

Phytochemical and pharmacological studies of *Eucalyptus globulus*: A review

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Abstract

Eucalyptus (*Eucalyptus* spp.), is a large genus of the *Myrtaceae* family, which includes 900 species and subspecies. This evergreen tall tree is native from Australia and Tasmania and is the second largest genera after acacia. In particular, the species *E. globulus* is widely used in the pulp industry, as well as for the production of eucalyptus oil extracted on a commercial scale in many countries as raw materials in perfumery, cosmetics, food, beverages, aromatherapy and phytotherapy. The 1,8-cineole (eucalyptol), is the principal and the most important constituent extracted from eucalyptus leaves, demonstrates antimicrobial and anti-inflammatory activities. Despite the fact that the healthy effects of eucalyptus have been well established by research, further studies are necessary to investigate other prime effects of the plant and its possible implication in the treatment of a greater number of pathological conditions.

Introduction

Eucalyptus oil is essentially obtained from fresh leaves of the tall, evergreen eucalyptus tree. Its species belong to the group of medicinal plants that naturally contain volatile oils [1]. The uses of the oils, particularly that of *Eucalyptus citriodora*, can be explored from field to final products that come from agricultural practices. The essential oil is created by steam distilling the leaves of the *Eucalyptus* tree. It's a colourless, pale-yellow oil with a camphoraceous aroma used traditionally in vapor rubs to treat coughs.[2] Many challenges posed by fungi and insects attacking agricultural products can be mitigated or eliminated completely by proper application of the oils with the belief that they are safer, cheaper to obtain, and environmentally friendly without having adverse and undesirable effects on nontarget organisms, which are some of the shortcomings of synthetic pesticides. From research reports highlighted in literature, the volatile oils of *Eucalyptus* can provide tremendous solutions as antimicrobial and insect repellent agents in food sciences in addition to its numerous uses and applications in pharmaceutical and medicinal areas.[3] *Eucalyptus* essential oil contains the naturally occurring constituent eucalyptol, which provides an invigorating sensation on the skin when applied topically and creates a refreshing breathing experience when inhaled or diffused.

Overview of *Eucalyptus*

The tree of *Eucalyptus* scientifically classified as *Eucalyptus Globulus* is also known as fever tree, blue gum tree or stringy bark tree. *Eucalyptus* contains many different chemicals. These chemicals might have various effects in the body. Also, some investigators suggest that eucalyptus may have activity against bacteria and fungi. [4] People use eucalyptus for many conditions including asthma, bronchitis, flu (influenza), and many others, but there is no good scientific evidence to support these uses.

Botanical Specifications

Eucalyptus glabrous is a broadleaf evergreen plant that can attain the maximum height of about 70 m as evidently found in Europe [5]. The bark of tree is hard, rough and deeply furrowed. Although more than 700 different species of this plant are found to exist but *Eucalyptus glabrous* is the most widespread among all other species in East Bay [6]. The most readily recognizable characteristics of eucalyptus species are the distinctive flowers and fruit (capsules or gum nuts). Flowers have numerous fluffy stamens which may be white, cream, yellow, pink or red in colour. In bud, the stamens are enclosed in a cap known as an operculum which is composed of the fused sepals or petals or both. Thus flowers have no petals, but instead decorate themselves with many showy stamens. As the stamens expand, operculum is forced off, splitting away from the cup-like base of the flower; this is one of the features that unite the genus [7]. The fruit looks like cone shaped woody capsules called "gum nuts", distinctive for the genus and their fruiting period is autumn and winter. The seed morphology of *Eucalyptus globulus* is extremely variable. Shape, size, colour and surface ornamentation are strongly inherited traits and indicative of taxonomic groups.

Eucalyptus globulus has a fresh mint like smell and a spicy, cooling taste and has various concentrations of minerals. *Eucalyptus* is naturally occurring cellulose or protein, while synthetic fibres are not found and identification of lipid constituents showed that this plant contains cutin and soluble lipids. *Eucalyptus* essential oil is colourless and has a distinctive taste and odour and typical volatility. Essential oil of *eucalyptus* is highly flammable and contains carbon di oxide.

Chemical Composition

Essential oil of *Eucalyptus glabrous* is composed of mixtures of volatile organic compounds including hydrocarbons, alcohols, aldehydes, ketones, acids, ethers and esters. Most of the components are monoterpenes and sesquiterpenes in nature which consist of two or more isoprene (C₅H₈) units. Essential oil has various concentrations of calcium, nitrogen, phosphorus, iron, manganese, zinc, boron and copper[8]

Phytochemistry

The essential oils obtained from the leaves, bare branches, flower buds and mature fruits of *Eucalyptus globulus* contain large number of highly valuable chemical compounds. The leaf oils were found to contain 1,8-cineole (4.10–50.30%) depending upon maturity and origin of their collection site. Other major components of the leaf oils are α -pinene (0.05–17.85%), p-cymene (trace-27.22%), cryptone (0.00–17.80%) and spathulenol (0.12–17.00%). In contrast, the essential oil of fruit, bud and branch oils is known to contain α -thujene (0.00%, 11.95% and trace respectively), 1,8-cineole (15.31%, 36.95% and 56.96% respectively) and aromadendrene (23.33%, 16.57% and 8.24% respectively).[9]

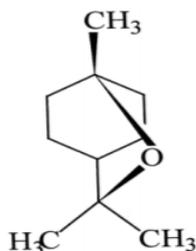


Fig 1 Chemical structure of 1,8-cineole

Pharmacological Uses

Eucalyptus globulus oil is used as an anti-septic and anti-spasmodic stimulant agent in bronchitis, asthma and minor respiratory complaints [10]. By using externally, it has increasing effects on blood flow and skin temperature. Therefore, it has been used in semi-solid dosage forms for the treatment of cough, to promote scar formation in burns and injuries and as an anti-rheumatic agent. It is used as an inhalant because 1,8-cineole is a well-known medicinal component that causes a sensation of cold and this is accompanied with a facilitated respiration [22]. Thus it is often inhaled in asthma, pharyngitis and related conditions [23].

CONCLUSION

In conclusion, studies conducted on *eucalyptus* plant demonstrated its pharmacological activities, due to the multitude of compounds contained in the leaves, stem and roots [13], that explain the traditional use of the plant as an antiseptic and in the treatment of respiratory tract infections.[14] Among the genus *Eucalyptus*, the species *E. globulus* is the most widely cultivated in the subtropical and Mediterranean regions, which reach a therapeutic importance thanks to its phytochemical's compounds. However, despite the several known healthy effects of *eucalyptus* plant, further studies are necessary to investigate other prime effects of the plant and the possible implication in the treatment of other pathological conditions, and in case of plant toxicity, the diffusion of injuries prevention strategies.

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