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Phytochemical and pharmacological profile of *Eucalyptus globulus*

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Abstract

Eucalyptus is a manifold genus of flowering trees and bush in the myrtle family, Myrtaceae. Medicinal plants play an important role in world health and one of the primarily used agents for ages for the treatment and to cure several diseases. *Eucalyptus* is commonly known as the blue gum which contains the constituents such as flavonoids, alkaloids, tannins and propanoids which are present in the leaf root and stem of the plant. The phytochemical and pharmacological studies reported in this review confirm the therapeutic value of *Eucalyptus globulus* which exhibits various properties like anti-inflammatory, anticancer, antibacterial and antiseptic.

Keywords:

Eucalyptus globulus, Antibacterial, Anticancer, Anti-viral

Introduction

Eucalyptus is the evergreen, tall tree, or bush, belonging to the Myrtaceae family. Although it is native to Australia and Tasmania, nowadays it has rapidly spread to other countries. It necessarily follows that the term *Eucalyptus* oil is meaningless from a scientific point of view unless the species from which it is derived is stated. There are great numbers of species of eucalyptus trees yielding essentials oils, the foliage of some being more odorous than that of others, and oils from the various species that differ widely in nature. Leaf extracts of eucalyptus have been approved as food additives and also used in cosmetic formulations. *Eucalyptus* species are remarkable for their rapid growth. Some species of them, in their natural habitat, attain gigantic sizes and are among the tallest trees in the world. Most of the species are popularly called “gum trees”. *Eucalyptus globulus* has a long history of rich medicinal values. Many studies have been carried out to extract various natural products for screening antimicrobial activity but attention has not been focused intensively on studying the combinations of these products for their antimicrobial activity. One of these medicinal plants, many species of the genus *Eucalyptus* from the Myrtaceae family are used in many parts of the world for the treatment of a wide variety of diseases including microbial infections.



Fig1. *Eucalyptus* Tree



Fig 2. Leaves of *Eucalyptus*



Fig 3 .Flower buds and opercula of *Eucalyptus*



Fig4. *Eucalptus* bark

Table 1. Vernacular names of *Eucalyptus globulus*

Vernacular names	
Hindi	<i>Neelgir</i>
English	<i>Gum Eucalypt</i>
Latin	<i>Eucllyptus globules</i>
Kanned	<i>Nilgiri</i>
Gujrati	<i>Harit Parn</i>
Sanskrit	<i>Tail Parn</i>

Table 2. A taxonomic account of *Eucalyptus globulus*

Kingdom	Plantae
Division	Flowering plants
Class	Dicotyledons
Family	Myrtaceae
Order	Myrtales
Genus	<i>Euclayptus</i>
Species	<i>Eucalyptus globulus</i>

The botanical version of plants

Leaves

Nearly all *Eucalyptus* are evergreen but some tropical species lose their leaves (Fig. 2) at the end of the dry season. *Eucalyptus* trees are usually towering and fully leafed, their shade is characteristically patchy because the leaves usually hang downwards. Moreover, the leaves are alternate, drooping on flattened yellowish petioles 1.5-4 cm long, narrowly lanceolate, 10-30 cm long, 2.5-5 cm wide, mostly curved acuminate at tip, acute at base, entire glabrous, thick, leathery, with fine straight veins and inside marlin, shiny dark green on both surfaces.

Flowers

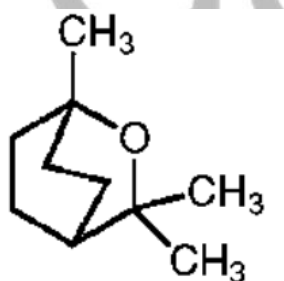
The flowers (rarely 2-3), at the leaf base, more than 5 cm across, the very numerous, white stamens 12 mm long. The buds appear top-shaped, 12-15mm long, and 12-25 mm wide. Stamens are many threadlike, white, anthers oblong opening in broad slits with round gland; pistil with inferior 3-5 celled ovary and long stout style.

Seeds

The seeds are many irregularly elliptical, 2-3 mm long, and dull black.

Microscopic depiction and photochemistry of plant

The composition of lipophilic extractives in the chloroform soluble fraction of the acetone extract from the *Eucalyptus globulus* wood has been examined. The lipids extract was fractionated by solid-phase extraction aminopropyl-phase cartridges into four different fractions of increasing polarity. The total lipid extract and the resulting fraction were analyzed by gas chromatography and gas chromatography-mass spectrometry, using high-temperature capillary columns. The main compound identifies include sterols, sterol esters, fatty acids, steroids ketones, hydrocarbons and triglycerides. Minor compounds such as fatty alcohols, mono & triglycerides, waxes and tocopherols were also identified among the lipids from *E. globulus* wood. The essential oils consisted mainly of oxygenated sesquiterpenes. Of these, 1, 8 eucalyptol (72.71%), α -terpineol (2.54%), terpinen-4-ol (0.34%), and linalool (0.24%) were the main oxygenated monoterpenes.



1,8-cineole (eucalyptol)

Fig 5: Chemical Structure of *Eucalyptol*

47 constituents of the essential oil from *Eucalyptus globulus* Labill grown in the cangshan mountain region in the Yunnan province of china were successfully identified and determined.

Pharmacological potentials

Antibacterial activity

A 50 % ETOH extract of *Eucalyptus globulus* leaves have antibacterial activity against oral pathogenic microorganism with the MIC value ranging from 0.20 microorganism/ml. A 50 % ETOH- soluble material was extracted from the dried leaves of *E. globulus* to show appreciable antibacterial activity against *S.mutansingbritt* and

p.gingivalis. The antibacterial activity of *E.globulus* leaf extract has been determined against *staphylococcus aureus*, *streptococcus pyogenes*, *streptococcus pneumonia* and *Haemophilus influenzae* obtained from 200 clinical specimens of patients with respiratory tract disorder.

Diuretic activity

Plant part used in this Eucalypt oil. An emulsion made by shaking up equal parts of the oil and powdered gum-Arabic with water has been used as urethral injections.

Antimycotic activity

Freshly prepared camphor oil from *E. globulus* with or without glycerol dilutions gave a complete cure of human facial demodicidosis with a concentration of 100%, 75%, and 50%. *Eucalyptus globulus* leaf extracts and oil showed antifungal property as they progressively inhibited the growth of *Malassezia furfur* on sabouraud's dextrose agar medium.

Anti-inflammatory and Anti-asthmatic activity

Hexane extract of leaves, ethanol extract of fruits and leaves of *E. globulus* inhibited dependent histamine release from RBL-2H3 cells. 1.8- cineole, a major constituent present in volatile oil of *E.globulus* is a strong inhibitor of cytokines, that might be suitable for long-term treatment of airway inflammation in bronchial asthma and other steroid-sensitive disorder. *E. globulus* oil has an anti-inflammatory effect on chronic bronchitis induced by lipo poly-saccharide in rats and the inhibition effect on hypersecretion of airway mucins.

Anti-diabetic activity

Eucalyptus globulus is used as a traditional treatment for diabetes. Incorporation of *E. globulus* in the diet (62.5 g/kg) and drinking water (2.5 g/l) reduced the hyperglycemia and associated weight loss of streptozotocin-treated mice. An aqueous extract of *E.globulus* (0.5 g/l) enhanced 2-deoxy-glucose transport by 50 %, glucose oxidation by 60 % and incorporation of glucose into glycogen by 90% in the abdominal muscle of mice. These data indicate that *Eucalyptus globulus* represent as an effective anti-hyperglycemic dietary adjunct for the treatment of diabetes and a potential source for the discovery of new orally active agents for therapy.

Wound healing activity

Intradermal administration of the essential oils from the leaves of Eucalyptus hybrid and seeds of *Seseli indicum* increased cutaneous capillary permeability when tested in Evan's blue-treated rabbits. This effect may be beneficial in their probable wound healing activity.

Anti-malarial activity

Eucalyptus globulus oil significant action against plasmodium species. It is a popularly used anti-malarial plant in Brazil. Intra-gastric administration of *Eucalyptus* leaf extract to mice (100 mg/lb body weight) did not inhibit the growth of *Plasmodium berghei*. Furthermore, administration of an aqueous or chloroform leaf extract to chickens by

gastric lavage did not inhibit the growth of *P.gallinaceum*. An ethanol-water extract of the leaves inhibited the growth in vitro of *P. falciparum* at a concentration of 75 mg/ml.

Hepatoprotective activity

Ursolic acid isolated from the leaves of Eucalyptus hybrid *E.terericomis* showed a dose-dependent (5-20 mg/kg) hepatoprotective activity (21-100%) in rats against thioacetamide galactosamine and carbon tetrachloride-induced hepatotoxicity.

Anti-plaque

Eucalyptus globulus may be useful in inhibiting dental plaque formation.

Antitumor

The antitumor-promoting activity of Euglobals Ia₁, Ia₂, Ib, Ic, IIa, IIb, IIc, III, IVb, and V and VII have been tested in vitro on 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced Epstein-Barr virus early antigen activation test system. Euglobal-III showed strong inhibitory activity, followed by euglobals Ib, IIa, Ic, Ia₁, Ia₂.

Antiviral

Twelve *Euglobals* from *Eucalyptus globulus* and their twenty-six related compounds were examined for their inhibitory effects on Epstein-Barr virus activation by a short-term in vitro assay. The results showed that most of the *Euglobals* having monoterpene structure, and *Euglobal-III* had a strong inhibitory activity. *E.globulus* oil has antiviral activity against herpes simplex virus.

Antioxidant

The method extract of *Eucalyptus globulus* showed efficiency in preventing the oxidation process.

Cytochrome p450 enzyme inhibitor

Eucalyptus oil is defined as an inhibitor of the six major cytochrome p450 enzymes with IC(50) value between 20 and 1000 µg/ml.

Intestinal fructose absorption inhibition

Eucalyptus globulus leaf extract inhibits intestinal fructose absorption and surpasses adiposity due to dietary sucrose in rats.

Larvicidal

Eucalyptus globulus leaves have potent action against *Culex quinquefasciatus* and *Culex tritaeniorhynchus*.

Conclusion

The extensive survey of the literature confirmed that *Eucalyptus* species is an important source of many pharmacologically and medicinally important chemicals, such as Essential oils, terpenoids which have also been widely studied for various pharmacological activities like analgesic, antifungal, antibacterial, antimalarial, antidiabetic, anti-inflammatory, antioxidant, anti-plaque, antitumor, cytochrome p450 enzyme inhibitor, hepatoprotective activities. Although aromatherapy is pleasant, inexpensive, and has few side effects (except for rare allergies), there is little evidence that it is effective in patients undergoing medical interventions. However, future studies are demanded to completely investigate other prime effects possessed by the plant to be named as a beneficial herbal supplement. Besides, *Eucalyptus globulus* oils, as plant secondary metabolites, offer many possibilities as natural preservatives in perfumery and food industries.

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