

Phytochemical Profiling and Formulation of Herbal-Based Toiletries

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Abstract— Polyherbal formulations, consisting of two or more herbs, have gained significant attention in recent years as the shift from traditional to modern medicine continues to unfold. Medicinal plants are being extensively studied to uncover their ethnomedicinal properties. This growing interest in herbal products is largely driven by their enhanced safety profile, minimal side effects, and overall consumer preference for natural alternatives. The present study aimed to develop versatile polyherbal toiletries using a range of medicinal herbs, including *Citrus limon*, *Citrus sinensis*, *Azadirachta indica*, *Rubia cordifolia*, *Terminalia arjuna*, *Syzygium aromaticum*, *Curcuma longa*, *Embllica officinalis*, and *Acacia concinna*. Specifically, we formulated a polyherbal face scrub, hair cleanser, and toothpaste. These formulations were subjected to various evaluations, including Saponification Value, pH, and phytochemical analysis. The findings revealed the presence of active constituents in these formulations, underscoring their potential effectiveness in promoting health and safety.

Index Terms- Polyherbal, phytochemicals, ethano-medicine, economic

I. INTRODUCTION

Plants are considered as a divine source for a botanist for gaining efficient therapeutic compounds. Plants have numerous medicinal benefits which are rendered by the secondary metabolites/phytochemicals like flavonoids, alkaloids, tannins, amines, terpenoids and glycosides that are present in them. Due to the presence of these active compounds known as phytochemicals, plants demonstrate anti-bacterial, anti-fungal, anti-inflammatory, anti-oxidant wound healing and many more medicinal properties (1). Hence, plants are used in medicine and are preferable

as an alternative source to the chemically synthesized drugs. Further, they are naturally available, safer for consumption, easily accessible, sustainable, with limited side-effects, environment friendly and highly economic.

From time immemorial indigenous inhabitants have used plants as a source of medicine to treat various ailments and disease conditions. Phytomedicine is a study that involves understanding various parts of a plant like leaves, bark, roots and seeds that are used as medicine. In the recent years and more prominently post- pandemic there has been an increasing demand for herbal/plant based medicines due to the rising cases in side effects and drug resistance emerging due to the constant use of chemical based drugs and its improper disposal. Plant based drugs are considered natural, safer and more effective than allopathic drugs (2). Ancient Indian populations and also presently in some of the rural areas the natives continue to employ medicinal plants products and their preparations such as Ubtans, shikakai (fruit), amla (fruit), neem (leaves) on a regular basis in their daily routine for cleaning and maintenance of regular hygiene (3).

To enhance the effectiveness of plant based medicines polyherbal preparations are being employed. Polyherbal preparations are defined as the mixing of two or more plants or their products to enhance its effectiveness. In this study we have prepared three different polyherbal toiletries namely, toothpaste, face scrub and shampoo using different plants like *Citrus limon*, *Azadirachta indica*, *Rubia cordifolia*, *Terminalia arjuna*, *Syzygium aromaticum*, *Curcuma longa* etc.. *Citrus limon* (lemon) has significant antioxidant effect and is recommended for use in anti-ageing cosmetics (4,5). Lemon contains abundant vitamin C. It promotes hair growth and pigmentation; it is an important component of hair tonics. (6)

Sapindus trifoliatus (Reetha) has a cooling effect and effectively cleanses the skin. It keeps the skin supple and stops the scalp from drying. Herbs like amla, reetha, neem, and shikakai are essential for strong hair, increased hair development, reduced hair loss, and voluminous hair. (7,8,9)

Azadirachta indica (Neem) is one of the plants recognized for its therapeutic properties. Its leaves are used for leprosy, upset, gum diseases, antibacterial agents, skin diseases, pain and Chickenpox scars can be eliminated with neem leaf paste (10).

Rosa indica (Rose) its petals contain vitamins K, C, and B, they have antibacterial properties. and good amounts of antioxidants (11). *Rubia Cordifolia* (Manjistha) is a well known skin care herb which can be used for lustre and glow (of the skin) and to get rid of pimples, freckles and discoloration. It is also used to treat in various skin disorders like leucoderma, black spots on the face, itching etc. According to Charaka, Manjistha is jvarahar a (febrifuge), varnya (improving the complexion), and visaghna (a detoxifier) (12,13). *Syzygium aromaticum* (cloves) is effective against a wide range of microorganisms, including those linked to dental caries and periodontal illness. Furthermore, research has documented that *Syzygium aromaticum* possesses anti-fungal, anti-carcinogenic, anti-allergic, and anti-mutagenic properties (14). *Zizyphus jujube*, The saponins of Jujube Bark extract remove impurities and flakes from the scalp and hair by inhibiting sebum production and decreasing the synthesis of 5-lipoxygenase (5-LOX), the enzyme that causes irritation, it is also known to promote hair growth (15). *Terminalia arjuna*, Arjuna paste has anti-inflammatory qualities, it helps control acne and pimples by lowering inflammation. Additionally, it contains astringent qualities that cause skin cells to shrink and aid in the reduction of acne, which is brought on by the skin producing too much oil (16). Guava (*Psidium guajava* L.) leaves have been used as a traditional herbal cure for hair loss in Thai folk medicine, they are also rich in Vitamins B and C, and they increase the activity of the collagen necessary for hair health (17). We have prepared polyherbal toiletries with a mixture of the above mentioned different plants/herbs depending on their properties, relevance, use in ayurveda and medicine. The

formulations were evaluated for their physical parameters and phytochemical properties.

II. MATERIALS AND METHOD

- Toothpaste

Leaves of *Azadirachta indica* (10gms), fruit of *Syzygium aromaticum* (5gms) and *Curcuma longa*(5gms), rock salt, (2.5 gms), Alum (1 gm). All the above components were dried, ground and stored in an air tight vial.

- Face scrub

Peels of *Citrus limon* (50gms), *Citrus sinensis* (50gms), leaves of *Azadirachta indica* (50gms), bark of *Rubia cordifolia* (50gms), bark of *Terminalia arjuna* (50gms) and petals *Rosa indica* (50gms) were dried, ground, sieved and stored in air tight vials.

- Hair cleanser

Fruit of *Embilica officinalis* (50gms), *Acacia concinna* (50gms), *Sapindus trifoliatus* (50gms), *Zizyphus jujube* (50gms), *Terminalia chebula* (50gms) and *Terminalia bellirica* (50gms), leaf of *Azadirachta indica* (50gms) and *Psidium guajava* (50gms), dried, ground, sieved and stored in air tight vials.

- Phytochemical Tests

Test for Saponin: In 2ml sample 2ml distil water and mixed well. The formation bubbles or foam indicate the presence of saponin in the sample (18).

Test for Flavonoid: in 2ml sample 1ml 2N sodium hydroxide was added and mixed. Development of yellow colour indicates the presence of flavonoid.

Test for Tannin

Ferric chloride test: 2ml of 5% ferric chloride solution was added to 1mL of plant extract and blue, black or dark green colour indicates the presence of tannin.

Test for Alkaloid

Wagner's test: 1ml of plant extract was added to 1mL of Wagner's reagent. (2g of iodine and 6g of KI in 100mL of water) reddish-brown precipitate indicates the presence of alkaloids.

Test for Starch

2 drops of iodine solution were added to 2mL of plant extract, blue-black colour indicates the presence of starch (19).

Test for Carbohydrate

Fehling's test: 0.5mL of Fehling A and Fehling B was added to the 0.5mL of plant extract and the mixtures were then heated in a water bath, the formation of brick red precipitate of cuprous oxide indicates the presence of carbohydrates.

Test for Fat

1mL of distilled water and few drops of ethanol were added to 1mL of plant extract, formation of white precipitate indicates the presence of fat.

Foaming Test: It was determined by using cylinder shake method. Briefly, 50 mL of the 1% formulated shampoo solution was placed into a 250 mL graduated cylinder; it was covered with one hand and shaken 10 times. The type of the foam content after 1 min of shaking was recorded (20).

Wetting time test: A canvas paper was cut into 1-inch diameter discs having an average weight of 0.44 g. The smooth surface of disc was placed on the surface of 1% v/v shampoo solution and the stopwatch started. The time required for the disc to begin to sink was noted down as the wetting time (21).

Patch Test: The prepared formulations of shampoo, face scrub and toothpaste, was mixed with water and applied on the scalp, skin and in the mouth respectively, it is then left for 30 mins and then washed. After washing, the skin is observed for visual rashes, signs of irritation or redness from 30 mins to 24 hours.

Thermal Stability test: The thermal stability of the formulations was evaluated at different temperatures. The formulations were left to stand in clean, covered test tube at temperatures conditions of 25oC, 37oC and 45oC. The physical appearance and stability was observed for 3 weeks.

III. RESULT

Herbal Face scrub, tooth paste and hair cleanser was prepared using plant sources such as leaves of *Azadirachta indica*, fruit of *Syzygium aromaticum* and *Curcuma longa*, rock salt,, Alum for toothpaste, Peels of *Citrus limon*, *Citrus sinensis*, leaves of *Azadirachta indica* , bark of *Rubia cordifolia* , bark of *Terminalia arjuna* and petals *Rosa indica* for face scrub and *Embilica officinalis*, *Acacia concinna* , *Azadirachta indica*, *Sapindus trifoliates*, *Zizyphus jujube* , *Terminalia chebula*, *Terminalia bellirica* , *Psidium guajava* for herbal hair cleanser. Using the established techniques available in literature the preliminary analysis of the preparations was done to determine the presence of several phyto-constituents (Table 2). The finished products were analyzed for the presence of phyto-constituents and their physical parameters.

Table 1: Physical parameters of the polyherbal formulations.

Parameters	Hair cleanser	Face scrub	Tooth paste
Color	Greenish brown	Brown	Cream
Texture	Powder	Powder	Powder
pH	6.9 (Neutral)	7.1 (Neutral)	6.9 (Neutral)
Foam type	Small and dense	-	-
Wetting time	120s	-	-
Patch test	No irritation	No irritation	No irritation
Stability test	Stable	Stable	Stable

The physical parameters suggest that the hair cleanser, toothpaste and face scrub has the desired neutral pH, is non-irritable to the skin and stable upto 45oC for 3 weeks satisfactory foam production without the addition of synthetic foam enhancers. The prepared face scrub was positive for flavanoids, tannin, carbohydrate, fat and starch. Toothpaste showed the presence of flavanoids and fat whereas the hair cleanser contained alkaloid, saponin, flavanoids, tannin, carbohydrate and fat. The presence of phyto-chemicals in the formulations signifies the presence of

biologically active constituents and hence the relevance of these formulations in treatment or medicine and its health benefits.

Table 2: Phytochemical evaluation of the polyherbal toiletries

Product name	Test for Alkaloid	Test for Saponin	Test for Flavonoids	Test for Tannin	Test for Carbohydrate	Test for Steroid	Test for Starch
Face scrub	-	-	+	+	+	+	+
Tooth Paste	-	-	+	-	-	+	-
Shampoo	+	+	+	+	+	+	-

CONCLUSION

The use of natural remedies is more favorable and preferred with the belief that they are way safer with fewer side effects than the synthetic ones. In the present day, the demand and use of herbal formulations is growing in the world market. In this scenario it is a good attempt to establish protocols for the formulation of herbal or polyherbal toiletries that are used on a regular or rather daily basis they are a lot cheaper as well. We conclude that are formulations are natural, safe, cheaper for long time use.

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