Eucalyptus - essential oil and herbal medicine

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Introduction

Eucalyptus is one of the most widely used essential oils in the world, however the therapeutic applications of the *Eucalyptus* genus goes well beyond that of the essential oil. Non-volatile constituents have been identified, many of which have been shown to have beneficial effects in humans. From my perspective as an Australian herbalist and naturopath, I believe Eucalyptus is one of our most under-used herbal medicines.

This review is in two parts – part 1 deals with the essential oil, while in part 2 I will focus on therapeutic aspects of the non-volatile constituents.

Part 1: Eucalyptus oils

Eucalyptus (family Myrtaceae) is a genus of evergreen trees, with well over 600 species and even more sub-species and varieties. Recently, over 100 species were reclassified from *Eucalyptus* to a new genus *Corymbia*, hence *E. citriodora* is now officially *Corymbia citriodora* (Hill & Johnson 1995). In general language, the term eucalypt can be used to describe species of *Eucalyptus, Corymbia* and *Angophora*.

I would like to acknowledge that we have learned a great deal from Australia's Aborigines regarding a multitude of uses for eucalypts. Such traditional applications as infusions of leaves to relieve head colds, steam inhalations, poultices and other topical applications are used by aromatherapists and herbalists alike. In addition, the sticky gum exudate (kino) from eucalypt trees was applied to cuts and wounds as an antiseptic healer, a practice which is well documented (Williams, 2011) but not often used today.

Which species is best?

The preferred species for essential oil production are those whose leaves have a high content of 1,8-cineole (aka cineole or eucalyptol), it being the main expectorant and decongestant component of Eucalyptus oil, and the most reflective of the familiar Eucalyptus odour. *E. globulus,* the most widely cultivated species globally, usually requires repeated distillations and rectification to obtain sufficiently high levels of 1,8-cineole. In this process, some secondary constituents are reduced or eliminated - a concern for aromatherapists since they include terpenes and alcohols whose antimicrobial actions help to reinforce the mucolytic action of cineole, and may endow the oils with a gentler action when applied topically.

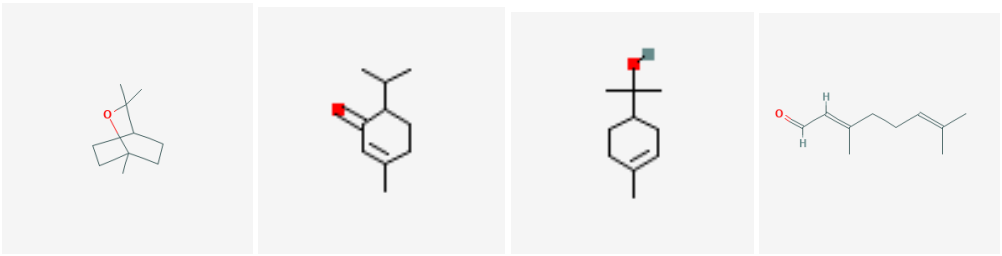
Antimicrobial actions of cineole and other essential oil constituents are due in part to their ability to disrupt bacterial membranes (de Oliveira et al, 2015).

A brief overview of the main species used for medicinal purposes follows:

Eucalyptus globulus, the Tasmanian blue gum, is often used in the form of an applied or inhaled oil to treat bronchitis, influenza, common cold, asthma, sinusitis and laryngitis. External applications relieve muscular and rheumatic pains.

There is variation in constituent profile between leaves gathered at different points of the life cycle. For example, one-year old leaves retain the immature round-leaf shape which produce a different fragrance from distilled adult leaves (Schnaubelt, 2011). Oil distilled from the fruit of this species contain significant levels of aromadendrene, a potent antimicrobial that kills multi-drug resistant bacteria more effectively than the other main constituent, cineole. Additionally, synergism was found to occur between aromadendrene and cineole against MRSA (Mulyangingsih et al, 2011).

Eucalyptus dives, the broad-leaf peppermint, is common across much of south-eastern New South Wales and Victoria. This tree yields high levels of essential oils in its leaves (up to 4%), the main constituent being the ketone, piperitone. A chemotype known as *E. dives* var. C contains 70% cineole with terpineol and citral, making it a most sought after eucalyptus oil. Another chemotype contains the fragrant α-phellandrene. These two chemotypes treat lower respiratory tract infections, and may have mild broncho-dilating effects (Webb, 2000).



1,8-cineole piperitone α -terpineol trans-citral (geranial)

Figure 1. Representative constituents of Eucalyptus oils.

Structures obtained from PubChem open chemistry database.

E. radiata, the narrow-leaf peppermint, has several chemotypes. Oil from one of these, often referred to as *E. australiana*, contains 65-72% cineole along with α-terpineol, α-pinene, geraniol and citral. The latter constituents impart a refreshing aroma to the oil, while its gentle action reflects the harmonious balance of constituents. A potent antiviral, this oil inhibits both herpes and influenza viruses, and helps prevent the progression of colds and respiratory tract infections. For influenza treatment, strong chest rubs are recommended using doses up to 2mL at a time, using oils distilled from *E. radiata* or *E. dives* (Schnaubelt, 2011).

E. polybractea or blue mallee is a dwarf form of *Eucalyptus* found in drier regions of New South Wales and Victoria. It produces high quality oil consisting of 75-90% cineole as well as cymene, australol, cuminal, phellandral and cryptone. Despite having been cleared from much of its range for wheat cultivation, blue mallee is still the most commonly distilled Eucalyptus oil in Australia. It is used in a similar way to *E. globulus.*

E. melliodora or yellow box is a common species on the basaltic soils of mid-western NSW and beyond. For several years, I lived in the region west of Merriwa and distilled this oil from trees at the "Burnbrae" property. Upon analysis, the oil contained 71% of 1,8-cineole and 13.7% of pinene (Pengelly, 1999). This level of cineole is higher than is recorded elsewhere for the species, and the chemical profile certainly meets the requirements for medicinal purposes.

*Corymbia citriodora (*syn*. Eucalyptus citriodora)*, the lemon-scented gum, is a tall forest tree from Queensland, and is cultivated as an ornamental in the southern states. The leaf essential oil contains citronellal, citronellol, citriodoral and esters. Indications for its use include viral and bacterial infections, dyspepsia, colic and mature onset diabetes. Externally, *C. citriodora* oil is widely used in insect repellant products and, due in part to these properties, it is the most widely researched and traded oil among eucalypt species (Barbosa, Filomeno & Teixeira, 2016). It was found to inhibit MRSA and other bacteria, while the most potent constituent in the oil was shown to be citronellol (Mulyangingsih et al, 2011).

Eucalyptus stageriana, the lemon ironbark*,* has a rich lemon odour due to a high content of citral. In one study this oil was found to inhibit all microorganisms for which it was evaluated, at a potency four time that of a standard antibiotic (Barbosa, Filomeno & Teixeira, 2016).

Table 1: Eucalypt oil profiles

Genus	Species	Common name	Major constituent	Minor constituents
Eucalyptus	*globulus*	Tasmanian blue gum	1,8-cineole	α-pinene
	radiata	narrow leaf peppermint	1,8-cineole	α-terpineol citral
	dives	broad leaf peppermint	piperitone	phellandrene
	polybractea	blue mallee	1,8-cineole	p-cymene
	stageriana	lemon ironbark	citral	α-phellandrene
	melliodora	yellow box	1,8-cineole	α-pinene
	smithii	gully gum	1,8-cineole	α-pinene
Corymbia	*citriodora*	lemon scented gum	citronallal	citronellol

Penetrating properties of Eucalyptus oil

Essential oils are known for their ability to penetrate skin layers, and high-cineole Eucalyptus is regarded as the most penetrating and stimulating of all. This property has been exploited as a

solvent for cutting grease and fat, in the manufacture of paint-stripping agents, in household cleaning products and even as a fuel additive (Boland, Brophy & House, 1991).

The combination of penetration and oil solubility makes for good adjuvants to increase skin absorption of hormones and steroids (Williams, 2011), an application that aromatherapists can also make use of to improve absorption of topical medications.

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