



Eucalyptus camaldulensis properties for use in the eradication of infections

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ABSTRACT

Eucalyptus camaldulensis (*E. camaldulensis*), called the eucalyptus has so many characteristics such as antimicrobial features. Common names include red gum, red chewing gum, river chewing gum, red chewing gum. Its class is *Eucalyptus*, which is comprised of 800 species worldwide, but three or four species are found in Australia. This tree generally grows on the edge of rivers with continuous or seasonal water. Most of the gray clay soils run along the riverside and are exposed to frequent floods, and clay content can save more water into the tree. Pharmacy departments and research groups have focused their attention on the cultivation and production of medicinal plants in many countries. Since plants, due to their particular nature, have inevitable the presence of certain defense mechanisms and antimicrobial agents in the form of androgens, they can be considered as a potential source of antimicrobial compounds. The active ingredient of these plants is primarily alkaloids, flavonoids, pigments, phenolics, terpenes, starches, steroids and essential oils. Recent studies have exhibited its antimicrobial effects against bacterial, fungal, parasitic and viral agents. In this study the effects against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Acinetobacterbaumannii*, *Streptococcus pyogenes*, *Proteus vulgaris*, *Salmonella typhi*, *Shigella* spp., *Candida albicans*, *Candida parapsilosis*, *Anopheles stephensi*, *Aedes aegypti*, *A. aegypti*, *A. albopictus*, *Culex pipiens*, *Trypanosoma brucei*, *Leishmania major*, *Trichomonas. Vaginalis*, *poliovirus type 1*, *coxsackie virus B*, *echovirus 6*, *West Nile Virus*, *herpes virus type 1*, *HSV-1 virus*, *Fusarium* spp., *Aspergillus flavus*, *Aspergillus niger*, *C. albicans*, *Alternaria alternata*, *Setosphaeria turcica* and *Magnaporthe grisea* was revealed.

1. Context

Very long before humans discover germs and the presence of germs, the idea that certain herbs have healing potential and what is now called antimicrobials [1]. There was. From the Old Testament, humans used plants for the treatment of infectious diseases, and still some of these traditional drugs are used as part of native and cure for illness. For example, the use of barberry juice and cranberry juice for the treatment of urinary tract infections; lemon, garlic, green tea as a broad spectrum antibacterial; is still popular [2]. Essential oil is said to be the most widely used in the treatment of infectious diseases of the respiratory system, urinary tract, gastrointestinal and intestinal systems, as well as skin, not their extract. For example, tree tree essential oil is a useful tool for the treatment of acne and other skin infections [3]. In the following, the past, present and future application of herbal medicines, as

antimicrobials and source of natural compounds that can be antimicrobial properties, are discussed. The aim of this study was evaluation of recent data on the properties of *E. camaldulensis* for infections eradication.

2. History of herbs used in the past

Over the past few decades, searches for many new drug disposals in the field of ethnic pharmacology have been sought after new disinfectants. Recueau et al. (1989) reviewed a list of 75 species of plants that were published between 1978 and 1988 and reviewed the articles that were claimed to have antimicrobial effect. In general, the review of these articles showed that phenolic are the dominant active chemical composition in these plants and that the gram-positive bacteria are more sensitive to plant phenolic substances. However, due to the lack of

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uniform and uniform methodology, these contradictory results were observed, which continues to this day. Based on this review, the use of diffusion methods for studying small to medium molecular size compositions and their antimicrobial spectrum was used by most researchers. Recently, the most commonly used classical methods used to evaluate the antimicrobial and antifungal effects of essential oils include agar (paper and pulp disks), propagation methods (agar and liquid fertilizer), and metric turbidimetric and impedometric methods for monitoring microorganisms growth, and for effective factors. The antimicrobial activity of essential oils in the laboratory and their mechanism of action have been investigated [3].

Publications published in Pubmed on the antimicrobial effects of herbs during the period 1966–1994 were about 115, although over 307 articles were published between 1995 and 2004, indicating an increase in interest in this kind of research among a scientific community that examines the properties and characteristics of medicinal plants. Many of these studies focused on plant extracts found in traditional medicine, essential oils, or isolated compounds such as alkaloids, flavonoids, lactones, dipropenes, tryptirps or naproquinones. Some studies have examined the natural flora of a particular region or country, accounting for about 17% of the articles. A group has also studied the effect of a specific herbal drug on a particular pathogen. Group interest has also been high in herbs affecting the beauty of the skin, and skin and nutrient preservatives [3].

The future of this type of study should focus on antimicrobial agents, focusing on ensuring the specific information available on medicinal plants and avoiding the study of plant chemistry. The separation of active compounds should be in line with the effects of medicinal herbs and the principles of uniformity should be used to distinguish their essential effects. In this case, we need to focus on the effects studied and studied deeper and to identify and investigate active compounds of each herb, their possible toxicity in humans and animals. These findings can lead to increased use of medicinal plants, extracts or natural products, alone, in combination, or with antibiotics [3].

However, the opinion of many experts is that studying medicinal plants as antimicrobial agents is necessary to achieve better insight than the herbal flora and the true value of each one, but standardized methods should be used.

Use proper concentrations and solvents. An antimicrobial effect of each antimicrobial herb must be studied and studied where the substance has an antimicrobial effect known and determined, its toxicity must be determined, the ratio and the active fraction of the substance should be determined. Finally, various studies are based on the mechanism of action, their interactions with antibiotics or other compounds of herbs, and the pharmacokinetic index of extracts is a priority [3].

3. Introduction to *E. camaldulensis*

Eucalyptus camaldulensis, called the eucalyptus, is native to Australia, originated from around the world. Common names include red gum, red chewing gum, river chewing gum, red chewing gum. Its synonyms include *Eucalyptus camaldulensis* and *E. rostrata*. Its scientific name derives from two Greek words eu, called good and Kalypto, which means hidden. Eucalyptus is a fast growing tree, resistant to salinity, water scarcity, drought, a range of adaptations and applications. It has a wide natural distribution and has a variety of species.

Eucalyptus is a dark family (Myrthas). Its class is Eucalyptus, which has 800 species worldwide, but three or four species are found in Australia. *E. camaldulensis* is a perennial tree, single stem, large trunk, medium to long height up to 30 m, although reported in height reports up to 45 m. This tree can last up to 1000 years.

This tree generally grows on the edge of rivers with continuous or seasonal water. Most of the gray clay soils run along the riverside and are exposed to frequent floods, and clay content can save more water into the tree [1].

4. Description and shape

The eucalyptus tree is relatively large, usually up to 20 m in height, but rarely exceeds 50 m. In open areas it has a short trunk, but its crown is wide and has many branches. It can have clear branches up to 20 m, but the crowns are light. The southern forms are usually Kamdolodnis, and the Northern forms of it are called Commodels. The skin is 2–1 m. The base of the tree is quite rough and rough. The higher the skin is, the smoother it becomes, the cream will be white to light gray with red spots. Its leaves are yellowish in green, and the flowers come from the end buds. Its flowers are fairly round shape.

5. Natural and artificial dispersal

This plant is from the dark family of a case and a large genus *E. camaldulensis*, which itself has 700 subspecies. It has the widest natural distribution among all tree species and is found in all Australian lands. It usually grows on the margins of the rivers. Eucalyptus camaldulensis is widespread throughout Australia's water resources. It is often a common ingredient in riverside communities and is an ecological and economic symbol for the Australian community. While Eucalyptus is larger than other demographic groups in Australia, and most of the trees in this land, today they are widely distributed in other countries, including Argentina, Chile, Orange and the tropical regions of Brazil, South Africa and India., And is grown and multiplied in more than 70 countries in general; it has been in Iran for about half a century and has been planted in the southern regions of the country, and so far its old trees in Fars, Khuzestan and Saravan (Table 1).

6. Eucalyptus extract compounds

Eliasy et al. (2012) concluded that the Eucalyptus extract contains various elements and is the most common substance in the extract of this cineol tree in a study to study the compounds in the extract of 8 species of eucalyptus. The following are the most commonly used compounds of Eucalyptus extract and oil.

7. *E. camaldulensis* oil

Eucalyptus oil is a basic oil derived from this tree that exists in tree leaves and can be isolated by distillation of water or steam [4]. This oil forms about 5% of the leaf mass and is in the category of 58 compounds. These values vary between different species and seasons and different geographic regions, but the main combination is unquestionably 1 and 8-cineol, also called eucalyptol, and it is reported to account for about 92% of oil [5]. Other compounds found in the above are comotene, alpha, beta-pinene, and py-siamen [4]. Essential oils are volatile, and Eucalyptus oil is due to the presence of alcohols, ketones, aldehydes, monoterpenes, hydrocarbons, and terpenoids in the oil-forming compounds; these compounds are the main constituents of terpinene-4-4 and alpha-terpinole, and 1 & 8-Cineole [6].

Terpenes are the products of the five carbon isoprenes, and are divided into groups based on their carbon structure. The most commonly used compounds are the most basic oils. Terpinene-4-El belongs to the monoterpenes group of the terpenes, because it has ten carbons, and this is a terpenoid that is modulated by a cyclic reaction and acts on

Table 1
Common compounds found in *E. camaldulensis* extracts.

<i>p</i> -Cymen-8-ol	α -Terpineol	Pinocarvone	α -Pinene	Viridiflorol
<i>cis-p</i> -Mentha	Verbenone	Terpinene-4-ol	Limonene	Spahulenol
Caryophyllene oxide	PHellandral	Aromadendrene	1.8-Cineole	Carvacrol
Epiglobulol	Cuminal	tr-Pinocarveol	γ -Terpinene	α -Eudesmol
Globulol	tr- <i>p</i> -Mentha	Cryptone	<i>p</i> -Cymene	β -Eudesmol

the cell wall of the bacteria.

We know that Eucalyptus oil has antibacterial and anti-fungal properties, although these properties require that the eucalyptus leaf contains at least 70% cineole, which can be used for medicinal and medicinal use [7].

Australians were the first people to use Eucalyptus for therapeutic purposes. They cut the eucalyptus leaves and used to treat wounds and fungal infections, and soaked the leaves of the tree and used it to open and remove the throat itching [8]. In modern medicine, Eucalyptus oil is often applied directly to the skin, either in the form of a cream or ointment, sprayed or inhaled. It is still used to relieve symptoms such as burns, nerve pain, coughing, ringworm, diabetes, asthma, genital herpes, cancer, and arthritis [9].

8. 1 and 8 Cineol

1 and 8 - Cineol is found in the essential oil of medicinal plants and trees and is one of the main elements of rosemary, lemon, lavender, grapefruit, and peppermint [10]. Studies on the antimicrobial effects of this substance indicate broad-spectrum effects on gram-positive and negative bacteria as well as *Candida albicans*, and it has been determined by the study of biofilms that this effect has a lasting effect [11,12].

It is a monotropic substance that contains carbon, hydrogen and oxygen atoms. A cyclic ether, which has a membrane permeability through the effect on the horny layer of the skin (SC), and polar groups and lipid droplets of the intracellular lipids, has led to a change in its regularity and not by a mechanism that is still known, For impenetrable materials that could not pass through the skin, it allows for entry, thus increasing the permeability of the cell membrane. This mechanism is used in drugs that can be combined with cineol and have the potential of coupling with water-loving compounds as well as lipophilic drugs [13].

Terpenes have been approved by the US Food and Drug Administration (FDA) as safe substances, and terpenes such as 1-8-cineole are safe and have complications such as mild skin-free mucosal irritation and have been licensed for cosmetics and dyes for several years. Have According to the report, cineol changes the skin's lateral chain and does not affect the main building chain [13].

9. Toxicity

Eucalyptus species contain high levels of phenolic and terpenoid compounds that can be toxic. Animals like Kuala Lakes, who feed on eucalyptus, have methods to detoxify these compounds in their liver. In addition, they have bacteria in their natural flora that break the tannin-protein compound, most animals do not have this ability.

The use of oils, extracts, fresh or processed fruits has been associated with side effects. A number of specific compounds that can be toxic or lead to side effects include: 1-8-Cineol, Cyanogenic glycosides, Ritin, Tannins. Most studies have done on the toxicity of Eucalyptus compounds on rodents, but most reported cases have been human-related, with little information available on domestic animals and breeding.

Excessive consumption of Eucalyptus oil in humans can cause gastrointestinal irritation, abdominal pain, vomiting, seizures, reduced respiration, and suppression of the central nervous system and may lead to death. Data on human deaths after eucalyptus oil consumption are not very accurate. Death reports are due to the use of 5–4 ml of oil, while reports of safe oil use are available up to 220 ml. According to studies on rodents, the Eucalyptus lethal dose in animals (which consumes at least 50% of the animals consumed) is very high and is about 4.44 g per kilogram.

It is believed that *Eucalyptus* compounds are not carcinogenic or contaminate breast milk. However, it has been reported in studies that citronella and flandernia in the tree can be mutagenic and carcinogenic,

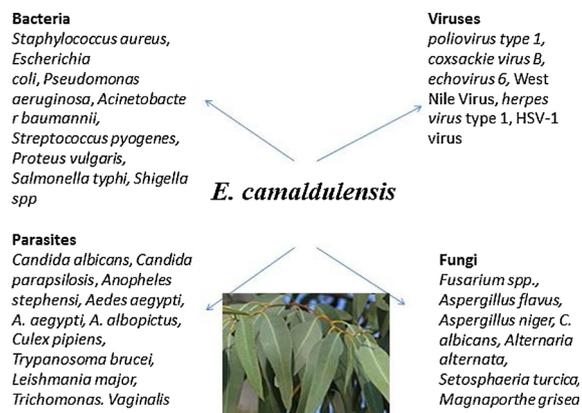


Fig. 1. The antimicrobial and anti-parasitic properties of *E. camaldulensis*.

respectively.

Determining the toxicity and side effects of Eucalyptus can be difficult because the type and amount of compounds depends on the species, age of the leaves, the method used to dry the leaves, buds or trunk, and the method of preparation of oil and its extract. In addition, references to Eucalyptus side effects have not been used. However, the US Food and Drug Administration has authorized the use of Eucalyptus oil and 1 and 8-cineole for humans. The European Commission has also approved the use of Eucalyptus as an additive to food (at 15 ppm).

10. Antimicrobial and antiparasitic effects

Antibacterial effects against multidrug-resistant *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans* and *Candida parapsilosis*, *Acinetobacter baumannii*, nematodes and some other species depicted in Fig. 1 [14–20].

11. Conclusion

Pharmacy departments and research groups have focused their attention on the cultivation and production of medicinal plants in many countries. Since plants, due to their particular nature, have inevitable the presence of certain defense mechanisms and antimicrobial agents in the form of androgens, they can be considered as a potential source of antimicrobial compounds.

Conflicts of interest statement

The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest or non-financial in the subject matter or materials discussed in this manuscript.

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