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FORMULATION, DEVELOPMENT AND EVALUATION OF COSMECEUTICAL NATURAL PIGMENTED LIPSTICK FROM OPUNTIA DILLENII FRUIT EXTRACT

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ABSTRACT
Opuntia dillenii, commonly known as the prickly pear, is a wild, invasive plant found in Yemen. The demand for cosmetics has been there since ancient times. The application of cosmeceutical lipstick formulations enhances the appearance of lips. The study focuses on the formulation and evaluation of natural cosmeceutical lipstick using Opuntia dillenii as primary ingredient. Opuntia dillenii is rich in bioactive compounds, including vitamins, antioxidants, essential fatty acids, making it a valuable ingredient for skincare and cosmeceutical applications. The lipstick was formulated with natural waxes, oils, and pigments, ensuring a safe and eco-friendly product. Comprehensive evaluations were conducted to assess the product's physicochemical properties, stability, sensory attributes, including color, texture, moisturizing effects. The results demonstrated that the Opuntia dillenii-based lipstick provides a nourishing and protective effect on the lips, with satisfactory color stability and wear ability. Cosmeceuticals are the substance used to alter the appearance or fragrances of the human body. Nowadays the demands for herbal cosmeceuticals in the world market are growing and are inevitable gifts of nature. There is a wide range of herbal cosmeceutical products to satisfy the need of women. Cosmeceutical Lipstick is a cosmetic product containing pigment, oils, waxes, and emollients that apply color, texture, and protection to the lips. The present study was done to formulate natural cosmeceutical lipstick. Attempt was also made to evaluate the formulated cosmeceutical lipstick. Which is having minimal or no side effects. It was concluded that these promising results suggest that this formulated natural cosmeceutical lipstick could serve as a safe and effective alternative to chemical lipstick, providing effective and safe management of Cosmeceutical Lipstick and has better option to women with minimal side effects.

KEYWORD: Cosmeceutical Lipstick, Opuntia dillenii, Cosmetics, Natural ingredients, Natural pigment, Formulation.

INTRODUCTION

Background of Opuntia Dillenii as Natural Cosmeceutical Lipstick[1-104]

Herbal preparations like herbal tablets, herbal paste, herbal creams, herbal lipsticks etc. has become more popular among the consumers. In present days the use of such products has increased and shades of color, texture and luster have been changed and become wider.

Cosmeceuticals are compounds that are applied to the human body to enhance its scent. Unlike synthetic herbal cosmetics that are suitable for human health, these contain a wide range of herbal cosmetics, such as skincare creams, lotions, powders, and scents. Recently, a great deal of formulas for toiletries and cosmetics have been developed using Indian botanicals. In addition to their historical use, Indian herbs have been reported in certain contemporary studies for use in personal care products. Due to its few side effects and skin-friendliness, herbal medication is highly sought after. The best thing about herbal cosmeceuticals is that they are made entirely of shrubs and herbs, which mean that they don't harm the body and instead give it nutrients and other beneficial minerals. The most popular Cosmeceutical used to makeup to accentuate the beauty of lips is lipstick.

Cosmeceuticals are substances used to enhance the appearance of the human body. Cosmeceuticals include skin-care creams, lotions, powders, perfumes, lipsticks, fingernail and toe nail polish, eye and facial makeup, permanent waves, colored contact lenses, hair colors, hair sprays and gels. Deodorants, baby products, bath oils, bubble baths, bath salts, butters and many other

types of products are in great demand in both developing and developed countries.

Opuntia Dillenii

Opuntia dillenii, commonly known as the prickly pear, is a wild, invasive plant found in Yemen. Opuntia dillenii is a plant form Cactaceae growing in dry and desert environments is a great medicinal herb, a shrub grows in desert and dry conditions with a height of about 1 to 1.8 meters. Additionally, Opuntia *dillenii* has very beautiful flowers with amazing coloration due to betalain Opuntia *dillenii*. It is a plant growing in deserts and semi-desert areas, including tropical and sub-tropical areas like south-eastern parts of North America and east coast of Mexico, the Bermudas, the West Indies and from the north of South America as well, the Gulf Coast of Texas and the south-eastern beaches of Brazil. Moreover, this plant is found in around the Mediterranean, the Canary Islands, Madagascar and Maritius, North Yemen, India, Pakistan, the south-eastern parts of Asia and Australia. As shown Figure 1.

Fig. 1: Opuntia Dillenii Fruit.

Chemical Composition of Opuntia Dillenii

The betalains a natural pigment with pharmacological properties such as antioxidant, anti- cancer, anti-lipidemic and antimicrobial activity are the most constitute of Opuntia *dillenii*. Their biosynthesis is based on the ability of plants to provide betalamic acid which condenses with cyclodopa or amino acids in non-enzymatic reactions. The consumption of Opuntia *dillenii* fruits represents an important contribution to the intakes of fiber, ascorbic acid, Mn, Cr and total phenolics which makes it a great antioxidant and also a powerful complementary diet.

Natural Pigment

The betalains are the most characteristic substances of Opuntia dillenii. Their biosynthesis depends on the ability of plants to form betalamic acid which condenses preferentially with cyclo-DOPA or amino acid in nonenzymatic reactions, leading to red-violet betacyanins (e.g., betanidin), or yellow betaxanthins (e.g., indicaxanthin,). While the latter compounds contain no glyosidic groups, betacyanins are mostly glycoside O Betalains are classified as polar chromo-alkaloid nitrogenous pigments that are the central group of compounds produced by cactus plants that are mainly described in the Opuntia genus. Betalains are natural pigments with ionizable carboxyl groups and a positive charge on the nitrogen molecule, with many applications for food, cosmetic, and pharmaceutical industries. Other betacyanins derive from these two isomers by O-glycosylation on one of the two free hydroxyl groups of cyclo-DOPA Glycosylation in position 5 is called Betanin and is the major. Some rare, like gomphrenins have been identified as 6-O-glucosides and non-glycosylated betacyanin 2- descarboxy-betanidin.

Traditional Uses

The fruit is considered a refrigerant, and is said to be useful in gonorrhoes. In the Deccan, the baked fruit is given in whooping cough. A syrup of the fruit appears to increase the secretion of bile when given in teaspoonful doses three or four times a day and to control spasmodic cough and expectoration. In Dacca, the milky juice is given as a purgative in doses of ten drops mixed in a little sugar. The leaves mashed up and applied as a poultice are said to allay heat and inflammation. The hot leaf applied to boils hastens suppuration, the leaf made into a pulp is applied to the eyes in cases of ophthalmia.

Anatomy of Human Mouth Lips

The skin of the lip forms the border between the exterior skin of the face, and the interior mucous membrane of the inside of the mouth. Lips are soft, movable body part at the mouth of humans and helps for the intake of food and speech. ‘’Labium superius ores’’ and ‘’Labium inferiors ores’’, are the upper and lower lips respectively. The meeting point where the lips joint the surrounding skin of smooth area is the vermilion border and reddish area within the border is called the vermilion zone. Cupid’s bow is the vermilion border of upper lips. The fleshy protuberance located in the center of the upper lip is a tubercle. known by various terms including the procheilon (also spelled prochilon), the "tuberculum labiisuperioris", and the "labial tubercle".

The skin of the lip, with three to five cellular layers, is very thin compared to typical face skin, which has up to 16 layers. With light skin color, the lip skin contains fewer melanocytes. Because of this, the blood vessels appear through the skin of the lips, which leads to their notable red coloring. With darker skin color this effect is less prominent, as in this case the skin of the lips contains more melanin and thus is visually darker.

The lips serve as an organ of suction and speech. It is composed of the skin, superficial fascia, orbicular is a muscle and the muscles inserted around it the margins of the lips are capped with dry, red mucous membrane, continuous with the skin and containing numerous vascular papillae and touch corpuscles. The mucous membrane internally is reflected from the upper and lower lip upon the gums, and in the median line forms two folds of superiors and inferiors. The areolar tissue or submucous layer contains the coronary vessels which completely encircle the buccal orifice near the free margin of the lips. The upper lip covers the anterior surface of the body of the maxilla. Its upper half is of usual skin color and has a depression at its center,

directly under the nasal septum, called the philtrum, which is Latin for lower nose, while its lower half is a markedly different, red-colored skin tone more similar to the color of the inside of the mouth, and the term vermillion refers to the colored portion of either the upper or lower lip. It is raised by the levator labiisuperioris and is connected to the lower lip by the thin lining of the lip itself, which can be seen by opening your mouth wide in front of a mirror. As shown in Figure 2.

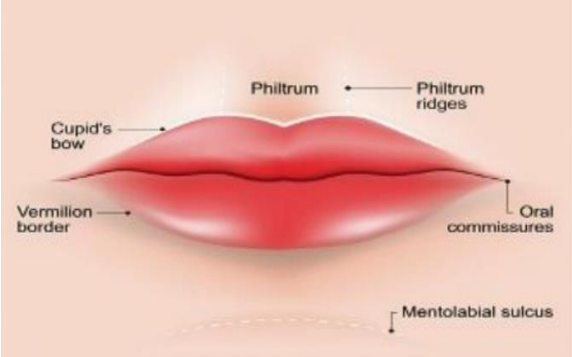

Fig. 2: Anatomy of Human Mouth Lips.

Cosmeceutical Lipstick

Cosmeceutical Lipstick is a cosmetic product used to apply coloration and texture to lips, often made of wax and oil. Different pigments are used to produce color, and minerals such as silica may be used to provide texture. Lipsticks are of both types' liquid and solid. It is applied on the area of lips. The function of lipstick is to apply coloration and texture to lips. There is a different type of lipstick like: lip gloss, lip liner, moisturizing lipstick, gloss lipstick, matte lipstick, and liquid lipstick. The main ingredients of the lipstick are: wax, oil, and pigment.

Cosmeceutical Lipstick may be basically defined as dispersion of the coloring matter in a base consisting of a suitable blend of oils, fats and waxes with suitable perfumes and flavors molded in the form of sticks to impart attractive gloss and color, when applied on lips. Lipsticks provide moist appearance to the lips accentuating them and disguising their defects. The word herbal is a symbol of safety in contrast to the synthetic one which has adverse effects on human health.

Herbal Cosmeceutical Lipstick

Herbal Cosmeceutical Lipstick is moisture-rich formulation of all-natural ingredients that gives moisture to dry lips and make them glossy. Herbal lipstick is safer and more effective than other chemical product. Because it contains all-natural ingredients which do not cause any type of side effect or chemical reaction. So, the lips can be free from any type of diseases. This lipstick has made from natural color obtained from fruit and gives different varieties of color. This advantage makes this product different from other marketed products.

Ideal Properties of Good Cosmeceutical Lipsticks

The ideal requirements for the formation of a good Cosmeceutical Lipstick may be as follows: It should efficiently cover lips with color and impart a gloss which would last long. It should be able to maintain the intensity of color without any alteration in the degree of its shade. It should be able to adhere firmly to the lips and should not provide any greasy appearance. It should possess good thixotropic property so as to deposit the color with minimum pressure. It should show a smear proof coloring effect.

It should possess required plasticity and be able to maintain all the properties throughout the storage period. It should not be gritty. It should be easily dried. The stick should possess even firmness and should maintain its strength at varying temperatures up to 55°C. The stick should not dry or crumble easily. The cosmeceutical lipstick should possess a pleasant fragrance and a good flavor. Should be safe and non-irritating to the lips. Result in blooming or sweating of the lips. As shown in Figure 3.

Fig. 3: Cosmeceutical Lipstick.

Objective of Study

The aim of the study is to create herbal cosmeceutical lipstick that contains an aqueous extract of Opuntia *dillenii* fruit and natural essential oils like castor oil. The main objective of this herbal lipstick is to provide hydration, softness, and moisture to the lips. The color produced by the lipstick is also purely natural. However, the most important purpose of this herbal lipstick is to provide anti-inflammatory and antioxidant effects to the lips.

The use of natural ingredients in cosmetics and personal care products has become increasingly popular due to concerns about the potentially harmful effects of synthetic ingredients. The *Opuntia dillenii* fruit extract is known for its anti-inflammatory and antioxidant properties, which can help protect the lips from damage caused by environmental factors like sun exposure and pollution. Natural essential oils like castor oil can help keep the lips moisturized and soft. Formulation and evaluation of Opuntia *dillenii* natural extract for Cosmeceutical Lipstick.

MATERIALS AND METHODS

Materials

Carnauba wax, ozokerite wax, Lanolin, Cetyl alcohol, Bess wax, and castor oil were purchased from S.D. Fine

chemicals limited. All chemicals used for analysis were of analytical grade. Coloring pigment- Opuntia *dillenii***.**

Opuntia dillenii

Pigment, also referred to as Cactaceae pigment or battalions, is a group of natural pigments found in the fruit, stems, and leaves of certain species of cactus plants, including the *Opuntia dillenii*. These pigments are responsible for the vibrant red, purple, and yellow colors of the Cactaceae.

***Opuntia dillenii* Fruit**

Betalains are water-soluble pigments that belong to the betalamic acid class of compounds. They are known for their antioxidant and anti-inflammatory properties, making them valuable for use in cosmetics and medicinal products. In the food industry, prickly pear pigment is utilized as a natural food coloring and is commonly added to candies, jams, and other processed foods. It is also used as a natural dye for textiles and cosmeceuticals.

Formulation and Evaluation of *Opuntia Dillenii* Fruit *L*ipstick Methods[50-200]

Sample Collection and Preparation of Extract

Mature purple fruits of Opuntia *dillenii*, the prickly pear plant, were collected from A-Mahweet governorate, directorate of Al-khabt in Yemen. The plant species was authenticated. The collected fruit specimens were washed with water to remove dust and spines, peeled and blended, then the juice was dehydrated by heating at 50°C and under pressure of 90 mmHg in an oven for 1day. Seeds and peels were washed with distilled water, dried at 20°C for 1 week, weighed, and then reduced to a fine powder using porcelain mortar and pestle. All components (seeds, juice, and peel) were stored at −20°C for a maximum of eight weeks.

Preparation of Extract

The method used to extract the *Opuntia dillenii* fruit involved homogenizing the peeled fruits with an equal amount of water. The resulting mixture was then heated for 5 minutes at 80°C and quickly cooled on an ice bath until it reached a temperature of 8-10°C. After this, the extract was centrifuged for 20 minutes to obtain a pure and concentrated extract. The centrifugation was done by the centrifuge hand machine. This process is commonly used to extract water-soluble compounds from plant materials and is often used in the production of natural cosmetic and herbal products. The aqueous and ethanolic extracts were stored in dark bottles at 4°C until use. As shown in Figure 4.

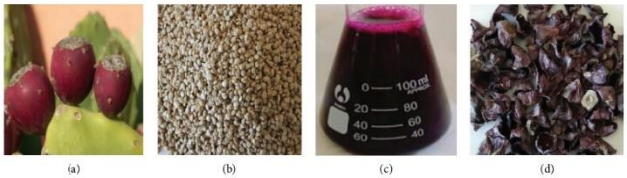

Fig. 4: Preparation of *Opuntia Dillenii* Extract (Fruits (a), Seeds (b), Juice (c), and Peel (d)).

Formulation of Pharmaceutical Dosage Form of Cosmeceutical Lipstick

using Opuntia dillenii fruit extract as a natural pigment. As shown in Table 1.

Table 1: Ingredients with the Prescribed quantity's Formulation of Opuntia Dillenii Cosmeceutical Lipstick.

Sr.no.	Ingredients	Quantity	Quantity taken for Three Lipsticks (15 gm.)	Activity
1.	**Carnauba Wax**	3%	0.45gm	Waxes
2.	**Ozokerite Wax**	8%	1.2gm	Waxes
3.	**Beeswax**	8%	1.2gm	Film Former
4.	**Lanolin**	10%	1.5gm	Emollient
5.	**Castor Oil**	65%	9.75ml	Plasticizer
6.	**Cetyl Alcohol**	5%	0.75ml	Emollient
7.	**Opuntia *Dillenii* Fresh Extract**	Q.S.	Q.S.	Colorant
8.	**Titanium Dioxide**	3%	Q.S.	Covering agent
9.	**Perfume**	Q.S.	Q.S.	Fragrance
10.	**Preservative**	0.05%	Q.S.	Preservative

Formulation of Cosmeceutical Lipstick

Wax Mixtures

Are basically important as desired melting point, viscosity and other physical properties are achieved with different waxes. Example: hard paraffin, soft paraffin, white beeswax, cetyl alcohol, ozokerite wax, lanolin etc.

Oil Mixtures
Act as dispersing agents for insoluble pigments. Castor oil is commonly used. Other examples are liquid paraffin-gives glossy appearance, isopropyl myristate, isopropyl palmitate, oleyl alcohol.

Bromo Mixtures
Bromo acids dissolved in polyols like propylene glycol (400, 1500, 4000), benzyl alcohol, butylene glycol, oleyl alcohol, butyl stearate, etc.

Colorants
Colorants are obtained from natural source, Opuntia *dillenii* aqueous extract, and titanium dioxide is used to modify shade of basic pigment.

ADDITIVES INCLUDE
Antioxidants
Butylated hydroxy toluene (BHT), butylated hydroxy anisole (BHA), propyl gallate, citric acid etc.

Preservatives
Propyl parahydroxy benzoate.

Flavors
Should not be irritating and toxic, should have good taste and should be able to mask the fatty odor of the base.

Manufacturing of Cosmeceutical Lipsticks
Involves four distinct operations.

Color Dispersion
Agglomerates of color pigments broken down and mixed with oil. If a solvent is used for the preparation of solution of bromo acids, it is prepared and set aside. Lake colors when used are dispersed in suitable amount of oil to make a paste. This paste can be passed through triple roller mills. The color mix is then mixed with bromo acid mixture. Lower melting point waxes melted and added to the color mix. Then additives are dissolved in remaining oil and mixed. But higher melting point waxes are melted at the end. The mixture should be finally milled Triple roller mill is used for color dispersion.

Mixing
After milling, the material is transferred to a steam-jacketed kettle and is heated. Over-heating and rapid mixing should be avoided. After the mixture is melted completely and blended, perfume is added and blended thoroughly. Next the molten mixture is strained through fine mesh screen and transferred to molds or storage containers. If the material is to be stored for a longer period, storage containers should be inert. SS steam jacketed kettle is used for mixing.

Molding
For molding, operation molds are used. Molds are made up of metals like brass, aluminum. Molten lipstick mixture is run on the seat of the mold and the speed of pouring should be appropriate. The molds are allowed to stand without movement until surplus material has congealed over the surface. The surplus material is then scraped off and molds are transferred to chilled metallic plates. Over-cooling should be avoided. Then molds are unclamped and lipsticks are pushed out. When large production is required, semi-automatic or automatic molding machines are used for this operation.

Flaming
The sticks are inserted in lipstick containers and the free end is reheated for a very short time. This makes the surface of the stick smooth and glossy. This process is usually done bypassing the lipstick through gas flame. Finally, the stick and containers are examined for visual defects.

Method of Preparation of Cosmeceutical Lipstick
Clean lipstick mold was taken, lubrication is done with soap solution and excess lubricant was drained and it was kept inverted in fridge or on ice (for half an hour). Color and titanium dioxide were mixed in glass mortar and pestle and they were passed through 100 mesh. Color mixture was placed in small beaker and levigated with part of castor oil. In big beaker waxes, lanolin and remaining castor oil were taken. Color phase and oil phase were heated to same temperature. Then oil phase was added to color phase with stirring. Overfilling of the mold was done with melted mass. It was allowed to settle. Lipstick was passed through flame. The base was trimmed and lipsticks were packed in a holder.

Evaluation Parameters of Opuntia Dillenii Cosmeceutical Lipstick Pharmaceutical Dosage Form
The basic requirements for a good lipstick are:
The lipstick shall be firm but not brittle in texture. It shall have an attractive appearance, pleasant taste and feel on the lips and shall be reasonably free from sweating, bloom and rancidity.

Evaluation Tests of Cosmeceutical Lipstick
Appearance: it should be attractive.
Softening Point: Methods for evaluation of lipstick.
Apparatus used: Flat bottom tube: 12cm long and 2.5 cm in diameter.
Thermometer: accurate to 0.1 °C.

Softening Test Procedures
The Cosmeceutical Lipstick was placed with protruded salve in the flat bottom tube. Then, the thermometer was fixed through a cork in such a way that the bulb of the thermometer just touches the lipstick salve. Then, this arrangement was inserted into a 1-liter beaker filled with water to a level 1cm above the upper tip of the lipstick salve. After that we slowly heated the water while stirring so that temperature rises at a rate not exceeding 2°C per min. When the temperature reaches about 45°C, we raised the temperature at the rate of 1° C per min. Constantly we watched the lipstick salve. Then, we recorded the temperature when the salve starts bending

and losing its shape. Color: In this color imparting on the lip surface is observed. Film: Type of film formed is observed. Spread ability: spread ability of formulation is observed.

RESULTS AND DISCUSSION

Formulation of Pharmaceutical Dosage Form of Cosmeceutical Lipstick

Using Opuntia dillenii fruit extract as a natural pigment. As shown in Figure 5.

Fig. 5: Final Cosmeceutical Lipstick Semisolid Dosage Form of Opuntia Dillenii Fresh Aqueous Extract.

Evaluation Parameters of Opuntia Dillenii Cosmeceutical Lipstick Pharmaceutical Dosage Form

Lipstick made up of Opuntia *dillenii* fresh extract is within the accepted limits on the basis of appearance, color dispersion, film, color, spreadability and hardness. As shown in Table 2.

Table 2: The Results of Evaluation Parameters of Opuntia Dillenii Cosmeceutical Lipstick.

Tests	Observation for Opuntia Dillenii Aqueous Extract Lipstick
Appearance	Dark red Greasy and Hard Structure
Softening Point	56 Degree
Color	Reddish-Purple
Film	Greasy
Spreadability	Easily Spreadable

CONCLUSION

The natural cosmeceutical lipstick composed of Opuntia *dillenii* fruit aqueous extract. The study focuses on the formulation and evaluation of natural cosmeceutical lipstick using the remarkable reddish-purple color of Opuntia *dillenii* aqueous extract. The prepared cosmeceutical lipstick exhibited excellent physical properties, including good appearance, consistency, and ease of application. It was concluded that these promising results suggest that this formulated natural cosmeceutical lipstick could serve as a safe and effective alternative to chemical lipstick, providing effective and safe management of Cosmeceutical Lipstick and has better option to women with minimal side effects.

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