



مجلة التربوي

مجلة علمية محكمة تصدر عن كلية التربية جامعة المرقب

المجلد الثالث والعشرون
يوليو 2023م

هيئة التحرير

رئيس هيئة التحرير: د. مصطفى المهدي القط
مدير التحرير: د. عطية رمضان الكيلاني
سكرتير المجلة: أ. سالم مصطفى الديب

- المجلة ترحب بما يرد عليها من أبحاث وعلى استعداد لنشرها بعد التحكيم .
 - المجلة تحترم كل الاحترام آراء المحكمين وتعمل بمقتضاها .
 - كافة الآراء والأفكار المنشورة تعبر عن آراء أصحابها ولا تتحمل المجلة تبعاتها .
 - يتحمل الباحث مسؤولية الأمانة العلمية وهو المسؤول عما ينشر له .
 - البحوث المقدمة للنشر لا ترد لأصحابها نشرت أو لم تنشر .
- (حقوق الطبع محفوظة للكلية)



ضوابط النشر:

- يشترط في البحوث العلمية المقدمة للنشر أن يراعى فيها ما يأتي :
- أصول البحث العلمي وقواعده .
- ألا تكون المادة العلمية قد سبق نشرها أو كانت جزءا من رسالة علمية .
- يرفق بالبحث تزكية لغوية وفق أنموذج معد .
- تعدل البحوث المقبولة وتصحح وفق ما يراه المحكمون .
- التزام الباحث بالضوابط التي وضعتها المجلة من عدد الصفحات ، ونوع الخط ورقمه ، والفترات الزمنية الممنوحة للتعديل ، وما يستجد من ضوابط تضعها المجلة مستقبلا .

تنبيهات :

- للمجلة الحق في تعديل البحث أو طلب تعديله أو رفضه .
- يخضع البحث في النشر لأولويات المجلة وسياستها .
- البحوث المنشورة تعبر عن وجهة نظر أصحابها ، ولا تعبر عن وجهة نظر المجلة .

Information for authors

- 1- Authors of the articles being accepted are required to respect the regulations and the rules of the scientific research.
- 2- The research articles or manuscripts should be original and have not been published previously. Materials that are currently being considered by another journal or is a part of scientific dissertation are requested not to be submitted.
- 3- The research articles should be approved by a linguistic reviewer.
- 4- All research articles in the journal undergo rigorous peer review based on initial editor screening.
- 5- All authors are requested to follow the regulations of publication in the template paper prepared by the editorial board of the journal.

Attention

- 1- The editor reserves the right to make any necessary changes in the papers, or request the author to do so, or reject the paper submitted.
- 2- The research articles undergo to the policy of the editorial board regarding the priority of publication.
- 3- The published articles represent only the authors' viewpoints.





Antimicrobial Activities of Methanol Extract of *Peganum harmala* Leaves and Seeds against Urinary Tract Infection Bacteria

Khaled Abdusalam B. A¹, Eman Mohammed Alshadhli², Tasnim Adel Betro³, Amara Lutfi Kara⁴, Mawada Bezain Almashloukh⁵
Department of Drug Technology, Yafran Medical Technical College^{1,2,3,4,5},
Department of Botany, Alassaba'a Faculty of Science, University of Gharyan, Libya¹
khaledbashirala.79@gmail.com

ABSTRACT: The problem of microbial resistance continues to increase in all regions of the world, and even though a very large number of antibiotics have been produced in the last 30 years, microbial resistance is maintained because of the wide use of these drugs against many infectious diseases. Thus, natural products are seen as the alternative solution. Based on previous studies, *Peganum harmala* has been reported to exhibit several biological properties including antibacterial and antifungal. Thus, the main aim of this study is evaluating antibacterial activities of *P. harmala* against *Escherichia coli*, *Klebsiella pneumoniae* and *Staphylococcus aureus*, which isolated from infected patients in (Alassaba'a hospital, Alassaba'a, west of Tripoli). Agar disk diffusion technique was used for detecting the antibacterial activity, and the minimum inhibitory concentration was tested by serial dilution methods. The results showed that the growth of all tested bacteria were inhibited strongly by methanol extract of seeds at 1.0% with inhibition zones 14.66, 12.00 and 15.33mm against *E. coli*, *k. pneumoniae* and *S. aureus* respectively. Besides, MIC values ranged between 0.625 to 1.25 mg/mL. While, MBC values ranging between 1.25 to 5 mg/mL. On the other hand, methanol extract of leaves was also inhibit the growth of *E. coli*, *k. pneumoniae* and *S. aureus* with inhibition zones 11.00, 9.66 and 10.00mm respectively. As well as, MIC values ranging between 1.25 to 2.5 mg/mL, while MBCs value ranging between 2.5 to 5 mg/mL. In conclusion, methanol extract of *P. harmala* seeds exhibited strongly antimicrobial activity against *E. coli*, *k. pneumoniae* and *S. aureus*, thus it can be developed as anti-bacterial agent.

Keywords: Antimicrobial activity; *Peganum harmala*; Urinary Tract Infection.

1. Introduction

Urinary tract infections (UTIs) are one of the most common bacterial infections. About 85% of these infections are caused by *Escherichia coli*. In addition, other bacteria can cause an infection included Gram-negative species *Klebsiella* and *Pseudomonas* and Gram-positive bacterial cocci, *Staphylococcus aureus* (Fatma *et al.*, 2016). These bacteria including *E. coli*, *K. pneumoniae* and *S. aureus* are multidrug resistant bacteria that pose threats to patients in hospitals and nursing homes as well as to patients whose conditions require medical devices such as ventilators and blood catheters (Mancuso *et al.*, 2021). On the other hand, natural products are of great importance, the medicinal plants have been used in folk medicine in Libyan and other countries as diuretics, topical anti-inflammants, and other using (Alghazeer *et al.*, 2012). Recently, searching for drugs and dietary supplements derived from plants have been accelerated which have been found in many studies to have antimicrobial properties (Fatma *et al.*, 2016).



Peganum harmala belongs to the Zygophyllaceae family, which commonly known as “harmal” in Libya. Extensively spread in Middle and East Asia and North Africa (Ahmed *et al.*, 2021). It is a highly branched perennial, herbaceous, glabrous plant, which grows from 30 to 60 cm tall with short creeping roots. It possesses narrow leaves arranged alter-nately on fleshy, bright green stiff stems. The flowers are solitary, small, pale yellow or white. The fruits are capsules with 3 chambers and about 6 to 10 mm across (Shahrajabian *et al.*, 2021). The main medicinal part of *P. harmala* is the seed (Niroumand *et al.*, 2015). The seeds are digestive, hallucinogenic, diuretic, antipyretic, antispasmodic, emetic, nauseant, narcotic and a uterine stimulant (Kartal *et al.*, 2003). In addition, the incense of seeds is used for toothache and repelling mosquitos (Tonkaboni *et al.*, 2007). On the other hand, the leaves used in the treatment of asthma, colic, dysmenorrhea, hiccups, neuralgia, hysteria and rheumatism (Ezer & Arisan 2006).

Various studies have been reported the antimicrobial activities of the *P. harmala* such as antifungal and antibacterial activities (Nenaah, 2010). Methanol extract of the seeds and leaves of *P. harmala* showed antibacterial activities against *Staphylococcus aureus* and *Escherichia coli* (Fatma *et al.*, 2016). In addition, ethanol extract of *P. harmala* can restrain the growth of *Streptococcus pyogenes*, *Staphylococcus aureus* and *Staphylococcus epidermidis* (Darabpour *et al.*, 2011). Moreover, *Bacillus subtilis* and *Proteus vulgaris* are the most sensitive bacteria to the metabolites derived from this plant (Moloudizargari *et al.*, 2013). As well as, ethanolic crude extracts of *P. harmala* seeds from Libya had higher activities against *Salmonella typhi*, *E. coli*, *Bacillus subtilis* and *Staphylococcus aureus* (Ahmed *et al.*, 2021). *P. harmala* also had activity against the *Candida albicans*, *Aspergillus flavus*, *Aspergillus fumigates* and *Aspergillus niger* (Saadabi, 2006). Besides, the methanol extract of leaves of *P. harmala* had a greater inhibitory effect than the seeds extract on the *Proteus mirabilis*, *E. coli*, *P. aeruginosa* and *S. aureus* (Fatma *et al.*, 2016).

The main aim of this study is evaluating antibacterial activities of *P. harmala* against *Escherichia coli*, *Klebsiellae pneumoniae* and *Staphylococcus aureus*, which isolated from urine culture of patients suffered from urinary tract infections. A further objective is to determine which part of plant (leaves or seeds) have a strongest activity against selected bacteria .

2. Methods and Material

2.1 Sample Collection and Processing

The leaves and seeds of *P. harmala* were collected from Umm al-Harmal area, in the city of Alassaba'a -Libya, in July 2022. A botanist (Prof. Sh-hoob Elahmir) authenticated plant identity and a voucher specimen (PH1642) was placed in the mini-herbarium of the faculty of sciences, Gharyan University. Plant samples were cleaned with distilled water, then dried for 5 days in oven at 40 C°.

2.2 Preparation of Extracts

Ten grams powder of each sample (leaves and seeds) were dissolved in 150 mL of 98% methanol and placed at room temperature for 24 hours and then extracts were filtered through Whatman No 1 filter paper, concentrated on a vacuum rotary evaporator at 40 C°. Then stored at 4 C° prior to further analysis.

2.3 Bacterial isolation, identification and preparation of Bacterial Inoculum

Clinical isolates of the following bacteria: *E. coli*, *K. pneumonia* and *S. aureus* were isolated from urine culture of patients in (Alassaba'a hospital, Alassaba'a, west of



Tripoli) suffered from urinary tract infections during the year 2022. Samples were cultured on fresh media (CLED agar), and incubated for one day at 37C°. The colonies identified based on colonial morphology. Sub-culture on other media such as Eosin-Methylene Blue Agar (EMB) and macconkey agar were also used to confirm the *E. coli*, *K. pneumonia* bacteria. While, Mannitol Salt Agar (MSA) used for *S. aureus*.

After identified the all bacterial strains, two to three colonies of bacteria were transferred into 1 mL of nutrient broth (using a sterile cotton swab and the bacterial suspension vortexed for 10 min and subsequently allowed for the development for one day at 37 C°. Then, 10 µL of the bacterial suspension was transferred into 10 mL of nutrient broth. The turbidity of inoculum was diluted to approximately to above 10⁶ colony-forming unit/mL (CFU/mL) concentrations, utilizing a standard broth microdilution (Rukayadi *et al.*, 2013) and inoculum quantification methods (Indira, 2014). Inoculum quantification was performed by plating 20 µL of bacterial suspension on MHA and counting the colonies formed after incubation for one day at 37C°.

2.4 Preparation of Standards and Stock Solutions

A10% solution of dimethyl sulfoxide (DMSO) has been used as a negative control in since it has been reported to show no inhibition or killing effect on the bacterial strains used throughout the current research (Rukayadi *et al.*, 2013). The solution was prepared by dissolving 10 mL of 99.9% DMSO (R and M Marketing, Essex, UK) in 90 mL of distilled water. Meanwhile, Vancomycin 10µg (VA) and Streptomycin 5µg (S) were used as the positive standard against gram (+) and gram (-) bacteria, respectively. The stock extracts were primed by dispersing a (10 mg) crude extracts in 100% dimethyl sulfoxide (DMSO; Fisher Scientific, Leicestershire, United Kingdom) to obtain a 100 mg/mL concentration. Additional dilution of all solutions was done employing 1:10 (v/v) sterile deionized distilled water (ddH₂O) to manufacture 10 mg/mL stock solution (1.0% concentration). The stocks were put in storage at 4C° until to use.

2.5 Antibacterial Assay

2.5.1 Antibacterial Disc Diffusion Assay

Antibacterial activity of the plant extracts have been evaluated using disc diffusion assay (CLSI, 2003). Briefly, the bacterial inoculum was streaked on the surface of MHA plate using sterile cotton swab. Sterile 6 mm filter paper discs (Whatman, Germany) were pre-wetted with 10 µL aliquots of the test extracts, prepared at a concentration of 10 mg/mL (1%). The discs were subsequently put on the inoculated plates at a good distance from each other. Positive 10µg (VA), 5µg (S) and negative (10% DMSO) control discs were put on the inoculated plate. The test plates have subsequently been incubated for 24 h at 37 C° and observed for clear zones, measured in millimeters, which indicated the prevention of bacterial growth by the test sample.

2.5.2 Determination of Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) Values

The MICs and MBCs were defined as described by CLSI (2003). The MICs and MBCs of 1% (10 mg/mL) methanol extracts of *P. harmala* leaves and seeds against *S. aureus*, *K. pneumoniae* and *E. coli* were accomplished in a 96-well microliter plate with two-fold consecutive standard stock microdilution method and bacterial concentration inoculum of approximately 10⁶ CFU/mL. Moreover, the micro titer



plate has been incubated aerobically at 37 °C for 24 h. MIC is the minimum antibacterial agent concentration, which completely prevents visible growth. MBC for every bacterial species has been determined as outlined for MIC by eliminating the media from every well, which showed no visible growth then sub culturing them on MHA plates. Thus, the plates were later incubated at 37 °C for 24 h until visible growth was seen in control plates. Correspondingly, MBC is identified as comparable concentrations that are required for killing microorganisms completely (Rukayadi *et al.*, 2008). Both the MIC and MBC test have been made in duplicates.

2.6 Statistical Analyses

Windows Excel 2010 was intended for the analysis of antimicrobial outcome data. The results were expressed as mean \pm SD of 3 replicates.

3. Results

The colonies identified based on colonial morphology on CLED agar as follows; *E. coli* appeared with large elevated, yellow with center more intense yellow, while *K. pneumoniae* extremely mucoid colonies varying in color from yellow to whitish-blue and yellowish medium. On the other hand, *S. aureus* appeared with deep yellow colonies about 0.75 mm (Figure 1). In addition, sub-culture on other media such as Eosin-Methylene Blue Agar (EMB) used to confirmed. *E. coli*, which grow with a metallic green sheen with a dark center. Whilst, *K. pneumoniae* had large mucoid dark pink colony on Macconkey agar. Furthermore, *S. aureus* on Mannitol Salt Agar (MSA) displayed a yellow (Figure 2). In addition, some chemical tests were used to identify these bacteria such as catalase and coagulase test for *S. aureus*, which gave positive results of both tests. As well as, *E. coli* gave positive results of catalase test a long with *k. pneumoniae*.

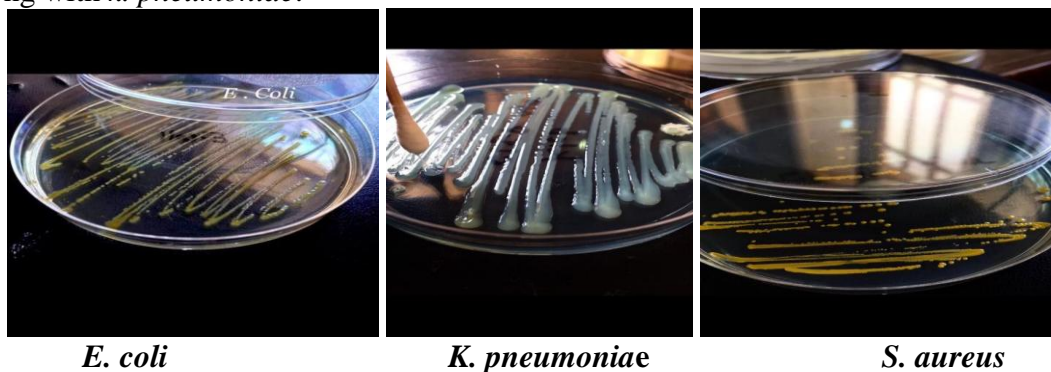


Figure 1: Isolated the bacterial tests

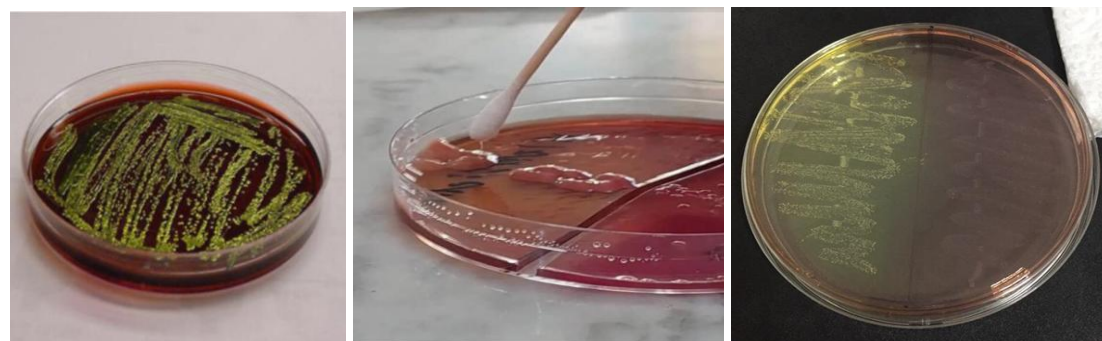


Figure 2: identified the bacterial tests on different types of media



Findings of the antibacterial disc diffusion test on the crude methanolic extracts of *P. harmala* against *E. coli*, *K. pneumoniae* and *S. aureus* are given in Table 1 and Figure 3. From the results, it has been found that the seed extract more effective against the bacterial strains compared to leaves extract.

Table 1: Disc diffusion of methanol extract of *P. harmala* against *E. coli*, *K. pneumoniae* and *S. aureus*.

Bacteria	Mean diameter of inhibition zone (mm)		
	Control (+)	Leaves	Seeds
<i>E. coli</i>	16.5 ±0.70	11.00±1.00	14.66±0.57
<i>K. pneumoniae</i>	18.5 ±0.70	9.66±0.57	12.00±1.00
<i>S. aureus</i>	14.00±0.00	10.00±1.00	15.33±0.57

All extracts were tested at 1% concentration. The diameter of inhibition zones in mm (including disc). Results were expressed as means ± standard deviation. Significant differences in means (triplicate).



Figure 3: Disk diffusion results of *P. harmala* leaves and seeds extract against tested bacteria

In general, the disc diffusion assay showed that the 1% crude methanolic extract of *P. harmala* seeds with the higher effects against all bacterial, which used in this study compared to leaves extract. The inhibition zones of seeds extract were, 14.66, 12.00 15.33mm against *E. coli*, *k. pneumoniae* and *S. aureus* respectively. While the inhibition zones of leaves extract were 11.00, 9.66 and 10.00mm against, *E. coli*, *k. pneumoniae* and *S. aureus* respectively.

Based on the inhibitory zone diameters, also the susceptibility of, *E. coli*, *k. pneumoniae* *S. aureus*, and *P. harmala* crude extracts were assessed on the basis of their minimum inhibitory concentration (MIC) and their minimum bactericidal concentration (MBC) values. The MIC and MBC values are given in Table: 2 and figure: 4 and 5.

Table 2: Minimal Inhibitory Concentration (MIC) and Minimal Bactericidal Concentration (MBC)

Type of bacteria	Leaves		Seeds	
	MIC	MBC	MIC	MBC
<i>E. coli</i>	2.5	5	1.25	5
<i>K. pneumoniae</i>	1.25	2.5	1.25	5
<i>S. aureus</i>	1.25	2.5	0.625	1.25



Figure 4: Minimum bactericidal concentration (MBC) of *P. harmala* leaves extract against tested bacteria



Figure 5: Minimum bactericidal concentration (MBC) of *P. harmala* seeds extract against tested bacteria

Current research demonstrated that the outcome leaves extract of *P. harmala* with MICs ranging between 1.25 to 2.5 mg/mL, while the MICs of seeds extract ranging between 0.625 to 1.25 mg/mL. However, the results of MBCs for the leaves extract ranging between 2.5 to 5 mg/mL and the MBCs of seeds extracts ranging between 1.25 to 5 mg/mL.

4. Discussion

Urinary tract infection is one of the common infections. Recently, there has been an increase in the incidence of resistant organisms causing urinary tract infection (Fatma *et al.*, 2016). The extracts of medicinal plants are used for their antimicrobial properties in many parts of the world, and the antibacterial action of the plants is poorly understood and remains in debate (Fatma *et al.*, 2016).

In this study, the antibacterial activity of 1% leaves and seeds extracts of *P. harmala* against tested bacteria mentioned previously was determined the disk diffusion, MICs and MBCs values. 1% seeds extract of *P. harmala* had a greater effects against all tested bacteria included *E. coli*, *K. pneumoniae* and *S. aureus* compared to leaves extract at the same concentration. In addition, the seeds extracts can inhibit the growth of all tested bacteria with a lowest MICs and MBCs value compared to leaves extract. Mostafa *et al.* (2018) reported that the difference in MIC of plant extracts is because due to the unstable nature of chemical components. *P. harmala* extracts are reported to contain many compounds included alkaloids, flavonoids and anthraquinones (Bensalem *et al.*, 2014). Besides, harmine, harmaline, harmalol, harmol, harmalol peganine and β -carboline have been isolated from different parts of this plant. Most of



these compounds had antimicrobial activities against many types of bacteria (Asgarpanah & Ramezanloo, 2012). Thus, the antibacterial activity of methanol extract of *P. harmala* seeds and leaves in this study might be linked to the high quantity of different compounds in the both extracts. In addition, their antimicrobial effect can be connected to their different ability to inactivate microbial adhesions, enzymes, cell envelope transport proteins, may also disrupt microbial membranes (Fatma *et al.*, 2016).

There were several reports concerning the susceptibility of many types of bacteria to antimicrobial of different solvent extracts of this plant.

Fatma *et al.* (2016) described the effect of aqueous extract of leaves and seeds of *P. harmala* from Algeria on urinary tract infection pathogens including *E. coli*, *S. aureus*, *P. mirabilis* and *P. aeruginosa* with inhibition zones from leaves 10.00, 5.00, 11.00 and 5.00 mm respectively, and inhibition zones from seeds 5.00 against all bacteria. Additionally, Mohsenipour *et al.* (2016) reported antimicrobial activity of methanol extract of *P. harmala* seed and stem against *S. aureus*, *B. cereus* and *E. coli* with inhibition zones of 12.3 ± 1.1 , 12 ± 1.4 and 10.4 ± 1.2 mm respectively, which were less than of current study results. On the other hand, methanol extract of *P. harmala* leave had low antimicrobial activity against *Salmonella* species and *E. coli*, with inhibition zones of 8.00 to 10.00 mm , while no effect against *S. aureus* and *B. subtilis* (Muhaisen *et al.*, 2016). Furthermore, Khademalhosseini *et al.* (2015) stated that ethanol extract of *P. harmala* seed was inhibited the growth of *S. aureus*, *E. coli* and *K. pneumoniae* with inhibition zones 13.0 mm, 13.0 and 11.5 mm respectively. Whiles, Ahmed *et al.* (2021) have reported that, ethanol extract of *P. harmala* was inhibited the growth of *S. aureus*, *S. epidermidis* and *E. coli* with inhibition zones of 12.33 ± 2 , 13.66 ± 3 and 10.00 ± 2 mm respectively, these results were less than of current study results.

On the other hand, Ahmed *et al.* (2021) have been reported antimicrobial activity of ethanolic extract of Libyan *P. harmala* against *Salmonella typhi* ATCC 14028, *E. coli* ATCC 25923, *B. subtilis* ATCC 6633 and *S. aureus* ATCC 29213 with MIC values ranging from 0.019 to 0.312 mg/mL and MBC values varied among 0.78 to 0.625 mg/mL. Methanol extract of *P. harmala* seed and stem from Iran inhibited also the growth of *S. aureus*, *B. cereus*, *E. coli* and *K. pneumoniae* with a MIC values of 0.039, 0.156, 0.156 and 0.312 mg/mL respectively, and MBC values of 0.78, 0.312, 0.625 and 1.25 mg/mL respectively (Mohsenipour & Hassanshahian, 2016). Such concentrations have been less than obtained values in the current research.

Moreover, the methanol extract of *P. harmala* seeds significantly suppressed the growth of *E. coli* and *S. typhi* with MIC values 0.625 mg/mL (Darbpour *et al.*, 2011). Additionally, Khademalhosseini *et al.* (2015) described that ethanol extract of *P. harmala* seeds inhibited the growth of *E. coli*, *K. pneumoniae*, *S. typhimurium*, *S. aureus*, *M. luteus*, *C. pseudotuberculosis* and *S. pneumoniae*, with MIC values ranging between 0.68-1.3 mg/mL, and MBC values varied among 1.3-5 mg/mL.

In addition, ethanol extract of Libyan *P. harmala* inhibited the growth of *E. coli*, *B. subtilis* and *S. aureus* with MIC values of 31.25 , 1.95 and 15.62 mg/mL respectively, while the MBC values of 62.50 , 7.80 and 31.25 mg/ml, respectively (Alabeed, 2021). This study will be continued by other studies to identify the chemical compounds of *P. harmala* seeds extract .



The results of current study showed *P. harmala* seeds extract as a potential source of antimicrobial drug against the most common urinary pathogens. This is particularly important in the fight against the recent resistant organisms with multiple drugs. These results suggest that future researches should be done to investigate the in vivo activity of this plant, toxicity and thus to determine the pharmacological activity in the seeds of this plant which have the greater antibacterial effect.

Acknowledgments

This research was under the supervision of the Accuracy Laboratory for medical analyzes in the city of Asaba. The authors gratefully acknowledge the technical assistance of the all workres of this Lab. In addition, a big thank to a botanist (Prof. Sh-hoob Elahmir) from the faculty of sciences, Gharyan University.

REFERENCES

- Ahmed, I.A., Abdul-Aziz, A., Sidik, N.J. and Allaq, A.A., 2021. Antioxidant, antibacterial, and phytochemical screening of ethanolic crude extracts of Libyan *Peganum harmala* seeds. *Journal of Pharmaceutical Research International*, 33(13), pp.74-82.
- Alabeed Alkamil, A., 2021. *Antioxidant, antibacterial activity and phytochemical screening of ethanolic seeds extract of Libyan Peganum Harmala and Cuminum Cyminum* (Doctoral dissertation, Universiti Teknologi MARA).
- Alghazeer, R., El-Saltani, H., Saleh, N., Al-Najjar, A. and Hebail, F., 2012. Antioxidant and antimicrobial properties of five medicinal Libyan plants extracts. *Natural science*, 4(5), pp.324-335.
- Asgarpanah, J. and Ramezanloo, F., 2012. Chemistry, pharmacology and medicinal properties of *Peganum harmala* L. *Afr J pharm pharmacol*, 6(22), pp.1573-80.
- Bensalem, S., Soubhye, J., Aldib, I., Bournine, L., Nguyen, A.T., Vanhaeverbeek, M., Rousseau, A., Boudjeltia, K.Z., Sarakbi, A., Kauffmann, J.M. and Nève, J., 2014. Inhibition of myeloperoxidase activity by the alkaloids of *Peganum harmala* L.(Zygophyllaceae). *Journal of ethnopharmacology*, 154(2), pp.361-369.
- Clinical and Laboratory Standards Institute (CLSI), 2003. Reference method for dilution antimicrobial susceptibility tests for bacteria that grow aerobically. *Approved standard M7-A6*. National Committee for Clinical Laboratory Standards, Wayne, Pennsylvania, USA.
- Darabpour, E., Bavi, A.P., Motamedi, H. and Nejad, S.M.S., 2011. Antibacterial activity of different parts of *Peganum harmala* L. growing in Iran against multi-drug resistant bacteria. *EXCLI journal*, 10, p.252.
- Ezer, N. and Arisan, Ö.M., 2006. Folk medicines in Merzifon (Amasya, Turkey). *Turkish Journal of Botany*, 30(3), pp.223-230.
- Fatma, B., Fatiha, M., Elattafia, B. and Noureddine, D., 2016. Phytochemical and antimicrobial study of the seeds and leaves of *Peganum harmala* L. against urinary tract infection pathogens. *Asian Pacific Journal of Tropical Disease*, 6(10), pp.822-826.
- Indira, G., 2014. In vitro antifungal susceptibility testing of 5 antifungal agents against dermatophytic species by CLSI (M38-A) micro dilution method. *Clin Microbial*, 3(3), pp.1-5.
- Kartal, M.U.R.A.T., Altun, M.L. and Kurucu, S., 2003. HPLC method for the analysis of harmol, harmalol, harmine and harmaline in the seeds of *Peganum harmala* L. *Journal of pharmaceutical and biomedical analysis*, 31(2), pp.263-269.



- Khademalhosseini, A.A., Tabatabaei, A., Akbari, P., Fereidouni, M.S. and Akhlaghi, M., 2015. Comparison of in vivo antiseptic and in vitro antimicrobial effects of Peganum harmala L. seeds ethanolic extract with Betadine. *J Coast Life Med*, 3(1), pp.70-7.
- Mancuso, G., Midiri, A., Gerace, E. and Biondo, C., 2021. Bacterial antibiotic resistance: The most critical pathogens. *Pathogens*, 10(10), p.1310.
- Mohsenipour, Z. and Hassanshahian, M., 2016. Antibacterial activity of Espand (Peganum harmala) alcoholic extracts against six pathogenic bacteria in planktonic and biofilm forms.
- Moloudizargari, M., Mikaili, P., Aghajanshakeri, S., Asghari, M. and Shayegh, J., 2013. Pharmacological and therapeutic effects of Peganum harmala and its main alkaloids. *Pharmacognosy reviews*, 7(14), p.199.
- Mostafa, A.A., Al-Askar, A.A., Almaary, K.S., Dawoud, T.M., Sholkamy, E.N. and Bakri, M.M., 2018. Antimicrobial activity of some plant extracts against bacterial strains causing food poisoning diseases. *Saudi journal of biological sciences*, 25(2), pp.361-366.
- Muhaisen, H.M., Ab-Mous, M.M., Ddeeb, F.A., Rtemi, A.A., Taba, O.M. and Parveen, M., 2016. Antimicrobial agents from selected medicinal plants in Libya. *Chinese journal of integrative medicine*, 22, pp.177-184.
- Navidinia, M., Karimi, A., Rahbar, M., Fallah, F., Ahsani, R.R., Malekan, M.A., Jahromi, M.H. and Gholinejad, Z., 2012. Study prevalence of verotoxigenic E. coli isolated from urinary tract infections (UTIs) in an Iranian children hospital. *The Open Microbiology Journal*, 6, p.1.
- Nenaah, G., 2010. Antibacterial and antifungal activities of (beta)-carboline alkaloids of Peganum harmala (L) seeds and their combination effects. *Fitoterapia*, 81(7), pp.779-782.
- Niroumand, M.C., Farzaei, M.H. and Amin, G., 2015. Medicinal properties of Peganum harmala L. in traditional Iranian medicine and modern phytotherapy: a review. *Journal of Traditional Chinese Medicine*, 35(1), pp.104-109.
- Rukayadi, Y., Lau, K.Y., Zainin, N.S., Zakaria, M. and Abas, F., 2013. Screening antimicrobial activity of tropical edible medicinal plant extracts against five standard microorganisms for natural food preservative. *International Food Research Journal*, 20(5), p.2905.
- Rukayadi, Y., Shim, J.S. and Hwang, J.K., 2008. Screening of Thai medicinal plants for anticandidal activity. *Mycoses*, 51(4), pp.308-312.
- Saadabi, A.M., 2006. Antifungal activity of some Saudi plants used in traditional medicine. *Asian journal of plant sciences*.
- Shahrajabian, M.H., Sun, W. and Cheng, Q., 2021. Product of natural evolution (SARS, MERS, and SARS-CoV-2); deadly diseases, from SARS to SARS-CoV-2. *Human Vaccines & Immunotherapeutics*, 17(1), pp.62-83.
- Tonkaboni MM. Tohfeh al-Momenin (Persian). 2007.Tehran: Shahid Beheshti University of Medical Sciences Publication, 150.



الفهرس

الصفحة	اسم الباحث	عنوان البحث	رت
1-10	Manal Mohammed bilkour	An optimal fuzzy zero point method for solving fuzzy transportation problem	1
11-24	Mohamed Bashir M. Ismail	Assessing the Adaptability of Students and Teachers in the Faculty of Arts at Alasmarya Islamic University to the Sudden Transition to Online Teaching and Learning Processes during the COVID- 19 Pandemic	2
25-34	Dawi Muftah Ageel	Environmental study for Cyanobacteria Blooms using Envisat data at the western coastal of Libya	3
35-53	Nuria Mohamed Hider	Possible solutions to ensure data protection in cloud computing to avoid security problems	4
54-60	Gharsa Ali Elmarash Najla Mokhtar	A printed book or an e-book? Student Preferences & Reasons	5
61-75	هدية سليمان هويدي نادية عطية القدار دعاء عبد الباسط باكير	التشهير الإلكتروني عبر مواقع التواصل الاجتماعي من وجهة نظر طلبة كلية طب الأسنان بمدينة زليتن	6
76-89	Hamza A. Juma Saif Allah M. Abgenah Mustafa Almahdi Algaet Munayr Mohammed Amir	Designing an Autonomous Embedded System for Temperature Monitoring and Warning in Medical Warehouses	7
90-101	Salem Msaoud Adrugi Tareg Abdusalam Elawaj Milad Mohamed Alhwat	The effect of using electronic mind maps in learning visual programming through e-learning platforms An experimental study of computer departments students at Elmergib University	8
102-110	Suad Mohamed Ramadan Zainab Ahmed Dali Ahlam Mohammad Aljarray Zenoba Saleh Shubar	Performance analysis of different anode materials of double chamber Microbial Fuel Cell technology using different types of wastewater	9
111-116	Faiza Farag Aljaray Saad Belaid Ghidhan	Evaluation of Hardness for Electroless Ni-P Coatings	10
117-128	Saleh Meftah Albouri Hadya S Hawedi Mansur Ali Jaba	Using Smartphone in Education: How Smartphone has impacted in Education, A Review Paper	11
129-139	Ibrahim O, Sabri	The Concept of Illegal Immigration and Its Causes in North Africa Region	12
140-151	A.S. Deeb I.A.S. Gjam	Solution of a problem of linear plane elasticity in region between a circular boundary with slot by boundary integrals	13



152-173	Musbah Ramadan Elkut	Transforming TESOL Pedagogy: Navigation Emerging Technology and Innovative Process	14
174-192	سالم علي سالم شخطور	آراء أبي محمد القيسي في خزانة الأدب "دراسة وتحليل"	15
193-217	نورية صالح إفريج	اعتراضات النحاة على حجية الشواهد في مسألة إعادة حرف الجر مع حتى العاطفة	16
218-238	نجاه صالح اليسير	الازدواجية اللغوية وأثرها في تعليم اللغة العربية الصفوف الأولى من المرحلة الابتدائية (أنموذجاً)	17
239-256	محمود محمد رحومة الهوش	الرضا الوظيفي وأثره على الاداء المهني لدى معلمي ومعلمات التربية البدنية ببلدية العجيلات	18
257-272	إبراهيم رمضان هدية	السرد الروائي عند إبراهيم الكوني في رواية الدنيا أيام ثلاثة	19
273-279	ابراهيم علي احمدودة ابراهيم علي ارحومة	التحليل الاستراتيجي لشركة الخطوط الجوية الليبية دراسة تطبيقية على الشركة باستخدام النماذج	20
280-294	Ismail F. Shushan Emad Eldin A. Dagdag Salah Eldin M. Elgarmadi	Petrography of Abushyba Formation columnar-jointed sandstones (Triassic-Jurassic) from Jabal Nafusa- Gharian, NW-Libya	21
295-307	Samera Albghil	Multimodal discourse analysis of variations in Islamic dress code in Bo-Kaap, Cape Town	22
308-317	عبداللطيف بشير المكي الديب رجب فرج سالم اقنيير	(استخدام نظم المعلومات الجغرافية والاستشعار عن بعد في تقدير النمو العمراني وأثره على البيئة المحلية بمنطقة سوق الخميس - الخمس / ليبيا)	23
318-331	حنان عبد السلام سليم عائشة حسن حويل	تطوير الخدمات العقارية باستخدام تقنية المعلومات (تطبيق أندرويد للخدمات العقارية أنموذجاً)	24
332-338	Mahmoud Mohamed Howas	Hepatoprotective Potential of Propolis on Carbontetrachloride-Induced Hepatic Damages in Rats	25
339-352	نورية محمد النائب الشريف	البناء العشوائي في مدينة الخمس (مفهومه - أسبابه - تأثيره على المخطط)	26
353-371	إسماعيل حامد الشعاب معمر فرج الطاهر سالم العامري	اختلاف القراء السبعة في البناء للفاعل وغير الفاعل وأثره في توجيه المعنى "نماذج مختارة"	27
372-376	عبد السلام صالح أبوسديل عطية رمضان الكيلاني	دراسة على مدى انتشار Gnathia sp. في بعض الأسماك البحرية المصطادة من شواطئ الخمس- ليبيا	28
377-392	الصغير محمد المجري	(بيان فعل الخير إذا دخل مكة من حج عن الغير) للملا علي القاري المتوفي سنة 1014هـ دراسة وتحقيق	29
393-421	نجيب منصور ساسي	فضل المواهب في شرح عيون المذاهب لعبد الرؤوف الأنطاكي (1009هـ) (الاستنجا ونواقض الوضوء من كتاب الطهارة) دراسة وتحقيق	30
422-439	حنان ميلاد عطية	برنامج ارشادي معرفي سلوكي في خفض مستوى الوحدة النفسية لأبناء النازحين الليبيين	31
440-457	Hanan A. Algrbaa,	Speaker recognition from speech using Gaussian mixture model (GMM) and (MFCC)	32
458-467	هشام علي مرعي	علاقة المنطق بالعلوم الشرعية عند الغزالي	33



468-476	خالد الهادي الفيتوري زينب أحمد زوليه	الحلول العددية للمعادلات التفاضلية الملزمة باستخدام ب-سبلين التكعيبية	34
478-500	خميس ميلاد الدزيري	تأثير نظم معلومات التسويقية على توزيع السلعة " دراسة تطبيقية على إدارة مصنع إسمنت المرقب "	35
501-517	منصور عمر سالم فرعون	إدارة الوقت في الإدارة المدرسية في ضوء مهامهم الإدارية	36
518-533	فائزة محمد الكوت	أراء العلامة الدماميني النحوية في باب الظروف في كتاب خزانة الأدب ولب لباب لسان العرب	37
534-547	محمد محمد مولود الأنصاري حمزة مسعود محمد مكاري	"فوائد الفرائد في الاستعارة " عبد الجواد بن إبراهيم بن شعيب الأنصاري (1073هـ)	38
548-559	عبدالرحمن بشير الصابري إبراهيم عبد الرحمن الصغير أبوبكر أحمد الصغير	حروف الجر بين التناوب والتضمين دراسة تطبيقية على آيات من القرآن الكريم "دراسة وصفية تحليلية"	39
560-565	Ayda Saad Elagili Abdualah Ibrahim Sultan	An Application of "Kushare Transform" to Partial Differential Equations	40
566-598	أمل إجمد إقميع فاطمة محمد ابوراس	الأداء الوظيفي للمعلم وأثره على العملية التربوية دراسة سوسولوجية على عينة من معلمين ومعلمات مرحلة التعليم الأساسي	41
599-623	خيري عبدالسلام كليب عبدالسلام بشير اشتوي طارق أبوفارس العجيلي محمد عبدالسلام الأسطي فتحية خليل طحيشات	مدى التزام المصارف التجارية بتطبيق مبادئ إدارة الجودة الشاملة (دراسة ميدانية على مصرف الجمهورية فرع المرقب)	42
624-633	Abdulrhman Iqneebir Khaled Muftah Elsherif	Determination of Some Physical and Chemical Parameters of Groundwater in Ashafyeen-Masallata Area	43
634-650	أحمد على معتوق الزائدي	أحكام الأهلية وعوارضها عند الإنسان	44
651-671	عمر مصطفى النعاس السيد مصطفى السنباطي	الثقة بالنفس وعلاقته بالتوجه نحو الحياة لدى طالبات كلية الآداب	45
672-700	فاطمة جمعة الناكوع	معايير جودة آليات التدريب الميداني	46
701-718	إيمان عمر بن سعد بثينة علي أبو حليقة عمر محمد بشينه وليد حسين الفقيه	أثر المخاطر المالية في الأداء المالي للمصارف التجارية الليبية للفترة من (2011-2017)	47
719-730	هدي الهادي عويطي	دور مداخل ادارة المعرفة في تحسين ادارة الموارد البشرية في المؤسسات الحديثة	48
731-739	Khaled Abdusalam B. A Eman Mohammed Alshadhli Tasnim Adel Betro Amera Lutfi Kara Mawada Almashloukh	Antimicrobial Activities of Methanol Extract of Peganum harmala Leaves and Seeds against Urinary Tract Infection Bacteria	49
740-750	فتحية زايد شنييه نجاة بشير الصابري	الصور البيانية في سورة الواقعة	50



751-757	Afifa Milad Omeman	Phytochemical, Heavy Metals and Antimicrobial Study of the Leaves of Amaranthus viridis	51
758-765	أسماء جمعة القلعي	قواعد المنهج عند ديكرت	52
766-777	فرج مجد صالح الدريع	النفط والاقتصاد الليبي 1963م - 1969م	53
778-789	عمر عبدالسلام الصغير رضا القدافي الأسمر	تقويم دية القتل الخطأ بغير الأصل	54
790-804	أبو عجيبة رمضان عويلي أحمد عبد الجليل إبراهيم	مناقشة المسألة الأربعين من كتاب المسائل المشكلة للفارسي	55
805-823	فتحية أبو عجيبة جبران صالحه عمر الخرازه	في منطقة سوق الخميس التلوث البيئي الناتج عن محطات الوقود (بحث مقدم للحصول على ترقية عضو هيئة تدريس)	56
824-856	هنية عبدالسلام البالوص	بعض المشكلات الضغط النفسي وعلاقتها بالصحة النفسية	57
857-871	احمد علي عزيز علي مفتاح بن عروس	تطبيقات البرمجة الخطية ونماذج صفوف الانتظار في مراقبة وتحسين الأداء دراسة إحصائية تطبيقية على القطاع الصحي بمدينة الخمس	58
872-879	Mona A. Sauf Fathi Shakurfow Sana Ali Soof Abdel-kareem El-Basheer	Isolation of Staphylococcus Aureus From Different Clinical Samples And Detects on Its Antibiotic Resistance	59
880-885	Wafa Mohamed Alabeid Omar Alamari Alshbaili	Combined Method of Wavelet Regression with Local Linear Quantile Regression in enhancing the performance of stock ending-prices in Financial Time Series	60
886-901	خالد مجد بالنور خالد أحمد قناو	حجم الدولة الليبية وأثره عليها طبيعياً وبشرياً	61
902-918	Amna Ali Almashrgy Hawa Faraj Al-Burrki Khadija Ali AlHebshi	EFL Instructors' and Students' Attitudes towards Using PowerPoint Presentation in EFL Classrooms	62
919-934	سالمه عبد العالي السيليني	اضطرابات الشخصية الحدية وعلاقتها بالجمود المعرفي	63
935-952	Samah Taleb	Common English Pronunciation Difficulties Encountered by Third Year Students at the Faculty of Education- English Department- Elmergib University	64
953-958	Hassan M. Krifa	A Study on Bacterial Contamination of Libyan Currency in Al-Khoms, Libya	65
959-964	Jamal Hassn Frjani	A New Application of Kushare Transform for Solving Systems of Volterra Integral Equations and Systems of Volterra Integro-differential Equations	66
965-978	Ismail Elforjani Shushan Saddik Bashir Kamyra Hitham A. Minas	Study of chemical and biological weathering effects on building stones of the Ancient City of Sabratha, NW-Libya	67
979-991	مجد عبد السلام دخيل	الآثار الاجتماعية والثقافية المصاحبة للتغير الاجتماعي في المجتمعات النامية	68



992-998	Ismael Abd-Elaziz Fatma Kahel	Molecularly imprinted polymer (poly-pyrrole) modified glassy carbon electrode on based electrochemical sensor for the Sensitive Detection of Pharmaceutical Drug Naproxen	69
999-1008	خالد رمضان الجربوع علي إبراهيم بن محسن صلاح الدين أبوغالية	علي الجمل وقصيدته (اليوم الأربعاء في رثاء النورس الكبير)	70
1009-1014	نادية مجد الدالي ايمان احمد اخميرة	Comparing Review between Wireless Communication Technologies	71
1015-1024	Khairi Alarbi Zaglom Foad Ashur Elbakay	The importance of Using Classroom Language in Teaching English language as a Foreign Language	72
1025-1042	حمزة بن ربيع لقرون	الأدلة المختلف فيها التي نُسب الاختصاص بها إلى مذهب مُعَيَّن (دراسة تحليلية مقارنة)	73
1043-1052	أسماء السنوسي لحيو	معدل انتشار بعض الأوليات المعوية الطفيلية في مدينة الخمس، ليبيا	74
1053-1067	برنية صالح إمام صالح	استعمالات (ما) النافية في سورة البقرة	75
1068-1085	اسماعيل عبدالكريم اعطية	عوامل نجاح وفشل نظام المعلومات دراسة تطبيقية على شركة الأشغال العامة بني وليد	76
1086-1098	نجوى الغويلي	"الرعاية الاجتماعية والدعم الاجتماعي والتربية الإيجابية للطفل"	77
1099-1105	Seham Ibrahim abosoria Fatheia Masood Alsharif Abdussalam Ali Mousa Hamzah Ali Zagloun	The Error Correction in second language writing	78
1106-1128	ميسون خيرى عقيلة	أساليب المعاملة الوالدية وعلاقتها بالتحصيل الدراسي لدى عينة من طلبة كليات جامعة المرقب بمدينة (الخمس)	79
1129-1135	Majdi Ibrahim Alashhb Mohammed Alsunousi Salem Mustafa Aldeep	Quality of E-Learning Learning Based on Student Perception Al Asmarya University	80
1136-1150	Ekram Gebрил Khalil	The Importance of Corrective Feedback in leaning a Foreign Language	81
1151-1164	سكينة الهادي الحوات فوزي مجد الحوات سلمية رمضان الكوت	شكل العلاقات الاجتماعية في ظل انتشار الأوبئة والأمراض السارية (جائحة كوفيد 19 نموذجاً)	82
1165-1175	Salma Mohammad Abad	A comparative study of the effects of Rhazya stricta plant residue on Raphanus sativus plant at the age of 15 and 30 days	83
1176-1191	مجد عمر مجد الفقيه الشريف	توظيف الاعتزال عند الزمخشري وانتصاره له من خلال تفسيره	84
1192	الفهرس		