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Eucalyptus camaldulensis: Phytochemical composition of ethanolic and aqueous extracts of the leaves, stem-bark, root, fruits and seeds

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Abstract

Phytochemicalsare active secondary plant metabolites responsible for most of the claimed medicinal activities of plants. Eucalyptus camaldulensis is one of those plants that possess these phytochemicals and claimed to possess medicinal activities on various ailments. The phytochemicals constituents of various parts of this plant were investigated using standard methods of phytochemicals screening in both aqueous and ethanolic extracts. Qualitative screening revealed that tannins, saponins, glycosides, steroids and anthraquinones were present in aqueous extract of all the parts of the plant, whereas alkaloids, flavonoids and terpenoids were absent. On the other hand, tannins and steroids were present in the ethanolic extract of all the parts of the plant, while saponins, alkaloids, flavonoids and terpenoids were present only in some parts of the plant. However, glycosides and anthraquinone were absent in all the ethanolic extracts. The quantitative screening revealed large amount of saponins in both aqueous and ethanolic extracts across the various parts of the plant. Whereas small amount of tannins, alkaloids and flavonoids were found only in the ethanolic extract of some parts of the plant. The presence of these phytochemicals in *Eucalyptus camaldulensis* could therefore justify the applications of the plant in management and curing of various ailments as claimed traditionally.

Keywords: *Eucalyptus camaldulensis*, Phytochemical screening, Aqueous extract, Ethanolic extract.

Introduction

Plants are considered as largely complicated chemicals factories which can turn the relatively simple ingredients of air and water into so many compounds including liquids and oils.[1] Plants have been serving the animals' kingdom as its source of energy (food, fuel) as well as its means of shelter. In addition to the source of energy, plants have been synthesizing a large variety of chemical substances. These substances in addition to basic metabolites include, phenolic compounds, terpenes, steroids, alkaloids and other chemicals substances which as known as "secondary metabolites" which have prominent effect on the animals systems and some possess important therapeutic properties which can be and have been utilized in the treatment and cure of human and other animals diseases for many centuries. Secondary metabolites differ from plants to plants. The plants which produce and accumulate constituents have medicinal values are generally designated as "medicinal plants'.[1]

The *Eucalyptus* tree is a large, fast-growing evergreen that is native to Australia and Tasmania. The tree can grow to 375-480 feet (125-160 meters). *Eucalyptus* trees belong to the myrtaceae family. Their name originates from the Greek word "eucalyptol" which means "well covered". Eucalyptus trees thrive in environments that maintain average temperatures of about 60^0C.

Eucalyptus trees are well known for the medicinal properties of the oil contained in their leaves. The oil was used in traditional aboriginal medicines to heal wounds and fungal

infections. Teas made of *Eucalyptus* leaves were also used to reduce fevers. *Eucalyptus* soon spread to other traditional medicine systems, including Chinese, Indian and Greek and European. *Eucalyptus* oil is believed to possess a wide variety of healing properties. It works very effectively as an antibiotic that is particularly successful against some strains of bacteria. The oil also possesses anti-inflammatory properties. It can help stimulate the flow of blood and works to ease muscle and joint pain. *Eucalyptus* oil also acts as an antiseptic and works well in treating sore throats, mouth sores, gum disease and gingivitis. The essential oil from the leaves is used as a disinfectant and in medicinal applications. Although *Eucalyptus* oil has been used orally to treat some conditions, the oil is toxic when taken by mouth and must be diluted.[2]

Eucalyptus is used in many medicines to treat coughs and the common cold. It can be found in many lozenges, cough syrups, rubs, and vapor baths throughout the United States and Europe. Herbalists often recommend using fresh leaves in teas and gargles to soothe sore throats and treat bronchitis and sinusitis. Ointments containing eucalyptus are also applied to the nose and chest to relieve congestion.[3]

Materials and Methods

Collection and Preparation of Plant Materials

Fresh leaves, stem-barks, roots, fruits and seeds of *Eucalyptus camaldulensis* were collected from Aliero town. These were air dried at room temperature under shade. The dried leaves, stem-bark, roots, fruits and seeds of the plant were grounded into powder form. 20 g of powder in each case was then dissolved in 200 ml of ethanol and distilled water separately,then filtered.The filtrate was allowed to evaporate in an oven at 40^0C for 72 hrs.

Phytochemical Screening (Qualitative and Quantitative Analyses)

The phytochemical screening was done according to the methods reported in literature.[4-6]

Results

The Phytochemical constituents of *Eucalyptus camaldulensis* plant sections aqueousextracts are presented in table 1, while those of ethanolic are presented in table 2.

Table 1: Phytochemical constituents of *Eucalyptus camaldulensis* plant sections aqueous extracts

Phytochemical	Leaves	Fruits	Stem-Bark	Seeds	Roots
Tannins	+ + +	+ + +	+ + +	+ + +	+ + +
Saponins	+	+	+	-	+
Alkaloids	-	-	-	-	-
Flavonoids	-	-	-	-	-
Glycosides	+ + +	+ + +	+ + +	+ + +	+ + +
Steroids	+ + +	-	+ + +	+ + +	+ + +
Terpenoids	-	-	-	-	-
Anthraquinones	+ + +	+ + +	+ + +	+ + +	+ + +

+++=Extremely present, ++=Moderately present, + = Present, - = Absent

Table 2: Phytochemical constituents of *Eucalyptus camaldulensis* plant sections ethanol extract

Phytochemical	Leaves	Fruits	Stem Barks	Seeds	Roots
Tannins	+ + +	+ + +	+ + +	+ + +	+ + +
Saponins	+ +	+ +	-	-	+
Alkaloids	+	-	+	+	-
Flavonoids	-	+ + +	-	-	+
Glycosides	-	-	-	-	-
Steroids	+	+	+	+ + +	+ + +
Terpenoids	-	-	-	-	+ ++
Anthraquinones	-	-	-	-	-

+++=Extremely present, ++=moderately present, + = present, - = absent

The results of the quantitative phytochemical secreening of the *Eucalyptus camaldulensis* plant sections in both aqueous and ethanolic extract are presented in table 3.

Table 3: Quantitative estimation of phytochemicals constituents of *Eucalyptus camaldulensis* plant sections aqueous and ethanolic extracts (g/100g)

Phytochemical	Extract	Stem Bark	Roots	Leaves	Fruits	Seeds
Tannins	Aqueous	0.12 ± 0.01	0.26 ± 0.00	0.06 ± 0.00	0.26 ± 0.01	0.11 ± 0.00
	Ethanol	0.03 ± 0.00	0.04 ± 0.01	0.34 ± 0.01	0.41 ± 0.02	0.12 ± 0.01
Saponins	Aqueous	19.90 ± 0.12	34.10 ± 1.21	9.70 ± 0.94	17.10 ± 0.89	-
	Ethanolic	-	26.10 ± 1.02	12.50 ± 0.24	8.20 ± 0.17	-
Alkaloids	Ethanolic	0.40 ± 0.03	-	0.20 ± 0.00	-	0.03 ± 0.00
Flavonoids	Ethanolic	-	0.30 ± 0.01	-	0.20 ± 0.01	-

Values are presented as mean ± standard deviation of triplicates. - =Not quantified.

Discussion

The phytochemical screening of the plant *Eucalyptus camaldulensis* shows that the leaves, stem-barks, fruits, seeds, and roots were rich in tannins in both aqueous and ethanol extracts. They were known to show medicinal activity as well as exhibiting physiological activity. Tannins are known to have high medicinal value. They perform many antimicrobial functions.[7]

Saponins were present in leaves, stem-barks, fruits and roots in aqueous extract and absent in seeds, while in ethanolic extracts of the leaves, fruits and roots were present and stem-barks and seeds were absent. Saponins carry out medicinal functions which include serving as expectorant and emulsifying agents and having antifungal properties.[8]

Alkaloids in ethanol extract show present in leaves, stem-barks and seeds and absent in fruits and roots, while in aqueous extract all the plant section were absent. Alkaloids are used in nicotine sulfate, a byproduct of tobacco industry, as a very potent insecticide.[9]

Flavonoids were absent in aqueous extracts in all sections of the plants and were present in fruits and roots only in ethanol extract while in contract with the opinion of who noted the presence of flavonoids in *Eucalyptus* leaves aqueous and ethanol extracts. The leaves, Stem-barks, roots fruits and seeds contain glycoside in aqueous extract but was absent in ethanol extract .On contrary, glycoside was present in stem-bark of ethanol extract and widely used in herbal medication.[4]

Leaves, stem-back and roots were rich in steroid but absent in fruit in aqueous extract while in ethanol extract all the sections of the plant contain steroids. Steroidal compounds are of important and interest in pharmacy due to their relationship with such compound as sex hormones.[10]

Terpenoids were absent in all the plant section were absent in both ethanol and aqueous, only root contain terpenoids in ethanol extract. Terpenoids is used to inhibit the germination and development of competing plants and in scent in flowers or fruits, attracts insects to distribute pollen or seeds.[9]

Anthraquinones is rich in all the section in aqueous extract but absent in ethanol extracts. Noted the absent of anthraquinone in stem-bark in aqueous extracts. Anthraquinone often shows antimicrobial activity and considered to be associated with innate resistance of plant to diseases.[11]

In quantitative estimate, tannins in aqueous extracts shows that fruits has the highest amount of tannin followed by roots, then stem-bark, seed, and leaves has the lowest amount of tannin.

Roots have the highest amount of saponnins followed by stem-back then fruits while leaves has the lowest amount but in ethanol extracts roots has the highest followed by leaves then fruit with the lowest amount.

In alkaloids stem-back has the highest then seeds followed by leaves with lowest in ethanol extract.

For flavonoids, roots have the highest amount than fruits in ethanol extract.The abundance of Flavonoids which are hydroxylated phenolic substances might be responsible for their therapeutic effectiveness against wide array of microorganisms probably due to their ability to complex with extracellular and soluble proteins and to complex with the bacterial cell wall.[12]

Conclusion

The result of the present study signifies the use of *Eucalyptus camaldulensis* as exerting various medicinal activities since it contains various bioactive components. The plant could therefore serve as source of bioactive agents for production of new drugs.

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