Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 3, Issue 12 (2025)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Phytochemical Screening of Selected Cholistani Plants and Their Biological Activities by In-Vitro Assays

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ABSTRACT

There is a surge of appeal with taking naturally occurring compounds extracted from plants to develop treatments that can combat infections. These plant-based extracts and compounds possess the ability to act as potent agents against harmful pathogens thereby opening new opportunities for treating diseases. Consequently, there is a growing preference for natural medicines which are typically milder, more economical and less toxic than their synthetic counterparts. This study ventures to investigate the antibacterial activity, antioxidant activity, enzyme inhibition activity and phytochemical constituents of methanolic extracts of *Zaleya pentandra* (L.) Jaffery (Aizoaceae) and *Lasiurus scindicus* (Henr.) (Poaceae) that are medicinally used by herbalists from the Cholistan region, Pakistan for the treatment of bacterial infections, cough, colds, kidney stones, UTIs, gastrointestinal disorders and as anti-venom. In vitro biological assays were used to test antibacterial (Agar disc diffusion), antioxidant (DPPH) and enzyme inhibition (urease) capabilities. Qualitative phytochemical analysis was performed to determine the important components. The antibacterial efficacy of organic crude extracts of *Z. pentandra* and *L. scindicus*

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towards bacterial strains is notable. Alkaloids, saponins, flavonoids, tannins, terpenoids and phenols were present in both plants, although the methanolic extract of both *Z. pentandra* and *L. scindicus* conspicuously lacked the presence of glycosides. Organic crude extracts of *Z. pentandra* and *L. scindicus* exhibited moderate antioxidant activity (41.86% and 54.28% respectively) with standard (Ascorbic Acid) scoring 84.05% but high in anti-urease activity (96.42% and 98.36% respectively) in comparison to the standard (Thiourea) used 95.83%. It is also evident from the study that organic crude extracts of *Z. pentandra* and *L. scindicus* were rich in nutrients that added value to the specifically selected medicinal plants to retain them in use in ethnomedicine.

Keywords: Cholistan, *Zaleya pentandra*, *Lasiurus scindicus*, Antibacterial, Antioxidant, Enzyme Inhibition

Introduction

Ethnobotanical knowledge has been transmitted across generations throughout history. Plants were primarily used for sustenance and shelter, but they were later explored for medicinal purposes. As a result, plants are now commonly exploited as medicine to treat various illnesses (Anand *et al.*, 2019). Local medicinal plants are extremely important throughout the world specifically in the healthcare system of third-world nations (Mbuni *et al.*, 2020). Life is always exceedingly precarious in desert habitats due to the scarcity of resources. It makes all forms of life extremely opportunistic, and this leads to a certain kind of flora and fauna. There is no exception in the arid rangeland of Cholistan. It is abundant in xerophytes and offers food, fuel wood, building materials and even treatment for tackling locals' illnesses (Azhar *et al.*, 2017).

Cholistan desert also known as Rohi and is located about 30 km from Bahawalpur, Punjab, Pakistan (Prince *et al.*, 2022). It encompasses a total area of 26000km^2 and is situated between 69°52' and 75°24' E longitude and 27°42' to 29°45' N latitude (Ali *et al.*, 2023). Among the 138 plant species the region of Cholistan is home to around 64 medicinal plants (Shamim *et al.*, 2022). It is worth noting that this secluded desert lacks modern healthcare amenities and its dwellers depend on native plants for various traditional medicinal purposes both for humans

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and animals (Azhar *et al.*, 2015; Shamim *et al.*, 2022). Many plants are being used for medical conditions such as in wound healing and septic conditions, stomach ailments and gastrointestinal problems, eye diseases, UTIs, diabetes, hypertension, respiratory and skin diseases (Ahmad *et al.*, 2014; Nisar *et al.*, 2014; Fatima *et al.*, 2019; Anwar *et al.*, 2023).

Currently, there is an overflow of synthetic antioxidant agents in the market with significant toxicity concerns that have compelled researchers to consider the aspect of natural antioxidants (Shahbaz *et al.*, 2022). Plants have received a lot of interest in this regard since they generate natural antioxidant chemicals like flavonoids that help to minimize oxidative stress (Fatima *et al.*, 2018). Cell viability depends on oxidation mechanisms. Aerobic cellular respiring organisms derive energy from organic molecules such as glucose, but they also produce free radicals which cause cellular damage in metabolism (Glucin, 2020). The pharmaceutical industry is heavily invested in developing antibacterial and antifungal medications to combat microbial resistance (Hu *et al.*, 2020). As bacteria can develop resistance to antibacterial drugs, it is crucial to create medicines that can adapt to the genetic and structural alterations of bacteria. (Zia, 2021).

Enzyme inhibition is emerging as an essential approach in novel medication development investigations. Multiple enzymes in humans are targeted for treatment in this setting. Urease is another pharmacological and agricultural target that facilitates the creation of ammonia and carbon dioxide during urea hydrolysis. The rapid nitrogen loss caused by the breakdown of urea in nitrogen fertilizer by soil microbes using urease enzyme is a major concern in food production. Urease inhibitors play a dynamic function at this stage by enabling nitrogen to remain in the soil and reach deeper layers during rainfall periods (Modolo *et al.*, 2015; Modolo *et al.*, 2018). The pharmaceutical sector is particularly interested in this topic. Because the enzyme has a function in bacterial infections caused by *Helicobacter pylori* in the digestive system, *Yersinia enterocolitica* and *Proteus mirabilis* in the urinary system. The urease enzyme has been revealed to be liable for creating optimal conditions for bacteria to grow in the alimentary tract through the production of metabolites. Inflammation of the stomach, ulcers in the gut and stomach cancer can all be caused

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by *H. pylori* cultures in the GI tract. In contrast the other two bacteria's urease activity has been related to urolithiasis and acute pyelonephritis. Current urease inhibiting agents such as phenyl phosphorodiamidate, acetohydroxamic acid and certain imidazoles have been either banned or restricted in clinical usage due to their cytotoxicity and weak stability (Modolo *et al.*, 2015; Graham and Miftahussurur, 2018; Hassan *et al.*, 2019).

The sewan grass (*Lasiurus scindicus* Henr.) also known as "the King of Desert grasses" and it is a dominant evergreen grass from the family *Poaceae*. It is indigenous to Asia (Pakistan, Northwest of India and far west up to Iraq and Saudi Arabia), North Africa and East Africa (Egypt, Ethiopia, Somalia and Mali). It thrives in dry regions and is highly drought-tolerant though during early establishment and it also requires protection from wind (FAO, 2010). *Lasiurus scindicus* creates shaggy coppices in sandy deserts which can be used for animal pasture, hay and feed for cattle. It grows best in arid open landscapes, rocky terrain, alluvial sandy plains, shallow dunes, hummocks and gravelly soils with a pH of 8.5 or above (Quattrocchi, 2006; Sanadya *et al.*, 2021). It is not tolerant of heavy grazing and disappears when overgrazed, although ruminants preferably enjoy it (El-Keblawy, 2009). *Lasiurus scindicus* is used as an antidiarrheal agent (Al-Harbi *et al.*, 2016) and is effective against cough, cold, skin diseases and bacterial infections (Younis *et al.*, 2018; Fatima *et al.*, 2019; Anwar *et al.*, 2023). It is a rich protein plant and increases milk production in dairy cows (Kaur and Gupta, 2017).

Zaleya pentandra (L.) also known as African pulsane and it is a member of the family *Aizoaceae*. Frequently, it would be misnamed as *It-sit* (Quattrocchi, 2006). It is a widely distributed prostrate and branched herb (Flora of Pakistan, 1960). *Zaleya* has six species that can be found in Asia, Africa and Australia. *Zaleya pentandra* is the only one among those species that grows in Pakistan. This perennial plant is a xero-halophyte that thrives in sandy salt flats near the coast of African and Asian countries including Iran, India and South Africa (Ehsen *et al.*, 2017). *Zaleya pentandra* has historically been employed to tend to gastrointestinal problems, influenza, and productive cough (Hameed *et al.*, 2011). It is also employed for the treatment of Athlete's foot and highly septic wounds as an astringent to tackle snake bites and flu,

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to treat gonorrhea , respiratory tract infections and it has been shown to be useful in UTI and renal disorders (Bhatti *et al.*, 2001; Khan and Qaiser, 2006; Qasim *et al.*, 2010; Afzal *et al.*, 2015; Ahmad *et al.*, 2014; Nisar *et al.*, 2014; Fatima *et al.*, 2019; Anwar *et al.*, 2023). It is also used as a food source by the Pakhtoon, Balochi and Brahvi communities of Baluchistan Province (Kosar *et al.*, 2023). *Z. pentandra* ethanol extract has antioxidants, anti-bacterial, anti-viral and many types of enzyme suppression activities, thereby rendering it a promising option for the treatment of microbial infections, diabetes, neurological conditions and dermatological issues (Shahid *et al.*, 2022).

Conducting scientific research on traditional herbal plants is imperative for unlocking their pharmacological potential through the utilization of sophisticated experimental methods and tools. This study is crafted to examine the biochemical attributes of methanolic extracts from *Z. pentandra* and *L. scindicus*. The plants were subjected to qualitative phytochemical testing to assess their phytochemical composition. Furthermore, various biological activities including antioxidant, antibacterial and enzyme inhibition assays on urease enzyme were also carried out.

Materials and Methods

Collection and Preparation of Plant Extracts

Plant samples were gathered from the Islamia University of Bahawalpur, *Bagdad-ul-Jadeed* campus (29°23'06.0"N and 71°45'18.1"E) falling in the coordinates of Cholistan in Punjab province in November 2022. The whole plants (aerial parts and roots) of *Zaleya pentandra* and *Lasiurus scindicus* were uprooted and collected in polythene bags. The fresh samples were washed thoroughly under fresh tap water, dried in the shade and ground to make fine powder. In this investigation consecutive extractions were carried out utilizing methanol as solvent. For five hours, somewhere between twenty-five and twenty-seven grams of dry ground plant materials were extracted with 250 mL of solvent. All organic extracts were concentrated using a rotary evaporator (Rotavapor R-210, BÜCHI) at low pressure and then allowed for a handful of days to dry up residual solvent. The extracts were then stored in a cold area until they were used.

Phytochemical Screening

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All unrefined plant extracts underwent qualitative chemical analysis with the goal of detecting several groups of secondary metabolites in these plants. The detection was based on the color change, precipitation or foam growth. Standard protocols would be used to detect alkaloids, flavonoids, saponins, tannins, glycosides, terpenoids and other compounds (Trease and Evans, 2002).

Biological Assay

Antioxidant Activity

The extract's inhibitory effects and IC_{50} on a free radical DPPH will be investigated utilizing the DPPH radical-scavenging technique outlined in the study presented by Goze *et al.* (2009). Two milliliters (2 mL) of plant extracts, diluted to a concentration of 0.5 mg/mL in methanol were combined with an equal volume of DPPH solution. After thorough agitation, the mixture was allowed to rest for 30 minutes before absorbance at 517 nm was measured using a UV spectrophotometer. Ascorbic Acid was employed as standard while methanol without any plant extract served as the negative control. The extract's inhibitory effects on DPPH free radical were confirmed using the following formula:

$$\% \text{ inhibition} = [(A_{control} - A_{sample})/A_{control}] \times 100,$$

Where $A_{control}$ represents the absorbance of the control and A_{sample} represents the absorbance of the sample.

Antibacterial Activity

The antibacterial effect was evaluated against six bacterial strains using the disc diffusion method following standard guidelines. This included two Gram-negative strains including *Escherichia coli* and *Pseudomonas aeruginosa* as well as four Gram-positive strains such as *Bacillus subtilis*, *Staphylococcus epidermidis*, *Bacillus pumilus and Staphylococcus aureus*. The micro-organisms obtained from the Department of Biochemistry, Biotechnology and Bioinformatics (IBBB), *Bagdad-ul-Jadeed* campus of Islamia University of Bahawalpur. Sterile paper discs of 5mm were impregnated with crude plant extracts to prepare 50, 250 and 500µg concentration discs of each extract and kept in aseptic conditions. Benzyl Penicillin Sodium was used as a standard Control, and its 30 µg discs were prepared and stored in the same manner as others.

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Enzyme Inhibition Activity

The urease inhibition capacity and IC_{50} of the extracts were determined using a colorimetric method described by Sahin *et al.*, (2022). In a 96-well plate 25 microliters of urease solution were mixed with 5 microliters of sample solutions and kept at 30°C for 15 minutes. The substrate solution was made up of 100 mM urea and phosphate buffer forty microliters (40 µL) (pH= 8.2). Following the application of the substrate solution to all wells, the plates were incubated for 30 minutes. The mixtures were then treated with 50 microliters of a phenol reagent which included 0.005% sodium nitroprusside (w/v) and 1% phenol (w/v) followed by 70 microliters of an alkali reagent containing 0.1% sodium hypochlorite and 0.5% sodium hydroxide (w/v). After a 20minute incubation the change in absorbance was measured at 630 nm using a plate reader.

Positive Control was chosen to be Thiourea. The previously mentioned antioxidant activity equation was utilized to calculate anti-urease activity as % inhibition.

$$\% \text{ inhibition} = [(A_{control} - A_{sample})/A_{control}] \times 100,$$

Where $A_{control}$ represents the absorbance of the control and A_{sample} represents the absorbance of the sample.

Statistical Analysis

All activities were performed in three replications. The findings were presented as mean and standard error; M ± SE (n=3). The statistical analysis of the values was carried out by using Statistical Package for Social Sciences (SPSS ver. 25) and running ANOVA on curated data.

Results

Phytochemical Screening

This study conducts a qualitative assessment of the phytochemical composition within the methanolic extracts obtained from *Z. pentandra* and *L. scindicus* and the findings are succinctly outlined in Table 1.

Biological Assay

Antioxidant Activity

The potential of methanol extracts of the two traditional medicinal plants to capture

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DPPH radicals was investigated. The extracts had modest scavenging activity. The radical scavenging activity of *Z. pentandra* (ZPM) and *L. scindicus* (LSM) methanol extracts through DPPH was mediocre to that of the reference standard (Ascorbic acid) however LSM had much higher activity than ZPM. The percentage inhibition at 0.5 mg/mL was observed to be 54.28% and 41.86% for LSM and ZPM, respectively. The number of extracts capable of scavenging at least fifty percent of the DPPH dye (IC_{50}) were computed. LSM was found to be not so active with IC_{50} of 351.69 µg/ mL. *Z. pentandra* showed measurable inhibition at the tested concentration but did not achieve IC50 within the tested range. The results are summarized in Table 2 and graphically represented in Figure 1 and 2.

Enzyme Inhibition Activity

Both *Z. pentandra* and *L. scindicus* extracts showed significant anti-urease activity with inhibition percentages of 96.42% and 98.36% respectively at a concentration of 0.25 mg/ mL. These values were considerable while considering the percentage inhibition in standard control. LSM showed slightly better results than ZPM, both scoring higher than the Control (Thiourea) 95.83%.

The IC_{50} values were obtained by inhibiting urease from the methanolic extracts of *Z. pentandra* and *L. scindicus*. A higher inhibitory value of the extracts was observed by a lower IC_{50} value. The IC_{50} values representing the concentration required to inhibit 50% of urease activity were 72.52 µg /mL for ZPM and 7.13 µg/ mL for LSM. Lower IC_{50} values indicated stronger antiurease activity emphasizing the potential of *L. scindicus* as a more potent inhibitor of urease (Table 2; Figure 2). It is concluded that LSM and ZPM exhibited promising anti-urease activity with a 7.13± 1.28 µg/mL and 72.52± 1.47 µg/ mL IC_{50} values as compared to standard Thiourea (23.54 ± 1.36 µg/ mL).

Antibacterial Activity

The antimicrobial efficacy of the plant extracts was assessed through the utilization of the disk diffusion technique against six bacterial types namely *E. coli*, *B. subtilis*, *P. aeruginosa*, *S. epidermidis*, *B. pumilus* and *S. aureus*. The inhibitory zones resulting from the application of *Zaleya pentandra* and *Lasiurus scindicus* extracts against each bacterial strain were quantified in millimeters (mm). The results stipulated that

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plants' methanol extracts exhibited bacteria-killing property against the tested bacterial strains. The size of the inhibition zones varied depending on the bacterial strain and the type of extract used as presented in Table 3 and Figure 3.

The antibacterial activity of *Z. pentandra* showed varying levels of effectiveness against different bacterial strains (Table 3). Specifically, the extract demonstrated stronger antibacterial activity and proved to be dose-dependent in effectiveness. Furthermore, the positive control (Benzyl penicillin sodium, 30 µg) demonstrated significantly larger inhibition zones against all tested variants of bacteria. The ranking of antibacterial efficacy for *Zaleya pentandra* extracts against the tested bacterial strains from strongest to weakest is as follows:

P. aeruginosa> *B. subtilis*> *S. epidemidis*> *E. coli*> *B. pumilus*> *S. aureus*

The extracts obtained from *Lasiurus scindicus* showed varying levels of effectiveness against different bacterial strains (Table 3; Figure 2). However, *L. scindicus* showed lesser antibacterial potential than *Z. pentandra.* The order of most sensitive to least sensitive bacteria against tested plant extracts is as follows:

E. coli> *S. epidemidis*> *B. pumilus*> *B. subtilis*> *P. aeruginosa*> *S. aureus*

Discussion

According to phytochemical testing of bioactive components, the extracts in question were high in secondary metabolites. Flavonoids, phenols, alkaloids, tannins, saponins and terpenoids were found in all the plant extracts. The increased concentration of phytochemicals in organic extracts in this study explains their superior biochemical potential. Many indicated phytoconstituents in *Z. pentandra* had been documented before (Saleem *et al.*, 2019; Shahid *et al.*, 2022). Although *L. scindicus* had low antibacterial activity, secondary metabolites such as alkaloids, flavonoids, tannins, phenols, terpenoids and saponins were found to be more abundant in all extracts. All the secondary metabolites observed during the screening agreed with previous research like Al-Harbi *et al.*, 2016 and Arif *et al.*, 2022.

The in-vitro antibacterial efficacy of two chosen medicinal plant species against four Gram-positive bacteria (*B. subtilis*, *S. epidermidis*, *B. pumilus*, and *S. aureus*) and two Gram-negative bacteria (*E. coli* and *P. aeruginosa*) demonstrated that they

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bear potential antimicrobial substances against most of the tested microorganisms. The plant extracts exhibited greater potency against Gram-positive bacteria compared to Gram-negative bacteria. *S. epidermidis* was the most sensitive bacteria and all the plants' organic crude extracts studied inhibited it. Gram-negative bacteria typically exhibit greater resistance compared to Gram-positive bacteria (Afzal *et al.*, 2016; Arif *et al.*, 2022).

Gram-positive bacteria are more sensitive because the outer peptidoglycan layer is exposed (Korir *et al.*, 2012), whereas Gram-negative bacteria have an additional external membrane characterized by an uneven dispersion of lipids with phospholipids located in the inner layer and lipopolysaccharide (LPS) located in the outer layer. This structural feature can act as a further obstruction that impedes the entry of irritants into the cell. All the methanolic plant extracts proved positive for antibacterial activity against most of the microorganisms used in the present research. Only the extract from *Z. pentandra* at 500 µg demonstrated comparable activity to the positive control against *S. spidermidis*, *B. pumilus* and *S. aureus* ($P>0.05$). The investigation in this study also demonstrated that the actions of the selected plants against the investigated germs differed (Afzal *et al.*, 2016; Shahid *et al.*, 2022). All the extracts demonstrated dosage-dependent activity at the tested concentrations with greater activity reported at the highest concentration.

Encouraging outcomes were gathered from antioxidant assessment with *L. scindicus* showing more activity than *Z. pentandra*. The DPPH scavenging activity of methanol concentrations from *Z. pentandra* (ZPM) and *L. scindicus* (LSM) were on par with the standard (Ascorbic acid). LSM exhibited superior activity at 0.5 mg/ mL with a 54.28% inhibition while ZPM displayed 41.86% inhibition. The IC_{50} value for LSM was 351.69 µg/ mL indicating lower potency while *Z. pentandra* did not show any IC_{50} value as of DPPH radical scavenging ability.

Our current investigation discovered that the chosen plants have anti-urease potential. The *Z. pentandra* and *L. scindicus* showed strong inhibitory activity against urease (Table 2; Figure 1). The *L. scindicus* extracted solution presented excellent action with 98.36% inhibition while the reference standard (Thiourea) demonstrated 95.83% inhibition. The present study's results are most comparable to the recent

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studies of Svane *et al.*, 2020 and Ashibuogwu *et al.*, 2022. Urease is a lethal contributor to gram-positive bacterial urinary tract infection (UTI) associate with *Staphylococcus saprophyticus* (Loes *et al.*, 2014) in *H. pylori*-associated ulcer (Bury-Mone *et al.*, 2001) and several other bacterial disease cases (Svane *et al.*, 2020).

These pathogenic bacteria can induce enlargement of the urethra, bladder and kidneys, leading to the formation of stones in the urinary tract in the event of UTIs. According to reports, it is active in soil and aquatic habitats (Svane *et al.*, 2020). The excessive presence of urease can lead to detrimental effects on the environment as it releases a significant amount of ammonia into the atmosphere during urea fertilization. This can be deteriorating for plants because the accumulation of ammonia and the emission of carbon (VI) oxide diminish critical nutrients. To tackle these issues surrounding the use of urea as a synthetic fertilizer, it is critical to use environmentally friendly urease inhibitors to limit urea disintegration. As a result of the outstanding anti-urease activity of the methanol extract reported in this investigation, alternatives to the less environmentally favorable artificially produced derivatives can be found.

Conclusion

The bioactivity of organic crude extracts of *Zaleya pentandra* and *Lasiurus scindicus* against bacterial strains is noteworthy. Alkaloids, flavonoids, phenols, tannins, saponins, and terpenoids were present in both plant species, although the methanolic extract of both *Z. pentandra* and *L. scindicus* conspicuously lacked the presence of glycosides. Organic crude extracts of *Z. pentandra* and *L. scindicus* were found to be moderate in antioxidant activity but high in anti-urease activity in comparison to the standards used. It is also evident from the study that organic crude *Z. pentandra* and *L. scindicus* extracts were packed with nutrients indicating the significance of the chosen medicinal plants for ongoing application in ethnomedicine. From the plant extracts studied the methanol extract of *L. scindicus* had a strong anti-urease action over the other plant studied thus indicating a potential urinary tract infection solution. From this research *Z. pentandra* is an excellent source of antibacterial components and hence, it may be of significance in the advancement of new antibacterial medication. The straightforward tests implemented in this work

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yielded promising results on the antibacterial, antioxidant and anti-urease capabilities of these plant extracts. More extensive research is needed to confirm the functioning of the potential extracts.

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http://amresearchreview.com/index.php/Journal/about
Volume 3, Issue 12 (2025)

Online ISSN 3007-3197
Print ISSN 3007-3189
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Table 1: Relative *abundance of detected phytochemicals in crude plant extracts*

Secondary Metabolites	*Zaleya pentandra*	*Lasiurus scindicus*
Phenols	+++	+++
Alkaloids	+++	++
Saponins	+++	+++
Tannins	+	+++
Glycosides	-	-
Flavonoids	+++	+++
Terpenoids	+++	+++

Key: +++: strong presence, ++: moderate presence, +weak presence, -: not detected

Table 2: The anti-urease and antioxidant studies of *Zaleya pentandra* and *Lasiurus scindicus* extracts. Data is the mean of three values (Mean±SEM, n=3).

Sr. No.	Samples	Urease Inhibition		Antioxidant (DPPH)	
		Inhibition (%) at 0.25 mg/mL	IC_{50} (µg/mL)	Inhibition (%) at 0.5 mg/mL	IC_{50} (µg/mL)
1	ZPM	96.42±1.67	72.52±1.47	41.86±1.47	-
2	LSM	98.36±1.65	7.13±1.28	54.28±1.36	351.69±1.17
3	Ascorbic Acid	-	-	84.05 ± 1.36	11.8 ± 1.08
4	Thiourea	95.83 ± 1.80	23.54±1.36	-	-

Key: -: No activity detected

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Table 3. Antibacterial activity of *Zaleya pentandra* and *Lasiurus scindicus* extracts against six bacterial strains in comparison to the control (Benzyl Penicillin Sodium). Data is the mean of three values (Mean±SEM, n=3).

Extract	Conc.	Zone of Inhibition (mm)					
		E. coli	*B. subtilis*	*P. aeruginosa*	*S. epidemidis*	*B. pumilus*	*S. aureus*
Control (Benzyl Penicillin Sodium)	30 µg	20±0	17±0	20±0	14±0	12±0	10±0
Zaleya pentandra	50 µg	-	-	-	-	-	-
	250 µg	6±0	9±0.33	11±0.88	6±0	8±0	6±0
	500 µg	10±0	13±0.4	14±0.33	11±0.33	10±0	8±0
Lasiurus scindicus	50 µg	-	-	-	-	-	-
	250 µg	6±0	6±0	6±0	7±0.33	7±0.33	6±0
	500 µg	7±0	6±0	-	6±0	6±0	-

Key: -: No activity detected

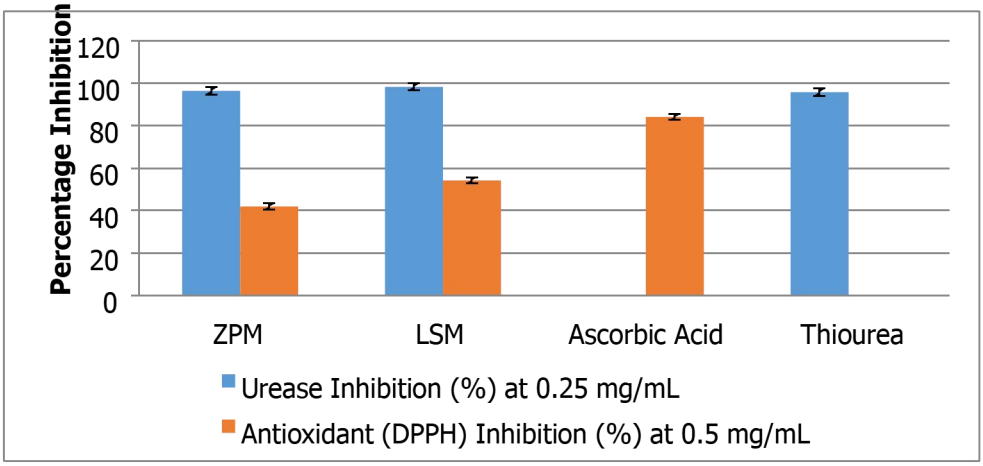

Figure 1. Percentage inhibition concentration (Inhibition (%) at 0.5 mg/mL) of

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Online ISSN 3007-3197
Print ISSN 3007-3189

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Zaleya pentandra and Lasiurus scindicus.

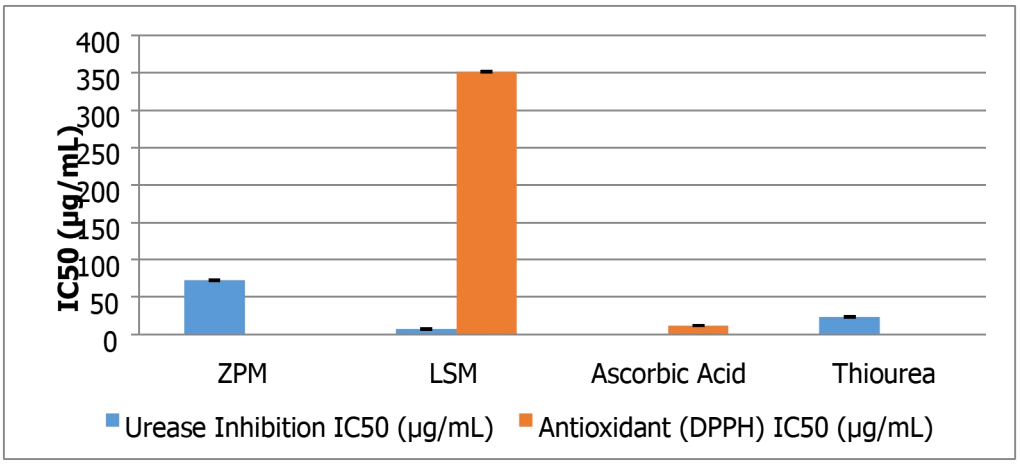

Figure 2. Median inhibition concentration (IC_{50} µg/mL) of Zaleya pentandra and Lasiurus scindicus.

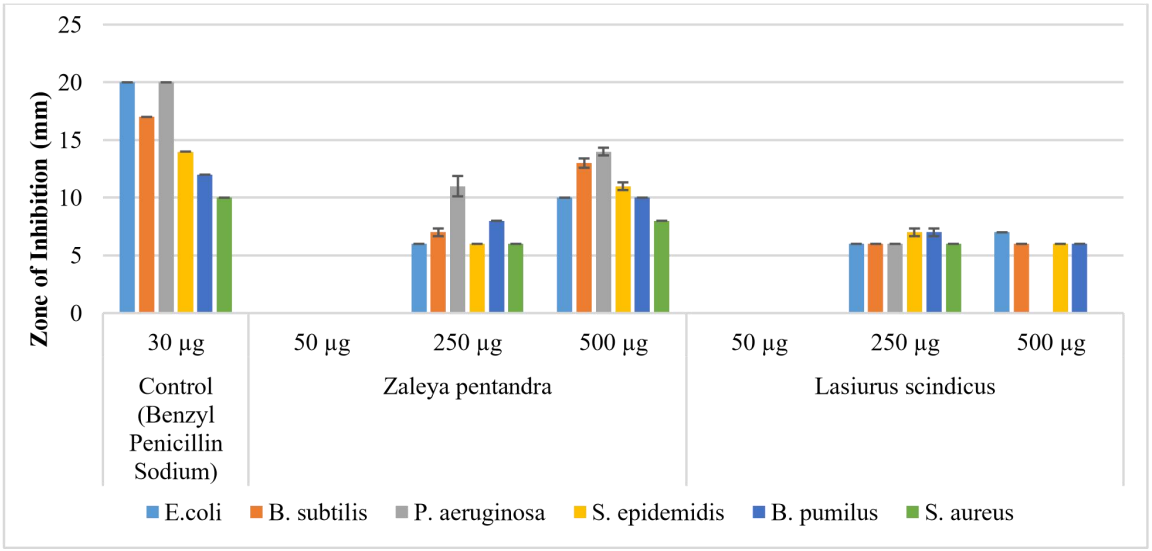

Figure 3. Zone of Inhibition (mm) observation of crude extracts of *Zaleya pentandra* and *Lasiurus scindicus* with respect to Positive Control (Penicillin) against six bacterial strains, *i.e., Escherichia coli, Bacillus subtilis, Pseudomonas aeruginosa, Staphylococcus epidermidis, Bacillus pumilus* and *Staphylococcus aureus.*