Formulation and Evaluation of Herbal Lipstick with Anti-Oxidant and Skin Lightening Effects

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ABSTRACT

The present study aimed to formulate and evaluate herbal lipstick preparations using a natural base of mango butter, beeswax, carnauba wax, and castor oil combined with plant-derived active ingredients including amla extract, licorice extract, almond oil, beetroot extract, tulsi oil, and lemon juice. Three formulations (F1, F2, and F3) were developed with varying concentrations of waxes and emollients to assess their effect on product performance. The prepared formulations were evaluated for physical appearance, spreadability, stability, melting behavior, and sensory properties under different storage conditions (room temperature, refrigeration, and accelerated temperature) over a 90-day period. F1 exhibited softer consistency with good spreadability but lower thermal stability, while F3 showed higher rigidity and excellent heat resistance but reduced smoothness. F2 demonstrated an optimal balance of firmness, spreadability, and stability across all conditions.The incorporation of herbal actives provided additional cosmetic benefits such as moisturization, antioxidant activity, mild pigmentation, and soothing effects. Among all formulations, F2 was found to be the most stable and cosmetically acceptable. Overall, the study concludes that a balanced combination of natural waxes, butters, oils, and herbal extracts is essential for developing an effective, stable, and consumer-friendly herbal lip balm.

Keywords: Mango butter, Amla extract, Beetroot extract, lip balm, spreadability

INTRODUCTION

The increasing consumer preference for natural and safe cosmetic products has led to a growing interest in herbal-based formulations, including lipsticks. Synthetic colorants and chemicals commonly used in conventional lipsticks pose risks such as carcinogenic effects, skin irritation, and allergies, which have prompted the exploration of herbal alternatives[1, 2]. Herbal lipsticks are formulated using natural colorants derived from sources like carrot, beetroot, turmeric, tomatoes, pomegranate, and cocoa, combined with natural waxes and oils to ensure desirable texture and stability[1]. Such formulations aim not only to enhance the appearance of lips with vibrant colors but also to provide added benefits like moisturizing, protection against environmental aggressors, and reduced chemical exposure[3].

The formulation and evaluation process of herbal lipsticks involves selecting appropriate natural pigments and excipients to achieve optimal color, texture, melting point, pH balance, and stability, along with sensory acceptability[1]. The shift towards herbal ingredients aligns with a broader trend in cosmetics to adopt green technology and eco-friendly components, ensuring safety, efficacy, and consumer wellness while minimizing adverse effects associated with synthetic additives [4,5]. Therefore, the development of herbal lipstick represents a significant advancement in cosmetic science, combining aesthetic appeal with therapeutic and protective properties derived from nature.

The active herbal ingredients incorporated in herbal lipsticks each offer distinct beneficial properties for lip care and protection. **Amla extract** is rich in vitamin C and antioxidants, promoting skin brightening, protecting

against free radical damage, and enhancing skin elasticity, thus contributing to healthier lips[6]. **Tulsi oil** possesses antibacterial, anti-inflammatory, and healing effects, which soothe chapped lips, reduce infection risk, and support the repair of damaged lip skin[7,8]. **Licorice extract** contains compounds like glabridin that provide skin-lightening and pigmentation-reducing benefits, helping to achieve even-toned, brighter lips while also exhibiting anti-inflammatory properties[9]. **Almond oil** is a natural moisturizer abundant in vitamin E, deeply nourishing and hydrating lips to prevent dryness and peeling while forming a protective barrier[10]. **Beetroot extract** supplies natural pigments (betalains) that enhance lip color naturally, alongside antioxidants that safeguard lip skin from oxidative stress[11]. Lastly, **lemon juice**, rich in vitamin C and citric acid, aids in brightening lips, improving skin tone, and offering a mild exfoliating effect, although it requires careful use to avoid irritation[12,13]. Together, these ingredients combine antioxidant protection, hydration, healing support, pigmentation enhancement, and skin brightening, making them ideal active components in herbal lipstick formulations[14.]

MATERIALS AND METHODS

Materials:

Bees wax, Carnauba wax, and castor oil were purchased from S.D. Fine chemicals limited. Mango butter of tattvalogy was purchased. Almond oil (Mfg. by Hamdard Laboratories India), Amla powder and liquorice powder was purchased from the local Ayurvedic shop Dagadu Teli, Nashik. Fresh beetroot and lemon fruits were purchased from the local market.

Fresh leaves and flowering tops of the Tulsi plant were collected from local region of Chandwad. The plant material was cleaned to remove any dirt and then the oil was extracted by using Clevenger apparatus. Since the essential oil is lighter than water, it floats on top of the water.

Beet roots were peeled off, cut into small pieces and grinded to form a slurry. It was filtered through muslin clothe and evaporated to get a dry extract. Amla and liquorice extract was prepared by macerating powder in methanol for 48 hrs. After maceration, it was filtered and concentrated.

Preparation of herbal Lip balm:

Beeswax, carnauba wax, and mango butter were melted together in a double boiler at controlled temperature (typically around 65–75°C). After the wax and butter are fully melted and homogenized, the measured amounts of castor oil and almond oil was added. The mixture was cooled slightly to below 40°C to preserve the bioactive compounds and Tulsi oil, amla extract, liquorice extract, beet root extract and lemon oil were added and mixed well. The mixture was mixed well to ensure uniform texture and color. The molten lipstick was filled into sterilized containers and allowed to cool at room temperature to solidify[15, 16]. All the ingredients with their percentage used are given in table no. 1.

Table 1 Formulation of Herbal lipstick with role of each ingredien

Sr. No.	Ingredient	F1	F2	F3	Role
	Mango Butter	8%	**10%**	9%	Moisturizes and adds a subtle, natural sheen
	Bees wax	4%	**6%**	8%	Film former
	Carnauba wax	1%	**2%**	3%	Impart Hardness and gloss
	Castor oil	15%	**16%**	17%	Plasticizer
	Almond Oil	10%	**12%**	14%	Emollient and nutritive
	Tulsi oil	4%	**2%**	1%	Flavoring agent and Skin penetrator

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	Amla extract	2%	**2%**	2%	Anti-oxidant, Immuno-modulator and Nutraceutical
	Liquorice extract	1%	**1%**	1%	Skin whitening and sun protective agent
	Beet root extract	2%	**3%**	4%	Coloring agent, anti-oxidant, anti-microbial
	Lemon Juice	0.5%	**0.5%**	0.5%	Anti-oxidant, skin brightening

Evaluation of Herbal Lip Balm:

Physical Appearance

A small amount of lipstick was visually examined under normal light. Color uniformity, presence of any particles, odor, and texture by gently rubbing between fingers was checked[17].

Melting Point

Melting point of the lipstick was determined by using the melting point apparatus. The lipstick was filled in to the capillary, tied to the thermometer, inserted into the liquid paraffin in Thiele's tube and heated gradually. The temperature at which the balm starts melting and completely liquefies was recorded.

pH Test

About 1 g of lipstick was dispersed in 10 mL of distilled water and pH was measured by using the pH meter.

Spreadability

After applying adequate lipstick to two glass slides, the top slide is subjected to a 100-gram weight for five minutes. Spreadability can be measured in two ways: the movement of the top slide over the lower slide and the time it takes the slides to separate[18].

Stability tests

The lipstick stability study began 24-48 hours following preparation, which allowed time for formulation stabilization. Over the course of 90 days, a 350 g batch was tested for color, odor, appearance, and phase separation. Samples were kept in duplicate at room temperature (22 ± 3°C), Oven (O, 40.0 ± 2.0 ºC) and Refrigerator (Re, 5.0 ± 1.0 ºC). The baseline (t_0) measurements were collected after 48 hours at room temperature. Evaluations were undertaken on days 3, 7, 15, 30, 60, and 90, with t_0 as the reference[19,20].

Skin Irritation Test

Applied a small quantity of lipstick on a patch of skin of forearm and leave it for 24 hours. After 24 hr. any redness, itching, or swelling was observed[21, 22].

Washability Test

The lipstick was applied on skin and attempted to wash it off with water[23].

RESULT AND DISCUSSION

The herbal lipstick was prepared as per the formula given in table no. 1. Tulsi oil, amla, liquorice, and beet root extracts bring antioxidant and antimicrobial benefits to the lipstick due to their rich phytochemical content, such as flavonoids and phenolic compounds, which protect lips from oxidative damage and microbial contamination[24, 25, 26]. Castor and almond oils contribute to moisturization and barrier restoration, containing fatty acids and

vitamins crucial for lip health[27]. Mango butter improves smooth feel and skin hydration. It provides skin nourishment and comfort on application. It improves the spreadability and glide reduces waxy feel from beeswax/carnauba wax[28, 29].

Beeswax functions primarily as a natural thickening and binding agent that contributes to the balm's texture and solidity, while also offering occlusive properties that help lock moisture into the skin[30]. Carnauba wax, a harder plant-derived wax, imparts firmness and raises the melting point of the formulation, enhancing the structural stability and longevity of the lipstick upon application[31]. Together, these ingredients ensure a smooth texture, appropriate melting behavior, and effective moisturizing and protective actions in lipstick products.

The prepared herbal lipstick was the evaluated and the results are shown in table no. 2. F1 formulation shows acceptable stability at room temperature and refrigerator temperature but less heat resistance. There was a slight softening and oil sweating at oven condition. F3 formulation showed slight hardening at room temperature, brittle at refrigerator temperature and no change in oven. F3 formulation showed no noticeable change, no phase separation, maintains structure integrity, smooth surface at all conditions.

Table 2 Evaluation of Herbal lip balm

Evaluation tests	**F1**	**F2**	**F3**
Physical Appearance	Soft, glossy, slightly oily appearance with pleasant odor	Smooth, uniform, and having pleasant odor	Hard, rigid, matte-waxy appearance with pleasant odor
Melting Point	44 - 45°C	55 to 56°C	65 to 67°C
pH	5.3	5.8	6.4
Spreadability	High	Moderate	Low
Wash ability	Easily washable	Moderate washable	Low washable
Stability	Oil sweating	No Change	Brittle

The F1 formulation found to be soft but less thermally stable, F2 formulation as smooth, uniform, and aesthetically balanced and stable formulation while F3 formulation as hard, rigid, matte-waxy appearance forming a brittle, firmer stick at low temperature.

CONCLUSION

The current study developed and examined three herbal lipstick formulations (F1, F2, and F3) that included mango butter, beeswax, carnauba wax, and castor oil, as well as amla extract, licorice extract, almond oil, beetroot extract, tulsi oil, and lemon juice. F1 demonstrated strong spreadability but lower heat stability due to its softer consistency. Because of its higher wax content, F3 had greater structural integrity and melting resistance, but it was also harder and less smooth. F2 had a balanced profile that included good spreadability, appropriate firmness, agreeable sensory qualities, and consistent behavior across all storage circumstances. Beetroot and amla supplied antioxidant and pigmentation effects, licorice and tulsi gave relaxing, sun protecting and skin-conditioning characteristics, almond oil increased moisture, and lemon juice brought mild lightening.

Overall, formulation F2 was identified as the most optimized product, offering a desirable balance between stability, texture, and functional benefits. The study highlights that a well-adjusted ratio of natural waxes, butters, oils, and botanical extracts is essential for developing an effective, stable, and consumer-acceptable herbal lip balm.

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