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Review on Role of Beetroot in Polyherbal Lipstic

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Abstract: *Beetroot (Beta vulgaris L.) is a widely cultivated root vegetable known for its vibrant red-purple color due to the presence of betalain pigments. These natural pigments, primarily betacyanins and betaxanthins, offer a safe and eco-friendly alternative to synthetic colorants in cosmetic formulations. In recent years, beetroot has gained importance in polyherbal lipstick formulations, providing both coloring and therapeutic benefits. It is rich in antioxidants, vitamins, flavonoids, and phenolic compounds, which contribute to lip protection, hydration, and healing.*

The inclusion of beetroot extract in lipstick enhances natural pigmentation, texture, and consumer acceptability while reducing toxicity risks associated with synthetic dyes. Despite its benefits, challenges such as color instability, oxidation, and microbial contamination must be addressed using modern stabilization and encapsulation techniques. This review highlights the pharmacognosy, phytochemistry, extraction methods, formulation aspects, evaluation parameters, safety, and future prospects of beetroot as a natural colorant in polyherbal lipstick..

Keywords: Beetroot, Beta vulgaris, Polyherbal Lipstick, Betalains, Natural Pigments, Antioxidant Activity, Lip Care

I. INTRODUCTION

Herbal cosmetics have gained remarkable attention as consumers increasingly prefer natural and chemical-free beauty products [1]. Lipsticks, being one of the most commonly used cosmetics, not only provide color but also serve to protect and hydrate the lips [2]. Traditional formulations often use synthetic dyes that may cause allergies, pigmentation, or toxicity on prolonged use [3]. Hence, the demand for plant-derived colorants such as beetroot, hibiscus, turmeric, and sea buckthorn has significantly increased in natural cosmetic development [4].

Beetroot (*Beta vulgaris L.*), belonging to the family Amaranthaceae, is a rich source of betalain pigments that impart bright red to violet hues. These pigments are water-soluble and possess antioxidant, anti-inflammatory, and wound-healing properties, making beetroot highly suitable for polyherbal lipstick formulations [5,6]. The combination of beetroot with other herbal ingredients, such as sea buckthorn oil, cocoa butter, and shea butter, enhances both the cosmetic appeal and therapeutic value of the product [7].

2. Botanical Profile (Pharmacognosy) of Beetroot

Biological Source: Beta vulgaris L. (Family: Amaranthaceae)
Common Names: Beetroot, Red beet, Garden beet
Part Used: Tuberous root
Habitat: Native to the Mediterranean region; cultivated globally.
Morphology: A fleshy, deep red-purple root with smooth outer skin and sweet earthy taste.
Microscopy: Shows concentric rings of vascular bundles; presence of betalain pigments in vacuoles.
Organoleptic Characteristics: Sweet, earthy odor and taste; dark red color [8].

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3. Phytochemical Profile of Beetroot :

Beetroot contains a variety of bioactive compounds, includingand yellow coloration.

Phenolic compounds – ferulic acid, caffeic acid, and vanillic acid contribute to antioxidant activity.

Flavonoids – quercetin, kaempferol, and rutin.

Vitamins – especially Vitamin C and B-complex.

Minerals – potassium, magnesium, iron, and calcium.

Other bioactives – saponins, alkaloids, and polysaccharides [9,10].

These components help protect lip skin from oxidative stress and UV damage, while providing color stability and moisturizing effects [11].

4. Extraction and Processing Techniques:

Extraction of beetroot pigments is generally achieved by:

1. Solvent extraction: Using ethanol, methanol, or aqueous solutions for betalain extraction.

2. Juice extraction and filtration: Fresh beets are crushed and filtered to obtain pigment-rich extract.

3. Concentration & drying: Extract is concentrated under reduced pressure and may be spray- or freeze-dried for long-term stability.

4. Modern methods: Techniques like ultrasound-assisted extraction (UAE) and encapsulation in liposomes or polymeric carriers improve pigment retention [12,13].

The stability of beet pigments depends on pH (4.5–6.5 optimum), temperature, and light. Incorporating antioxidants such as ascorbic acid or tocopherol can enhance stability [14].

5. Formulation Considerations :

Base Compatibility: Beetroot extract blends well with natural waxes (beeswax, carnauba) and oils (castor, jojoba).

Color Stability: Requires controlled pH and minimal exposure to light/heat[15].

Texture & Spreadability: Depends on ratio of wax to butter; sea buckthorn oil can enhance shine.

Preservatives: Natural preservatives like tea tree oil or tocopherol are recommended[16].

Additives: Small amounts of titanium dioxide can improve opacity and UV protection [17].

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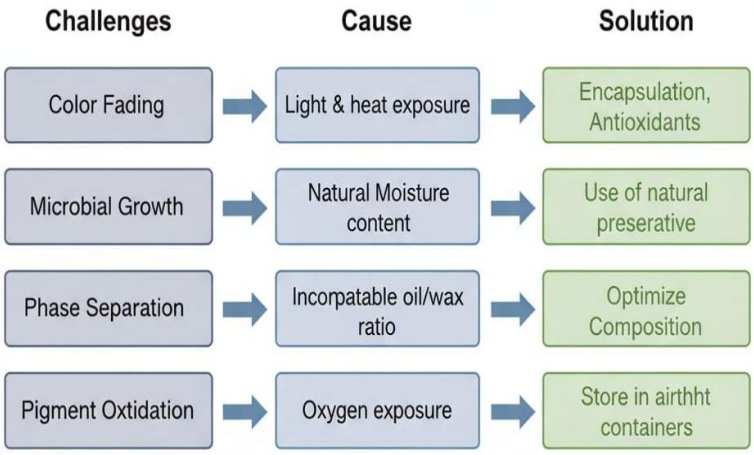
6. Evaluation Parameter :

Parameter	Purpose	Method
Color & Appearance	Visual Uniformity	Visual Observation
Melting Point	Stability of Base	Capillary Method
PH	Skin Compatibility	Digital PH Meter
Texture & Spreadability	Consumer Acceptability	Panel Testing
Stability	Shelf-life	Accelerated Stability testing
Microbial	Safety	Panel count method
Irritation Test	Dermal Safety	Patch test on volunteers

18,19

7. Formulation Challenges & Solutions : [20,21]



8. Regulatory and Safety Aspects :

Beetroot and its pigments (betalains) are classified as Generally Recognized as Safe (GRAS) by the U.S. FDA for food and cosmetic use [22].

EU Cosmetic Regulation (EC No. 1223/2009) allows natural plant extracts like beetroot for colorants with defined purity standards [23].

BIS (Bureau of Indian Standards) recommends testing for pH, microbial limits, heavy metals, and color stability for herbal lipsticks [24].

9. Pharmacological Benefits of Beetroot for Lips :

Beetroot (Beta vulgaris L.), belonging to the family Amaranthaceae, is a vibrant red root vegetable widely recognized for its bioactive compounds such as betalains, phenolic acids, flavonoids, vitamin C, and minerals. These compounds not only give beetroot its characteristic red color but also impart numerous pharmacological and cosmetic benefits when used in lip care formulations. Incorporation of beetroot extract into polyherbal lipsticks provides natural pigmentation, hydration, antioxidant protection, and therapeutic activity, making it a valuable natural ingredient for both cosmetic and functional purposes.

1. Antioxidant and Anti-Aging Effects :

Beetroot is rich in betalains (betacyanins and betaxanthins) and phenolic compounds that exhibit potent antioxidant activity, protecting lip tissues from oxidative damage caused by UV radiation and pollution. The presence of vitamin C enhances collagen synthesis, maintaining lip elasticity and preventing premature aging or pigmentation of the lips [25,26].

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2. Moisturizing and Hydration Effect :

The natural sugars and polysaccharides in beetroot act as humectants, drawing moisture from the environment and helping to keep lips hydrated and smooth. When formulated with emollients like shea butter or castor oil, beetroot extract enhances lip softness and prevents dryness [27,28].

3. Wound-Healing and Regenerative Activity :

Beetroot possesses strong regenerative and healing properties due to its antioxidant and anti-inflammatory constituents. It promotes collagen formation and epithelial regeneration, which are crucial for healing cracked or chapped lips and restoring the natural lip barrier [29].

4. Anti-Inflammatory Properties :

The flavonoids and phenolic acids in beetroot (such as ferulic acid and caffeic acid) exhibit anti-inflammatory action by inhibiting inflammatory mediators like COX-2 and NO synthase. This helps soothe lip irritation, redness, and inflammation caused by environmental factors or chemical exposure [30].

5. Natural Pigmentation and Photoprotective Action :

Beetroot's characteristic red pigment, primarily due to betanin, offers a natural and safe colorant alternative to synthetic dyes. Betanin absorbs harmful UV rays, providing mild photoprotective effects, which prevent lip darkening and damage from sunlight [31,32].

6. Antimicrobial and Detoxifying Properties :

Trace minerals like zinc, manganese, and copper in beetroot contribute to its antimicrobial and detoxifying activities. These elements help prevent microbial contamination, maintain lip hygiene, and promote healthy skin tissue [33,34].

7. Overall Lip Health and Appearance :

Due to its synergistic blend of antioxidants, vitamins, and minerals, beetroot extract improves lip tone, texture, and overall appearance. Regular application through polyherbal lipstick provides both aesthetic appeal and nourishment to the lips [35].

10. Future Prospects :

Beetroot's potential in natural cosmetics can be expanded through:
Nanoencapsulation to enhance color stability and controlled release.
Combination with other pigments (sea buckthorn, hibiscus) for varied shades.
Green extraction technologies (supercritical CO_2 extraction).
Development of cosmeceutical lipsticks with combined beauty and healing properties [36,37].

II. CONCLUSION

Beetroot (Beta vulgaris L.) represents a safe, effective, and sustainable natural colorant for polyherbal lipstick formulations. Beyond its vibrant hue, it offers antioxidant, moisturizing, and protective properties, aligning with the current shift toward eco-friendly and health-conscious cosmetics. With ongoing advances in formulation and stabilization technologies, beetroot-based herbal lipsticks hold strong potential in the natural cosmetics industry.

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