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Antibacterial Activity of the Crude Phenolic, Alkaloid and Terpenoid Compounds Extracts of Lactuca serriola L. on Human Pathogenic Bacteria

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Abstract
Objective: To reveal the effect of the crude phenolic, alkaloid and terpenoid compounds extracts of *Lactuca serriola* L. on some Human Pathogenic Bacteria.**Methods:** Antibacterial activities of the crude Phenolic, Alkaloid and Terpenoid of medicinal plant were determined by *in vitro* by agar diffusion-method against some human pathogenic bacteria.**Results:** obtained results showed that among nine pathogenic bacteria, only *Staphylococcus aureus* and *Staphylococcus saprophyticus* Gram-positive were susceptible for Terpenoid, Alkaloid and Phenolic compounds while *Staphylococcus epidermidis* was resistant to active compounds.**Conclusion:** This study demonstrates that we can conclude that the effect of active compounds in same plant has different effect on different pathogenic organisms in different concentration.
Keywords: Antibacterial Activity; *Lactuca serriola* L; Pathogenic Bacteria

INTRODUCTION

The use of medicinal plants as a source for relief from illness can be traced back over five millennia to written documents of the early civilization in China, India and the Near east, but it is doubtless an art as old as mankind. Neanderthals living 60,000 years ago in present day Iraq used plants such as hollyback, these plants are still widely used in ethnomedicine around the world [1, 2].

Plant based antimicrobials represent a vast untapped source for medicines and further exploration of plant antimicrobials needs to occur. Antimicrobials of plant origin have enormous therapeutic potential [3]. Human infections particularly those involving microorganisms i.e. bacteria, fungi, viruses, they cause serious infections in tropical and subtropical countries of the world. In recent years, multiple drug resistance in human pathogenic microorganisms has been developed due to indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of such diseases [4, 5]. In general, bacteria have the genetic ability to transmit and acquire resistance to drugs, which are utilized as therapeutic agents [6].

The problem of microbial resistance is growing and the outlook for the use of antimicrobial drugs in the future is still uncertain. Therefore, actions must be taken to reduce this problem, for example, to control the use of antibiotic, and develop research to better understand the genetic mechanisms of resistance and to continue studies to develop new drugs, either synthetic or natural. The ultimate goal is to offer appropriate and efficient antimicrobial drugs to the patient [7]. The potential of higher plants as source for new drugs is still largely unexplored. Among the estimated 250,000-500,000 plant species, only a small percentage has been investigated phytochemically and the fraction submitted to biological or pharmacological screening is even smaller. Thus, any phytochemical investigation of a given plant will reveal only a very narrow spectrum of its constituents. Historically pharmacological screening of compounds of natural or synthetic origin has been the source of innumerable therapeutic agents. Random screening as tool in discovering new biologically active molecules has been most productive in the area of antibiotics [8]. Medicinal plants represent a rich source of antimicrobial agents. Plants are used medicinally in different countries and are a source of many potent and powerful drugs [9].

A wide range of medicinal plant parts is used for extract as raw drugs and they possess varied medicinal properties. The different parts used include root, stem, flower, fruit, twigs exudates and modified plant organs. While some of these raw drugs are collected in smaller quantities by the local communities and folk healers for local used, many other raw drugs are collected in larger quantities and traded in the market as the raw material for many herbal industries [10]. Although hundreds of plant species have been tested for antimicrobial properties, the vast majority of have not been adequately evaluated [11]. *Lactuca serriola* L. (Compositae) is an herbaceous species, known by several vernacular names, that is, Prickly lettuce, jagged lettuce, Kahu and Khas [12]. It is native to Himalaya, Siberia, and Atlantic areas [13] but cultivated also in temperate lands of Europe, India, Pakistan, and Iran [14]. The plant is used for multiple purposes in traditional medicines, like sedative, hypnotic, expectorant, cough suppressant, purgative, demulcent, diuretic, antiseptic, vasorelaxant, and antispasmodic and hence used to manage bronchitis, asthma, pertussis, gastrointestinal, and various other ailments [12, 13].
The aim of the present study was to investigate the possible effects of antibacterial activity of active compounds of *Lactuca serriola* upon Human Pathogenic Bacteria.

MATERIALS AND METHODS

Collection of Plant Material: The aerial parts of *Lactuca serriola* were collected from the botanical garden of Babylon university, Hilla, Iraq in July, 2012. The plant was identified by the taxonomist, Professor Dr. Abdull-Alkareem AL-Bermani, at the College of science for women, Babylon University. The leaves were washed thoroughly 2-3 times with running water and once with sterile distilled water, leaf material was then air-dried on sterile blotter under shade.

Solvent Extraction: Twenty five grams of shade-dried powder was filled in the thimble and extracted successively with methanol solvent in Soxhlet extractor for 24h. The solvent extracts were concentrated under reduced pressure and preserved at 5°C in airtight bottle until further use. One gram of each concentrated solvent extracts were dissolved in 9 ml of distilled water and used for antibacterial assays.

Phenolic Extraction: The Phenolic compounds were extracted according to [15].

Alkaloid Extraction: The Alkaloid compounds were extracted according to [16].

Terpenoid Extraction: The Terpenoid compounds were extracted according to [17].

Preparation of Inoculum: The gram positive and gram negative bacteria were pre-cultured in nutrient broth overnight at 37°C,

Anti-bacterial Activity: The organism to be tested was inoculated into sterile nutrient agar. After incubation period of 24 h at 37°C, a loop of inoculum was transferred into 5 ml of nutrient broth and incubated for 2 h at 37°C which served as fresh suspension inoculum. Five wells (5 mm diameter) were made in sterile nutrient agar plate by using Cork borer (one in the center and four wells at the corner) and inoculum containing 106 CFU/ml of test bacteria were spread on solid plates with the help of sterile swab moistened with the bacterial suspension. Then 50 µl of extract of all the leaves were placed in the wells made in inoculated plates. The treatment also includes 50 µl of sterilized distilled water as control. All the plates were incubated for 24 h at 37°C and zone of inhibition if any around the well were measured in millimeter (mm). For each treatment three replicates were maintained.

RESULTS

The antibacterial activity of Terpenoid, Alkaloid and Phenolic compounds extracts of selected plants against human pathogenic bacteria both Gram-positive and Gram-negative bacteria are presented in Table (1).

Table 1: Antibacterial Activity of the crude phenolic, alkaloid and terpenoid *Lactuca serriola* L against some human pathogenic bacteria

Pathogenic bacteria	Phenolic compounds		Alkaloid compounds		Terpenoid compounds	
	Concentrations					
	50 mg/ml	100 mg/ml	50 mg/ml	100 mg/ml	50 mg/ml	100 mg/ml
	Inhibition zone/ mm/ diameter					
Staphylococcus aureus	R	R	9	10	10	18
Staphylococcus epidermedis	R	R	R	R	R	R
Staphylococcus saprophyticus	R	35	R	28	R	30
Klebsilla	R	R	R	R	R	R
Serratia	R	R	R	R	R	R
Proteus	R	R	R	R	R	R
Escherichia coli	R	R	R	R	R	R
Pseudomonas	R	R	R	R	R	R
Provedenatia	R	R	R	R	R	R

- R= Resistant

Activity was analyzed at (50 & 100) mg/ ml. the results revealed that among nine pathogenic bacteria, only *Staphylococcus aureus* and *Staphylococcus saprophyticus* Gram-positive were susceptible for Terpenoid, Alkaloid and Phenolic compounds while *Staphylococcus epidermidis* was resistant to active compounds. The results also revealed that all Gram-negative bacteria were resistant to active compounds.

DISCUSSION

Recently, much attention has been directed toward plant extracts and biologically active compounds isolated from popular plant species. The use of medicinal plants plays a vital role in covering the basic health needs in developing countries and these plants may offer a new source of antibacterial, antifungal and antiviral agents with significant activity against infective microorganisms [18]. On the basis of the result obtained in this present investigation, we conclude that the effect of active compounds in same plant have different effect on different

pathogenic organisms in different concentration. This implied that the gram-positive bacteria were more susceptible to the active compounds extract than the gram-negative bacteria. Possibly because of the presence of outer membrane that serves as an effective barrier in gram-negative species [19, 20]. In addition, the results showed that *S. aureus* was the most susceptible bacterium, an observation that may be attributed to the presence of single membrane of the organism which makes it more accessible to permeation by active principles of the extract of active compounds. In contrast, *Staphylococcus epidermidis* showed the resistant to active compounds extracts. This may be due to the fact that *Staphylococcus epidermidis* has intrinsic resistance from a restrictive outer membrane barrier and transenvelope multidrug resistance pumps (MDRs) [7, 21, and 23]. The obtained results may provide a support to use of the plant in traditional medicine. Based on this, further chemical and pharmacological investigations to isolate and identify minor chemical constituents in *Lactuca serriola* and to screen other potential bioactivities may be recommended [22].

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