

Letter to Editor

In vitro Antibacterial Activity of *Taraxacum officinale* Leaves Extract

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Abstract

Background and Aim: The purpose of this letter to the editor was to investigate the antibacterial activity of *Taraxacum officinale* leaves extract.

Materials and Methods: In the present study, *Taraxacum officinale* leaves were collected from the University of Ghana Staff Village, and then ethanolic and methanolic extractions were performed. The antimicrobial activity of *Taraxacum officinale* leaves extract against *Staphylococcus aureus*, *Escherichia coli*, and *Klebsiella pneumonia* was evaluated using the agar well diffusion method.

Results: *Staphylococcus aureus* was resistant to the ethanolic extract of *T. officinale* leaves but it was effective against *Escherichia coli* and *Klebsiella pneumonia*. The methanolic extract was effective against all of them effectively.

Conclusion: According to the results, the methanolic extract of *Taraxacum officinale* leaves could exhibit in vitro antibacterial activity against *Staphylococcus aureus*, *Klebsiella pneumonia*, and *Escherichia coli*.

Keywords: Antibacterial activity, *Taraxacum officinale*, Methanolic extract, Ethanolic extract

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Introduction

A native medicinal plant that has recently received considerable attention in the explorative process of combating increased antibacterial resistance is *Taraxacum officinale*, which is commonly called dandelion. Different parts of this herbaceous plant are loaded with diverse medicinal properties, including antibacterial properties (1). These properties have been reported as a result of the presence of

antibacterial bioactive compounds such as caffeoyl tartaric acid, cinnamic acid, and flavonoids in different parts of the plants, including the leaves (2, 3). multidrug-resistant bacterial strains (MDRS) continue to spread, and the need for novel antibacterial agents with high therapeutic index and less toxicity continues to grow (4). It is evident that the usefulness of *T. officinale* as a potential ancillary antibacterial agent has not been extensively explored, especially in Ghana. Besides, discrepancies in the medicinal properties of

some plants due to geographical location has been reported (5). It is on this background that this pilot study was conducted to determine the possible antibacterial activity of aqueous, ethanolic, and methanolic extracts of *T. officinale* leaves (in Ghana) against some clinical bacterial strains.

Materials and Methods

Collection of Plant Materials and Preparation

Fresh leaves of healthy *T. officinale* were harvested from the University of Ghana Staff Village and washed 3-4 times with running water followed by distilled water. It was dried at 40°C hot air oven for 3 days with intermittent observation for microbial damage of the leaves. The dried leaves were grounded into the powdered form using a clean grinder.

Preparation of Plant Extracts

One hundred grams (100g) of each powdered leaves was soaked in 1000ml of 70% methanol and ethanol separately in sterile conical flasks and shaken for 72 h at 120 rpm. The contents were filtered and kept at 4 °C until they were ready for use.

Evaluation of Antibacterial Activity of the Extracts
Antimicrobial susceptibility of the bacteria strains to the extracts was investigated using the agar well diffusion method in accordance with the National Committee for Clinical Laboratory Standards (NCCLS)(6). A 0.5 McFarland standard was prepared

with bacterial cell suspension using normal saline for each bacterial strain. A 50 µl of the suspension was spread on a 25 ml Mueller-Hinton agar (MHA) plate (Fluka, Sigma-Aldrich Chemie, Buchs, Switzerland). Five (5) mm diameter wells were made in each agar medium, filled with 100µl of each plant extract and allowed to diffuse for two hours at ambient temperature. All the plates were subsequently incubated for 24 h at 37°C. The wells containing the same volume of distilled water, ethanol, and methanol were included as negative controls; whereas standard antibiotic discs of Ciprofloxacin (5µg), Ceftriaxone (30µg), and Amikacin (30µg) were considered as positive controls. After the 24 h incubation, the plates were read and the zones of inhibition (in millimeters) were measured. Antibacterial activity assays using each extract were carried out in triplicates for each of the test organisms - *Staphylococcus aureus*(*S. aureus*), *Escherichia coli* (*E.coli*)and *Klebsiella pneumonia*(*K. pneumonia*). All the test strains were maintained on nutrient at 4 °C and sub-cultured onto Mueller-Hinton media for 24 h prior to testing.

Statistical Analysis

The tests were performed in triplicates for each bacterium, and zones of inhibition (in millimeters) were presented as mean inhibition zone diameter (IZD) values. One-way ANOVA, followed by Tukey's post-hoc multiple comparison test was used to assess the

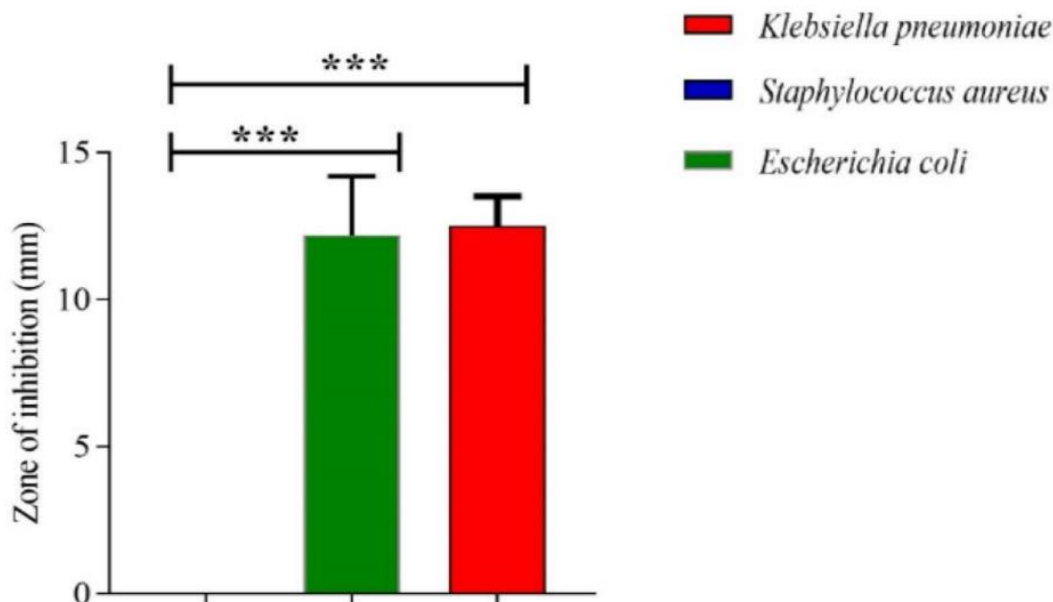


Figure 1. A comparison of the ethanolic extracts of *Taraxacum officinale* leaves against test organisms (p<0.05, **; p<0.01, ***; p<0.0001) No ZOI was recorded for the *Staphylococcus aureus*.

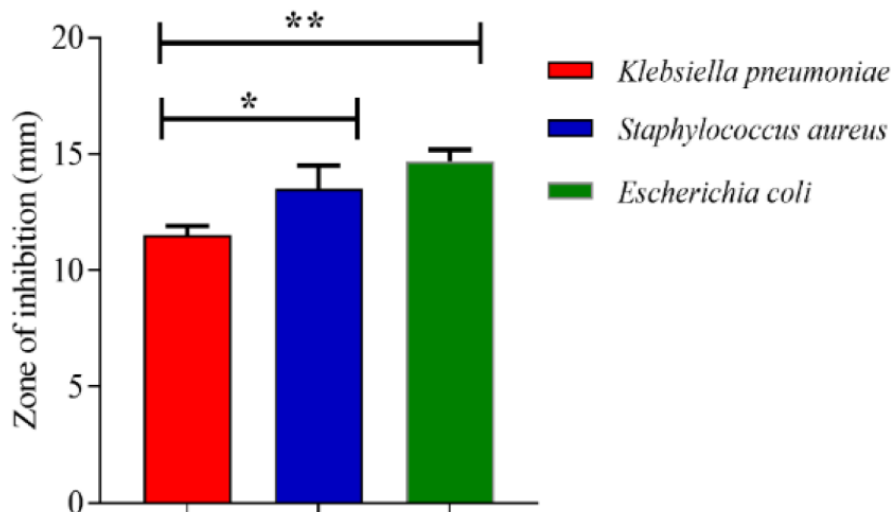


Figure 2. A comparison of various methanolic extracts of *Taraxacum officinale* leaves against test organisms ($p < 0.05$, **, $p < 0.01$).

significance of difference between IZDs of various *T. officinale* leaf extracts against different bacteria. Confidence was set at 95%, and a $p < 0.05$ was considered as statistically significant. All the statistical analyses were performed using GraphPad Prism 7 version 7.04.

Results and Discussion

S. aureus was resistant to the ethanolic extract of *T. officinale* leaves but it was effective against *E. coli* and *K. pneumoniae* (Figure 1). The methanolic extract was effective against all the three bacteria (Figure 2). There were no IZD for all the solvents (negative controls) and all the antibiotic discs had IZD > 15.0 mm.

The global need and search for novel sources of antibacterial agents to combat pathogenic bacteria, especially MDRS cannot be over emphasized. The potential of *T. officinale* to contribute to the fulfillment of this need and for its potential to be explored and realized, necessitates wide scientific experimentations. This pilot study found the ethanolic extracts of *T. officinale* leaves effective against *E. coli* and *K. pneumoniae*, but not against *S. aureus*. However, the methanolic extract was effective against all the three bacteria. Similar findings have been reported (3,7). However, the effective extract

minimum inhibitory concentration (MIC) in the study conducted by Sa'id *et al.*, at the minimum IZD was higher compared with the present study with regards to the ethanolic extract (7). Other reasons resulting in differences and similarities in this study and that of others referenced earlier include the method of preparation of the leaves extracts, the solvents used, age and geographical location of the plant, and time of harvesting of the plant leaves (1, 3,5)..

Conclusion

It was found in this study that the methanolic extract of *T. officinale* leaves possesses *in vitro* antibacterial activity against *S. aureus*, *K. pneumoniae*, and *E. coli*. The leaves can, therefore, be a source of bioactive antibiotic compounds with broad spectrum activity, and may contribute to the combat against MDRS, when extensively explored.

Acknowledgment

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Conflict of Interest

The authors declare that they have no conflict of

interest.

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References

1. Napoli A di, Zucchetti P. "A comprehensive review of the benefits of *Taraxacum officinale* on human health," *Bull. Natl. Res. Cent.* 2021;45:1–7.
2. Lis B, Jedrejek D, Rywaniak J, Soluch A, Stochmal A, Olas B. Flavonoid Preparations from *Taraxacum officinale* L. Fruits-A Phytochemical, Antioxidant and Hemostasis Studies. *Molecules.* 2020;25(22):5402.
3. Li M, Zhang H, Hu X, Liu Y, Liu Y, Song M, et al. Isolation of

a New Polysaccharide from Dandelion Leaves and Evaluation of Its Antioxidant, Antibacterial, and Anticancer Activities. *Molecules.* 2022;27(21):7641.

4. Morris S, Cerceo E. Trends, Epidemiology, and Management of Multi-Drug Resistant Gram-Negative Bacterial Infections in the Hospitalized Setting. *Antibiotics (Basel).* 2020; 9(4):196.

5. Liu Y, Chen P, Zhou M, Wang T, Fang S, Shang X, et al. Geographic Variation in the Chemical Composition and Antioxidant Properties of Phenolic Compounds from *Cyclocarya paliurus* (Batal) Iljinskaja Leaves. *Molecules.* 2018;23(10):2440.

6. Valgas C, De Souza SM, Smânia EFA, Smânia A. "Screening methods to determine antibacterial activity of natural products," *Brazilian J. Microbiol.* 2017;38(2):369–380.

7. Sa'id, AM, Mustapha HU, Mashi JA, Muhammad YY, Abubakar SM, et al. "Nutritional and Pharmacological Potential of Ethanol Leaves Extract of *Taraxacum officinale*," *Asian J. Biol. Sci.* 2018;12 (1):1–8.

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