



FORMULATION AND EVALUATION OF ANTI-BACTERIAL HERBAL SOAP

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ABSTRACT:

The abstract provides an overview of herbal soap, its ingredients, formulation, pharmacological effects, and comparison with cosmetic soap. Herbal soap incorporates natural plant extracts and essential oils known for their antibacterial, anti-inflammatory, antioxidant, and moisturizing properties. Ingredients like neem, tulsi, reetha, and shikakai offer therapeutic benefits for skin care. The formulation process involves melting glycerin soap, adding essential oils and dried herbs, and pouring the mixture into molds. Evaluation methods include organoleptic and physical properties assessment. Pharmacological effects include antibacterial action, anti-inflammatory effects, antioxidant properties, moisturizing, wound healing, soothing, exfoliating, antifungal effects, and aroma therapeutic benefits. Active pharmaceutical ingredients like neem and tulsi contain chemical constituents with medicinal properties. Comparing herbal soap with cosmetic soap reveals differences in ingredients, purpose, chemical content, skin benefits, environmental impact, price, usage, and preservatives. Herbal soap focuses on natural, gentle, and therapeutic skincare, while cosmetic soap emphasizes fragrance and appearance. Overall, herbal soap offers a natural and beneficial alternative for skincare, catering to individuals seeking gentle and effective solutions for their skin concerns.

Keywords: Herbal soap, Ingredients, Formulation, Pharmacological effects, Comparison

INTRODUCTION:

The word "cosmetic" is derived from the Greek term "kosm tikos," meaning "having the power, arrange, and skill in decorating." The history of cosmetics is intertwined with human civilization. As early as 3000 BC, prehistoric humans used colors for decoration, to attract animals for hunting, and to protect themselves by painting their bodies, intimidating both human and animal adversaries. The Drugs and Cosmetics Act defines cosmetics as substances intended to be applied to the human body for cleansing, beautifying, enhancing attractiveness, or altering appearance. Herbal cosmetics, made from plant-derived phytochemicals, affect skin functions and provide essential nutrients for healthy skin and hair. These natural products are used in cosmetic preparations for their aromatic properties. Herbal soaps are therapeutic products containing antibacterial and

antifungal agents derived from plants. These soaps, available in forms such as creams, lotions, gels, and ointments, are applied topically and have been used to treat various skin conditions. The most common skin infections are caused by streptococcus species and staphylococcus aureus. Traditional medicine uses plant juices and extracts topically as antibacterial and anti-inflammatory treatments for conditions like eczema, ringworm, and pruritus. This review article highlights herbal soap ingredients like neem, Tulsi, Shikakai, and Reetha, known for their antibacterial, antifungal, and anti-inflammatory properties. Neem, the primary ingredient, has therapeutic qualities including anti-inflammatory, anti-ulcer, antimalarial, antifungal, antibacterial, antioxidant, and anticarcinogenic properties. Tulsi, another key ingredient, lowers blood glucose levels, relieves respiratory conditions, reduces stress, increases stamina, and has antifungal properties. Reetha is a natural purifier, ideal for face wash and soap due to its saponin content, and helps treat psoriasis and eczema. Shikakai is effective against wrinkles and various skin infections, such as scabies. Ancient Ayurveda texts, like the Charaka Samhitha and Varnya Kashaya, describe using herbs for a radiant complexion. Herbs like seta, lata, chandana, nagkeshara, padmak, khus, yashtimadhu, manjistha, and sariva are used to purify the blood and eliminate vitiated doshas (vata, pitta, and kapha), which are believed to cause ailments and skin issues. Herbs such as khadira, abhaya, amalaki, haridra, bhallataka, saptaparna, karavira, vidanga, and jati are noted for treating skin conditions. Traditional natural ingredients like indigo and haldi were used for Bindi/tika and face packs, enhancing the cosmetic value of Ayurvedic products. With increasing awareness of skin functions and structure, as well as natural solutions for skin conditions, the importance of herbal cosmetics is growing. Ayurveda's reputation for effectively curing illnesses suggests that herbal cosmetic products will continue to gain popularity.

Herbal Soap:

Herbal soap is a type of soap that incorporates natural plant extracts, essential oils, and botanical ingredients, often derived from herbs. These soaps are crafted to harness the potential benefits of herbs for skincare. The formulation typically avoids synthetic chemicals and relies on the properties of herbs like neem, Reetha, lavender, aloe vera.

Skin Types and Basic skin care:

The requirements for the basic skin care

- a) Cleansing agent, which remove the dust, dead cells and dirt. that blockage the pores of the skin. Some of the common cleanser include vegetable oils like coconut, sesame and palm oil
- b) Use of toners: The toners help to tighten the skin and keep it from being exposed to many of the toxins that are floating in the air or other environmental pollutants some of the herbs used as toners are witch hazel, geranium, sage, lemon, ivy burdock and essential oil
- c) Moisturizing: The moisturizing helps the skin to become soft and supple. Moisturizing shows a healthy glow and are less prone to aging. Some of the herbal moisturizers include vegetable glycerin, sorbitol, rose water, jojoba oil, aloe vera and iris.

Table 1 – Skin types and their care

Skin type	Features	Herbal	Essential oils
Normal	Has even tone, soft, smooth texture, no visible pores or, blemishes and no greasy, patches or flaky areas. Has a clear, fine, textured, supple and, smooth surface which is, neither greasy nor dry.	Pomegranate leaves, juice, Herbal Face Pack, Gingil Oil	Chamomile Fennel, Geranium, Lavender, Lemon, Rose, Sandal Wood, Patchouli
Dry	Low Level of sebum and, prone to sensitivity. Has a parched look, feelsa, “tight Chapping and, cracking are signs of, extremely dry, dehydrated skin.	Aloe vera, Olive Oil, Calendula Comfrey	Chamomile Fennel, Geranium, Lavender, Lemon, Rose, Sandal Wood, Patchouli, Almond, Avocado
Oily	Shiny, thick and dull colored Chronically	Aloe vera, Burdock Root chamomile	Bergamot, Cypress Frankincense
Combination	Some parts of your face are dry or flaky, while the center part of your face, nose, chin, and forehead (called the Tzone) is oily. Combination skin can also describe conditions where wrinkles and breakouts or rosacea and dry skin are present at the same time	Witch Hazel, Menthol, Aloe Vera, Turmeric, Wheat Germ, Sweet Flag	Citrus Oils, Jasmine Oil, Sandal

General Characteristics of Soap

Soap is a widely used and familiar cleaning product, defined variously by different authors. According to Warra (2019), soap is any cleaning agent produced in forms such as granules, bars, flakes, or liquid, made by reacting potassium or sodium salts with naturally occurring fatty acids (salts of non-volatile fatty acids). Any water-soluble fatty acid salt with eight or more carbon atoms can also be referred to as soap. Soaps are designed for many purposes, including cleaning, bathing, and medicinal use. The cleaning effect of soap comes from the negative ions on the hydrocarbon chain connected to the carboxylic group of the fatty acids. The hydrocarbon chain attracts grease and oil, while the carboxylic group has an affinity for water, making soap effective when used with water. To enhance its application, additional compounds are often added to the basic soap formula. For instance, medicated soaps include substances with medicinal value. The discovery and development of soap, in the sense of a substance made by reacting fats and oils with a base, have been significant throughout human history. However, the benefits of soap were not immediately recognized, and its discovery was likely accidental. Judging ancient civilizations based on their knowledge of soap, as Liebig and others have done, is difficult because many cultures developed cleaning agents independently. For example, the Fanti of West Africa and the Gauls of the first century A.D. seemed to have discovered soap independently, while the Egyptians and Greeks did not use soap as we know it. Instead, these civilizations used various substances like alkalis, tallow, and vegetable oils in their therapeutic formulations. According to the Papyrus Ebers, these ointments were used to treat herpes and reduce fat around the eyes. Lead plasters were also common. The Berlin Papyrus contains recipes for ointments made from natron and tallow, while Hippocrates used mixtures of soda and oil as purgatives. Early records suggest that the Assyrians washed their heads with a concoction of castor oil and alkali. Moreover, almost every ancient culture knew how to produce alkaline lyes from plant ashes, although the widespread production of soap as we know it did not begin until the Christian era.

S.no	Author name	Work done
1.	Prashant, L., Kole et al	The purpose of this study was to assess the effects of neem leaf extracts in three different forms: aqueous, ethanolic, and ethyl acetate. Reetha, neem, Shikekai, and Tulsi were employed as herbal soap ingredients; neem leaf and seed were found to be effective against certain dermatophytes. Tulsi demonstrates antiviral activity, while Shikeki and Reetha function as a detergent and have cleaning and foaming properties.
2.	Dr.A. Seetha Devi	People are most susceptible to bacterial skin infections, which need careful attention both during treatment and in order to maintain healthy skin. It has been discovered that certain plant extracts and their oils have antibacterial properties. The current study's goal is to create and assess antibacterial herbal soap using oils from <i>Azadirachta indica</i> and <i>Ocimum tenuiflorum</i> .
3.	Safal Sharma	The study's findings support the notion that the cold process method can be used to formulate herbal soap while taking into account a variety of factors, including skin type and the potential and activity of the herbs. This sought of herbal formulation can bring a big difference in the field of herbal cosmetic as there are many alignment and related flaws in different polyherbal or chemical-based formulations which can be removed.
4.	Pradeep Dwived	Herbs are used in herbal soap to provide a natural fragrance, heal and soothe the skin, and reduce stress and anxiety through aromatherapy, among other advantages. Herbal soap's natural ingredients have antibacterial, antifungal, and anti-inflammatory qualities that help treat a variety of skin issues, including psoriasis, eczema, and acne.
5.	Sushlita Pradhan	The ultimate objective of this study is to create and assess herbal bath soap using extracts from a variety of bioactive herbal plants, including <i>Solanum lycopersicum</i> , <i>Sapindus mukorossi</i> , <i>Acacia nilotica</i> , <i>Citrus limon</i> , <i>Aloe barbadensis</i> , <i>Piper betle</i> , <i>Curcuma longa</i> , and <i>Cocus nuucifera</i> , which have varying ethnomic and dermatological significance in Ayurveda.
6.	Munde Govind Anant, Dr. Hingane L.D., Miss. Shinde R	Neem offers additional therapeutic benefits. Anti-inflammatory, anti-hypergyasemic, anti-ulcer, antimalarial, antifungal, antibacterial, antimutagenic, and anticarcinogenic properties have been shown for neem leaves and their chemical constituents. The aloe plant yields a substance that is used in cosmetic products and is used to treat psoriasis, acne, burns, and other skin conditions. Use of tocopheryl acetate in cosmetics. Tocopheryl acetate's antioxidant qualities have an anti-inflammatory and anti-free radical effect, which can help shield skin from UV damage. Tulshi provides numerous skin-benefiting benefits, such as beep-clean skin.

MATERIAL AND METHODS:

Chemicals:

These include stearic acid, soft paraffin, ethanol, orange oil.

Collection, identification and processing of plant:

From various mature plants, the leaves of *Azadiracta indica*, *Ocimum tenuiflorum*, *Sapindus mukorossi* seeds, and *Acacia concinna* pods were obtained. For the experiments, the leaves were ground, dried in a hot air oven, and kept in airtight bottles

Pharmacological Effect on Human body

herbalsoaps have a variety of properties that make them beneficial for skin care. These properties include: Antibacterial herbal soaps have various pharmacological effects on the human body due to their natural active ingredients. Here are the primary pharmacological effects:

1. Antibacterial Action

Herbal soaps containing ingredients like neem, tea tree oil, and eucalyptus oil have potent antibacterial properties. These components can:

- Inhibit the growth of bacteria on the skin.
- Prevent infections by killing or inhibiting pathogenic bacteria such as *Staphylococcus aureus* and *Streptococcus* species.
- Help in maintaining skin hygiene by reducing bacterial load.

2. Anti-inflammatory Effects

Ingredients such as aloe vera, chamomile, and calendula in herbal soaps possess anti-inflammatory properties that:

- Reduce skin inflammation and redness.
- Soothe irritated skin, making them suitable for conditions like eczema and dermatitis.
- Aid in the healing of minor wounds and burns by reducing the inflammatory response.

3. Antioxidant Properties

Herbal soaps often contain antioxidants from ingredients like green tea, rosemary, and turmeric. These antioxidants:

- Protect the skin from oxidative stress caused by free radicals.
- Help in preventing premature aging by protecting skin cells from damage.
- Support overall skin health and resilience.

4. Moisturizing and Hydrating

Natural oils and butters (such as coconut oil, olive oil, and shea butter) in herbal soaps provide moisturizing effects:

- Hydrate the skin by forming a protective barrier that prevents moisture loss.
- Nourish the skin, making it soft and supple.
- Help in the management of dry skin conditions.

5. Wound Healing

Herbal ingredients like honey, aloe vera, and lavender have wound healing properties that:

- Promote faster healing of cuts, abrasions, and minor wounds.
- Provide antiseptic benefits, reducing the risk of infection in wounds.
- Enhance tissue regeneration and repair.

6. Soothing and Calming

Ingredients like lavender, chamomile, and peppermint in herbal soaps provide soothing and calming effects:

- Relieve skin irritation and itching.
- Provide a calming effect on the skin and senses, beneficial for stress-related skin issues.
- Reduce symptoms of conditions like psoriasis and dermatitis.

7. Exfoliating

Some herbal soaps include natural exfoliants like oatmeal, crushed almonds, or poppy seeds that:

- Help remove dead skin cells.
- Promote a smoother and more radiant complexion.
- Prevent clogged pores and reduce the occurrence of acne.

8. Antifungal Effects

Herbs such as neem, tea tree oil, and thyme in herbal soaps have antifungal properties that:

- Help treat and prevent fungal infections like athlete's foot and ringworm.
- Maintain a healthy balance of skin flora, preventing fungal overgrowth.

9. Aromatic and Aromatherapeutic Benefits

Essential oils used in herbal soaps provide aromatherapeutic benefits:

- Enhance the sensory experience of bathing, contributing to mental relaxation and stress relief.
- Certain essential oils, like eucalyptus and peppermint, can clear nasal passages and improve respiratory function when inhaled during a bath.

10. Detoxifying

Some herbal soaps include detoxifying ingredients like activated charcoal and clay that:

- Draw out impurities and toxins from the skin.
- Unclog pores and absorb excess oil, which is beneficial for acne-prone skin.
- Leave the skin feeling fresh and clean without stripping natural oils.

Active pharmaceutical ingredients

S.no	API	Chemical constituents
1.	Neem	Azadirachtin, Nimbin , Nimbodin, Salanin, Quercetin
2.	Tulsi	Oleanolic acid, Ursolic acid, Rosmarinic acid, Eugenol
3.	Reetha	Saponins, Sugars, Mucilage
4.	Shikekai	Lupeol, Spinasterol, Acacic acid, Lactone, Arabinose

INGREDIENTS USED IN HERBAL SOAP

1: **Neem** (*Azadiracta indica*)

Neem is often used as an ingredient in herbal soaps. It's known for its antibacterial and antifungal properties, which can help with various skin issues. Using neem in soap can be a great way to take advantage of its benefits while cleansing your skin



Fig 1: (Neem)

2: Tulsi (Ocimum tenuiflorum)

Tulsi is used in herbal soap; it can help cleanse and purify the skin. It has antimicrobial properties that can combat bacteria and prevent skin infections. Tulsi is also rich in antioxidants, which can help protect the skin from damage caused by free radicals and environmental stressors. Additionally, Tulsi has soothing properties that can help calm irritated skin and reduce inflammation. It can also promote a healthy glow and even out the skin tone. It's refreshing aroma can also provide a pleasant and uplifting experience while using the soap. Overall, incorporating Tulsi in herbal soap can be a wonderful way to enhance your skincare routine. It offers a range of benefits, from cleansing and purifying to soothing and rejuvenating the skin.



Fig 2: (Tulsi)

3: Reetha (Sapindus mukorossi)

reetha is used in herbal soap, it creates a rich lather that effectively cleanses the skin without stripping away its natural oils. It's especially beneficial for those with sensitive skin or scalp conditions like dandruff or eczema. Reetha contains saponins, which have natural foaming and cleansing properties. It can help remove dirt, excess oil, and impurities from the skin, leaving it feeling fresh and revitalized. Reetha is also known for its mild exfoliating effect, which can help unclog pores and promote a smoother complexion. Using reetha in herbal soap is a wonderful way to incorporate a natural and gentle cleanser into your skincare routine.



Fig 3: (Reetha)

4 : Shikekai (Acacia concinna)

Shikekai is used in herbal soap, it offers several benefits for the skin. It is known for its cleansing and conditioning properties, making it a great choice for those with dry or damaged skin. Shikekai helps to remove dirt, excess oil, and impurities from the skin while maintaining its natural moisture balance. Additionally, shikekai is rich in vitamins and antioxidants, which can help nourish and protect the skin. It can promote a healthy and radiant complexion, leaving the skin feeling soft and rejuvenated. Shikekai is also known to have soothing properties, which can help calm irritation and inflammation. Using shikekai in herbal soap is a wonderful way to incorporate a natural and gentle cleanser into your skincare routine.



Fig 4: (Shikekai)

The formula shown in table 4 is suited for the preparation of herbal soap.

Table no : 4

Sr.no	Ingredients	Use
1.	Stearic Acid	Hardening
2.	Soft Paraffin	Hardening
3.	Ethanol	Solvent
4.	Reetha	Surfactant
5.	Shikekai	Cleanser
6.	Tulsi	Anti viral
7.	Orange oil	Perfume

Comparison between Herbal soap and Cosmetic soap

Criteria	Herbal Soap	Cosmetic Soap
Ingredients	Natural plant extracts, essential oils, natural fats	Synthetic ingredients, fragrances, colorants, preservatives
Purpose	Therapeutic benefits (moisturizing, healing, soothing)	Cleaning and beautifying (emphasizing fragrance and appearance)
Chemical Content	Free from harsh chemicals, parabens, sulfates	May contain sodium lauryl sulfate (SLS), parabens, synthetic fragrances, and colorants
Skin Benefits	Anti-inflammatory, antibacterial, antioxidant properties	Primarily cosmetic benefits, such as smooth skin and pleasant scent
Environmental Impact	Environmentally friendly, biodegradable ingredients	Larger environmental footprint, non-biodegradable ingredients
Price	Often more expensive due to high-quality, natural ingredients	Generally cheaper and widely available due to mass production
Usage	Ideal for sensitive skin and treating skin conditions (eczema, acne)	Preferred for convenient, fragrant, and aesthetically pleasing products
Preservatives	Uses natural preservatives if needed	Uses synthetic preservatives for longer shelf life
Overall Focus	Natural, gentle, and therapeutic skincare	Convenient, aesthetic enhancement, and mass-market appeal

Method of formulation

1. Cut and melt the glycerin soap in microwave.
2. Add few drops of essential oils to add fragrance.
3. Grind dried herbs to mix them into liquid glycerin.
4. Pour the soap mixture into soap moulds.
5. Then after let the soap cool at room temperature for about 1 to 2 hrs.
6. Remove the bars of soap from the soap moulds.

Evaluations

The herbal soap formulated was evaluated for the following:

1. Organoleptic Evaluation:

- a) Color:
- b) Odor:
- c) Appearance:

2. Physical evaluation

The herbal soap formulated was evaluated for the following properties:

- a) pH: the pH was determined by using pH paper and pH meter.
- b) Foam retention: .
- c) Foam height:

REFERENCES:

1. Hughes, G.R., J.Soc. Cosmet. Chem., 1959, X, 159.
2. Encyclopedia Britannica, 14th Edn; 1929.
3. Kapoor., Herbal Cosmetics for Skin and Hair Care, Natural Product Radiance, p 306-314.
4. Harry R.G, In: Modern Cosmetology, Vol 1(Revision Eds), Wilkinson J.B., Clark.R., Green E., Mclaughlin T.P., 1962, Leonard Hill (Books) Ltd, London.
5. Sankholkar.D.S. S, Current Regulations and Suggested Way Forward, The Pharma Times, Vol.41, No.8,2009, p 30-31
6. Kareru, P. G., Keriko, J. M., Kenji, G. M., Thiong'o, G. T., Gachanja, A. N., and Mukiira, H. N. (2010). Antimicrobial activities of skincare preparations from plant extracts. African Journal of Traditional, Complementary and Alternative Medicines, 7(3).
7. Bandyopadhyay, U., Biswas, K., Sengupta, A., Moitra, P., Dutta, P., Sarkar, D., ... and Banerjee, R. K. (2004). Clinical studies on the effect of Neem (*Azadirachta indica*) bark extract on gastric secretion and gastroduodenal ulcer. Life Sciences, 75(24), 2867-2878.
8. Sharma, J., Gairola, S., Sharma, Y. P., and Gaur, R. D. (2014). Ethnomedicinal plants used to treat skin diseases by Tharu community of district Udham Singh Nagar, Uttarakhand, India. Journal of Ethnopharmacology, 158, 140-206.
9. Kapoor, V. P. (2005). Herbal cosmetics for skin and hair care.4(4). 306-315.
10. Charaka Samhita, Handbook on Ayurveda, Editor, Gabriel Van Loon, 2002-2003 Vol 1.
11. Prashant, L., Kole et al, Cosmetics potential of herbal Extracts, natural Product Radiance, Vol 4(4), 2005, p 315-321.
12. The Wealth of India: A Dictionary of Indian raw Materials and Industrial products- Raw materials Series, Publication and Information Directorate, CSIR, New Delhi, Vols I-XI, 1948-1976; Revised Series IA, 1985; 2B, 1988; 3 Ca-Ci, 1992.
13. Chopra R.N., Nayar S.I., Chopra I.C., Glossary of Indian Medicinal Plants, Publications and Information Directorate, CSIR, New Delhi, 1956.

14. D'Amelio F.S, Sr, In: Botanicals A Phyto cosmetic Desk Reference (Ed. FS D'Amelio, Sr), 1999, CRC Press, London.
15. Kumar S, Medicinal Plants in Skin Care Director, Central Institute of Medicinal and Aromatic Plants, Lucknow, 1994.
16. Thakur R.S., Puri, H.S., Hussain, A, In: Major Medicinal Plants of India, 1989, CIMAP, Lucknow.
17. The British herbal Pharmacopoeia, British Herbal Medicine Association, 1996.
18. Ceres A, The healing power of herbal teas. Thorson's Publishers, London, 1984.
19. Warra, A. A. (2013) Soap making in Nigeria using indigenous technology and raw materials, African Journal of Pure and Applied Chemistry, 7(4): 139-145
20. Okeke, S. U. N. (2009) Home economics for schools and colleges, Onitsha: Africana First publishers Plc Nigeria
21. Adaku, U. and Melody, M. (2013) Soap Production Using Waste Materials of Cassava Peel and Plantain Peel Ash as an Alternative Active Ingredient, Implication for Entrepreneurship, IOSR Journal of VLSI and Signal Processing,3(3): 2319 – 4197
22. Antezana, W., Calve, S., Beccaccia, A., Ferrer, P., Blas, C. D., Rebollar, P. G. and Cerisuelo, A. (2015) Effects of nutrition on digestion efficiency and gaseous emissions from slurry in growing pigs: III. Influence of varying the dietary level of calcium soap of palm fatty acids distillate with or without orange pulp supplementation, Animal Feed Science and Technology, 209: 128-136
23. Phanseil, O. N., Dueno, E. and Xianghong, W. Q. (1998) Synthesis of exotic soaps in the chemistry laboratory, Journal of Chemistry Education, 75(5): 612
24. Kuntom, A., Siew, W. L. and Tan, V. A. (1994) Characterization of Palm acid oil, Journal of American Oil and Chemical Society, 71: 525-528
25. C. P. Bryan, The Papyrus Eber, London, 1930, 12, 139, etc.
26. J. R. Partington, Origine and Development of Applied Chemistry, London, 1933, 198.R. von Grot, Historische Studio aus dem Phannabologischen Institute, Hallo, 1889, i, 94
27. R. C. Thompson, Assyrian Herbal, London, 1924, 191, 270. Pliny, Natural History, lib. XXVIII, emp. 51.
28. Panda, H. (2011). Herbal soaps and detergents handbook. NIIR Project Consultancy Services
29. Reddy, Y. R. R., Kumari, C. K., Lokanatha, O., Mamatha, S., and Reddy, C. D. (2013). Antimicrobial activity of Azadirachta Indica (neem) leaf, bark and seed extracts. Int. J. Res. Phytochem. Pharmacol, 3(1), 1-4.
30. Joshi, M. G., Kamat, D. V., and Kamat, S. D. (2008). Evaluation of herbal Handwash Formulation.7 (5), 413-15.
31. Kumar, K. P., Bhowmik, D., Tripathi, K. K., and Chandira, M. (2010). Traditional Indian Herbal Plants Tulsi and Its Medicinal Importance. Research Journal of Pharmacognosy and Phytochemistry, 2(2), 93-101
32. Afsar, Z., Khanam, S., and Aamir, S. (2018) Formulation and comparative evaluation of polyherbal preparations for their Disinfectant Effects, 1 (1), 54-65.
33. Dhanasekaran, M. (2016) International Research Journal of Pharmacy. 7(2), 31-35