

Original Research Article

Phytochemical Analysis and Antibacterial Activity of *Launaea taraxacifolia* Ethanolic Leaf Extract

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Abstract: The study was carried out on *Launaea taraxacifolia* leaves ethanolic extract for its antibacterial activity and phytochemical constituents. The leaf extract was tested on five bacterial species such as *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Candida albicans*, *Proteus spp.*, *Bacillus subtilis* and *Streptococcus mutans*. The ethanolic leaf extract of *Launaea taraxacifolia* showed inhibitory effect on only 5 bacterial species which include *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Candida albicans* and *Proteus spp.* The ethanolic leaf extract showed no effect on *Bacillus subtilis* but inhibited *Streptococcus mutans* at concentration of 25 µl. The inhibition zones for *S. aureus* were 8 mm, 9 mm and 10 mm at concentrations of 15 µl, 20 µl and 25 µl respectively. The ethanolic extract displayed 6 mm, 8 mm and 9 mm against *Proteus spp.* At 25 µl concentration of extract the inhibition zone 13 mm was observed for *Escherichia coli* and *Candida albicans*. The phytochemical analysis showed the presence of Carbohydrates, Phenols, Tannins, Steroids, Cardiac glycosides, Flavanoids, Alkaloids, Terpenes, Proteins and Saponins.

Keywords: *Launaea taraxacifolia*, Antibacterial, Phytochemicals, Leaf, Extract, Ethanolic.

INTRODUCTION

Launaea taraxacifolia which belongs to the family Compositae (Asteraceae) is used in West Africa as a leafy vegetable and for its medicinal properties. It is used as salad or it can be freshly eaten or cooked in soups or sauces. It is an annual herb of Tropical West African origin commonly known as wild lettuce. Wild lettuce is among the underutilized and neglected vegetable in the Southern parts of Nigeria. The whole plant is very rich in a milky sap (lactucarium) that flows freely from any wound of the plant (leaves, stems or root). The sap changes its color to yellow at first and then brownish, hardens and dries when in contact with air [1].

The plant is taxonomically referred to as *Lactuca taraxacifolia* and *Launaea taraxacifolia* [2]. Wild lettuce has several traditional uses and it is sometimes grown for the purpose of harvesting the leaves which are sold in the markets as uncooked or cooked vegetable. Several studies have revealed that wild or semi-wild plants including this plant are nutritionally important due to high levels of vitamins, minerals, proteins, essential fatty acids and fiber contents [3]. The leaves are rich in antioxidants and other health related phytochemicals linked to protection against cardiovascular and other degenerative diseases. The leaves are given to cows in

Northern Nigeria to promote and increase milk production and to rabbits, sheep and goats to induce multiple births. The leaves of *L. taraxacifolia* have been reported to have hypolipidaemic effects and also have the ability to manage water retention disorder [2, 3]. The leaf has been estimated to have a total energy value of 287.47 kcal/100g of the dry sample. This low calorific value and high protein content (20.67%) may be recommended to individuals suffering from overweight and obesity. The leaf mixed with fine ash are rubbed onto the sores of yaws by herbal practitioners in Ghana and the boiled leaves are applied to the head of a newly-born baby to promote proper fixing of the frontal bones [4].

The sap has been anciently known to work effectively against whooping cough and brings some relief to those suffering from bronchitis. Wild lettuce is used homeopathically for restlessness and insomnia. The leaf extract mixed with breast milk of a nursing mother is administered medically to cure partial blindness resulting from snake bite among villagers. The leaves are rubbed on the limbs of backward children to induce them to walk in Ghana [1, 3, 4]. According to [5], the administration of the leaf extract (10-5000 mg/kg) to mice and rats in acute and sub-acute toxicity studies did not have any negative effect on the physical, haematological and serum

biochemical parameters assessed. Furthermore the photomicrographs of the kidney showed less damage in the extract-treated experimental rats especially at higher doses indicating a possible protective effect of the extract on the kidney.

The various usage of wild lettuce by local people suggests that the plant contains nutritional and bioactive substances which may have antibiotic properties. Hence, the focus of this research is to undertake the phytochemical screening of the plant and evaluate the antimicrobial properties of the leaf ethanolic extract of *Launaea taraxacifolia* L. using different organic solvents.

MATERIALS AND METHODS

Collection of Plant Sample

The plant (*Launaea taraxacifolia*) was collected from the wild around the express road, Asaba, Delta State, Nigeria. The leaves were hand-picked, washed with clean water, wiped dry with paper towels, shredded and air dried at room temperature under shade. After 10 days of drying (10% moisture content) it was milled and sieved to obtain fine powder which was then stored in an air tight glass containers for laboratory analyses.

Microorganisms

The leave extracts of *Launaea taraxacifolia* were tested against five pathogenic bacteria. The test organisms include *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis* and *Streptococcus mutans*.

Extraction process

Preparation of extract was done according to the procedure done by [6]. 25 g of leave powder was packed in soxhlet extraction unit and exhaustively extracted using 100 mL of ethanol at 60°C for 12 hours. The extract was completely dried in water bath at 40 °C and subsequent stored at 4 °C.

Phytochemical analysis

The phytochemicals were qualitatively analysed by using standard procedures [7, 8, 9, 10, 11]. The phytochemicals were observed by using following reagents and chemicals. Carbohydrates were observed with Molisch's test, Foam test was done for saponins, Phytosterols with Liebermann-Burchard's test, Flavonoids were observed with NaOH/HCl, ferric chloride solution was used to find Tannins and Phenols, Ninhydrin test, Biuret test, Millon's test were done for Proteins and amino acids. Mayer's reagent, Hager's reagent and Dagendorff's reagent were used to find Alkaloids and Terpenes.

Determination of antibacterial activity

Antibacterial activity was measured by well diffusion method [12]. Nutrient agar (Hi media) was prepared and poured in to the petriplates. After solidification of media, overnight bacterial cultures were inoculated on the surface of media. By using a sterile gel puncher 4 mm of wells were made in each petri plates. Then 15 µl, 20 µl and 25 µl of ethanol, water extracts of Leaves of *L. taraxacifolia* were added in to the three wells respectively. The plates were incubated in the incubator at 37°C for optimum bacterial growth. In the next day, diameter of the zone of inhibition was measured.

RESULTS

Anti-bacterial activity

The ethanolic leave extract of *Launaea taraxacifolia* showed inhibitory effects on all bacterial species tested (*Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Candida albicans* and *Proteus spp.*). The ethanolic leave extract showed no effect on *Bacillus subtilis* but *Streptococcus mutans* was inhibited at 25 µl. The inhibition zones for *S. aureus* were 8 mm, 9 mm and 10 mm at concentrations of 15 µl, 20 µl and 25 µl respectively. The ethanolic extract displayed 6 mm, 8 mm and 9 mm against *Proteus spp.* At 25 µl concentration of extract the inhibition zone 13 mm was observed for *Escherichia coli* and *Candida albicans*. The antibacterial results of ethanolic extract were given below in Table 1 and demonstrated in Fig 1.

Table 1: Inhibition Zones of Ethanolic Extract against Test Pathogenic Bacteria

Test bacterial species	Inhibition zones in (mm)		
	15 µl (ethanolic extract)	20 µl (ethanolic extract)	25 µl (ethanolic extract)
<i>Staphylococcus aureus</i>	8mm	9mm	10mm
<i>Proteus spp.</i>	6mm	8mm	9mm
<i>Bacillus subtilis</i>	-	-	-
<i>Escherichia coli</i>	8mm	11mm	13mm
<i>Streptococcus mutans</i>	-	-	5mm
<i>Klebsiella pneumoniae</i>	5mm	8mm	9mm
<i>Candida albicans</i>	10mm	12mm	13mm

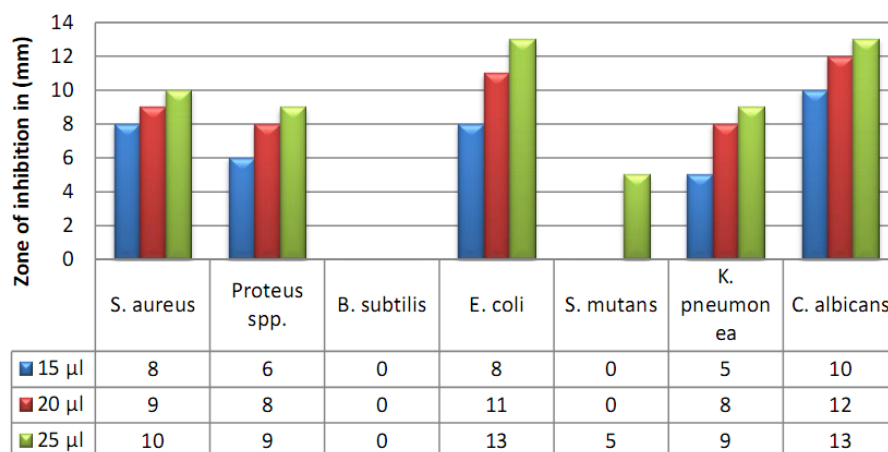


Fig 1: Zones of Inhibition of Ethanolic Extract on Different Bacterial species

Phytochemical analysis

The phytochemical analysis showed the presence of Carbohydrates, carbohydrates, tannins,

phenols, steroid, cardiac glycoside, flavanoids, alkaloids, proteins and saponins in Table 2 below.

Table 2: Presence of Phytochemicals in Leave Ethanolic Extract of *Launaea taraxacifolia*

S. NO	Phytochemicals	Presence of phytochemicals in ethanolic extract
1.	Carbohydrate	+
2.	Flavonoids	+
3.	Alkaloids	+
4.	Tannins and Phenols	+
5.	Proteins	+
6.	Saponins	+
7.	Sterols	+
8.	Terpenes	+
9.	Cardiac glycosides	+

+ = presence, - = absence

DISCUSSION

Medicinal plants are gaining a lot of importance now a day because of their efficacy in traditional healing. Researchers are turning focus on the traditional healers in order to find plant based drugs [5]. As the modern antibiotics have various anarchic toxic effects, these plant extracts could serve as a better alternative as antibacterial agents. This study showed that the leave extract of *Launaea taraxacifolia* showed a reasonable antibacterial activity on *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Candida albicans* and *Proteus spp* but had no effect on *Bacillus subtilis* and very little effect on *Streptococcus mutans*. In a single plant many active secondary metabolites are present and medicinal effect can be attributed to either a single compound or combined effect of many compounds. The antibacterial activity of *Launaea taraxacifolia* in this study can either be due to the presence of some specific bioactive molecule or due to the synergistic effect of different phytoconstituents [13]. Previous studies conducted on leaves of *Launaea taraxacifolia* showed potent antimicrobial activity [5]. In the present study the leave ethanolic extract has showed reasonable antibacterial effect than the previous

studies conducted on leaves of *Launaea taraxacifolia*. Studies by [14] confirm that alcohol is a good solvent for the extraction of antimicrobial in *Launaea taraxacifolia*. The phytochemical contents of the leaves of *Launaea taraxacifolia* serve as supplements for food because of their nutritional properties and also have the potential to improve the health status of its user through their phytochemical and antimicrobial properties. The phytochemical screening of the plant showed that it is rich in tannins, flavonoids, saponins, phenols, steroid and cardiac glycoside which are common constituents of many traditionally prepared herbal medicines and leafy vegetables. The presence of these compounds in plants has been attributed to their biological activities. Furthermore, it has been noted that the presence of phytochemical compounds in this plant is responsible for the observed antimicrobial activities. The results of the present studies also indicate that the leaves of *Launaea taraxacifolia* contain essential nutrients and phytochemicals which compare favourably with other conventional edible leafy vegetables which are commonly used in this locality. The plant is an important source of leafy vegetables which is

recommended for diabetic patients in this community because of its low caloric value.

CONCLUSION

The investigation on ethanolic leave extract of *Launaea taraxacifolia* revealed the presence of phytochemicals like carbohydrates, tannins, phenols, steroid, cardiac glycoside, flavanoids, alkaloids, proteins and saponins and also showed a reasonable antibacterial activity on *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Candida albicans* and *Proteus spp.* Traditional healing system has provided many important herbs that have the potentials to cure many diseases. Based on previous studies, this plant *Launaea taraxacifolia* has various medicinal properties. Hence effective work should be done to isolate of various phyto inhibitors.

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