

# Therapeutic Effect of *Salvadora persica* on Multiple Skin Diseases

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## ABSTRACT

*S. persica* is a type of chewing stick and its properties showed that it is very useful for the oral hygiene that prevent to bacterial infections. *S. persica* was used as tooth brush for a hundred of years and still it is utilized as tooth brush in many countries. It had numerous constituents that gave supplements and bacterial protection from our teeth. In the past examination physiological reactions and cancer prevention agent potential under saltiness stress were explored in callus culture. A colossal connection between cancer prevention agent limit and phenol substance was watched demonstrating that phenolic mixes are the huge supporters of the cell reinforcement potential in persica. These fixings can be utilized to forestall bacterial diseases, plaque development as well as gingivitis. *S. persica* additionally indicated inhibitory action and the cariogenic *S. mutans* demonstrated fluctuated defenselessness when contrasted and control. The fundamental cariogenic microorganisms in human's viridians *Streptococci*, for example, *Streptococcus mitis*, *Streptococcus sanguis* and *Streptococcus mutans* are seen as tolerably impervious to anti-microbials. The methanol removes showed a more grounded antibacterial development against Gram-negative (3.3 to 13.6 mm) rather than Gram-positive (1.8 to 8.3 mm) microorganisms. Most negligible minimum inhibitory concentration for *E. coli* was 0.39, 1.56 µg/mL, trailed by *Streptococcus pyogenes* (1.56 µg/mL). Most noteworthy, Minimum Inhibitory Concentration (MIC) regard (6.25, 12.5 µg/mL) was recorded for Methicillin-Obstruction *Staphylococcus aureus* (MRSA), *Acinetobacter baumannii*, and *Stenotrophomonas maltophilia* Antibiotics, such as, penicillin and erythromycin have been accounted for to adequately expect dental cavities in animals and humans. These disadvantages legitimize that further innovative work is required for the development of regular antibacterial specialists that are alright for the host and explicit for oral pathogens.

**Keywords:** Effect of salinity; Callus culture; *Dalbergia sissoo*; Physiological; Biochemical processes; Plant growth

## INTRODUCTION

*Salvadora persica* is a tree species and its woody part is used as a toothbrush. It has many beneficial properties which were discovered such as it provides prevention against bacterial infections and multiple diseases [1]. Pharmacological studies indicated that *S. persica* had the ability to prevent and cure anti-inflammatory, anti-microbial, aphrodisiac, anti-plaque, analgesic, alexiteric, astringent, diuretic, anti-pyretic and bitter stomach performance, Troubles in nose, scabies, piles, leukoderma, gonorrhea, boils, scurvy, venereal disease, pain in tooth, hook worm, rheumatism, cough, asthma, high cholesterol plasma levels, stress induced ulcer, issues related to spleen functioning, epilepsy, skin diseases along with pain in joints (Figure 1) [2-7].

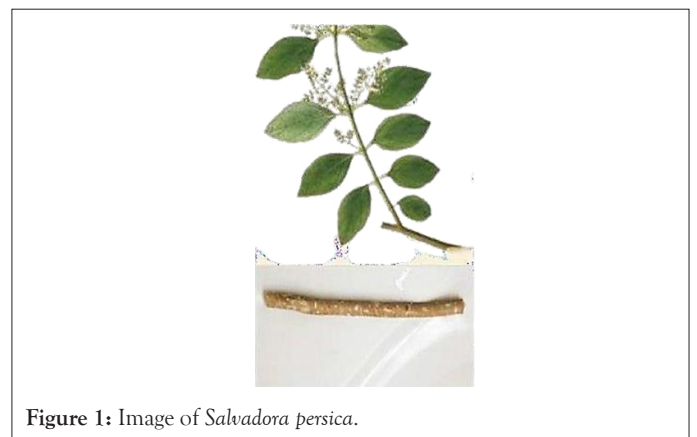


Figure 1: Image of *Salvadora persica*.

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**Received:** 07-Jan-2022, Manuscript No. JPBP-22-15423; **Editor assigned:** 10-Jan-2022, PreQC No. JPBP-22-15423 (PQ); **Reviewed:** 24-Jan-2022, QC No. JPBP-22-15423; **Revised:** 29-Jan-2022, Manuscript No. JPBP-22-15423 (R); **Published:** 05-Feb-2022, DOI: 10.35841/2329-9029.22.10.278

**Citation:** Shahid A, Arif A, Rehman MU, Arshad S, Akram A, Samar H, et al. (2022) Therapeutic Effect of *Salvadora persica* on Multiple Skin Diseases. J Plant Biochem Physiol. 10:278.

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## DISEASES

**Athlete's foot:** Approximately 15%-25% people have athlete's foot anytime in life. The disease can blowout to different body's parts and other people. This parasitic disease cause whiteness and wet skin in between toes, dehydrated and flaky bottoms, or becoming flushed and bothering of the skin wherever all through the foot. It is not a life-threatening in people with ordinary insusceptible status, anyway in specific people they cause persistent itching and last, fissuring. Couple of individuals is unmistakably clueless of preserving this disease. The contamination can infect to other body parts and people [8,9]. Medicines uses to treatment of athlete's foot are clotrimazole, tioconazole, bifonazole, econazole nitrate, sulconazole nitrate and miconazole nitrate.

**Jock itch:** Jock itch is an inflammatory skin state of the groin. There is a burning itching of the inward thighs, the skin is delicate, and the athlete is typically incapable to be completely active. There are three significant sorts: mechanical intertrigo (scraping), dermatophytosis (shallow growth contamination), and candidiasis (yeast disease). To avert muscle head tingle, the athlete should wear lose fitting clothes that don't bind in the groin and keep the zone clean, dry, and cool. Cool packs will relieve and inflammation. Low-strength steroid creams will help assuage aggravation; however more grounded ones ought to be kept away from in light of the fact that they may cause atrophic striae [10, 11]. Medicines uses for treatment of jock itch are miconazole, clotrimazole, terbinafine.

**Ringworm foot:** In exhibiting this finished investigation of shoes and slippers as a source of contamination or reinfection in instances of ringworm of the feet, we have included a valuable investigation of a little arrangement of cases (25) in which we were keen on realizing whether the living beings found in the shoes and on the skin were indistinguishable. Examination of this arrangement will pursue the discussion of the primary study [12,13]. At the point when one considers the across the board commonness of diseases of the feet because of organisms that are viewed as pathogenic in man, it is just normal to hope to discover these growths investments in personal contact with the influenced regions. It is likewise accepted that the dispersion of these creatures is as general in the mycological as in the bacterial field. Subsequently the human foot would be in visit contact with organisms, both pathogenic and nonpathogenic, which could presumably be found at practically whenever on the feet, particularly between the toes, on the tights and in shoes which had been worn for a couple of days or weeks [14]. Medicines use for treatment of ringworm foot are miconazole (azolen, carrington antifungal, aloe vesta antifungal, cruex prescription strength, podactin, segura antifungal, derma-fungal, fungoid tincture, desenex, micatin, micaderm, miranel, baza antifungal, micro-guard, mitrazol, remedy antifungal, critic aid clear) terbinafine (lamisil) and ketoconazole (xolegel).

**Impetigo:** Impetigo is a very irresistible, super facial skin contamination that most normally impacts children from two to five years of age [15]. There are couple sorts of impetigo are

contagious impetigo (non-bollous impetigo) and bullous impetigo. The finding when in doubt is made clinically, anyway on occasion a culture may be important. Regardless of the way that impetigo normally retouches all of a sudden inside around fourteen days without scar, treatment facilitates pain, recover corrective appearance, and forestall the spread of an individual structure that may cause various ailments (e.g., glomerulonephritis). Various choices are available rather than standard treatment. The topical enemy of contamination operators fusidic and mupirocin destructive are fruitful and can be superior to oral counter agent's toxins. Oral anti toxins can be considered for patients with wide ailment [16]. Oral penicillin V is just sporadically convincing; by and large, there is no sensible tendency among hostile to staphylococcal penicillin, amoxicillin/clavulanate, cephalosporin, and macrolides, disregarding the way that hindrance rates are rising to erythromycin. Topical disinfectants are not effective in the treatment of impetigo.

Medicines uses for treatment of Impetigo are dicloxacillin, clindamycin,cephalexin, amoxicillin/clavulanate, minocycline, macrolides are options but penicillin is not. trimethoprim/sulfamethoxazole, doxycycline.

**Rosacea:** It is a normally skin disease in adults, experienced chronic inflammatory with a preference for profoundly noticeable territories of the skin, for example, face. It portrayed by redness of skin, pustules, pimples and enlarged veins [17]. Eyes are frequently included, and thickening of the skin with broadening (phymas), particularly nose, can happen in some patients. Mix of indications and signs centered about the focal face be partitioned in primary and secondary qualities [18]. In spite of the fact that rosacea can happen in anybody, it most normally influences moderately aged ladies with reasonable skin, blue eyes, blonde hair and less regular in skin photo types 5 and 6. Studies have appeared about in the Swedish populace, it is 10% while 2%-3% in France and Germany about 2%-3% [19]. Familial foundation is depicted in 15%-40% of the patients. There are three leukocyte antigens in human-HLA alleles (MHC class II) are essentially connected with rosacea [20]. Medicines uses for treatment of rosacea are doxycycline (vibramycin), erythromycin (eryc), metronidazole (flagyl), minocycline (dynacin).

**Seborrhea dermatitis:** Seborrheic dermatitis is a typical chronic inflammatory skin condition, described by scaling and ineffectively characterized erythematous patches. It might be related with pruritus, and it essentially influences sebum-rich zones, for example, the scalp, face, upper chest, and back. In spite of the fact that its pathogenesis isn't totally seen, some hypothesize that the condition results from colonization of the skin of influenced people with types of the variety *Malassezia* yeasts [21]. An assortment of treatment modalities is accessible, including annihilation of the growth, diminishing or treating the fiery procedure, and diminishing sebum generation [22]. Medicines use for treatment of Seborrheic dermatitis are Medicated Shampoo in which, coal tar, selenium sulfide, ketoconazole, zinc parathion and antifungal cream.

Components of *S. persica* are mentioned in Figure 2 and Table 1.

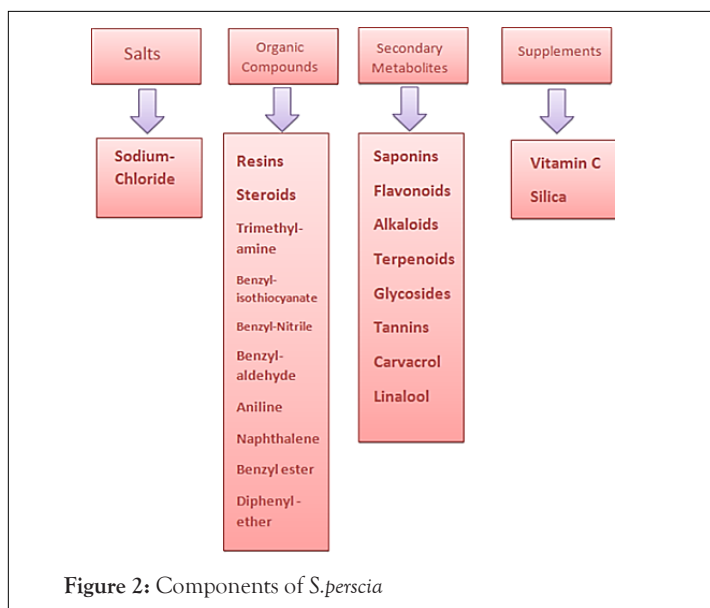
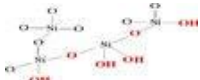
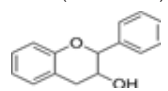
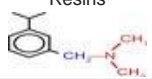
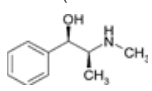
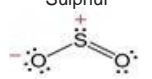
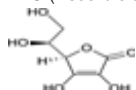
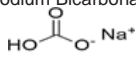
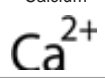
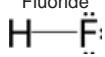
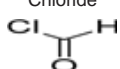

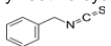


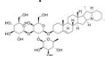



Figure 2: Components of *S.perscia*

Table 1: Components, function and mode of action.

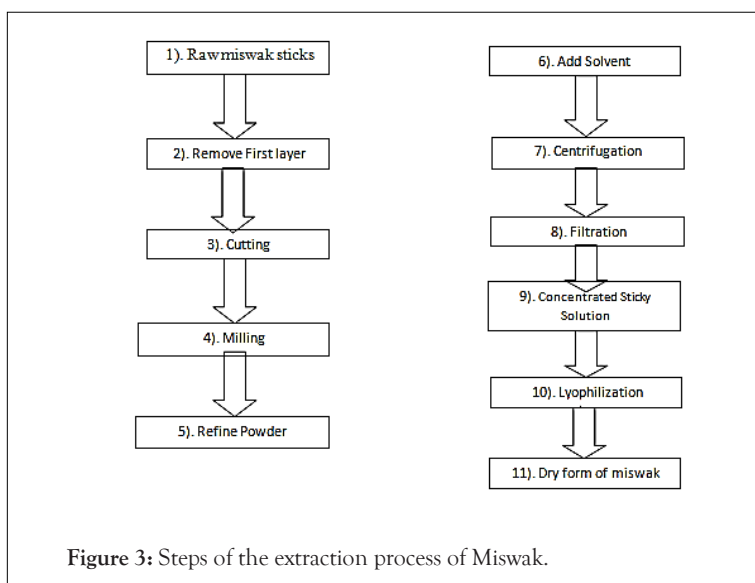
Components	Function	Mode of action
Silica 	Act as rough material to get rid of plaque and strains present on the teeth	Abrasive
Tanins (Tannic acid) 	Reduce clinically detectable gingivitis - Reduce plaque and gingivitis - Reduce <i>Candida albicans</i> counts when tannic acid is treated with denature bases.	Antifungal
Resins 	It has protective activity against dental cavities due to a layer over the enamel surface	Forms a layer on enamel surface
Alkaloids (Salvadorine) 	Have antifungal activity	Bactericidal, antifungal
Sulphur 	Have a bacterial effect	Bactericidal
Vitamin C (Ascorbic acid) 	It helps in tissue repairing process and healing.	Healing/repair
Sodium Bicarbonate 	It acts as a mild abrasive and also used as a dentifrice.	Abrasive
Calcium 	It inhibits the loss of minerals and induces the resorting of minerals of outer layer of teeth	Induces the remineralization and Inhibits demineralization
Fluoride 	It acts as cariogenic activity and restore the minerals of tooth.	Antimicrobial
Chloride 	Inhibits the formation of calculus	Prevent calculus deposition on teeth surfaces; Inhibits demineralization and advances remineralization

N-benzyl-2-phenyl acetamide 	It represses the human collagen- incited platelet collection and has antibacterial action against <i>E. coli</i>	Antibacterial activity against <i>E. coli</i>
Benzyl isothio cyanate 	Act as a chemo- preventive agent	Preventive agent It has a role as an antibacterial drug
Trimethylamine 	It has antibacterial, and gum- stimulating effect	As an insect attractant, as a warning agent for natural gas, and as a corrosion inhibitor
Flavonoids 	Has cytotoxic activity	Bactericidal and bacteriostatic by damaging cytoplasmic membrane
Saponins 	-It decreases the cholesterol level and protects body from cancer. - Lower cancer risks, lipids in blood and blood glucose reaction.	phytochemicals
Linalool 	- Linalool contains powerful analgesic and anti-inflammatory properties. - One regular downstream result of linalool is nutrient E.	Analgesic and anti- inflammatory properties.

## DISCUSSION

For quite a long while, therapeutic plants have been utilized in creating nations as elective medicines to medical issues. Numerous plants concentrate and fundamental oils secluded from plants have been appeared to apply organic action, which build up another examination chance and portrayal of antifungal action of the plants. Since plants make a collection of blends with characteristics to fight against microbe [23]. It is typical that screening programs for some under-addressed focuses, for instance, antifungal action, may give up applicant blends for developing new antifungal drugs [24-27]. History and usage of miswak (tooth stick) as an oral instrument similarly as the characteristic effects of *S. persica* are looked into studies exhibit that *S. persica* removes oral infection causing bacteria and plaque, for instance, chlorhexidine gluconate, at whatever point used at a high center biting sticks was in like manner used by the Egyptians and Islamic Empires [28-31]. In vitro assessment displayed that

the watery concentrate of *S. persica miswak* inhibitory influenced the improvement of *Candida albicans* that may be credited to have high sulfate contents examined the auxiliaries of *S. persica miswak* using three various research office strategies, and indicated strong anti-microbial property on the improvement of Streptococcus sp. likewise, *Staphylococcus aureus* [32]. Additionally, demonstrated that *Enterococcus faecalis* is the touchiest micro-organism affected by the usage of *S. persica miswak*, and saw equal anti-microbial activity either its newly cut from tree or a month old. Relationship of the alcohol and water concentrate of *S. persica miswak* uncovered the alcoholic concentrate had dominant properties to fight against microbes than watery concentrate (Figure 3). Research has recognized a couple of anionic pieces of *S. persica miswak* that have anti-microbial effects assessed that these portions had amazing sponsor ramifications for salivary peroxides thiocyanate and hydrogen peroxidase antimicrobial structures [33].



There is a wide variety of medicines being used as a treatment for multiple skin infections including many bacterial and fungal infections. Moreover, these medicines are also being used to treat inflammation. Many articles explained that miswak plays an important role in maintaining the oral hygiene but beside its role in oral hygiene miswak also plays a vital role in being the cure to skin infections caused by bacteria and fungi along with the cure for inflammation. According to the earlier studies, composition of miswak is comprised of certain components which have an ability to act against bacteria, fungi and inflammation ultimately resulting in a healing effect.

### Supplementary

There are many gram-positive bacteria that caused different types of the diseases. Following are the gram-positive bacteria and their causes

#### Bacteria gram (+ve) bacteria caused diseases

***Streptococcus aureus***: It can cause the disease like boils, wound infections, skin deep infection and food poisoning. This is round shaped bacteria usually present in upper respiratory and on the skin [34]. The antibiotics that use for the treatment are the daptomycin, vancomycin, gentamycin, clindamycin, ceftaroline fosmil.

***Streptococcus epidermidis***: This Bacteria can cause the endocarditic and joint infection and the antibiotics that use for the treatment are the vancomycin, rifampin, amino glycosides [35].

***Streptococcus saprophyticus***: It can cause the urinary tract infection globular shaped bacteria and the antibiotics that use for the treatment are the ciprofloxacin, quinoline [36].

***Streptococcus agalactiae***: A gram-positive bacterium, coccus shaped, having ability of chain formation. It is beta-hemolytic catalase, negative and facultative anaerobe. It can cause meningitis in new natal and the antibiotics that use for the treatment are the penicillin [37].

***Streptococcus pyogenes***: *Streptococcus pyogenes*, or Group A *Streptococci* (GAS), is a Gram-positive coccus, facultative that develops in chain and produce various contaminations in people including pharyngitis, tonsillitis, erysipelas, red fever, post streptococcal glomerulonephritis rheumatic fever, cellulitis, necrotizing fasciitis and the anti-toxins that utilization for the treatment are the ciprofloxacin, augmentin [38].

***Streptococcus bovis***: This is gram positive bacteria and can caused the urinary tract infections, endocarditic and colorectal cancer ceftriaxone, gentamycin [39].

***Streptococcus pneumoniae***: This is gram positive bacteria alpha- hemolytic, facultative anaerobic member of the genus streptococcus. It can cause the pneumonia [40] ciprofloxacin, penicillin V, penicillin G.

***Viridians streptococcus***: This is the gram-positive bacteria.

It caused the endocarditis and the antibiotics that use for the treatment are erythromycin [41].

***Bacillus anthracis***: This is the etiologic agent of anthrax a common disease is the anthrax. These bacteria are the rod shaped and the antibiotics that use for the treatment are ciprofloxacin, doxycycline [42].

***Bacillus cereus***: This is rod shaped, aerobic facultative and gram positive bacteria, they are present in the food and soil. It can cause food poisoning [43]. This is gram positive bacteria, rod shaped and aerobic facultative they are commonly found in the soil and food. It causes food poisoning. The medicines used for the treatment are Omeprazole, Sodium bicarbonate.

***Clostridium tetani***: *Clostridium tetani* are the gram-positive bacteria, shape is rod and up to 2.5 micrometers long. It is mostly present in soil and caused the tetanus [44].

***Clostridium botulinum***: This is, motile bacterium, gram-positive, rod in shape, spore form in anaerobic condition and have capability to produce the neuro-toxin botulinum. It can cause botulism and the antibiotics that use for the treatment are the trivalent antitoxin made by horse [45].

***Clostridium perfringens***: This is positive-gram rod in shape, anaerobically spore-forming pathogenic bacterium. It can cause food poisoning and gas gangrene and the antibiotics that use for the treatment are penicillin G [46].

***Clostridium difficile***: This is gram positive bacteria. It can cause the diarrhea. It can easily transfer from infected person that have recently treated with antibiotics to the other healthy persons and the antibiotics that use for the treatment are metronidazole, vancomycin [47].

***Corynebacterium***: This is gram positive bacteria non-encapsulated, non-motile, non-sporulating rod shaped bacterium. It has high GC- contents and occurs in forbears and caused the diphtheria and the antibiotics that use for the treatment are erythromycin, penicillin G [48].

***Listeria monocytogenes***: This is the gram-positive bacteria, anaerobic bacterium, capable of surviving in the presence or absence of oxygen. It can cause meningitis and the antibiotics that use for the treatment are ampicillin, gentamycin [49]. There are many gram-negative bacteria that caused different types of the diseases.

Following are the gram-negative bacteria and their causes

#### Bacteria gram(-ve)

***Neisseria meningitidis***: It can cause meningitis and different types of meningococcal malady, for example, meningococemia. It is dangerous sepsis. It has additionally been accounted for to be transmitted through oral sex and caused urethritis in men and the anti-infection agents that utilization for the treatment are penicillin G [50].

***Neisseria gonorrhoea***: It can cause the gonorrhoea and the

antibiotics that use for the treatment are ceftriaxone, Doxycycline [51].

**Escherichia coli:** Rod shaped, coli form bacterium. It is normally found in the lower part of intestine of warm blooded organisms. It can cause the urinary tract infection and the antibiotics that use for the treatment are Ampicillin, trimethoprim, sulfamethoxazole [52].

**Salmonella typhi:** It infects the intestinal tract and blood. This disease is denoted to as typhoid fever and the antibiotics that use for the treatment are ceftriaxone, ciprofloxacin [53].

**Shigella:** It is gram negative facultative high-impact, non-spore-forming, non-motile, rod shaped microscopic organisms hereditarily firmly identified with *E. coli*. It can cause shigella that create fever, looseness of the bowels and stomach cramps beginning a day or two after they are presented to the microbes. It ordinarily settles in 5 to 7 days and the anti-toxins that utilization for the treatment are ciprofloxacin [54].

**Vibrio cholerae:** This is gram negative bacteria, rod in shape. It can cause the cholera and the antibiotics that use for the treatment are tetracycline, electrolytes and glucose [55].

**Campylobacter jejuni:** Campylobacter is one of the most widely recognized reasons for food contamination in Europe and US. It can likewise cause looseness of the bowels and enterocolitis erythromycin, ciprofloxacin [56].

**Helicobacter pylori:** This is also gram-negative bacteria found in stomach. It can cause the sore called Ulcer in the upper part of the small intestine or lining of the stomach. For some people an infection can lead to stomach cancer and the antibiotics that use for the treatment are bismuth trisylcate, amoxicillin, MTZ [57-59].

## CONCLUSION

There is a wide variety of medicines being used as a treatment for multiple skin infections including many bacterial and fungal infections. Moreover, these medicines are also being used to treat inflammation. Many articles explained that miswak plays an important role in maintaining the oral hygiene but beside its role in oral hygiene miswak also plays a vital role in being the cure to skin infections caused by bacteria and fungi along with the cure for inflammation. According to the earlier studies, composition of miswak is comprised of certain components which have an ability to act against bacteria, fungi and inflammation ultimately resulting in a healing effect.

## REFERENCES

- Gupta A, Verma S, Kushwaha P, Srivastava S, Rawat, A. Phytochemical and antioxidant studies of *L.* stem and twig. *Indian J Pharm Educ Res.* 2015;49(1):71-75.
- Noumi E, Snoussi M, Trabelsi N, Hajlaoui H, Ksouri R, Valentin E, et al. Antibacterial, anticandidal and antioxidant activities of and *Juglans regia L.* extracts. *J Med Plant Res.* 2011;5(17):4138-4146.
- Sher H, Al-Yemeni MN, Yahya SM, Arif HS. Ethnomedicinal and ecological evaluation of *L.* A threatened medicinal plant in Arabian Peninsula. *J Med Plants Res.* 2010;4:1209-1215.
- Noumi E, Snoussi M, Hajlaoui H, Valentin E, Bakhrouf A. Antifungal properties of and *Juglans regia L.* extracts against oral *Candida* strains. *Eur J Clin Microbiol Infect Dis.* 2010;29:81-88.
- Abdillahi HS, Stafford GI, Finnie JF, Staden JV. Ethnobotany, phytochemistry and pharmacology of *Podocarpus sensus latissimo* (S.I). *South Afr J Bot.* 2010;76:1-24.
- Garboui SS, Borg-Karlson AK, Palsson K. Tick repellent properties of three Libyan plants. *J Med Entomol.* 2009;46:1415-1419.
- Kamil M, Jayaraj AF, Ahmed F, Gunasekhar C, Samuel S. Pharmacognostic and phytochemical studies on *Salvadora persica*. *J Pharm Pharmacol.* 1999;227:51-58.
- Al-Quran S. Taxonomical and pharmacological survey of therapeutic plants in Jordan. *J Nat Prod.* 2008;1:10-26.
- Semel JD, Goldin H. Association of athlete's foot with cellulitis of the lower extremities: Diagnostic value of bacterial cultures of ipsilateral interdigital space samples. *Clin Infect Dis.* 1996;23(5):1162-1164.
- Talwar P, Kumar B, Ayyagiri A, Kaur S. Prevalence of bacteria and fungi in athlete's foot of varying severity and response to topical antibacterial and antifungal therapies. *Sabouraudia.* 1985;23(4):303-312.
- Brodin MB. Jock Itch. *Phys Sportsmed.* 1980;8(2):102-108.
- Ramsey ML. How I manage jock itch. *Phys Sportsmed.* 1984;12(5):109-113.
- Degreef H. Clinical forms of dermatophytosis (ringworm infection). *Mycopathologia.* 2008;166(5-6):257-265.
- Jamieson RC, Mc Crea A. Ringworm of the feet: Shoes and slippers as a source of reinfection. *Archives of Dermatology and Syphilology.* 1941;44(5):837-848.
- Achterman RR, White TC. A foot in the door for dermatophyte research. *PLoS pathogens.* 2012;8(3): e1002564.
- Darmstadt GL, Lane AT. Impetigo: An overview. *Pediatric dermatology.* 1994;11(4):293-303.
- Hartman-Adams H, Banvard C, Juckett G. Impetigo: diagnosis and treatment. *American family physician.* 2014;90(4):229-235.
- I de Bersaques J. Historical notes on (acne) rosacea. *Eur J Dermatol.* 1995;5:16-22.
- Tope WD, Sanguenza OP. Rhinophyma's fibrous variant. *Histopathology and immunohistochemistry.* *Am J Dermatopathology.* 1994;16:307-310.
- Abram K, Silm H, Maaros HI, Oona M. Risk factors associated with rosacea. *J Eur Acad Dermatol Venereol.* 2010;24(5):565-571.
- Chang ALS, Raber I, Xu J, Li R, Spitalo R, Chen J, et al. Assessment of the genetic basis of rosacea by genome-wide association study. *J Invest Dermatol.* 2015;135(6), 1548-1555.
- Gupta A K, Bluhm R. Seborrheic dermatitis. *J Eur Acad Dermatol Venereol.* 2004;18(1):13-26.
- Gupta AK, Bluhm R, Cooper EA. Seborrheic dermatitis. *Dermatol Clin.* 2003;21(3):401-412.

24. Salehi P, Momeni Danaie S. Comparison of the antibacterial effects of persica mouthwash with chlorhexidine on *Streptococcus mutans* in orthodontic patients. *DARU J Pharm Sci.* 2006;14(4):178-182.
25. Al-Lafi T, Ababneh H. The effect of the extract of the miswak (chewing sticks) used in Jordan and the Middle East on oral bacteria. *Int Dent J.* 1995;45(3):218-222.
26. Buadu CY, Bokaye Yodem AE. The antibacterial activity of some Ghanaian chewing sticks. *Ghana Pharmacological J.* 1973;1(1):150-53.
27. Rotimi VO, Mosadomi HA. The effect of crude extracts of nine African chewing sticks on oral anaerobes. *J Med Microbiol.* 1987 Feb;23(1):55-60.
28. Al-Bagieh NH, Almas K. In vitro antimicrobial effects of aqueous and alcohol extracts of miswak (chewing sticks). *Cairo Dental Journal.* 1997;13(2):221-24.
29. Almas K, Al-Bagieh NH, Akpata ES. In vitro antimicrobial effects of extracts of freshly cut and 1-month old miswak (chewing sticks). *Biomedical Letter.* 1997;56(2):145-49.
30. Almas K. The effect of storage condition on the antimicrobial properties of miswak (*Salvadora persica*) used in Saudi Arabia. *Egyptian Dental J.* 1999;45(4):484-548.
31. Almas K, Stakiw JE. The effect of miswak extract from *Salvadora persica* stored for 18 years on microbes in vitro. *Egyptian Dental J.* 2000;46(1):227-30.
32. Enwonwu CO, Anyanwu RC. The chewing stick in oral health care. *World Health Forum.* 1985; 6:323- 34.
33. Eid MA, Al-Shammery AR, Selim HA. The relationship between chewing stick (miswak) and periodontal health II. Relationship to plaque, gingivitis, pocket depth and attachment loss. *Quintessence Int* 1990 Dec; 21(12):1019-22.
34. Al-Bagieh NH, Idowu A, Salako NO. Effect of aqueous extract of miswak on the in vitro growth of *Candida albicans*. *Microbios.* 1994;80(323):107-113.
35. Mohamed SA, Al-Malki AL, Khan JA, Sulaiman MI, Kumosani TA. Properties of peroxidase from chewing stick miswak. *Afr J Pharm Pharmacol.* 2012;6(9):660-670.
36. David TJ, Cambridge GC. Bacterial infection and atopic eczema. *Arch Dis Child.* 1986;61(1):20-23.
37. Otto, M. (2009). *Staphylococcus epidermidis* - the "accidental" pathogen. *Nature Rev Microbiol.* 2009;7(8):555-567.
38. Sousa VSD, da-Silva APDS, Sorenson L, Paschoal RP, Rabello RF, Campana EH, et al. *Staphylococcus saprophyticus* recovered from humans, food, and recreational waters in Rio de Janeiro, Brazil. *Int J Microbiol.* 2017; 4287547.
39. Botelho ACN, Oliveira JG, Damasco AP, Santos KT, Ferreira AFM, Rocha GT, et al. *Streptococcus agalactiae* carriage among pregnant women living in Rio de Janeiro, Brazil, over a period of eight years. *PloS one.* 2018;13(5):e0196925.
40. Pato C, Melo-Cristino J, Ramirez M, Friães A, Vaz T, Gião M, et al. *Streptococcus pyogenes* causing skin and soft tissue infections are enriched in the recently emerged emm89 clade 3 and are not associated with abrogation of CovRS. *Front Microbiol.* 2018;9(1):2372.
41. Shanani S, Gumaa SA, Sandström G, Abd H. Significant Association of *Streptococcus bovis* with Malignant Gastrointestinal Diseases. *Int J Microbiol.* 2011;792019.
42. Weiser JN, Ferreira DM, Paton JC. *Streptococcus pneumoniae*: Transmission, Colonization and Invasion. *Nat Rev Microbiol.* 2018;16(6):355-367.
43. Patterson MJ, Baron S. *Streptococcus*. In *Medical Microbiology*. 4th edition. University of Texas Medical Branch at Galveston. 1996.
44. Spencer RC. *Bacillus anthracis*. *J Clin Pathol.* 2003;56(3):182-187.
45. Bottone E J. *Bacillus cereus*, a volatile human pathogen. *Clin Microbiol Rev.* 2010;23(2):382-398.
46. Hanif H, Anjum A, Ali N, Jamal A, Imran M, Ahmad B, et al. Isolation and Antibiogram of *Clostridium Tetani* from clinically diagnosed tetanus patients. *Am J Trop Med Hyg.* 2015;93(4):752-756.
47. Peck MW. *Clostridium botulinum* and the safety of minimally heated, chilled foods: An emerging issue. *Journal of Applied Microbiology.* 2006;101(3):556-570.
48. Uzal FA, Freedman JC, Shrestha A, Theoret JR, Garcia J, Awad MM, et al. Towards an understanding of the role of *Clostridium perfringens* toxins in human and animal disease. *Future Microbiol.* 2014;9(3):361-377.
49. Ofosu A. *Clostridium difficile* infection: A review of current and emerging therapies. *Ann Gastroenterol.* 2016; 29(2):147-154.
50. Oliveira A, Oliveira LC, Aburjaile F, Benevides L, Tiwari SB, Silva A, et al. Insight of genus *Corynebacterium*: Ascertaining the role of pathogenic and non-pathogenic species. *Front Microbiol.* 2017; 8(1):1937.
51. O'Byrne C, Utratna M. *Listeria monocytogenes*: At the coalface of host-pathogen research. *Bioeng Bugs.* 2010; 1(6): 371-377.
52. Roupheal NG, Stephens DS. *Neisseria meningitidis*: Biology, microbiology, and epidemiology. *Methods Mol Biol.* 2012; 799(1):1-20.
53. Budkaew J, Chumworathayi B, Pientong C, Ekalaksananan T. Prevalence and factors associated with gonorrhoea infection with respect to anatomic distributions among men who have sex with men. *PLoS One.* 2019; 14(4): e0211682.
54. Nataro JP, Kaper JB. Diarrheagenic *Escherichia coli*. *Clin Microbiol Rev.* 1998;11(1):142-201.
55. Kadiravan T, Wig N, Kapil A, Kabra SK, Renuka K, Misra A. Clinical outcomes in typhoid fever: adverse impact of infection with nalidixic acid-resistant *Salmonella typhi*. *BMC Infect Dis.* 2005;5(1):37.
56. Zaidi MB, Estrada-García T. *Shigella*: A highly virulent and elusive pathogen. *Curr Trop Med Rep.* 1(2):81-87.
57. Siriphap A, Leekitcharoenphon P, Kaas RS, Theethakaew C, Aarestrup FM, Sutheinkul O, et al. Characterization and genetic variation of *Vibrio cholerae* isolated from clinical and environmental sources in Thailand. *PLoS One.* 2017; 12(1): e0169324.
58. Salehi M, Bameri Z, Zahedani SS, Bokaeian M, Mirzaee B, Mirfakhraee S, et al. Prevalence and antimicrobial resistance of *Campylobacter jejuni*. *Int J Infect.* 2014;1(2):e19229.
59. Diaconu S, Predescu A, Moldoveanu A, Pop CS, Fierbințeanu-Braticevici C. *Helicobacter pylori* infection: old and new. *J Med Life.* 2017;10(2):112-117.