types, thymol, 'red thyme oil', linalol type for its very gentle soft action and thuyanol for antiviral properties are used. A rectified



(Photo: Provided by members of SAEOPA and KARWIL Consultancy)

product, 'white thyme oil' is also used, and it is milder on the skin. Applied to the skin, thyme relieves bites and stings, and relieves sciatica and rheumatic aches and pains. The infusion may be added to bathwater as a stimulant.

Thyme is useful for ringworm, athlete's foot, thrush, and other fungal infections, as well as scabies and lice. Thymol is one of the active ingredients in Listerine® mouthwash and provides the "medicated" properties of many consumer products. Thyme is said to aid digestion of fatty foods.

5. OTHER

It forms a good companion crop that repels cabbage fly, whitefly and aphids. Only a few thyme species are used as landscape ornamentals. Thyme is excellent for rock gardens. Creeping thyme will tolerate occasional foot traffic and

can be used between stepping stones along garden paths. Thyme can also be utilised as an edging or border plant in herb gardens.

6. SAFETY DATA

Do not use thyme in cases of high blood pressure. Certain chemotypes that contain high levels of thymol and carvacrol phenols are toxic and should be avoided in aromatherapy.

The linalol, geraniol, thuyanol and citral types are nonsensitising and safer to use, however, these should be diluted. Do not use during pregnancy. Essential oils can be harmful if swallowed and should be kept out of children's reach. With proper storage essential oils remain potent for 6 months to 2 years.

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