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A brief review on herbal lipsticks using natural colorants over synthetic colorants

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***Abstract*---**Nowadays herbal lipsticks are gaining popularity because natural cosmetics are safe to use. Synthetic coloring agents may cause allergic reactions and are found to be carcinogenic. We will study how the coloring matter from natural sources such as beetroot, grapes, blueberry, papaya, tomato, strawberry, watermelon, pomegranate, etc is beneficial over synthetic colorants in the preparation of lipsticks.Natural ingredients such as beeswax, carnauba wax, white soft paraffin, vanilla essence, castor oil, and vitamin E formulate herbal lipstick. Natural colorants in cosmetics also show different activities such as anti-anti-cancer, anti-oxidant, anti-microbial, anti-inflammatory, rich in vitamins, reducing the appearance of dark spots, fine lines, and wrinkles, and protecting from UV radiation, etc.

***Keywords*---**herbal lipstick, natural colorants, natural ingredients, anti-cancer, anti-oxidant, anti-microbial, anti-inflammatory.

Introduction

Cosmetics are substances used to enhance the appearance of the human body. Cosmetic means any article intended to be sprayed poured rubbed or sprinkled on, or introduced into, or any parts of the body for cleansing, beautifying, promoting attractiveness, or altering the appearances. Cosmetics also include skincare, lotions, powders, perfumes, fingernails, nail polish, eyelashes, colored

contact lenses, hair colors, hair spray and gels, deodorants, baby products, oils, bubble baths, bath salts, butter, and many other types of products are in great demand in both developing and developed countries.[1] Cosmetics are substancesused to alter the appearance or fragrance of the human body. Nowadays the demand for herbal cosmetics in the world market is growing and are inescapable gifts of nature. There is a wide range of herbal cosmetic products to gratifya person's needs. In contrast to a synthetic ones, herbal cosmetics are safe for human health.

Lipsticks

Are the most widely used cosmetics addedtomakeup. It enhances the beauty of lips. At present days the use of products has increased and a lot of changes occur in the choice of shades of color, textures, and luster of the lipstick. A good lipstick should haveimpressionablecharacteristics and be acceptable to the consumer, such as having a suitable texture and antioxidant properties. Bases, oils, emollients, and colorants are among the variety of components that contribute to the properties of fine lipstick.[2] Texture, melting point, and hardness of lipstick are the dominant characteristics that can be modified by varying the ratio of components that are used in the formulation. Colorants or pigments are the components that play an important role in the lipstick formulation.Colorants can be from synthetic and natural sources. Synthetic colors are manufactured from chemicals. The synthetic dyes that contribute to the colorof the lipstick are dangerous to a human on consumption and may cause adverse effects such as allergy, dermatitis, skin discoloration, drying of lips, etc. In some cases, synthetic colors can be carcinogenic and even fatal.[3] This is the limitation that leads to the use of natural colorants in the production of lipsticks. Natural colors are extracted from natural sources such as plants, insects, and algae.

Fig.1. Lipsticks

Herbal Cosmetics

Herbal cosmetics have expanding demand in the world market and are a helpful gift of nature. There is a wide range of herbal cosmetic products to satisfy our beauty establishment, adding herbal ingredients to cosmetics is much protected for the skin. Human beings have been using herbs for disparate directions like food, medicine, beautifying with the advancement of science and technology. However, there is abounce in the use of herbs both as drugs and cosmetics.[3] Human skin acts as a protective barrier, through which natural ingredients penetrate. Therefore, consumers always search for natural-based cosmetics to avert allergic conditions or reactions and any sort of side effect lipsticks are lip

tinting agents. At present, the popularity of this product has increased and the choice of its different shades, texture, and luster has become very demanding.

Advantages of herbal cosmetics over synthetic cosmetics

Herbal cosmetics are popular nowadays and are favored over chemicals as these products provide nutrients to the body, boost health, are free from synthetic chemicals, and have no side effects related to synthetic cosmetics. Some of the advantages of using herbal cosmetics which make them a better choice over synthetic ones are safe to use, compatible with the body, natural in nature, inexpensive, have a variety of products, have no side effects, and are not tested on animals.

Synthetic colorants

Synthetic dyes are manufactured from the chemicals such asearth minerals and petroleum by-products. These synthetic dyes are also known as coal tar dyes and are obtained from coal tar. Synthetic dyes were first discovered in1856. These synthetic dyes have low production costs, a much brighter color, and are long-lasting. Synthetic dyes are more stable than natural pigments. They are highly stable towards heat, light, and also hydroxyl ion concentration. There are five major classes of synthetic dyes, they are azo dyes, xanthones, triarylmethane, quinoline,etc. [4]

Synthetic colorants in cosmetics

Mostcosmetics products use colorants in their formulation. There are approximately 54 synthetic dyes available out of these 54 dyes 38 dyes were used in cosmetics and among these 38 dyes 7 seven were azo. Azo dyes have brighter colors that's why they are mostly used in cosmetics. Colorants used in cosmetics vary based on theproducts. Colorants are used for both lip care as well as hair care cosmetics products.[4]

Lip care products

Azo dyes have brighter red colorthat's why they are used in the manufacturing of lip care products such as lip gloss, lipstick, lip lacquer, etc.Triarylmethane, xanthones, and quinoline are also used in manufacturing lip care products.[5]

Table 1
Common colors and their synthetic derivatives

Colour	Synthetic Dyes
Bright yellowtogreen	Quinoline dye
Red to maroon	Carmoisine dye
Lemon yellow	Tartrazine dye
Pink to reddish pink	Erythrosine dye

Problems associated with synthetic colorants

- Synthetic dyes which are used in cosmetics have been reported for various health problems.
- Azo dyes are the major class of synthetic dyes that interact with the intestinal bacteria, liver cells, and also skin microflora.
- These dyes cause various genotoxic, mutagenic, and carcinogenic effects.
- These azo dyes are responsible for various types of skin problems.
- Various records have been given for the triarylmethane dyes which indicate that this triarylmethane when taken through cosmetic products directly enters into the bloodstream and causes various kinds of illness.
- Synthetic dyes are considered xenobiotics which are more harmful to the environment.
- Dyes such as aniline are flammable which may cause several hazardous effects.
- Some of the synthetic dyes contain heavy metals such as lead and cadmium which are highly toxic to human beings.[6]

Natural colorants

Due to various problems faced by synthetic dyes people prefer to use natural colorants in cosmetics. The use of natural colorants in cosmetics is increasing nowadays. Natural colorants are obtained from a biological source and these natural colorants are mostly eco-friendly and do not cause any problems. Natural pigments are obtained from various biological sources such as plants, microbes, and so on. Natural colorants are obtained from plant parts such as fruits, flowers,stems, bark, leaves, seeds, etc. Henna, Teak, Annatto, Carrot, Red Cabbage, Turmeric, etc. are used as natural sources ofcolor. The advantages of natural colorants include non-toxic, no side effects, non-carcinogenic, eco-friendly, causes reduced pollution, and it has health benefits such as anti-cancer, anti-oxidant, vitamin A rich,and so on.[7]

Sources of natural colorants

- **Microbial pigments:** Microbes are the major source of producing natural-colored pigments. Some microorganisms produce colored pigments which can be used in cosmetics and other industries. Microbial pigments are stable to heat and light. Microorganisms are commonly found in the environment and can be grown easily in a suitable environment to obtain natural-colored pigments. Microorganisms like algae, bacteria, and fungi produce colored pigments which have various properties like anticancer properties, etc. Various types of pigments like zeaxanthin, astaxanthin, canthaxanthin, β-carotene, and pyocyanin blue are produced by a wide variety of microorganisms.[8]
- **Animal pigments:** Animals also produce pigments. Animal pigments are produced to protect the animal from predators, it serves as warning coloration. The animal pigments are sometimes produced to attract their mates. The best example ofanimal pigment is melanin. Melanin is responsible for the color of the hair, skin, and fur of animals.[9]

- **Plant pigments:** Plants produce secondary metabolites which are known as phytochemicals. These phytochemicals are not essential for the growth and development of the plant. The phytochemicals have medicinal property which tends to be used in the pharmaceutical industry. The pigments are produced in different parts of the plants including stem, bark, leaves, and flowers. Plants approximately produce 2,00,000 compounds among which few compounds are said to be colored. Major classes of plant pigments include Anthocyanins, Carotenoids, Betalains,Flavones, Chlorophylls, Lycopene,etc. [8]

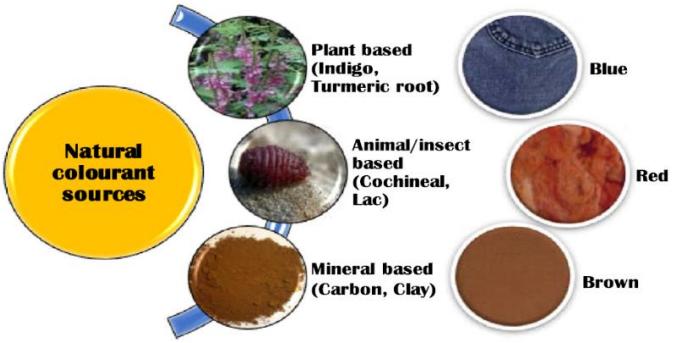

Fig. 2. Natural colorant sources

Table 2
Common Colour and Plant Sources

Colour	Chromophore Plant	Sources
Purple, Blue	Anthocyanin	Grapes, blueberry, plum, blackberry
Green	Chlorophyll	Avocado, cucumber, broccoli, spinach, kiwi
Yellow, orange	Carotenoids	Papaya, carrot, orange, pineapple, pumpkin
Red	Lycopene	Beetroot, tomato, strawberry, watermelon, pomegranate
White-tan	Anthoxanthins	Potato, cauliflower, banana, ginger

Anthocyanins

Are the main compounds responsible for the colors, red, blue, and purple are in fruits and vegetables. Berries, currants, grapes, and some tropical fruits have a high amount of anthocyanins.

- Anthocyanins found in plants are very useful. Red, blue and purple-colored pigments extracted from flowers, fruits, and vegetables are traditionally used as dye and food colorants.
- The color of anthocyanins depends upon thepH. In acidic conditions, some of the anthocyanins appear red. Anthocyanins have a purple hue in neutral pH while the color changes to blue in an increasing pH condition.[11]
- The colored pigments of anthocyanin fromblackcurrants,berries, and other types of red to blue-colored fruits are strong antioxidants.

- It possessesantimicrobial activity against a wide range of microorganisms, especially in inhibiting the growth of food-borne pathogens.
- Anthocyanins have been extensively studied for their anticancer properties, as well as antiangiogenetic.
- Anthocyanidin and anthocyanin pigments also have anti-obesity properties.
- Stability of anthocyanins is dependent on the type of anthocyanin pigment, co-pigments, light, temperature, pH, metal ions, enzymes, oxygen, and antioxidants.[12]

Chlorophyll

Has a richly green natural pigment and serves as an essential element in the biological process of photosynthesis in plants

- Chlorophyll is rich in antioxidant properties and helps in lightening dark lips.
- It has anti-inflammatory properties that assist wounded cells in repairing themselves.
- Chlorophyll is also rich in vitamins A, C, E, and K, which all play an equally important role in your skin appearing youthful, rejuvenated, and radiant.
- It can visibly reduce the appearance of fine lines, dark spots, and wrinkles, which are often the result of sun damage.[13]
- Magnesium is a key component in chlorophyll's molecular makeup. Though low levels of magnesium correlate with inflamed, itchy, and dry skin, higher levels of magnesium assist in storing and properly storing oxygen in skin cells which will provide sustenance and nourishment for your skin.

Carotenoids

Are the natural yellow, orange, red, or sometimes violet dyes found in plants.

- Carotenes are a sub-group of carotenoids responsible for the orange dye.
- Xanthophylls area sub-group of carotenoids responsible for yellow or yellow-orange dye.
- Carotenes and xanthophylls provide protection against the negative effects of sunlightdue to their antioxidant properties.
- Carotenoids reduce discoloration caused by UV radiation, hormones, or inflammatory conditions.
- Carotenoids help to repair and regenerate collagen and elastin fibers damaged by UV radiation, restoring and improving skin thickness.
- They stimulate the process of epidermal regeneration after keratinization and UV damage, making skin smooth and soft.
- β-carotene is used to treat photosensitivity in patients with the metabolic condition protoporphyria.
- Carotenoids also normalize the work of sebaceous glands, reducing the oils on the skin and reducing the tendency to form comedones and eczema.[14]

Betalain

Is the main bioactive compound of beetroot belonging to the class of red and yellow pigments.

- Betalain contains two categories of pigments, betacyanins the red to violet one,and betaxanthin the yellow to orange pigment.
- Betanin exhibits an antioxidant activity that is ten times higher than tocopherol, and three times higher than catechin.
- Betalains especially betacyanin, play an important role in human health because of their pharmacological activities as an antioxidant, anti-cancer, anti-inflammatory, hepatoprotective, anti-lipidemic, and antimicrobialagents.
- Betalaininhibits cervical ovarian and bladder cancer cells *in vitro*, and can also inhibit the proliferation of cells in human tumors. Consumption of red beetroot reduced the incidence of tumors in the skin, lung, liver, colon, and esophagus.
- Betalains are also used as additives in the food and cosmetic industry on account of their natural colorant properties, high solubility in water, and lack of toxicity.[15]

Anthoxanthins

Are water-soluble pigments that areresponsible for the color range from white or colorless to creamy to yellow often on petals of flowers.

- These pigments are generally yellowed in an alkaline medium and whiter in an acid medium.
- Anthocyanins have a higher antioxidant activity than other flavonoids which helps in lightening dark lips.
- Italsoprotects the human skin from UV-B irradiance by inhibiting keratinocyte apoptosis.
- It has anti-cancer properties too.
- It helps in reducing the skin pigmentation caused by UV radiations or inflammatory conditions.[13]

Idealcharacteristicsof goodlipsticks

- It should be long-lasting.
- Smooth and easy to apply.
- It should be non-toxic and non-irritant.
- It should not dry on storage.
- It should have sufficient plasticity.
- It should be free from the gritty particle.
- It should have attractive color and shine.
- It should be non-drying and free from grittiness.
- It should be physically and chemically stable.
- It should have a pleasant taste, odor, and flavor.
- Don’t lose its smooth and shiny appearance after application. [16,1]

Anatomy of lips

Lips, soft pliable anatomical structures that form the mouth margin of most vertebrates, are composed of a surface epidermis (skin), connective tissue, and (in typical mammals) a muscle layer. The upper lip extends from the base of the nose superiorly to the nasolabial folds laterally and to the free edge of the vermilion border inferiorly. The lower lip extends from the superior free vermilion edge superiorly, to the commissures laterally, and to the mandible inferiorly.

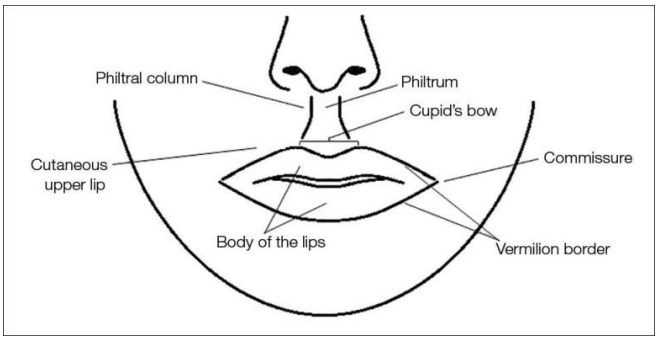

Fig. 3. anatomy of lips

A general method for lipstickformulation

- Beeswax wax is melted in a beaker at 70°C on a water bath.
- Similarly, castor oil, coconut oil, and olive oil is taken in another beaker & melted at 70°C ina water bath in decreasing order of their melting point.
- Coloured pigment (extract) is added to the oil phase until a homogenous mixture is obtained.
- Oil phase is added to the wax phase at the same temperature.
- The mixture is cooled to 40°C, and vitamin E and vanilla essence is added.
- The molten mixture is poured into lipstick molds,
- Upon solidification it is separated from the molds and fitted in a lipstick case.[17]

Components of Lipstick

lipstick is composed of waxes, oil, pigments, and emollients which are adjusted to desired melting point and viscosity. Various agents in lipstick formulation are: -

Table 3
Components of Lipstick and Formulations

S.No.	Ingredients	Importance	%(W/W)
1	Solid waxes (beeswax, carnauba wax, cocoa butter)	Provides hardness and creaminess	10
2	Oils (castor oil, olive oil, coconut oil)	Dispensing the pigment and giving gloss to the lipsticks	65

3	Coloring agent/pigment	Give color	Adequate
4	Perfumes	Give aroma	Adequate
5	Miscellaneous agents (antioxidants, preservatives, flavors)	Stabilize the formulation	Adequate

Advantages of lipsticks prepared using natural colorants

- Ingredients in these lipsticks are all-natural and are safe to use.
- They also contain natural nutrients that keep lips healthy.[18]
- They have fewer or no aspect impacts.
- They are non-toxic, anti-oxidants, anti-microbial, anti-inflammatory, and are used in leukoderma of lips.
- There is an extensive range of colors to choose from.
- Colorants have different original shades of color like purplish red, ruby red, beetroot purple, dark violet, pastel red, pale red, purplish-red, rose red, deep magenta, dark purple, orange, and deep violet.
- Different shades can be obtained from the combinationof these colors.
- By adding organic and inorganic acids and bases color may be changed to different shades.[19]

Evaluationparametersoflipsticks

It is very necessary to maintain a uniformity criterion for herbal lipstick, keeping this view in mind the formulated herbal lipsticks are evaluated on the parameters such as melting point, breaking point, pH,solubility, surface anomalies, the force of application, skin irritation, etc.

- **Melting point: -**Take both ends open glass capillary tubes. Introduce into each of the 5 capillary tubes a sufficient amount of lipstick, about 10mm high and allow the tubes to stand for the appropriate time and at the prescribed temperature in the capillary tube is taken as the melting point. Repeat the operation 3 times using the other 4 capillary tubes and calculate the result.
- **Breaking point: -** Value (10gm) at a specific interval of 30 seconds and weight at which breaks Breaking point test is to determine the strength of lipstick. Place lipstick in a socket horizontallyan inch away from the edge of support. Increasing the weight of a species is considered the breaking point.
- **Force of Application: -** It is a test for determining the force to be applied for application. Keep a piece of coarse brown paper on a shadowgraph balance and apply lipstick at a 45*c angle to cover a 1 sq. Inch area until fully covered. The pressure leading is an indication of the force of application.
- **Surface anomalies: -**This test is for determining the surface defects, such as no formation of crystals on surfaces, no contamination by molds, fungi, etc.
- **Aging stability: -**Store the product at 40*C for 1 hour and observe the various parameters such as application characteristics, crystallization of wax on the surface, and oil bleeds.
- **Solubility test: -**In this test, we dissolve the lipstick in differentsolvents and observe the solubility in each solvent.

- **PH parameters: -**pH of the lipstick is determined by using a pH meter.
- **Skin irritation test: -**It is done by applying the lipstick on the skin for 10min and observing.
- **Perfume stability: -**Perfume stability can also be assessed by storing lipstick in the oven at 40*c and by making periodic comparisons of perfume with a fresh one.

Defects in lipsticks
Formulation Related Problem

- Sweating: - It is the most common problem with lipstick. It occurs due to high oil content or inferior oil binding. It may ariseat any temperature or in any climate.
- Bleeding: - This refers separation of color to the liquids from the waxy base.
- Streaking: - A thin line or band of a different color or substance appears on the finished product.

Moulding Related Problems

- Laddering: -Lipstick does not look smooth or homogenous after congealing and setting instead it has a multi-layered appearance.
- Deformation: -It is a moulding-related problem where the shape of the lipstick looks deformed. Itappears on both sides of the lipstick and it is noticeable.
- Mushy Failure: - This is a problem in which the central core of the lipstick lacks structure and breaks.[20]

Table 3
Non-herbal ingredients and additives and their herbal counterparts[21]

Category	**Non-Herbal**	**Herbal**
Waxes	Paraffin, Ozokerite, ceresin	Bay Berry, Carnauba Wax
Oils, Fats	Mineral Oil, Petrolatum (petroleum jelly)	Almond, Sunflower oil, Cocoa Butter
Emollients	Cetyl/stearalkonium chloride	Aloe Vera, Glycerine, camauba wax
Detergents, soaps	SLS, cocamidopropyl Betaine, Cocamide DEA	Coconut and Palm oil
Astringents	Ethyl alcohol, Isopropanol, Acetone	Witch Hazel extract, Ethanol (natural)

Humectants	Ethylene Glycol/Propylene Glycol, Dimethicone	Glycerine, Sorbitol
Surfactants	Sodium layuryalsulfate, quartemarium-7	Sapindusmukorossi
Foaming agent	Lauramide,trithanolamine	Quillaja&yucca saponins
fungistats	methyl	Peel extract
Colors/dyes	FD & C and D&C colures. Also, Iron Oxides, Carbon Black, Titanium Dioxide, Zinc Oxide, Chromium Oxide Green, Barium sulfate, Alumina	Beetroot powder (red), CarminePowder (purplish red), Paprika Oleoresin (orange-red), Saffron (yellow-orange), Carotenes (orange), Annatto (yellow-orange), Curcumin (yellow),Chlorophyll.

Conclusion

This review concludes that the use of natural colorants in lipstick formulation has no or minimum side effects whereas Synthetic colorants are toxic as they possess a carcinogenic property, they are non-degradable. Most synthetic dyes are considered xenobiotics. Synthetic dyes like azo dyes have numerous effects on human health. Due to these reasons, people prefer to use natural colorants. Natural colorants are obtained from various sources like microorganisms, plants, and animals. Thus, we can move towards the use of natural colorants like beetroot, grapes, blueberry, papaya, tomato, strawberry, watermelon, pomegranate, etc, to prepare lipstick. Hence the use of natural color is a step toward healthy cosmetics and can be widely utilized by women with great pleasure. These natural pigments are eco-friendly and they do not cause any effects on people.

Natural pigments such as betanins, carotenoids, and anthocyanins possess various properties like anticancer, anti-inflammatory, anti-obesity, anti-diabetic, antioxidant, etc., Carotenoids which possess yellow color are rich in Vitamin A, and also have free radical scavenging activity which helps to fight cancer. Some natural pigments from annatto seeds, beta carotene, etc., are approved to be safe to use in cosmetics by FDA and have given color index. Anthocyanins are used as colorants in the food industry, textile industry, etc., They can be used in cosmetics for their antioxidant property and color. Lycopene and chlorophyll also possess a bright colorthat can be used in the cosmetic industry.

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