

Production of Lip Balm from Natural Dyes

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Abstract: Recently, demands for natural products increases especially in the cosmetics industries. Lip balm is one of the widely used cosmetic products whose purpose is to give a colour to the lip as well as prevent lip dryness and acts as lip treatment. The purpose of this study is to extract natural dyes from five selected plant sources which are roselle (*Hibiscus sabdariffa*), dragon fruit (*Hylocereus costaricensis*), beetroot (*Beta vulgaris*), betel leaf (*Piper betle*) and red cabbage (*Brassica oleracea*) and also to produce a good quality, good colour consistency and effective dyes in the production of natural lip balm. There are several methods used to extract the dyes from selected plant which involved different kind of solvent. Results from this study shows that the best solvent used for all the extraction processes is ethanol compared to methanol and distilled water. It is proved by the higher yield of extracted dyes that comes from extraction using ethanol as a solvent. The plant roselle produces 117.6 ml of dyes, soaked dragon fruit produces 300 ml of dyes, for other sources which are beetroot, red cabbage and betel leaf produces 300 ml, 250 ml and 100 ml respectively. Roselle produce dark red dyes as appears on lip balm, dragon fruit produces dark purple dyes and turn to pink when mixed with natural ingredient in lip balm. Whereas, dragon fruit peel produces light pink dyes and appears yellowish on lip balm. Beetroot produces dark purple dyes, followed by red cabbage produces light purple dyes while in lip balm it appears purple and betel leaf produces dark green dyes while appears green in lip balm. In addition, the colour obtained from betel leaf on lip balm is darker compared to dyes produced by roselle, dragon fruits, beetroot and red cabbage. The lip balm was applied on a piece of paper to check the colour visibility as well as the consistency of colour which applied on human skin for 10 minutes to check the itchiness or any changes on the skin. In summary, natural dyes from different plant sources were successfully extracted to produce high quality of dyes on cosmetic product. This product has higher marketing potential where the production cost is cheaper and it is considered as organics product.

1 INTRODUCTION

Nowadays, people increasing interest in natural products, as the public becomes aware of ecological and environmental effects related to the use of abundant chemicals in the daily products. Cosmetics made from natural sources as raw material considered as organic cosmetics which are believed as safe and sometimes may act as health cure. Furthermore, no or mild chemical reactions are involved in the preparation of the product and it claims as harmonized with nature. Organic cosmetics refer to the cosmetics that made by 95% of the raw materials comes from natural sources, while natural products contain at least 5% organics raw materials as an ingredient (Fernandes et al., 2013). One of the main source of raw materials in cosmetic is dye or

colourant. Natural dyes refer to the colorants produced from the natural sources such as plant, animal, insect or minerals. The dyes also can be used widely in the colouration of textiles, foods, medicine and craft products as well as in cosmetics. Although, some processing was required in the process to obtain the dyes but essentially the dye itself was obtained from natural sources. The greatest sources of dyes were been the Kingdom Plantae, notably fruits and leaves.

Lip balm refers to the formulations that can be applied onto the lips to prevent drying and protects lips against adverse environmental factors (Kadu et al., 2014). There are many established companies produce lip balm in the market such as The Body Shop, Nivea, Mentholatum etc which may contains chemical origin. However, it is necessary to balance the concentration of the main ingredients to formulate

lip balms including the base, oils, colouring agents and flavouring agents. Natural lip balms offer a natural way to maintain and promote healthy lips (Fernandes et al., 2013). Lip balms are also often eaten away by the user and it is imperative that the ingredients are not dangerous to humans on consumption. There are four main components as key formulations ingredients for natural lip balm (Kadu et al., 2014). Basically, waxes are used as base to give the more stable structure and make it easier to form desirable shape of lip balm. Oils are required to blend properly to the waxes, so that provide a suitable film on the applied lip skin to protect and moisturizes the lip. Colouring agents or dyes is mainly used to impart a distinctive appearance to the products. Dye is an important ingredient of cosmetic formulations as user desire controlled by three senses namely sight, touch and smell (Kadu et al., 2014). Dyes used is cosmetic should not affected by oxidizing or reducing agents as well as pH changes and it also should not interferes with the tests and assays. The usage of synthetic dyes was done commercially for attractive colours but it is hazardous to skin and environment (Devi et al., 2013). The natural dyes have not commercially succeeded as synthetic dyes due to lack of the botanical knowledge and precise technical knowledge on the extraction methods and dyeing procedure (Devi et al., 2013). Flavouring agents is required to mask the four basic taste sensations namely salt, bitter, sweet and acid from the other ingredients. This is optional to give a value added in the products. In this research, natural dyes from the plant roselle, dragon fruit, betel leaf, beetroot and red cabbage was extracted to produce a high quality of desirable natural dyes mainly because of the quality of colour that can be created with them.

2 MATERIALS AND METHODS

2.1 Collection of Plant Materials

Traditionally, the sources used from 5 varieties of dye yielding plants were collected from different farms in Malaysia. Firstly, the plant roselle was collected from two different farms which are located at sek 36 Shah Alam and the other one is from Tropical Fruit Farm located at Jalan Teluk Bahang, Penang. Next, dragon fruit were collected from Multi Rich Pitaya farm which is located at Sepang. In addition, red cabbage and beetroot were collected from same place which is from Titi Eco Farm Sdn. Bhd, Kuala Klawang, Negeri Sembilan. Finally, the betel leaf was collected from a small farm in Kampung LBJ, Jalan Labu. The local

and scientific names of dye yielding plants used in this study are given in Table 1.

Distilled water, laboratory grade ethanol and methanol are used as solvent in the extraction methods. Petroleum gel and virgin coconut oil has been used to solidify the product and added as the treatment for lip.

Table 1: Local and scientific names of dye plant sources.

Local name	Scientific name	Plant parts used
Roselle	<i>Hibiscus sabdariffa</i>	Calyces
Dragon fruit	<i>Hylocereus costaricensis</i>	Fruits (peel and flesh)
Beetroot	<i>Beta vulgaris</i>	Tuber
Red cabbage	<i>Brassica oleracea</i>	Leaf
Betel leaf	<i>Piper betle</i>	Leaf

2.2 Selection and Preparation of Raw Material

The process to obtain a dye was basically done in four stages which are extraction of dyes from five different plant sources, formulation of product, effectiveness of dyes & skin irritation test. Matured plants used which are harvested in a healthy condition. The plant sources were collected and wash thoroughly with running water and then with deionized water to remove the impurities. After drying at room temperature, the samples were ground into powder form with grinder.

2.3 Dye Extraction

In an attempt to prepare dye solution from the plant sources, the solvent extraction method was used. It is a process where natural colours were extracted using organic solvents such as acetone, ethanol and methanol (Mirjalili and Karimi, 2013). The cleaned samples were crushed, dissolved in deionized water and was boiled for 2 hours in a hot water bath for quick extraction. After 2 hours, the total color was extracted. The solution was then double filtered and used for further analysis. The solvent extraction method was chosen because it able to extract both water-soluble and water-insoluble substances from the plant sources. The extraction yield is thus higher as compared to the aqueous method as a larger number of chemicals and coloring materials were extracted (Mitra and Das, 2015). Purification of

extracted dyes were easy as the solvents can be easily removed by using rotary evaporator (Saxena and Raja, 2014).

Next aqueous extraction were also used to extract dyes from plant source. In this aqueous extraction, the dye containing material were broken into powdered and sieved in order to improve extraction efficiency (Uddin, 2015). It is then soaked with distilled water for a long time usually overnight to loosen the cell structure and then boiled to get the dye solutions which were filtered to remove non dye plant remnants. The process of boiling and filtering is repeated to remove as much dye as possible (Wanyama et al., 2014).

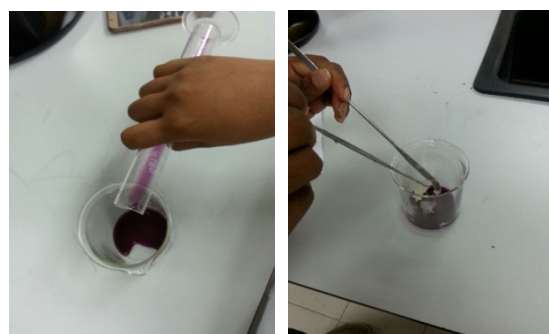
Table 2: Solvent used for solvent extraction methods.

Plant sources as raw materials		Solvents used	Solvent's volume (ml)
Roselle		Ethanol	132.4
		Distilled water	132.4
Dragon fruit	Dried & grinded	Ethanol	490
		Distilled water	490
	Soaked dragon fruit	Ethanol	490
Beetroot		Ethanol	490
		Distilled water	490
Red cabbage		Ethanol	375
Betel leaf	Dried & blended leaf	Ethanol	143.35
		Methanol	143.35
		Distilled water	143.35

2.4 Formulation of Lip Balm

The prepared dye solution from different plant sources was then added to petroleum gel and virgin coconut oil. The mixture then double boiled to melt all the ingredients until mixed thoroughly. Petroleum gel, virgin coconut oil and extracted dyes (solution) were prepared with the ratio 1:1:1. The materials were weighted using analytical balance. Each ingredient was weighted equally.

The mixture then was put in the water bath until all materials in the mixture were melt and transform to liquid form. After melting completely, a mixture was poured into the container and it was let to be air dried at room temperature. Next, it was put into the refrigerator for about 48 hours so that it will solidify.



(a) prepared dye on the beaker (b) petroleum gel was added



(c) virgin coconut oil was (d) double boiled the mixture



(e) poured into suitable container (f) the mixture was allowed to solidified

Figure 1: Preparation steps for lip balm formulation as follows: (a) prepared dye on the beaker (b) petroleum gel was added (c) virgin coconut oil was added (d) double boiled the mixture (e) poured into suitable container (f) the mixture was allowed to solidified at room temperature before kept on chiller for 48 hours.

2.5 Evaluation of Lip Balm

2.5.1 Effectiveness Test on Papers

Finally, after taking out the lip balm from chiller, it was tested by applying the lip balm on a piece of paper. This process is important to determine colour obtained from different sources. It also can determine the effectiveness of the colour produced.

2.5.2 Skin Irritation Test

It is carried out by applying lip balm on the skin for 10 minutes.

3 RESULTS AND DISCUSSION

Three different solvents used for the extraction processes. The best solvent is ethanol compared to methanol and distilled water. It is proved by the higher yield of extracted dyes solution that comes from extraction using ethanol as a solvent. This result is very useful since ethanol is non toxic compared to methanol and it can be used safely in cosmetics. The plant roselle produces 117.6 ml of dyes, soaked dragon fruit produces 300 ml of dyes, for other sources which are beetroot, red cabbage and betel leaf produces 300 ml, 250 ml and 100 ml respectively. The extracted dye solution can be left for evaporation so that the dyes will become thicker in colour.

Table 3: Dye solution obtained from solvent extraction methods.

Plant sources		Solvents	Sample weight (g)	Solvent volume (ml)	Dyes obtained (ml)
Roselle		Ethanol	26.48	132.4	117.6
		Distilled water	26.48	132.4	114.6
Dragon fruit	Dried & grinded	Ethanol	327	490	215
		Distilled water	327	490	290
	Soaked dragon fruit	Ethanol	327	490	300
Beetroot		Ethanol	327	490	300
		Distilled water	327	490	240
Red cabbage		Ethanol	250	375	250
Betel leaf	Dried & blended leaf	Ethanol	28.67	143.35	100
		Methanol	28.67	143.35	90
		Distilled water	28.67	143.35	80

The colour value of dyes was analyzed visually and compared with different plant sources. Change in colour characteristics in terms of hue and lightness was observed. Based on the Figure 2, the colour of betel leaf on lip balm is darker compared to the others and the colour of dragon fruit on lip balm is lesser, followed by the colour of red cabbage, roselle and beetroot. Even though, the 5 types of extracted dyes shows different properties in term of colour consistency ,yet all the 5 extracted dyes have shown

the colour on the lip balm. This shows that the application of extracted dyes on lip balm is successful.



Figure 2: Different plant sources produces different colour. From left: red cabbage, roselle, dragon fruit, beetroot and betel leaf.

For the colour assessment, the visual aspect was considered as good. No colour changes was observed on the lip balm from the evaluation day onwards.

Table 4: Analysis of colour and rating of the dye from different sources.

Plant sources	Colour	Rating
Red cabbage	Light purple	Good
Roselle	Dark red	Good
Dragon fruit	Light red	Good
Beet root	Dark purple	Good
Betel leaf	Dark green	Good

Other than that, the lip balm was applied on a piece of paper to check the visibility of natural dye as well as the consistency of colour. The developed formulation of natural lip balm exhibited an appropriate appearance after several months, regardless of storage conditions. It shows that the composition and ration of ingredients were adequate.



Figure 3: Lip balm applied on a piece of paper. From left: beetroot, roselle, red cabbage, dragon fruit and betel leaf.

Finally, all five different lip balms show no skin itchiness and irritation when applied onto the skin for more than 10 minutes.

4 CONCLUSION

The dye yield resulted from the solvent extraction method and the colour strength produced after formulation of lip balm indicated that dye plants under this study have considerable potential for application as a source of natural dye for cosmetic purpose. Ethanol showed the best solvent in this extraction method. This research results also showed that all the lip balm made from natural dyes were stable and had a good force of application. In addition, after 1 year storage in the room temperature, the condition of the product was still good. Finally yet importantly, this product did not cause irritation to lip. Meanwhile, they were safe to apply as organic cosmetics. In order to produce the high quality of extracted dye for the purposes in the cosmetic; integrated knowledge of the extraction procedures and the treatments of the plant parts that want to apply as a dye are needed. There are broad of procedures that will make the production of dyes are present in many conditions. For instant, the selection of solvents and the adjustment concentration of solvents used will make the yield of dye extracted in a variety of colours are need to be focused.

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APPENDIX

