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Development and evaluation of *Punica granatum* fruit based herbal lipstick

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ABSTRACT

Cosmetics are designed to enhance and bring out the facial features of women, beautify them, in hope to boost their confidence. One of the most commonly used and known cosmetics is lipstick. Lipstick formulations are mostly used to enhance the shape and beauty of lips and add a touch of glamour to the makeup, completing the whole look. Most of the lip product available commercially on the market globally is based on chemical compounds, with the possibility of various side effects such as skin irritation or rash to certain women with skin sensitivity issues. The chemical in the cosmetic also possesses a risk to the wider environment. In order to cope with this problem, some of the cosmetic company started creating environmentally friendly vegan products based on natural sources, creating products that possess less harm to the consumers as well as to the environment. With this aim and objectives in mind, I attempt to develop an herbal-based lipstick by using *Punica granatum* extract. The herbal-based lipstick was manufactured through various stages of melting, mixing, moulding, flaming and packaging. The formulated lipsticks were then evaluated for its physicochemical evaluation such as melting point, hardness, spreadability, surface anomalies, aging stability, solubility, pH, and perfume stability. The formulated lipstick will also be evaluated for its manufacturing defects such as sweating, bleeding, laddering, deformation, cratering and stability study.



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INTRODUCTION

Lipstick is the most popular cosmetics being used due to its functions. Lipstick being popular for women compared to other cosmetics is because of the widening choice of colours available such as red, orange, black, blue, pink, purple and other. Moreover, lipsticks not only improve our beauty but also act as a protective layer of the lip to prevent dryness and crack lip. Other than that, lipstick

can be utilised in many ways, such as a person with a thin mouth can be corrected by extending the lipstick above the upper lip line, or while apply the lipstick well within the natural lip line can make the mouth look smaller. Normally, the lipstick weight is about 5-6 g and present in the cylindrical shape that aid of application whilst protect the stick, and ease of carrying because of the shape of the container is the small and cylindrical shape. Synthetic lipstick uses some harmful ingredient like lead and harmful pigments like coal tar and carmine. Moreover, some of the harmful heavy metal present in the ingredients of synthetic lipstick such as nickel, chromium, arsenic, and cobalt may also be absorbed by the lips and stomach (Elumalai *et al.*, 2012). Hence, the herbal lipstick is formulating to minimize the problem faces by synthetic lipstick. Natural pigment or dye extract from plants are used to substitute the synthetic ingredient.

The development and evaluation of *Punica granatum* herbal lipsticks used to improve female appearance, economic and easily available. Herbal lipstick overcomes the side effect caused by synthetic lipstick and provides moisture to prevent drying of the lips. Moreover, some synthetic ingredient in the lipstick may cause blackening and cracking of lips can be prevented by herbal lipstick. The herbal ingredients provide natural antioxidant that neutralises free radicals and protects lips from photo-damage that may cause lip related problem.

MATERIALS

Beeswaxes, Lanolin, Castor oil, *Punica granatum* powder, Vitamin E, Vanilla extract. All other chemicals were used in analytical grade.

METHODS

Production of colour pigments: The ripe pomegranate fruits were selected based on the red color of the peel that indicated mature fruits and no black spots or blemishes for about few second. After that, the arils of the fruit were then extracted with maceration process in an alcoholic solvent (ethanol) in the ratio of 1:4, which means that 400 ml of ethanol was used to macerate with 100 g of arils of fruits. The total amounts of arils were about 1000 g, so the total amount of ethanol required was approximately 4 L. After 24 hours' extraction, the sample was then filtered with filter paper to obtain the red-purple filtrate. The filtrate was required to filter for several times to remove the residue and impurities. The red-purple filtrate that leftover was clear liquid without sedimentation. Furthermore, the filtrates were then evaporated for approximately five days to remove the solvent in the dark. (Draelos and Thaman, 2006).

Lipstick formulation

Table 1: Formulation of herbal lipsticks

	F1	F2	F3	F4	F5	F6
Beeswax	10	11	10	12	10	13
Lanolin	20	19	20	18	20	17
Castor oil	20	20	20	20	20	20
<i>Punica granatum</i> extract	5	6	8	7	10	9
Vitamin E	qs	qs	qs	qs	qs	qs
Vanilla extract	qs	qs	qs	qs	qs	qs

First, all the ingredient used in the formulation were weighed and measured accordingly. Second, the lanolin was melted in a beaker in a water bath at about 60 °C. Then the pigment was mixed into it to form a paste, in the ratio of 1:3 The castor oil was then poured into the above mixtures then stirred the mixtures in the water bath. The melted beeswax and antioxidant, flavouring and preservative were added in the above mixture. The lipsticks

were allowed to cool and settle down in the mould and then separated. Lastly, the lipstick formed was pass through a flame to produce a glossy finish to lipstick. The flames were adjusted to a level that hot enough to just melt the surface of the lipstick. The formulation is shown in table 1.

Physicochemical evaluation of herbal lipstick

Evaluation of herbal lipstick is important to maintain a standard of herbal lipstick. The prepared formulations were evaluated for the following tests.

Colour of lipsticks

The evaluation of color was assessed by physical observation of the lipstick products. The results are shown in table 2 and fig 1.

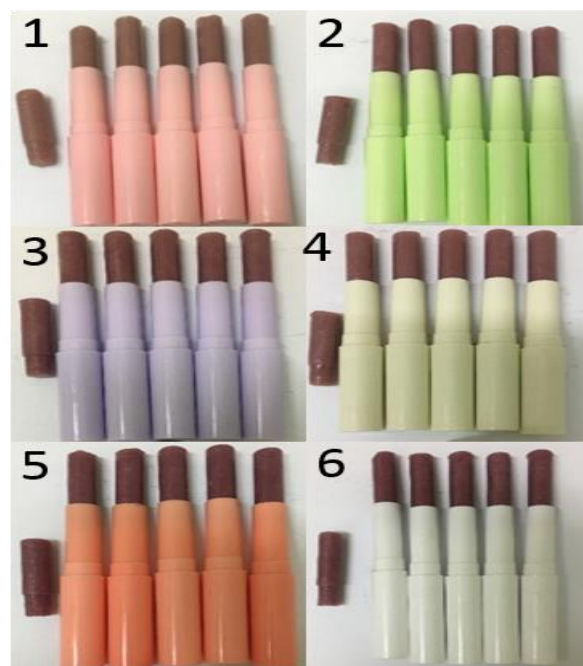


Figure 1: Colour of herbal lipsticks; Formulations: 1,2,3,4,5,6

Table 2: Colour of lipsticks

Formulation Code	Colour
F1	Pale Purple
F2	Purple
F3	Purple
F4	Purple
F5	Purple
F6	Purple

Determination of melting point

Take both ends of lipstick in open glass capillary tubes. Then, a sufficient amount of lipstick was introduced into each of five capillary tubes, about 10 mm high and allows the tubes to stand for the appropriate time and at the prescribed temperature in capillary tube apparatus. After that, the temperature at which the lipsticks begin to melt in the capillary tube was taken as the melting point. The op-

erations were repeated for five times, and the average was calculated and recorded. The results are shown in table 3 and fig 2.



Figure 2: The average melting point of herbal lipsticks

Table 3: Average melting point of prepared herbal lipstick

Formulation code	Average melting point
F1	53.8
F2	55.9
F3	60
F4	62
F5	60
F6	63

Determination of spreadability

It was tested by repeatedly applying the lipstick onto the glass slide to observe the uniformity in the formulation of the protective layer and whether the stick fragmented, deformed, or broke during application. Good: uniform, fragments do not occur, perfect application, without deformation of lipstick. Intermediate: uniform, leave fragment, good application but with little deformed. Bad: not uniform, leaves many fragments, difficult to apply and deformed. The results are in table 4 and fig 3.

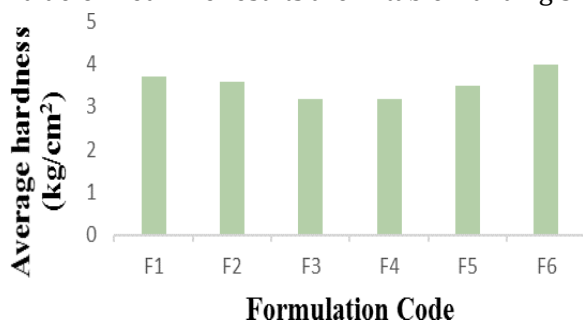


Figure 3: Spreadability of herbal lipsticks

Table 4: Spreadability of herbal lipsticks

Formulation Code	Spreadability(n=5)
F1	Intermediate
F2	Intermediate
F3	Intermediate
F4	Good
F5	Good
F6	Good

Determination of hardness

Five formulated lipstick from each formulation were selected randomly and measured using Monsanto hardness tester. The average result of each formulation was calculated and recorded. The results are shown in table 5 and fig 4.

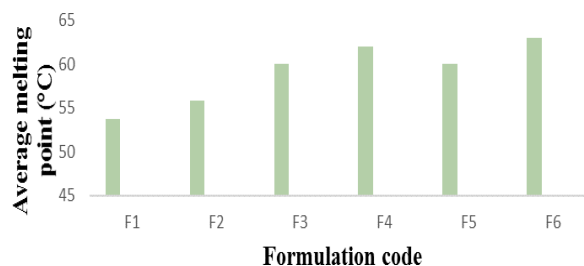


Figure 4: The average hardness of herbal lipsticks

Table 5: Average hardness of herbal lipsticks

Formulation Code	Average Hardness (kg/cm²)
F1	3.7
F2	3.6
F3	3.2
F4	3.2
F5	3.5
F6	4.0

Determination of surface anomalies: Determination of surface anomalies was studied about the surface defects, such as any crystal formation on lipstick surfaces, any contamination by moulds, fungi.

Determination of aging stability: The formulated lipstick was stored in hot air oven (40°C), room temperature (22°C), and refrigerator (4°C to 8°C) for one hour each and observed various parameter such as bleeding, crystallisation on surface and ease of application. Three lipsticks for each condition were used to ensure obtained the consistency and accurate results. The results are shown in table 6.

Determination of solubility: The solubility of the herbal lipsticks was observed after dissolved lipsticks in various solvents such as acetone, ethanol, hexane, petroleum ether, and water.

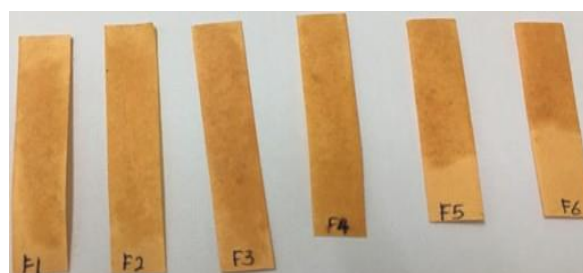


Figure 5: pH of herbal lipsticks

Determination of pH: PH of the herbal lipstick was determined by using pH paper. The average

Table 6: Aging stability of herbal lipsticks

	Condition	Formulation Code					
		F1	F2	F3	F4	F5	F6
Hot air oven (40 °C)	Bleeding on lipstick surface	No	No	No	No	No	No
	Crystallization on surface	No	No	No	No	No	No
	Ease of application	Yes	Yes	Yes	Yes	Yes	Yes
Room temperature (22 °C)	Bleeding on lipstick surface	No	No	No	No	No	No
	Crystallization on surface	No	No	No	No	No	No
	Ease of application	Yes	Yes	Yes	Yes	Yes	Yes
Refrigerator (4-8 °C)	Bleeding on lipstick surface	No	No	No	No	No	No
	Crystallization on surface	No	No	No	No	No	No
	Ease of application	Yes	Yes	Yes	Yes	Yes	Yes

result of each formulation was calculated and recorded. The results are shown in fig 5.

Determination of perfume stability

The lipstick products were evaluated, and the fragrance results were recorded after 30 days.

Stability study

This stability test was conducted to evaluate the spreadability, and organoleptic properties of lipstick formulation (colour, odour, and appearance) for 30 days under the conditions such as room temperature (22°C ± 3.0°C), and refrigerator temperature (5°C ± 3.0°C). The formulations were stored at room temperature for forty-eight hours and then evaluated at baseline (t₀). It was then stored under different conditions. According to the stability study, and the characteristics will be assessed on the 3rd, 7th, 15th, and 30th days. The value of t₀ will be used to compare with the value of the results (Fernandes *et al.*, 2013)

RESULTS AND DISCUSSIONS

Colour of lipsticks: All the formulated lipstick shown attractive purple colour except the F1 shown pale purple. The 5% of *Punica granatum* extract pigment for F1 was insufficient to formulate an attractive lipstick whereas a range of 6% to 10% of the extract pigment sufficiency to formulate a bright and attractive lipstick colour.

The melting point of herbal lipsticks: All the formulated lipstick was from the range of 53-63°C. The F1 fall out the optimum range of 55-75°C whereas others was within the range. According to the Howard, 1974, the F4 is the most quality lipstick as the temperature fall exactly 62°C. As compare the F1, F3 and F5, the percentage of castor oil, lanolin, beeswax and other ingredient were the same; the only difference was the percentage of *Punica granatum* colour extract. Thus, the insufficient pigment extract causes the low melting point of lipsticks.

Spreadability of herbal lipsticks: F1 to F3 showed Intermediate result because leave fragment and little deformed of the lipstick whereas F4

showed Good result because of little deformed on lipstick and without leaving any fragment on a glass slide. F5 to F6 showed Good result because no fragment found on the glass slide, perfect application and without any deformation.

Hardness: The hardness of prepared herbal lipstick was in the range of 3.2 kg/cm² to 4.0 kg/cm². F1, F3, and F5 which contain 10% of beeswax but show different hardness of 3.7 kg/cm², 3.2 kg/cm², and 3.5 kg/cm². F2 which contain 11% of beeswax show better mechanical strength of 3.6 kg/cm² when compared to F4 which contain 12% of beeswax with 3.2 kg/cm². The result formed is due to the different percentage of *Punica granatum* extract. F6 which contain 13% of beeswax has the highest mechanical strength of 4.0 kg/cm².

Surface Anomalies: All the herbal lipstick formed did not show any surface defects such as any crystal formation on lipstick surface, any contamination by molds and fungi.

Ageing stability: All the formulation prepared did not exhibit any bleeding and crystallisation on the lipsticks surface and perfect application.

The solubility of herbal lipsticks: All the formulated herbal lipsticks were tested in five various solvents such as acetone, benzene, ethanol, hexane and water. All the six formulations were only dissolved in acetone and ethanol.

The P^H of herbal lipsticks: The pH of all six formulations were neutral seven and should not cause any irritation on the lips.

Perfume stability of herbal lipstick: All the six formulations remained the vanilla fragrance after 30 days.

Stability study: Stability study of lipsticks important to predict the possible changes that may occur to the lipsticks since the product manufactured until the end of the product shelf life. In the stability study, the formulations were subjected to different temperature condition to assess the changes that occur over time. The stability study was conducted for one month. The herbal lipstick

formulated did not exhibit any changes over time. The colour, odour and spreadability of all the formulated herbal lipstick remained unchanged over one month. All the formulations stored in the room temperature and refrigerator showed similar results as the t0.

CONCLUSION

In the study, the herbal lipsticks were formulated by using *Punica granatum* extract and other ingredients such as castor oil, lanolin, beeswax, vanilla essence, and vitamin E. The formulation was done by melting, mixing, moulding, flaming and packaging. All the formulations showed overall good results in all the physiochemical evaluation. It can be confirmed that the sixth formulation, F6 which contain 13% of beeswax, 17% of lanolin, and 9% of *punica granatum* extract was found to be the most desired formulation. Formulation F6 show good colour, melting point, spreadability and hardness compared to other formulations. In the near future, it is hoped that this formulation can see its chance of being selected for further investigation on the skin irritation test to identify the action and effect of the lipstick on human.

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