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Phytochemical Analysis and Antimicrobial activity of *Oxalis latifolia*

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Abstract:

This study aimed to investigate the phytochemical composition and antimicrobial activity of *Oxalis latifolia* to assess its potential therapeutic applications. Phytochemical screening was conducted on plant extracts, revealing the presence of several phytochemicals, including terpenoids, steroids, saponins, flavonoids, alkaloids, proteins, carbohydrates, phenolic components, tannins, and quinine. These phytochemicals are utilized as potential sources of therapeutic compounds. The results indicated that *Oxalis latifolia* possesses significant antimicrobial potential, highlighting the plant's promise as a source of natural antimicrobial agents. This study provides valuable insights into the phytochemical profile and antimicrobial efficacy of *Oxalis latifolia*, suggesting its potential application in the development of alternative therapeutic agents for managing infectious diseases.

Key word: *Oxalis latifolia*, phytochemical, antimicrobial

1. INTRODUCTION:

Members of family Oxalidaceae have a number of medicinal uses. Averroha carambola is one of the important plants in Oxalidaceae family. The plant is utilized in Ayurvedic medicine for various purposes, including its use as an anti-helminthic, antimalarial, antipyretic, digestive tonic, febrifuge, antiscorbutic, and as an antidote for poisoning (Payal *et al*., 2012). The aerial parts of Oxalis corniculata and *Oxalis latifolia* contain flavonoids, phytosterols, and diterpenes, which may contribute to various pharmacological activities. The flavonoids present in the methanol extract of Oxalis corniculata may play a role in its antioxidant and anti-inflammatory effects (Sakat *et al*., 2010). The alkaloids and phytochemical contents may be present in all organs of the plant including roots, stems, buds, leaves, flowers and fruits. All plant parts syntheses some chemicals with themselves which metabolite their physiological activities. Antibacterial active principles isolated from higher plants is appears to be one of the important alternative approaches to contain antibiotic resistance and the management of disease. It is believed that plant based drugs cause less or no side effect when compared with synthetic antibiotics. *Oxalis latifolia* is a species of flowering plant known by the common names garden pink-sorre and broadleaf woodsorrel. It is native to Mexico

and parts of Central and South America. Medicinal Importance Members of family Oxalidaceae have a number of medicinal uses, among them *Oxalis latifolia* having a wide spectrum of biological activity.

This study was conducted to explore the phytochemical composition and antimicrobial activity of Oxalis latifolia, with the aim of evaluating its potential as a natural therapeutic resource. Phytochemical screening of *Oxalis latifolia* extracts revealed the presence of numerous bioactive compounds, including terpenoids, steroids, saponins, flavonoids, alkaloids, proteins, carbohydrates, phenolic components, tannins, and quinine. These compounds are well-known for their therapeutic properties, particularly their antimicrobial effects. To assess the antimicrobial potential, extracts from *Oxalis latifolia* were tested against a range of pathogenic microorganisms, including both Gram-positive and Gram-negative bacteria. Standard antimicrobial methods, such as disc diffusion and broth dilution, were employed to evaluate the effectiveness of the plant's extracts.

The results of this study provide compelling evidence of the significant antimicrobial activity of Oxalis latifolia, indicating its potential as a natural source of antimicrobial agents. This research not only enhances our understanding of the phytochemical profile of *Oxalis latifolia* but also suggests its promising application in the development of alternative therapeutic agents for the management of infectious diseases.

2. MATERIAL AND METHODS

The fresh leaves of *Oxalis latifolia* were collected from yercaud, Tamilnadu, India. The leaves were cut and dried at room temperature, grounded to powder and finally stored in air tight containers until further use.

Preparation of extracts

Sample (20 gm) of the shade-dried powder of peel was extracted in a Soxhlet extractor successively with 200 ml Chloroform and methanol until colourless extract was obtained on the top of the extractor. Each of the solvent extract was concentrated separately under reduced pressure. After complete solvent evaporation, each of these solvent extracts was weighed and dissolved with DMSO. Extracts were maintained at a temperature between 2 - 8°C for further studies (Mohana *et al*., 2008).

Preliminary phytochemicals studies (Ugochukwu *et al*., 2013)

Test for Carbohydrates

Molish’s test

To 2 ml of plant sample extract, two drops of alcoholic solution of α- naphthol are added. The mixture is shaken well and few drops of concentrated sulphuric acid are added slowly along the sides of test tube. A violet ring indicates the presence of carbohydrates.

Test for Alkaloids

Mayer's test

To a few ml of plant sample extract, two drops of Mayer‟s reagent are added along the sides of test tube. Appearance of white creamy precipitate indicates the presence of alkaloids. b. Wagner's test A few drops of Wagner‟s reagent are added to few ml of plant extract along the sides of test tube. A reddish- Brown precipitate confirms the test as positive.

Anthraquinones

Take About 0.5 g of the extract in to dry test tube and add 5 ml chloroform and shake for 5 min. filter the extract and the filtrate shake with an equal volume of 100% ammonia solution. A pink violet or red colour in the ammoniacal layer (lower layer) indicates the presence of free anthraquinones. (Bontrager's test).

Cardiac glycoside-

Dissolve Total 100 mg of extract in 1 ml of glacial acetic acid containing one drop of ferric chloride solution, then underlayered with 1 ml of concentrated sulphuric acid. a brown ring obtained at the interface indicates the presence of de-oxysugar characteristics of cardenolides. (Keller Killiani test).

Tannins

In to 10ml of freshly prepared 10% potassium hydroxide (KOH) in a beaker, add 0.5 g of extract and shake to dissolve. A dirty precipitate is observed which indicates the presence of tannin.

Flavonoids

Alkaline Reagent Test: 2ml of extract will be treated with few drops of 20% sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on addition of dilute hydrochloric acid, indicates the presence of flavonoids.

Phenols

Ferric Chloride Test: Extracts will be treated with 3-4 drops of ferric chloride solution. Formation of bluish black color indicates the presence of phenols.

Tests for Amino acid and Protein:

Biuret test (General test):-Leaf and bark (mixture) extract were treated with 1 ml 10% sodium hydroxide solution separately and heated. A drop of 0.7% copper sulphate solution to the above mixtures was added. The formation of purplish violet colour may indicate the presence of proteins.

Detection of unsaturated sterols and/or triterpenes:

Dissolve the residue in 10 ml of Petroleum ether or anhydrous chloroform and filter. Divide the filtrate into two equal portions and test as follows: Salkowski's Test: Filtrate will be treated with 2 ml of sulphuric acid, shaken and allowed to stand. Appearance of golden yellow color changing to orange and then to red, indicates the presence of unsaturated sterols and/or triterpenes.

Determination of antibacterial activity

This test was carried out according to the method of Jahir *et al*., 2011. The twenty ml of sterilized Mueller hinton agar (MHA) was poured into each Petri plate (90 mm diameter) and allowed to solidify. The plates were incubated with freshly prepared inoculums which were swabbed over the entire surface of the medium, rotating the plate 60 degrees after each application by using a sterile cotton swab, to ensure the spread of the tested microbes on the surface of the plate completely. Inoculums were 108 CFU/ml of bacteria. One wheel of 6mm diameter was bored with the medium of each plate with the help of sterile cork-borer. Different concentration of plant extract was filled each well with the help of micropipette. Ampicillin (5µg/ml) was used as positive control.

3. RESULTS

Phytochemical analysis Among the solvents extracts, methanol extract was selected for preliminary phytochemicals studies, which was selected based in the good inhibitory activity. In this study, phytochemicals were found in this solvent extract, namely Terponoids, Steroids, Saponin, Flavoniods, Alkaloids, Protein, Carbohydrate, Phenol components, Tannin, and quanin were not observed. The results were tabulated in table. 1

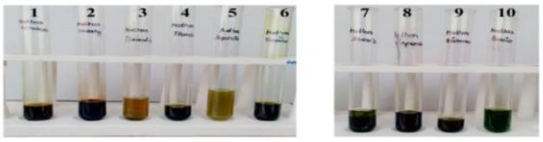
Phytochemical analysis indicated that the methanol extract demonstrated significant inhibitory activity and contained terpenoids, steroids, saponins, flavonoids, alkaloids, proteins, carbohydrates, phenolic components, and tannins. These findings suggest that *Oxalis latifolia* has notable antimicrobial potential, further supporting its use as a natural source of therapeutic compounds in table 1.

Table 1. Phytochemical studies of *Oxalis latifolia*

S.No	Phytochemicals	Types of extracts
		Methanol
1.	Terponoids	+
2.	Steroids	+

3.	Saponin	+
4.	Flavoniods	+
5.	quanin	+
6.	Tannin	+
7.	Alkaloids	+
8.	Phenol components	+
9.	Carbohydrate	+
10.	Protein	-

Phytochemical analysis of Methanol extract



1.Alkaloids, 2.Carbohydrate, 3.Flavoniods, 4.Phenols, 5.Saponins
6.Tannin, 7. Sterols, 8.Terpenoids, 9. Quinon, 10. Proteins

Antibacterial activity of Chloroform extract of *Oxalis latifolia*

In case of chloroform extract, the zone of inhibition ranged from 10 to 14 mm. among the 5 bacterial genera, *E.coli* was not inhibited by chloroform extract and highly inhibited to *K.pneumoniae*. When using chloroform extract, zone of inhibition observed from 7.5mg concentration of plant extract. The result was tabulated in table 2

Table.2 Antibacterial activity of Chloroform extract of *Oxalis latifolia*

S. No	Isolates	Zone of inhibition (mm) Con. of methanol extract					Std Ab
		2.5	5	7.5	10	DMSO	
1.	*E.coli*	-	-	-	-	-	-
2.	*Enterococcus faecalis*	-	-	10	12	-	-
3.	*S.aureus*	-	-	11	13	-	-
4.	*K.pneumoniae*	-	-	-	14	-	-
5.	*P.aeruginosa*	-	-	-	11	-	-

Antibacterial activity of Chloroform extract of *Oxalis latifolia*

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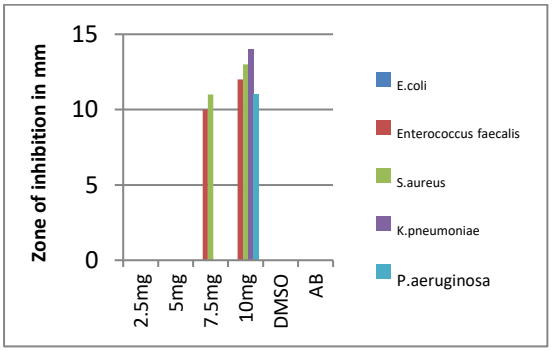
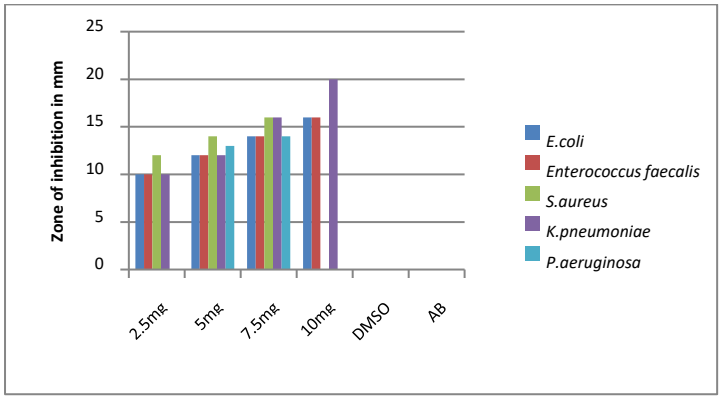


Antibacterial activity of methanol extract of *Oxalis latifolia*



Antibacterial activity of methanol extract of *Oxalis latifolia*

S. No	Isolates	Zone of inhibition (mm) Con. of Chloroform extract					Std Ab
		2.5	5	7.5	10	DMSO	
1.	*E.coli*	10	12	14	16	-	-
2.	*Enterococcus faecalis*	10	12	14	16	-	-
3.	*S.aureus*	12	14	16	18	-	-
4.	*K.pneumoniae*	10	12	16	20	-	-
5.	*P.aeruginosa*	-	13	14	-	-	-

Plate 1 Antibacterial activity of methanol extract of *Oxalis latifolia* Plate.

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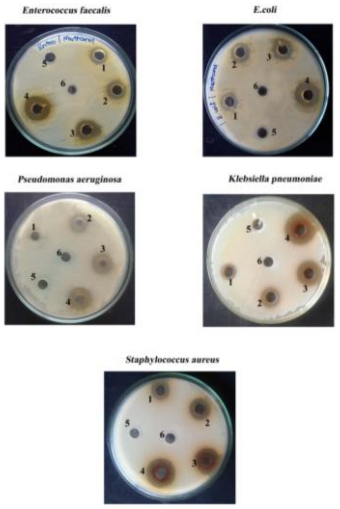
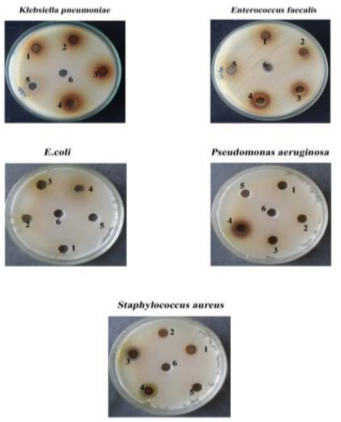


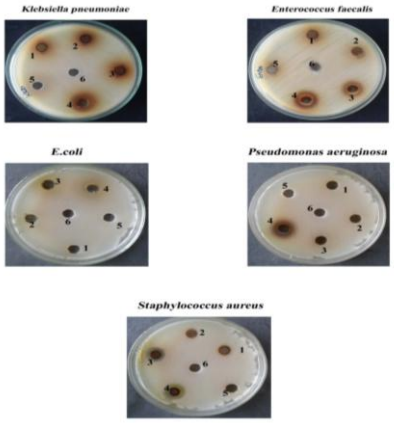
1-2.5m, 2- 5mg, 3-7.5mg, 4-10mg, 5- DMSO, 6- Std antibiotic (Ampicillin 10µg)

Antibacterial activity of Chloroform extract of *Oxalis latifolia*



1-2.5m, 2- 5mg, 3-7.5mg, 4-10mg, 5- DMSO, 6- Std antibiotic (Ampicillin 10µg)

Antibacterial activity of Chloroform extract of *Oxalis latifolia*



4. DISCUSSION

Among the extracts tested, the chloroform extract of *Oxalis latifolia* demonstrated significant antibacterial activity, particularly against both Gram-positive and Gram-negative bacteria. This was consistent with findings from similar studies where chloroform, a non-polar solvent, was known to extract lipophilic bioactive compounds that exhibited potent antimicrobial effects. The antibacterial activity observed could be attributed to the synergistic effects of the phytochemicals identified, such as flavonoids, alkaloids, and terpenoids, which are known to disrupt bacterial cell membranes, inhibit enzyme activity, and interfere with essential metabolic pathways in microorganisms. The antimicrobial efficacy of *Oxalis latifolia* supported its traditional use as a remedy for infections, and further exploration of its active compounds could have led to the development of novel therapeutic agents.

The chloroform extract, in particular, showed promise as a natural source of antibacterial agents, and additional studies focused on the isolation and characterization of specific compounds were necessary to fully understand the mechanisms behind the observed activity. This research highlighted the potential antimicrobial of *Oxalis latifolia* as a valuable plant in the search for new, natural antimicrobial substances. Given the increasing resistance to conventional antibiotics, plants like *Oxalis latifolia* offered a sustainable alternative for managing infectious diseases. Further investigations into its broader therapeutic potential, including its safety profile and possible synergistic effects with other natural agents, were crucial for its development into effective treatments. Further studies are to isolate and identify the active compounds responsible for its antimicrobial effects.

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