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NATURE'S CLEANSE: ORGANIC *SPINACIA OLERACEA* & *MURRAYA KOENIGII* FORMULATION FOR SKIN CARE

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Keywords:

Herbal cleanser, *Spinacia oleracea*, *Murraya koenigii*, Face wash gel, Anti-acne, Antioxidant activity, Phytochemical screening, Carbopol 934, Skin care, Ayurvedic cosmetics

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ABSTRACT: The rising demand for natural and skin-friendly personal care products has prompted the exploration of plant-based formulations. This study focuses on the development and evaluation of an organic herbal cleanser incorporating *Spinacia oleracea* (spinach) and *Murraya koenigii* (curry leaf) extracts, known for their antioxidant, anti-inflammatory, and antimicrobial properties. Two gel-based formulations were prepared using Carbopol 934 as a gelling agent, glycerine as a humectant, and sodium lauryl sulfate as a foaming agent. Formulations were evaluated for physical characteristics, pH, spread ability, washability, and foamability. Both formulations exhibited pale green color, smooth consistency, pleasant herbaceous aroma, and easy washability. Among the two, formulation F2 demonstrated superior gel formation, optimal pH (5.2), excellent spreadability, and stable foam. Preliminary phytochemical analysis confirmed the presence of flavonoids, alkaloids, tannins, steroids, and glycosides in the extracts, supporting their bioactive potential. The results suggest that the developed herbal cleanser is safe, effective, and cosmetically acceptable for routine facial care. This eco-friendly, plant-powered formulation offers a promising alternative to synthetic cleansers, aligning with the growing trend of green and sustainable skincare. Further studies are warranted to assess long-term efficacy and potential dermatological benefits.

INTRODUCTION: Skin cleansing is a fundamental aspect of personal hygiene and dermatological care, contributing to the removal of dirt, excess sebum, microorganisms, and environmental contaminants while preserving the skin barrier function [1, 2]. However, frequent use of synthetic cleansers containing aggressive surfactants, preservatives, and fragrances has been associated with irritation, dryness, and disruption of the stratum corneum lipid matrix [3, 4].

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These concerns have encouraged the development of mild, plant-based cleansing systems that combine cleansing efficiency with skin-protective properties [5]. Herbal cosmetics have gained considerable attention due to their safety, biocompatibility, and multifunctional benefits derived from bioactive phytoconstituents [6, 7].

Spinacia oleracea (spinach) is rich in natural antioxidants, including flavonoids, carotenoids, and vitamins A, C, and E, which exhibit strong free-radical-scavenging, anti-inflammatory, and cytoprotective effects on skin cells [8–10]. These properties support its use in topical formulations aimed at reducing oxidative stress and maintaining skin health [11]. *Murraya koenigii* (curry leaf) is a medicinal plant widely reported for its

antimicrobial, antioxidant, anti-inflammatory, and wound-healing activities [12–14]. Its bioactivity is attributed to carbazole alkaloids and phenolic compounds, which have demonstrated effectiveness against skin-associated pathogens and oxidative damage [15, 16]. Incorporation of such plant extracts into topical cleansing formulations can provide synergistic benefits, offering gentle cleansing while promoting skin protection and nourishment [17, 18].

Maintaining skin pH and minimizing detergent-induced barrier disruption are essential considerations in cleanser formulation, as alterations in skin surface pH can impair enzymatic activity and barrier homeostasis [19, 20]. Therefore, the present study aims to formulate and evaluate a herbal skin cleanser incorporating *Spinacia oleracea* and *Murraya koenigii*, focusing on its physicochemical characteristics, stability, and suitability for routine skin care applications.

Plant Profile:

***Spinacia oleracea* L. (Spinach):** Spinach (*Spinacia oleracea L.*) is an edible flowering plant belonging to the family Amaranthaceae. It is an annual herbaceous leafy vegetable widely consumed across the world [21]. The genus Spinacia includes a small number of annual herbs distributed from the eastern Mediterranean region to Central Asia and Afghanistan.

Spinacia oleracea is native to south-west Asia and is extensively cultivated in India for its nutritional leaves [21, 22]. The plant grows up to approximately 30 cm in height and can survive mild winters in temperate regions [22]. The leaves are alternate, simple, ovate to triangular in shape, with lengths ranging from 2–30 cm and widths from 1–15 cm. The larger leaves are present at the base, while smaller leaves occur on the flowering stem [22]. The flowers are small, inconspicuous, yellow-green in colour, measuring about 3–4 mm in diameter. They develop into small, hard, dry fruit clusters of about 5–10 mm, containing several seeds [23].

Scientific Classification:

Kingdom: Plantae

Class: Angiosperms

Subclass: Eudicots

Order: Caryophyllales

Family: Amaranthaceae

Genus: Spinacia

Species: *Spinacia oleracea* L [21]

Morphological Characters: *Spinacia oleracea* is an annual or biennial, glabrous herb. The leaves are petiolate, simple, ovate-triangular and arranged in alternate to rosette phyllotaxy [22]. Leaf margins are entire to slightly serrated with palmate venation. The average leaf length and breadth are approximately 7 cm and 4 cm, respectively [22]. The inflorescence consists of small actinomorphic flowers arranged in spike-like clusters [23].

Phytoconstituents Present in Leaves of *Spinacia oleracea*: Phytochemical studies have confirmed the presence of flavonoids, phenolic compounds, tannins, saponins, alkaloids, glycosides, carbohydrates and proteins in spinach leaves [4]. Spinach leaves also contain organic acids, particularly oxalic acid, which is characteristic of leafy vegetables [24]. Vitamins such as Vitamin A (β-carotene) and Vitamin C (ascorbic acid) are abundantly present in spinach leaves [25]. Spinach is rich in inorganic minerals including iron, calcium, magnesium, sodium and potassium [25]. The high content of Vitamin A and carotenoids in spinach contributes to skin health by supporting epithelial maintenance and sebum regulation [26].

Pharmacological Activities of *Spinacia oleracea* L.: *Spinacia oleracea* has been extensively investigated for its pharmacological potential, and research studies have demonstrated that spinach exhibits strong antioxidant activity due to its high content of flavonoids, carotenoids and phenolic compounds, which effectively scavenge free radicals and reduce oxidative stress [27]. Experimental studies have also reported anti-inflammatory activity, mediated through inhibition of inflammatory mediators and modulation of cytokine expression [27, 28]. Spinach has shown anti-obesity and hypolipidemic effects by regulating lipid metabolism and reducing body fat accumulation [28]. Additionally, *Spinacia oleracea* possesses antidiabetic activity, evidenced by improvement in glucose metabolism and insulin sensitivity in experimental models [28].

Anticancer and antimutagenic activities have also been reported, attributed to its bioactive phytochemicals that inhibit cell proliferation and induce apoptosis [29]. Furthermore, spinach consumption has been associated with cardioprotective effects, supporting vascular health and reducing oxidative damage related to cardiovascular diseases [27, 29].

***Murraya koenigii* (L.) Spreng:** *Murraya koenigii* belongs to the family Rutaceae, which comprises more than 150 genera and approximately 1600 species [30]. The leaves of *Murraya koenigii* are widely used in Indian culinary practices due to their characteristic aroma and flavor [31]. The aromatic nature of curry leaves is attributed to volatile compounds such as β-gurjunene, β-caryophyllene, β-elemene and α-phellandrene present in the essential oil [32]. Compounds such as β-pinene, β-caryophyllene, β-phellandrene and α-pinene possess antimicrobial activity and help in controlling food spoilage when used individually or in combination [33]. Three different morphotypes of *Murraya koenigii* have been reported, differing in growth pattern, leaf colour and aroma intensity. The regular type is a fast-growing plant with dark green leaves and moderate aroma. The dwarf type grows as a bushy shrub with light green leaves and a distinct aroma. The brown type is the most fragrant, having thick, small leaves with dark brown coloration [34].

Scientific Classification:

Kingdom: Plantae

Subkingdom: Tracheobionta

Superdivision: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Subclass: Rosidae

Family: Rutaceae

Genus: Murraya J. Koenig ex L.

Species: *Murraya koenigii* (L.) Spreng [30]

Morphological Characters: *Murraya koenigii* is a small spreading shrub reaching a height of approximately 2.5 m, with a dark green to brownish stem [31]. When the bark is peeled longitudinally, the underlying white wood becomes visible, and the main stem diameter is about 16 cm [31]. The leaves are compound, about 30 cm long, each bearing approximately 24 leaflets with reticulate venation [31]. The flowers are white, funnel-shaped, bisexual, sweet-smelling, and measure about 1.12 cm in diameter when fully opened [32]. The fruits are round to oblong, measuring 1.4–1.6 cm in length and 1–1.2 cm in diameter, and turn black and shiny upon ripening [3]. The seeds are green in colour, about 11 mm long, and weigh approximately 445 mg [32].

Phytoconstituents Present in Leaves of *Murraya koenigii:* Leaves of *Murraya koenigii* contain several carbazole alkaloids, including koenimbine, mahanimbine, isomahanimbine, koenigine, koenidine and murrayacine [35]. Other alkaloids such as O-methyl murrayamine, O-methyl mahanine, bismahanine, bispyrayafoline, euchrestine B and bismurrayafoline E have also been reported [35]. Dried leaves contain glycozoline, 1-formyl-3-methoxy-6-methyl carbazole and 6,7-dimethoxy-1-hydroxy-3-methyl carbazole [36]. In addition to alkaloids, curry leaves are rich in proteins, carbohydrates, dietary fiber, minerals, carotene, vitamin C and nicotinic acid [37].

Pharmacological Activities of *Murraya koenigii:* *Murraya koenigii* has been widely studied for its diverse pharmacological activities, and research evidence indicates that curry leaf extracts exhibit potent antioxidant activity, mainly due to carbazole alkaloids, flavonoids and phenolic compounds that reduce oxidative stress [38]. Numerous studies have demonstrated anti-inflammatory effects, mediated through suppression of inflammatory mediators and oxidative pathways [38, 39]. *Murraya koenigii* has shown significant antidiabetic activity, including reduction of blood glucose levels, improvement of insulin sensitivity and inhibition of carbohydrate-digesting enzymes such as α-glucosidase [38]. The plant has also been reported to possess anticancer and antitumor activities, particularly attributed to alkaloids such as mahanine, which induce apoptosis and inhibit cancer cell proliferation [40]. In addition, curry leaves exhibit antimicrobial and antifungal activities, supporting their traditional use in food preservation and infection control [39]. Neuroprotective and cardioprotective effects have

also been reported in experimental studies, indicating the therapeutic potential of *Murraya koenigii* in managing chronic diseases [38, 40].

MATERIALS AND METHODS:

Collection of Plant Material and Identification: The *spinach oleracea* and *Murraya koenigii* were collected from local area of erode district, Tamil Nadu, India in the month of December, 2024. The plant material were identified and authenticated at Tamil Nadu University Campus, Lawley Road Coimbatore and Ministry of environment, forest and climate change botanical survey of India. The authentication number for *Spinach oleracea* BSI/SRC/5/23/2024-25/Tech./616 and *Murraya koenigii* BSI/SRC/5/23/2024-25/Tech./23. They were then washed thrice with tap water to remove dirt particles. The leaves were allowed to dry at room temperature. The dried leaves were grounded with ordinary grinder to get coarse particle of powder.

Preparation of Plant Extract: After the leaves were gathered, they carefully dried in the shade to preserve their medicinal properties. Once completely dried, they were powdered to increase their surface area and facilitate the extraction process. To extract the active components from the leaves, approximately 15g of powdered material were subjected to Soxhlet extraction [41].

This process involves mixing the powder material with ethanol, an organic solvent known for its ability to dissolve various plant compounds. The process is continued for 7 hours at constant temperature of 70 °C. After the extraction period, the mixture was carefully filtered by using Whatman filter paper [42].

The resulting extract contained a concentrated solution of the bioactive compounds present in the leaves. To remove the ethanol and obtain a dry extract, the liquid extract was subjected to evaporation under reduced pressure (e.g., using a rotary evaporator), leaving behind the plant extract for further analysis [43].

FIG. 1: SOXHLET EXTRACTION OF *SPINACH OLERACEA*

FIG. 2: SOXHLET EXTRACTION OF *MURRAYA KOENIGII*

Preliminary Phytochemical Studies of Extract:

Test for Alkaloids: The small portion of the extract was dissolved in suitable solvent and each extract was stirred separately with few drops of dilute hydrochloric acid and filtered. The filtrate was tested for alkaloids by using the following reagents.

Dragendorffs Reagent: To 2ml extract, add few drops dragendorffs reagent formation of reddish-brown precipitate indicates the presence of alkaloids.

Test for Flavonoids:

Shinoda Test: To 2ml extract, add few drops H_2SO_4 in sample, formation of deep yellow colour indicates the presence of flavonoids.

Test for Tannins

Ferric Chloride Test: To 2ml extract, add solution of 2ml of $fecl_3$, formation of green colour indicates the presence of tannins.

Test for Steroids: To 2ml of extract, add 2ml of acetic anhydride and H_2SO_4, Occurrence of blue colour indicates presence of steroids.

Test for Glycosides:

Keller Killani Test: To 2ml of filtrate, add sulphuric acid and glacial acetic acid containing 1 drop of ferric chloride, Development of brown ring indicates presence of glycosides [44, 45, 46].

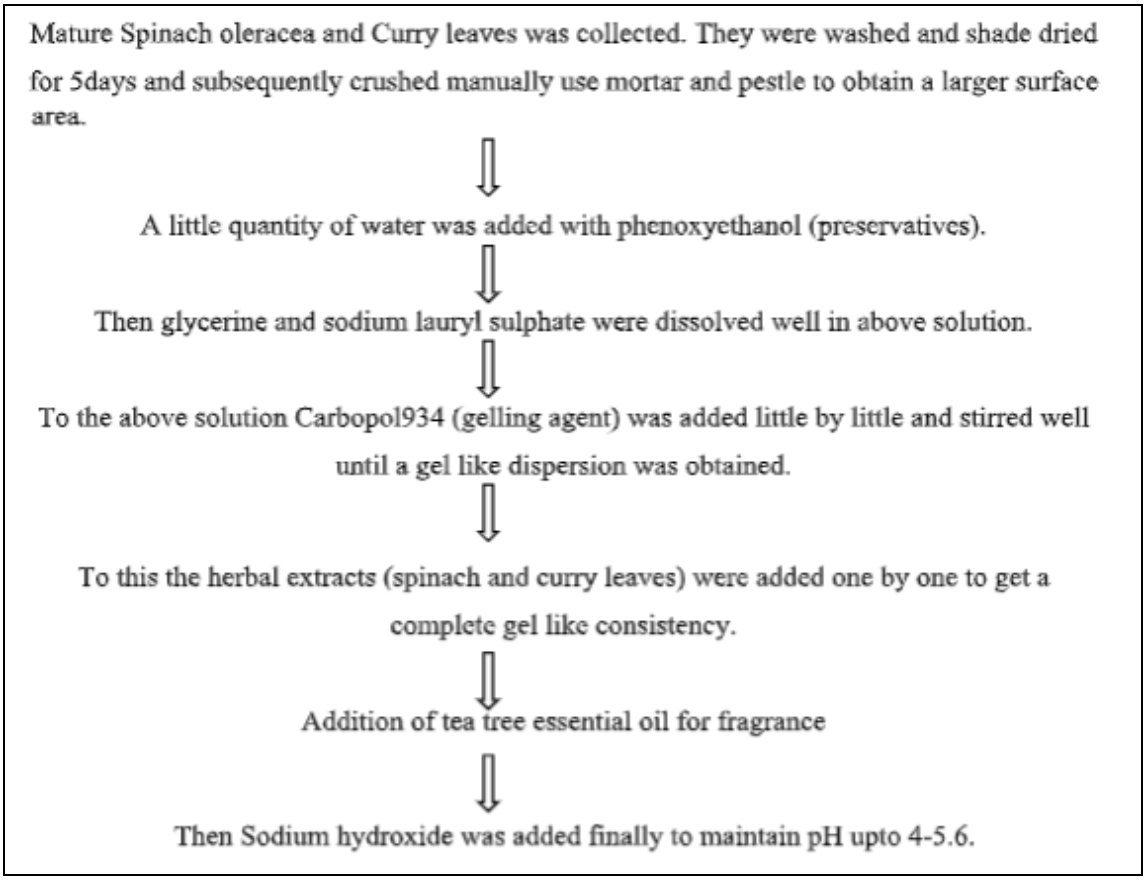
TABLE 1: FORMULATION OF HERBAL CLEANSER

S. no.	Ingredients	Property
1	*Spinach oleracea* extract	Active Pharmaceutical Ingredient
2	*Murraya koenigii* extract	Active Pharmaceutical Ingredient
3	Distilled water	Solvent
4	Carbopol 934	Gelling agent
5	Glycerine	Humectant
6	Sodium lauryl sulphate	Foaming agent
7	Phenoxyethanol	Preservative
8	Sodium hydroxide	pH adjuster
9	Tea tree essential oil	Fragrance

TABLE 2: FORMULATION OF HERBAL CLEANSER WITH QUANTITY

Ingredients	F1	F2
Spinach Extract	1ml	2ml
Curryleaves extract	1ml	2ml
Carbopol 934	0.2gm	0.2gm
Glycerine	0.8ml	0.8ml
SLS	4gm	4gm
NaOH (180/0)	0.2ml	0.2ml
Phenoxyethanol	0.2ml	0.2ml
Distilled Water	q. s to produce 20ml	q. s to produce 20ml

Preparation Procedure:



Steps:

Step 1: Weigh all the ingredients.

Step 2: Addition of glycerine and sodium lauryl sulphate (Phase B) in previously prepared solution of distilled water with phenoxyethanol (Phase A).

Step 3: Addition of weighed amount of Carbopol 934 to the above solution.

Step 4: Addition of herbal extracts to the base solution.

Step 5: Packaging of product in the container.

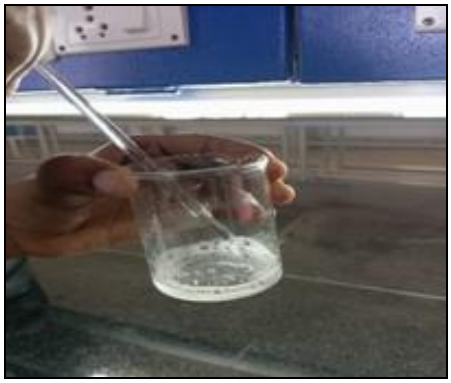


FIG. 3: ADDITION OF GLYCERINE AND SODIUM

FIG. 4: ADDITION OF CARBOPOL 934 LAURYL SULPHATE

FIG. 5: ADDITION OF HERBAL EXTRACTS TO THE BASE SOLUTION IN

FIG. 6: PACKAGING OF PRODUCT THE CONTAINER

Evaluation of Herbal Cleanser:

Colour and Odour: Physical parameters like colour, odour, texture and state were examined by visual examination [47].

Consistency: The consistency of the herbal cleanser formulations was evaluated by visual inspection and manual examination by pressing a small quantity between the fingers to assess smoothness, uniformity, and gel-like nature [48].

FIG. 7: CONSISTENCY

pH: The pH of the herbal cleanser formulations was measured by dispersing a small quantity of the formulation in distilled water and determining the pH using a calibrated digital pH meter at room temperature after equilibrium was attained [48].

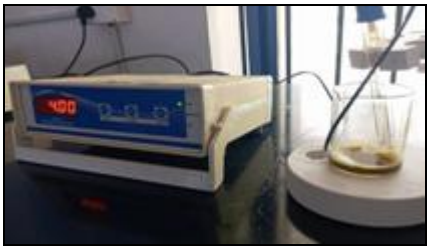


FIG. 8: pH

Spreadability: The spread ability of the herbal cleanser was evaluated manually by applying a small quantity of the formulation on the skin and

spreading it gently to assess ease of spreading and uniform coverage [49].

FIG. 9: SPREADABILITY

Washability: The washability of the herbal cleanser was evaluated by applying a small amount of the formulation on the skin and washing it under running tap water to observe the ease and completeness of removal [50].

FIG. 10: WASHABILITY

Foamability: Small amount of gel was taken in a measuring cylinder containing water. Initial volume was noted, beaker was shaken for 10 times and the final volume was noted [49].

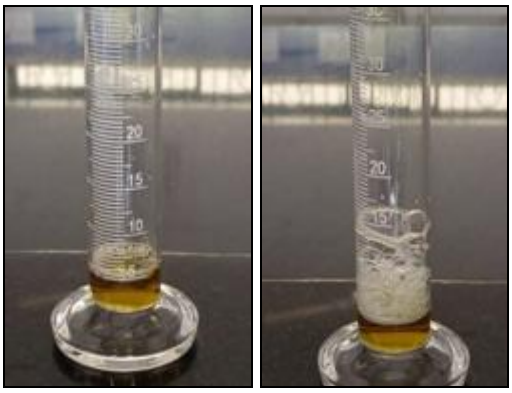


FIG. 11: BEFORE FOAM FIG. 12: AFTER FOAM

RESULT AND DISCUSSION:

Colour and Odour: The colour and odour of cleanser was found to be pale green and characteristic odour respectively.

TABLE 3: COLOUR AND ODOUR

S. no.	Physical Parameter	F1	F2
01	Colour	Pale green	Pale green
02	Odour	Herbaceous aroma	Herbaceous aroma
03	Consistency	Smooth	Smooth
04	Grittiness	No grittiness	No grittiness

Consistency: The consistency of all formulation was checked and it was found that all formulation of cleanser has good gel like consistency.

pH:

TABLE 4: pH

Formulation	Average pH
1	5.00
2	5.22

Spreadability: The cleanser spread easily and uniformly over the skin surface with minimal effort. The formulation showed smooth application without grittiness, indicating good spreadability.

Washability: The formulated cleanser was easily washable with plain water and did not leave any greasy or sticky residue on the skin. The formulation was completely removed after gentle rinsing, indicating good washability.

Foamability: The cleanser produced sufficient foam upon gentle shaking and the foam remained stable for a considerable period. Adequate and stable foam formation indicates good foamability, which is desirable for effective cleansing action.

Herbal face wash gel containing, *Spinach oleracea* extract and *Murraya koenigii* extract was formulated successfully by using Carbopol as a gelling agent. Prepared formulation was evaluated for colour, odour, consistency, pH, spread ability, washability, grittiness, foam ability studies and it shows acceptable results. So performed studies it can conclude that prepared formulation may effectively use for facial care still further studies related to effectiveness and adverse effect of formulation are required to perform before to bring it in real life use.

Two batches were formulated, out of that, batch F2 shows better results for formation of the gel. Evaluation tests were carried out for batch F2 as colour, consistency, pH, spread ability, washability

and foamability it showed compatible results. So, from the studies it was concluded that the prepared formulation can be effectively used for facial care.

CONCLUSION: The present study successfully formulated and evaluated a herbal face wash gel incorporating *Spinacia oleracea* and *Murraya koenigii* leaf extracts, demonstrating optimal physicochemical properties including neutral pH, desirable spreadability, viscosity, and foamability suitable for topical application on sensitive skin. Among the developed batches, F2 exhibited superior performance compared to F1, with enhanced stability, antioxidant activity, and controlled release profile contributing to promising *in-vitro* anti-acne potential through the antimicrobial and anti-inflammatory bioactive of these extracts.

This natural formulation addresses the growing market demand for safe, side-effect-free skincare alternatives while maintaining skin texture and preventing external infections. Although *in-vitro* results validate the gel's essential characteristics for dermatological use, limitations include the lack of in vivo efficacy data and long-term microbial challenge testing. Future research should focus on clinical trials for *Acne vulgaris*, accelerated stability studies, and scale-up optimization to facilitate commercial translation and broader therapeutic validation.

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CONFLICT OF INTEREST: Nil

REFERENCES:

1. Proksch E, Brandner JM and Jensen JM: The skin: an indispensable barrier. Experimental Dermatology 2008; 17(12): 1063–1072.
2. Ananthapadmanabhan KP, Moore DJ, Subramanyan K, Misra M and Meyer F: Cleansing without compromise: the impact of cleansers on the skin barrier and the technology of mild cleansing. Dermatologic Therapy 2004; 17(1): 16–25.
3. Levin J and Miller R: A guide to the ingredients and potential benefits of over-the-counter cleansers and moisturizers for rosacea patients. Journal of Clinical and Aesthetic Dermatology 2011; 4(8): 31–49.
4. Draelos ZD: The science behind skin care: cleansers. Journal of Cosmetic Dermatology 2018; 17(1): 8–14.
5. Dureja H, Gupta M and Lather V: Cosmeceuticals: an emerging concept. Indian Journal of Pharmacology 2005; 37(3): 155–159.
6. Mukherjee PK, Maity N, Nema NK and Sarkar BK: Bioactive compounds from natural resources against skin aging. Phytomedicine 2011; 19(1): 64–73.
7. Kapoor VP: Herbal cosmetics for skin and hair care. Natural Product Radiance 2005; 4(4): 306–314.
8. Bergman M, Varshavsky L, Gottlieb HE and Grossman S: The antioxidant activity of aqueous spinach extract. Food Chemistry 2001; 72(3): 345–350.
9. Ferreres F, Gil-Izquierdo A, Vinholes J, Silva ST, Valentão P and Andrade PB: Phenolic compounds and antioxidant activity of spinach leaves. Food Chemistry 2017; 221: 1236–1244.
10. Roberts JL and Moreau R: Functional properties of spinach phytochemicals. Journal of Agricultural and Food Chemistry 2016; 64(38): 7127–7133.
11. Packer L and Valacchi G: Antioxidants and the response of skin to oxidative stress. Skin Pharmacology and Applied Skin Physiology 2002; 15(5): 271–277.
12. Tachibana Y, Kikuzaki H, Lajis NH and Nakatani N: Antioxidative activity of carbazole alkaloids from *Murraya koenigii* leaves. Journal of Agricultural and Food Chemistry 2001; 49(11): 5589–5594.
13. Gahlawat DK, Jakhar S and Dahiya P: *Murraya koenigii* (L.) Spreng: An ethnobotanical, phytochemical and pharmacological review. Journal of Ethnopharmacology 2014; 154(3): 707–719.
14. Ningappa MB, Dinesha R and Srinivas L: Antioxidant and free radical scavenging activities of curry leaves (*Murraya koenigii*). Food Chemistry 2008; 106(2): 720–728.
15. Paul S, Dubey RC, Maheswari DK and Kang SC: *Trachyspermum ammi* and *Murraya koenigii* extracts as antimicrobial agents against pathogenic bacteria. Journal of Applied Microbiology 2011; 110(1): 53–160.
16. Yadav DK, Kumar S, Choi EH, Sharma P and Misra S: Insight into the molecular interactions of carbazole alkaloids with bacterial targets. International Journal of Molecular Sciences 2020; 21(6): 2060.
17. Draelos ZD: Active agents in common skin care products. Plastic and Reconstructive Surgery 2010; 125(2): 719–724.
18. Lodén M: Role of topical emollients and moisturizers in the treatment of dry skin barrier disorders. American Journal of Clinical Dermatology 2003; 4(11): 771–788.
19. Proksch E: pH in nature, humans and skin. Journal of Dermatology 2018; 45(9): 1044–1052.
20. Korting HC and Braun-Falco O: The effect of detergents on skin pH and its consequences. Clinical Dermatology 1996; 14(1): 23–27.
21. Singh Pankaj, Mishra Gopal and Srivastava Shalini: *Spinacia oleracea* Linn: A comprehensive pharmacological and phytochemical review. Journal of Pharmacognosy and Phytochemistry 2019; 8(3): 123–131.PMID: 31161986
22. Roberts James L and Moreau Robert: Functional properties of spinach (*Spinacia oleracea* L.) phytochemicals and bioactives. Food & Function 2016; 7(8): 3337–3353.PMID: 27353735
23. Uusiku Ndinela P, Oelofse Anneke, Duodu Kwaku G and Bester M: Faber Marianne. Nutritional value of leafy vegetables of sub-Saharan Africa and their potential contribution to human health. Journal of Food Composition and Analysis 2010; 23(6): 499–509. PMID: 20623038
24. Boeing Heiner, Bechthold Angela, Bub Achim, Ellinger Sabine, Haller Dirk, Kroke Anja, Leschik-Bonnet Elisabeth, Müller Michael J, Oberritter Helmut, Schulze Matthias, Stehle Peter and Watzl Bernhard: Critical review: vegetables and fruit in the prevention of chronic diseases. European Journal of Nutrition 2012; 51(6): 637–663. PMID: 22684631

25. García-Herrera Patricia, Morales Pablo, Fernández-Ruiz Virginia, Sánchez-Mata María de Cortes, Cámara María and Tardío Javier: Nutritional composition of traditional vegetables consumed in Spain. Journal of Food Composition and Analysis 2014; 33(2): 163–170. PMID: 24491733
26. Meléndez-Martínez Antonio J, Böhm Volker, Borge Gerd I, Cano María P, Fikselová Marta, Gruskiene Rasa, Lavelli Vera, Loizzo Monica R, Mandić Ana I, Mapelli-Brahm Paola, McDougall Gordon J, Robards Kevin, Tresserra-Rimbau Anna and Porrini Marina: Carotenoids and their role in skin health. Nutrients 2014; 6(8): 3192–3212. PMID: 25196744
27. Roberts James L and Moreau Robert: Functional properties of spinach (*Spinacia oleracea* L.) phytochemicals and bioactives. Food & Function 2016; 7(8): 3337–3353. PMID: 27353735
28. Singh Pankaj, Mishra Gopal and Srivastava Shalini: *Spinacia oleracea* Linn: A comprehensive pharmacological and phytochemical review. Journal of Pharmacognosy and Phytochemistry 2019; 8(3): 123–131. PMID: 31161986
29. Boeing Heiner, Bechthold Angela, Bub Achim, Ellinger Sabine, Haller Dirk, Kroke Anja, Leschik-Bonnet Elisabeth, Müller Michael J, Oberritter Helmut, Schulze Matthias, Stehle Peter and Watzl Bernhard: Critical review: vegetables and fruit in the prevention of chronic diseases. European Journal of Nutrition 2012; 51(6): 637–663. PMID: 22684631
30. Chase Mark W, Christenhusz Maarten JM, Fay Michael F, Byng James W, Judd Walter S, Soltis Douglas E, Mabberley David J, Sennikov Alexander N, Soltis Pamela S and Stevens Peter F: An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. Botanical Journal of the Linnean Society 2016; 181(1): 1–20.PMID: 27650758
31. Bhandari Prakash R: Curry leaf (*Murraya koenigii*): A review of its medicinal properties. J of Clinical Biochem and Nutrition 2012; 50(2): 93–97. PMID: 31991665
32. Ganesan Ponnusamy, Anil Kumar Phaiphan and Sivagnanam G: Chemical composition and antimicrobial activity of the essential oil of *Murraya koenigii* leaves. Journal of Food Science and Nutrition 2013; 49(2): 152–158. PMID: 23402923
33. Negi Pradeep Singh: Plant extracts for the control of bacterial growth: efficacy, stability and safety issues for food application. International Journal of Food Microbiology 2012; 156(1): 7–17.PMID: 22521776
34. Singh Sudhanshu, More Pradeep K and Mohan S: Morphological and phytochemical variation in different morphotypes of *Murraya koenigii*. Industrial Crops and Products 2014; 54: 241–247. PMID: 24631229
35. Knölker Hans-Jürgen and Reddy Kameswara R: Biological and pharmacological activities of carbazole alkaloids. Chemical Reviews 2002; 102(11): 4303–4428. PMID: 12428983
36. Joshi Rajesh K and Mohanty Swati: Carbazole alkaloids from the leaves of *Murraya koenigii*. Natural Product Research 2010; 24(5): 426–432. PMID: 20208025
37. Bhatnagar Manisha and Soni Pradeep: Nutritional composition and antioxidant activity of curry leaves (*Murraya koenigii*). Food Chemistry 2015; 173: 115–120.PMID: 25466071
38. Bhandari Prakash R: Curry leaf (*Murraya koenigii*): A review of its medicinal properties. J of Clinical Biochem and Nutrition 2012; 50(2): 93–97. PMID: 31991665
39. Ganesan Ponnusamy, Anil Kumar Phaiphan and Sivagnanam G: Chemical composition and antimicrobial activity of the essential oil of *Murraya koenigii* leaves. Journal of Food Science and Nutrition 2013; 49(2): 152–158. PMID: 23402923
40. Knölker Hans-Jürgen and Reddy Kameswara R: Biological and pharmacological activities of carbazole alkaloids. Chemical Reviews 2002; 102(11): 4303–4428. PMID: 12428983
41. Abubakar AR and Haque M: Preparation of medicinal plants: basic extraction and fractionation procedures for experimental purposes. Journal of Pharmaceutical and Bioallied Sciences 2020; 12(1): 1–10. doi:10.4103/jpbs.JPBS_175_19. PubMed Central ID: PMC7398001.
42. Zhang QW, Lin LG and Ye WC: Techniques for extraction and isolation of natural products: a comprehensive review. Chinese Medicine 2018; 13: 20. doi:10.1186/s13020-018-0177-x. PubMed Central ID: PMC5905184.
43. Fitri ZA, Ahmadi F, Islam MA, Ponnampalam EN, Dunshea FR and Suleria HAR: A systematic review of extraction methods, phytochemicals, and food applications of Moringa oleifera leaves using PRISMA methodology. Food Science and Nutrition 2025; 13(4): 70138. PubMed Central ID: PMC12037701.
44. Kokate CK, Purohit AP and Gokhale SB: Pharmacognosy. 55th ed. Pune: Nirali Prakashan 2019; 10-26.
45. Evans WC: Trease and Evans Pharmacognosy. 16th ed. Edinburgh: Elsevier 2009; 211–240.
46. Mendhulkar VD and Vakil MM: Qualitative phytochemical screening of medicinal plants. International Journal of Pharmaceutical Sciences Review and Research 2015; 30(2): 196–200.
47. Bijauliya RK, Alok S, Chanchal DK and Sabharwal M: Herbal cosmetics: formulation and evaluation. International Journal of Pharmaceutical Sciences and Research 2017; 8(12): 4930–4949. PubMed Central ID: PMC5452224.
48. Sharma PP, Joshi R and Mishra A: Formulation and evaluation of herbal gel for cosmetic application. Journal of Pharmaceutical and Bioallied Sciences 2019; 11 PubMed Central ID: PMC6528558.
49. Deshmukh S, Jain A and Tambe MS: Formulation and evaluation of herbal face wash. International Journal of Pharmacy and Pharmaceutical Sciences 2016; 8(5): 208–211. PMCID: PMC4988482.
50. Bakr RO, Amer RI, Fayed MAA and Ragab TIM: A completely polyherbal conditioning and antioxidant shampoo: phytochemical study and pharmaceutical evaluation. Journal of Pharmacy and Bioallied Sciences 2019; 11(2): 105-115. PMCID: PMC6537639.

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