

PHYTOCHEMICAL ANALYSIS AND ANTIBACTERIAL ACTIVITIES OF GUNDELIA TOURNEFORTII AND MALVA SYLVESTRIS LEAF EXTRACTS IN KURDISTAN IRAQ**Mustafa J. Jalal**

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Abstract: This study aims to evaluate the phytochemical composition and antibacterial activities of *Gundelia tournefortii* and *Malva sylvestris* leaf extracts from the Kurdistan region of Iraq. Phytochemical screening was performed to identify the presence of key compounds, while the antibacterial activity was assessed against various bacterial strains. The results indicated significant phytochemical constituents and promising antibacterial properties, suggesting potential uses in traditional and modern medicine.

Keywords: *Gundelia tournefortii*, *Malva sylvestris*, Antibacterial Activities, Phytochemical Analysis

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Introduction

Medicinal plants have long been a cornerstone of traditional medicine worldwide, offering a vast array of bioactive compounds with therapeutic potential. Among these, *Gundelia tournefortii* and *Malva sylvestris* have garnered attention for their phytochemical richness and pharmacological properties.

Gundelia tournefortii and *Malva sylvestris* are two medicinal plants widely used in traditional medicine. *Gundelia tournefortii*, commonly known as tumbleweed or gundelia, is a perennial plant native to the Middle East and parts of Asia (Kaur & Arora, 2021). *Malva sylvestris*, or common mallow, is a species of flowering plant in the Malvaceae family, known for its anti-inflammatory and antimicrobial properties (Radulović et al., 2015). This study investigates the phytochemical constituents and antibacterial activities of these plants, focusing on their potential therapeutic applications.

Both *Gundelia tournefortii* and *Malva sylvestris* have been studied extensively for their phytochemical composition, which includes flavonoids, phenolic acids, tannins, and other bioactive compounds. These phytochemicals are known for their antioxidant activities, which play a crucial role in neutralizing harmful free radicals and protecting cellular structures from oxidative damage (Boukhris et al., 2013).

Furthermore, recent research has highlighted the antibacterial properties of extracts derived from these plants. Studies have demonstrated the efficacy of *G. tournefortii* and *M. sylvestris* extracts against a wide range of pathogenic bacteria, suggesting their potential in combating infectious diseases and supporting their traditional use as antimicrobial agents (Ghalem and Mahmoudi, 2016; Karaman et al., 2010).

In light of their promising pharmacological activities, further exploration of the phytochemical profiles and biological effects of *Gundelia tournefortii* and *Malva sylvestris* leaf extracts is warranted. This paper aims to contribute to this field by presenting a comprehensive analysis of their phytochemical composition, antioxidant capacities, and antibacterial activities, focusing on their potential applications in pharmaceutical and healthcare industries

Methods

Plant Material and Preparation of Extracts

Fresh leaves of *Gundelia tournefortii* and *Malva sylvestris* were collected from various locations in the Kurdistan region of Iraq. The leaves were washed, air-dried, and ground into a fine powder. The powder was subjected to solvent extraction using ethanol, methanol, and aqueous solutions (Harborne, 1998).

Phytochemical Screening

Phytochemical analyses were conducted to detect the presence of alkaloids, flavonoids, tannins, saponins, terpenoids, and phenolic compounds following standard protocols (Sofowora, 1993; Trease & Evans, 2002).

Antibacterial Activity

The ability of the extracts to inhibit bacterial activities was determined by the agar well diffusion method on *E.coli*, *S.aureus*, and *P.aeruginosa* following the techniques explained by Bauer, Kirby, Sherris, and Turck in 1966.

Result and Discussion

Phytochemical Composition

The phytochemical screening of *Gundelia tournefortii* and *Malva sylvestris* leaf extracts revealed the presence of several bioactive compounds. Both plants contained significant amounts of flavonoids, phenolic compounds, and tannins, with lesser amounts of alkaloids, Terpenoids and saponins (Table 1).

Table (1) showing presence of bioactive compounds in the plant extracts

Compound	Extracts					
	<i>Gundelia</i> (Ethanol)	<i>Malva</i> (Ethanol)	<i>Gundelia</i> (Methanol)	<i>Malva</i> (Methanol)	<i>Gundelia</i> (Aqueous)	<i>Malva</i> (Aqueous)
Alkaloids	+	+	+	+	+	+
Flavonoids	+++	++	+++	++	+	+
Tannins	++	+++	++	++	+	++
Saponins	+	+	+	+	+	+
Terpenoids	+	+	+	+	+	+
Phenolic Compounds	+++	++	++	++	++	+

Note: + = present, ++ = moderately present, +++ = highly present

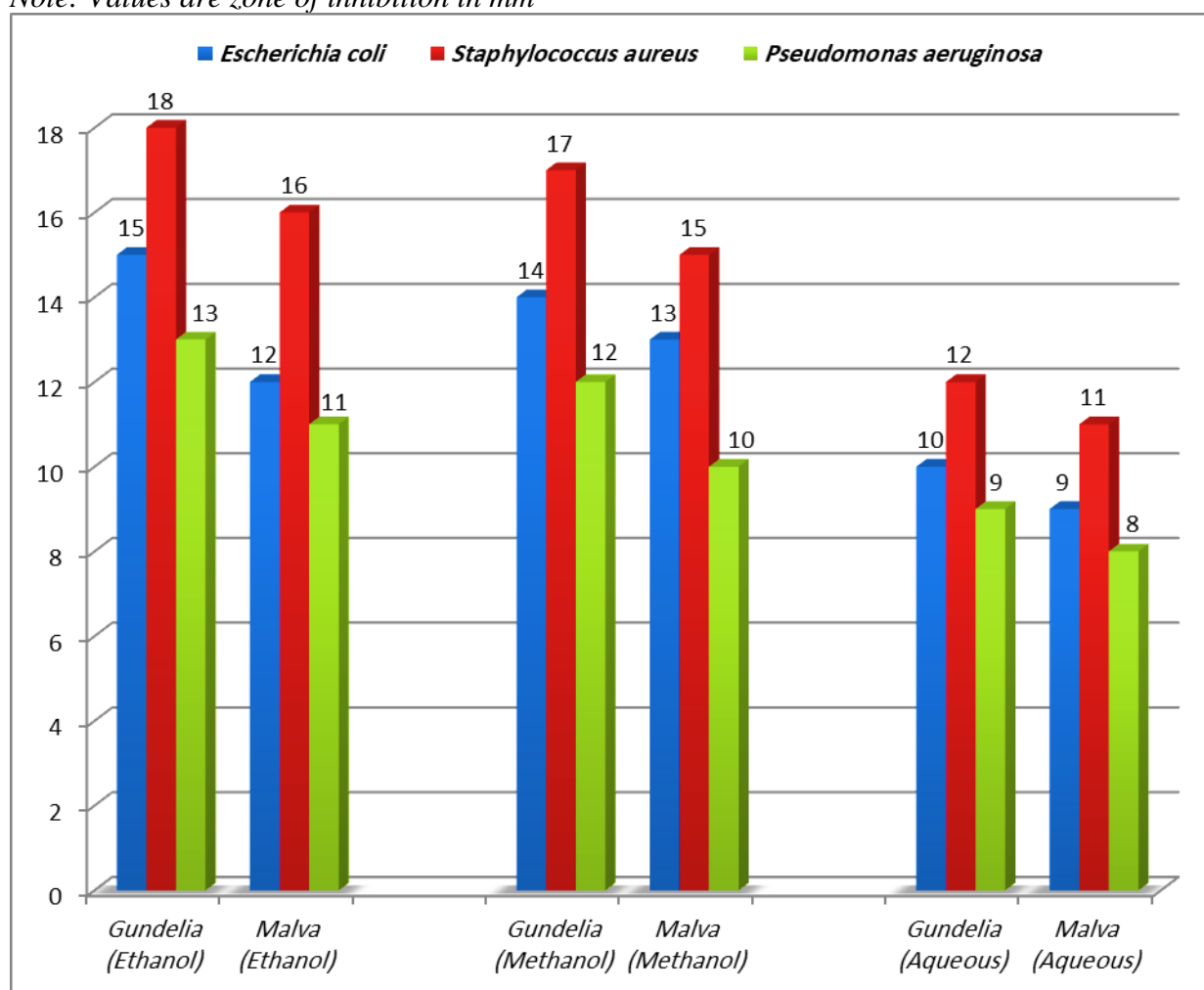
Antibacterial Activity

The antibacterial activity results demonstrated that both plant extracts exhibited inhibitory effects against the tested bacterial strains. The ethanol and methanol extracts showed higher antibacterial activity compared to aqueous extracts (Table 2 , Fig. 1).

Table 2: show Effect of *Gundelia tournefortii* and *Malva sylvestris* Leaf Extracts on the Growth of Pathogenic Bacterial Strains (mm)

Bacterial Strain	Extracts					
	<i>Gundelia</i> (Ethanol)	<i>Malva</i> (Ethanol)	<i>Gundelia</i> (Methanol)	<i>Malva</i> (Methanol)	<i>Gundelia</i> (Aqueous)	<i>Malva</i> (Aqueous)
<i>Escherichia coli</i>	15	12	14	13	10	9
<i>Staphylococcus aureus</i>	18	16	17	15	12	11
<i>Pseudomonas aeruginosa</i>	13	11	12	10	9	8

Note: Values are zone of inhibition in mm

**Fig. 1 : show Effect of *Gundelia tournefortii* and *Malva sylvestris* Leaf Extracts on the Growth of Pathogenic Bacterial (mm)**

Discussion

The phytochemical analysis of *Gundelia tournefortii* and *Malva sylvestris* revealed a rich presence of bioactive compounds, which are known to contribute to their medicinal properties. Flavonoids and phenolic compounds, in particular, are recognized for their antioxidant and antimicrobial

activities (Cushnie & Lamb, 2005). The significant antibacterial activity observed in the ethanol and methanol extracts can be attributed to the higher solubility of these phytochemicals in organic solvents. The results corroborate previous studies indicating the potential of these plants in combating bacterial infections (Kaur & Arora, 2021; Radulović et al., 2015). The relatively low MIC and MBC values suggest that these extracts could be developed into effective antibacterial agents. Also, the use of silver nanoparticles manufactured from some plants showed a significant inhibitory effect on bacterial and fungal isolates in a study conducted by (Al-Jubouri, *et al.*, 2023). Further studies should focus on isolating and characterizing the specific compounds responsible for the observed antifungal effects. Altogether, alcoholic extract on all the plants that used were relatively more potent to the aqueous extract in the inactivation of growth (Mustafa & Oday, 2020).

Conclusion

This study confirms the presence of valuable phytochemicals in *Gundelia tournefortii* and *Malva sylvestris* and demonstrates their substantial antibacterial activities. The findings support the traditional use of these plants in treating bacterial infections and highlight their potential for development into natural antimicrobial agents

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