

# Durable Moisturizing Herbal Lip Balm with Honey, Hyaluronic Acid, and SPF

Hafizh Fadhullah<sup>\*</sup>, Anisa Megantika, Kanya Citta Hana Alifia, Pandu Nugroho, Talitha Zada Gofara

Department of Chemical Engineering, Faculty of Engineering, University of Indonesia, Depok, 16424, Indonesia

*\*e-mail: hafizh.fadhullah1@gmail.com*

---

**Abstract**—Lip balm is one of the most commonly used cosmetic products. Its main function is to moisturize the lips, relieve chapped lips, and protect them from dryness. It has been commonly used and has many variations; however, it also has some negative effects. For example, chemical-based lip balm causes side effects, and its moisturizing effect lasts shortly. Thus, we create a new concept of lip balm that not only contains herbal ingredients to reduce side effects but also maintains the durability of its moisturizing effect. Our product concept is durable moisturizing herbal lip balm with honey, hyaluronic acid, and SPF. It positively affects consumers' lips because it is made of 100% herbal ingredients containing a combination of an emollient, a humectant, and an occlusive agent to enhance the duration of the moisturizing effect of lip balm. Our product provides the following benefits: it is a uniquely patented product; it contains a combination of a humectant, an emollient, and an occlusive moisturizer to maintain moisture on the lips; and it is manufactured using 100% herbal ingredients.

**Keywords**—lipbalm; durable; herbal; moisturizing; hyaluronic acid

---

## I. INTRODUCTION

Cosmetics are substances or products applied on the body to improve appearance. The usage of cosmetic products has been increasing rapidly. The use of cosmetic products is promoted by key factors, such as increased urbanization, lifestyle improvements, and trend of posting pictures on social media. An increasing number of working women and time spent by people on social media have also enhanced their consciousness about their appearance (Bellis, 2017). In developing countries, the increasing young population, along with the growing disposable income of people, also results in an increase in the sales of cosmetic products, including lip products (P&S Market Research, 2018).

In cosmetic products, the presence of toxic chemicals poses challenges to market growth. Nowadays, consumers have a high concern in choosing cosmetic products. Manufacturers compete to innovate cosmetic products that are safe to use and environmentally friendly. Global Industry Analysts, Inc. (GIA) has launched the global market for lip care products and forecasted them to reach US\$2 billion by 2020 because of the growing demand for organic and natural lip care products, increasing awareness about the need to protect the lips from overexposure to the sun, and new product innovations (Global Industry Analysts, 2015).

Coloring lips has been practiced since ancient times, and the use of lipsticks has increased. Choices of shades or color, texture, and luster have also changed and widened. For example, lip jelly, lip balm, and

lipsticks are marketed in hundreds of shades of colors to satisfy the demand (Jain et al., 2017).

The lips differ from the structure of the skin. Generally, the top corneum layer of the skin has 15–16 layers mainly for protection. Conversely, the top corneum layer of the lips contains about only 3–4 layers and is very thin compared with the typical facial skin. The lip skin contains few melanin cells. As a result, blood vessels appear more clearly through the skin of the lips and give a lovely pinkish color to the lips. The lip skin has no hair follicle and no sweat glands. Therefore, it does not have sweat and body oil that protect it from the outside environment (Kadu et al., 2015). One type of lip products is lip balm. It mainly functions to prevent drying and protect against adverse environmental factors. However, some lip balm products have side effects. For example, lip balms containing phenol, menthol, and low-quality ingredients can harm the lips. Such lip balms may cause drying instead of moisturizing the lips.

Herbal or natural cosmetics are formulated using different cosmetic ingredients to form the base in which one or more herbal ingredients are used to cure various skin ailments. It combines the skills of specialists in chemistry, physics, biology, medicine, and botany (Fisher, 2018). Herbals do not produce instant cures; however, they provide a way to properly tune the body with nature. The demand of herbal medicines is increasing rapidly because of their skin friendliness and lack of side effects. The natural contents of herbs do not have any side effects on the human body; instead, they provide the body with nutrients and other useful minerals. Another reason of

using herbal cosmetics is to replace synthetic products because of their harsh nature. Herbal products do not contain other harmful ingredients that synthetic products do, e.g., petrochemicals, artificial fragrances, flavors, and colors (Biraghi, 2017; Child, 1841; Chopra, 2016).

## II. MATERIALS AND METHODS

### A. Materials

TABLE I. MATERIAL BALANCE OF EACH PROCESS

Process	Material	Input (kg)	Output (kg)
Oils Mixing	Olive Oil	4.68	7.17
	Jajoba Oil	2.49	
Grinding	Dragon Fruit	1.02	1.02
Filtration	Dragon Fruit	1.02	0.00
	Concentrate	0.00	1.02
Emulsifying Mixing	Oils Mixture	7.17	8.34
	Lecitin	0.15	
	Dragon Fruits Concentrate	1.02	
Mixing with Hot Waxes	Beeswax	1.32	14.55
	Candelilla wax	1.83	
	Cocoa Butter	2.19	
	Oils, Emulsifier and Dragon Fruit Concentrate Mixture	8.34	
	Hyaluronic Acid	0.10	
	Honey	0.78	
Filling	Herbal Lip Balm	14.55	28.62
	Plastic tube (PVC)	14.07	
Cooling	Herbal Lip Balm in a tube	28.62	28.62
Labeling	Herbal Lip Balm in a tube	28.62	31.97
	PVC	3.35	
Packaging	Labelled Herbal Lip Balm	31.97	46.03
	Cardboard	14.06	
TOTAL		167.34	167.34

Table 1 shows the ingredients needed to make this lipbalm. Several steps, including mixing, packaging, and labeling, are needed in this process so that ingredients are evenly mixed and homogeneous. Each ingredient has unique benefits, which are explained one by one in the following section.

#### Beeswax

Beeswax is used as an emollient and thickener to achieve lip balm consistency. The wax is insoluble in water but can be dissolved in organic solvents, such as acetone, chloroform, and benzene. It can be obtained straight from a bee farm or bought from another company in a form of solid pellets. Beeswax is chosen in a form of solid pellets from PT Sumber Berlian Kimia and delivered from Jakarta, Indonesia. One package of this product contains 1 kg of beeswax, and the required amount is 4 kg of beeswax per day.

#### Candelilla wax

Candelilla wax is used to create hardness and serve as an occlusive agent that creates a barrier to trap water and prevent it from evaporating. The wax consists of 20%–29% wax ester, 12%–14% alcohol and sterol, 49%–50% hydrocarbon, 7%–9% free fatty acids, 2%–3% humidity, and 1% minerals. The physical and chemical properties of wax may vary depending on the age of a candelilla plant and the year when it was extracted. Wax is insoluble in water but can be dissolved in organic solvents, such as acetone, chloroform, and benzene. Candelilla wax is chosen in a form of solid pellets bought from PT Sumber Berlian Kimia and delivered from Jakarta, Indonesia. One package of this product contains 1 kg of candelilla wax to fulfill the specification; that is, the company needs 6 kg of candelilla wax per day.

#### Hyaluronic acid

Hyaluronic acid and sodium hyaluronate are used as strong humectants that can absorb water from the air to hydrate the lips. It is sold in a powder form that can be dissolved in water. Hyaluronic acid is chosen to be bought from PT Cortico Mulia Sejahtera and delivered from South Jakarta, Indonesia. One package of this product contains 1 kg of hyaluronic acid and sodium hyaluronate. The process needs 0.5 kg of hyaluronic acid and sodium hyaluronate per day.

#### Olive oil

Olive oil functions as an emollient that softens the skin and serves as a source of antioxidants, which promote collagen production. This oil is obtained by pressing olive fruits, thus producing olive oil. The remaining oil in the pulp is also extracted with the help of a solvent. Olive oil is bought from CV Mawar Herbal and delivered from Bekasi, Indonesia. It is sold in a liquid form with the name “olive oil pomace” to differentiate between oil used for industrial purposes and extra virgin olive oil for consumption. One package of this product contains 5 L of olive oil, and the amount bought is 14 kg of olive oil per day.

#### Jajoba oil

Jajoba oil is a mixture of long-chain unsaturated fatty ester, which is structurally different from triglycerides. It is extracted from jajoba seeds (*Simmondsia chinensis*), and its color varies from golden to transparent. Its shelf life is longer than that of some oils because jajoba oil does not contain triglycerides. Thus, the tendency of jajoba oil to become oxidized and rancid decreases. Jajoba oil is bought from PT Sumber Berlian Kimia and delivered from Jakarta, Indonesia. It is sold in a liquid form in a container. One package of this product contains 5 L of jajoba oil. The amount needed is two packages of jajoba oil per day containing a total of 10 L.

#### Honey

Honey functions as a natural humectant and emollient, serves as a source of vitamins B1 and B6 (nourishment), stimulates new skin cell formation

(softening lips), elicits an anti-inflammatory effect on chapped lips, protects the lips from the damaging effect of free radicals, exhibits antibacterial and antiseptic properties to prevent bacterial infection, and provides relief to symptoms of chapped lips because of its vitamin C content. Raw honey is obtained by pressing beehives and then purifying it into pure honey. Honey is bought from PT Agromaret Digital Indonesia, with Mr. Iwan Fitrianto as the supplier. The chosen variant of honey is "Madu Super," with a minimum order of 500 kg, and the company can provide approximately 10 MT per month. Honey is transported from West Java, Indonesia, and the amount needed is 3 kg of honey per day.

### Dragon Fruit Extract

This herbal lip balm uses dragon fruit extract as its colorant. Dragon fruits are processed in a grinder and then filtered through microfiltration to obtain its liquid extract. The dragon fruit is bought from PT Trisna

Naga Asih because the location of the farm is relatively near the factory. The dragon fruits are transported from Subang to Karawang with the amount of 6 kg of dragon fruits because 3 kg of liquid extract is needed per day.

### Organic Lecithin

Lip balm does not need an emulsifier to create the base because all the ingredients (wax, oil, and butter) are hydrophobic. However, the product combines hyaluronic acid, which is hydrophilic, dragon fruit extract, which is water based, and oil-based ingredients, so an emulsion is needed. Organic soy lecithin is chosen instead of other emulsifiers because the product is herbal based. Organic lecithin is bought from CV Arum Deun Kimia, and it comes in a powder form with the amount of 0.5 kg of organic lecithin per day.

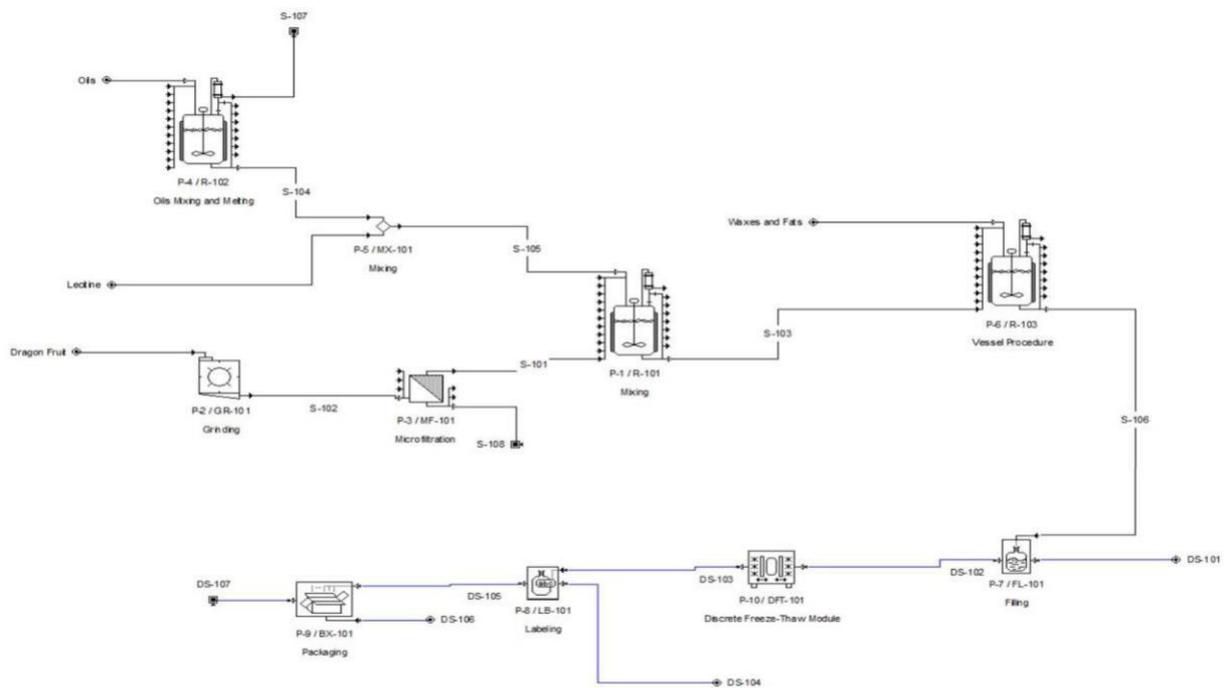


Fig. 1. Process flow diagram herbal lip balm

## B. Methods

### Material preparation

Material preparation is included in raw material procurement: beeswax, candelilla wax, hyaluronic acid, sodium hyaluronate, olive oil, jojoba oil, cocoa butter, honey, dragon fruit extract, and emulsifier (organic lecithin). They are stored in a storage tank because of its sensitivity. In this section, ingredients, which are imported or brought from another city, are unloaded from trucks and placed in a storage room and storage tanks.

### Mixing

The raw ingredients of lipsticks are melted at 80 °C and mixed separately because of the different types of ingredients used. One of the three mixtures contains solvents, the second mixture comprises oils, and the third mixture is composed of fats and waxy materials. These materials are heated in separate stainless steel or ceramic containers. The solvent solution and liquid oils are then mixed with the color pigment mixture. This process introduces air to the oil and pigment mixture, so the mixture should be mechanically worked. The mixture is stirred for several hours; at this point, some producers use vacuum equipment to withdraw air. After the pigment mass is ground and mixed, it is added to the hot wax mass until uniform color and

consistency are obtained. For one batch, it can produce 13.86 kg of lip balm via a filling and labeling machine.

#### *Grinding and Microfiltration*

Grinding and microfiltration are needed because size should be further reduced. A roller mill is used to obtain particles with a diameter of around 1 mm. This size reduction is necessary to avoid the “grainy” feel of lipsticks. This process introduces air to the oil and pigment mixture, so the mixture should be mechanically worked. The mixture is stirred for several hours; at this point, some producers use vacuum equipment to withdraw air. Afterward, microfiltration is applied to separate solid and liquid phases, so the liquid phase is mixed with other materials.

#### *Molding and Folding*

Once the lipstick mass is mixed and free of air, it is ready to be poured into a tube. The melted mass is dispensed into a mold, which consists of the bottom portion of the plastic tube and a shaping portion that fits snugly with the tube. Lipstick is poured upside down so that the bottom of the tube is at the top of the mold. Any excess is scraped from the mold. The lipstick is then passed through a flaming cabinet or is flamed by hand to seal pinholes and improve its finish. The lipstick is visually inspected for air holes, mold separation lines, or blemishes and reworked if necessary. For one batch, it can produce 3,300 entities/batch with 4.2 g per entities.

#### *Refrigertaing*

The lipstick is cooled to 25 °C to expedite production. Automated molds are kept cold, and manually produced molds are transferred to a refrigeration unit. The lipstick is also separated from the mold, and the bottom of the tube is sealed.

#### *Labeling and packaging*

After the lipstick is retracted and the tube is capped, the lipstick is ready for labeling and packaging. Each batch is identified with its corresponding label, which is applied as a part of the automated operation. Although the quality and appearance of the finished lipstick product have been widely explored, the appearance of lip balms has been rarely investigated. Lip balms are produced in an automated process except those for experimental or test batches. The heated liquid is pured into the tube in the retrated position; the tube in the retracted position; the tube is then capped by machine—a far less laborious process.

The final step in the manufacturing process is the packaging of a lipstick tube. Various packaging options are available, and they range from bulk packs to individual packs. Lip balms are packaged in bulk, with 12 and 18 items per box, but each box generally has minimum protection to prevent shipping damage. For primary packaging, lip balms are packaged in a stick.

### III. RESULTS AND DISCUSSION

Our product concept is a durable moisturizing herbal lip balm with honey, hyaluronic acid, and SPF. The improved quality of our product compared with other commercially available lip balms includes the enhanced duration of the moisturizing effect and the all-natural herbal ingredients, which are less likely to create any side effects, such as irritation, allergy, or dry lips.

#### *A. Ability to Moisturize Lips and Protect from Sunlight*

The top corneum layer of the regular skin has 15–16 layers mainly for protection. The top corneum layer of the lip contains about only 3–4 layers and is very thin compared with the typical facial skin. The lip skin contains few melanin cells. As a result, blood vessels more clearly appear through the skin of the lips and give a lovely pinkish color of the lips. The lip skin has no hair follicle and no sweat glands. Therefore, it does not have sweat and body oil glands that protect the lips from the outside environment (Kadu, Vishwaasrao, & Singh, Review on Natural Lip Balm, 2014).

These characteristics of the lips prompt the need for specific lip protection against external environmental factors to avoid chapped and dry lips. A lip balm is a solution to this problem because it has formulation to maintain the moisture of the lips and protect them from external factors. The working mechanism of moisturization is traditionally believed to inhibit transepidermal water loss through occlusion. Water originates from deeper epidermal layers, moves upward to hydrate cells in the stratum corneum, and eventually evaporates. Occlusive moisturization prevents the dehydration of the stratum corneum. The epidermis, particularly the stratum corneum, has been widely described. The “brick and mortar” model suggests that the epidermis is an active membrane. The loss of intercellular lipids, i.e., ceramides, cholesterol, and fatty acids that form bilayers, damages the water barrier function. The stratum corneum is involved in action repair mechanisms. The natural moisturizing factor, which is a natural mixture of amino acids, lactates, urea, and electrolytes, helps the stratum corneum retain water. Dry skin occurs when the moisture content is less than 10%, and the stratum corneum is continuously lost (Kasparaviciene, 2016)

Three major mechanisms of moisturizers for the skin and lips involve the functions of an occlusive agent, a humectant, and an emollient (Taha, 2012).

1. Occlusive agents: These skincare ingredients form a film on the skin and prevent water loss through the skin (Figure 3.1). They can be effective but can be waxy or greasy on the skin and cause acne or folliculitis (Rio, 2013). For our lip balm, occlusive ingredients are olive oil, beeswax, and candelilla wax.

Fig. 2. Occlusive moisturizer

Fig. 3. Humectant moisturizer

2. Humectant: This ingredient draws water molecules out of the environment toward itself (Figure 2). If you wear a moisturizer with a humectant ingredient, it actively sucks water from the surrounding air and sticks it onto a consumer's face. This substance helps rehydrate the skin's surface and can irritate the skin when it is applied at high concentrations (Rio, 2013). For our lip balm, the humectant ingredient is hyaluronic acid.

3. Emollient: This ingredient smoothens the skin's surface by filling in the cracks between skin cells (Figure 3). It softens the skin, makes the skin more flexible, and contributes to the creamy texture of a moisturizer. However, this ingredient is not always effective or long lasting (Rio, 2013). For our lip balm, the emollient ingredients are beeswax, honey, and olive oil acid.

Fig. 4. Emollient moisturizer

The ideal lip balm mixture should be a combination of the three abovementioned ingredients. A variation in the ratio of a humectant, an occlusive, and an emollient creates different physicochemical properties of lip balms. These properties can affect how well a product is perceived by consumers. For example, the viscosity and melting point of lip balms affect spreadability

when they are applied on the lips. Consistency has implications, in addition to the ease of use. When a lip balm is too stiff, the moisturizer cannot be applied evenly. Furthermore, when the lip balm is too runny, it does not stay long on the lips. The melting point of wax-based ingredients is relatively high (62 °C–700 °C), whereas the melting point of oil-based ingredients is relatively low (55 °C–650 °C). Therefore, the different ratios of both ingredients can change the melting point of lip balms (Kadu, Vishwaasrao, & Singh, Review on Natural Lip Balm, 2014). The melting point indirectly affects how long the moisture of lip balm lasts on lips.

The working mechanism of our humectant, namely, hyaluronic acid, also plays a major role in moisturizing. It is a high-molecular-weight biopolysaccharide, and its structure is shown in Figure 4. It is found in animal connective tissues and particularly concentrated in the synovial fluid, the vitreous fluid of eyes, and the umbilical cord.

Hyaluronic acid is hygroscopic, and this property is important in modulating hydration and osmotic balance. It can absorb the water content by almost 1000 times its own weight because of its ability to form a hydrogen bond with a free water molecule. This property combined with the occlusive ability of waxes should create a lip balm formulation with more lasting moisture.

Olive oil alone can be used to condition and protect the lips from drying or becoming chapped by slightly smearing on the lips whenever they feel dry or overnight. Although olive oil may help keep the lips hydrated, it may not function well as a product specifically formulated to moisturize lips. Using olive oil on the lips may cause breakouts and irritate the skin around the mouth because of its oily nature, especially if consumers have oily skin (Fisher).

Beeswax and candelilla wax combined with olive oil create an occlusive barrier over the lips and reflect the sunlight away. Thus, our herbal lip balm product has a sun-protective property without any additional chemical SPF.

#### *B. Ability to Nourish and Heal*

Honey acts as a natural humectant and emollient by drawing moisture from air to the dry lips and helps retain moisture to prevent further dryness. It is a rich source of vitamins B1 and B6, which are essential for the proper nourishment of the skin, including the lips. These vitamins also stimulate new skin cell formation, resulting in softer and more moisturized lips. The vitamin B complex in honey has an anti-inflammatory effect on chapped lips. It reduces the swelling caused by peeling or infections. It also contains vitamin B2 and zinc, which nourish the skin and protect the lips from the damaging effect of free radicals. It is a natural antibacterial and antiseptic that prevents chapped and cracked lips from being infected by harmful bacteria. Vitamin C in honey provides relief to topical symptoms of chapped lips, such as peeling, painful

sores, and bleeding. Honey also acts as a mild natural exfoliant to remove dead and damaged skin cells from the surface of dry lips. It unclogs pores and results in fresh and smoother skin cells, which make dry lips appear softer (Magee 2010; Moore 2018).

Olive oil is an unsaturated fatty acid derived from plants. It is relatively less stable than saturated fatty acids, such as wax and coconut oil, but it gives a smoother consistency and glossy appearance. Olive oil also contains vitamins A, D, E, and K, which are major antioxidant agents, specifically named polyphenols and phytosterols. They have anti-aging benefits by promoting collagen production. Olive oil also improves the exfoliation of dead skin cells on the lips so that chapped lips can be prevented (Team, 2017).

The additional function of hyaluronic acid is its ability to act as a signaling molecule by interacting with cell surface receptors and regulating cell proliferation. Thus, the self-healing ability of chapped and dry lips is induced. Hyaluronic acid is highly hydrophilic, so it is a polymer well suited to applications requiring minimal cellular adhesion. Postoperative adhesions, which form between adjacent tissue layers following surgery, impede wound healing, and often require additional surgical procedures to be repaired successfully. Barriers made from cross-linked hyaluronic acid have been effectively used to prevent the formation of such adhesions. Furthermore, the adhesion of bacteria to biomaterials can induce infections and constitute a great risk to patients. As such, esterified hyaluronic acid has also been used to prevent bacterial adhesion to dental implants, intraocular lenses, and catheters (Necas, Bartosikova, Brauner, & Kolar, 2008).

#### IV. CONCLUSION

Our product has the following benefits. It is a uniquely patented product. It contains a combination of a humectant, an emollient, and an occlusive moisturizer to maintain lip moisture. It is manufactured using 100% herbal ingredients and safely approved by the government. It can be used by males and females. It has additional functions, such as nourishment, scar healing, and sun protection.

Our product concept is a durable moisturizing herbal lip balm with honey, hyaluronic acid, and SPF. Our product positively affects consumers' lips because it is made of 100% herbal ingredients containing a combination of an emollient, a humectant, and an occlusive agent to enhance the duration of the moisturizing effect of our lip balm. Our product has the following benefits. It is a uniquely patented product containing a combination of a humectant, an emollient, and an occlusive moisturizer to maintain lip moisture. It is manufactured using 100% herbal ingredients and safely approved by the government. It can be used by males and females. It also has additional functions, such as nourishment, scar healing, and sun protection.

#### REFERENCES

- [1] B. Bellis, M., (2017). ThoughtCo. [Online] Available at: <https://www.thoughtco.com/history-of-chapstick-and-carmex-1991474> [Accessed on 20 February 2018].
- [2] Biraghi, E., & Abba, P, Lip balm, system thinking, *Technique Nouve*, 2017, pp. 16-18.
- [3] Child, M. F. L., *The American Frugal Housewife: Dedicated to Those who are Not Ashamed of Economy*. 27th penyunt. New York: Samuel S. & William Wood, 1841
- [4] Chopra, Sunil; Meindl, Peter. *Supply Chain Management: Strategy, Planning And Operations* 6th Edition. NJ: Pearson Education, 2016
- [5] Fisher, G. (n.d.). Is olive oil good for my lips: How Stuff Works. Retrieved March 8, 2018, from How Stuff Works: <https://health.howstuffworks.com/skin-care/lip-care/tips/olive-oil-good-for-lips.htm>
- [6] Global Industry Analysts. (2015). Lip Care Product: A Global Strategic Business Report. [Online] Available at: [www.strategyr.com/pressMCP-5086.asp](http://www.strategyr.com/pressMCP-5086.asp) [Accessed on 12 February 2018].
- [7] Jain, M., Shriwas, S., Dwivedi, S. & Dubey, R. Design, Development and Characterization of Herbal Lipstick Containing Natural Ingredients. *American Journal of Life Science Researches*, 2(5), 2017, pp. 36-39.
- [8] Kadu, M., Vishwasrao, S. & Singh, S. Review on Natural Lip Balm. *International Journal of Research in Cosmetic Science*, 1(2), 2015, pp. 1-7.
- [9] Kasparaviciene, Giedre; Savickas, Arunas; Kalveniene, Zenona; Velziene, Saule; Kubiliene, Loreta; and Bernatoniene, Jurga. Evaluation of Beeswax Influence on Physical Properties of Lipstick Using Instrumental and Sensory Methods. Lithuania: Hindawi Publishing Corp. 2016.
- [10] Magee, S. V., Bachert, J. O., Partridge, N. & Dickerson, R. J., *Botanical Butter Stick Lip Balm*. United States, Patent No. US 7,695,727 B2, 2010
- [11] Moore, A. (n.d.). Lip Care Center: Consumer Health Digest. Retrieved March 8, 2018, from Consumer Health Digest: <https://www.consumerhealthdigest.com/lip-care-center/chapped-lips.html>
- [12] P&S Market Research. (2018). Global Lipstick Market Size, Share, S. Development, Growth and Demand Forecast to 2023. [Online] Available at: <https://www.psmarketresearch.com/market-analysis/lipstick-market/toc> [Accessed on 20 February 2018].
- [13] Rio. (2013, October 14). Beauty Skin: XOJane. Retrieved March 8, 2018, from XOJane: <https://www.xojane.com/beauty/skin/beauty-vocab-humectants-emollients-occlusive-agents-moisturizer>
- [14] Taha, H. (2012, May 9). What are the differences between occlusive, humectant, and reparative moisturizers: FutureDerm. Retrieved March 8, 2018, from FutureDerm: <https://www.futurederm.com/what-are-the-differences-between-occlusive-humectant-and-reparative-moisturizers/>