



Pharmaceutical development and standardization of a novel polyherbal topical application for complexion enhancement, based on the “*Varnya Dashakaya*”

De Silva C.S*, Senarathne U. R. S. R. K.

Faculty of Indigenous Medicine, University of Colombo, Sri Lanka

*Corresponding author: csdesilva19@gmail.com
(accepted September 27, 2025)

ABSTRACT

Context: The global popularity of skin complexion enhancers has surged in the present era. Numerous such products are disreputable due to the inclusion of harsh chemicals that often result in skin damage. The *Varnya Dashakaya* (वर्ण्य दशकय) mentioned in the *Charaka Samhita* (चरक संहिता) is a herbal group specifically indicated for skin complexion enhancement. **Objective:** to develop a purely natural poly-herbal topical application containing selected ingredients from *Varnya Dashakaya* (वर्ण्य दशकय) to enhance skin complexion and accomplish its pharmaceutical standardization. **Methods:** herbal ingredients were selected based on their availability, feasibility, and efficacy towards skin conditions. Virgin coconut oil and beeswax were used as the base, and no artificial ingredients were added. The product was developed following the *Malahara Kalpana* (मलहार कल्पना) process mentioned in *Rasa Tharangini* (रसतरंगिणी). Three replicates were prepared to standardize the process and mean, and standard deviation values were applied to standardize the product. Analytical parameters including organoleptic parameters, homogeneity, spread-ability, pH values, moisture content, total ashes value, saponification value, qualitative phytochemical screening, development of TLC were conducted. **Results:** low moisture, total ash and saponification values were observed as well as stability of the product. Phytochemical screening detected alkaloids, tannins, flavonoids and terpenoids. **Conclusion:** our poly-herbal topical application is a potential agent for the enhancement of skin complexion; however, further clinical studies are needed to accurately determine its safety and efficacy.

Keywords: ayurveda, pharmaceutical standardization, formulation, skin complexion, varnya dashakaya

INTRODUCTION

The popularity of skin care products has amplified tremendously among the worldwide population. Among them, skin complexion promoters are favored mainly due to their ability to enhance one's skin complexion and beauty. Environmental, psychological and physical factors have influenced the rise of uneven skin tone, hyperpigmentation, acne and melasma which ultimately leads to the loss of skin luster. Therefore, skin complexion promoters are used extensively to combat such dermatological conditions. More often the chemical ingredients included in these commercial products for the skin, on prolonged usage leads to graver health conditions. According to Ayurveda, physical, mental, social, and spiritual influences contribute towards the beauty of an individual (Dakhole *et al.*, 2023), and healthy skin reflects the overall positive health of the body (Chouragade and Lambat, 2022). Therefore, radiant skin is attained through the equilibrium of *Tridosha* (त्रिदोष) (somatic humors of the body), appropriate nourishment of the *Dhatu* (धातुः) (ayurveda concept of tissue elements of the body), suitable functioning of *Agni* (अग्नि) (digestive fire) and the proper evacuation of *Mala* (मल) (waste products) (Dakhole *et al.*, 2023). Furthermore, Ayurveda believes that a radiant face is a direct reflection of *Ojas* (ओजस) (vital factor of life), which is the ultimate result of positive physiological homeostasis (Gupta *et al.*, 2022).

Ayurveda has documentations of various herbal groups and daily regimens for the maintenance of beauty. Among such herbal groups, the *Varnya Dashakaya* (वर्ण्य दशकय) mentioned in the *Charaka Samhita* (चरक संहिता) (Sharma & Dash, 2014), is a herbal group specifically indicated for the enhancement of skin complexion. The *Varnya Dashakaya* (वर्ण्य दशकय) includes 10 plants, namely, *Chandana* (चन्दन) (*Santalum album* L. (Santalaceae), *Tunga* (तुङ्ग) (*Calophyllum inophyllum* L. (Calophyllaceae), *Padmaka* (पद्मक) (*Prunus cerasoides* D. D (Rosaceae), *Ushira* (उशीर) (*Vetiveria zizanioides* N. (Poaceae), *Madhuka* (मधुक) (*Glycyrrhiza glabra* L. (Fabaceae), *Manjishta* (मञ्जिष्ठा) (*Rubia cordifolia* L. (Rubiaceae), *Sariva* (शरिवा) (*Hemidesmus indicus* R.B. (Apocynaceae), *Payasya* (पयस्य) (*Ipomoea paniculata* R. Br. (Convolvulaceae), *Sita* (सीता) (white variety of *Cynodon dactylon* (L.) Pers. (Poaceae), and *Lata* (लता) (Black variety of *Cynodon dactylon* (L.) Pers. (Poaceae) (Sharma & Dash, 2014). Accordingly, this research aims to develop and pharmaceutically standardize a novel poly-herbal topical application from selected ingredients of the *Varnya Dashakaya* (वर्ण्य दशकय) mentioned in Ayurveda for the purpose of enhancing skin complexion.

METHODS

Plant material

From *Varnya Dashakaya* (वर्ण्य दशकय), *Chandana* (चन्दन) (*S. album*), *Ushira* (उशीर) (*V. zizanioides*), *Madhuka* (मधुक) (*G. glabra*) and *Manjishta* (मञ्जिष्ठा) (*R. cordifolia*) were selected for the development of the poly-herbal topical application due to availability, feasibility and proven efficacy of the plants regarding skin disorders. Dry plant materials were obtained from an accredited collector Ayurveda Drug Cooperation, Navinna, Sri Lanka specializing in Ayurveda medicinal resources. Beeswax and coconut oil were also purchased from Ayurveda Drug Cooperation, Navinna, Sri Lanka. All the ingredients were identified and authenticated by the Department of Ayurveda Pharmacology, Pharmaceutics and Community Medicine, Faculty of Indigenous Medicine, University of Colombo, Sri Lanka. The data and information on the properties of the herbal material, procedures and measures for the development and standardization were gathered from the Ayurveda authentic texts, Ayurveda textbooks and published journal articles across the databases of Google Scholar, PubMed and Science Direct. The journal articles that were relevant for the topic and included information regarding the selected herbal ingredients and secondary metabolites were selected for this research. However, articles that were incomplete and not available in full form were not selected. All the herbal ingredients were obtained separately in dry form, ground and sieved through a 150-gauge sieve to obtain of the fine powder of *Chandana* (चन्दन) heartwood (6g), *Manjishta* (मञ्जिष्ठा) root (6g), *Madhuka* (मधुक) stem (2g) and *Ushira* (उशीर) root (2g).

Preparation of base

Coconut oil 60ml (6 parts) was measured using a measuring cylinder and heated in a stainless-steel container using a water bath not exceeding 80 degrees Celsius. To the warmed oil, 10g of Bee's wax (1 part) was added and stirred till completely dissolved in the oil and formed into a uniform consistency. The base is then removed from heat and filtered.

Formulation

Three replicates of the poly-herbal topical application were developed based on the *Gandhaka Malahara Kalpana Paribasha* (गन्धक मलहार कल्पना परिभाषा) mentioned in the Ayurveda authentic texts (*Rasa Tarangini* (रसतरंगिणी), Chapter 8), at the Pharmacy of the Department of Ayurveda Pharmacology, Pharmaceutics and Community Medicine, Faculty of Indigenous medicine, University of Colombo, Rajagiriya. To the base, while it is still in liquified state and with continuous stirring, fine powder of *Chandana* (चन्दन) (6g), *Manjishta* (मञ्जिष्ठा) (6g), *Madhuka* (मधुक) (2g) and *Ushira* (उशीर) (2g), was added. Two drops (2.1g) of natural Sandalwood essential oil (Ayurveda Drug Cooperation, Navinna, Sri Lanka) were also added to enhance the

fragrance. The stirring was continued for 2 minutes to obtain a homogenous mixture and poured into a glass container to cool.

Three samples were prepared as replicates by following the same process and considered as Sample A, Sample B and Sample C. There was no control as this product is new and novel, therefore a suitable comparable product was not available commercially.

Evaluation

The standardization procedures for the poly-herbal product were selected based on the Standard Operating Procedures (SOP) for the regulation of Ayurveda products put forth by the Ayurveda Formulary Committee of the Department of Ayurveda, Ministry of Health, Sri Lanka. The selected procedures were then conducted according to the methods mentioned in The Indian Ayurveda Pharmacopoeia, WHO and references. Accordingly, evaluation of organoleptic parameters, homogeneity, spread ability, pH value, total moisture content, total ashes value, saponification value, qualitative phytochemical screening, development of TLC and HPTLC fingerprints were conducted according to Standard Operating Procedures (2021), Matangi *et al.*, 2014, The Indian Ayurveda Pharmacopoeia, Suen *et al.*, 2024, and quality control methods for medicinal plant materials, World Health Organization (2011), Geneva. Qualitative phytochemical screening was carried out according to the methods described by Dahanayake and coworkers in 2019 (Dahanayake *et al.*, 2019).

Extraction

The ethanolic extract was obtained using the magnetic stirrer to conduct the phytochemical screening procedure (Pandey and Tripathi, 2014). Sample A and ethanol were mixed on a 1:3 ratio in a flat-bottomed conical flask and kept on the magnetic stirrer at max speed and 60 degrees Celsius for 1 hour. After which, the conical flask was removed from the magnetic stirrer, covered in foil paper to prevent evaporation and kept in the freezer at -19 degrees Celsius for 24 hours. At the end of 24 hours the obtained ethanolic extract of sample A was collected into sample bottles, filtered, evaporated in a hot air oven at 40 degrees Celsius for 24 hours, and then stored at a cool temperature for further use. Same procedure was followed to collect ethanolic extracts from Sample B and Sample C.

Tests for alkaloids

Mayer's reagent test- Six drops of Mayer's reagent and 1% HCL was added to 2ml of extract and mixed well. Red/orange/cream/brown precipitate indicates the presence of alkaloids (Dahanayake *et al.*, 2019). Wagner's test- two drops of the Wagner's reagent were added to 2 ml of extract and mixed well. The appearance of reddish color indicates the presence of alkaloids.

Test for tannins

Ferric Chloride test- five drops of Ferric chloride were added to 2ml extract and mixed well. Appearance of blue-black precipitate indicates the presence of tannins (Dahanayake *et al.*, 2019). Lead acetate test- three drops of Lead acetate were added

to 5ml of extract and mixed well. Appearance of yellow precipitate indicates the presence of tannins.

Test for saponins

Frothing test- 5ml of distilled water was added to 2ml of extract, shaken vigorously and kept for 10 minutes. The persistence of froth for at least 10 minutes indicates the presence of saponins.

Test for flavonoids

Ammonia test- 5ml of dilute ammonia solution was added to 3ml of the extract. Then conc. H₂SO₄ was added. The appearance of yellow color disappears on standing indicates the presence of flavonoids (Dahanayake *et al.*, 2019). Test- Piece of metallic Mg was added to 5ml of extract, followed by the addition of 3 drops of conc. HCL and heated. The appearance of red-orange color indicates the presence of flavonoids.

Test for terpenoids

Salkowski test- 2ml of extract was mixed with 3ml of chloroform in a test tube and conc. 3ml of conc. H₂SO₄ was added along the sides of the test tube. A brown/green/red color indicates the presence of terpenoids.

Thin layer chromatography

Three milliliters of each sample were transferred into separate containers and evaporated in a water bath at a temperature not exceeding 40°C to concentrate the extracts and then spotted on a 10×10 plate. TLC fingerprint profile was developed using a solvent system of toluene, ethyl acetate and n-butanol in a ratio of 2.5:1.5:3.5 v/v. The plate was visualized under UV radiation (366 nm).

RESULTS

Plant material

This polyherbal topical application was developed by following the process of *Gandhaka Malahara Kalpana Paribasha* (गन्धक मलहार कल्पना परिभाषा) mentioned in Ayurveda. The base consisted of Beeswax and coconut oil while the active plant ingredients were *Chandana* (चन्दन) (*S. album*), *Ushira* (उशीर) (*V. zizanioides*), *Madhuka* (मधुक) (*G. glabra*) and *Manjishta* (मज्जिष्ठा) (*R. cordifolia*) in powder form. Natural sandalwood essential oil was used to enhance the sandalwood aroma and provide added therapeutic effects for the herbal product. Coconut oil presents many pharmacological activities including antioxidants, wound healing, anti-inflammatory, immunomodulatory, analgesic, anti-pyretic and hepatoprotective activities (Kappally *et al.*, 2015) and has been proven to be extremely beneficial in the maintenance and improvement of skin health. Beeswax contains carotene, which is a source of vitamin A, leading to its properties of delayed collagen breakdown and accelerated mitotic division of the skin epidermal layer which in turn leads to faster skin regeneration (Gorecka *et al.*, 2020). It also exhibits anti-microbial properties especially against the yeast *Candida albicans* and bacterial strains like *Proteus vulgaris*, *Bacillus subtilis* and *E.*

coli (Dumitru et al., 2022). According to Ayurveda, the skin is the seat of *Bhrajaka Pitta* (भ्राजकपित्त), which is a sub-type of the somatic humor *Pitta Dosha* (पित्तदोष) responsible for the luster, complexion and health of the skin (Chouragade and Lambat, 2022). The normal and abnormal states of this type of *Pitta Dosha* (पित्तदोष) greatly affect the overall health, especially the color of the skin (Chouragade and Lambat, 2022). The herbal ingredients mainly consist of the *Madhura* (मधुर) (sweet), *Tikta* (तिक्त) (bitter), *Kashaya* (कषाय) (astringent) *Rasa* (रस) (taste), *Shita Virya* (शीतवीर्य) (cold potency), *Madhura Vipaka* (मधुरविपाक) (post digestive state) and *Kapha-Pittahara* (कफपित्तहर) properties (Jangde et al., 2021). These properties all act to pacify the vitiated *Pitta Dosha* (पित्तदोष) thereby appeasing any sort of abnormality of the *Bhrajaka Pitta* (भ्राजकपित्त), of the skin. This prevents and heals conditions like hyper pigmentation, uneven skin tone and acne. Moreover, such properties are beneficial in the detoxification of the blood and provide an antioxidant effect due to the *Shita Virya* (शीतवीर्य) by reducing the intracellular levels of reactive oxygen species in addition to the *Varna Prasadana* (वर्णप्रसादन) (color promoting) properties. Furthermore, the *Kashaya Rasa* (कषाय रस) which is a predominant feature of this group is responsible for removing the *Twak Vaivarnyata* (त्वक् वैवर्ण्यता) (discoloration of skin) which is beneficial in restoring the normal color of the skin (Jangde et al., 2021). Below mentioned are the standardization procedures conducted on the poly-herbal topical application.

Organoleptic evaluation

All three replicates of the formulated herbal product were evaluated for their organoleptic properties including consistency, color, odor and texture. The results are presented in Table 2. The topical application is a reddish-brown, semisolid mass with a uniform, smooth texture. It presents the characteristic sandalwood aroma enhanced by the inclusion of the sandalwood essential oil. Although the fragrance is strong it is not overpowering, thereby providing a relaxing and soothing sensation. The product contains a fatty base, allowing it to lock in moisture and form a protective barrier on the skin. As a result, it provides prolonged nourishment, hydration, and protection. Therefore, the topical application can be perceived as a semi solid, reddish-brown paste with smooth consistency and characteristic odor. It was noted that the consistency and the organoleptic parameters of the product remained unchanged throughout the study period (3 months) suggestive of its stability. However, further research is needed to accurately determine shelf life.

Table 2. Organoleptic properties

Sample Name	Consistency	Color	Odor	Texture
A	Semisolid	Reddish-brown	Characteristic	Smooth
B	Semisolid	Reddish-brown	Characteristic	Smooth
C	Semisolid	Reddish-brown	Characteristic	Smooth

Homogeneity

The replicates were evaluated for homogeneity and they were determined as equally homogenous. Results are presented in Table 3.

Table 3. Homogeneity

Sample Name	Homogeneity
A	+++
B	+++
C	+++
Mean value	+++

pH

The pH of all three replicates A, B and C was determined by comparing the pH strips immersed in the diluted samples to the Universal Indicator Color Standard. The mean value of all three samples was 5.4 and the standard deviation was 0.387. This confirms the suitability of the product as a topical application, as the ideal pH range for skin products is considered to be 4-6 (Lukic *et al.*, 2021).

Moisture content

Moisture content was determined for all samples. The mean value of moisture content was 4.2% and the standard deviation was 0.404. A mean moisture content below 5%, indicates a low moisture percentage in the developed product. This suggests a reduced risk of microbial growth, which enhances its natural preservative properties. Additionally, the low moisture content may help increase shelf life by minimizing the risk of accelerated hydrolysis of chemical components. Furthermore, low moisture content might improve spread ability by making the product thicker and less runny, as well as increasing its efficacy due to the higher concentration of active compounds.

Total ash content

The total ash percentage of the samples was 4.1% and the standard deviation was 0.1. A low mean total ash percentage below 5%, indicates the purity and absence of

contaminants in the produced herbal product. Additionally, it indicates the presence of bio-active compounds in a higher concentration which in turn is beneficial for the therapeutic efficacy of the developed product.

Saponification values

Mean of the saponification value was 0.2454 and the standard deviation was 0.0027. This is suggestive of the herbal product having a low-fat content, non-greasy, lighter texture which is highly desirable in products developed for the skin. Furthermore, it also suggests that the product may contain water soluble bio active compounds as compared to lipophilic ingredients which prove to be suitable in skin care treatments.

Qualitative phytochemical screening

The extracts were screened for the phytochemicals, alkaloids, tannins, saponins, flavonoids and terpenoids and are given in Table 4. The results of the phytochemical screening of the poly herbal topical application revealed the presence of alkaloids, tannins, flavonoids and terpenoids. Tannins, flavonoids and terpenoids presented high results indicating their noteworthy presence.

Table 4. Qualitative phytochemical screening of developed product

Phytochemicals	Test	Sample A	Sample B	Sample C
Alkaloids	Mayer's test	+(red precipitate)	+(red precipitate)	+(red precipitate)
	Wagner test	++(red color)	++(red color)	++(red color)
Tannins	Ferric chloride test	+++ (blue-black precipitate)	+++ (blue-black precipitate)	+++ (blue-black precipitate)
	Lead acetate test	++ (orange-yellow precipitate)	++ (orange-yellow precipitate)	++ (orange-yellow precipitate)
Saponins	Frothing test	-	-	-
Flavonoids	Ammonia test	+++ (yellow color)	+++ (yellow color)	+++ (yellow color)
	Test (b)/Magnesium test	+++ (orange color)	+++ (orange color)	+++ (orange color)
Terpenoids	Salkowski test	+++ (red-brown color)	+++ (red-brown color)	+++ (red-brown color)

Herbal alkaloids are one of the largest groups of natural products and are characterized by the presence of a basic nitrogen at any location or position of the molecule (Bribi 2018). The presence of such alkaloids indicates the therapeutic efficacy due to the proven properties of antibacterial specially against methicillin-resistant

Staphylococcus aureus (Khan *et al.*, 2020), antiviral, antioxidant, anti-inflammatory and anticancer properties (Adamski *et al.*, 2020; Kaur & Arora, 2015; Khan *et al.*, 2020).

Tannins are a polyphenolic phytochemical that is found in higher plants (Hossain *et al.*, 2021). The identification of the presence of this phytoconstituent group suggests the range of therapeutic efficacy that can be expected from the herbal product, due to their proven antioxidant and free radical scavenging properties, notable bactericidal properties, antimicrobial, antiviral, cytotoxic, anti-inflammatory and wound repair properties (Hossain *et al.*, 2021; Pizzi, 2021.).

The presence of flavonoids indicates the proven antioxidant-free radical scavenging activity, antiaging, anti-inflammatory, immunomodulatory, antimicrobial, antiviral, antibacterial, antiparasitic and antifungal properties as well as the beneficial effects on the skin due to its soothing and anti-inflammatory, antioxidant activities (Sangeetha *et al.*, 2016).

The presence of terpenoids indicates the presence of antioxidant, anti-aging, anti-inflammatory, antibacterial, immunoregulation, antimalarial, insect resistance, anti-tumor in addition to its capability to promote the transdermal absorption which is especially beneficial in products used for the skin (Yang *et al.*, 2020).

The absence of saponins is noteworthy since this phytochemical group is known for its surfactant and foaming properties. Their absence in this herbal product suggests that the developed poly-herbal paste has limited or less foaming capabilities, which is beneficial in a skin care product that is meant for being non-greasy. While saponins are a beneficial phytoconstituent, in high doses they could become toxic, therefore, the absence may suggest a comparatively safer formulation.

TLC

The TLC analysis, when viewed under UV light (366 nm), identified five distinct yellow spots on the chromatogram of each sample to prove the presence of 5 different compounds (Figure 1).

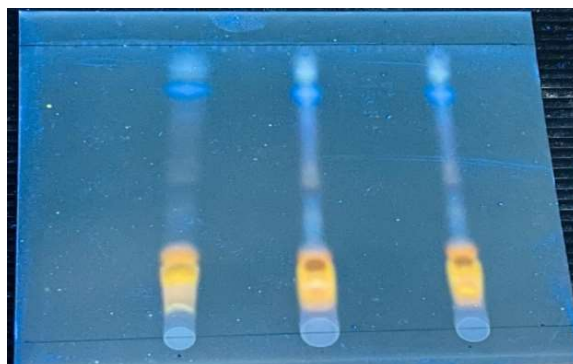


Figure 1: TLC

CONCLUSION

The polyherbal topical applications were developed utilizing authentic ayurveda knowledge without any synthetic products or dyes. The literature studies on the herbal material suggest its efficacy as a complexion promoter according to ancient ayurveda. This developed topical application was standardized by various physio-chemical and phytochemical analysis methods. The average pH of the samples is safe for application on the skin and the conducted analyses revealed the presence of multiple phytochemical groups indicating the various antioxidant, anti-bacterial, anti-microbial, anti-inflammatory, anti-aging and free radical scavenging properties of the poly-herbal product. Therefore, the developed product could be included in skin care as a natural, safe and effective Ayurveda poly herbal topical application for the promotion of skin complexion and maintenance of skin health among the Sri Lankan community.

DECLARATIONS OF INTEREST

None

DECLARATION OF HONOUR

We declare in our honor that our results are not fake and made up.

AI ASSISTANCE DISCLOSURE

The authors used [ChatGPT/GPT-5] to improve the clarity and readability of the manuscript. The authors carefully reviewed and edited the content to ensure accuracy and take full responsibility for the final text.

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