

Eucalyptus



BOTANY

Eucalyptus globulus L. belongs to the Myrtaceae family. Its common name is Blue gum tree or Tasmanian blue gum. There are more than 700 different species of eucalyptus (most of them native to Australia) but adult specimens of *E. globulus* are easily recognizable because it is the only arboreal species that has a single cone (or fruit).

The eucalyptus is an **evergreen** with a general height of 25 to 60 m (although they can reach 90 m in their natural habitat) and a smooth, ash gray-colored bark, with lenticels surrounded by balsamic gum and reddish wood. The outer bark (ritidome) is light brown colored and sheds in strips, leaving gray or tan spots on the smoother inner bark. Eucalyptus forests can cause uncontrollable forest fires due to the enormous height that these trees attain in a short period of time and the inflammability of the wood. In dense eucalyptus forests, the flames of a forest fire can reach heights of more than 300 m, as has been seen in Australia during the dry season.

The **leaves** and buds of the young trees are opposite, oval-shaped, sessile, of light green color, clear, waxy and with a rounded edge. On the other hand, the leaves of mature trees are alternate, curved, short-petiolate, flat, of grayish green color, leathery and sickle shaped.

The single white flowers display a combined calyx (top-shaped) and corolla, with a cap that covers the stamens and pistil. The calyx is shed after flowering, thus releasing a multitude of fluffy, yellow-colored



stamens.

The fruit is an almost black colored glaucous capsule with a bluish gray coating. It is hard, angular, and divided into 3–4 locules that contain numerous seeds.

The natural habitat of the eucalyptus is **Australia and Tasmania**, where more than 300 species of the Eucalyptus genus are found. In the 19th century, the eucalyptus was introduced in Europe, where it is now perfectly adapted. The present distribution of the species is extended throughout most of the world.

Due to its **rapid growth rate** and powerful root system, the eucalyptus can grow to gigantic size. The tree has a strong and aromatic aroma and is cultivated for wood production, the manufacture of paper pulp, extraction of essential oil, or to obtain chemical products. In addition, it has ornamental value, being widely used in gardens. It has also been particularly used in swampy areas to **eliminate humidity**. This has made it very useful in the control of malaria in many areas of Asia, South America and Southern Europe.

Nonetheless, the water-absorbing capacity makes eucalyptus trees an aggressive species for the environment because they transform ecosystems by drying out the land where they are planted. They also release a substance into the earth that inhibits the growth of other plant species around them. The eucalyptus tree prefers slightly acidic soil and **cool, humid areas**. It is not very resistant to intense cold and is somewhat sensitive to prolonged drought.

Eucalyptus is obtained from the **leaves** of *Eucalyptus globulus L.*

CHEMISTRY

Eucalyptus leaves contain 5–10% water, 5% mineral matter, tannins, resins, **flavonic compounds** such as quercetin heteroside and eucalyptin, **rutin, quercetin and quercetrin, eucalyptin, phenolic acids** such as gallic, ellagic, ferulic, gentisic and caffeic acids, and a complex phenolic heteroside known as **calyptoside**. They also contain other compounds such as ellagitannins, triterpenes (ursolic acid and derivatives), sesquiterpenes, monoterpenes and **essential oil** (0.5–3.5%).

The primary active compound of the essential oil of eucalyptus leaves is cineol or **eucalyptol**, which is predominant, reaching 70–80% of the total.

The rest of the components, which are found in smaller amounts, include α -pinene, piperitone, phellandrene, butyraldehyde, caproaldehyde, α -phellandrene, β -pinene, γ -terpinene, camphene, pineole, citriodorol, globulol, linalol, d-limonene, d-myrtanol, geraniol and thymol.

TRADITIONAL USES

The tree received the generic name "eucalyptus" because of the structure that covers the stamens and pistil of the flower; the Greek word **eu-kalypto** means "well-covered". The blue eucalyptus owes its scientific name to buttons known as "**globulus**", which were in fashion in France at the end of the 18th



century, because they are very similar in shape to the gumnut of the eucalyptus.

The introduction of the eucalyptus as medicinal plant in Western herbal therapy is fairly recent. The eucalyptus first began to be used in the 18th century because, as a tree from other latitudes, its properties only became known when the species was grown in areas distant from its natural habitat. From then until now, the

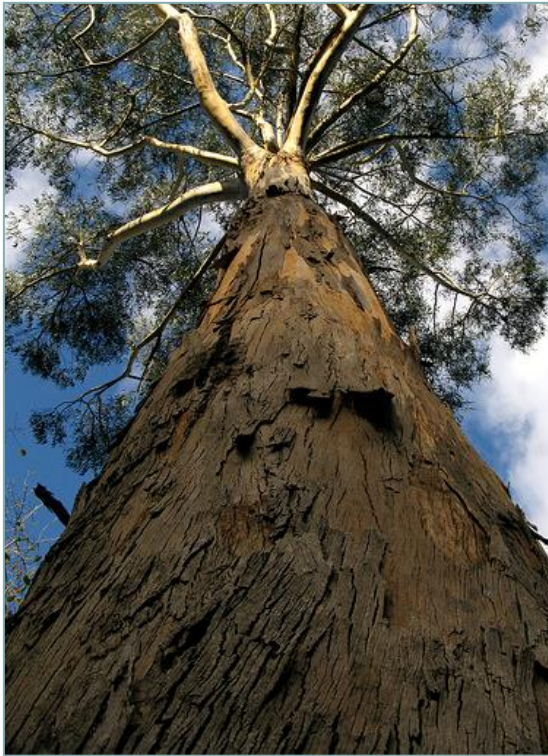
eucalyptus has been considered one of the best plant species for the treatment of diseases of the **respiratory system** and as a **disinfectant**. Ingested eucalyptus products are excreted via the respiratory tract. Therefore, upon dissolution in the respiratory tract, they have a medicinal effect on the respiratory system. The eucalyptus is popularly considered to have the following benefits:

- **Antimicrobial**: It is capable of **eliminating** many **bacteria and fungi**. Application of the essential oil to cultures of staphylococci, *Candida*, *Mycobacterium tuberculosis* and other microorganisms inhibits their growth (bacteriostatic) or can even eliminate microorganisms altogether (bactericide). The release of eucalyptus oil in a closed room eliminates 70% of the staphylococci present in the room. Consequently, this oil is used in countries that have few available resources for **disinfecting the air** and as an insect repellent.

- **Expectorant**: Eucalyptus is used to **clear the airways** of accumulated mucus. Its essential oils are suitable for inhalations to prevent and stop the growth of microorganisms that are harmful for the respiratory system.

- **Anti-inflammatory**: it **reduces inflammation** and improves breathing. In the case of inflammation of the nasal passages, eucalyptus stimulates the villi that cover the nasal passages, causing them to

open and free excess mucus. For that reason, eucalyptus is used to treat bronchitis, flu, pharyngitis, asthma, sinusitis and rhinitis. In addition, because of its pleasing aroma, it is used externally in inhalations and commercial applications to combat these diseases.



- Its **antiseptic and astringent** properties are useful as an **external application** for the treatment of **skin diseases**. The many uses of eucalyptus include application as a treatment for mouth ulcers, **wounds, cuts** and small puncture wounds (as a disinfectant and promoter of healing), in cases of herpes simplex (essential oil diluted in water is used), for **acne** (to reduce blackheads and pimples) and for gingivitis (to reduce gum inflammation).

The **oil** extracted from fresh leaves, which are rich in essential oils, has a refreshing effect. The essential oil has been used for many years in ointments that are rubbed into the chest and back. The oil is applied due to its beneficial effects on the respiratory system, facilitating the dissolution and elimination of mucus from the bronchi. It is an emollient, antipyretic, mucolytic, expectorant, stimulant, tonic, and antirheumatic; and helps to fight bacteria and certain viruses. It is appropriate in cases of diabetes, urinary infection and in the prevention of epidemics.

The **essential oil** of eucalyptus, which has a characteristic balsamic aroma, is a powerful natural **disinfectant**. It is also used in **aromatherapy** as a stimulant and tonic (emotional aspect), and in the physical aspect as an antiviral and expectorant. The oil can also be applied externally and used to relax the feet due to its decongestant and analgesic properties and its effect in stimulating the circulation.

In the **cosmetic industry**, eucalyptus is widely used due to the eucalyptol that it contains, which not only is a good antiseptic and an excellent wound remedy, but it is a highly aromatic component. Thus eucalyptus is present as an ingredient in many products, such as dandruff shampoo, toothpaste, soaps, creams, lotions and air fresheners. The leaves are used to prepare bath sachets and oils.

Eucalyptus and its wood are used primarily for industrial purposes: papermaking, mining, construction, as a fuel source, and in chipboard manufacture. However, it is also necessary for the survival of certain species of animals, such as koalas, which feed mainly on eucalyptus.

COSMETIC PROPERTIES

The principal use of eucalyptus leaves in cosmetics derives from their essential oils and tannin content. Its disinfectant and astringent action makes it valuable as an addition to cosmetic products such as bath gels (as a deodorant), astringent lotions for oily skin, acne treatments, dandruff shampoos, and for purifying products in general.

Astringent: Tannins act topically as astringents, **purifying** and reducing problems caused by an excess sebaceous production. The tannins are local hemostatics and promote blood clotting in wounds, in addition to combining with a variety of substances to form complexes.

Applied topically, tannins make the outermost layers of the skin and mucosa waterproof, thus protecting the underlying layers. Because of their mild vasoconstrictor effect, tannins reduce fluid loss and protect against external aggressions, favoring tissue regeneration (**epithelizing agent**) particularly in cases of superficial wounds and burns (Bruneton, J., 2001).



In addition, eucalyptus leaves, which are rich in **gallic acid**, have valuable **astringent properties** that help to disinfect the skin and promote healing, reducing sebum accumulation (blackheads and pimples) and relieving the inflammation generated by diverse infections and wounds.

For that reason, Eucalyptus is recommended in sebo-regulating and purifying cosmetic products and wound healing agents.

Antimicrobial: Eucalyptus leaves are capable of eliminating many microorganisms that cause skin problems. It has been demonstrated that the application of the essential oil to cultures of microorganisms, such as staphylococci, *Candida*, *Mycobacterium tuberculosis* and others, inhibits microorganism growth (**bacteriostatic** properties) or eliminates them (**bactericidal** or **fungicidal** properties). It also has been observed in various experiments that eucalyptus oil in a closed room eliminates up to 70% of the staphylococci present.

This activity is due in part to the **essential oil** in eucalyptus leaves, since all essential oils exhibit antimicrobial activity to varying degrees. This antimicrobial activity is measured by means of the phenol coefficient. This value indicates the strength or weakness of antimicrobial activity by comparison with that of pure phenol, which has a reference coefficient of 1.00. Phenol is a compound

that has similarities to alcohol and thus is attributed with antimicrobial activity. The larger the phenol coefficient of the essential oil, the greater its antimicrobial activity.

The main component responsible for these properties of eucalyptus leaves is **eucalyptol**, which is also the most abundant component of the essential oil and the component that is responsible for its purifying and antiseptic properties. Other components of the essential oil enhance its antibacterial activity: α -pinene (antiacne, antiviral, antiseptic and antibacterial agent), β -pinene (antiseptic and candidacidal substance), α -phellandrene (antibacterial, anti-staphylococcal and fungicidal agent), γ -terpinene (acaricide), caffeic acid, linalol, geraniol and thymol.

In addition, some essential oils are also **active against the fungi** responsible for fungal and yeast infections (*Candida*). The active doses are low and the doses that are ascertained *in vitro* can be directly extrapolated for external use. Some examples are linalol, geraniol or thymol, which are, respectively, 5, 1 and 20 times more antiseptic than phenol (Bruneton, J., 2001).



Moreover, due to their astringent activity, **tannins** (gallic acid and others) present in eucalyptus leaves are capable of precipitating extracellular enzymes secreted by infective microorganisms. For that reason, these compounds are capable of combating microorganism growth and the damage that they cause (Carretero Accame, M.E., 2000).

Their high **flavonoid** content reinforces the bacteriostatic properties of the leaves.

For that reason, Eucalyptus is highly recommendable in antibacterial, antifungal, and antiseptic cosmetic products.

Anti-inflammatory: Eucalyptus leaves reduce inflammation due to the actions of **eucalyptol**, **thymol**, diverse **acids** and **flavonoids**. In addition, the principal components of the essential oil, **α -pinene**, **limonene** and **β -pinene** also have this property.

Eucalyptus is also a wonderful expectorant, which is why it is often used to open the airways when they are obstructed with a large amount of accumulated mucus. The anti-inflammatory properties of eucalyptus give it an advantage in the treatment of airway diseases, such as bronchitis, flu, pharyngitis, asthma or sinusitis.

For that reason, Eucalyptus is recommended in anti-inflammatory and sedative cosmetic products

COSMETIC APPLICATIONS

Action	Active Ingredient	Cosmetic Use
Astringent	Tannins Gallic acid	Sebaceous secretions regulator Epithelizing agent
Antimicrobial	Eucalyptol Essential oil Tannins Flavonoids	Deodorant Antiseptic Purifying
Anti-inflammatory	Flavonoids Acids Essential oil	Anti-inflammatory Sedative Wound healing agent Antiedema agent

RECOMMENDED DOSAGE

The recommended dosage is 0.5 to 5%.

- Treatment creams: 0.5–2%
- Body creams and/or creams for specific areas: 0.5–2%
- Bath gel: 2–5%
- Shampoo: 2–4%

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