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Phytochemical Profiling and In-Vitro Antibacterial Activity of the Selected Wild Vegetable *Launaea procumbens*

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Abstract:

Wild edible plants are increasingly recognized as valuable sources of biologically active secondary metabolites. The present study aimed to investigate the phytochemical profile and in-vitro antibacterial activity of the wild leafy vegetable Launaea procumbens collected from the surroundings of ***Radhanagari Wildlife Sanctuary****. Leaf extracts were prepared using aqueous–ethanol and chloroform solvents. Qualitative phytochemical screening was performed to detect major classes of secondary metabolites, followed by quantitative estimation of total alkaloids and total phenolic content. Antibacterial activity of the extracts was evaluated against clinically isolated bacterial strains of Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa using the agar well diffusion method. The results revealed the presence of alkaloids, flavonoids, phenolic compounds, tannins, Saponins, glycosides and proteins in the leaf extracts. Quantitative analysis indicated appreciable levels of total alkaloids and phenolics. The extracts exhibited concentration-dependent antibacterial activity against the tested pathogens. The study confirms that Launaea procumbens is a promising wild vegetable with potential application as a natural source of antimicrobial agents.*

Keywords: Launaea procumbens, wild vegetable, phytochemical screening, antibacterial activity, phenolics, alkaloids*.*

Introduction:

Wild vegetables are traditionally consumed in many rural regions and are often valued for their nutritional as well as medicinal properties. These plants grow naturally without cultivation and are exposed to various environmental stresses, which frequently leads to the synthesis of a wide range of bioactive secondary metabolites. Phytochemicals such as alkaloids, phenolic compounds, flavonoids, tannins and Saponins are known to play important defensive roles in plants and exhibit a wide spectrum of biological activities including antioxidant, anti-inflammatory and antimicrobial properties. In recent years, increasing microbial resistance to conventional antibiotics has intensified the search for alternative antimicrobial agents of plant origin.

Launaea procumbens is a commonly available wild leafy vegetable that grows abundantly in open fields, roadsides and disturbed habitats. Traditionally, the plant is used in folk practices for the treatment of inflammation, pain and minor infections. However, systematic evaluation of its phytochemical composition and antibacterial potential remains limited.

Therefore, the present study was undertaken to evaluate the phytochemical constituents and in-vitro antibacterial activity of leaf extracts of *Launaea procumbens* collected from the Radhanagari region of Maharashtra, India.

Materials and Methods:

Collection and identification of plant material:

Fresh and healthy leaves of *Launaea procumbens* were collected from the forest fringe and nearby open fields of the Radhanagari region, Kolhapur district, Maharashtra, India. The plant material was authenticated by a qualified botanist and used for further laboratory investigations.

Processing of plant material:

The collected leaves were washed thoroughly with distilled water to remove adhering debris and shade-dried at room temperature. The dried material was ground into a fine powder using a sterile grinder and stored in airtight containers until extraction.

Preparation of plant extracts:

Ten grams of powdered leaf material were soaked in 100 mL of aqueous–ethanol (50:50, v/v) for 12 h. The extract was filtered using Whatman filter paper and stored at 4 °C.

For chloroform extraction, 10 g of powdered sample was soaked in 100 mL of chloroform for 12 h and filtered. The filtrates were used for phytochemical and antibacterial analyses.

Qualitative phytochemical screening:

Standard qualitative tests were performed to detect major phytochemical groups in the extracts as follows:

- Alkaloids – Wagner's test
- Carbohydrates – Benedict's test
- Glycosides – Modified Borntrager's test
- Saponins – Foam test
- Phytosterols – Salkowski test
- Phenolic compounds – Ferric chloride test
- Tannins – Gelatin test
- Flavonoids – Lead acetate test
- Proteins – Xanthoproteic test

Quantitative estimation of total alkaloids:

Total alkaloid content of the aqueous–ethanol extract was determined using a titrimetric method. The extract was treated with 0.1 N hydrochloric acid and the alkaloids were separated using n-butanol. The acidic layer containing alkaloids was titrated against 0.1 N sodium hydroxide using methyl red as indicator.

The total alkaloid content was calculated using the equivalence:

1 mL of 0.1 N HCl = 0.0162 g of alkaloids.

Determination of total phenolic content:

Total phenolic content was estimated by the Folin–Ciocalteu colorimetric method. Tannic acid was used as a standard. After reaction with Folin–Ciocalteu reagent and sodium bicarbonate, absorbance was measured at 560 nm using a UV–visible spectrophotometer. The results were expressed as milligrams per gram of dry plant material.

Test microorganisms:

Clinically isolated strains of the following bacteria were used:

- *Escherichia coli*
- *Staphylococcus aureus*
- *Pseudomonas aeruginosa*

Antibacterial assay:

Antibacterial activity was evaluated using the agar well diffusion method. Nutrient agar plates were inoculated with freshly prepared bacterial cultures. Wells were made using a sterile cork borer and filled with 50 µL, 100 µL and 150 µL of *Launaea procumbens* leaf extract (1 mg/mL). Plates were incubated at 37 °C for 48 h. Zones of inhibition were measured in millimetres and percentage inhibition was calculated relative to control plates.

Results:

Phytochemical screening:

Qualitative phytochemical analysis of *Launaea procumbens* leaf extracts revealed the presence of several bioactive constituents. Alkaloids, flavonoids, phenolic compounds, tannins, saponins, glycosides, phytosterols and proteins were detected in both aqueous–ethanol and chloroform extracts. The aqueous–ethanol

extract showed comparatively stronger reactions for phenolics and flavonoids.

Total alkaloid content:

The total alkaloid content of *Launaea procumbens* leaf extract was estimated to be approximately **0.0486 g** per analysed sample using the titrimetric method.

Total phenolic content:

The total phenolic content of *Launaea procumbens* leaf extract was found to be **17.812 mg/g** of dry plant material.

Table 1: Titrimetric method for determination of total Alkaloids

Name of the sample	Result
Launaea procumbens	4.7

Table 2: Phytochemical qualitative analysis of *Launaea procumbens*

Sr. No	Phytochemical Test	Reagent used to performed test	Inference	Aqueous EE	CE
1.	Alkaloids	Wagners Reagent	Reddish brown color	+	+
2.	Carbohydrates	Benedicts reagent	Formation of orange /red ppt	–	–
3.	Saponins Test	Fort Test	Formation of foam	–	–
4.	Phytosterols	Salkowskis Regent	Golden yellow color	+	–
5.	Phenoloics	Ferric chloride	Bluish black color	+	+
6.	Tannins	Gelatin	Formation of white ppt	+	+
7.	Flavonoids	Lead Acetates	Formation of yellow color	+	+
8.	Glycosides	Modified Borntrager's	Formation of rose pink color	+	–
9.	Detection of Proteins	Xanthoproteic Test	Formation of yellow color	+	–

Antibacterial activity:

The leaf extracts of *Launaea procumbens* exhibited concentration-dependent antibacterial activity against all tested microorganisms. The highest inhibitory effect was observed at 150 µL concentration. Moderate inhibition was recorded against *Escherichia coli* and *Pseudomonas aeruginosa*, whereas comparatively lower inhibition was observed against *Staphylococcus aureus*. No inhibition was observed in the control wells.

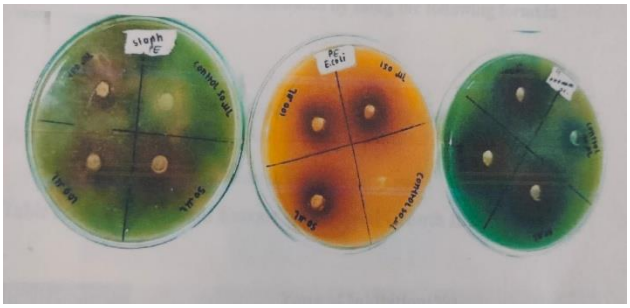

Fig 1: Launaea procumbens* show antibacterial activity against *E.coli, P.aeruginosa* and *S. aureus

Discussion:

The present study demonstrates that *Launaea procumbens* is rich in diverse classes of secondary metabolites. Alkaloids, phenolics and flavonoids are widely recognized for their ability to inhibit microbial growth through mechanisms such as disruption of cell membranes, inhibition of

nucleic acid synthesis and interference with bacterial enzyme systems.

The appreciable phenolic content observed in the leaf extract may be responsible for its antibacterial activity, as phenolic compounds are known to damage microbial cell walls and destabilize cytoplasmic membranes. The presence of tannins and flavonoids may further contribute to the observed inhibitory effects by forming complexes with bacterial proteins and cell wall components.

The moderate but consistent antibacterial activity observed against both Gram-positive and Gram-negative bacteria suggests that *Launaea procumbens* possesses broad-spectrum antimicrobial potential. The comparatively lower activity against *Staphylococcus aureus* may be attributed to strain-specific resistance or limited permeability of the extract components.

Overall, the findings support the traditional use of *Launaea procumbens* as a medicinal wild vegetable and highlight its importance as a potential source of natural antimicrobial compounds.

Conclusion:

The present investigation confirms that the wild vegetable *Launaea procumbens* contains several biologically important phytochemicals, including alkaloids, phenolics, flavonoids, tannins and saponins. The leaf extracts exhibited measurable in-vitro antibacterial activity against clinically relevant bacterial pathogens. These results indicate that *Launaea procumbens* can serve as a valuable natural resource for the development of plant-based antimicrobial agents. Further studies focusing on isolation of active compounds, toxicity evaluation and in-vivo validation are required to establish its pharmaceutical potential.

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