

# Antimicrobial Effect of Essential Oils of the Plant *Eucalyptus Camaldulensis* on Some Pathogenic Bacteria

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**Abstract**—Essential oils have many therapeutic properties. In herbal medicine, they are used for their antiseptic properties against infectious diseases of fungal origin, against dermatophytes, those of bacterial origin [3, 4]. The aim of our study is to determine the antimicrobial effect of essential oils of the plant *Eucalyptus camaldulensis* on some pathogenic bacteria which is a medicinal plant used in traditional therapy. The test adopted is based on the diffusion method on solid medium (sensitivity), this method allows to determine the susceptibility or resistance of an organism vis-à-vis the sample studied. The analysis allowed obtaining by hydrodistillation of the plant samples one essential oil of light Yellow color with a 0,99 % returns. Our study reveals that essential oil of the plant *Eucalyptus camaldulensis* has a different effect on the resistance of germs to *Pseudomonas aeruginosa* is a strain weakly sensitive with 6,33 mm zone of inhibition, *Escherichia coli* is moderately sensitive with a zone of inhibition equal to 9,69 mm. By against, *Antirobactère* and *Proteus* are strains which represent a high sensitivity zone of inhibition equal to 10 and 11,66 mm respectively.

**Index Terms**—Essential oils, hydrodistillation, eucalyptus camaldulensis, antibiogramme.

## I. INTRODUCTION

The plant world is the source of many medicines. Recently, researchers have estimated that there are about 400,000 species of plants worldwide, including about a quarter or a third have been used by companies for medicinal purposes [1].

Humans use plants for thousands of years to treat various ailments, in many developing countries; much of the population relies on traditional doctors and their collections of medicinal plants to cure them [1].

The MAP are plants that have grown or have picks in his natural environment for its medicinal and had an infinite variety of jobs, to report the therapeutic area, food, cosmetics, industrial, etc.. Herbs can play an important role in conserving biodiversity. These plants are actually very familiar to rural people who are very sensitive to their scarcity and their disappearance. Indeed, medicinal plants play an important role of health care population and represent a significant source of income for many families in the countryside and cities [2].

It is known that some plants emit odors to attract insects to defend themselves. These smells come from small glands on the surface of leaves, stems or flowers that contain the essential oil. The essential oil is a volatile aromatic substance extracted from the plant. Little or no fat, it is called oil because it does not mix with water. Like gasoline, it ignites. Once extracted from plants, essential oils are used in perfumery, cosmetics, in food and other industries [1].

Essential oils have many therapeutic properties. In herbal medicine, they are used for their antiseptic properties against infectious diseases of fungal origin, against dermatophytes [4], those of bacterial origin.

Throughout history, the plant kingdom has provided the essential human resources to its feeding, hygiene and health. Since ancient times, the fragrances of these same plants are associated with mystic rites, artistic and aesthetic.

In this work we try to study the biological activity of essential oils on the plant: *Eucalyptus camaldulensis*.

## II. WORK METHODOLOGY

### A. Hardware Plant

The aromatic plant harvested in the month of May 2010 is among the most abundant species in the region northwest of Algeria. These *Eucalyptus camaldulensis*: has been selected for screening antibacterial.

The River Red Gum (*Eucalyptus camaldulensis*) is a tree of the genus *Eucalyptus*. It is one of around 800 in the genus. It is a plantation species in many parts of the world but is native to Australia where it is widespread especially beside inland water courses. Oddly, it is named for a private estate garden near the Camaldoli monastery near Naples (L'Hortus Camaldulensis di Napoli), from where the first specimen came to be described. Material from this tree was used by Frederick Dehnhardt, Chief Gardener at the Botanic Gardens in Naples, to describe this species in 1832 [5].

Leaves contain 0.1–0.4% essential oil, 77% of which is cineol There is some cuminal, phellandrene, aromadendren (or aromadendral), and some valerylaldehyde, geraniol, cymene, and phellandral [8]. Leaves contain 5–11% tannin. The kino contains 45% kinotannic acid as well as kino red, a glucoside, catechol, and pyrocatechol. Leaves and fruits test positive for flavonoids and sterols. The bark contains 2.5–16% tannin, the wood 2–14%, and the kino 46.2–76.7 [7]. It is Reported to be anesthetic, antiseptic, astringent, the redgum eucalyptus is a folk remedy for colds, colic, coughs, diarrhea, dysentery, hemorrhage, laryngalgia, laryngitis, pharyngitis, sore throat, spasm, trachalgia, and wounds [6].

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B. Classification

**Riegner:** Plantae  
**Sous règne:** Angiosperms  
**Class:** Eudicots  
**Order:** Myrtales  
**Family:** Myrtaceae  
**Genus:** *Eucalyptus*  
**Species:** *Eucalyptus camaldulensis*

C. Biological Materials

Bacterial strains have been the subjects of this study are: *Pseudomonas aeruginosa*, *Antirobactère*, *Escherichia coli* and *Proteus* (Table I). They are identified and confirmed in the laboratory of the hospital Mohamed Bodiou Ouargla (Algeria).

TABLE I: BACTERIAL SOUCHES

Bacterial species	Gram
<i>Pseudomonas aeruginosa</i>	-
<i>Escherichia coli</i>	-
<i>Proteus Antirobactère</i>	-

D. Extraction of Essential Oils by Hydrodistillation

The extraction of essential oils of the plant *Eucalyptus Camaldulensis* was performed by hydrodistillation in a Clevenger type apparatus 200g of dry leaves in a balloon disposed of 1000 ml of water for 2 hours. The essential oils collected in small vials opaque. The extraction yield of essential oil is calculated by the weight of the dried plant material before extraction [3].

E. Biological Tests

1) Preparing Disks

The antibiogram Figure n°1 is starting from the preparation of records, including Whatman paper was cut into 6 mm white disc. After sterilizing oven pastor for 20 min at 160 ° C, the discs were soaked in solutions with paravant prepares. Then, they are placed in petri dishes where they suffered a drying before being placed on the culture medium [9] [10].

2) Preparation of Microbial Suspension

Preparation of microbial suspension is done by introducing two well isolated pure colonies of each species studied, in 10 ml of saline contained in a test tube Fig. 1: Illustration of the method of Aromatogram on a Petri dish [8] [9].

3) Inoculation

The microbial suspension prepared was cast on the Muller Hinton agar. After the inode of the entire surface of the medium by the microbial suspension, the supernatant was discarded. Therefore, these plates were left to dry for 15 min at 37 ° C [8] [9].

4) Application of discs

The discs are prepared disposer to the surface of culture medium, pressing lightly with a sterile forceps, and then these dishes are incubated in an oven at T 37 ° C for 24 h [8] [9].

5) Reading Results

We have methods to measure the diameter of the zones of

inhibition in the case of microbial sensitivity around the discs of 6 mm in diameter.

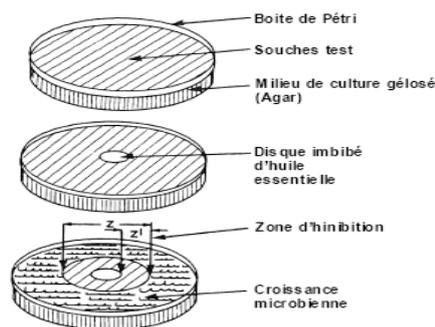


Fig. 1. Illustration of the method of Aromatogram on a Petri dish. [9]

III. RESULTS

The analysis of samples obtained by steam distillation an essential oil plant light yellow with a yield of 0.99%.

The study of antibacterial extracts *Eucalyptus camaldulensis* by the agar diffusion method or the method of absorbing disk. Measuring the diameter of inhibition zones including the disc (6 mm) to determine the antimicrobial activity of this plant in vitro. The following table shows the results of tests of antimicrobial activity of essential oils from the plant *Eucalyptus camaldulensis* on bacterial strains: *Antirobactère*, *Escherichia coli*, *Proteus* and *Pseudomonas aeruginosa*.

TABLE II: THE RESULTS OF TESTS OF ANTIMICROBIAL ACTIVITY OF ESSENTIAL OILS

Concentration g/ml	Inhibition zone diameter (mm)			
	<i>Pseudomonas aeruginosa</i>	<i>Escherichia coli</i>	<i>Proteus</i>	<i>Antirobactère</i>
<i>Eucalyptus camaldulensis</i>	6,33	9,69	10	11,66

IV. DISCUSSION

Test results of antibacterial activities conducted on essential oils on different bacterial strains indicated in precedent table shows that the antimicrobial effect of *Eucalyptus camaldulensis* on different bacterial strains have a bactericidal effect.

*Antirobactère* strain is more sensitive to essential oils tested a zone of inhibition equal to 11.66 mm. In addition, *Proteus* and *Escherichia.coli* strains are moderately susceptible to essentials oils of *Eucalyptus camaldulensis* with an inhibition zone of 10 mm and 9.69 mm respectively.

Similar results were reported by Alitonou and al [11]. They show that the essential oil of *Eucalyptus tereticornis Sm.a*, a fairly broad inhibitory power in respect of the microorganisms studied; also Sohounhloué and al [12] have shown that essential oils of *Clausena anisata*, of *Eucalyptus camadulensis* and *Ocimum basilicum* have biological activity on microorganisms. In against, *Pseudomonas aeruginosa* is weakly sensitive to essential oils tested with an inhibition zone of 6.33 mm.

## V. CONCLUSION

In this study, we performed the extraction of essential oils of the plant *Eucalyptus camaldulensis* their analysis on the four bacterial species *Pseudomonas aeruginosa*, *Escherichia coli*, *Proteus* and *Antirobactère* we find that:

All samples of essential oils of the plant *Eucalyptus camaldulensis* showed an interesting biological activity on the four bacterial strains.

Studies have complied with the antimicrobial effectiveness of essential oils against microorganisms studied.

Regarding the sensitivity of microbial species against of essential oils, we found that the bacterial strain: *Antirobactère* is most sensible to essential oils of the plant *Eucalyptus camaldulensis*, *Proteus* and *Escherichia.coli* moderately susceptible. By against, *Pseudomonas aeruginosa* are Stem weakly sensitive to essential oils of the plant *Eucalyptus camaldulensis*.

It might be interesting to further phytochemical and biological investigations on these plants including purification of the extracts obtained to isolate the molecules responsible for the antimicrobial activities, which will larger armamentarium of herbal plants.

Finally, we are recommending people to a reasonable use of medicinal plants, as improper use of these plants will probably lead to harmful side effects to human health.

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