WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Antimicrobial activity of Unani medicinal plants: A Comprehensive review

Shalina Shaikh[1], Shaikh Imran[2], Jamal Akhtar[3], Ghazala Javed[4], Nirmala Devi[5], N. Zaheer Ahmed[6]

[1,2] Research Associate (Unani), Clinical Research Unit (U), Goa 403006, India
[3]Research Officer (Unani), CCRUM, New Delhi 110058, India
[4]Assistant Director (Unani), CCRUM, New Delhi 110058, India
[5]Assistant Director, RRIUM, Mumbai 410210, India
[6]Director General CCRUM, New Delhi 110058, India
Corresponding Author
Shalina Shaikh, RA (Unani), CRU, Goa, 403006, Under CCRUM, New Delhi, India
E-mail- drshalinasheikh768@gmail.com & Contact no.- 9019511248

ABSTRACT :

For thousands of years, people have used plants to preserve and enhance food, treat illnesses, and fight of infections, including epidemics. To treat diseases caused by microbial infections and stop the spread of infectious diseases, medicinal plants have proven essential. In addition, medicinal plants provide an extensive range of potentially beneficial compounds for the generation of new chemotherapeutic medications, which have significantly enhanced human health and well-being. Products made from plants can control microbial growth under various circumstances. The chemical components of these plant antimicrobial compounds and the mechanisms underlying the suppression of microbial growth in specific infection control cases have been the subject of numerous studies. either alone or in conjunction with conventional antibiotics. According to WHO (1993), plant extracts or their active ingredients are used in 80% of traditional therapies worldwide. In developing nations, traditional medicinal plants continue to be essential for meeting basic health needs. Drug resistance to human pathogenic bacteria has been widely reported worldwide in recent years. Because antibiotics are used so frequently, microorganisms have developed resistance. Aside from this issue, antibiotics can also have negative effects on the host, such as immunosuppression, allergic reactions, hypersensitivity, and the loss of helpful gut and mucosal bacteria. In the treatment of infectious diseases, this has led to significant clinical issues. As a result, alternative antimicrobial medications are required to treat infectious diseases; screening herbal medicinal plants for potential antimicrobial qualities is one method. All those who are concerned should be made aware of such works. A brief description of some of these varieties of plants will be provided in the current paper. Numerous herbs are mentioned in the Unani medical system as ways to improve mental and physical health. These drugs are used as diuretics, emmenagogues, aphrodisiacs, stone bladders, memory enhancers, for treating palpitations, appetite loss, and for treating scorpion bites, among other uses. They are also said to have antimicrobial properties, such as antibacterial, antiviral, antifungal, and antiparasitic properties, as well as analgesic, anti-inflammatory, and antihistaminic properties.

Keywords: Herbs, Antibiotics, *Muhallil, Ufunat*, and Unani medicine

Introduction

A significant portion of modern drugs originates from plants. Some of these medicines have well-known products like aspirin, that have a precursor, salicin, that was first made from willow (Salix spp.) bark and leaves. The first commercial source from which salicin was derived was subsequently utilized to name aspirin. Since ancient times, medicinal plants have been recognized as a rich source of therapeutic agents for the prevention of diseases and ailments, and they are highly respected globally. India has been referred to as the world's medicinal garden. Ancient civilizations such as China, India, South America, and Egypt, among others, continue to use a variety of plant remedies to treat a range of ailments. India holds a special place in the world in that it uses several well-known indigenous medical systems, including Ayurveda, Siddha, Unani, Homeopathy, Yoga, and Naturopathy, to treat its citizens[2]. Herbal medications tend to be popular among both the Indian rural and urban populations of peoples. Plants and their extracts have been used for medicinal purposes for as long as human society has existed. In many cultures surrounding the world, natural products—such as those derived from plants, animals, or minerals—have long served as the foundation for the treatment of human ailments. Around the world, medicinal plants are widely used in a variety of traditional medical systems, such as Chinese, traditional, Unani, homeopathy, and Aboriginal medical systems[3]. The Unani medicine recognizes that environmental variables and ecological conditions have an impact on people's health. In addition to treating medical conditions, Unani medicine places a strong focus on preventing illness and enhancing current health by adhering to the six essential factors (*Asbab-e-Sitta Zarooriyah*) of life. It places a strong focus on maintaining an appropriate ecological equilibrium and ensuring that food, water, and air are free of any potential contaminants and conditions[4]. The contemporary understanding of infection is the same as the Unani medicine's explanation of the

'Ufunat (infection) process. *Dafi'-i 'Ufunat* (antiseptic), *Dafi'-i Humma* (antipyretic), and *Muhallil-i-warm* (anti-inflammatory) treatments are prescribed by Unani physicians to treat a variety of infectious diseases[5]. Numerous references to various infectious diseases, including endemic and epidemic cases, with thorough explanations of the disease's pathophysiology, causes, and treatment methods, can be found in the Unani classical texts. These include *Sarsam* (meningitis), *Sill wa Diq* (tuberculosis), *Judham* (leprosy), *Judri wa Hasba* (smallpox & measles), *Nazla Waba'i* (influenza), *Khunaq Waba'i* (diphtheria), *Ta'un* (plague), and many more[6]. The Unani medicines are used to treat a variety of illnesses[7]. To prevent and treat infectious diseases, many single and compound formulations have been common for a very long time[4]. Many different kinds of illnesses are treated with unani medicines[7]. Numerous plants mentioned in the Unani literature as having therapeutic value have been scientifically confirmed by researchers and have been found to have fascinating pharmacological effects, such as anti-arthritic, anti-diabetic, anti-ulcer, anti-HIV, and antitumor qualities. The current work provides a brief description of 22 climbers with medicinal significance. These climbers are frequently utilized to treat a range of acute and chronic conditions in traditional medicine, specifically the Unani medicine[8]. Medicinal plants have antimicrobial agents. Plants are utilized as medicine in several countries, and they are a source of promising and successful drugs[9].

Unani herbs with antimicrobial activity: This section reviews the antimicrobial activity of several medicinally significant plants, including *Terminalia bellirica, Phyllanthus emblica* Linn., *Withania somnifera* L., *Anacyclus pyrethrum*, *Trachyspermum ammi* L., *Acacia arabica, Cinnamomum zeylanicum*, *Tinospora cordifolia*, *Terminalia chebula*, *Ferula foetida, Cichorium intybus*, *Nigella sativa, Allium sativum*, *Azadirachta indica, Coriandrum sativum*, *Laurus nobilis, Ocimum sanctum, Operculina turpethum*, *Smilax ornata, Acorus calamus*, and *Zingiber officinale*[10]. All of these plants have antimicrobial properties and will be used in scientific research. The following are reviews for these plants:

1. **Ajwain** (Trachyspermum ammi L.)

Agar diffusion assay was used to test the antibacterial efficacy of Trachyspermum ammi acetone and aqueous extracts against Escherichia coli, Klebsiella pneumoniae, Enterococcus faecalis, Salmonella typhi, Salmonella typhimurium, Shigella flexneri, Pseudomonas aeruginosa, and Staphylococcus aureus. The results showed that the acetone extract was more active than the aqueous extract[11,12]. Another study found that T. ammi's ethanolic extract exhibited antibacterial activity against eight distinct Helicobacter pylori strains.

Using the agar well-diffusion method, even the methanolic extract of T. Ammi showed bactericidal activity against 11 species at 2 mg/well[11,12]. The Diameter of Inhibition Zones (DIZ) was used to measure it. DIZ was more than 10–14 mm against Bacillus pumilus and Pseudomonas aeruginosa; 15 mm against Staphylococcus aureus and Staphylococcus epidermidis; and 7-9 mm against Bordetella bronchiseptica, Escherichia coli, and Klebsiella pneumonia. Aspergillus niger and Curvularia ovoidea were properly inhibited at 5000 ppm by the total essential oil extracted from seeds, which was tested for fungicidal effects[11,12].

2. **Amla (**Phyllanthus emblica Linn.)

A 70% ethanol extract of *Phyllanthus emblica* Linn. (*Emblica officinalis* Gaertn.) fruits and their phytochemicals (gallic acid, ellagic acid, rutin, and quercetin) demonstrated strong antibacterial activity against *S. aureus, E. coli,* and *K. pneumoniae,* with MIC values ranging from 3.13 to 6.25 µg/ML, according to recent studies. Using the extract or compounds (gallic acid, ellagic acid, rutin, and quercetin) in combination with ampicillin and chloramphenicol also showed synergistic effects against the tested bacteria, *Pseudomonas aeruginosa*, *Escherichia coli,* and *Staphylococcus aureus*[13,14].

3. **Asgandh** (Withania somnifera L.)

The in vitro agar well diffusion assay showed that *Asgand's* aqueous root extract possessed potent antibacterial activity against methicillin-resistant *Staphylococcus aureus* (MRSA), contact bioautography[15]. The two-dimensional thin layer chromatography (TLC) was used to separate the bioactive compounds from the plant extract. According to the study, extract from *Withania somnifera* exhibits significant antimicrobial effects against *S. aureus* and *E. coli*[16].

4. **Aqarqarha** (Anacyclus pyrethrum)

A study by Selles et al. (2012) studied the methanolic extract of *Anacyclus pyrethrum,* which demonstrates antimicrobial activity against *Candida albicans* (81%) and three gram-positive bacteria: *Listeria monocytogenes* (100%), *Bacillus cereus* (69%), and *Staphylococcus aureus* (66%). *Anacyclus pyrethrum* extract exhibited negligible antibacterial activity in another antibacterial study. It works well against *Streptococcus aureus* and *Streptococcus sanguis,* but not against *Pseudomonas aeruginosa* or *Streptococcus mutans*[17].

5. **Balela** (Terminalia bellirica)

By precipitating microbial protein and making nutritive proteins unavailable to them, tannins in *Terminalia bellirica* fruit extract can prevent the growth of germs (Sabnis, 2014; Badrul et al., 2011)[18].

6. **Babool** (Acacia arabica)

Shazia et al (2011) have studied the antimicrobial activity against medicinally important bacterial strains, such as *Pseudomonas aeruginosa, Proteus vulgaris, Staphylococcus aureus,* and *Streptococcus cereviceae*[19]. The anti-microbial activity was determined in methanolic extracts using the agar well diffusion method. results showed anti-bacterial activity against *Staphylococcus aureus, Pseudomonas vulgaris, Escherichia coli,* and anti-fungal activity against *Streptococcus cereviceae*[19]. Antimicrobial activity of the extracts against clinical isolates was performed by agar diffusion method. It exhibited potent activity against all clinical isolates. The minimum inhibitory concentration for ethanol extract was 5 mg/ml, while 10 mg/ml for petroleum ether extract. These results may be helpful for the rational use of this plant in the modern system of health care[19].

7. Darchini (Cinnamomum zeylanicum)

The ethanolic extract of *Darchini* possesses antibacterial activity against methicillin-resistant *Staphylococcus aureus* (MRSA). In the treatment of such infection, the extract of *Darchini* could have a valuable effect and may also help to achieve the potential antimicrobial agents against MRSA bacteria[20].

8. Gilo (Tinospora cordifolia)

The antimicrobial nature of the plant extracts (ethanolic, methanolic, and aqueous extracts of the leaf) against *E. coli* was tested by Kumar et al. (2017) using the slip disc method. The degree of antimicrobial character of the plant extracts was inferred by the comparative studies of the zone of inhibition (in mm diameter). The results shown after the research proved that the natural medicinal character of the climber is an economical alternative form of medicine compared to the currently used conventional medicines[21].

9. Halela (Terminalia chebula Retz.)

Gallic acid and its ethyl ester isolated from the ethanolic extract of *Terminalia chebula* Retz showed antimicrobial activity against methicillin-resistant *Staphylococcus aureus*. It also has growth-inhibitory action against *Salmonella typhi* and intestinal bacteria[22].

10. Hing (Ferula asafoetida)

Antimicrobial, antioxidant, and anti-inflammatory activities of the essential oils of 18 plant species from Tajikistan (Central Asia) were investigated. The essential oils of these aromatic plants, including *Ferula asafoetida,* showed antimicrobial, antioxidant activities[23].

11. Kasni (Cichorium intybus L.)

Nandagopal & Kumari (2007) reported that "root extract of *Cichorium intybus* possesses potent antimicrobial activity, suggesting that cichory root extracts contain the effective active constituents responsible for eliminating the bacterial pathogens[24].

12. Kalonji (Nigella sativa)

The sensitivity of test strains to *Kalonji* extracts and common antimicrobials was determined by disc diffusion assay on Muller Hinton agar (MHA) plates (for non-fastidious bacteria) or on brain heart infusion agar (BHIA) plates (fastidious bacteria as *Streptococcus, Brucella,* and Pasteurella strains)[25]. The results were interpreted for the sensitivity of strains to different antimicrobials based on the diameter of the zone of growth inhibition as per CLSI. Any visible zone against *Kalonji* extract discs was counted as positive for antimicrobial activity, and the zone of inhibition was recorded in mm, as has been reported earlier[25].

13. Lahsun (*Allium sativum* Linn.)

Studies demonstrated that at low concentrations, allicin and garlic juice both inhibited the growth of Bacillus, Brucella, Streptococcus, and Staphylococcus. Antiviral activity When given with influenza vaccine, it increases the production of neutralizing antibodies and protects mice from infection with the intranasally inoculated influenza virus, demonstrating its antibacterial properties in vivo. antifungal action. Research showed that numerous in vitro and in vivo investigations suggested notable antifungal activity[26].

14. Neem (Azadirachta indica)

A variety of bacteria, including B. cereus, B. pumilus, S. aureus, M. tuberculosis, E. coli, P. vulgaris, S. typhi, K. pneumoniae, S. dysenteriae, Enterococcus faecalis, Streptococcus mutans, Streptococcus salivarius, Streptococcus mitis, Streptococcus sanguis, and even strains that are resistant to streptomycin, are effectively inhibited by neem oil preparations (Rosaline et al. 2013). The leaves of Azadirachta indica suggested potent antibacterial activity, demonstrating the high potential of bioactive compounds. This helps to justify the plant's use in primary healthcare[27].

15. Pudina (Coriandrum sativum L.)

According to Dimic et al. (2014), coriander extract is also effective at inhibiting Aspergillus parasiticus, Cladosporium cladosporioides, Eurotium herbariorum, Penicillium chrysogenum, and Aspergillus carbonarius[28,29].

16. Teejpatta (Laurus nobilis)

Antibacterial activity has been shown by *L. nobilis* essential oil, methanolic seed oil extract, and seed oil in vitro. However, compared to essential oil and seed oil, the methanolic extract of seed oil exhibits more potent antibacterial activity (Ozcan et al., 2010)[30]. Seven strains of plant-pathogenic fungi were evaluated for *L. nobilis's* antifungal activity in vitro at various concentrations, such as 50, 125, and 250 mg/mL. At a concentration of 250 mg/mL, the greatest antifungal activity was observed against the fungus *Botrytis cinerea* (Patrakar et al., 2012)[30].

17. Tulsi (Ocimum sanctum)

Tulsi contains two antibacterial agents, namely, terpenes and carvacrol. The same purpose is likewise served by a sesquiterpene called β-caryophyllene. This ingredient, which is found naturally in tulsi, is a food additive approved by the Food and Drug Administration (FDA). It aids in protecting the body against disease-causing bacteria[28,31]. An ethanolic extract of basil leaves inhibited poliovirus type-3 in Vero cells at a nontoxic range of 22.5-0.175 mg/ml, whereas an aqueous extract showed a nontoxic effective range of 2.25-1.75 mg/ml. A virus inhibition assay demonstrated that ethanol and aqueous extracts of basil inhibited 99.9% and 99.68% of poliovirus type-3, respectively (Parida MM, et al., 1997)[31].

18. Turbud (Operculina turpethum Linn.)

The antimicrobial activity of petroleum ether and ethanolic extracts of *OT* leaves was determined by Alam et al. in 2010. The standard disc diffusion method was used to assess the antimicrobial activity against Gram-negative bacteria, such as *Pseudomonas aeruginosa, Shigella sonnei,* and *Shigella dysenteriae,* and Gram-positive bacteria, such as *Streptococcus haemolyticus* and *Bacillus subtilis*[32].

19. Ushba (Smilax ornata)

While the aqueous extract showed moderate antibacterial activity against gram-positive bacterial strains and performed better against *Staphylococcus aureus*[32], the alcoholic extract showed good antibacterial activity against gram-positive bacterial strains, with this activity being higher against *Streptococcus pyogenes*[33].

20. Waj turki (*Acorus calamus* L.)

The highest antibacterial activity against Staphylococcus aureus, Candida albicans, and Escherichia coli is identified in the ethyl acetate fraction in A. calamus rhizomes[34,35].

21. Zanjabeel (Zingiber officinale)

Intraperitoneal administration of ginger extract (10 mg/kg) revealed dose-dependent antimicrobial activity against *Salmonella typhimurium, Escherichia coli, Candida albicans,* and *Pseudomonas aeruginosa*[36]. *Ginger* extract has good antifungal and antibiofilm formation by fungi against *Candida albicans* and *Candida Krusei*, as shown by a study on its antifungal and anti-biofilm traits against *Candida* species[37].

Conclusion

Furthermore, to raise the risk of many harmful side effects in humanity, the careless use of modern antibiotics causes bacteria to become resistant to them more quickly. This process drives the health economy and makes antibiotics useless. Medical books written in Unani refer to infections as a process of *Ufunat*, or putrefaction. To grow, *Ufunat* needs heat and moisture. The Unani medical literature goes into great detail about infectious fevers, which include their causes, traits, and onset trends. Infections due to a variety of bacterial etiological agents, such as pathogenic *E. coli, Staphylococcus aureus, Klebsiella pneumoniae, Enterococcus faecalis, Salmonella typhi, Pseudomonas aeruginosa,* etc., are more common.

The search for new antimicrobial drugs is now needed due to the rise in antimicrobial resistance to existing antibiotics. Many plants are frequently used as herbal medicines to treat infectious diseases in India's rural and underdeveloped areas. For this reason, plants that people regularly consume were examined for possible antimicrobial properties.

REFERENCES :

1. Izzaty RE, Astuti B, Cholimah N. Botanical Pharmacognosy : Microscopic Characterization of Botanical Medicines. Angewandte Chemie International Edition, 6(11), 951–952. 1967. 5–24 p.
2. Harborne JB. Pharmacognosy and Phytochemistry. Vol. 11, Phytochemistry. 1972. 1869–1870 p.
3. Rainsford KD. Therapeutic Use of Medicinal Plants and Their Extracts : VolumRainsford, K. D. (n.d.). Therapeutic Use of Medicinal Plants and Their Extracts : Volume 1 (Vol. 1).e 1. Vol. 1. 2017.
4. Anwar N, Ahmed NZ, Begum S, Fathima AF, Khan AA. Emergence of antimicrobial resistance and magnitude of Unani medicine - Scope and challenges. J Complement Integr Med . 2021;18(3):477–83.
5. Fatima S, Scholar MPG, Roqaiya M, Scholar PG, Jahan D, Khan AA, et al. Immunomodulatory herbs of Unani medicine: A review. ~ 19 ~ Int J Herb Med. 2015;3(4):19–21.
6. CCRUM. AYUSH Guideline 2019-Covid19. مجلة الدراسات القانونية والاقتصادية. 2020;6(1):1–56.
7. Nasution AK, Alqaaf M, Islam RM, Wijaya SH, Ono N, Kanaya S, et al. Identifying Potential Natural Antibiotics from Unani Formulas through Machine Learning Approaches. Antibiotics. 2024;13(10):1–17.
8. Hashmat I. Importance of some medicinal herbs in Unani medicine. 2022;
9. Fao. Trade in Medicinal Plants. Food Agric Organ. 2005;1–53.
10. Duke JA. Handbook of Medicinal Herbs. In: International Clinical Psychopharmacology. 2nd ed. Boca Raton, London, New York, Washington, D.C.: CRC Press; 1990. p. 14.
11. Zaki Z. A Review on Trachyspermum ammi (Ajwain). J Integ Comm Heal [Internet]. 2021;10(1):22–6. Available from: https://orcid.org/0000-0003-3883-4361
12. Awais Hanif M, Mona Hassan S, Sharif Mughal S, Rehman A, Khurram Hassan S, Ibrahim A, et al. An Overview on Ajwain (<i> Trachyspermum ammi</i>) Pharmacological Effects: Current and Conventional. Pharm Sci Technol. 2021;5(1):1.
13. Nalina Kumari CB, Ambalavanan N, Rajesh Kumar S, Mahendra J, Sudhakar U. Anti-oxidant, anti-inflammatory and antimicrobial activity of aqueous extract from acerola and amla. Bioinformation. 2024;20(7):765–70.
14. Tiwana G, Cock IE, Cheesman MJ. Phyllanthus emblica: Phytochemistry, Antimicrobial Potential with Antibiotic Enhancement, and Toxicity Insights. Microorganisms. 2025;13(3):1–18.
15. Saiyed A, Jahan N, Majeedi SF, Roqaiya M. Medicinal properties, phytochemistry and pharmacology of Withania somnifera: an important drug of Unani Medicine. J Sci Innov Res. 2016;5(4):156–60.
16. Poonkothai M, Hemaiswarya S, Kavitha D. Antibacterial activity of Withania somnifera. J Microbial World. 2005;7(10):97–9.
17. Ahmad K, Ahmad H. Review on Aqarqarha (Anacyclus pyrethrum); A Unique Mufrad Advia (single drug) of Unani System of Medicine. J Phytopharm. 2020;9(6):423–8.
18. Urooj A, Hashir M, Akram M, Shifa Zaidi S. EFFICACY OF TERMINALIA BELLIRICA (Balela): A REVIEW. Indian J Unani Med. 2023;16(02):138–42.
19. Roqaiya M, Begum W, Jahufer R. Acacia arabica (Babool) - A review on ethnobotanical and unani traditional uses as well as phytochemical

and pharmacological properties. Int J Pharm Phytopharm Res [Internet]. 2015;4(6):315–21. Available from: http://www.eijppr.com//api/uploads/2015/July/output/5. Manu 9 eIJPPR 379.pdf%0Ahttps://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emed16&AN=605202852%0Ahttps://discover.lshtm.ac.uk/openurl/44HYG/44HYG_services_page?sid=OVID:embase&id=do

20. Ahmed R, Ahmed A, Ansari SA, Ahmed MW, Khan AS, Ansari A, et al. Darchini (Cinnamon): A versatile drug in the Unani system of medicine: An extensive review. Int J Herb Med [Internet]. 2021;106(4):106–11. Available from: www.florajournal.com
21. Kalam MA, Noor A, Qayoom I, Gani R, Humma H. Gilo (Tinospora Cordifolia (Willd.) Miers: A Wonder Drug of the Unani System of Medicine. Indian J Unani Med. 2021;14(1).
22. Dar PA, Sofi G, Parray S, Jafri MA. Halelah siyah (Terminalia chebula retz): in the unani system of medicine and modern pharmacology: a review. 2018;(November).
23. Javaid R, Javed G, Javaid R, Anju, Ahmed F, Khan AA. HING (Ferula foetida Regel): A potent Unani Herb with its descriptive parameters of pharmacognosy and pharmacology: A Review. J Drug Deliv Ther. 2020;10(5):362–7.
24. Parween A. Kasni (Cichorium intybus Linn.): A Scientific Recap. European J Med Plants. 2025;36(3):1–8.
25. BR S, DK S, Bhardwaj M, Vadhana P, Saraf A, VKO R, et al. Antimicrobial activity of kalonji oil and its comparison with methanolic and aqueous extracts of Nigella sativa (Kalonji) seeds. Nat Prod An Indian J. 2017;13(2)::1–13.
26. Nasir A, Fatma G, Neshat N, Aftab Ahmad M. Pharmacological and therapeutic attributes of garlic (Allium sativum Linn.) with special reference to Unani medicine-A review. ~ 6 ~ J Med Plants Stud [Internet]. 2020;8(3):6–09. Available from: www.plantsjournal.com
27. Uddin DMS, Nuri DZN, Alam DMK, Hoq DO. Neem (Azadirachta indica) in health care: A review. Int J Unani Integr Med. 2018;2(2):29–35.
28. Sanjay Kumar Rao, Anshu Sharma, Deepak Jain. A review of medicinal and traditional uses of the Tulsi plant (Ocimum sanctum L.). World J Biol Pharm Heal Sci. 2023;13(1):450–6.
29. Rama Koteswararao* & Dr. Lankalapalli. Journal of Drug Delivery and Therapeutics. J Drug Deliv Ther. 2019;9(4):173–80.
30. Batool S, Khera RA, Hanif MA, Ayub MA. Bay Leaf. Med Plants South Asia Nov Sources Drug Discov. 2019;(January):63–74.
31. Sareen A, Shah S, Patil S. A Review on Indian Plant Tulsi (Ocimum sanctum) and its Medicinal Uses. 2024;15(5):176–82.
32. Hoq DMO, Tamanna T. Medicinal importance of Operculina turpethum (Linn.): A Review. Int J Unani Integr Med. 2019;3(1):56–61.
33. Ahmed R, Khan NA. Journal of Drug Delivery and Therapeutics: A short review and study on antimicrobial activity of Unani drug - Ushba (Smilax ornata). 2019;9:347–50.
34. Khan MR, Kihara M, Omoloso A. Anti-microbial activity of. 2001;44(8):2–5.
35. Hamdard J, Delhi N, Hamdard J, Delhi N. ISSN : 2277 – 4998. 2022;11(8):3608–21.
36. Rehman Ansari, Assistant Professor F, Alam Chodhary K, Ahad M, Rehman Ansari F. A review on ginger (Zingiber officinale Rosc) with unani perspective and modern pharmacology. ~ 101 ~ J Med Plants Stud [Internet]. 2021;9(3):101–4. Available from: www.plantsjournal.com
37. Abdullah Tauheed, Hamiduddin* AA, and MZ. Tauheed et al.. Int J Pharm Sci Res. 2017;8(8):3218–30.