



Extraction and manufacture of natural cosmetics

⁽¹⁾ Christina Atef Kamel, ⁽²⁾ Fatma Abotaleb Hussein, ⁽³⁾ Fatma Mamdouh Ibrahim, ⁽⁴⁾ Fatma Mohamed El-Sayed, ⁽⁵⁾ Kawthar Mahrous Abdel-Alim, ⁽⁶⁾ Laila Emad Abdel Hamid.

Supervisor: Dr. Ebtesam Mohamed – Lecturer of inorganic chemistry, Chemistry department, Faculty of Education, Ain Shams University.

Faculty of Education, Ain Shams University, Bachelor of Science and Education (Preparatory and Secondary) Chemistry major (in Arabic).

Abstract

The global goal for consumer goods, including cosmetics, is sustainable development. Demand for natural products has been rising recently, particularly in the industry of cosmetics. This project proposes to manufacture cosmetics such as eye mascara, eyebrow gel, tint, and lip balm from natural ingredients. Colorants are crucial cosmetic ingredients that are widely utilized in sustainable cosmetics, which led us in this study to extract natural dyes from three selected plant sources –hibiscus, beetroots, and red cabbage– to produce high-quality, good color consistency, and effective dyes for the manufacturing of chemical-free cosmetics. Coconut oil, which is formed by crushing copra, has several advantages and can be utilized in cosmetics. It additionally has a long shelf life. Consuming cosmetics that employ natural preservatives instead of chemical compounds is becoming more popular. Due to the recent applications of herbal extracts as preservation agents, this review discusses the use of natural extract from rosemary in cosmetics and its preservation properties.

Key Words:

Cosmetics; mascara; eyebrow gel; tint; lip balm; natural dye extract; rosemary.

1. Introduction:

In recent times, there has been a rising preference for natural products, driven by growing public awareness of the environmental and ecological consequences of excessive chemical use in everyday items. Organic cosmetics, crafted from natural raw materials, are regarded as safer alternatives, occasionally offering potential health benefits. Moreover, their production typically involves minimal or no chemical processes, ensuring alignment with sustainable and nature-friendly practices. Additionally, the production of these products involves minimal or no chemical processes, ensuring their compatibility with environmentally sustainable practices. Organic cosmetics are defined as those formulated with at least 95% of their raw materials sourced from nature, whereas natural products include a minimum of 5% organic ingredients within their composition. [Fernandes et al., 2013, p.293]. A primary component in cosmetics is dyes or colorants, which are essential raw materials. Natural dyes are derived from organic sources, including plants, animals, insects, or minerals. These colorants find extensive applications in various industries, such as textiles, food, pharmaceuticals, artisanal crafts, and cosmetics. While extracting these dyes may involve some processing, their origin remains entirely natural. Among the most significant sources of these dyes are plants, particularly their fruits and leaves.

Many natural dyes are primarily extracted from various plant components,

including flowers, fruits, roots, and leaves. Among these dyes is anthocyanin, a pigment responsible for imparting vibrant hues like red, blue, purple, and orange to numerous grains, vegetables, fruits, and flowers [Jackman et al., 1996, P.244].

Anthocyanin pigment exhibits multiple characteristics, notably its ability to alter color depending on pH levels, displaying blue, red, and purple hues in acidic, mildly acidic, and alkaline environments, respectively. [Mašović et al., 2003, p.102]. The pigment is tasteless, odorless [Lebling et al., 2006, p.12–21], and non-toxic, making it suitable for use as a food colorant and in cosmetic formulations. Additionally, it offers several health benefits due to its antioxidant, anti-cholesterol, and anti-carcinogenic properties. Furthermore, it aids in stabilizing blood sugar levels, supporting weight management, protecting neural and retinal health, and mitigating the effects of aging. [Kiuchi et al., 2014, P.48] [Zhu et al., 2018, P.232] [Shen et al., 2016, P.1003] [Tsuda, 2012, P.159].

Beetroot (*Beta vulgaris* L.) is recognized for its applications in herbal remedies and as a potent source of antioxidants, while also functioning as a natural food colorant due to the betalain content extracted from its roots and stems [Bahadoran et al., 2017, p.830] [Masih, 2019, p.162] [Koubaier, 2014, p.1934]. Betalain, a water-soluble flavonoid compound, is categorized into two types: red betacyanin and yellow betaxanthin. [Antigo, 2018, p.72] [Kezi, 2014, p.51].

Generally, natural colorants are non-toxic, non-allergenic, and exhibit minimal

adverse effects. Their biodegradable nature renders them a safer alternative to synthetic dyes, which can occasionally pose risks to both human health and the environment [Verma, 2017, p.57] [Miraj, 2016, p.404]. Additionally, natural colorants provide antimicrobial properties, UV protection, deodorizing effects, moth resistance, and serve as effective food colorants.

Mascara is a cosmetic product designed to enhance the appearance of eyelashes. It provides amplification through lengthening, curling, and darkening effects. For individuals with short, fine, or fragile eyelashes, a mascara that increases volume and extends length is essential. Numerous formulations are available commercially, with desirable mascara attributes including rapid drying, a glossy finish, lightweight texture, ease of application, uniform pigmentation, and minimal risk of allergic reactions. While conventional mascaras provide desirable attributes, their synthetic chemical composition can adversely affect the skin. Certain chemicals employed in these formulations may, over time, exhibit carcinogenic properties, cause skin irritation, or lead to eye swelling. Consequently, rosin has been incorporated in some products, though it too may produce side effects. In contrast, herbal mascaras, formulated without such substances, are significantly less likely to induce toxic reactions. All components are sourced from natural origins, including plants and animals. A minimal number of ingredients, such as wax, oil, and pigments, are employed in the formulation,

with the primary aim of producing natural mascaras free from chemical interactions. These natural mascaras are deemed more effective than their synthetic counterparts [Butler, 2000] [Sharma, 1998].

Eyebrows, as a key facial element, significantly influence facial aesthetics, emotional expression, and symmetry. Over time, diverse cosmetic products, including pencils and gels, have been created to enhance their appearance. However, growing interest in sustainable and natural alternatives has spurred research into plant-based ingredients for eyebrow enhancement. Despite the longstanding use of natural substances in hair care, there persists a lack of comprehensive studies on the systematic development and evaluation of natural creams formulated specifically to promote eyebrow growth [Rao et al. 2018, p.94] [Sharma et al. 2009, p.90] [Sultana et al. 2004, p. S86].

The usage of tint is very common among ladies since it protects their skin in addition to improving appearance. Women can look more attractive by using tint to give color to their skin. Unfortunately, popular cosmetic tints frequently contain harmful substances like methylparaben, propylparaben, tartrazine, and rhodamine B. Using these substances in a tint on a regular basis might cause unwanted side effects like allergies, dry skin, and even skin damage. In order to lower the possibility of adverse effects on the health of skin users, it is vital to look for safer and more natural substitute ingredients for the manufacturing of tints. [Altalia & Astuti, 2024, p. 9552] [Putri et al., 2022, p.837].

The term "lip balm" describes products that can be applied to the lips to keep them from drying out and shield them from harmful environmental elements. [Kadu et al., 2014, p.1]. The Body Shop, Nivea, Mentholatum, and other popular brands are among the numerous well-known manufacturers of lip balm that may have a chemical basis. To formulate the base, oils, coloring, and flavoring ingredients of lip balms, the concentration of the main components must be balanced. Healthy lips can be maintained and encouraged naturally with the help of natural lip balms. [Fernandes et al., 2013, p.293]. Additionally, lip balms are frequently consumed by the user, therefore it's critical that the chemicals be safe for ingestion. For the formulation of natural lip balm, there are four major ingredients. [Kadu et al., 2014, p.1]. Wax is essentially used as a basis to provide lip balm a more robust structure and to facilitate the formation of the desired shape. To form an appropriate layer on the applied lip skin that protects and hydrates the lips, oils must blend well with waxes. Dye or colouring substances are mostly employed to give the products a unique look.

Coconut oil is a popular product in the cosmetics business because of its many qualities. It slows down the ageing process while also providing the skin with the ideal amount of moisture and nourishment. It can also be used to make anti-acne cosmetics and to fight skin redness because of its antibacterial properties [https://foodcom.pl/en/coconut-oil-in-the-

production-of-cosmetics-and-dietary-supplements-how-to-use-its-properties].

Compounds with antioxidant qualities, including vitamins E and C, glutathione, enzymes, and phenolic compounds, are abundant in herbs and plants [Del baño et al., 2004, p. 4987]. Number of spice extracts could stop unsaturated triacylglycerols from autoxidizing [Reblova et al., 1999, p.13]. Especially, numerous studies have documented the antioxidative properties of a natural extract from the Lamiaceae family, which includes thyme, sage, and rosemary. [Nieto et al., 2011, p. 11] [Botsoglou et al., 2002, p.259]. An aromatic member of the Lamiaceae family, *Rosmarinus officinalis*, L. is native to the Mediterranean region. One of the main importers and processors of rosemary is the province of Murcia in southeast Spain. Rosemary is a special spice that is sold commercially as an antioxidant in the US and Europe [Cuvelier et al., 1996, p.645]. Rosemary extracts have been utilised in the treatment of illnesses, due to their hepatoprotective potential [Rašković et al., 2014, p.225], medicinal potential for Alzheimer's illness [Habtemariam et al., 2016, p.2680409] and its antiangiogenic properties [Kayashima et al., 2012, p.115]. However, because they stop oxidation and microbiological contamination, they have been utilised in food preservation. [Djenane et al., 2002, p.407] [Nieto et al., 2010, p.23] [Nieto et al., 2012, p.140]. As a result, rosemary extract may be able to reduce or even replace artificial antioxidants in food. Rosemary extracts provide a number of

technological and consumer benefits as preservatives.

The goal of this research is to utilize natural dyes extracted from plants (Such as beetroot, hibiscus, and red cabbage) in the production of natural cosmetics like eye mascara, eyebrow gel, tint, and lip balm. Moreover, the incorporation of natural oils obtained from rosemary and coconut in these cosmetics will serve as a preservative and moisturizer, respectively.

2. The Theoretical Framework

Cosmetics: consist of blends of chemical substances sourced from either naturally occurring materials or artificially produced ones [Schneider et al., 2001]. Cosmetics serve multiple functions, such as personal and skincare. They may also be applied to hide imperfections and accentuate natural traits (like the eyebrows and lashes). Cosmetics can also bring color to an individual's face, accentuate their features, or alter the face's appearance completely to resemble another person, being, or thing.

Eyebrow: pencils, creams, waxes, gels, and powders are utilized to tint, fill, and outline the brows [Riordan et al., 2004]. Eyebrow tinting procedures are likewise employed to change the color of the eyebrow hairs to a deeper shade, either for a short time or permanently, without affecting or coloring the skin beneath the eyebrows.

Mascara: is used to apply a viscous, cream-like product using a spiral bristle mascara brush to the eyelashes in order to darken, lengthen, thicken, or enhance them. Mascara comes in a variety of colors, some of which incorporate

glitter, although it is often black, brown, or clear. Mascara is generally marketed and sold in multiple formulations that promote features like waterproofing, volume enhancement, length enhancement, and curl enhancement, and it may be paired with an eyelash curler to boost the natural curl of the eyelashes mascara [Butler, 2000] [Sharma, 1998].

Lip products: encompassing lipstick, lip gloss, lip liner, and lip balms, typically enhance the color and texture of the lips, while also working to hydrate the lips and outline their outer contours [Fernandes et al., 2013, p. 293].

3. Methodology:

3.1 Material

hibiscus, beetroots, red cabbage, Fresh rosemary leaves, coconut, aloe vera, shea butter, activated charcoal capsules, vitamin E oil capsules, sugar, castor oil, fragrant oil, and olive oil.

3.2 Measurements

A strainer, fine sieve, digital scale, and magnetic stirrer were used in the study, which was carried out at the chemical laboratory of Ain Shams University's faculty of education.

3.3 Synthesis

3.3.1 Natural dye extraction

Procedures for dye preparation
<https://ar.wikihow.com/%D8%B5%D8%A8%D8%BA-%D8%A7%D9%84%D8%A3%D9%82%D9%85%D8%B4%D8%A9->

[%D8%A8%D8%A7%D8%B3%D8%AA%D8%AE%D8%AF%D8%A7%D9%85-%D8%A7%D9%84%D8%A8%D9%86%D8%AC%D8%B1](#)

- 1- First, tap water and then distilled water were used to wash the plants
- 2- To measure the plant in standard cups, it was chopped into small pieces for the dyeing process.
- 3- After that, we bring a pot that can be placed on a flame and fill it with water, making sure that the water is twice as much as the ingredients that are dyed. We then set the pot on low heat and let it boil for an hour, or until the solids are gone, then store the dye in the refrigerator until it is needed.

3.3.2 Extraction of natural oils

a- Extraction of coconut oil [Anonymous. Coconut Oil: Chemistry, Production and Its Applications – A Review (2014)]:

- 1- Fill a blender with 500 grams of dried coconut and one liter of boiling water.
- 2- Blend the mixture until it's smooth, 15 minutes, and then strain it through a strainer to remove the coconut milk. Next, let the coconut milk cool until it reaches room temperature.
- 3- For a full day, keep the coconut milk refrigerated. A solid layer will develop on top of the liquid after refrigeration. Gather this solid layer, then melt it slowly over low heat.
- 4- Natural coconut oil will separate from the melted layer.

b-Extraction of rosemary oil as a Natural Preservative [Gema et al., 2018, p.98]:

- 1- Fill a beaker with the natural coconut oil that has already been made.
- 2- Incorporate the coconut oil with fresh rosemary leaves.
- 3- Set up a water bath for the beaker.
- 4- Allow the rosemary to infuse into the oil by slowly heating it for half an hour. Let the mixture cool to room temperature after heating.
- 5- Use a fine strainer to get rid of the rosemary leaves from the oil.
- 6- Store the infused oil in sanitized, air-tight containers.

It's time to get natural cosmetics when extraction procedures are finished.

3.3.3. preparation of natural cosmetics

3.3.3.1. Preparation of Natural Mascara

- 1- Put shea butter and aloe vera gel in a sanitized beaker.
- 2- In a water bath, slowly heat the mixture until both ingredients melt and combine
- 3- Add 1 capsule of vitamin E oil and 1-5 drops of castor oil and mix well.
- 4- To improve consistency and stabilize the mixture, add 1 tablespoon of chia seed gel.
- 5- Add 2-3 drops of rosemary oil for preservation.

- 6– Stir thoroughly to ensure all ingredients are evenly mixed.
- 7– Fill an empty mascara bottle with the finished mixture.
- 8– Before using, let the mascara cool and set.

- 2– Using a spoon or spatula, add the ingredients and mix until thoroughly blended.
- 3– Fragrance oil is added to the mixture to provide a pleasing scent.

3.3.3.2. Preparation of Natural Eyebrow Gel

- 1– Put 1 tablespoon of petroleum jelly (the Vaseline mixture) and 1 tablespoon of aloe vera gel in a clean basin.
- 2– Use the water bath method to gradually heat the mixture until both ingredients melt and combine.
- 3– Mix thoroughly after adding one vitamin E oil capsule and one to five drops of castor oil.
- 4– For stability and a smooth texture, add 1 tablespoon of chia seed gel.
- 5– For preservation, add two to three drops of rosemary oil.
- 6– Give everything a good stir to make sure everything is combined.
- 7– Transfer the mixture into a little, sanitized, airtight container.
- 8– Let the gel cool down and set.

3.3.3.4. Preparation of Natural Lip Balm

- 1– First, take one tablespoon each of extracted coconut oil and Vaseline.
- 2– Put both components in a boiler and heat them gradually until they melt and mix thoroughly.
- 3– After the mixture has melted, stir well and add two capsules of vitamin E oil.
- 4– Create three equal portions out of the mixture.
- 5– Add 1 tablespoon of betanin dye (extracted from beetroot) to one part of the mixture, 1 tablespoon of anthocyanin dye (extracted from hibiscus) to the second part, and 1 tablespoon of anthocyanin dye (extracted from red cabbage) to the third part. Mix each part individually well until the dyes are fully incorporated.
- 6– As a natural fixer, add 1 tablespoon of chia seed gel to each component.
- 7– As a natural preservative, add two to three drops of rosemary oil to each combination.
- 8– Transfer all the mixtures into tiny, transparent, air-tight glass containers after they have been thoroughly blended.

3.3.3.3. Preparation of Natural Liquid tint

- 1– Combine 40g of granulated sugar, 10g of coconut oil, 10g of olive oil, and 10g of rosemary oil in a dry, clean bowl. Then, add extracted dye from hibiscus to the mixture.

- 9– Prior to sealing the containers, let the lip balm to fully cool and harden.

3.3.4 Evaluation of natural cosmetics

3.3.4.1 Effectiveness Test on Papers

The produced cosmetics were finally evaluated by applying them to a piece of paper after being removed from the chiller. Determining the color from various sources from this procedure. This process can also determine the efficiency of the produced color.

3.3.4.2 Skin Irritation Test

Applying the prepared natural cosmetics to the skin for ten minutes is how it is done.

4. Results of Research

Water was used in this work to extract anthocyanin dye from hibiscus, beetroot, and red cabbage because it has no harmful effects, doesn't change the dye's composition, and evaporates at low temperatures without changing the extracted dye's chemical structure [Ncube et al., 2008, P.1797]. To make the dyes thicker in color, the extracted dye solution can be allowed to evaporate.

Visual analysis was used to compare the dyes' color values with those of various plant sources. It was noted that the hue and lightness of the colors changed. According to Figure 1, the hibiscus has a darker hue than the other vegetables, while the red cabbage has the least amount of color, followed by the beetroot. As illustrated in Figure 2, all three extracted dyes are incorporated to the lip balm, despite their varying color consistency

characteristics. Additionally, as seen in Figure 3. Also, the extracted dye from the hibiscus plant is applied on a tint as shown in Figure 3. This demonstrates the effectiveness of using extracted dyes in cosmetics.

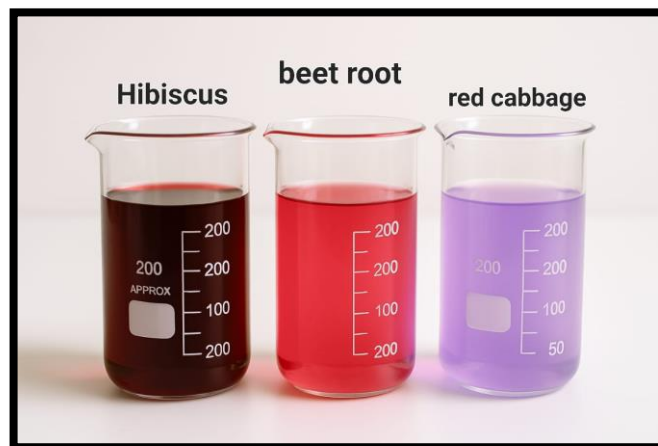


Figure 1: Different produced colors from different plant sources.



Figure 2. Natural lip palm with different colors.



Figure 3. Natural tint with extracted dye from hibiscus.

According to the color assessment, the visual component was deemed satisfactory. From the evaluation day onwards, no color changes were noticed in the cosmetics, as indicated in Table 1.

Apart from that, the lip balm, for example, was applied on a piece of paper (Figure 4) to test the color consistency and visibility of the natural dye. The formulation created of natural cosmetics showed a suitable appearance after several weeks, irrespective of storage conditions, indicating that the ingredient ratio and composition were sufficient.



Figure 4: Lip balm applied on a piece of paper.

When applied to the skin for longer than ten minutes, none of the four cosmetics—eye mascara (Figure 5), eyebrow gel (Figure 6), tent, and lip balm—show signs of itching or irritation.

Plant sources	Color	Rating
hibiscus	Dark red	Good
beetroots	Light red	Good
red cabbage	Light purple	Good

Table 1: Analysis of color and rating of the dye from different plant sources.



Figure 5. Natural mascara



Figure 6. Natural eyebrow gel.

Lastly, the addition of natural oils which are extracted from rosemary and coconut to these prepared natural cosmetics played an effective role in preserving them for a long time and moisturizing them.

5. Conclusion

The cosmetics industry is booming because of the enormous demand for beauty-enhancing goods. The status of natural cosmetics has been examined in this paper. Additionally, this examined every facet of natural cosmetics, including formulation techniques, natural components, evaluation,

and natural dyes like anthocyanin dye which extracted from hibiscus, beetroots, and red cabbage. The color strength obtained during the creation of natural cosmetics suggested that the dye plants used in this investigation have a great deal of promise for use as a natural dye source in cosmetics. Extracts from rosemary may be used to preserve cosmetics. Due to its affordability, accessibility, and lack of toxicity, rosemary extracts or essential oils with high phenolic component levels should be introduced into the cosmetics business. Therefore, it can be said that a thorough review of the literature on natural cosmetics has been done and that there is a lot of room for these products in the future.

Acknowledgement

We would like to express our profound gratitude to the Chemistry Department's laboratories in general and the Inorganic Chemistry Research Laboratory at Ain Shams University's Faculty of Education in particular for providing us with the means to carry out laboratory experiments pertaining to the research topic as well as a variety of measuring instruments and equipment.

References

A. R. Fernandes, M. F. Dario, C. A. S. Pinto, T. M. Kaneko, A. R. Baby and M. V. R. Velasco, (2013) Stability evaluation of organic lip balm, *Brazilian Journal Pharmaceutical sciences*. 49, 293–298.

Altalia, E., & Astuti, M. (2024). Kelayakan Ekstrak Buah Bit (*Beta Vulgaris* L.) Sebagai

Anonymous. Coconut Oil: Chemistry, Production and Its Applications – A Review (2014), Indian Coconut Journal.

Anonymous, (2012), The Economic Geography of Emirates State, 1st edition, El Emirates Publishing House.

Antigo, J.L.D., Bergamasco, R.C., and Madrona, G.S., (2018), Effect of pH on the stability of red beet extract (*Beta vulgaris* L.) microcapsules produced by spray drying or freeze drying, *Food Sci. Technol.*, 38 (1), 72–77.

Bahadoran, Z., Mirmiran, P., Kabir, A., Azizi, F., and Ghasemi, A., (2017), The nitrate-independent blood pressure-lowering effect of beetroot juice: A systematic review and meta-analysis, *Adv. Nutr.*, 8 (6), 830–838.

Botsoglou, N.A.; Christaki, E.; Fletouris, D.J.; Florou-Paneri, P.; Spais, A.B, (2002). The effect of dietary oregano essential oil on lipid oxidation in raw and cooked chicken during refrigerated storage. *Meat Sci.*, 62, 259–265. [CrossRef].

Butler. H.: *POUCHER’S – Cosmetics*, 10th Edition, Springer, Cumbria, USA, 2000.

Cuvelier, M.E.; Richard, H.; Berset, C. (1996). Antioxidative activity and phenolic composition of pilot-plant and commercial extracts of sage and rosemary. *J. Am. Oil Chem. Soc.*, 73, 645–652. [CrossRef].

Del baño, M.J.; Lorente, J.; Castillo, J.; Benavente-Garcia, O.; Marín, P.; Del Río, J.A.; Ortuó, A.; Ibarra, I. (2004). Flavoid distribution during the development of leaves flowers, stems and roots of *Rosmarinus officinalis* postulation of the Biosynthetic pathway. *J. Agric. Food Chem.*, 52, 4987–4992. [CrossRef] [PubMed].

Djenane, D.; Sánchez-Escalante, A.; Beltrán, J.A.; Roncalés, P. (2002). Ability of α -tocopherol, taurine and rosemary, in combination with vitamin C, to increase the oxidative stability of beef steaks displayed in modified atmosphere. *Food Chem.*, 76, 407–415. [CrossRef]

Gema Nieto, Gaspar Ros, and Julián Castillo (2018), Antioxidant and Antimicrobial Properties of Rosemary (*Rosmarinus officinalis*, L.): A Review, *Medicines*, 5, 98.

Habtemariam, S. (2016). The therapeutic potential of rosemary (*Rosmarinus officinalis*) diterpenes for Alzheimer’s disease. *Evid. Based Complement. Altern. Med.*, 2680409. [CrossRef] [PubMed].

hispanica). Jurnal Media Bina Ilmiah, 17(1978), 837–846.

Jackman RL, Smith JL., (1996). Anthocyanins and betalains. In: Hendry GAF, Houghton JD, editors. Jackman Natural food colorants. 2nd ed. London: Blackie; pp. 244–309.

Kayashima, T.; Matsubara, K. (2012). Antiangiogenic effect of carnosic acid and carnosol, neuroprotective compounds in rosemary leaves. Biosci. Biotechnol. Biochem. 76, 115–119. [CrossRef] [PubMed].

Kezi, J., and Sumathi, J.H., (2014). Betalain – a boon to the food industry, *Discovery*, 20 (63), 51–58.

Kiuchi F, Goto Y, Sugimoto N, Aka Kohno Y, Haga E, Yoda K, Shibata M, Fukuhara C, Tomita Y, Maeda Y, Kobayashi K, (2014). Adsorption behavior of natural anthocyanin dye on mesoporous silica J. Phys. Chem. Solids, 75, pp. 48–51.

Koubaier, H.B.H., Snoussi, A., Essaidi, I., Chaabouni, M.M., Thonart, P., and Bouzouita, N., (2014). Betalain and phenolic compositions, antioxidant activity of Tunisian red beet (*Beta vulgaris* L. *conditiva*) roots and stems extracts, *Int. J. Food Prop.*, 17 (9), 1934–1945.

Lebling RW, Pepperdine D., (2006). Natural remedies of Arabia. Saudi Aramco World. 57(5), 12–21.

M. Kadu, S. Vishwasrao and S. Singh, (2014) Review on natural lip balm, *International Journal of Research in Cosmetic Science*. 5, 1–7.

Masih, D., Singh, N., and Singh, A., 2019, Red beetroot: A source of natural colourant and antioxidants: A review, *J. Pharmacogn. Phytochem.*, 8 (4), 162–166.

Mašović S, Janković M, Bukvić B, Vukosavljević P, (2003). Change of anthocyanins content during raspberry extraction. *Journal of Agricultural Sciences*. 48, 85–102.

Miraj, S., 2016, Chemistry and pharmacological effect of *Beta vulgaris*: A systematic review, *Pharm. Lett.*, 8, (19), 404–409.

Ncube NS, Afolayan Aj, Okoh AI., (2008). Assessment techniques of anti-microbial properties of natural compounds of plant origin: Current methods and future trends. *African Journal of Biotechnology*, 1797, 7(12).

Nieto, G.; Bañon, S.; Garrido, M.D. (2014). Incorporation of thyme leaves in the diet of pregnant and lactating ewes: Effect on the

fatty acid profile of lamb. *Small Rumin. Res.* 105, 140–147. [CrossRef]

Nieto, G.; Díaz, P.; Bañón, S.; Garrido, M.D. (2010). Dietary administration of ewe diets with a distillate from rosemary leaves (*Rosmarinus officinalis* L.): Influence on lamb meat quality. *Meat Sci.* 84, 23–29. [CrossRef] [PubMed]

Nieto, G.; Huvaere, K.; Skibsted, L.H. (2011). Antioxidant activity of rosemary and thyme by-products and synergism with added antioxidant in a liposome system. *Eur. Food Res. Technol.* 233, 11–18. [CrossRef]

Pewarna Alami Dalam Pembuatan Lip Balm. 8, 9552–9559.

Putri, D. A., Chaidir, & Hanafi, M. (2022). Moisturizing Effectiveness Of Organic Lip Cream Formulation with Beetroot Extract (*Beta vulgaris* L) and Chia Seed Oil (*Salvia*

Rao S, Prakash K. Formulation and Evaluation of Herbal Shampoo. *Asian J Pharm Clin Res*, (2018). 11(4): 94–97. doi:10.22159/ajpcr.2018.v11i4.24052.

Rašković, A.; Milanović, I.; Pavlović, N.; Čebović, T.; Vukmirović, S.; Mikov, M. Antioxidant activity of rosemary (*Rosmarinus officinalis* L.) essential oil and its hepatoprotective potential. *BMC*

Complement. Altern. Med. 14, 225. [CrossRef] [PubMed].

Reblova, Z.; Kudrnova, J.; Trojakova, L.; Pokorny, J. Effect of rosemary extracts on the stabilization of frying oil during deep fat frying. *J. Food Lipids* 1999, 6, 13–23. [CrossRef].

Riordan, Teresa (12 December 2004). "Inventing Beauty". *The New York Times*. ISSN 0362-4331. Archived from the original on 24 August 2021. Retrieved 24 August 2021.

Schneider, Günther; Gohla, Sven; Schreiber, Jörg; Kaden, Waltraud; Schönrock, Uwe; Schmidt-Lewerkühne, Hartmut; Kuschel, Annegret; Petsitis, Xenia; Pape, Wolfgang (2001). *Skin Cosmetics*. Ullmann's Encyclopedia of Industrial Chemistry. John Wiley & Sons, Ltd. doi:10.1002/14356007.a24_219. ISBN 978-3-527-30673-2. OCLC 910197915. Archived from the original on 21 February 2022. Retrieved 21 February 2022.

Sharma D, Saxena VK. (2009). Evaluation of natural products in prevention of hair damage by UV and other environmental factors. *Int J Pharm Sci Drug Res*, 1(2), 90–96. <http://ijpsdr.com/pdf/vol1-issue2/20.pdf>.

Sharma, P.P: Formulation and Quality Control, 4th Edn, Vandana Publishers Pvt. Ltd., New Delhi, March 1998.

Shen Y, Zhang H, Cheng L, Wang L, Qian H, Qi X, (2016). In vitro and in vivo antioxidant activity of polyphenol extracted from black highland Barley Food Chem., 194, pp. 1003–1012.

Sultana Y, Kohli K, Athar M, Khar RK. A (2004). potential new mechanism of skin toxicity in black-pigmented hair dyes: H₂O₂-mediated oxidative stress from p-phenylenediamine. J Am Acad Dermatol, 51(5): S86–S91. doi: 10.1016/j.jaad.2003.12.031.

Tsuda T, (2012). Dietary anthocyanin-rich plants: biochemical basis and recent progress in health benefits studies Mol. Nutr. Food Res., 56, pp. 159–170.

Verma, S., and Gupta, G., (2017). Natural dyes and its applications: A brief review, *Int. J. Res. Anal. Rev.*, 4 (4), 57–60.

Zhu F, (2018). Anthocyanin in cereals: composition and health effects Food Res. Int., 109, pp. 232–249.

<https://ar.wikihow.com/%D8%B5%D8%A8%D8%BA-%D8%A7%D9%84%D8%A3%D9%82%D9%85%D8%B4%D8%A9-%D8%A8%D8%A7%D8%B3%D8%AA%D8%AE%D8%AF%D8%A7%D9%85-%D8%A7%D9%84%D8%A8%D9%86%D8%AC%D8%B1>