

Antibacterial effects of the Algerian *Tetraclinis articulata* leaf extract against *Klebsiella pneumoniae*

Houria Bouabane^{*1}, Khedoudja Kanoun², Boumediene Meddah³

¹Faculty of Nature and Life Science, Environment department, Laboratory of Molecular Microbiology Health and Proteomics, Rectorat Ex ITMA, BP 89 Sidi-Belabbes, Algeria.

²Faculty of Nature and Life Science, Biology department, Laboratory of Molecular Microbiology Health and Proteomics, Rectorat Ex ITMA, BP 89 Sidi-Belabbes, Algeria.

³Faculty of Nature and Life Science, Biology department, Laboratory of Research, Bioconversion, Engineering Microbiology and Health Safety, BP 305 Mamounia Road, Mascara Algeria.

Email*: houria.bouabane@univ-sba.dz

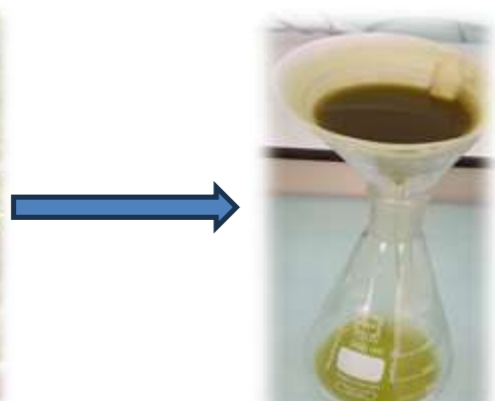
INTRODUCTON AND AIM

Antibiotics, discovered in the 19th century, reduced bacterial infection risks, but their overuse has led to increased bacterial resistance and side effects like allergies. To address this, researchers are exploring effective antibacterials, particularly from traditional remedies. Plant-based treatments are gaining popularity as they are natural, affordable, and generally free of side effects [1].

Tetraclinis articulata is a medicinal plant from Algeria's traditional pharmacopoeia, used to treat various diseases. Recent studies confirm its antioxidant, antimicrobial, anti-inflammatory, neuroprotective, vasorelaxant, and anticancer properties due to its bioactive compounds [2]. This research aims to detect and analyze the antibacterial agents in the aqueous extract from *Tetraclinis articulata* leaves.

METHOD

1. Extraction by Decoction



10 g of *T. articulata* leaf powder was mixed with 100 ml of distilled water And boiled at 100°C.

The decoction was filtered using filter paper.

and then evaporated to obtain the aqueous extract.

2. Phytochemical Screening

Total polyphenols

FeCl₃ Test

Flavonoids

Shinoda Test

3. Antibacterial Activity Evaluation

The susceptibility of *Klebsiella pneumoniae* to the aqueous extract of *Tetraclinis articulata* leaves was evaluated using the well diffusion method, and the Minimum Inhibitory Concentration (MIC) was determined through a microdilution assay [3].

RESULTS AND DISCUSSION

The preliminary screening of phytochemical compounds revealed that the *Tetraclinis articulata* leaf extract is rich in phenolic compounds and flavonoids. These metabolites are responsible for various biological activities of medicinal plants, particularly antioxidant and antibacterial effects, among others.

The antibacterial activity of the aqueous extract (at different concentrations) and the antibiotic chloramphenicol was evaluated in vitro against *Klebsiella pneumoniae*, with results presented in Figure 01.

It was observed that the inhibition zone increased with the rising concentration of the tested extract. The highest antibacterial potential of the *Tetraclinis articulata* leaf aqueous extract was seen at a concentration of 200 mg/ml, showing an inhibition zone of 11 ± 0.00 mm and a minimum inhibitory concentration (MIC) of 25 mg/ml. In comparison, the inhibition zone for chloramphenicol (which was used as the positive control) was 27 mm, a significantly higher result than the extract.

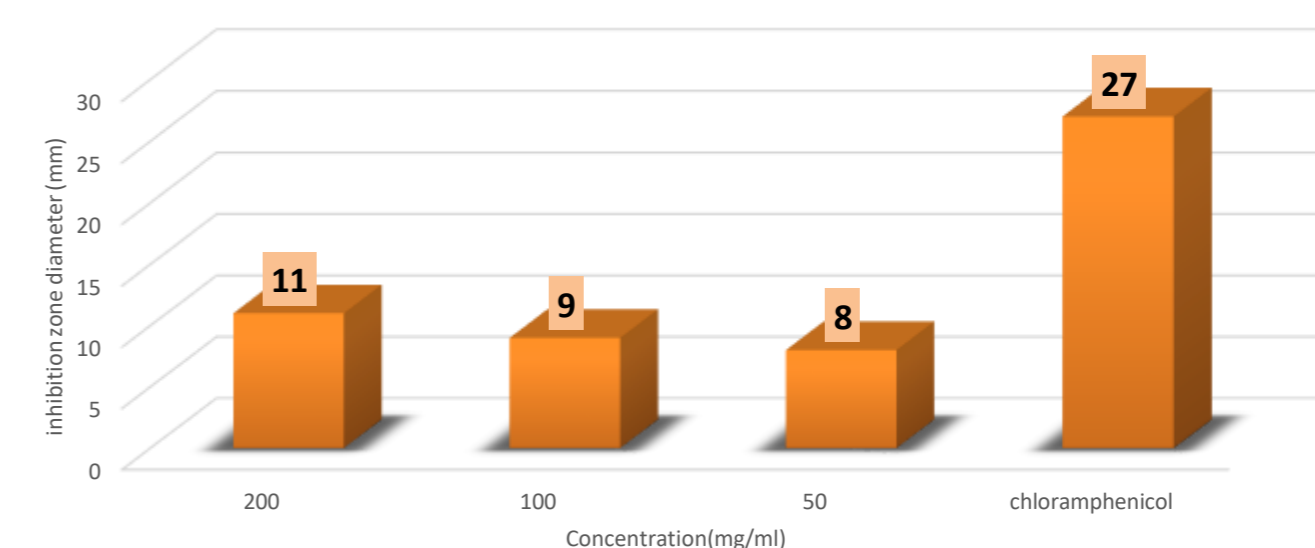


Fig. 01. Diameters of inhibition zones of the aqueous extract at different concentrations and chloramphenicol against *Klebsiella pneumoniae*.

The findings of this study validate the traditional medicinal use of *Tetraclinis articulata* and demonstrate that its aqueous extract contains components with strong antibacterial effects [4]. These bioactive compounds have the potential to be developed into new antimicrobial treatments for infections caused by *Klebsiella pneumoniae*. This highlights the plant's potential role in creating alternative therapies for bacterial infections.

CONCLUSION

The aqueous extract from *Tetraclinis articulata* leaves has shown effectiveness in inhibiting the growth of *Klebsiella pneumoniae*. Utilizing this extract as a natural antibiotic to combat infections caused by *K. pneumoniae* could serve as a promising alternative to conventional treatments, potentially reducing the risk of antibiotic resistance while offering a natural solution.

REFERENCES

- [1]: Ghosh, A., Das, B. K., Roy, A., Mandal, B., & Chandra, G. (2007). Antibacterial activity of some medicinal plant extracts. *Journal of Natural Medicines*, 62(2), 259–262.
- [2]: Khatib, S., Sobeh, M., & Bouissane, L. (2022). *Tetraclinis articulata* (vahl) masters: An insight into its ethnobotany, phytochemistry, toxicity, biocide and therapeutic merits. *Front. Pharmacol.* 13:977726.
- [3]: Maqbool, H., Visnuvinayagam, S., Zynudheen, A. A., Safeena, M. P., & Kumar, S. (2020). Antibacterial activity of beetroot peel and whole radish extract by modified well diffusion assay. *Int. J. Curr. Microbiol. App. Sci*, 9(1), 1222-1231.
- [4]: Zahir, I., Er-rahmany, A., Es-sadouny, R., & El Hadri, I. (2020). Activités biologiques de *Tetraclinis articulata*: revue de synthèse. *Bulletin de la Société Royale des Sciences de Liège*.