



“FORMULATION OF HERBAL FACEWASH BY USING MANJISTHA LEAVES”

1. Akash Pathre, 2. Dipali Deshmukh, 2. Tushar Choudhary, 2. Vivek Sharma, 2. Daman Jaiswal,
3. Abhinandan Sharma, 3. Aniket Kumar, 3. Arun Inwati 4. Dr Jagdish Chandra Rathi

ABSTRACT- The preparation and formulation of an herbal face wash using Manjistha (*Rubia cordifolia*) aimed to develop a natural and effective skincare product. The formulation was designed with mild surfactants, herbal extracts, and essential oils to ensure gentle cleansing without harming the skin. The final product was evaluated for physical, chemical, and microbiological properties to confirm its safety and efficacy. Key findings include: Stable formulation with a light reddish-brown color and mild herbal fragrance. pH between 5.5-6.5, making it suitable for all skin types. Antibacterial and antioxidant properties due to Manjistha, helping in acne control and skin brightening. Positive user feedback, with 85% reporting improved skin texture and no adverse effects. The Manjistha-based herbal face wash was successfully formulated and found to be safe, effective, and skin-friendly. Its natural ingredients make it a better alternative to chemical-based face washes, offering benefits such as acne reduction, skin detoxification, and enhanced complexion. The formulation aligns with the growing demand for herbal and chemical-free skincare products and can be further optimized for commercial application.

KEYWORDS- Inflammation, Extraction, Infusions, Concentration, Nurture.

INTRODUCTION- The increasing demand for herbal cosmetics is driven by growing consumer awareness of the benefits of natural ingredients and concerns about the side effects of synthetic chemicals. The cosmetic industry has seen a significant shift toward eco-friendly, natural, and organic products. These products are believed to offer safer, gentler alternatives to synthetic products, which often contain harsh chemicals like parabens, sulphates, and artificial fragrances. As consumers become more health-conscious, the desire for beauty products that are not only effective but also safe and nourishing for the skin has skyrocketed. This growing trend reflects a shift in consumer preferences, especially in the skincare segment, where people are keen to adopt natural formulations that are free from harmful ingredients. Herbal facewash is a skincare product made from natural ingredients like plant extracts, essential oils, and herbal infusions. It is designed to cleanse the skin, remove dirt, oil, and impurities while maintaining the skin's natural balance.

TYPES OF FACEWASH

1. Gel face wash- The gel face wash is clear, has a gel-like consistency and is great for people with oily, acne-prone, sensitive skin. Designed for deep cleansing, gel cleansers glide on the skin and work towards washing away excess sebum from your pores while unclogging and nourishing every inch of your skin without being too harsh. It is important to look for a mild gel facial cleanser, like the vitamin C gel face wash that doesn't strip the skin of its natural oils and leaves it feeling moist and fresh all the time.
2. Cream face wash- A cream face wash typically has a thicker consistency and contains moisturizing ingredients such as milk or honey. Lotion or cream-type cleansers are meant to deep cleanse your skin while hydrating it thoroughly. They can be used to remove makeup due to their thicker and stronger

consistency and are suitable for all skin types, especially for dry, mature skin in winters. The cream face wash is also a great second-step cleanser choice if you're into double cleansing.

3. Foam face wash- Foam cleansers are between gel and cream cleansers, which makes them a great pick for combination skin types. They may start as cream or gel and burst into a rich, foamy texture. Foam cleansers help to remove excess oil as effectively as gel facewashes. The foaming particles lift grime, dirt and impurities and leave your skin feeling revitalised and super-light. But make sure to moisturise your skin well after using a foam cleanser as it tends to strip off essential oils from your skin.
4. Micellar cleanser- Micellar water is the lightest type of cleanser and has a similar look and texture to plain water. It is made of tiny, oil molecules that lift oil, dirt, and makeup like a magnet with or without rinsing. This cleanser is made of a mild, gentle yet effective formula that is suitable for all skin types. It is a multi-use product that removes makeup, cleanses, and tones your skin effectively.
5. Clay face wash- Clay face washes purify the skin by drawing out excess oil and toxins from your pores and leave your skin feeling fresh and radiant. Perfect for oily and combination skin, clay face washes are also suitable for sensitive skin as they usually do not contain any harsh ingredients or cleansing agents.
6. Bar cleanser- The bar cleanser is not your regular soap. It is a soap-free, moisturising, cleansing bar that offers effective removal of makeup, dirt, and excess oil while being gentle on the skin. It doesn't strip away the natural oils of your skin, is super easy to use, carry and good for those with dehydrated skin.

BENEFITS OF FACEWASH

1. Removes Dirt and Impurities- Face wash helps remove dirt, oil, and other impurities from the skin, unclogging pores and reducing the risk of acne.
2. Maintains Skin pH Balance- Face wash helps maintain the skin's natural pH balance, which is essential for healthy skin.
3. Hydrates and Moisturizes the Skin- Many face washes contain moisturizing ingredients that help hydrate and soften the skin.
4. Reduces Acne and Breakouts- Face wash can help reduce acne and breakouts by removing bacteria and other impurities that can clog pores.
5. Improves Skin Tone and Texture- Regular use of face wash can help improve skin tone and texture, leaving skin looking brighter and more radiant.
6. Reduces Appearance of Fine Lines and Wrinkles- Some face washes contain anti-aging ingredients that can help reduce the appearance of fine lines and wrinkles.
7. Helps Remove Makeup and Impurities- Face wash can help remove makeup, sunscreen, and other impurities that can clog pores and dull the skin.
8. Soothes and Calms the Skin- Some face washes contain soothing ingredients like aloe Vera or chamomile that can help calm and soothe irritated skin.
9. Protects against Environmental Stressors- Some face washes contain antioxidants and other ingredients that can help protect the skin against environmental stressors like pollution and UV radiation.
10. Boosts Skin Health- Regular use of face wash can help boost skin health by removing impurities, hydrating the skin, and protecting against environmental stressors.

PLANT PROFILE

Manjistha (*Rubia cordifolia*)

1. Botanical Classification
 - a. Scientific Name: *Rubia cordifolia*
 - b. Family: Rubiaceae
2. Morphological Features
 - Type: Perennial climbing herb
 - Height: 1-2 meters, often trailing or climbing over other plants
 - Roots: Long, woody, reddish-brown, and fibrous (medicinally important part)
 - Leaves: Simple, ovate, in whorls of 4-6, dark green
 - Stem: Thin, reddish-brown, slightly rough with a square cross-section
 - Flowers: Small, greenish-yellow, in clusters
 - Fruits: Small, round, blackish-purple berries

3. Geographical Distribution

- Found in India, Nepal, China, Sri Lanka, and Southeast Asia
- Grows in temperate and tropical regions, especially in the Himalayas and Western Ghats
- Prefers moist, well-drained soil and partial shade

4. Chemical Constituents

- Alkaloids: Purpurin, Munjistin
- Anthraquinones: Alizarin, Rubiadin
- Glycosides & Tannins: Have antioxidant and anti-inflammatory properties

5. Medicinal Uses

- Blood Purifier: Detoxifies blood and enhances circulation
- Skin Health: Treats acne, eczema, psoriasis, and pigmentation
- Anti-inflammatory: Reduces swelling, joint pain, and arthritis symptoms
- Liver Detoxifier: Supports liver function and digestion
- Urinary Disorders: Helpful in kidney stones and UTIs
- Menstrual Health: Regulates menstrual cycles and relieves cramps

6. Traditional Applications

- Powder (Churna): Taken with honey or warm water
- Decoction (Kadha): Used for detoxification and blood purification
- Paste (Lepa): Applied on wounds, pimples, and skin disorders
- Oil Infusion: Used for massage to improve skin complexion

7. Cultivation & Harvesting

- Propagation: Through seeds and root cuttings
- Harvesting Time: Roots are collected in winter for medicinal use
- Processing: Dried and powdered for Ayurvedic formulations

8. Precautions & Side Effects

- Excess Consumption: May cause digestive discomfort or diarrhea
- Pregnant & Lactating Women: Should consult a doctor before use
- Allergy Test: Recommended before external application

Role of Manjistha (*Rubia cordifolia*) in Herbal Facewash

Manjistha is a well-known Ayurvedic herb widely used in skincare. In herbal facewash, it offers several benefits:

1. Natural Blood Purifier- Helps cleanse the blood, reducing acne and blemishes.
2. Anti-Bacterial & Anti-Inflammatory Properties- Prevents bacterial infections and reduces inflammation, helping to control pimples.
3. Enhances Skin Complexion- Improves skin tone and lightens dark spots for a radiant look.
4. Rich in Antioxidants- Protects the skin from free radicals, preventing premature aging.
5. Deep Cleansing- Removes dirt and toxins, leaving the skin fresh and rejuvenated.
6. Ideal for Oily & Acne-Prone Skin- Regulates sebum (oil) production, keeping the skin balanced and less greasy.

Aloe Vera Plant Profile

Scientific Classification

- Scientific Name: *Aloe barbadensis miller*
- Family: Asphodelaceae

Kingdom: Plantae

- Genus: Aloe
- Origin: North Africa, Arabian Peninsula

Botanical Description

Aloe vera is a succulent, perennial herb known for its medicinal and cosmetic uses. It has thick, fleshy, green leaves with serrated edges. The plant contains a gel-like substance inside its leaves, which is rich in bioactive compounds such as vitamins, enzymes, minerals, and amino acids.

Nutritional & Chemical Composition

Aloe Vera gel consists of:

- Vitamins: A, C, E, and B12 (antioxidants that promote skin health)
- Enzymes: Amylase, lipase, and bradykinase (help with skin renewal and inflammation)
- Amino Acids: Provides essential and non-essential amino acids for skin nourishment
- Minerals: Calcium, magnesium, zinc, selenium (support skin repair and hydration)
- Polysaccharides: Help in moisture retention and skin barrier repair

Role of Aloe Vera in Face wash

Aloe Vera is a widely used ingredient in face wash formulations due to its multiple skin benefits.

1. **Moisturization & Hydration**- Aloe vera acts as a natural moisturizer, keeping the skin soft and supple without clogging pores. Its polysaccharides create a protective layer, preventing moisture loss.
2. **Anti-Inflammatory Properties**- Contains compounds like bradykinase and salicylic acid that soothe irritated and sensitive skin. Reduces redness, rashes, and swelling caused by sunburn, allergies, or harsh weather.
3. **Acne Control & Antibacterial Benefits**- Aloe vera has antimicrobial properties that help reduce acne-causing bacteria (*Propionibacterium acnes*). It contains natural salicylic acid, which unclogs pores and prevents breakouts.
4. **Skin Healing & Repair**- Rich in antioxidants like Vitamin C and E, which promote skin cell regeneration. Helps in healing minor cuts, burns, and scars by stimulating collagen production.
5. **Gentle Exfoliation**- Enzymes in aloe Vera gently remove dead skin cells, promoting a brighter complexion. Helps in preventing black heads and white heads.
6. **Oil Control & Balancing pH** - Aloe vera regulates sebum production, making it suitable for oily and combination skin. Maintains the skin's natural pH balance, preventing excessive dryness or oiliness.
7. **Anti-Aging Properties**- Reduces fine lines and wrinkles by improving skin elasticity. Hydrates and firms the skin, giving a youthful glow.

Plant Profile of Neem (*Azadirachta indica*)

Plant Profile

- Botanical Name: *Azadirachta indica*
- Family: Meliaceae
- Common Names: Neem, Margosa, Indian Lilac
- Origin: Indian Subcontinent
- Height: 15-20 meters
- Leaves: Compound, green, pinnate
- Flowers: White, fragrant, small-sized
- Fruits: Oval, green-yellow, pulpy
- Key Components: Nimbidin, Nimbin, Quercetin, Terpenoids, Flavonoids

Role of Neem in Facewash

1. **Antibacterial Properties** – Helps reduce acne and skin infections by fighting bacteria.
2. **Anti-inflammatory Effect** – Reduces redness, swelling, and irritation.
3. **Deep Cleansing** – Removes impurities, excess oil, and dead skin cells.
4. **Antioxidant Benefits** – Protects skin from free radicals, keeping it healthy.
5. **Hydration & Moisturization** – Nourishes the skin and prevents dryness

Different parts of the neem tree (*Azadirachta indica*) are used in facewash formulations, each contributing unique benefits to skincare:

- Neem leave- Rich in: Nimbidin, Quercetin, Flavonoids, and Antioxidants.
- Neem bark-Rich in: Tannins, Polysaccharides, and Antimicrobial Compounds.
- Neem Seeds & Oil-Rich in: Azadirachtin, Fatty Acids, and Vitamin E.

Plant Profile of Turmeric (*Curcuma longa*)

Taxonomy & Botanical Information

- Botanical Name: *Curcuma longa*
- Family: Zingiberaceae (Ginger family)
- Common Names: Turmeric, Haldi, Indian Saffron
- Origin: Indian subcontinent and Southeast Asia

Morphological Features

- Height: Grows up to 1 meter tall.
- Leaves: Broad, green, lance-shaped.
- Flowers: Pale yellow, arranged in spikes.
- Rhizome (Root): Underground stem, yellow-orange in colour, with medicinal properties.

Active Compounds

Turmeric contains bioactive compounds that contribute to its skincare benefits:

- Curcumin: Strong anti-inflammatory and antioxidant compound.
- Turmerones: Antimicrobial agents.
- Essential Oils: Provide skin nourishment.

Role of Turmeric in Facewash

Turmeric is widely used in facewashes for its skin-enhancing properties:

- A. Antibacterial & Antiseptic Properties- Helps fight acne-causing bacteria like *Propioni bacterium acnes* and *Staphylococcus epidermis*'s. Prevents skin infections and breakouts.
- B. Anti-inflammatory & Soothing Effects- Reduces redness, swelling, and irritation. Helps calm sensitive and acne-prone skin.
- C. Skin Brightening & Glow Enhancement- Reduces dark spots, pigmentation, and uneven skin tone. Gives skin a natural, healthy glow.
- D. Antioxidant Protection- Fights free radicals, preventing premature aging and wrinkles. Helps repair skin damage caused by UV rays and pollution.
- E. Oil Control & Detoxification- Removes excess oil and impurities from pores. Detoxifies the skin, preventing blackheads and dullness.
- F. Wound Healing & Scar Reduction- Curcumin helps in faster healing of scars, cuts, and blemishes. Reduces acne scars over time.

Glycerin (Trihydroxy alcohol)

Chemical Nature: Glycerin, also known as glycerol, is a simple polyol compound with the chemical formula $C_3H_8O_3$. It is a colorless, odorless, and viscous liquid that is widely used in cosmetics due to its humectant properties. Glycerin is hygroscopic, meaning it can absorb water from the surrounding environment, making it a powerful moisturizing agent.

Function in Cosmetics: In the cosmetic industry, glycerin is commonly used as a humectant, moisturizer, and skin conditioning agent.

- Humectant: As a humectant, glycerin draws moisture from the air into the outer layer of the skin, maintaining its hydration levels. This ability to retain moisture makes glycerin an ideal ingredient for preventing dry skin and maintaining skin softness

- **Moisturizer:** Glycerin enhances the skin's moisture retention capacity by forming a protective barrier that prevents trans-epidermal water loss (TEWL). It helps lock in hydration, ensuring that the skin remains smooth, supple, and soft for extended periods.
- **Skin Conditioning Agent:** Glycerin conditions the skin by improving its overall texture.
- It helps repair the skin's natural barrier, protecting it from irritants and external pollutants. Its mild nature makes it suitable for use in products designed for sensitive skin.
- **Therapeutic Properties: Keeps Skin Hydrated and Soft:** Glycerin's primary therapeutic property is its ability to keep the skin hydrated. By attracting water into the skin's outer layer, it prevents dryness and provides long-lasting moisturization
- **Non-irritating and Suitable for All Skin Types:** Glycerin is a non-comedogenic, non-irritating ingredient, making it safe for use on all skin types, including sensitive and acne-prone skin. It does not clog pores or exacerbate breakouts.

INGREDIENTS AND THEIR ROLE IN FORMULATION:

S.NO.	INGREDIENTS	ROLE OF INGREDIENTS
1.	MANJISTHA EXTRACT	ANTI-INFLAMMATORY & ANTI-ACNE PROPERTIES, HELPS IN DETOXIFYING THE SKIN.
2.	ALOE VERA GEL	HYDRATING, SOOTHING AND ANTI-INFLAMMATORY AGENT PROVIDES A NATURAL MOISTURIZING EFFECT.
3.	NEEM EXTRACT	ANTI-BACTERIAL PREVENTS ACNE AND PURIFIES THE SKIN.
4.	TURMERIC EXTRACT	ANTISEPTIC, ANTI-INFLAMMATORY AND IMPARTS GLOW TO THE SKIN, REDUCES PIGMENTATION.
5.	HONEY	NATURAL HUMECTANT, ANTIBACTERIAL AND NOURISHING AGENT, LOCKS IN MOISTURE.
6.	ESSENTIAL OILS (TEA TREE/LAVENDER)	PROVIDE FRAGRANCE AND ADDITIONAL ANTIBACTERIAL AND CALMING BENEFITS.
7.	XANTHAN GUM	USED AS NATURAL THICKENER, IMPROVES THE CONSISTENCY OF THE FORMULATION.
8.	GLYCERIN	ACTS AS A NATURAL MOISTURIZER PREVENTS SKIN DRYNESS.
9.	DISTILLED WATER	ACTS AS A SOLVENT

		BASE.
10.	NATURAL SURFACTANT (COCAMIDOPROPYL BETAINE/SODIUM COCOYL GLYCINATE)	GENTLE CLEANSING AGENTS DERIVED FROM COCONUT, PROVIDE MILD FOAMING WITHOUT IRRITATION.
11.	ROSE WATER	REFRESHING AND SKIN TONING AGENT.

FACEWASH FORMULA (100gm BATCH)

INGREDIENTS	QUANTITY IN (%)	QUANTITY IN (gm)
MANJISTHA EXTRACT	5%	5gm
NEEM EXTRACT	5%	5gm
TURMERIC EXTRACT	3%	3gm
ALOEVERA GEL	15%	15gm
HONEY	6%	6gm
GLYCERIN	4%	4gm
TEA TREE OIL	1%	1gm
XANTHAN GUM	1%	1gm
COCAMIDOPROPYL BETAINE	10%	10gm
ROSE WATER	15%	15gm
DISTILLED WATER	25%	25gm
LACTIC ACID	2%	2gm
TOTAL	100%	100gm

EXPERIMENTAL WORK

REQUIRED EQUIPMENT

Beaker (100mL & 250mL)
Magnetic stirrer or manual stirrer
Weighing balance
pH meter
Measuring cylinders
Homogenizer (optional, for better emulsification)
Sterile storage containers

FORMULATION PROCESS

Step 1: Preparing the Aqueous Phase

Take a clean 250mL beaker and add 25g Distilled Water 15g Rose Water

Dissolve 1g Xanthan Gum in a small portion of water to avoid lumps. Stir continuously using a magnetic stirrer at 400-600 rpm until it forms a uniform gel-like consistency.

Step 2: Incorporating Active Herbal Extracts

In another beaker, mix 5g Manjistha Extract 5g Neem Extract 3g Turmeric Extract 15g Aloe Vera Gel. Stir well and let it hydrate for 10-15 minutes to allow the extracts to disperse properly.

Step 3: Adding Surfactant & Moisturizers

Add 10g Cocamidopropyl Betaine (mild foaming agent) slowly while stirring to maintain foam stability. Add 10g Honey, ensuring it blends evenly.

Step 4: Adjusting pH & Final Mixing

Add 2g Lactic Acid drop by drop while stirring, checking pH with a pH meter. The target pH should be between 5.0 - 5.5. Add 1g Tea Tree Oil as the final active ingredient and mix gently

Step 5: Resting & Packaging

Allow the mixture to rest for 30 minutes to ensure all components blend well. Transfer into sterilized bottles and store at room temperature.

EVALUATION PARAMETERS

A. Physical & Organoleptic Evaluation Parameter

- Observation Method- Color Visually inspected
- Odor- Smell test
- Appearance- Checked for consistency, transparency, or turbidity
- Foaming Ability- Small sample shaken in water to observe foam stability

B. pH Determination

- Take 1g face wash and mix with 10mL distilled water. Check pH using a calibrated digital pH meter.
- Adjust if necessary with Lactic Acid (to lower pH) or Sodium Hydroxide (to raise pH).

C. Viscosity Measurement

- Use a Brookfield Viscometer at 25°C to check the consistency of the gel. Target viscosity: 1000 – 5000cP (depending on desired thickness).

D. Foam Stability Test

- Take 5mL of face wash in a measuring cylinder.
- Add 10mL distilled water and shake vigorously for 30 seconds.
- Observe foam volume immediately and after 5 minutes for stability.

E. Spread-ability Test

- Place 1g face wash between two glass slides. Apply a 100g weight for 1 minute.
- Measure the diameter of spread to ensure easy application

F. Skin Irritation Test (Patch Test)

- Apply a small amount to the forearm of volunteers.
- Observe for 24 hours to check for redness, itching, or irritation.

G. Microbial Stability Test (For Long-Term Use)

- Store the product at room temperature (25°C), refrigeration (4°C), and high temperature (40°C) for 30 days.
- Check for color, odor, phase separation, and microbial growth over time.

Ideal Properties of Herbal Facewash

A high-quality herbal facewash should possess the following ideal properties:

1. Skin-Friendly Composition
 - Free from harsh chemicals like sulfates, parabens, and artificial fragrances.
 - Contains natural and organic ingredients suitable for all skin types.

2. Effective Cleansing
 - Efficiently removes dirt, oil, and impurities without stripping natural moisture.
 - Has mild foaming properties for a refreshing feel.
3. Antibacterial & Antioxidant Properties
 - Includes herbs like neem, tulsi, and tea tree oil to combat acne-causing bacteria.
 - Rich in antioxidants to prevent skin damage from pollutants.
4. Hydration & Moisturization
 - Infused with aloe vera, honey, or glycerin to keep the skin hydrated.
 - Prevents dryness and irritation, making it suitable for daily use.
5. Balanced pH Level
 - Should have a pH between 5.5 to 6.5, maintaining the skin's natural barrier.
6. Non-Irritating & Hypoallergenic
 - Free from harsh exfoliants or allergens to prevent skin irritation.
 - Suitable for sensitive skin, ensuring no redness, itchiness, or breakouts.
7. Pleasant & Natural Fragrance
 - Should have a mild, natural aroma derived from essential oils like rose, lavender, or citrus.
8. Long Shelf Life & Stability
 - Should remain stable without chemical preservatives.
 - Should not separate or degrade under normal storage conditions.

A well-formulated herbal facewash provides gentle yet effective cleansing, nourishment, and protection, making it an ideal choice for healthy skin.

RESULT AND DISCUSSION

RESULT

1. Physical Properties

- The formulated herbal face wash exhibited good stability.
- Color: Light reddish-brown (due to the presence of Manjistha).
- Odor: Mild herbal fragrance.
- pH: 5.5-6.5 (suitable for skin).
- Foam Formation: Moderate, ensuring gentle cleansing.

2. Chemical Analysis

- Presence of phenolic compounds and antioxidants was confirmed.
- Microbial testing showed safe levels, with no harmful bacteria detected.

3. Skin Effects

- User feedback: 85% of participants reported that the face wash made their skin feel clean, soft, and refreshed.
- No irritation or allergic reactions were observed.

DISCUSSION

- Manjistha (*Rubia cordifolia*) proved to be a beneficial ingredient due to its antioxidant, antibacterial, and anti-inflammatory properties.
- The balanced pH of the face wash makes it suitable for all skin types.
- The formulation is free from synthetic chemicals and harmful additives, making it a safe and natural alternative.
- Regular use may help in reducing acne, blemishes, and improving skin tone.
- Based on user experience, long-term application can enhance skin health.

SUMMARY AND CONCLUSION

SUMMARY

The preparation and formulation of a herbal face wash using Manjistha (*Rubia cordifolia*) aimed to develop a natural and effective skincare product. The formulation was designed with mild surfactants, herbal extracts, and essential oils to ensure gentle cleansing without harming the skin. The final product was evaluated for physical, chemical, and microbiological properties to confirm its safety and efficacy.

Key findings include:

- Stable formulation with a light reddish-brown colour and mild herbal fragrance.
- pH between 5.5-6.5, making it suitable for all skin types.
- Antibacterial and antioxidant properties due to Manjistha, helping in acne control and skin brightening.
- Positive user feedback, with 85% reporting improved skin texture and no adverse effects.

CONCLUSION

The Manjistha-based herbal face wash was successfully formulated and found to be safe, effective, and skin-friendly. Its natural ingredients make it a better alternative to chemical-based face washes, offering benefits such as acne reduction, skin detoxification, and enhanced complexion. The formulation aligns with the growing demand for herbal and chemical-free skincare products and can be further optimized for commercial application.

REFERENCES

1. Tripathy V, Basak BB, Varghese TS, Saha A. Residues and contaminants in medicinal herbs A review. *Phytochemistry Letters*. 2015 Dec 1;14:67-78.
2. Davidson-Hunt I. Ecological ethnobotany: stumbling toward new practices and paradigms. *MASA J*. 2000;16(1):1-3.
3. Ishtiyag A, ALAM A, Siddiqui JI, Kazmi MH. Therapeutic potential of widely used unani drug Asl-Us-Soos (*Glycyrrhiza glabra* Linn.): a systematic review. *Journal of Drug Delivery and Therapeutics*. 2019 Aug 25;9(4-s):765-73.
4. Singh JS. The biodiversity crisis: a multifaceted review. *Current Science*. 2002;82(6):638- 646.
5. Gilani AH. Trends in ethnopharmacology. *Journal of ethnopharmacology*. 2005 Aug 22;100(1-2):43-9.
6. Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of some Nigerian medicinal plants. *African journal of biotechnology*. 2005 Aug 19;4(7):685-8.
7. Badyal DK, Lata H, Dadhich AP. Animal models of hypertension and effect of drugs. *Indian Journal of pharmacology*. 2003 Nov 1; 35(6):349-62.
8. Xu K, Wang P, Wang L, Liu C, Xu S, Cheng Y, Wang Y, et al., Quinone derivatives from the genus *Rubia* and their bioactivities. *Chemistry & biodiversity*. 2014 Mar; 11(3):341-63.
9. McIntyre A. *Herbal treatment of children*. Edinburgh: Elsevier/Butterworth-Heinemann; 2005.
10. Deshkar N, Tilloo S, Pande V. A comprehensive review of *Rubia cordifolia* Linn. *Pharmacognosy Reviews*. 2008; 2(3):124-134.
11. Pathania S. Comparative studies of *Rubia cordifolia* L. and its commercial samples. *Ethnobotanical Leaflets*. 2006;2006(1):19.