GSC Biological and Pharmaceutical Sciences
eISSN: 2581-3250 CODEN (USA): GBPSC2
Cross Ref DOI: 10.30574/gscbps
Journal homepage: https://gsconlinepress.com/journals/gscbps/

(RESEARCH ARTICLE)

Check for updates

To design and characterization of herbal soap from Manjistha and *Mimosa pudica* extract for melasma /hyperpigmentation

Ankit P. Godane *, Vidhi P. Nagbhire, Vaishnavi V. Dorlikar, Mayuri S. Rahangdale and Mauli R. Zirne

Manoharbhai Patel Institute of Pharmacy (B. Pharmacy) Kudwa, Gandia (MH)-441614.

GSC Biological and Pharmaceutical Sciences, 2025, 33(02), 119-131

Publication history: Received on 26 September 2025; revised on 05 November 2025; accepted on 07 November 2025

Article DOI: https://doi.org/10.30574/gscbps.2025.33.2.0429

Abstract

Herbal formulations are gaining increasing popularity due to their minimal side effects and skin-friendly nature. Among them, herbal soaps serve as a promising alternative to synthetic soaps that often cause skin irritation and dryness. This project focuses on the formulation and evaluation of an herbal soap using *Rubia cordifolia* (Manjistha) and *Mimosa pudica* (Mimosa), two medicinal plants known for their skin-healing, Skin lightening, anti-inflammatory, and antioxidant properties. The powdered form of the dried roots of Manjistha and leaves of Mimosa was extracted using the Soxhlet method with aqueous and hydroalcoholic solvents. The obtained extracts were incorporated into a standard soap base using the cold process method. The prepared herbal soap was evaluated for various parameters including foaming ability, pH, foam retention, total fatty matter, and irritation. Results indicated that the soap possessed suitable consistency, a skin-friendly pH, and good cleansing and lathering properties. This study concludes that the herbal soap formulated using Manjistha and Mimosa is a safe and potentially effective product for maintaining skin health and managing minor skin issues. Further in vivo studies are needed to confirm its therapeutic benefits.

Keywords: Herbal Soap; Hyperpigmentation; Melasma; Manjistha; Mimosa

1. Introduction

Herbal soaps are skin-purifying and skin-beautifying products. The primary benefit of utilizing herbal cosmetics is their purity, which leaves the body rich in nutrients and other beneficial minerals instead of causing any negative side effects. Individuals' skin and hair beauty is influenced by their health, lifestyle choices, regular occupation, environment, and upkeep. Summertime dehydration from prolonged heat contact to the skin results in wrinkles, freckles, blemishes, pigmentation, and sunburns.[1] Herbal soap preparation is a medicine that contains antibacterial, anti-aging, anti-oxidant, and anti-septic properties. It mainly uses parts of plants like seeds, rhizomes, nuts, leaves, flowers, and pulps to treatment for an injury or disease or to achieve good health. Herbal soap does not contain any artificial colour agents, flavour agents, fluorides, etc. [1] Herbs are natural products mostly found in the treatment of almost all diseases and skin problems owing to their high medicinal value, cost-effectiveness, availability, and compatibility. Most common diseases are Eczema, Acne, Rashes, Psoriasis, Allergy, dry skin, urticaria, etc. [2] the herbal remedies used for special skin problems are given in Special skin problem and Herbal Remedies. Soap is a common cleansing agent well known to everyone in the world. Many authors defined soap in different ways. Soap can also be said to be any water-soluble salt of fatty acids containing eight or more carbon atoms Soaps are produced for a variety of purposes likes as washing, bathing, medication, etc.[2] The affinity of the hydrocarbon chain to oil and grease, while the carboxylic group to water is the main reason soap is being used mostly with water for cleaning purposes A natural soap may be generally divided based on the production method into: a melt pour soap, a hot process soap and a cold process soap. The hot process soap is called a transparent or translucent soap. The soap has good detergency or cleansing power, good moisturizing effects, long-lasting fragrance, and less of irritant. Herbal soaps are prepared by adding various dried herbs, flowers and stems into soap base. Herbs are the natural products could be found in the treatment of almost all diseases and skin

* Corresponding author: Ankit P. Godane

problems owing to their high medicinal value, cost effectiveness, availability and compatibility; hence it can be used in soap base. The attribute of a soap includes gentleness on the skin, rich lather, protection against various skin disorders (including rashes, eczema, scabies) treatment of skin infection (such as ringworm), protection of even skin toning and smoothness of the skin. Herbal soap does not contain the artificial colours, flavours, fluorides etc., when compared to the content of commercial soap.[1] Natural soaps help maintain skin pH levels easily without disturbing the natural balance. Herbs are the natural products mostly found in the treatment of almost all diseases and skin problems owing their high medicinal value, cost effectiveness, availability and compatibility.[4] Hyperpigmentation is a common dermatologic condition that is found in all skin types but is most prominent in skin of colour. Any inflammation or injury to the skin can almost immediately be accompanied by alterations in pigmentation, either hyperpigmentation or hypopigmentation. Post inflammatory hyperpigmentation appears in many skin conditions, including acne, eczema, and contact dermatitis, and treatment can be challenging. The goal is to reduce the hyperpigmentation without causing undesirable hypopigmentation or irritation in the surrounding area. A variety of topical agents are available to treat hyperpigmentation. [3]

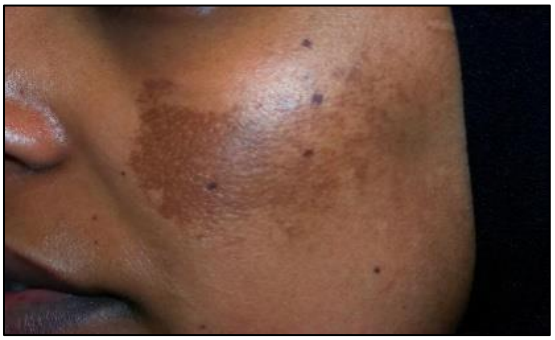


Figure 1 Melasma

1.1. Advantage Of Herbal Soap

- **Mild on the skin:** Herbal soaps are often kinder and milder on the skin than synthetic soap, which makes them appropriate for skin types that are more sensitive.
- **Natural ingredient:** They frequently include skin nourishing and hydrating natural ingredients including coconut oil, etc.
- **Chemical-Free:** The absence of harsh chemicals, artificial perfumes, and synthetic colours in herbal soaps lowers the possibility of allergic responses and skin irritation.
- **Environmentally** Friendly: Compared to synthetic soaps, the herbal ones are typically biodegradable and environmentally friendly as they are made with natural ingredients.
- **Aromatherapy advantages**: By combining essential oils with herbal soaps, aromatherapy advantages including stress alleviation, mood enhancement, and relaxation can be experienced

2. Plant Profile

2.1. *Mimosa pudica*

- Botanical name-*Mimosa pudica*.
- Kingdom-Plantae
- Order-Fables
- Family-Fabaceae
- Genus-Mimosa
- Species- *M. pudica*
- Popular Name(s)- Laari, Lajwanti, churmuri, touch me not plant
- Part use -leaves
- Habitat- It is native to south America and Central America.
- Chemicals constitute: - The ethanol extract consisted of alkaloids (9.05%), Flavonoids (8.32%), Steroids (2.49%), Saponins (8.15%), Phenols (1.02%), Tannins (0.083%), Cyanogenic glycosides (0.122%) and anthocyanins (1.913%).

2.1.1. Uses

- To treat hyperpigmentation and melasma
- Removal of dark spot
- Used for healthy and glowing skin

Figure 2 *Mimosa pudica*

2.2. *Rubia cordifolia*

- Botanical name-*Rubia cordifolia*.
- Kingdom-Plantae
- Order-Gentian ales
- Family-Rubiaceous
- Genus-Rubia
- Species- *R. cordifolia*
- Popular Name(s)- Indian madder, common madder
- Part use -Roots.
- Habitat-It is native to Himalayan region and India.
- **Chemical Constituent:** The ethanol extract consisted of alkaloids (9.05%), Flavonoids (8.32%), Steroids (2.49%), Saponins (8.15%), Phenols (1.02%), Tannins (0.083%), Cyanogenic glycosides (0.122%) and anthocyanins (1.913%).

2.2.1. Uses

- It is used in Blood Purification.
- Removal of dark spot.
- Used for healthy and glowing skin.
- Used as Anti-inflammatory properties

Figure 3 *Rubia cordifolia*

3. Material and method

Table 1 List of ingredients and their sources

Sr.no.	Chemicals	sources
1	Manjistha extract powder	Lab prepared
2	Mimosa extract powder	Lab prepared
3	Coconut oil	Marico Ltd Mumbai
4	Glycerine Soap base	Buhari North Delhi

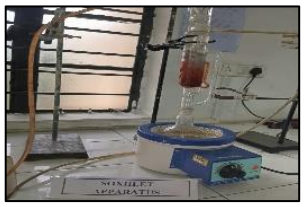
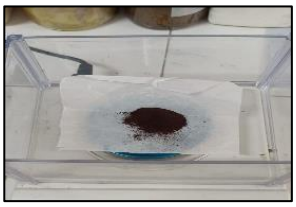
Table 2 List of equipment's

Sr.no.	Name of equipment's
1	Soxhlet Apparatus
2	Reflux condenser
3	Hot air oven
4	Hot plate
5	Muffle furnace
6	Beaker, test tube
7	Measuring cylinder
8	Stirrer, porcelain dish

3.1. Methodology of isolation

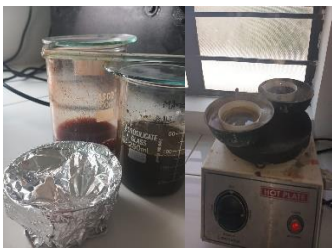
Procedure: -25gm of Manjistha powder was placed into the thimble and placed in the Soxhlet chamber. 200 ml of selected solvent (distilled water) were placed in a round bottom flask and assembled for Soxhlet extractor then the distillation process was begun. After completed the extraction process, the solvent and extractor were placed on water bath to evaporate the solvent.[6]

Table 3 Extraction of Manjistha

		
Soxhlet extraction	Extraction of Manjistha	Extract powder
Actual weight = 1.969 gm	Theoretical yield=2.5 gm	Percentage yield =7.88%

Procedure: -25gm of mimosa powder was placed into the round bottom flask 250 ml of selected solvent (water) were placed in that, then the distillation process was begun in reflux condenser. After completed the extraction process, the solvent and extractor were filtered then placed on water bath to evaporate the solvent.[5]

Table 4 Extraction of Mimosa

		
Reflux condenser	Extraction of mimosa	Extract powder
Actual weight=1.479	Theoretical yield=2.5	Percentage yield=5.916%

3.2. Preparation of hyperpigmentation herbal soap

Table 5 Procedure

STEP -1	Solidified basic glycerine soap was weighed and broken in to smaller pieces.
STEP -2	It was transferred in to vessel and heated in water bath to melt the soap base and stirred
STEP -3	The powder compositions were added to the base after soap base was liquefied. The mixture was stirred continuously.
STEP -4	Homogenous mixture was removed from the water bath, oil was added.
STEP-5	The homogenous mixture was added the soap mould and dried overnight.

Table 6 Formulation of soap

Ingredients	**F1**	**F2**	**F3**
Manjistha	0.50gm	1.00gm	1.50gm
Mimosa	0.50gm	1.00gm	1.50gm
Coconut oil	2.00ml	2.00ml	2.00ml
Essential oil	0.75ml	0.75ml	0.75ml
Glycerine soap base	q, s	qasr	qasr
Total	20.00 gm	20.00 gm	20.00 gm

Figure 4 Soap formulation

3.3. Reformulation studies

3.3.1. Foreign Matter Test

Table 7 Foreign matter test

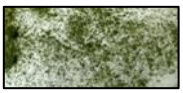
Sr.no.	Name of Ingredients	Observation	inference
1	Manjistha		No foreign matters are found
2	Mimosa		No foreign matters are found

Table 8 Determination of Loss on Drying (Lod)

Manjistha **Initial weight=36.406m**	**Mimosa** **Initial weight=36.988 gm**
Weigh of sample after 1st drying = 36.316gm	Weigh of sample after 1st drying =36.941gm
Weight of sample after 2nd drying =36.282 gm	Weight of sample after 2nd drying =36.847
Difference between both drying=0.034gm	Difference between both drying=0.09 gm
Percentage yield = 7.61%	Percentage yield =0.338%

Table 9 Determination of Total Ash Value

Manjistha **Weight of empty dish (x) = 30.854 gm**	**1.Mimosa: -** **Weight of empty dish (x) = 29.868 gm**
Weight of dry powder taken (y) = 2.004 gm	Weight of dry powder taken (y) =2 gm
Weight of dish + ash (z) = 31.011 gm	Weight of dish + ash (z) =31.857 gm
Weight of ash = 0.157 gm	Weight of ash =0.247 gm
Total cash value of Manjistha = 7.83%	Total cash value of Mimosa =12.35%

Table 10 Determination of Acid Insoluble Ash Value

Manjistha **Sample weight w_s = 2 gm**	**mimosa** **Sample weight w_s =2gm**
Crucible weight w = 30.845 gm	Crucible weight w = 30.781 gm
Crucible + ash weight w^f = 30.847 gm	Crucible weight + ash weight w^f = 30.880 gm
Acid insoluble ash == 0.1%	Water soluble ash =4.9 %

4. Determination of extractive value/ extractive matter

4.1. Determination Of Alcohol Soluble Extract

Table 11 Percentage of extractive value of alcohol soluble extract

Sr.no.	Name of powder	Extractive value
1	Manjistha	11.4%
2	Mimosa	11.2%

4.2. Determination Of Water- Soluble Extract

Table 12 Percentage of extractive value of water-soluble extract

Sr.no.	Name of powder	Extractive value
1	Manjistha	10.9%
2	Mimosa	10.6%

Mimosa

Manjistha

Cold maceration

Figure 5 Cold maceration and extractive value

5. Preliminary Phytochemical Screening [8]

5.1. Tests For Carbohydrates

5.1.1. General test

- Molisch's test (General test): To 2–3 ml aqueous extract, add a few drops of α-naphthol solution in alcohol, shake, and add conc. H_2SO_4 from the sides of the test tube.
- Violet ring is formed at the junction of two liquids.

5.1.2. Tests for reducing sugars:

- Fehling's test: Mix 1 ml Fehling's A and 1 ml Fehling's B solutions, boil for one minute. Add an equal volume of test solution. Heat in boiling water bath for 5–10 min. Yellow to brick-red ppt. is observed.
- Benedict's test: Mix equal volumes of Benedict's reagent and test solution in a test tube.
- Heat in boiling water bath for 5 mi. Solution appears green, yellow, or red depending on the amount of reducing sugar.

5.1.3. Test for non-reducing polysaccharides (starch):

- Iodine test: Mix 3 ml test solution and a few drops of dilute iodine solution. Blue colour appears; disappears on boiling and reappears on cooling.

- Tannic acid test for starch: With 20% tannic acid, the test solution gives ppt.

5.1.4. Tests for proteins

- Biuret test (General test): To 3 ml test solution add 4% NaOH and a few drops of 1% $CuSO_4$ solution. Violet or pink color appears.
- Millon's test (for proteins): Mix 3 ml test solution with 5 ml Millon's reagent. Warm. White ppt. turns brick red, or ppt. dissolves giving red-colored solution.

5.2. Tests for glycosides

5.2.1. Tests for Cardiac Glycosides

- Baljeet's test
- A section shows yellow to orange colors with sodium picrate.

5.2.2. Liebermann's test (for guaianolides)

Add 2 ml plant extract to 2 ml acetic anhydride, cool in ice, add H_2SO_4 carefully along test tube sides. Color change from violet to blue-green indicates steroid nucleus.

5.2.3. Tests for Anthraquinone Glycosides

- Borntrager's test: To 3 ml extract, add dilute H_2SO_4, boil, and filter.
- Add equal volume benzene or chloroform, shake, separate organic layer, add ammonia.
- Ammoniacal layer turns pink or red.

5.2.4. Tests for Saponin Glycosides:

- Foam test: Shake drug extract or dry powder vigorously with water. Persistent stable foam observed.
- Tests for Cyanogenetic Glycosides: Add 3% aqueous mercuric nitrate solution to dry drug powder or extract. Metallic mercury forms.

5.3. Tests For Tannins and Phenolic Compounds

- To 2–3 ml of aqueous or alcoholic extract, add few drops of the following:
- 5% $Fecal_3$ solution: Deep blue-black color.
- Lead acetate solution: White ppt.

5.4. Tests for alkaloids

- Evaporate extracts (aqueous, alcoholic, chloroform) separately. Add dilute HCl, shake, filter, and perform
- Drage Dorff's test: Add a few drops of Drage Dorff's reagent to filtrate. Orange-brown ppt. formed.
- Mayer's test: Add a few drops of Mayer's reagent to filtrate. Cream or white ppt. formed.

5.5. Tests For Amino Acids

- Ninhydrin test (General test): Heat 3 ml test solution with 3 drops 5% Ninhydrin solution in boiling water bath for 10 min. purple or bluish color appears.
- Test for Tyrosine: Heat 3 ml test solution with 3 drops Millon's reagent. Dark red color appears.

5.6. Test For Flavonoids

- Shinoda test: To dry powder of extract, add 5ml 95% ethanol, few drops conc. HCL and 0.5g magnesium turnings. Orange, pink, red to purple color appears.
- Sulphury acid test: On addition of sulphury acid Flavones and flavone dissolve into it. deep yellow color appears.

5.7. Test for steroids

- Salkowski reaction: To 2ml of extract, add 2ml chloroform and add 2ml con.H2SO4 Shake well. Chloroform layer appears red and acid layer shows greenish yellow fluorescence.
- Liebermann-Burchard reaction: Mix 2ml extract with chloroform. Add 1-2 ml acetic anhydride and 2 drop cons. H2SO4 from the side of test tube. First red then blue and finally green colour appears.

Table 13 Phytochemical Screening of Ethanolic Extract

Sr.no.	Test	Inference	
		Mimosa	**Manjistha**
Tests for carbohydrates			
1	Molisch's test (general test)	+ve	+ve
2	Fehling's test	+ve	+ve
3	Benedict's test	+ve	+ve
4	Iodine Test	+ve	+ve
Test for proteins			
1	Biuret Test (General test)	+ve	-ve
2	Millon's Test	+ve	-ve
Tests for cardiac glycosides			
1	Baljeet's Test:	+ve	+ve
2	Liebermann's Test (for bufadienolides)	+ve	+ve
Tests for anthraquinone glycosides			
1	Borntrager's Test	-ve	+ve
Tests for saponin glycosides			
1	Foam Test	+ve	+ve
Test for cyanogenetic glycoside			
1	Sodium Picrate Test	-ve	+ve
Tests for tannins and phenolic compound			
1	Lead Acetate Solution	+ve 	+ve
Tests for alkaloids			
1	Dragendorff's test	+ve	+ve
2	Mayer's test	+ve	+ve
Tests for amino acids			
1	Ninhydrin test (General test	+ve	-ve
2	Test for tyrosine	+ve	-ve
Test for steroids			
1	Salkowski reaction	+ve 	----
2	Liebermann-Burchard reaction:	+ve	----
Test for flavonoids:			

1	Shinoda test	+ve	+ve
2	Sulphuric acid test	+ve	+ve

6. Evaluation Parameter

- **PHYSICAL PARAMETERS:** The color and odour of the prepared soap were observed with naked eye keeping it on white background. The odour of the soap was smelled.[2]
- **pH:** The pH was determined by using pH paper. [7]
- **FOAMABILITY:** 50 ml of distilled water was taken and 2 gm of soap sample was dissolved completely by stirring. It was then transferred into a 250 ml measuring cylinder along with washings. The volume was made up to 200 ml by adding distilled water. 25 uniform strokes were given to the mixture and kept stand still for some time until the water volume comes to 200 ml. The foam height was measured from above the water volume.[2]
- **FOAM RETENTION:** In the 100 ml of measuring cylinder transfer the Prepared the 25 ml of the 1% soap solution. Then the cylinder was shaken 10 times. The volume of foam retention was recorded.[2]

6.1. Determination Of Total Fatty Matter (TFM)

- In each of the soap sample, 5 g was weighed and dissolved in 100 ml of hot water.
- Thereafter, 40 cm^3 of 0.5 N HNO_3 was added to make it acidic.
- The mixture was heated until fatty acids were floating as layer above the solution.
- It was cooled in an ice water to solidify the fatty acids.
- The fatty acids were separated and the aqueous solution was treated with 50 cm^3 chloroform to remove the remaining fatty acids.
- The separated fatty matter was mixed together; solvent was evaporated and the yield noted.[7]
- IRRITATION: Performed by rubbing soap into the skin for 10 minutes. If there is no irritation, the product is regarded as non -irritating.[7]

7. Result

7.1. Physical parameter

Table 14 Physical parameter

Parameters	F1	F2	F3
Color	Red	Green	Green
Oduor	Lemon	Mogra	Morga
Shape	Rectangle	Rectangle	Rectangle

Figure 6 Soap

Table 15 pH of soap

Parameters	F1	F2	F3
pH	09	09	09

Figure 7 Determination of pH

7.2. Foamability of soap

Table 16 Foamability of soap

Parameters	F1	F2	F3
Foamability	9.0cm	6.0cm	7.0cm

Figure 8 Foamability of soap

7.3. Foam Retention of Soap

Table 17 Foam Retention of Soap

Parameters	F1	F2	F3
Foam Retention	3 min 10 sec	3 min 15 sec	3 min 22 sec

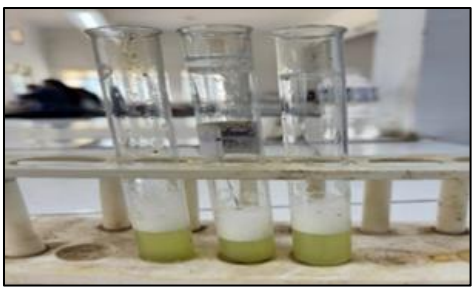


Figure 9 Determination of foam Retention

7.4. Total Fatty Matter of Soap

- The total fatty matter was calculated using the following method:
- Weight of dish (x) =0.72g
- Weight of dish + soap after drying (y) =4.19g
- Weight of soap sample =5g
- % of fatty matter = (y-x) ×100/ weight of soap sample =70.43%

Table 18 Total fatty matter of soap

Parameters	F1	F2	F3
% Total fatty matter	77.5%	63%	70%

Figure 10 Total fatty matter

8. Evaluation of results of herbal soap

Table 19 Evaluation parameters of soap

Sr.no.	Parameters	F1	F2	F3
1	Color	Red	Green	Green
2	Oduor	Fragrant	Fragrant	Fragrant
3	shape	Rectangle	Rectangle	Rectangle
4	pH	9	9	9
5	Foamability	9cm	6cm	7cm
6	Foam retention	3 min 10 sec	3 min 15 sec	3 min 22 sec
7	Total fatty matter	75.5%	63%	70%
8	Irritation	No irritant	No irritant	No irritant

9. Conclusion

The study successfully formulated and characterized an herbal soap using Manjistha and *Mimosa pudica* extracts, targeting melasma and hyperpigmentation. The soap demonstrated desirable physicochemical properties, including stable formation and consistency. Incorporation of herbal extracts showed potential skin-lightening and anti-hyperpigmentation activity, suggesting that the formulation could serve as a safe and natural alternative for managing melasma. Among the three formulations developed, Formulation F1 was found to be the most effective, showing the highest total fatty matter (75.5%), good foamability (9 cm), and an acceptable pH of 9, which is ideal for skin.

Future Scope

Further studies on clinical efficacy and long-term use could establish its effectiveness in real-world applications.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Dr. A. Seetha Devi, et.al., "Formulation and evaluation of antimicrobial herbal soap", published by International Journal of pharmaceutical sciences Review and Research (2021), page no. 122-125.

[2] Annapurna Jagannath Pradhan, et.al., "Formulation and evaluation of herbal soap",

[3] Published by International Journal for Multidisciplinary Research, (2024), volume 6 page no 1616-1622 E-ISSN: 2582-2160

[4] Ayobami O. Oyedele, et.al., "Physiochemical properties and antimicrobial activities of soap formulations containing senna alata and eugenia unfloral leaf preparation", published by Journal of Medicinal Plants Research December 2017, vol. 11(48), page no.778-787. ISSN 1996-0875.

[5] G. Sai Manoj. Et.al., "Formulation and evaluation of poly herbal soap", published by Indo American Journal of Pharmaceutical Research, (2023), ISSN: 2231-6876

[6] Vd. Rashmi. et.al., "Management of Vyanga with Manjistha Lepa", published by World journal of pharmaceutical research,2021, volume 10, issue2 page no1109-1116 ISSN: 2277-7105

[7] Sandip sen, et.al., "Pharmacological evaluation of ethanolic extract of Rubia cardifolia, published by World journal of pharmaceutical science volume 6, Issue 12, 1616-1622-year 2017.

[8] J. Abba, et.al., "Determination of Alkali Content and Total Fatty Matter of Some Soaps Used Within Zaria, Nigeria", Published by Nigerian Research Journal of Chemical Sciences (2021), Volume 9, Issue 2, Page no. 334-339, ISSN: 2682-6054.

[9] Dr. K. R. Khandelwal, et.al., "A book of practical pharmacognosy technique and experiments by Nirali prakashan 26th edition February (2016), page no 23.3-25.9.