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Original article

The Assessment of The Antifungal Effects of *Chamomile* and *Lavender* Extracts on *Candida Albicans*

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Abstract
Herbal formulations are widely used for therapeutic purposes and to improve the clinical manifestations of vaginal and urinary tract infections by both patients and healthcare practitioners. These formulations are renowned for their anti-inflammatory, antimicrobial, and wound-healing activities. The objective of this study was to evaluate the antimicrobial activity of medicinal plant extracts utilized in traditional medicine. This paper presents a comparative study of the antimicrobial properties and effectiveness of different extracts by testing which formulation yields the highest efficacy. In this work, the antifungal activity of extracts of two medicinal plants, lavender and chamomile, was examined. Alcoholic and aqueous extracts of lavender and chamomile were prepared at selected concentrations and then tested against Candida albicans. Samples from vaginal and urinary tract infections were obtained from a laboratory. Filter paper discs impregnated with the respective plant extracts (aqueous, ethanol, and methanol extracts) were applied to cultures of Candida albicans, and the inhibition zones were measured. In the highest concentration, the methanol extract of lavender produced an inhibition zone with a diameter of 32 mm. In comparison, chamomile at its highest concentration showed an inhibition zone of 7 mm. This study confirmed that both lavender and chamomile exert an inhibitory effect on Candida albicans, particularly in cases of vaginal infections as well as urinary tract infections.
Keywords: Lavender, Chamomile, Candida Fungus, Vaginal Infections.

Introduction

In recent times, chemical synthesis has largely replaced natural sources for drug production through the manufacturing of various pharmaceutical compounds. However, in many cases, the side effects arising from these synthetic drugs are more debilitating than the disease itself. Consequently, many have returned to traditional medicinal plants, which are considered safer and more benign [1,2]. Medicinal and aromatic plants are widely used in the production of pharmaceutical drugs to treat numerous diseases. They have been used as stimulants, antiseptics, tonics, analgesics, topical ointments, and for various other applications [3]. In addition, these plants are known for their significant inhibitory effects against certain fungal species, as they mimic the mechanism of antibiotics by disrupting or halting certain metabolic pathways in pathogenic fungi [4]. Among these plants, chamomile and lavender are the focus of the present study. Chamomile is an herb [5,6] known scientifically as Matricaria chamomilla, which is the wild type belonging to the Asteraceae (Compositae) family. There is also another species, commonly referred to as Anthemis nobilis (Chamomile nobilis), which differs in appearance from the first species; both, however, contain active compounds [7].

The most utilized medicinal part of the plant is the flower heads. These contain various bioactive compounds extracted from the dried flowers, including essential oils that make up approximately 1.5% of the dried flowers [8,9]. The essential oil of chamomile is rich in alpha-bisabolol, bisabolol oxide B, beta-trans-licranene, and chamazulene (a compound responsible for the blue color of the oil), as well as spathulenol. The flowers also contain flavonoid compounds such as flavone glycosides, apigenin aglycones, luteolin, quercetin, isorhamnetin, and rutin [10]. In addition, the flowers include hydroxycoumarin, ambelliferon, herniarin, and about 10% mucilaginous materials. The most active ingredient is 1% of the blue essential oil component chamazulene, along with azulene, which contributes to chamomile's healing properties. Its chemical affinity often allows it to integrate rapidly with other substances to produce beneficial compounds [11,12].

Lavender (Lavandula officinalis) is distinguished by its strong aromatic fragrance emitted by its flowers and leaves [11,12]. In lavender, the major component is its essential oil, which is found in the flowers and leaves at a concentration of about 3%. The key constituents include linalool, linalyl acetate, lavandulyl acetate, ocimene, and various hydroxycoumarins such as herniarin and umbelliferone, as well as tannins, caffeic acid, and rosmarinic acid. In addition, lavender contains sesquiterpenes, triterpenes, and polar compounds such as polyphenols and coumarins [13]. High-performance liquid chromatography (HPLC) analysis has confirmed the presence of rosmarinic acid (2.52–10.82 µg/mg), ferulic acid, caffeic acid (1.70–3.10 µg/mg), morin (1.02–13.63 µg/mg), coumarin (1.01–5.97 µg/mg), and herniarin (1.05–8.02 µg/mg) [7,14].

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The plant extracts were tested on Candida albicans, a yeast among the most common fungal pathogens. There are approximately 20 different species of Candida; the most prevalent in humans is Candida albicans. It normally exists in the upper respiratory tract, mouth, intestines, and vagina. When the fungal population increases beyond normal limits, an opportunistic fungal infection develops. This is due to the virulence factors of Candida albicans, whose ability to cause disease depends on the host's immune status. Its pathogenicity increases in individuals with compromised immune systems, such as those with acquired immunodeficiency syndrome (AIDS), malignant tumors, diabetes mellitus, pregnancy, or those using antibiotics or immunosuppressive drugs. Candida albicans can produce either systemic infections, leading to conditions such as sepsis and multi-organ involvement, or localized infections that are either superficial (e.g., cutaneous, oral, or vaginal candidiasis) or deep-seated (e.g., endocarditis, meningitis, or renal candidiasis) [1,15,16].

Vaginal candidiasis is one of the primary infections affecting women; it accounts for 56.4% of all vaginal infections [2]. One major disorder affecting vaginal health is vulvovaginal candidiasis (VVC). When recurrent, it is known as Recurrent Vulvovaginal Candidiasis (RVVC) [17]. The causative agents include Candida albicans, followed by other species such as Candida glabrata [17]. These species, especially C. albicans, are key pathogens that naturally colonize the vaginal area in women. Vaginal candidiasis occurs when there is a disturbance in the delicate balance of the vaginal flora [18,19]. In addition, the incidence of urinary tract infections in women is 48.8%, and many women with recurrent urinary tract infections (RUTI) and/or vaginal infections resort to alternative therapies to reduce the use of antibiotics and antifungals, thereby avoiding their harmful side effects. Repeated use of antibiotics may cause side effects such as diarrhea, skin rashes, secondary candidiasis, and can be associated with depression, anxiety, and even psychosis. Currently, the most commonly employed antifungal agent for treating Candida infections is fluconazole, whose resistance rate has been increasing [20]. This has contributed to growing interest in alternative and herbal treatments [21].

Chamomile flowers and their essential oils are known for their anti-inflammatory properties, antibacterial effects, and their ability to inhibit microbial growth. Chamomile is used in treating inflammation of the mucosal membranes in the mouth, pharynx, and respiratory passages, as well as for treating cough, fever, colds, wounds, and burns. Chamomile is applied topically as a gargle for gingivitis, as an infusion for inflammatory respiratory diseases, and as a wash or bath for genital, skin, and mucosal inflammations; it is also used in the treatment of bacterial skin infections and inflammatory gynecological disorders [22-24]. Moreover, chamomile extracts have demonstrated clear efficacy in inhibiting the growth of cancer cells [25]. It is important to avoid using chamomile with anticoagulants (as it decreases their effectiveness) and during pregnancy (because it may induce abortion). Caution is advised for patients with known allergies to essential oil components or a history of skin irritation [26].

Lavender, in addition to its antimicrobial and anti-inflammatory properties, also exhibits lipid-lowering and anticancer effects. It is used to treat poor appetite, digestive disorders, nervous conditions, insomnia, and circulatory problems. Lavender essential oil is popularly used for alleviating nervous tension and sleep disorders [27-29]. It is also used to treat bronchitis, rheumatism, migraines, and menstrual irregularities. Topically, it is applied as an herbal bath to alleviate stress and promote relaxation, and it is utilized for treating non-healing wounds, anal eczema, preventing colds, and stimulating blood circulation [30]. However, side effects may occur with the use of essential oil formulations, such as gastrointestinal disturbances and skin irritation; more than two drops should not be taken, as high doses may depress the central nervous system, cause constipation, respiratory depression, headache, and vomiting. Furthermore, it should not be administered concomitantly with alcohol, sedatives, or analgesics [31]. Both lavender and chamomile are also used in non-medicinal fields; they are ingredients in perfumes, cosmetics (ointments, soaps, shampoos, deodorants), and in the food industry. For example, the aqueous and ethanolic extracts of lavender are used as preservatives, particularly for meats, against bacteria and fungi, including Candida albicans [32,7].

Methods

Extraction procedure

The extraction was carried out by the cold maceration method. A weight of 150 g of lavender and 150 g of chamomile was separately placed in a 1000 ml beaker. Each plant was divided into four portions, and 700 ml of ethanol was added to each sample for both chamomile and lavender. Similarly, 700 mL of methanol was added to both the chamomile and lavender samples. The beakers were then covered (to prevent evaporation of volatile compounds) and left for three days. Table 1 details the solvents along with their boiling and melting points.

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Table 1. Solvents with their Melting and Boiling Points

Solvent	Melting Point (M.P.)	Boiling Point (B.P.)
Ethanol	114.3 °C	78.4 °C
Methanol	98 °C	65 °C

After maceration, the extracts were filtered using a Hirsch funnel with filter paper. The filtrate was collected in a 250 ml beaker for each solvent (ethanol and methanol) for both chamomile and lavender extracts. The filtrates were then covered with perforated lids (to allow evaporation) and labeled with the appropriate data. After three days, the samples were placed in an oven at 40–45 °C for three hours daily for one week, until the alcohol evaporated and a sticky, crude extract was obtained for both methanol and ethanol extracts of chamomile and lavender. Two concentrations were prepared for both lavender and chamomile extracts, dissolved in ethanol and methanol. The concentrations were prepared as follows: 0.03 g/ml (30 mg/ml) of the extract was weighed using a sensitive balance and dissolved in 1 ml of DMSO (99.9% purity) to obtain a concentration of 0.03 g/ml. A second concentration of 0.05 g/ml (50 mg/ml) was prepared similarly as mentioned in Table 2. The extracts were then stored in specially capped tubes and labeled appropriately.

Table 2. Solvents and Concentrations Used

Solvent	Concentrations
Ethanol	50 mg/ml, 30 mg/ml
Methanol	50 mg/ml, 30 mg/ml

In addition, an aqueous extract of chamomile and lavender was prepared. For this purpose, 100 g of chamomile and 100 g of lavender were separately ground using a mortar and pestle. Then, 200 ml of distilled water was added to completely submerge the plant material in a beaker. The beaker was tightly closed, stirred, and left for one full day. On the following day, the mixture was filtered using a Hirsch funnel and collected in a conical flask. An appropriate volume of the aqueous extract was then distributed into several special tubes, after which the tubes were centrifuged at 350 rpm for 10 minutes. Subsequently, 1 ml of the supernatant was withdrawn using an electronic pipette and transferred to a capped tube, labeled, and stored in a refrigerator until further use.

Microbiological testing

Two strains of Candida albicans were obtained from the National Cancer Institute's laboratory. These strains were isolated, cultured on blood agar, and incubated at 37 °C for 24 hours. Sterile filter paper discs were then prepared by punching out appropriately sized pieces. These discs were soaked in the prepared extract concentrations and left overnight in the incubator to ensure adequate absorption of the extract. After 24 hours, the cultured Candida isolates (obtained from vaginal and urine samples using cotton swabs) were removed from the incubator. A 1 ml sample of 0.9% normal saline was added to each collected swab sample and mixed well. The entire blood agar plate was swabbed uniformly, and then the extract-soaked filter paper discs were placed on the agar surface using sterile forceps. The plates were incubated at 37 °C for 24 hours. On the following day, the inhibition zones (clear areas around the discs) were measured.

Results

In Table 3, the inhibition zones on vaginal C. albicans are depicted as follows: For lavender methanolic extract: 0 mm at the lower concentration and 32 mm at the higher concentration. For lavender ethanolic extract: 27 mm at the lower concentration and 20 mm at the higher concentration. For chamomile methanolic extract: 0 mm at the lower concentration and 7 mm at the higher concentration. For chamomile ethanolic extract: 8 mm at the lower concentration and 10 mm at the higher concentration. The aqueous extract (combined chamomile and lavender) produced a 24 mm inhibition zone.

Thus, the highest concentration of the lavender methanol extract produced the largest inhibition zone (32 mm) compared with chamomile, which had a maximum zone of 7 mm. In addition, the lavender ethanol extract at the lower concentration (27 mm) exhibited more potent activity than the chamomile ethanol extract (8 mm). The aqueous extract of the two plants resulted in an inhibition zone of 24 mm, which is favorable compared to previous studies on Candida albicans.

Table 3. Inhibition Zone Diameters (mm) at Different Concentrations for Candida albicans Isolated from Vaginal Infections

Concentration (mg/ml)	Lavender Methanol	Lavender Ethanol	Chamomile Methanol	Chamomile Ethanol	Aqueous (Chamomile–Lavender)
300	–	27 mm	–	8 mm	–
500	32 mm	20 mm	7 mm	10 mm	–
100	–	–	–	–	24 mm

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Earlier research indicated that the chamomile ethanolic extract produced an inhibition zone of 15.7 mm – the lowest result compared to our study, where the chamomile extract showed 8 mm at the lower concentration and 7.5 mm at the higher concentration. Similarly, the lavender ethanolic extract in a previous study recorded an inhibition zone of 23.5 mm, while our measurements showed 7.5 mm at the lower concentration and 10.5 mm at the higher concentration. Figure 1 provides photographic illustrations of the inhibition zones measured for vaginal isolates.

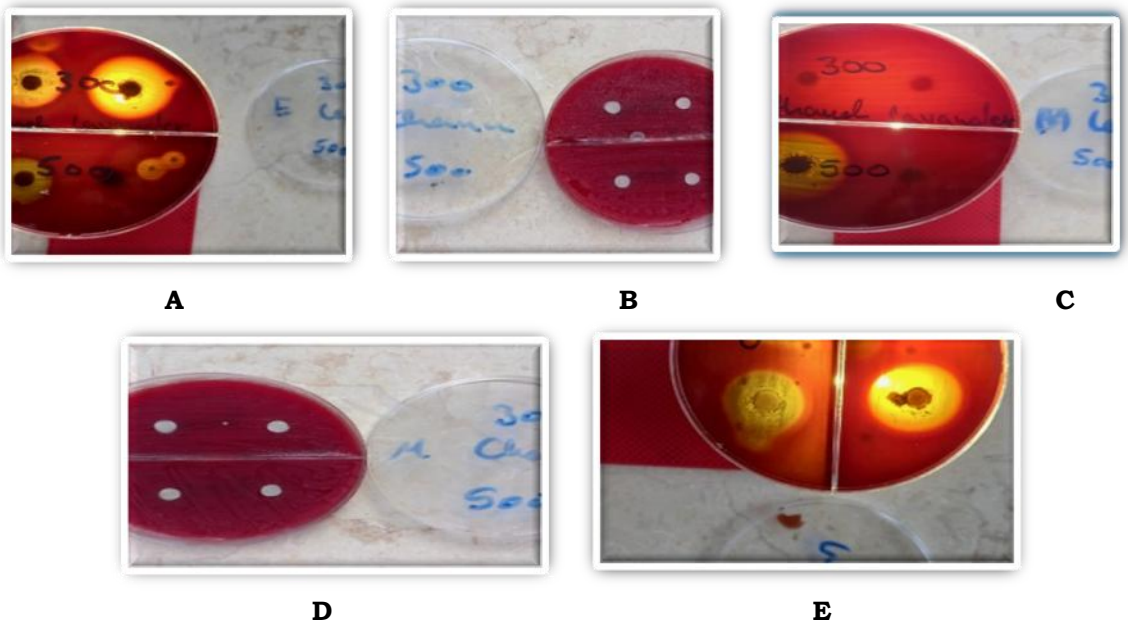

Figure 1. Photographic Representations of Inhibition Zone Measurements on Vaginal Candida albicans: (A) Inhibition zone of lavender ethanolic extract at two concentrations. (B) Inhibition zone of lavender methanolic extract at two concentrations. (C)Inhibition zone of chamomile ethanolic extract at two concentrations. (D)Inhibition zone of chamomile methanolic extract at two concentrations. (E)Inhibition zone of the aqueous extract (combined chamomile and lavender).

In the urinary tract isolates, the highest concentration of the lavender methanol extract exhibited an inhibition zone of 17 mm, while the lower concentration (20 mm) showed greater efficacy than the higher concentration. The chamomile methanol extract demonstrated an inhibition zone of 12 mm at the higher concentration and 7 mm at the lower concentration, which is less effective compared to lavender. For the lavender ethanolic extract, the higher concentration resulted in a 7.5 mm zone, while the lower concentration yielded 10.5 mm, indicating that for this solvent, the lower concentration was more effective. Similarly, the chamomile ethanolic extract at the higher concentration showed 7.5 mm, while at the lower concentration, it produced 8 mm, suggesting that lower concentrations are more effective in this case. The aqueous extract produced an inhibition zone of 10.5 mm, as mentioned in Table 4.

Table 4. Inhibition Zone Diameters (mm) for Candida albicans Isolated from Urinary Tract Infections

Concentration (mg/ml)	Lavender Methanol	Lavender Ethanol	Chamomile Methanol	Chamomile Ethanol	Aqueous (Chamomile–Lavender)
30	20 mm	10.5 mm	7 mm	8 mm	–
50	17 mm	7.5 mm	–	–	–
100	–	–	–	–	10.5 mm

Overall, the results demonstrated that the plant extracts (both aqueous and alcoholic) of chamomile and lavender have a greater inhibitory effect on C. albicans isolated from vaginal infections compared to those isolated from urinary tract infections, as illustrated in Figure 1. Lavender consistently exhibited superior antifungal activity relative to chamomile, with the highest inhibition zone for lavender (32 mm at 50 mg/ml) being the largest recorded in this study. Moreover, the aqueous extract (a combination of chamomile and lavender) yielded an inhibition zone of 24 mm on vaginal isolates and 10.5 mm on urinary isolates. Figure 2 provides additional photographic documentation of the inhibition zones for the urinary isolates.

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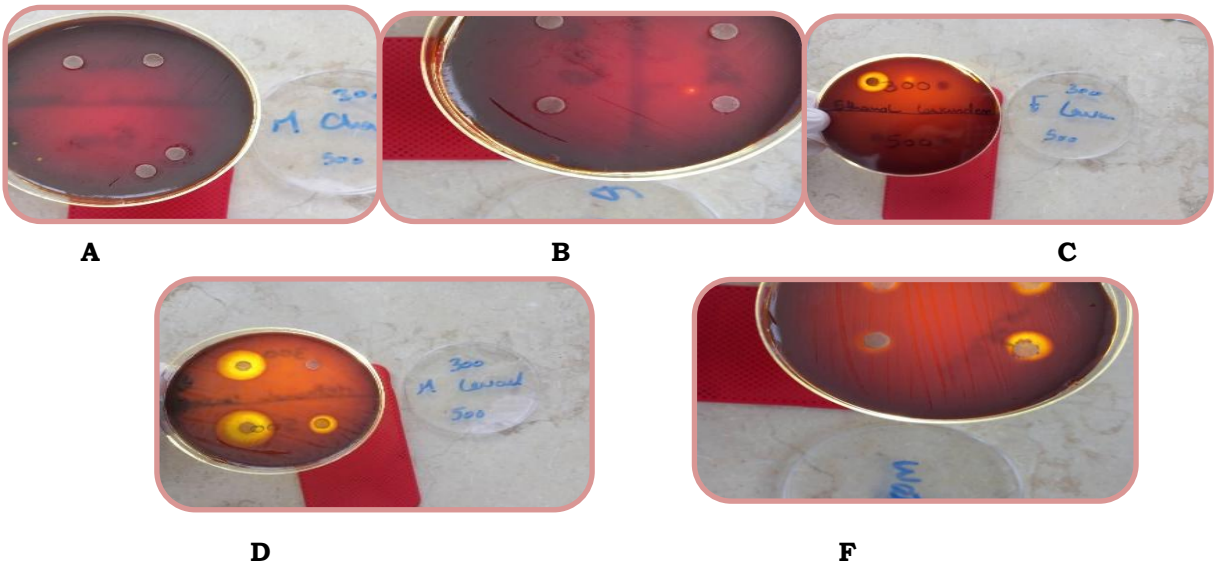

Figure 2. Photographic Representations of Inhibition Zones on Urinary Candida albicans: (A) Inhibition zone of chamomile ethanolic extract at two concentrations. (B) Inhibition zone of chamomile methanolic extract at two concentrations. (C) Inhibition zone of lavender ethanolic extract at two concentrations. (D) Inhibition zone of lavender methanolic extract at two concentrations. (E) Inhibition zone of the aqueous extract (combined chamomile and lavender).

Discussion

The study evaluated the effects of ethanolic, methanolic, and aqueous extracts of lavender (Lavandula) and chamomile (Chamomilla) against Candida albicans. Previous studies have shown that the main active compounds in lavender—linalool and linalyl acetate—account for 32.75% and 43.13% of the essential oil, respectively. Lavender oil showed antifungal activity against C. albicans at concentrations ranging between 0.125% and 2%, with fungicidal activity observed at concentrations between 0.5% and 4%. Among the two compounds, linalool proved to be the most effective against vaginal isolates, while linalyl acetate exhibited comparatively lower efficacy [33].

Candida albicans is an opportunistic pathogen responsible for approximately 60% of superficial and systemic fungal infections. Its ability to transition between yeast and hyphal forms plays a crucial role in adherence, morphological transformation, and invasiveness. This dimorphism aids in the secretion of proteases, lipases, and other enzymes that facilitate tissue invasion, and the filamentous form shows increased resistance to phagocytosis by immune cells [33]. A study conducted in 2005 revealed that lavender oil possesses both fungistatic and fungicidal activities against various C. albicans strains. Moreover, lavender oil was found to inhibit hyphae formation at concentrations lower than those required to suppress yeast growth [33]. The discovery that lavender exhibits potent antifungal properties is particularly significant given that many patients suffering from fungal infections have severely compromised immune systems [33]. By inhibiting hyphal formation and reducing filamentous extension, lavender oil can effectively impair the dimorphic switch of C. albicans, thereby limiting fungal development and the spread of infection [33]. A 2015 study demonstrated the efficacy of lavender and its major active compounds against C. albicans in comparison with clotrimazole [35]. Similarly, a 2010 study confirmed the antifungal effectiveness of chamomile and highlighted its therapeutic benefits; it was concluded that appropriate, well-regulated usage of chamomile formulations is safe and beneficial, whereas indiscriminate or improper use may be harmful [36]. In 2021, researchers at the University of Misurata (Department of Chemistry) evaluated the antimicrobial effectiveness of the active compounds in chamomile [37]. Another study (2009, by Reda Ibrahim, Hussein Inayah, et al.) investigated the active chemical constituents of chamomile in both aqueous and alcoholic extracts, assessing their inhibitory effects on microorganisms—especially C. albicans. At a concentration of 50 mg/ml, both the alcoholic and aqueous extracts exhibited inhibition zones ranging between 8 and 16 mm.

In our study, the chamomile methanol extract produced a 7 mm inhibition zone for vaginal isolates and 10 mm for the ethanolic extract, while for urinary isolates, the methanol extract produced 12 mm (high concentration) and 7 mm (low concentration), with the ethanolic extract yielding 7.5 mm at high concentration and 8 mm at low concentration [38]. A 2017 study further investigated the active compounds in lavender and their medicinal efficacy when using its aqueous extract [30]. Likewise, another study conducted in 2017 underscored the psychological and medical importance of lavender, confirming its value as a natural antifungal and antibacterial agent [30]. The current results are in accord with these previous studies, and no evidence was found contrary to the antifungal activities of chamomile and lavender extracts. A previous study (2015) also demonstrated a significant synergistic effect of the aqueous extracts of

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chamomile and lavender against C. albicans. Moreover, the aqueous and ethanolic extracts of lavender from other plant sources have demonstrated even greater efficacy [34].

Conclusion

The extracts of lavender and chamomile yielded better antifungal results, with a greater inhibitory effect observed on Candida albicans isolated from vaginal infections compared to those isolated from urinary tract infections. Specifically, the high concentration methanol extract of lavender demonstrated the best antifungal activity, whereas the lower concentration of lavender ethanolic extract was more effective than its high concentration. In contrast, for chamomile, the high concentrations yielded better results than the lower concentrations. In summary, the lavender extract exhibited a greater inhibitory activity than chamomile on vaginal isolates of C. albicans, whereas its efficacy was lower on urinary isolates. Additionally, the aqueous extract showed superior results on vaginal isolates compared to those from the urinary tract.

Conflict of interest

The authors declared no conflict of interest

References

1. Lamloum HAR, Al-Kamshi MA, Al-Kayekh RM. Isolation of Candida albicans from patients attending Al-Jalaa Hospital, Tripoli (Obstetrics Department) and the evaluation of the effects of certain plant extracts on inhibiting fungal growth. J Coll Educ. 2019;:254-75.
2. Hasan H, Jadallah S, Akrim Z, Ali F, Saber M. The Anti-Cancer, Anti-Inflammatory, Antibacterial, Antifungal, Anti-Oxidant and Phytochemical Investigation of Flowers and Stems of Anacyclus Clavatus Plant Extracts. AlQalam Journal of Medical and Applied Sciences. 2025 Mar 9:415-27.
3. Gurib-Fakim A. Medicinal plants: traditions of yesterday and drugs of tomorrow. Mol Med. 2006;27:1-93.
4. Ratkevicha L, Nikolajeva V, Banarikina A, Babarykin D, Kumina G. Influence of plant extracts on the growth of oral pathogens Streptococcus mutans and Candida albicans in vitro. Proc Est Acad Sci. 2014;:62-7.
5. Mahmoud ST. Herbs and medicinal plants in the tradition. J Arab Sci Herit. 2011;:273-7.
6. Sarbol DAAM, Othman DMA. The production, harvesting, and medicinal benefits of German chamomile. National Research Center; 2006.
7. Aksad. Atlas of medicinal and aromatic plants in the Arab world. Arab Center for Dryland Studies and Arid Lands; 2023.
8. Mohammed DSI, Al-Asaf STJ, Al-Naimi PDAKSH. The effect of thermal treatments on the activity of chamomile extract against certain pathogenic fungi. J Basic Educ Res. 2012;:738-43.
9. Aziz, D. R. A. (2022). Determination of the Main Components of the Essential Oil Extracted from Matricaria chamomilla L. Using GC-MS Technology. Journal of Al-Baath University, 31–44.
10. Slimane-Ait Kaki SA, Oulebsir-Mohandkaci H, Boudieb ABK. Photochemical characterization and antimicrobial potentialities of two medicinal plants, Chamaemelum nobile (L.) All and Matricaria chamomilla (L.). Int J Innov Approaches Sci Res. 2018;:126-39.
11. Haig TJ, Seal AN, Pratley JE, An M, Wu H. Lavender as a source of novel plant compounds for the development of a natural herbicide. J Chem Ecol. 2009;35(9):1129-36. doi:10.1007/s10886-009-9689-2
12. Al-Mushar IM, Al-Shahri AAAA. Saudi lavender initiatives: towards the development of human, spatial, and rural environments. Sci J Damietta Fac Sci. 2023;:30-8.
13. Lrhorfi LA, Berrani A, El Haoud H, Zaher A, Bouhaddioui B, Benguedour R, Boufellous M. Phytochemical screening of the medicinal plant: Lavandula stoechas (Lamiaceae). J Pharmacogn Phytochem. 2017;:56-62.
14. Abu Ghra M, Al-Abrus IAN. Chemical analysis of the essential oil of Lavandula officinalis L. grown in Nabek, Syria, and its effect on Xanthomonas translucens. J Univ Damascus Agric Sci. 2019;:137-58.
15. Wilson D, Hube B, Mayer FL. Candida albicans pathogenicity mechanisms. Landes Biosci. 2013;:119-28.
16. Al-Saadi LH, Jassem NO, Habib R. Isolation and identification of some Candida spp. and their sensitivity to various antifungal agents. J Babylon Univ Pure Appl Sci. 2015;23(3):955-64.
17. Al-Fituri NAWA. Study on the resistance of Candida isolated from pregnant women using various plant extracts on fungal isolates. Faculty of Science, Al-Zaawiya University; 2024. 119 p.
18. Diekema DJ, Gibbs DL, Newell VA, Ellis D, Tullio V, Rodloff A, Pfaller MA. Results from the ARTEMIS DISK Global Antifungal Surveillance Study, 1997 to 2007: a 10.5-year analysis of Candida species susceptibilities to fluconazole and voriconazole as determined by CLSI standardized disk diffusion. J Clin Microbiol. 2010;48(4):1366-77. doi:10.1128/JCM.02117-09
19. van Wietmarschen HA, van der Werf ET, Witteman L. Complementary medicine and self-care strategies in women with (recurrent) urinary tract and vaginal infections: a cross-sectional study on use and perceived effectiveness in the Netherlands. Antibiotics (Basel). 2021;10(3):250. doi:10.3390/antibiotics10030250
20. Saki K, Golshahi H, Rafieian-Kopaei M, Abdali N, Adineh A, Namdari F, Bahmani M. Ethnobotanical and therapeutic uses of chamomile. J Chem Pharm Res. 2015;7(5):640-5.
21. Taghipoor S, Shahinfard N, Kheiri S, Heydari Z, Moghim SRH. Antifungal effects of Allium ascalonicum, Matricaria chamomilla, and Stachys lavandulifolia extracts on Candida albicans. J HerbMed Pharmacol. 2014;3(1):9-14.

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22. Dai YL, Li Y, Wang Q, Niu FJ, Li KW, Wang YY, Wang J, Zhou CZ, Gao LN. Chamomile: A Review of Its Traditional Uses, Chemical Constituents, Pharmacological Activities and Quality Control Studies. Molecules. 2022 Dec 23;28(1):133. doi: 10.3390/molecules28010133.
23. Khorasani NT, Darban RA, Rehimi HR, Moghaddam MS. The effect of chamomile extract on coronavirus. Rev Clin Med. 2021;:92-5.
24. Radan M, Faghihi G. Side effects of herbal drugs used in dermatologic disorders. J Cosmet Dermatol Sci Appl. 2011;1:1-3.
25. Pasha H, Sefidgar SAA, Moghadamnia A, Behmanesh ZBF. A comparative study of the antifungal activity of lavender brew, lavender essential oil, and clotrimazole: an in vitro study. J Reprod Med. 2015;:26-30.
26. Kazeminia M, Rajati F, Ghavami T. The effect of lavender on stress in individuals: a systematic review and meta-analysis. Complement Ther Med. 2022;68:102832. doi:10.1016/j.ctim.2022.102832
27. Lis-Balchin M. Lavender: the genus Lavandula. Taylor & Francis; 2002.
28. Hitter T, Szekely-Varga MC, Zsolt. The healing power and uses in landscape design of lavender (Lavandula angustifolia L.). Herb Med Plants. 2017;21:47-55.
29. Zeraati H, Masroornia M, Vafayi S, Hashemi F, Shahinfar J. Comparison of the effects of lavender and diazepam on the anxiety levels of patients before orthopedic surgery. Med Surg Nurs J. 2016;:1-5.
30. Al-Halwani Z, Nizam PDA, Younis PDAA. Evaluation of the biological activity of various extracts from wild Syrian lavender on some pathogenic agents isolated from local red meats. J Univ Damascus Basic Sci. 2021;:143-55.
31. Tecca M, Strippoli V, Salvatore G, Battinelli L, D'Auria FD. Medical mycology. Taylor & Francis; 2005.
32. Ratkevicha L, Nikolajeva V, Banarikina A, Babarkina D, Krumina G. Proceedings of the Estonian Academy of Sciences. Biology. 2015.
33. Shankar E, Gupta S, Srivastava JK. Chamomile: a herbal medicine of the past with a bright future (review). Mol Med Rep. 2010;3(6):896-901. doi:10.3892/mmr.2010.377
34. Al-Shuraimi F, Ambeirika SM, Al-Qadi RM, Ismail A, Atiya RRAM. Qualitative analysis of the active compounds in aqueous and alcoholic extracts of chamomile. J Acad Res Appl Sci. 2021;19:95-9.
35. Inayah H, Al-Saadi S, Fadel SASMN, Al-Bayati HDRI. A study on some components of chamomile flower and the effect of its extracts on the growth of microorganisms. J Coll Educ. 2009;3:1180-9.
36. Naseef PP, Kuruniyan MS, Jain GK, Zakir F, Aggarwal G. A comprehensive study of the therapeutic applications of chamomile. Pharmaceuticals (Basel). 2022;15(10):1284. doi:10.3390/ph15101284
37. Gow NA, Berman J, Sudbery PE. The distinct morphogenic states of Candida albicans. Trends Microbiol. 2004;12(7):318-24. doi:10.1016/j.tim.2004.05.008
38. Gupta S, Srivastava JK. Chamomile and marigold tea: chemical characterization and evaluation of anticancer activity. J Agric Food Chem. 2007;55(23):9470-8. doi:10.1021/jf071961k

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