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## Antibacterial Activity of *Limoniastrum guyonianum* Medicinal Plant Used in Algerian Traditional Medicine

Assia Belfar<sup>1</sup>, Mohamed Hadjadj<sup>1</sup>, Messaouda Dakmouche<sup>1</sup>, Cheyma Bensaci<sup>1</sup>, Mahdi Belguidoum<sup>1</sup>, Zineb Ghiaba<sup>1</sup>, Youcef Cherbi<sup>2</sup>

<sup>1</sup>Laboratory of Valorization and Promotion of Saharan Resources (VPRS), University of Ouargla, 30000 Ouargla, Algeria

<sup>2</sup>Laboratoire Central, Public Institution Ouargla, Algeria

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### ABSTRACT

In the present study, evaluation of antibacterial activity of Acetic Acid extracts of medicinal plant *Limoniastrum guyonianum* from Ouargla and El Oued regions (Algeria) against three bacteria strains: *Staphylococcus aureus* (ATCC 6538), *Escherichia coli* (ATCC 25922) and *Pseudomonas aeruginosa* (ATCC 9027) was done by using disc agar diffusion method. Acetic Acid extracts showed antibacterial activity against all the tested strains. Diameter inhibition values ranged in extracts of *L. guyonianum* Ouargla (LO) from 15 mm to 24.3333 mm, while diameter inhibition values ranged in extract of *L. guyonianum* El Oued (LE) from 12 mm to 24.3333 mm.

**Keywords:** *Limoniastrum guyonianum*; Antibacterial activity; Disc diffusion method; *Staphylococcus aureus*; *Escherichia coli*; *Pseudomonas aeruginosa*

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### INTRODUCTION

Bacterial infections are still among the major cause of morbidity and mortality worldwide; the situation is complicated by the appearance and emergence of multidrug resistant strains. The spread of bacterial phenotypes propels the search of novel antibacterials to combat phenotypes [1].

The most critical problem related with health and causes of mortality rates in society is infectious disease [2]. Since ancient times, medicinal plants have provoked interest as sources of natural products. They have been screened for their potential uses as alternatives remedies for the treatment of many infectious diseases. Plant products are rich sources of a variety of biologically active compounds, mainly phenolics, and these phytochemicals have been found to possess various biological properties like antioxidant and antimicrobial potentials [3,4]. Plants have long been used as the primary source for human treatment, and according to World Health Organization (WHO)'s report, approximately 80% of the world population rely on plants or derived products for their treatment. Lots of evidence showed that plants, especially traditional herbs, represent potential source of new anti-infective agents. They could markedly mitigate infectious diseases, but lack adverse side effects which are often associated with traditional antimicrobial agents, including hypersensitivity, allergic reaction, and immunosuppression [5]. New therapy classes of antibiotics have become a popular choice to reduce antibiotic resistance. However, antibiotic resistance is difficult to reduce. One strategy to avoid this is by using alternative therapeutic agents from plants that are effective against antibiotic resistant bacteria, safe and have low cost [6,7].

In our search of antibacterials from botanical source, we designed the present work to investigate in vitro the antibacterial activity of the Acetic Acid extracts of *L. guyonianum* medicinal plant.

## MATERIALS AND METHODS

### Plant materials

*L. guyonianum* (Plumbaginaceae) was collected from Ouargla region (Algeria), in February 2012 and from El Oued region (Algeria), in February 2011, plants have been drying in the shade and stored in paper bags.

### Acetic Acid extract preparation

Powdered aerial parts of *Limoniastrum guyonianum* (10 g) were macerated with 100 ml of petroleum ether, extracted with 100 ml of Acetic Acid: water (50:50, v/v) for 24 h at room temperature the procedure was repeated twice. After filtration, the filtrate was evaporated, recovered with distilled water and partitioned successively using ethyl acetate and n-butanol. The phenolic extracts were dissolved in dimethyl sulfoxide (DMSO).

### Antibacterial activity evaluation

Determination of antibacterial activity of Acetic Acid extracts was assessed by Paper disc agar diffusion method described by Soumia *et al.* with slight modification [3]. The antimicrobial activity was achieved by the agar diffusion method. The microbial cultures were harvested and then suspended in sterile saline (0.9% NaCl) and the cell density was adjusted to 0.5 McFarland. Sterile 6 mm-diameter filter disk (Whatman paper no 3), impregnated with 10 µL of the extracts solutions (800 mg/mL), were placed on the inoculated surface. Before incubation, all Petri dishes were stored in the dark at 4°C for 1 h, to allow the diffusion of the extracts from disc to medium without microbial growth. At the end of incubation time (18 h to 24 h at 37°C), the antibacterial activity was assayed by measuring the diameter of the inhibition zone formed around each paper disc. The diameter of zone of inhibition can be measured in millimetres [8].

## RESULTS AND DISCUSSION

The results of the antimicrobial screening extract of *L. guyonianum* against three bacteria species are summarized in Table 1. The size of the inhibition area varies depending on the solvent, the region and the bacterial strain used Figure 1.

From the Table 1, with regard to *L. guyonianum* Ouargla fraction Butanol attributed higher degree of inhibitory activity with the maximum zone of inhibition of 24.3333 mm against *P. aeruginosa* and minimum inhibitory effect against *S. aureus* (15 mm) in ethyl acetate fraction. As for *L. guyonianum* El Oued the highest zone of inhibition against *P. aeruginosa* (24.3333 mm) in ethyl acetate fraction whereas the lowest inhibitory activity noticed against *E. coli* (12.6667 mm) in Butanol fraction.

Gram positive bacterial strains were found to be slightly more sensitive than Gram negative bacterial strains. It may be due to the absence of lipopolysaccharide layer in Gram positive bacteria that might function as a barrier to the phytochemical substances that are responsible for antibacterial activity [9]. These results can be attributed to the rich content of polyphenolic content already demonstrated in our previous work [10].

The research for new antibacterial agents has become a very important endeavor, especially in recent times, considering the escalating levels of antibiotic resistance among pathogenic bacteria. One of the efforts in this research is focused on the use of medicinal plants, which are widely available resources, less if no side effects, less expensive and have shown antimicrobial properties. Also, the therapeutic properties of medicinal plants are well recognized at a global level, especially for antibiotic development. Thus, the research of alternative and effective medicines from plants against such resistant bacteria has become an important concern all over the world [6]. Plants are important source of potentially useful structures for the development of new chemotherapeutic agents. The first step towards this goal is the *in vitro* antibacterial activity assay [9,11,12].

## CONCLUSION

The present study report the antibacterial activity of the Acetic Acid extract of *Limoniastrum guyonianum* from two Algerian regions; Ouargla and El Oued. This plant was extracted with Ethyl acetate and butanol and then investigated against three bacterial strains. These bacteria are responsible for an array of human diseases such as cholecystitis, urinary tract infection, skin infections etc. The different extracts showed a good inhibition. This plant showed a promoting biological activity and can be a source of new active substances.

Table 1: Antibacterial activity of *L. guyonianum* extracts against the bacteria strains

Inhibition zone Micro-organisms diameter (mm)						Fraction Regions
<i>S. aureus</i>		<i>E. coli</i>		<i>P. aeruginosa</i>		
<i>BF</i>	<i>EF</i>	<i>BF</i>	<i>EF</i>	<i>BF</i>	<i>EF</i>	
21.6667	15.000	21.6667	14.6667	24.3333	17.3333	Ouargla
15.000	17.6667	12.6667	20.000	16.6667	24.3333	El Oued

EF: Ethyl acetate Fraction BF: Butanol Fraction

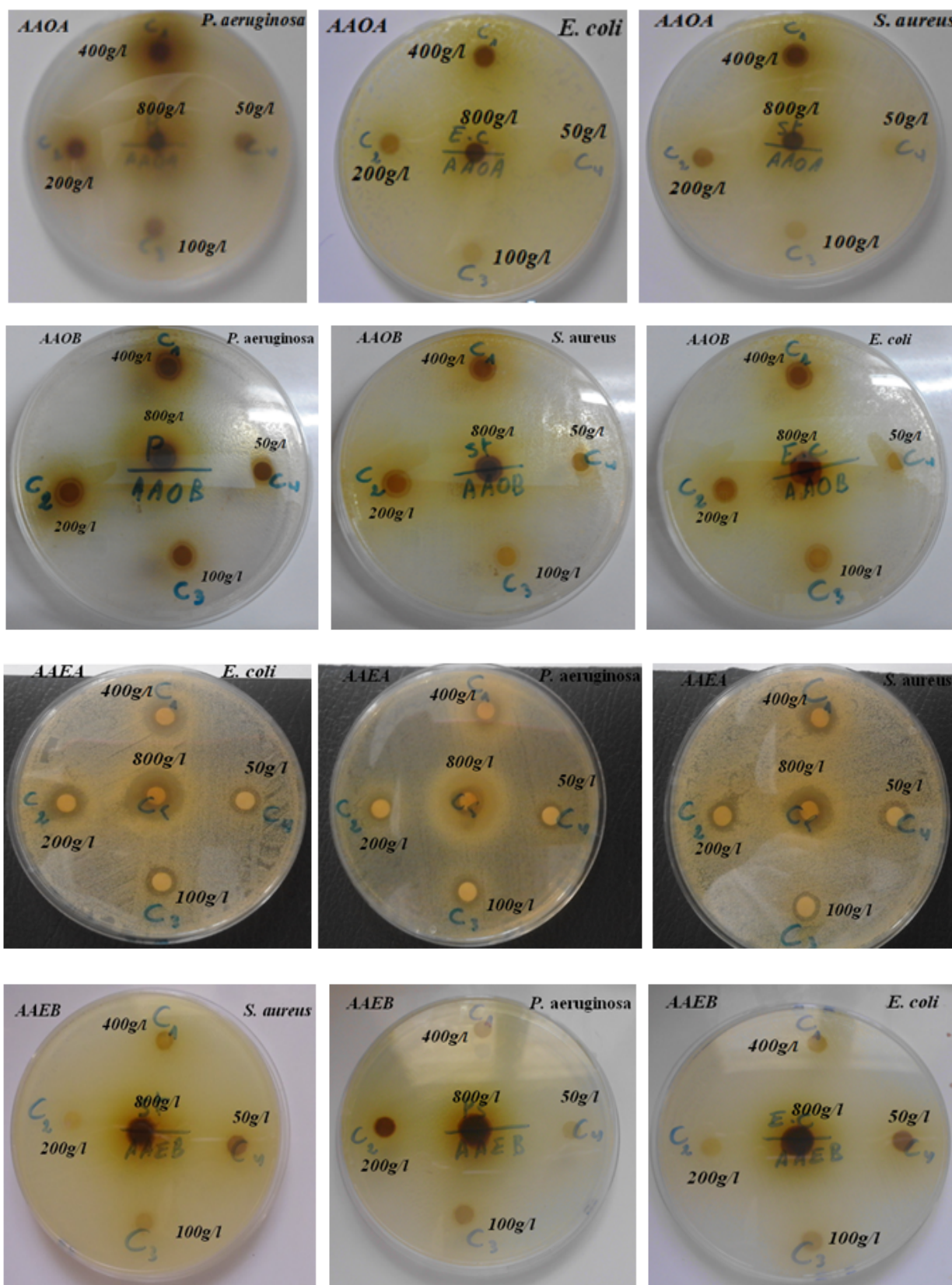


Figure 1: Antibacterial activity of *Limoniastrum guyonianum* against *Pseudomonas aeruginosa*, *Escherichia coli* and *Staphylococcus aureus*.

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