

# Improved properties of lipstick formulation with engkabang fats

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**E**ngkabang fats are known as an excellent cocoa butter equivalent. It is selected to be aimed as potential softening ingredient in waxy base of lipstick formulation that promotes moisturising protection for the lips. The formulation was prepared by mixing homogeneously the base and colour intermediate at 70–80°C, moulded in casing, followed by cooling at -20°C. The optimum ratio of lipstick formulation containing engkabang fats and other waxes was (10:20) in percentage. The other ingredients used were oils (60%) and colour agent (10%). The physico-chemical properties of formulations were determined including texture analysis, pH, melting point, colour intensity, stability and moisture content. From the results, engkabang fats exhibited a good softening and moisturising properties. Engkabang fats lipstick formulations showed better application on the lips compared lipstick without engkabang fats.

**Key words:** *Engkabang fats, lipstick formulation, moisturizing, physico-chemical properties, softening*

## INTRODUCTION

The basic components of lipsticks are waxes, oils/emollient and colorant. The ingredients used in formulation are the important thing that affects the final product.<sup>[1,2]</sup> The formulation of lips moisture protection used to cure lip problems can be achieved by aesthetical sense. The best moisturising lipsticks is containing hydrating ingredients that moist the lips skin. Moisture in lips is primarily supplied by the saliva, giving lips the tendency to dry out, especially in cold and dry weather.<sup>[3,4]</sup> Therefore, the prime duty of lips care preparations is to prevent the drying and cracking of the lips. A moisturising lipstick soothes and prevents chapped lips by deeply hydrating the very delicate outer skin cells on the lips. If the outer layers of skin are allowed to dry out, crack or peel, they expose the sensitive inner layer of skin, which can cause discomfort feel.<sup>[5]</sup> Hence, engkabang fats is chosen due to its close resembling of cocoa butter in structure; whereby the extractable fats contain more than 50% of desired triglycerides that mostly made up from stearic, oleic and palmitic acid.<sup>[6,7]</sup> The aim and objective of this study was to formulate lipstick with engkabang fats, which moisturise the lips skin.

The challenge of this new moisturising lipstick is the pre-formulation to obtain optimum ratio of engkabang fats in the lipstick formulation.

## MATERIALS AND METHODS

Engkabang fats were obtained from the extraction of engkabang seed from the genus of *Shorea*, which can be found in the forest of Borneo (Sarawak and Kalimantan). Waxes, oils and colour pigment used from Making Cosmetic (USA) with cosmetic grade.

### Preparation of lipstick formulations (control)

For the preparation of lipstick base formulation without engkabang fats (control), the colour intermediate, which dry pigment red Fe<sub>2</sub>O<sub>3</sub> was dispersed in castor oil and palm oil ester for about 45 min. Wax intermediate containing beeswax, carnauba wax, candelilla wax and microcrystalline wax, respectively, were melted at 80°C. The colour intermediate was added into the melted wax intermediate and stirred for 45 min to obtain uniform phase of lipstick formulation. Then, the liquid phase of lipstick formulation was cooled

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for about 6 h at  $-20^{\circ}\text{C}$  to allow complete crystallisation of the fats, wax and emollients present in the lipstick base formulation. Similar process is carried out for the preparation of engkabang fats lipstick, whereby the fats was added to the wax intermediate. The ingredients of the lipstick formulation are tabulated in Table 1.<sup>[6,8,9]</sup>

### Evaluation parameters

Experiments were carried through statistical analysis performed using Minitab Software (Version 16.0, Sydney, Australia). Descriptive statistical parameter such as mean and SD were calculated to describe the values. Different among various formulation were tested for significant using the one-way analysis of variance (ANOVA) at significant level of  $P \leq 0.05$ .

### pH

The pH of the formulations was tested at room temperature using pH meter (Mettler Toledo, Delta 320, USA).<sup>[5]</sup>

### Melting point

Determination of melting point is important as it is an indication of the limit of safe storage. The melting point of formulated engkabang fats lipsticks were determined by capillary tube method. Glass capillary tubes open at both ends was inserted with sufficient amount of sample attached with thermometer and temperature was increased gradually at a rate of  $1^{\circ}\text{C}/\text{min}$ .<sup>[8,9]</sup>

### Colour intensity

Five gram of lipstick product was placed in a tray of Lovibond Tintometer (Model F Calorimeter, United Kingdom) and the intensity of colour range was determined.<sup>[9]</sup>

### Thermal stability

Lipstick formulations in casing were observed at 4, 25, 37 and  $45^{\circ}\text{C}$  for 3 months.<sup>[8,9]</sup>

**Table 1: Ingredients of lipsticks without engkabang fats (control) and with engkabang fats**

Composition (%)	EB	B	EC	C	ECn	Cn	EM	M
Fats/wax base								
Engkabang fats	10	0	10	0	10	0	10	0
Beeswax	20	30	20	0	20	0	20	0
Carnauba wax	0	0	0	30	0	0	0	0
Candelilla wax	0	0	0	0	0	30	0	0
Microcrystalline wax	0	0	0	0	0	0	0	30
Emollient base								
Castor oil	30	30	30	30	30	30	30	30
Palm oil ester	30	30	30	30	30	30	30	30
Colouring agent								
Red $\text{Fe}_2\text{O}_3$	10	10	10	10	10	10	10	10

EB: Engkabang fats+beeswax, B: Beeswax, EC: Engkabang fats+carnauba wax,

C: Carnauba wax, ECn: Engkabang fats+candelilla wax, Cn: Candelilla wax,

EM: Engkabang fats+microcrystalline wax, M: Microcrystalline wax

### Texture analysis

Texture analysis determined the physical characteristics of lipstick such as hardness, brittleness and stiffness. Hardness was determined by the maximum force value; meanwhile, the brittleness was determined by distance at which the break occurs (deformation at peak load) and stiffness measurement was carried out by determining the gradient of the slope during the bending action. Texture profile analysis on formulated products was conducted by using Heavy Duty Texture Analyser (TA.HD.plus Texture Analyser, Stable Micro Systems, Godalming).<sup>[4,8,9]</sup>

### Moisture analysis

Moisture loss of lipsticks was determined by moisture analyser (XM 120, Precisa, Switzerland). Lipsticks were placed in an aluminium plate and heated at  $40^{\circ}\text{C}$  for 4 h.<sup>[5]</sup>

## RESULT AND DISCUSSION

### pH

There are very low significant differences between control and engkabang fats lipsticks. The pH of lipstick base (control) and the engkabang fats lipsticks and references lipstick with range 7.45–7.75 [Table 2]. Thus, it provided natural taste and safe for the lips skin since no ingredients from acid and alkaline base was used. The pH range is safe to apply on lips.

### Melting point

The melting point of the lipstick formulation is affected by the presence of engkabang fats. The melting point results of engkabang fats lipstick compared to the control have significant value [Table 2]. Melting point of engkabang fats lipsticks were lower than control lipsticks due to lower melting point of engkabang fats ( $37\text{--}38^{\circ}\text{C}$ ).<sup>[6,7]</sup> Lower melting point gives suitable hardness and better spread-ability as well as its temperature close to body temperature. Melting point of lipstick products was increased in the following order: EM ( $52^{\circ}\text{C}$ ) < EB < CM1 < EM < ECn < CM2 < EC < M < B < Cn < C ( $76^{\circ}\text{C}$ ). The engkabang fats lipsticks melting point was close the references lipsticks melting point range of  $55\text{--}60^{\circ}\text{C}$ .

### Colour intensity

Colour intensity of lipstick products showed almost the same value with 13.2R, 2.2Y and 3.1B since 10% of colorant was used in all formulations. The colour intensity of engkabang fats lipstick was no significant as compared to lipstick formulations used as control and commercial lipsticks. Colour pigment was dispersed uniformly in the formulations and showed good intensity of colour [Figure 1a and b, Table 2].

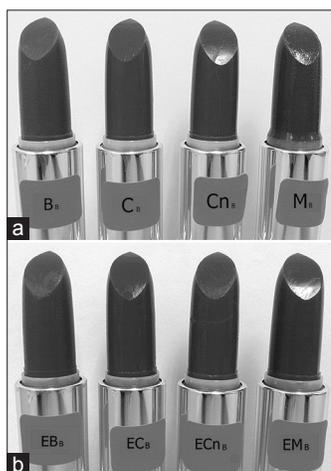
### Thermal stability

Stability test on various temperatures and optimum ratio of engkabang fats with other waxes for 3 months after

**Table 2: Efficacy of lipsticks without engkabang fats (control), with engkabang fats and references**

Lipstick	EB	B	EC	C	ECn	Cn	EM	M	CM1	CM2
pH	7.45	7.55	7.55	7.65	7.65	7.75	7.45	7.55	7.5	7.45
Melting point (°C)	54	68	63	76	58	73	52	65	56	60
Colour intensity	13.2R	13.2R	13.2R	13.2R	13.2R	13.2R	13.5R	13.5R	14.2R	14.5R
	2.2Y	2.5Y	2.7Y							
	3.1B	3.1B	3.1B	3.1B	3.1B	3.1B	2.0B	2.0B	3.0B	3.0B
Stability										
45°C	Good									
37°C	Good									
25°C	Good									
4°C	Good									

EB: Engkabang fats+beeswax, B: Beeswax, EC: Engkabang fats+carnauba wax, C: Carnauba wax, ECn: Engkabang fats+candelilla wax, Cn: Candelilla wax, EM: Engkabang fats+microcrystalline wax, M: Microcrystalline wax, EFats: Engkabang fats, CM1: Commercial lipstick 1, CM2: Commercial lipstick 2



**Figure 1:** (a) Lipstick without engkabang fats (control), (b) Engkabang fats lipsticks

formulating were investigated [Table 2]. The lipsticks were stable and in good condition at refrigeration temperature of 4°C, room temperature (25°C), body temperature (37°C) and sweat and no bleeding at high temperature (45°C).

### Texture profile

Value on hardness, brittleness and stiffness of lipsticks were obtained from the texture analysis. Engkabang fats lipstick as compared with the control, have very significant texture profile [Figure 2]. Engkabang fats lipsticks containing various waxes exhibited good hardening effect in the range of 35–84.5 g of hardness; 5.6–12.3 g/mm of stiffness; 4.2–8.9 mm of brittleness, meanwhile the lipstick without engkabang fats (control) showed higher values of hardening effect in the range of 40.4–140.5 g; 6.8–32.3 g/mm of stiffness and 5.2–10.8 mm of brittleness. Engkabang fats lipsticks have low significant value with commercial lipstick which has range of hardness 50.5–54.5 g, stiffness 7.1–7.4 g/mm and brittleness 5.5–5.7 mm.

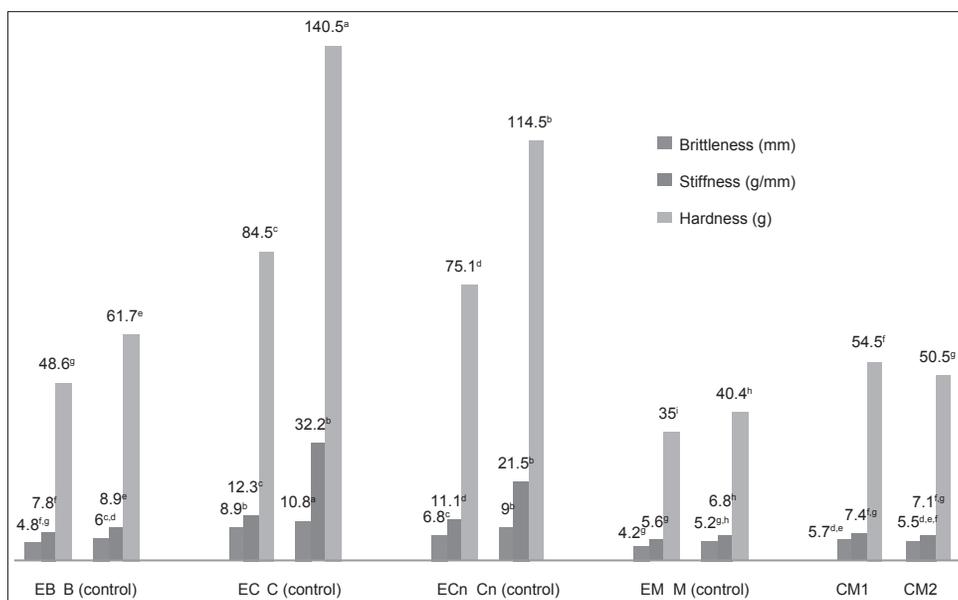
Whereby the engkabang fats itself showed 25.5 g of hardness, 55 mm of brittleness and 3.4 g of stiffness. The soft value of engkabang fats tends to smooth and easier to draw uniformity

outline on the lips. Engkabang fats lowered the texture of lipstick due to its fats properties which is soft and melt at low temperature; hence, it gives smooth outline on the lips. The texture profile of engkabang fats lipstick also showed almost similar results as the texture profile of reference lipsticks. Therefore, the engkabang fats lipstick is comparable to the commercial lipstick.

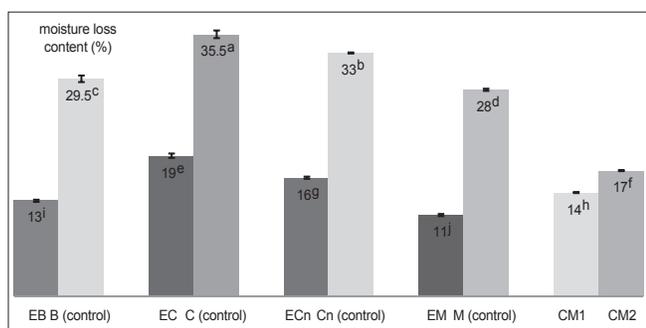
### Moisture loss content

The main point of engkabang fats lipstick which promotes moist property was determined by moisture content. The moisture loss content gradually decreased from the original moisture (100%). Figure 3 shows the moisture loss content of lipsticks (control) and engkabang fats lipsticks with different waxes have very significant values. The moisture content of lipsticks was decreased in the following order: C (35.5%) < Cn < B < M < EC < CM2 < ECn < CM1 < EB < EM (11.0%). On an average, the moisture of lipsticks with engkabang fats was better than lipsticks without engkabang fats with 14.75% compared 31.5%; meanwhile, the commercial lipstick demonstrated 15.5% of moisture loss. Engkabang fats lipsticks exhibit ability to prevent moisture loss 2 times better than the control lipstick formulations and as good as commercial lipstick.

Lipstick formulation was prepared to evaluate engkabang fats as moisturising ingredients in lipstick formulation. The physico-chemical characterisations were determined with specific interest in lipstick applications. Based on the previous studies, the pH of lipstick were in the range of 6.40–7.60, melting point 50–75°C and hardness 50–150 g as well as stable at several temperate conditions without bleeding sign.<sup>[4,8,9]</sup> Colour and texture should not change or deteriorate during normal storage and use. It is essential that the texture, melting point and thermal stability be tested together due to formula-ingredient dependent.<sup>[3,5]</sup> All these physico-chemical characterisations were based on the formulation of lipstick. A lipstick must have suitable texture, melting point and thermal stability to be successful in the market.<sup>[1,2]</sup> The results of this study showed that engkabang fats lipstick properties are comparable with the commercial lipsticks. The engkabang fats lipstick products promote moisturising property as well



**Figure 2:** Texture profile of lipsticks without engkabang fats (control), with engkabang fats lipsticks and references. EB: Engkabang fats + Beeswax; B: Beeswax; EC: Engkabang fats + Carnauba wax; C: Carnauba wax; ECn: Engkabang fats + Candelilla wax; Cn: Candelilla wax; EM: Engkabang fats + Microcrystalline wax; M: Microcrystalline wax; CM1: Commercial Lipstick 1; CM2: Commercial Lipstick 2



**Figure 3:** Moisture loss content (%) of lipsticks without engkabang fats (control), with engkabang fats and references. EB: Engkabang fats + Beeswax; B: Beeswax; EC: Engkabang fats + Carnauba wax; C: Carnauba wax; ECn: Engkabang fats + Candelilla wax; Cn: Candelilla wax; EM: Engkabang fats + Microcrystalline wax; M: Microcrystalline wax; CM1: Commercial Lipstick 1; CM2: Commercial Lipstick 2

as potential in soften components as softening components and/or agents.

## CONCLUSION

Engkabang fats exhibited good moisture protection properties and softening effect in the formulation lipstick. Lipstick with engkabang fats showed better physico-chemical properties in texture, pH, melting point, colour intensity and moisture content compared to the lipstick base products and also comparable with the commercial lipstick in the market.

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