



STUDY OF THE ANTIBACTERIAL EFFECT OF OCIMUM CAMUM HARVESTED IN BAMAKO AND ITS PERI-URBAN AREA.

Mamadou Traoré ^{1,*}, Modibo Diakité ¹, Mantiéré DIARRA ², Kadiatou COULIBALY ¹, Chaka Traoré ¹ and Brahima SACKO ^{1,3}

¹ Central Veterinary Laboratory of Bamako (Mali).

² Bioenergy Laboratory of the Faculty of Science and Technology of the University of Science, Technology and Technology of Bamako (Mali).

³ Department of Biology, Faculty of Science and Technology at University of Science, Technology and Technology, Bamako, Mali.

* Corresponding Author: Brahima SACKO

World Journal of Biology Pharmacy and Health Sciences, 2026, 27(02), 326–330

Publication history: Received on 21 July 2026; revised on 26 August 2026; accepted on 28 August 2026

Article DOI: <https://doi.org/10.30574/wjbphs.2026.27.2.0452>

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ABSTRACT

The overuse of antibiotics against various infections leads to a reduction in their effectiveness. These excesses have led some therapists to return to alternative solutions, in particular so-called gentle medicines, based on the properties of plants and in particular essential oils. *Ocimum Canum* is a plant with many therapeutic virtues. This study conducted between August and September in the districts of Sotuba ACI, Daoudabougou, Bakorobabougou, Yirimadio and the village of Mofa (Baguineda) aimed to determine the therapeutic virtues of *O. canum* in traditional medicine and the effects of its essential oil on *E. coli*, *Salmonella* spp and staphylococci. The surveys were conducted among 40 herbalists from 5 markets in Bamako. The *Ocimum. canum* samples harvested before sunrise were dried in the shade for 7 days. The essential oils from the dried samples were extracted by steam distillation. The results of the surveys showed a frequent use of *Ocimum. canum* for high blood pressure, malaria, colds and especially for funeral spiritual practices. The yield of the essential oils varied from 1.24 to 1.74%. Biological tests conducted on *Escherichia Coli*, *Salmonella* spp and staphylococci showed an effectiveness of these oils on staphylococci at a concentration of 50%.

Keywords: *Ocimum canum*, Essential Oils, Medicinal Plants, Antimicrobial Resistance

1 INTRODUCTION

Plants naturally produce active substances that protect themselves from insects, diseases or external attacks from which essential oils have been extracted [7]. Essential oils constitute a diverse group of natural products; they are an important source of aromatic chemicals used in the food, industrial and pharmaceutical sectors [16]. Among plant species (800,000 to 1,500,000 according to botanists), only 10% are called "aromatic". The genera capable of producing the constituents of essential oils are distributed in a limited number of families (Myrtaceae, Lauracea, Rutaceae, Lamiaceae, Asteraceae, Cupressaceae, Poaceae, Zingiberaceae and Piperaceae) [6]. *O. canum* is part of the Lamiaceae family, also called Labiatae; this family has 6,500 species and some 200 genera [13]. The Lamiaceae family is a fairly large family of dicotyledonous plant. These species are almost cosmopolitan, but absent in the coldest regions of high latitude or

altitude [9,18]. The excessive use of antibiotics against various infections leads to a reduction in their effectiveness. These excesses have led some therapists to return to alternative solutions, in particular so-called gentle medicines, based on the properties of plants and in particular essential oils [8]. *O. Canum* attributed interesting therapeutic virtues. The leaves are used in the treatment of skin parasitosis, colic, stomach and eye tumors. It is also used in the treatment of fevers; its tonic, diuretic, diaphoretic, sudorific, spermicidal, spasmolytic, hemostatic, ophthalmic and emetic properties have been reported. Its leaves are said to attract scorpions, which they immobilize. The effectiveness of its root in the treatment of snake venoms reported [1]. The decoction is used in women after childbirth. The plant is also used in a magico-religious ritual intended to ward off misfortune and evil spirits. [11]. *O. canum* is used in Congolese pharmacopoeia for the treatment of several diseases such as cough, hemorrhoids, diarrhea and sickle cell disease [14]. Extracts of *O. canum* have given good results in the treatment of helminths and sickle cells, these effects are linked to their phytochemical compounds. [4]. *O. canum* essential oils are antibacterial, active against *Enterococcus faecalis*, *Enterococcus faecium*, *S. aureus*, *S. epidermis* and antifungal against *Candida* [12]. *O. canum* essential oils have been very effective against *L. monocytogenes* and *S. Typhimurium* [10]. *O. canum* essential oils possess remarkable insecticidal potential against *Cylas puncticollis*. They induced 100% mortality of adult *C. puncticollis* Boheman at a concentration of 50 $\mu\text{L/L}$ after 72 h of exposure [5]. *O. canum* leaves are a good source of phytochemicals and nutrients that can be used to combat nutritional deficiencies, particularly in rural communities [2]. Although relatively abundant in Mali, very few studies have been carried out on *O. canum*, which is why we carried out a study focusing on essential oils.

2 MATERIAL AND METHODS

2.1 Field Survey

The survey form was developed and sent to 40 herbalists (18 women and 22 men) in Bamako, aged between 15 and 90. The surveys covered the markets of Bakorobabougou, Yirimadio, and Boulkassoumbougou.

2.2 Sampling

The young plants were harvested in their entirety. The aerial parts of larger flowering plants were harvested using pruning shears and placed in blue bags before being transported to the drying area. The samples were dried in the instrumentation room of the Toxicology and Environmental Quality Control Laboratory of the Central Veterinary Laboratory for one week.

2.2.1 Essential Oil Extraction

O. canum essential oils were extracted by steam distillation.

2.2.2 Essential Oil Dilution:

The essential oil was diluted with DMSO (Dimethylsulfoxide) $\text{C}_2\text{H}_6\text{OS}$. Concentration solutions of 5%, 10%, 20%, 30%, 40%, and 50% were prepared using a 5 mL graduated pipette.

2.2.3 Essential Oil Testing

"The reference method used is CA-SFM / EUCAST 2024 from the Antibiogram Committee of the French Society of Microbiology." The bacterial strain was spread on the surface of the Petri dish containing the appropriate agar medium. A "Whatman No. 1" filter paper disc soaked in the essential oil to be tested was then placed on the surface of the Petri dish. After the incubation period in the incubator, the inhibition zone that appeared around the disc was measured using a graduated ruler. This manipulation was carried out in several stages:

2.2.4 Inocula Preparation

The inoculum of *E. coli*, *Salmonella* spp., and *Staphylococcus aureus* bacteria was prepared by removing a well-isolated bacterial colony using a platinum loop. The contents of the loop were transferred into a tube containing 5 ml of sterile nutrient broth. The test tubes were incubated at 37°C for 24 h.

2.2.5 Disc Preparation

The 6 mm diameter filter paper discs (Whatman No. 1) were autoclaved at 120°C for 20 minutes.

2.2.6 Antibacterial Activity Test

The antibacterial activity test was performed by placing the nutrient agar in a water bath (100°C). Once melted, it was maintained at 45°C until use. A quantity of nutrient agar equivalent to 18 ml was poured into the Petri dishes. The dishes were left ajar in front of the flame until solidification (15 minutes). They were then inoculated with a sterile swab using

tight streaks with an inoculum of 5.105 bacteria/ml, and the agar surface was thoroughly dried. The discs impregnated with essential oils were gently placed on the agar surface (three discs per dish). The petri dishes are placed at low temperature (+4°C) for 15 to 30 minutes to allow the essential oils to diffuse into the agar before the bacteria begin to multiply. The petri dishes are incubated in an oven at (37°C) for 24 hours.

3 RESULTTS

3.1 Processing of survey forms

The various respondents offered varying opinions on the uses of *O. canum*. The majority of respondents said they knew nothing about the medicinal properties of *O. canum*. However, those who provided answers claimed to use it for high blood pressure and nightmares. In addition to the therapeutic properties of *O. canum*, 12 respondents attributed spiritual virtues to it. As its name suggests in the Bamanan language, "Chou kolan," which means "tree with which the dead e washed, » used in villages to wash the bodies of the deceased, to perfume them, and to ward off evil spirits. It is also hung in the windows and doors of houses to ward off lightning and evil spirits.

3.2 Yield of essential oils

The extraction of essential oils was done by steam distillation, the color of the extract obtained is light yellow. The yield of essential oils varied from 1.24 to 1.74%.

Table 1: Yield of essential oils by site

Site	Mass of sample (g)	Mass of essential oils obtained (g) (%)	Yield (%)
Mofa	547.74	9.5	1.74
Bakorobabougou	359.34	5.06	1.40
Daoudabougou	135.34	1.69	1.24
Yirimadio	140.50	1.84	1.30
Sotuba ACI	306.75	4.32	1.40

3.3 Reading Petri dishes

The test used *Ocimum canum* essential oils and some common antibiotics. The antibiotic test is intended to confirm the method used.

Table 2: Effect of *O. canum* essential oils and some antibiotics on bacteria (*E. coli*, *Salmonella* spp and *Staphylococci*)

Bacteria	HE Concen- tration (%)	Z.I (mm)	Antibiotic	Concentration (µg/ml)	Z.I (mm)
<i>E. coli</i>	5	None	Kanamycin	30	24.39
	10	None	Imipene	10	19.87
	20	None	Amoxicyllin	30	23.69
	30	None	Colistine	10	14.76
	40	None	Cyprofloxacylin	5	38.94
	50	None	Gentamycin	30	23.67
<i>Salmonella sp</i>	5	None	Nalicide Acide	30	26.74
	10	None	Kanamycine	30	25.63
	20	None	neomycine	30	26.78
	30	None	Tetracyclin	30	19.56
	40	None	/	/	/

	50	None	/	/	/
<i>Staphylococci sp</i>	5	None	Tetracyclin	30	29.76
	10	None	gentamycin	30	32.60
	20	None	Erytromycin	15	31.43
	30	None	Kanamycin	30	29.43
	40	None	Neomycin	30	30.33
	50	18.59	/	/	/

Analysis of this table shows a sensitivity of *Staphylococci sp* at a concentration of 50%. Cyprofloxacylin gave the best result against *E. coli* and the lowest result was recorded at the level of Colistin on *E. coli*.

4 DISCUSSION

The surveys conducted in three markets in the District of Bamako with 40 herbalists, the results of these surveys showed that *O. canum* is mainly used to fight against high blood pressure, stomach aches, malaria, colds, women's menstruation, angina, nightmares, fear and traditional rituals to ward off evil spirits. Studies conducted in Madagascar [11] showed that the leaves used for sore throats by inhaling the vapors, the decoction is used in women after childbirth. The plant is used in a magico-religious ritual intended to ward off misfortune and evil spirits. These results are similar to those we obtained in this study. This similarity could be explained by the originality of African cultures. The samples of *O. canum* collected at four sites in Bamako and Baguineda. These samples, dried in the shade and extracted in the organic chemistry and natural substances laboratory of the FST, gave a yield of 1.24% to 1.74%. In Mali a study [17] gave a yield of 0.99% to 1.29% for dry samples, these results are close to ours. This is justified by the fact that the experiments were carried out in the same laboratory. In Cameroon a study [15] showed that the fresh leaves of *O. canum* are richer in essential oil (0.44%) than those of *O. basilicum* (0.11%). This result differs from what we obtained. This difference could be due to the fact that these samples extracted in the fresh state. On the microbiological level, tests carried out in the medical bacteriology laboratory of the Central Veterinary Laboratory. Biological tests conducted on three bacteria *E. coli*, *Salmonella sp* and staphylococci showed a sensitivity of staphylococci at a concentration of 50%. A study conducted in Burkina Faso [2] showed that the inhibition diameter of essential oils from the flowers and leaves of *O. canum* varied from 6 to 22 mm and from 6 to 10 mm, respectively during the tests. The largest inhibition zone obtained with *Bacillus cereus* and *Staphylococcus camorum* while the lowest obtained with *Shigella dysenteria*. These results are close to ours for staphylococci. The essential oil of *O. canum* is antibacterial, active against *Enterococcus faecalis*, *Enterococcus faecium*, *S. aureus*, *S. epidermis* and antifungal against *Candida* [12]. These results are different from ours, this could be explained by the difference in the strains of bacteria used.

5 CONCLUSION

The results of this study showed that *Ocimum canum* is used in traditional medicine to combat high blood pressure and for funeral rituals. This plant should be used in modern medicine to combat *Staphylococcus* infections.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Disclosure of conflict of interest

Mamadou Traoré coordinated the design and planning of the study, the implementation of the laboratory analyses. Brahim SACKO wrote of the article and participated in the statistical analysis of the data.; Modibo Diakité, Chaka Traore, Kadiatou Coulibaly, and Mantiéré DIARRA participated in the design, planning and implementation of the study;

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