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# NATURAL PIGMENTS AS A SOURCEOF LIPSTICKS COLOURS: A FUTURE PROSPECT

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**Abstract**

Manufacturers are being pushed to search for safer and more sustainable alternatives due to rising awareness about the toxic effects of synthetic ingredients used in cosmetics. Synthetic lipsticks contain toxic dyes and heavy metals that may cause injury and harmful long-term effects. In this case, natural pigments from plant sources could be a good alternative. This study demonstrates the potential of plant-based pigment as a colourant for lipsticks. Colors obtained from Bixa Orellana, Terminalia Catappa, Ixora. Beta vulgaris, Daucus carota and coccinea are common formulation herbs.Carotenoids, anthocyanins, and betalains are examples of natural colorants that give formulations beautiful shades.

Moreover, they may also exhibit activities such as antioxidant, anti-inflammatory, and antimicrobial activities, thus promoting lip health. They don't harm both human as well as animal health. Despite their advantages, PEG surfactants also have some disadvantages such as less stability, less shelf life, sensitivity to pH, temperature, light.Continuous development of improved/advanced extraction techniques and biotechnological innovations enables the promise to enhance stability of these pigments. Therefore, they provide functional, sustainable alternatives to synthetic dyes and have the vast potential to become a key ingredient for future cosmetics formulation.



## INTRODUCTION

Cosmetics are any substances which are applied externally on the human body to enhance beauty, smell and the appearance of the person. The Greek term kosmetikos, which translates to the art of beautification and adornment, is the origin of the word cosmetic. Usually applied to the skin, hair, lips, nails, the like.To enhance the cosmetic appearance, texture and maintain healthy skin of an individual [1,2]. Herbal cosmetics predominantly comprise of natural or plant origin ingredients. They are formed formulations contain exclusively of natural originate ingredients. That is to say, herbal ingredients is complex language referring to bioactive phytochemical compound of a plant which has got a definite therapeutic effect like presence of active antioxidants, anti-inflammatory, nourishment etc. Herbal cosmetics are a safer option and much better as compared to synthetic cosmetics [1,3]. Composition of lipsticks includes wax, oils, pigments and emollients which provides colour, texture and protection to lips. They improve facial appearance by adding colour to the lips. Furthermore, they keep the lips hydrated and protects the lips of the environmental damage and also makes one's lips look better [4,5]. In the traditional era, many lipsticks were made from artificial inks and dyes. Compounds that make bright and long-lasting colours are not safe as they can pose a health hazard. Ultimately they can cause toxicity, irritation, presence of heavy metals etc.Due to concerns related to safety and increased consumer awareness, there is a demand for cosmetic products having natural and safer ingredients [6,7]. The use of natural pigments derived from Bixa Orellana and Terminalia Catappa for producing attractive colours for lipstick manufacturing has been an object of interest. The investigation into the biological properties of essential oils is an important area of research by scientists. As a result, the production of safer lipstick is essential for the new approach to lipstick product formulation [5,8].

**BENEFITS OF HERBAL LIPSTICK COMPARED TO SYNTHETIC** LIPSTICK. Leading brands of cosmetics today are herbal. Although some cosmetic products contain significant body nutrients, others in their use cultivate a feeling of well-being. Some of them don't contain any synthetic ingredients at all. Having been made with natural ingredients, they mostly have lesser side effects compared to their chemical counterparts. The first is that they are completely safe for daily use. The second is that they are not harmful to the body. The third is that they are made from natural products. The most remarkable thing about essential oils is that they may not be terribly expensive, are effective, available in many forms, do not harm us, mostly involving no animal testing [9]. DRAWBACKS OF HERBAL LIPSTICK VERSUS SYNTHETIC LIPSTICK Synthetic dyes have been used in several cosmetics and they can cause various health hazards. Synthetic dyes often used in textile sectors-Azo dyes. Due to the bacteria present in intestinal cells, liver cells, and even normal cowry on our skin, they get metabolized. As a result, they can cause many skin-related maladies as well as genetic damage and even cancer as per the WHO. Another group of dyes that raise health concerns is tree. Bixa Orellana Bixa Orellana, which is also known as Annatto or Achiote, is a factory which falls under the category of the Bixaceae family. This factory can be established in a tropical region in the form of a shrub or a tree. The seeds of this Bixa Orellana factory contain a pigment which gives them an orange-red colour. The composites of this Bixa Orellana factory pledge their usage in the domain of nutrition and medicine. Bixa Orellana can be used in the form of a colorant parcel and an ornamental and traditional food [11- 15]. Two such composites are bixin and norbixin. These composites have been used as a colouring agent in the food industry as well as in ornamental purposes. The natural accessories which are used as a source of bixin, norbixin, and carotenoids are known as annatto. This is owing to the fact that it is derived from shops and is non-poisonous. Besides the fact that it has the conditioning of colouring, it has been ascertained that bixin has antioxidant, anti-cancer, analgesic, hypoglycaemic, anti-bacterial, anti-diarrheal, and anti-seditious conditioning which can be used for remedial purposes. Bixin exists in two major forms: cis-bixin and trans-bixin. This type of isomer is called cis-, and it is considerable in natural excerpts, resulting in orange achromatism, polar organic detergents, and undoable in vegetable canvases [16-20]. Trans- Bixin is heat stable and has a lipophilic nature and is used in oil painting on a ground material [2025]. Bixin is a natural pigment, and its derivative, annatto, is used in paints and in giving a yellow colour to cheese.

## NATURAL PIGMENTSOURCE: BIXIN

The Annatto is a crude colour contain bixin and norbixin. Bixin is lipophilic in nature and used in oil painting- grounded expression, but norbixin is hydrophilic in nature. As it's lipophilic and hydrophilic in nature used in artificial applications including ornamental colourings [3, 26.

Figure 01: The image shows Annatto seeds, obtained from the plant Bixa orellana.

It's generally safe andnon-toxic and frequently acting as a natural volition to synthetic colorings. It provides a vibrant red orange colour, is considered gentle on the skin.

**Advantages and Disadvantages**

Bixa Orellana (annatto) is valued for its diverse pharmacological and industrial applications, but it also has certain limitations. One of its main advantages is the presence of natural carotenoid pigments such as bixin and norbixin, which exhibit strong antioxidant activity and help protect cells from oxidative stress. Furthermore, the bioactive compounds in the plant may have limited stability and bioavailability, which can reduce their therapeutic effectiveness. There is also insufficient safety information regarding its use during pregnancy and lactation. Therefore, while Bixa Orellana shows promising potential, more well-designed studies are required to establish its safety, efficacy, and appropriate dosage.

**Terminalia Catappa**

Terminalia catappa may be seen as one amongst the major medicinal shops in the world. Terminalia catappa is employed as a traditional medicine in several countries, both inside and outdoors India. It's typically appertained to as "Indian almond or Tropical almond." Phytochemical studies on several corridor of the factory species Terminalia have been carried out considerably. There are 190 species of Terminalia, out of which several are of profitable importance as cosmetic shops and timber-yielding shops. The name Terminalia may be derived from the Latin word "terminalis" that means "end" or "boundary." This name Terminalia points out one amongst the major features in the factory's growth pattern, as the leaves accumulate at the ends of the shoots. Terminalia catappa L., generally referred to as Indian almond or tropical almond, is an imperishable tropical tree of medium or large dimension [27] Tropical almond is a less- known fruit that has a high vitamin, antioxidant, and natural colour content. The fruits are substantially consumed by humans as well as catcalls and creatures.

## Natural Pigment Source: Anthocyanins

The Tropical Almond, or Terminalia Catappa, is a protean botanical for colorings, mainly in the form of waterless or solvent excerpts of its departed leaves and fruit cocoons. On the other hand, the color in Achiote comes from carotenoids similar to those in Bixin. The colorants in Tropical Almond are mainly hydrolysable tannins, flavonoids, and anthocyanins. Birth is a protean process, and by adjusting the type of detergent and temperature, fragments of color can be created. This means that tones of color, ranging from deep yellows and brows to violent blacks, can be made. This capability to make water-soluble and ethanol-soluble colours makes T. catappa an efficient and environmentally safe volition for synthetic colourings [13,28].

## TERMINALIA CATAPPA

(tropical almond) leaves are generally regarded as safe and can serve as an ecofriendly natural color source for camo when they're duly reused. They've long been used in traditional drug and ornamental medications and are considered on-toxic to humans when used in moderate quantities. Some component databases classify Terminalia catappa splint excerpt as safe for teenagers, suitable for use on lips, and doubtful to beget skin vexation.

Figure 02: Dried leaves and fruits of Terminalia catappa (Tropical almond).

**Advantages and Disadvantages**

Terminalia catappa (commonly known as tropical or Indian almond) is an important plant valued for both medicinal and environmental uses, with notable benefits as well as certain limitations.Terminalia catappa (L.) is reported to have a rich inventory of flavonoids, plus tannins and also phenolic components. Subsequently, these components possess strong antioxidant potential, which stops them from damaging the body via oxidation, which benefits the body [29] Likewise, it is noted to have an antimicrobial,anti-inflammatory as well as an anti-diabetic activity and being a traditional use, this justified. Additionally, some research has observed that Terminalia catappa possesses hepatoprotective activity that protects against liver damage [30-35. The Terminalia catappa leaves are primarily used in aqua farms for improving water quality and controlling water microbial contamination apart from their medicinal use. While there are many advantages, there are also a few disadvantages. A majority of scientific evidence comes from animal or in vitro studies. Additionally, a limited number of studies have focused on clinical research in humans, which has restricted acceptance in mainstream medicine [36]. The high dose or prolonged use may have consequences that include gastrointestinal disorders or toxicity due to the high concentration of tannins [37]. Another limitation is that there is no standardized dose or method of preparation which itself may produce variable therapeutic effects. Not enough is known about the safety of L-Carnitine in pregnancy and breastfeeding which is why it is quite doubtful. In general, the Terminalia catappa has good therapeutic potential but it surely requires more clinical evidence to demonstrate its safety, efficacy and doses for use.Overall, while Terminalia catappa exhibits considerable therapeutic promise, further clinical research is required to establish its safety, efficacy, and proper usage.

## IXORA COCCINEA

The other name given to this plant is Dauk Chem or Jungle Honey. The family name given to this plant is Rubiaceae. This plant is substantially involved in demitasse and Malaysia [28, 29-39]. This plant was substantially involved in post-harvest. This plant has a certain role to play in Floriculture assiduity. This plant has opposite, thick leaves. These leaves are usually oblong. The leaves have base angles ranging from acute to rounded. Also, the leaves have an apex ranging from blunt to slightly pointed. This factory has thick clusters of flowers. These flowers are usually compact cymes. Flowers are usually sanguine. Also, flowers are radially symmetrical. Flowers have a slightly rounded lobe. The tube of the corolla ranges from 3.0 to 3.5 cm. This factory has black/gloose fruits. In using this plant for medicinal purposes, a decoction of the root is taken by women after parturition. A fresh infusion made from the flowers may be employed in controlling bleeding. This infusion may be employed in the initial stages of tuberculosis. Also, a decoction of the flowers may be employed in the treatment of amenorrhea. and hypertension, while root decoctions are generally used in managing bronchial diseases [40].

## NATURAL PIGMENT SOURCE: ANTHOCYANINS

The Ixora Coccinea factory generally called “jungle honey” is starting to get noticed for its organic colours. This is because it has a lot of flavonoids and Anthocyanins. while the people have always loved it for its beauty and mending benefits, there’s a growing interest in using its vibrant colours for colourful diligence. How the colorings are uprooted is important. The way we get the colours from Ixora substantially depends on the types of detergents and the heat we apply during the birth. The bright colours of the flower come from anthocyanins, which dissolve well in water. These colours are veritably reactive, and their colour ranging from vibrant reds to dark violets depends on the pH position and the temperature used during birth. By changing the type of detergent, like using acidified water or fusions of ethanol, we can concentrate on and separate groups of colours. This versatility makes Ixora a great resource for numerous diligence, offering bright colours for food and long-lasting colours for fabrics [41].

Figure 03: Fresh red flowers of Ixora coccinea (Jungle geranium).

It is natural colorant in lipsticks and indicate no skin irritation and it serves as a safer.

**Uses & Benefits of Ixora coccinea**

Traditionally used in herbal preparations for managing digestive disorders such as diarrhoea and dysentery, although strong clinical validation is still limited. Research has indicated that Ixora coccinea extracts possess antioxidant and antimicrobial properties but needs to be supported further. Ixora coccinea, better known as the Jungle geranium, is a commonly cultivated shrub in the garden. Additionally, this plant will attract lots of butterflies and bees, adding to the ecosystem. The other therapeutic uses of I. The following highlights coccinea. The roots and leaves of this plant have been historically used in herbal preparations for the management of digestive disorders mainly diarrhoea and dysentery but still lack strong clinical confirmation. The leaves and roots of the plant show potential anti-inflammatory activity in the treatment of wounds and skin infections as observed by folk medicine. It also plays an ecological role by attracting pollinators like butterflies and bees, supporting biodiversity.

## BETA VULGARIS

Beta vulgaris L., generally known as beetroot, belongs to the Chenopodiaceae family (now frequently included under Amaranthaceae in a broader bracket). It's considered an economically important factory within a family that comprises around 100 rubrics and roughly 1,400 – 1,500 species. It's a dicotyledonous, biennial factory characterized by a fleshy, tuberous root system. Although extensively honored for sugar product, it's also cultivated as a food crop and has operations in bioethanol product. The factory exhibits strong rigidity, being suitable to grow in saline soils, repel limited water vacuity, and tolerate a range of environmental conditions including temperature axes and low light intensity [42]. The title of Beta vulgaris varies across regions; it's generally appertained to as theater beet in the United States, beetroot in Europe, and Swiss chard in certain regions. [43]. Other generally used names include sugar beet, red beet, golden beet, beet flora, and spinach beet. The comestible taproot, which generally matures within 50 – 60 days and weighs roughly 100 – 150 g, is known as beetroot, whereas the upstanding corridor conforming of leaves and stalks are appertained to as beet flora [44,45]. The species is farther classified into different cultivar groups, similar as the Conditiva group, Cicla group, and Flavescens group, each comprising several kinds with distinct characteristics. Beta vulgaris is valued as a salutary element due to its rich nutritive and phytochemical composition. It's particularly popular among athletes because of its high carbohydrate content, which contributes to energy supply.In addition to its nutritive significance, Beta vulgaris plays an important part in sugar product. Alongside sugarcane (Saccharum officinarum), sugar beet serves as a major source of sucrose and is considerably employed in countries similar as Egypt, Iran, and France for the manufacture of table sugar. In discrepancy, some regions still depend generally on sugarcane for this purpose. Compared to sugarcane, sugar beet offers advantages similar as advanced sucrose attention, effective yield, and felicity for biofuel product, particularly ethanol. likewise, it contains notable antioxidant composites, enhancing its functional and artificial value [ 46].


Figure 04: Fresh fruit of Beta vulgaris

**Natural Pigment Source**: BETALAINS Beta vulgaris L.(beetroot) is extensively honoured as an important natural source of colours, particularly betalains, which are water-answerable nitrogen- containing composites responsible for its characteristic red and unheroic colours. These colours are substantially classified into two groups betacyanins(red – violet colours similar as betanin) and betaxanthins(unheroic – orange colours). Among these, betanin is the most abundant and commercially significant colour uprooted from beetroot.Beetroot colours are considerably used as natural colorings in the food assiduity due to their safety,non-toxic nature, and factory origin. They're generally applied in products similar as potables, confectionary, dairy particulars, and reused foods as an volition to synthetic colorings. In addition to food operations, betalains are also employed in cosmetics and pharmaceutical phrasings because of their colouring capability and natural properties.Apart from their colouring function, betalains parade strong antioxidant exertion, helping to neutralize free revolutionaries and reduce oxidative stress [19, 47].

**Uses & Benefits of Beta vulgaris**

Beetroot has traditionally been used for the therapeutic formulation and analysis as anticancer, carminative agent, and styptic properties but lack clinical trials to support these findings. Outlook advise a substance as an antagonist substance, as a regular supply of nitrites, and a potential application in vessel condition,63 although evidence is limited. Beetroot is used for its colour in trade [48].

## DAUCUS CAROTA

Daucus carota L. subspecies. Sativus is the cultivated version of wild carrot, which grows naturally in temperate areas of Europe and western Asia [49] Historical and archeo botanical studies show that people first started growing carrots in ancient Persia, which is now Iran and Afghanistan. At first, The plant was valued for its leaves and seeds, especially for their essential oils. People began eating the taproot as food more often in later times [50] Over time, farmers focused on growing the edible taproot, which is now the most commonly eaten part, though the leaves are sometimes used too. Carrot is a biennial plant in the Apiaceae family, also know as umbellifers. In its first year, it grows a cluster of leaves and a large taproot that store nutrients. In the second year, the plant grows a flowering stem among Apiaceae crops, carrot is one of the most important vegetables for both nutrition and the economy. It is grown around the world as a root vegetable because it adapts easily and is very nutritious [51]. Carrot roots exhibit a wide range of colours, including white, yellow, orange, red, purple, and deep purple, depending on the type and pigment composition. Historically, yellow and purple carrot varieties were the earliest to be cultivated. The commonly consumed orange carrot was later developed in Central Europe during the 15th and 16th centuries and gained popularity due to its high provitamin A content.The variation in colour among carrot cultivars is primarily determined by the presence of different pigments. Carrots contain important antioxidant compounds, mainly carotenoids and anthocyanins, Carotenoids give carrots their yellow, orange, and red colours and are especially abundant in yellow and orange varieties. Among these, orange carrots are particularly rich in alpha-carotene and beta-carotene, both of which act as key sources of provitamin A in the diet.The yellow colour of certain carrot varieties is mainly due to lutein, a compound known for its role in supporting eye health and reducing the risk of macular degeneration. Red carrots contain pigments such as lycopene, which is fat-soluble, and in some cases, water-soluble anthocyanins; however, these pigments do not significantly contribute to provitamin A activity. The high lycopene content is responsible for the red coloration in these varieties.Purple carrots are characterized by a high concentration of anthocyanins, which are powerful antioxidants and give the root its distinct dark purple colour. Overall, the diversity in carrot colour reflects differences in phytochemical composition, which influences both nutritional value and health benefits [52].

Figure 05: Fresh Carrot

**Natural pigment source:** carotenoids Carrot scientific name Carrot is a must-have source of pigments In addition, they are mainly carotids. In carrots, they help provide yellow, orange and red colours. The carrot carotenoids are β-carotene, α-carotene, lutein, lycopene, and many more. Among them, β-carotene is the most common carotenoid. The compound that is an important source of vitamin A nutritionally. The application of carrot carotenoid, its coloring use and physiological effects, is elaborated here. Carotenoids are increasingly favoured as food colouring due to their safety, biodegradability and consumer preference for green colors. Carotenoids Impart Yellow to Orange Colour Shades Beverages, bakery, dairy, confectionaries, and processed foods, etc. Use colors in these food products Carotenoids are not only used in food but also in cosmetics and pharmaceutical formulations as colourants and functional ingredients. Natural coloring agents, and most importantly, they have no toxic side effects. Carotenoids have a very strong antioxidant activity. They're very important antioxidants based on herbal researches. As a result, oxidative damage and the danger of chronic diseases caused by free radicals are reduced.One of the biggest commercial phytochemical classes in carrots are the important pigments for plants pigments "carotenoids". The cultivated plants show the presence of pigments that are yellow, orange and red in colour. These pigments are known as carotenoids. Orange carrots have very high levels of α- and β-carotene, while yellow carrots have much higher levels of lutein [53-56]. Uses and Benefits of Carrot (Daucus carota) Carrots are vegetables that are eaten as food and these are rich in beta-carotene. This means that carrot is excellent for eye sight. They can also serve as an active element in a variety of products. The functioning of the immune system is stabilized by active ingredients. Your skin can also benefit from them, and they can be found in cosmetics. Despite having medicinal uses, they should be put through further clinical trials for proper evaluation. Carrots help prevent constipation and ensure smooth functioning of the intestines. Carrots help the cardiovascular system by ensuring proper functioning. This also helps in cholesterol regulation but this needs more research for proof.A natural sweetener and colourant go well with blue agave. Carotenoids are an active ingredient in many products. It is also used in juices, salads and processed preparations [57-58]. Future prospect: Innovations on the Horizon Natural lipsticks that use plant-based colorants are not stable in their shades. The damage that occurs to the colorants under light, heat and oxygen eventually compromises the quality and shelf life of the finished product. Current research is looking at ways in which the performance of organic pigments in natural lipsticks can be improved, so as to enhance their range. High-end extraction technologies are among the latest technologies being applied in this sector. Analyzed through the methods of the SFE, which is a Supercritical Fluid Extraction.This refers to "Solvent-Free Extraction" and "Microwave-Assisted Extraction". These advanced techniques isolate the pigments in highly concentrated and purified form with enhanced colour intensity, significantly better stability and low sensitivity. Clinical Significance Natural pigments don't merely lay on the surface; they have a beneficial interaction with the lips' delicate skin. The antioxidant that deals with free radicals, which are produced by UV radiation, preventing the premature aging (wrinkling) of the lips. The property which inhibits the growth of bacteria (Staphylococcus aureus) thereby reducing infection or cheilitis. The anti-inflammatory agent that calms chapped or irritated lips useful in conditions like lip leukoderma. Moisturizers with natural extracts generally contain fatty acids that strengthen the lipid barrier of the lips [59-65].

## CONCLUSION

In conclusion, herbal lipsticks formulated with natural pigments from plants such as Bixa orellana, Terminalia catappa, Ixora coccinea, Beta vulgaris, and Daucus carota offer a safer and eco-friendly alternative to synthetic cosmetics. These natural pigments not only provide attractive colours but also possess beneficial properties such as antioxidant, antimicrobial, anti-inflammatory, and moisturizing effects that help protect and nourish the lips. Unlike synthetic dyes, herbal ingredients are generally non-toxic and less likely to cause irritation or harmful side effects. Although challenges such as pigment instability and lack of standardized formulations remain, advancements in extraction technologies and increasing consumer preference for natural products support the future development of effective and sustainable herbal cosmetic formulations.

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Both are contributed equally.

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