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PHYTOCHEMICAL SCREENING AND ANTIBACTERIAL ACTIVITY OF LEAF EXTRACTS FROM *PORTULACA OLERACEA*

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ABSTRACT: Phytochemicals are plant-derived bioactive substances that are extensively used in conventional herbal treatment. The locals employ these herbal remedies to treat a wide range of illnesses, including serious conditions like diabetes mellitus, cancer, HIV and others. The current study's goals were to screen for these phytochemicals and assess the antibacterial efficacy of methanolic and ethanolic extracts from *Portulaca oleracea* and study of antibacterial activity of leaf extracts from *Portulaca oleracea*.

INTRODUCTION: A valuable source of therapeutic plants with a wide range of chemicals is nature. Medicinal, which has been used historically and is currently utilized in traditional treatments by a large portion of the global population [1]. Antimicrobial compounds found in plants are abundant and effective against diseases, but they also appear to have a higher probability of surviving the spread of microbial resistance mechanisms [2]. Purslane, or *Portulaca oleracea L*., is a significant member of the Portulacaceae family Juss [3]. It grows mostly in the tropics and subtropics and is distributed throughout the planet. Africa and South America are its primary origins [4]. The Latin words "porto," which means "to carry," and "lac," which means "milk," are the source of the name "portulaca," which denotes the presence of milky juice in the plant [5, 6]. Due to its unique medicinal properties, *Portulaca oleracea* (*P. oleracea*) is highly significant. Its numerous biologically active constituents, such as flavonoids (Apigenin, kaempferol, quercetin, luteolin, myricetin, genistein, and genistin), alkaloids, coumarins, anthraquinone glycoside, cardiac glycoside, and a high concentration of ω-3 fatty acids, are responsible for all of its therapeutic benefits [7]. Omega-3 fatty acids, which are crucial for bolstering the immune system and avoiding heart attacks, were abundant in *P. oleracea* [8].

P. oleracea has been linked to a number of biological characteristics, including skeletal muscle relaxant, bronchodilator, anti-ascorbic, antipyretic, anti-asthma, and antitussive effect, antiseptic, antispasmodic, diuretic, vermifuge, anti-scorbutic, antibacterial, wound-healing, and analgesic effects [9]. As part of an effort to find new antibacterial chemicals, *P. oleracea* surface extract from Arabian region was subject for study using a

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bioassay approach. This was carried out due to the fact that a number of studies have shown that plant exudates have the ability to contain antimicrobial compounds. This fractionation was done in order to assess the surface extract's antibacterial efficacy against *Staphylococcus aureus, Candida albicans*, and *Pseudomonas aeruginosa*. In addition, its antibacterial efficacy was evaluated against resistant microbial strains because of the increasing antibiotic resistance brought on by overuse and oftentimes improper administration of antibiotics. The study looked at the values of the minimal inhibitory concentration (MIC) and the capacity of active compounds to prevent the formation of biofilms.

To our knowledge, this is the first time in Yemen the plant has been extracted by different solvents and study photochemical and biological efficacy against various microorganisms have been examined.

MATERIALS AND METHODS:

Plant Materials: The resinous leafy branches of *P. oleracea* were harvested from Otmah city near of Dhamar City on January 6, 2024.The plant was identified by Dr. Khalid Imran assistant professor in Faculty of Agriculture. Thamar University.

Preparation of the Alcoholic Extracts: Up to a weight 1 Kg Leaves were separate from the branches of *P. oleracea* plant and macerated by 2 liter of methanol for 3 days at room temperature. Extracted leaves were allowed to dry in open air to a constant weight of 500 g. The methanol extract was decanted and filtered through some glass wool into a 2.5L Winchester bottle. The alcoholic was recovered using a rotary evaporator and the concentrate was preserved in an open glass bottle and stored in a vacuum desiccator to study qualitative phytochemical tests and antibacterial activity.

Qualitative Phytochemical Analysis:

Alkaloids Test: To 2 mL of extract, a few drops of Mayer's reagent (prepared from 5 grams of iodide in 100 ml of mercury iodide in 100 ml of distilled water) were added by the side of the tube. A white precipitate confirms the presence of alkaloids [10].

Flavonoid Test: To 2 mL of alcoholic extract, a piece of magnesium ribbon was added and 1 mL of concentrated hydrochloric acid. Pink-red or red coloration of the solution indicates the presence of flavonoids [11].

Phenol Test: To 2 mL of alcoholic extract was added into 5 mL of distilled water. To this, a few drops of neutral 5% ferric chloride solution were added. A dark green color indicated the presence of phenolic compounds [12].

Steroid Test: To 2 mL of extract was dissolved in chloroform and few drops of acetic anhydride and concentrated sulphuric acid were added to the chloroform solution. Violet blue and finally green colour was formed indicating the presence of steroids [13].

Tannins Test: Take 2 ml of alcholic extract and add 30 ml of distilled water to it, then heat then cool and add ferric chloride to it, brownish red or dark blue, indicating the presence of tannins [14].

Cardiac Glycosides Test: Take 2 ml of methanolic extract and 1 mL of glacial acetic acid, 1 mL ferric chloride and 1 mL concentrated sulphric acid were added. Green-blue coloration of solution confirms the presence of glycosides [15].

Terpenoids Test: 2 ml of extract was treated with 2 ml of acetic anhydride. Few drops of concentrated sulfuric acid was then added to this solution and observed the formation of blue, green rings that indicates the presence of terpenoids [16].

Saponins Test: Take 2 ml of methanolic extract and add 20 ml of the distilled water – heat – cool – filter) the filter is transferred to a test tube, shaken vigorously, then left for 3 minutes, noticing the no presence any foam indicates there are not any saponins in the extract [17].

Antimicrobial Screening: The selected strains were tested for the antibacterial activities of the extracts using the agar well diffusion method [18].

Twenty milliliters of sterilized nutritional agar medium were added to each sterile Petri plate, and the plates were then allowed to solidify. The test bacterial cultures were standardized to the 0.5% McFarland standard and then evenly spread throughout the appropriate media using a swab stick [19]. Afterwards, 6 mm sterile corn borer holes

were made in the media [20]. After creating sample solution concentrations, they were appropriately diluted to the required amount (10 mg/mL). Following the addition of these concentrations (0.1 mL) to various wells, the plates were incubated at 35 °C for 24 hours. Using a clear ruler, zones of growth inhibition (ZI) were measured.

RESULT AND DISCUSSION:

Qualitative Phytochemical Screening: Since, the primary factor in the significance of therapeutic plants is their existence of phytochemical (active compounds) with a strong physiological effect, phytochemical analysis is crucial for identifying the presence of beneficial chemicals with medical and industrial significance. These potent substances have a variety of functions that could aid in preventing a number of chronic illnesses. The natural chemical components of the "*Portulaca oleracea*" plant were extracted for this study, and the crude extract's antibacterial activity and qualitative phytochemical analysis were also examined. Studying medicinal plants is essential to enhancing their appropriate application and validating their potential as sources of novel medications. The existence of many chemical compounds of different components that result in secondary metabolite products is primarily responsible for the medicinal characteristics of medicinal plants [21-23].

Table 1 lists all of the chemical components found in *P. oleracea* leaf extracts, including alkaloids, tannins, steroids, terpenoids, flavonoids, phenols, and glycosides by using methanol were most available than ethanol extract. It has been documented that the majority of plants contain these components, which have demonstrated therapeutic benefits [24]. A plant's tannin content demonstrates potential as an antiviral, antimicrobial, and anti-parasitic [25, 26, 27] and cardiac glycosides are used to treat cardiac arrhythmia and congestive heart failure. The plant's terpenoids contradict the phytochemical conclusions of Iyekowa *et al.* (2012) [28].

The plant is used to cure burns, skin conditions, and insect stings since terpenoids have been linked to antibacterial and antineoplastic properties [29, 30, 31]. *Portulaca oleracea* plant is common vegetable for salads and soups [32, 33]. Its potential use as an anti-allergic, anti-inflammatory, anti-oxidative, antibacterial, anti-diarrhea, and anticancer agent is indicated by the presence of flavonoids [34, 35, 36, 37, 38, 39]. The antibacterial, anti-inflammatory, and antioxidative qualities of *Portulaca oleracea* have been observed using a rat model [40, 41, 42]. The results of the current investigation are corroborated by evidence that alkaloids are important chemical components of this species [8]. Alkaloids are employed pharmacologically to create analgesics, stimulants, antihypertensives, antibacterial, anticancer, anti-arrhythmia, antimalarial, and recreational drugs. Iyekowa *et al.* (2012) [28] reported the presence of steroids in *Portulaca oleracea* extract, which is contrary to the results of the current experiment.

This could be because the plant's species or distribution varies. *Portulaca oleracea* known reproductive activity may be impacted by the plant's steroid content, which can act as a source of reproductive hormones [43]. It has been found that phobatannin, a condensed form of tannin, is absent from *Portulaca oleracea.*

TABLE 1: THE QUALITATIVELY PHYTOCHEMICAL ANALYZED OF *PORTULACA OLERACEA* EXTRACT

S. no	Phytochemical analyzed	*Portulaca oleracea* Methanol	Ethanol
1	Alkaloids	+++	+++
2	Flavonoids	+++	++
3	Steroids	++	+
4	Phenols	+++	++
5	Saponins	---	---
6	Terpenoids	+++	++
7	Cardiac Glycosides	+++	++
8	Tannins	+++	+++

Absent (---), present (++), more present (+++).

Antimicrobial Activities: The antimicrobial activity of methanol and ethanol extracts for leaves of *P. oleracea* against human pathogenic bacteria *Escherichia coli*, *Staphylococcus aureus*,

Streptococcus pyogen and *Klebsiella pneumoniae* is measured by quantifying the zone of inhibition in disc diffusion method. The organisms and zone of inhibition to the corresponding extracts are shown in **Table 2**.

The Zones of inhibition range from 10-30 mm for leaves of extracts against bacteria and. The methanol leave extract of *P. oleracea* has higher inhibition zones, i.e., 30, 16, 14 and 10 mm, against *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus Pyogen* and *Klebsiella pneumoniae* while as the zones of inhibition of ethanol extracts range from 5-15 mm for leaves of extracts against bacteria and the higher inhibition zones, *i.e.*, 15, 10, 9 and 5 mm, against *Escherichia coli*, *Staphylococcus aureus, Streptococcus pyogen* and *Klebsiella pneumoniae* shown in the **Table 2.**

TABLE 2: ANTIBACTERIAL ACTIVITIES OF *PORTULACA OLERACEA*, AND THE POSITIVE CONTROL TESTED AGAINST MICROORGANISMS BY DISK DIFFUSION METHOD

Bacteria Name	Methanol Extract	Ethanol Extract
Escherichia coli	30	15
Staphylococcus aureus	16	10
Streptococcus Pyogen	14	9
Klebsiella pneumoniae	10	5
Amoxacillin	R	
Ampicillin	R	

CONCLUSION: The current article highlights investigations on the phytochemical components and study antibacterial activity of *Portulaca oleracea*. *Portulaca oleracea* is plant that grows naturally in Yemen has phytochemical Constituents and the plant also possess antibacterial activity against many of bacteria. The most promising products from this plant are medications that destroy bacteria by influencing them via a variety of methods. As a result, focus is required to identify these compounds' active ingredients while also pursuing the development of this product as a natural product.

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CONFLICT OF INTEREST: Nil

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