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ترسل البحوث وجميع المراسلات المتعلقة بالمجلة إلى العنوان التالي:

كلية العلـــوم – جامعــة الزيتونــة – ترهـــونة

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الكلمة الافتتاحية،،

السلام عليكم ورحمة الله وبركاته،،

عليه نتوكل، وبه نستعين، نحمده سبحانه على كل عمل.

أعزائي القراء والمهتمين بالمعرفة والعلم،

بحمد الله وتوفيقه تم صدور العدد العاشر من مجلة "روافد المعرفة"، الصادرة عن كلية العلوم بجامعة الزيتونة. إن هذا الإصدار الذي نقدمه لكم يعكس التفاني والتميز الذي يتميز به فريق العمل والباحثين الذين ساهموا في إثراء هذا العدد بمقالاتهم وأبحاثهم الرائعة.

مجلة "روافد المعرفة" تعد نافذةً مهمة لنشر العلم والبحث العلمي، وهي تسعى جاهدة لتعزيز التواصل العلمي وتبادل المعرفة بين الباحثين والمهتمين بالمجالات العلمية المختلفة. إن تنوع المواضيع المطروحة في هذا العدد يعكس الاهتمام الكبير بمجالات العلوم الطبيعية والتطبيقية، ويعزز الوعي والفهم العلمي للقراء.

في هذا العدد العاشر، ستجدون مقالات متنوعة تتناول العديد من المواضيع المميزة والمفيدة في مجالات العلوم الطبيعية والتطبيقية. ولذلك، نحن واثقون من أن هذا العدد سيثري ثقافتكم ويوسّع آفاق المعرفة لديكم.

في ختام كلمتنا، أود أن نعرب عن امتناننا العميق للفريق الذي عمل بجد واجتهاد لجعل هذا العدد حقيقةً، وأشكر جميع الباحثين الذين شاركوا معنا معرفتهم وخبراتهم. وأتمنى أن يكون هذا العدد بمثابة نقطة انطلاق لمزيد من النجاح والتألق في المستقبل.

نتمنى لكم قراءة ممتعة ومفيدة، ونحن في انتظار ملاحظاتكم وآرائكم القيّمة.

شكراً لثقتكم ودعمكم المستمر.

دمتم بخير وعلم نافع.

هيئة التحرير

اشتراطات النشر في مجلة روافد المعرفة

1- أن يكون البحث أصيلاً ومبتكراً ولم يسبق نشره في أي جهة أخرى، وتتوفر فيه شروط البحث العلمي المعتمدة على الأصول العلمية والمنهجية المتعارف عليها في كتابة البحوث الاكاديمية.

-2- أن يكون البحث مكتوباً بلغة سليمة، ومراعياً لقواعد الضبط ودقة الرسوم والاشكال – إن وجدت و مطبوعاً بخط Microsoft Word (Simplified Arabic) ببنط (14) للغة العربية، وخط (Times New Roman) ببنط (12) للغة الإنجليزية، وألا تزيد صفحات البحث عن (35) صفحة متضمنة المراجع والملاحق (إن وجدت).

-3- يجب أن يشتمل البحث على العناصر التالية - عنوان البحث باللغتين العربية والإنجليزية - - ملخص تنفيذي باللغتين العربية والإنجليزية في نحو 100 - 125 كلمة والكلمات المفتاحية (keywords) بعد كل ملخص .

-4 يتم توثيق الهوامش وفق طريقة الجمعية الأمريكية السيكولوجية (APA) بإصدارتها المختلفة.

-5- يُفضل أن تكون الجداول والاشكال مدرجة في أماكنها الصحيحة، وأن تشمل العناوين والبيانات الإيضاحية الضرورية، ويراعى ألا تتجاوز أبعاد الاشكال والجداول حجم حيز الكتابة في صفحة.

-6- أن يكون البحث ملتزماً بدقة التوثيق، استخدام المصادر والمراجع، وأن تثبت مصادر ومراجع البحث في نهاية البحث.

7- تحتفظ المجلة بحقها في اخراج البحث وإبراز عناوينه بما يتناسب واسلوبها في النشر.

-8- - ترحب المجلة بنشر ما يصلها من ملخصات الرسائل الجامعية التي تمت مناقشتها وإجازتها على أن يكون الملخص من إعداد صاحب الرسالة نفسه.

9 - تُرسل نسخة من البحث مطبوعة على ورق بحجم (A4) إلى مقر المجلة، ونسخة إلكترونية إلى إيميل المجلة : wafedalmarefa@gmail.com او على رقم الواتساب 0921253199 على أن يدون على صفحة الغلاف اسم الباحث لقبه العلمي، مكان عمله، تخصصه، رقم هاتفه وبريده الإلكتروني.

10- يخطر الباحث بقرار صلاحية بحثه للنشر من عدمها خلال مدة شهرين من تاريخ استلام البحث.

11- في حالة ورود ملاحظات وتعديلات على البحث من المحكم ترسل تلك الملاحظات إلى الباحث لإجراء التعديلات اللازمة بموجبها على أن تعاد للمجلة خلال مدة أقصاها شهر واحد.

-12- الأبحاث التي لم تتم الموافقة على نشرها لا تعاد إلى الباحثين.

- 13- تؤول جميع حقوق النشر للمجلة.

ملاحظة.

البحوث المنشورة في هذه المجلة تعبر عن رأي أصحابها ولا تعبر بالضرورة عن رأي المجلة أو الكلية أو الجامعة.

المحتويات

Antibacterial, antifungal, and cytotoxicity activity of *Drimia maritima*

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الملخص

الخلفية: جنس الدريميا **Drimia** وتسمى أيضا أورجينيا **Urginea** هي نباتات ذات شكل منتفخ لها خصائص طبية قوية ومميزة. بعض الأنواع مثل العنصل البحري واسمه العلمي **Drimia maritima** والذي يختصر له بـ **D. maritima** موطنه الأصلي منطقة حوض البحر الأبيض المتوسط وقد تم استخدامه تقليديًا لعدة قرون لعلاج العديد من الأمراض المختلفة. كشفت الدراسات الكيميائية للنبات عن وجود مركبات الفلافونويد والعفص كمكونات رئيسية وقلويدات وجليكوسيدات. أظهرت الدراسات أن مستخلص نبات العنصل له تأثير مضاد للميكروبات ضد العديد من مسببات الأمراض. الهدف: هدفت الدراسة إلى تقييم النشاط المضاد للبكتيريا والفطريات والسمية الخلوية لنبات العنصل ضد بعض العزلات البكتيرية والفطرية ذات الأهمية الطبية. الطريقة: تم تقييم النشاط المضاد للميكروبات للمستخلصات النباتية ضد العزلات ذات الأهمية الطبية باستخدام طريقة الانتشار في الأجار. تم تحديد تأثير السمية الخلوية للمستخلصات النباتية باستخدام النشاط الانحلالي لكريات الدم الحمراء البشرية. النتيجة: أظهرت النتائج أن للمستخلصات المائية والكحولية والبنزين للنبات تأثيرات تثبيطية مختلفة ضد الانواع البكتيرية المختبرة، وكان التأثير المضاد للبكتيريا الأكثر وضوحا للمستخلصات الثلاثة على بكتيريا الإشريكية القولونية، كما أظهرت المستخلصات ضعف أو عدم النشاط على الأنواع الفطرية المختبرة. أظهرت نتائج السمية الخلوية أن الأوراق كانت ذات سمية متوسطة، بينما لم تظهر على الدرنات أي تأثيرات سمية. الاستنتاج: إجمالاً، تدعم النتائج التأثيرات الطبية لنبات العنصل وإمكانية استخدامه كمصدر بيولوجي ضد بعض الكائنات الحية الدقيقة المسببة للأمراض.

الكلمات المفتاحية: النباتات الطبية في ليبيا، المستخلصات النباتية، العنصل البحري، الفعل الضد بكتيري، الفعل الضد الفطري، السمية الخلوية.

.Abstract

Background: Drimia (synonym Urginea) plants are bulbous plants and are distinctive, powerful medicinal plants. some species such as Drimia maritima (D. maritima) are indigenous to the Mediterranean basin and have been traditionally utilized for centuries to cure various diseases. The phytochemical studies of the plant reveal the presence of flavonoids, and tannins as major constituents, alkaloids, and glycosides. Studies have shown that the D. maritima extract has antimicrobial action against many pathogens. Objective: The study aimed to evaluate the antibacterial, antifungal activity, and cytotoxicity of D. maritima against some bacterial and fungal isolates of medical importance. Methods: The antimicrobial activity of the extracts was evaluated against medical-importance isolates using agar diffusion. Determination of the Cytotoxicity effect of plant extract was performed using Hemolytic Activity using human red blood corpuscles. Result: The results showed the aqueous, alcoholic, and benzene extracts had different inhibitory effects against the tested bacteria, and the most obvious antibacterial action of the three extracts on E. coli, and the extracts showed a weak or non-activity on fungal species. The cytotoxicity results showed that the leaves had moderate toxicity, while the tubers did not have any toxic effects. Conclusion: Altogether, the results support the medicinal effects of D. maritima and its potential use as a biological source against some pathogenic microorganisms.

Keywords: Libyan medicinal plants, Plant extract, D. maritima, Antibacterial, Antifungal, Cytotoxicity.

INTRODUCTION:

Drimia genus is a perennial bulbous plant from of Asparagaceae family. *Drimia* L. is a genus consisting of one-hundred species (Manganyi *et al.*, 2021). Species of this genus are used as medicinal plants to treat diseases in various traditional medicines. *D. maritima* (Pharaohn plant in the Libyan dialect) is one of the original plants in the Mediterranean region, commonly known as squill, and it is a commercially important drug because of its medicinal value (Bozorgi *et al.*, 2017). *D. maritima* has long been known for treating human cardiac diseases and its deadly effects on rodents (Knittel *et al.*, 2014). Plant parts are traditionally used in many treatments such as dropsy, respiratory diseases, bone, joint disorders, jaundice, epilepsy, and cancer, and are used to alleviate coughs as an expectorant agent (Jorjani, 1976; Avicenna, 2008; Williamson *et al.*, 2009). Some studies have indicated the biological effects of this plant as antibacterial, antioxidant, anticancer, and insecticidal activity (Mammadov *et al.*, 2010; Belhaddad *et al.*, 2018). Over the last years, commercial antimicrobials have been used to control pathogenic microorganisms and other infectious diseases.

The resistance of microbial strains to antimicrobials is still a concern for all healthcare professionals, as the sooner an antibiotic is discovered, resistant strains appear against it. (WHO, 2003). Multidrug-resistant microorganisms are one of the reasons for the investigation of compounds with antimicrobial effects. Libya is one of the countries in the Middle East rich in many natural resources, including medicinal plants. Due to their distinctive geographical nature, the wild plants were used as food and other parts of medicine in the places where these plants spread (Rahman *et al.*, 2011).

Studies have varied in the anti-microbial activity of *D. maritima*, some studies indicate that the action was strong on the tested strains, while others show that it had no anti-microbial activity. In this study, screening of *D. maritima* extracts was conducted against three bacterial test strains *Staphylococcus aureus* SA-404 (*S. aureus* SA-404), *Enterococcus faecalis* EF -501 (*E. faecalis* EF -501), and *Escherichia coli* EC -506 (*E. coli* EC -506), two fungi *Candida albicans* CB -509 (*C. albicans* CB -509), and *Aspergillus niger* (*A. niger*) to determine the antimicrobial activity, and human Red Blood Cells to determine the cytotoxicity activity of extracts.

Material and methods

Plant collection and identification:

The fresh tubers and Leaves of *D. maritima* were collected in the months of February from the high areas and the

forests surrounding the farms of Tarhuna, Libya, located at 32°27'33.7"N 13°45'46.9"E. The identification of the plant was confirmed by Dr. Alsadegh Ali Zawia Lecturer of plant physiology, Biology Department, Faculty of Science, Azzaytuna University. The work was conducted in the Biology Department, Faculty of Science, Azzaytuna University, Tarhuna, Libya.

Processing and extraction of plant material

The plant materials were thoroughly washed with distilled water and dried in the oven at 35 °C for about 5 days. The dried plant parts were ground well into a fine powder in a mixer grinder and sieved to give a particle size of 50-150 mm. The powders were stored in air-sealed polythene bags at room temperature, until further analysis.

Preparation of plant Extract

Each time, 50 g of plant powder was soaked in 250 ml of water, ethanol, and benzene (Sigma-Aldrich Co) and then incubated at 25 °C for 72 h with shaking at 120 rpm. The mixtures were centrifuged at 3000 rpm for 10 minutes at 25 °C, then the supernatant evaporated to remove the solvent, which was kept in glass containers at 4 °C for further use. Solvent control was prepared under the same condition. The crude extract was prepared for antibacterial assay by dissolving 100 mg/ml in 1% dimethyl sulfoxide (DMSO) (Sigma-Aldrich Co) centrifuged at 10,000 rpm to remove the solid residues.

Tested strains and estimation of antimicrobial activity.

Tested bacteria (*S. aureus*, *E. faecalis* and *E. coli*), and fungal strains (*C. albicans* and *A. niger*) were obtained from the Bacteriology Lab, Botany and Microbiology Department, Faculty of Science, Al_Azhar University, Egypt. The glycerol stocks of microbial strains were revived by sub-cultured on Nutrient agar (NA), and potato dextrose agar (PDA), and incubated at 37 °C for 24 h and 28 °C for 5 days for bacteria and mold respectively, the strain was stored at 4 °C For future studies. The bacterial and fungal suspension was prepared in NaCl 0.85% by transferring the organism from fresh cultures (1X 10^8 CFU/ml).

Disc and wells agar diffusion assay were used to identity antibacterial and antifungal activity using NA and PDA respectively. For culture studies, the fresh 24h old cultures were prepared in the case of *S. aureus*, *E. faecalis*, *E. coli*, 48 h culture for *C. albicans*, and 7 days culture for *A. niger*. After inoculation and incubation of tested strains, the inhibition zone was determined by measuring the diameter in millimeters (mm) and using a paper disc containing solvent only as a negative control for each tested species. The experiment was repeated three times. The Steps of preparation of *D. maritima* extract and antimicrobial assay are described in Figure 1.

Figure 1. Shows steps of preparation of *D. maritima* extract and antimicrobial assay. This work was done in Lab 116, Biology Department, Faculty of Science, Azzaytuna University.

Cytotoxicity assay

In-vitro toxicity was determined by Hemolytic activity using human red blood corpuscles as previously described (Dathe, M. *et al*.,1996). The human blood samples were obtained from a healthy man from Tarhuna Educational Hospital. The blood was centrifuged at 2,500 rpm for 10 minutes. The RBCs were washed three times. 2% RBCs suspension was prepared in sterile normal saline for hemolytic study. The hemolytic activity of the crude extract was tested under in vitro conditions, for each plant extract sample, various concentrations of extracts were added to 0.85% NaCl solution and then received a 2% suspension of human erythrocytes. After 30 min incubation at 37 °C, cells were centrifuged, and the supernatant was used to measure the absorbance of the liberated hemoglobin at 540 nm. Two controls were prepared without extracts; the negative control received sterile normal saline, while the positive control received distilled water. Since the extracts used are colored extracts, the amounts of this discoloration should be subtracted from the pigment released from the erythrocyte breakdown used as a guide to the toxicity of the extract. The average value was calculated from triplicate assays. The hemolysis percentage for each sample was calculated by dividing the sample's absorbance by positive control absorbance (complete hemolysis) multiplied by 100.

$$\text{Hemolysis \%} = \frac{\text{Abs of Test extract (t)} - \text{Abs of Extract (e)}}{\text{Abs of } Erythrocytes\ in\ normal\ saline\ (n)} \text{ X } 100$$

t = Absorb of RBCs suspended in tested extract, e = Absorb of extract only, n = Absorb of RBCs suspended in normal saline. In this study, the results were interpreted as follows: 0 - 9% = non-toxic; 10 - 49% = slightly toxic; 50 - 89% = toxic; and 90 - 100% = highly toxic (Ralph *et al.*, 2009).

Data analysis:

Calculations for numerically solving the differential equation and the integral of the mathematical model were performed with the software program EXCEL 2016 (Microsoft).

Results

The aqueous extract of Root tubers of *D. maritima* showed antimicrobial activity against tested bacterial and fungal strains, while the activity was less for the Leaves extract of the same plant as shown in Table 1 and the following figure.

Table 1. Shows the antimicrobial activity of the aqueous extract of *D. maritima* on the tested strains.

		Bacterial strains			Fungal strains	
		S. aureus SA-404	*E. faecalis* EF -501	*E. coli* EC -506	*C. albicans* CB -509	*A. niger*
Root tubers	Control (-)	0	0	0	0	0
	Test	18	14	15	18	0
Leaves	Control (-)	0	0	0	0	0
	Test	0	7	0	11	0

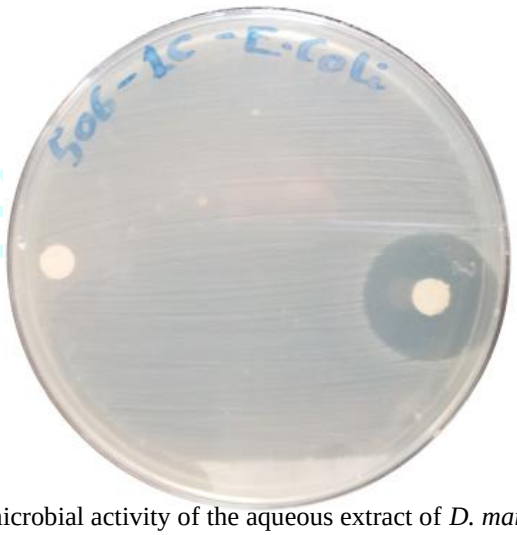

Figure 2. Shows the antimicrobial activity of the aqueous extract of *D. maritima* on the *E. coli* EC 506, on the right the test disk is saturated with the tested plant, and on the left side normal saline as control negative.

The Benzene extract of *D. maritima* tubers showed antimicrobial activity only against tested *E. coli*. In contrast, the Benzene extract of *D. maritima* leaves did not show any activity against all tested strains as shown in Table 2.

Table 2. Shows the antimicrobial activity of the benzene extract of *D. maritima* on the tested strains.

			Bacterial strains			Fungal strains	
			S. aureus SA-404	*E. faecalis* EF -501	*E. coli* EC -506	*C. albicans* CB -509	*A. niger*
Root tubers	(-)	Control	0	0	0	0	0
		Test	0	0	20	0	0
Leaves	(-)	Control	0	0	0	0	0
		Test	0	0	0	0	0

The alcoholic extract of *D. maritima* tubers and leaves showed antimicrobial activity only on *E. coli* as shown in Table 3.

Table 3. Shows the antimicrobial activity of the alcoholic extract of *D. maritima* on the tested strains.

		Bacterial strains			Fungal strains	
		S. aureus SA-404	*E. faecalis* EF -501	*E. coli* EC -506	*C. albicans* CB -509	*A. niger*
Root tubers	Control (-)	0	0	0	0	0
	Test	0	0	23	0	0
Leaves	Control (-)	0	0	0	0	0
	Test	0	0	35	0	0

Compared with the negative and the positive controls, the tubers extract of *D. maritima* had no toxic effect on human red blood cells. At the same time, the toxicity of the leaves was moderate, reaching 52% on red blood cells, as shown in the table. 4, and the following figure.

Table 4. Shows the cytotoxicity assay of *D. maritima* by hemolysis activity.

Hemolysis test	Absorption	Toxicity%	Explanation
Control negative (N=Normal saline)	0.371	0 %	Nontoxic
Control positive (H_2O=Distilled water)	0.601	161 %	High toxic
Root tubers extract in RBCs (Rt)	0.402	0.27 %	Nontoxic
Root tubers extract in N. Saline (Re)	0.401		
Leaves extract in RBCs (Lt)	0.568	52 %	Toxic
Leaves extract in N. Saline (Le)	0.375		

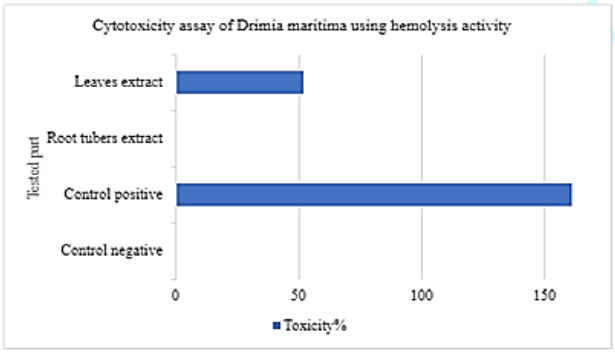

Figure 3. Shows the cytotoxicity assay of *D. maritima* by hemolysis activity.

Discussion

To date, antibiotics are still an essential therapy for several infections (Wang *et al.*, 2021). The rise in microorganisms' resistance led to the evolution of chronic diseases (Tshitshi *et al.*, 2020). Global and local estimates indicate an increasing proportion of multi-drug resistant strains in health and community systems, which may be a bad omen if appropriate measures are not taken. (Serwecińska, 2020; Ismail *et al.*, 2022). Several solutions have been proposed to address this threat and many experiments have been conducted to evaluate such solutions, including the use of metal nanoparticles, but these solutions may be fraught with mineral long-term toxicity risks (Abushiba. *et al.*, 2019; El-Sherbiny *et al.*, 2022). There are many alternative sources of natural antimicrobials derived from medicinal plants with different modes of action. Many secondary metabolites that have antimicrobial properties are derived from

some medicinal plants (Tiwari and Singh, 2004, Lewis and Ausubel, 2006).

A number of studies have documented antimicrobial activities such as antiviral, antibacterial, antifungal, and antibacterial properties of the *Drimia spp* in both in vivo and in vitro assays (Bozorgi *et al.*, 2017). Results of the study showed the aqueous extract of *D. maritima* tubers was effective on the tested bacterial strains *E. coli*, *E. faecalis*, *S. aureus* as well as fungal strain *C. albicans*, where the mean diameter of the inhibition zone was 16 mm. Whereas the aqueous extract of *D. maritima* leaves was effective only on *E. faecalis* and *C. albicans* where the average diameter of the inhibition zone was 9 mm. The study confirms the result of (Maazoun *et al.*, 2019) which used an aqueous extract and found that it had antimicrobial activity against both Gram-positive and Gram-negative bacteria. The researchers reported that the plant extract possessed a high antibacterial activity against *S. aureus* followed by *Bacillus subtilis*. However, *Klebsiella pneumoniae* was found to be less susceptible. Therefore, it can be proposed that the antibacterial activity of the aqueous extract of *Drimia maritima* tubers against the tested strains was associated with the Gram-positive and Gram-negative bacteria as well as tested strains of fungi. In fact, the activity of aqueous *D. maritima* tubers extract on the different bacterial species of Gram-negative and Gram-positive bacteria was different, this may be due to the different bacterial cell-wall structures between the different species that act as a strong barrier to permeability (Smith-Palmer *et al.*,1998). The effectiveness of *D. maritima* tuber extract against tested strains can be attributed to its phenolic and alkaloid compounds as documented by Maazoun *et al.*, 2017. Some studies reported that the antimicrobial activity is due to phenolic content (Paolillo *et al.*, 2011, Borges *et al.*, 2013, Jinukuti and Giri 2013, Karunanidhi *et al.*, 2013, Kumar and Pruthi, 2014). Some studies concluded that the site of action of these compounds may be related to their binding to some components in the cytoplasmic membrane. This results in a Permeability problem, followed by damage to membrane functions (Maazoun *et al.*, 2019). Indeed, when cytoplasmic membranes of bacteria become compromised by binding with antimicrobial agents, intracellular components tend to leak (Denyer and Stewart, 1998).

The benzene extract of *D. maritima* tubers showed antimicrobial activity on *E. coli* and *S. aureus*, while the Leaves extract using benzene only had an antimicrobial activity on *E. coli*. Ethyl extract of leaves and stems of *D. maritima* showed activity against microbial only on *E. coli*, where the average diameter of the inhibition zone was 29 mm. This agrees with the results of Maazoun et al. in 2019 that expected

D. maritima tuber extract able to interact with inner membrane components such as lipids, which led to increased membrane permeabilization, which led to an increased release of cytoplasmic β-galactosidase in *E. coli* suspension time-dependently. This variation in the antimicrobial action is due to the method of extraction as well as the variation in the concentration of the active compounds in the plant parts. In this study, we believe that the antimicrobial compounds are more concentrated in the tubers than in the leaves. Pandey and Gupta (2014) extracted the metabolites of *Urginea indica* from the leaves, stems, and roots using non-polar (chloroform), polar (aqueous, methanol), and dipolar (acetone) solvents. The *Urginea indica* extracts were tested for antimicrobial activity against gram-positive bacteria *S. aureus*, *Staphylococcus epidermidis*, *Bacillus cereus*, *Bacillus subtilis*, and gram-negative bacteria *E. coli*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Klebsiella Pneumoniae*, and against two fungi, *A. niger*, and *Candida albicans*. They reported that root methanol extracts exhibited the highest activity against *B. cereus*, while acetone extracts inhibited *Pseudomonas aeruginosa*. Fungi *A. niger* and *Candida albicans* were inhibited by root acetone extract. Furthermore, the phytochemical analysis showed major compounds such as flavonoids, alkaloids, glycosides, tannins, quinones, saponins, phytosterols, and resins.

The results of this study showed that the tubers extract of *D. maritima* had no significant toxicity when using in-vitro toxicity by Hemolytic activity using a human red blood corpuscle, while the leaves of this plant had moderate toxicity. Zhang *et al.*, (2022) reported that tuber extracts of *D. maritima* showed lower flavonoid content compared to Leaves extract. Also, aqueous and methanol were found to be relatively better solvents for extracting total phenolics and flavonoids, respectively, from the Leaves of *D. maritima*. The research in traditional and current medicines indicated that *D. maritima* is regarded as a toxic plant, therefore, its use should be done cautiously (Mahboubi *et al.*, 2019).

Conclusion

In this study, three extracts of *D. maritima* were tested for their antimicrobial and cytotoxicity activities. The antibacterial activity of *D. maritima* against the tested strains were varies, and the activity on gram-negative bacteria was more than on gram-positive. In this study, three extracts of *D. maritima* were tested for their antimicrobial and cytotoxicity activities. The antibacterial activity of *D. maritima* against the tested strains were varies, and the activity on gram-negative bacteria was more than on gram-positive. The results of the study showed an antifungal activity on the *C. albicans*, but it did not have any effect

against *A. niger*. The results showed variation in antimicrobial action on the tested strains, as well as the size of the inhibition zone. This difference is due to the difference between the tested microorganisms among them. Also, difference is also due to the quantity and quality of the compounds extracted by the different methods that were used in this study. The cytotoxicity study of the plant showed the toxic compounds were concentrated in the leaves and the tubers were less toxic action according to the method used. Altogether, the results support the medicinal effects of *D. maritima* and its potential use as a biological source against some pathogenic microorganisms. We expect it to be used against many cutaneous and subcutaneous infections due to it having antimicrobial compounds, especially the smallpox parts of the plant due to its weak toxicity to host cells. We recommend conducting more tests on experimental animals, to avoid many drug interactions, also recommend conducting synergistic activities with other antimicrobials to reduce plant toxicity.

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