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PREPARATION AND CHARACTERIZATION OF FACIAL POWDER CLEANSERS PREPARED FROM COLORED CLAYS

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Keywords:

Colored clays, Facial powder cleansers, Foaming tea, Sodium cocoyl isethionate, Foaming property, Cleansing property

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ABSTRACT: The objectives of the present study were to formulate facial powder cleansers using colored clays, green clay or red clay, as main ingredients and to investigate the foaming and cleansing properties of the powder cleansers. For foaming and cleansing purposes, natural foaming tea and synthetic sodium cocoyl isethionate (SCI), were employed. Eight formulations were prepared by varying types and amounts of colored clays (58.5% and 68.5% w/w) as well as surfactants (10% and 20% w/w). The formulations F1 to F4 contained red clay whereas F5 to F8 contained green clay. Then, appearances, pH values, foaming and cleansing abilities of the formulations were investigated. The stability of the cleansers was also evaluated by keeping the preparations at ambient temperature and 45 °C for 60 days. Small differences in color shades of facial cleansers were detected using a spectrophotometer and CIELAB color system. The prepared cleansers had weak acidic pH (pH 5.7 to pH 6.5). The formulations with synthetic SCI had superior foaming property to those with foaming tea ($p < 0.05$). Every formulation had the ability to remove makeup (lipstick and liquid foundation) applied on glass petri dishes. Again, the cleansing ability depended on the type of surfactants used and the synthetic SCI displayed more effectively than the natural one ($p < 0.05$). Under stability study, the foaming and cleansing abilities of the formulations reduced significantly ($p < 0.05$). In the current work, color shades and amounts of surfactants did not noticeably affect the foaming and cleansing properties of the powder cleansers.

INTRODUCTION: Cleansing is a way to remove unwanted materials on the skin surface. These materials include makeup cosmetics, dead cells, dirt, oil (excess sebum) and soil. Facial and body cleansers are used for cleansing purposes. Nowadays, facial cleansers formulated from a variety of substances are on the market.

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In order to reduce unwanted side effects of synthetic compounds, natural ingredients obtained from natural sources: animals, plants or minerals, are of our interest [1]. In the current study, natural-colored clays were selected to formulate natural-based cleansers.

Although several forms of cleansing products are commercially available, in the current work, the powder form of facial cleansers was formulated since it is less susceptible to bacterial growth, easier to carry, especially when there is a restriction of liquid quantity. Generally, the stability of the powder formulations is greater than that of the water-containing formulations [2].

The facial powder cleansers can be used by adding small amount of water into the powder before applying on the skin surface. Clay is a type of natural earthy material. Clays/clay minerals are basically composed of a group of layered aluminosilicates [3]. Clays possess unique surface properties and have been applied for various types of cosmetic products. They can be used as active or additive ingredients in formulations [4, 5].

Clays are very useful for facial cleanser preparations because of their ability to clean the skin and absorb excess oil (sebum) as well as toxins. Clays also improve skin circulation and act as exfoliating agents [4, 6]. Moreover, they are not expensive and environmentally friendly. In the current study, red clay, green clay and white clay (kaolin, China clay), were selected as main excipients in the facial cleansers. The three colored clays share the same INCI name, kaolin. The differences in color shades resulted from the presence of elements in the clays, especially iron [5, 7]. Apart from the main ingredients, an essential ingredient in the cleansing formulations is a surfactant. Both natural and synthetic surfactants we employed in order to compare the efficacy (cleansing and foaming properties) of the formulations. The natural surfactant was foaming tea or tea saponin, whereas the synthetic one was sodium cocoyl isethionate. Foaming tea (tea saponin) can be classified as plant-derived surfactants [8].

Tea saponin is majorly extracted from seeds of *Camellia* plants such as *Camellia sinensis*, *Camellia japonica* and *Camellia oleifera*. A general basic structure of saponin is composed of two parts: triterpenoids and sugars. Among several benefits, tea saponin possesses foaming and detergent abilities and it is categorized as a natural non-ionic surfactant [8, 9].

Sodium cocoyl isethionate is a synthetic anionic surfactant. It is considered a mild surfactant and has been widely used in a variety of personal care products [10]. Due to its gentle property, it is commonly applied in baby/children's products. The rest of the ingredients of the formulations were also from natural sources: plant extract (*Aloe vera* extract) and essential oil (tea tree oil). Aloe vera (*Aloe barbadensis*) has moisturizing and antiseptic properties which are beneficial to the skin [1, 11]. Essential oil of tea tree is generally obtained from *Melaleuca alternifolia,* a native plant in Australia. The most abundant compounds found in the essential oil are terpene hydrocarbons, in particular, cyclic terpenes (e.g. monoterpenes). Tea tree oil has been reported to have antimicrobial and anti-inflammatory properties; the *in-vitro* studies of these activities have been considerably investigated [12]. All ingredients used in the current study were derived from natural sources except for the synthetic surfactant (sodium cocoyl isethionate).

The objectives of the current work were to formulate facial powder cleansers from colored clays and to assess the foaming and cleansing properties of the powder cleansers prepared with natural or synthetic surfactants. To the best of our knowledge, we were the first to compare the foaming and cleansing efficacy of colored clays, green clay and red clay. We speculated that the element composition in colored may be related to the foaming and cleansing characteristics of the formulations.

MATERIALS AND METHODS: Kaolin (China clay), red clay and green clay were purchased from Chanjao Longevity Company Limited, Bangkok, Thailand. The two surfactants: sodium cocoyl isethionate and foaming tea (*Camellia sinensis* seed extract), were supplied by the same company. The other ingredients: *Aloe vera* extract and tea tree oil were also from Chanjao Longevity Company Limited, Bangkok, Thailand. All materials were cosmetic grade. Drinking water (Nestle Pure Life®) was obtained from Nestle (Thai) company limited, Thailand.

Colored Clay Investigation: Appearances (e.g. color, texture), morphology and pH of the main ingredients, colored clays, were examined as follows:

The colors of the clays were investigated by naked eyes and using an instrument, Spectrophotometer CM-700d (Konica Minolta, Inc., Japan). The spectrophotometer measures the color of powder clays according to the CIE (Commission Internationale de l'Eclairage) color scales: L*, a* and b*. The first value, L* is for lightness, ranking from 0 (dark) to 100 (light); a* is for green-red color component and b* is for blue-yellow color component. The values of both a* and b* axis are approximately − 128 to + 128. Based on the CIELAB system, colors of objects can be expressed in L* a* b* coordinates [13]. The morphologies of powder clays coated with gold/palladium alloy were examined using a scanning electron microscope, Hitachi SU3900 (Hitachi High-Tech Corporation, Japan) at 10 kv accelerating voltage. The images were taken at magnifications of 1000x and 5000x. The pH values of the clay powder were also evaluated using a digital pH meter (Mettler Toledo Co. Ltd., Switzerland). Distilled water (50 ml) was added to a known weight of the clay sample (1 g). A suspension of the clay sample was made prior to pH determination. The measurement was performed within 5 minutes after the preparation.

Formulations of Powder Cleansers for Faces: The formulations of powder cleansers were composed of clays, *Aloe vera* extract, tea tree oil and surfactants as shown in **Table 1**. The amount of kaolin or white clay was fixed at 20% w/w, whereas the amount of red clay and green clay varied from 58.5% to 68.5% w/w.

The surfactants (foaming tea and sodium cocoyl isethionate) were used at two concentrations: 10% and 20% w/w (recommended concentration ranges by the company). The total of eight formulae was prepared by weighing each ingredient and mixing them together in a Wedgewood mortar using a geometric dilution technique. Each formula was prepared in triplicate (n=3). The finished formulations were stored in tight containers and protected from light.

TABLE 1: FORMULATIONS OF FACIAL CLEANSERS IN POWDER FORM

Ingredient	% w/w							
	F1	F2	F3	F4	F5	F6	F7	F8
Aloe vera extract	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Tea tree oil	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Foaming tea	10.0	20.0	-	-	10.0	20.0	-	-
Sodium cocoyl isethionate	-	-	10.0	20.0	-	-	10.0	20.0
Kaolin (white clay)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Red clay	68.5	58.5	68.5	58.5	-	-	-	-
Green clay	-	-	-	-	68.5	58.5	68.5	58.5

Investigation of Powder Cleanser Formulations: The prepared formulations (F1 to F8) were tested for appearances and pH using the same techniques as formerly mentioned above. In addition, foaming ability and cleansing ability of the formulations were examined as the following procedures:

The foaming ability of the cleanser formulations was measured based on the cylinder shake technique with some modification [14, 15]. The foaming property was tested by weighing 1 g of the powder cleanser, transferring it into a 100-ml graduated cylinder and adding water (20 ml) into the cylinder. After that, the cylinder was shaken 10 times and left for 1 minute prior to recording the foam volume. The cleansing ability of the powder cleansers was examined according to the method of NIKKOL group and Raknam *et al*. with some modification [16]. Makeup cosmetics, which were a lipstick and a liquid foundation, were used to test the effectiveness of the cleansers. The lipstick and liquid foundation were smeared on each glass petri dish at areas of 2x2 cm^2 and 4x3 cm^2, respectively. The powder cleansers (200 mg) were mixed with water (3 ml) and placed on the applied areas of lipstick or liquid foundation. After rubbing with fingers 10 times for lipstick and 25 times for liquid foundation, 5-ml water was poured onto the lipstick and liquid foundation. The test areas were continuously massaged 25 times. Then, the petri dishes were immersed in water and immediately removed. The cleansing property (removal property) of each formulation was determined by scoring the cleanliness of the test area on the glass petri dish.

Stability of Powder Cleansers: The stability of the prepared formulations was carried out using two conditions (accelerated and normal conditions) based on the guidelines of the Cosmetic, Toiletry, and Fragrance Association, CTFA[17] with some modification.

In the case of the accelerated condition, the finished formulations were kept in a constant climate chamber HPP260 (Memmert GmbH + Co.

KG, Germany) at temperature of 45 ± 2°C, 75 %RH for 60 days. For the normal storage conditions, the cleanser formulations were stored in ambient temperature (around 30 °C) for 60 days. Appearances, pH, foaming ability, and cleansing property of the powder cleansers were evaluated before and after the storage.

Statistical Analysis: Statistical analysis was performed using one-way analysis of variance (ANOVA).To compare the data between freshly prepared and the stored formulations, paired sample T-test was used to analyze the variables. The p-value of <0.05 was considered significantly different.

RESULTS AND DISCUSSION:

Appearances, Morphology and pH of Single Colored Clays: To formulate the powder cleanser preparations, understanding the natures of colored clays was essential. Physical appearances of colored clays, which were color and texture, were explored with naked eyes and using a spectrophotometer. The appearances of the clay powders are shown in **Fig. 1**. It was found that kaolin (white clay) had fine powder with white color **(Fig. 1 top).** Reddish powder Red clay was fine reddish powder **Fig. 1** and green clay was fine dark (**Fig. 1** left) (Fig. 1 left) green powder (**Fig. 1** right). Kaolin possessed the finest powder followed by green clay.

FIG. 1: APPEARANCES OF KAOLIN (WHITE CLAY, TOP), RED CLAY (LEFT) GREEN CLAY (RIGHT)

The colors of clay powders were also investigated by a sophisticated instrument, spectrophotometer CM-700d. The results are shown in **Table 2**. According to the CIELAB system, kaolin had L*, a* and b* values of 62.93, 0.14 and 5.94, respectively. The L* of kaolin was the highest compared with the other two clays, indicating the lightness of kaolin. The rank order of lightness was kaolin > green clay > red clay.

The red clay possessed the highest a* value, representing red shade of the sample. It was noted that a* positive values were obtained from kaolin and red clay, whereas green clay exhibited negative value. The negative a* value indicated green of the green clay. All three clays had b* positive values, indicating the yellow tone of the samples. The highest b* value was obtained from red clay.

TABLE 2: COLOR VALUES AND pH OF COLORED CLAYS

Samples	Color values determined by a Spectrophotometer CM-700d			Ph (Mean ± SD, n=3, where n is number of samples)
	L*	a*	b*	
Kaolin	62.93	0.14	5.94	8.99±0.07
Red clay	38.52	8.33	6.42	8.59±0.04
Green clay	52.46	-5.14	4.80	8.68±0.01

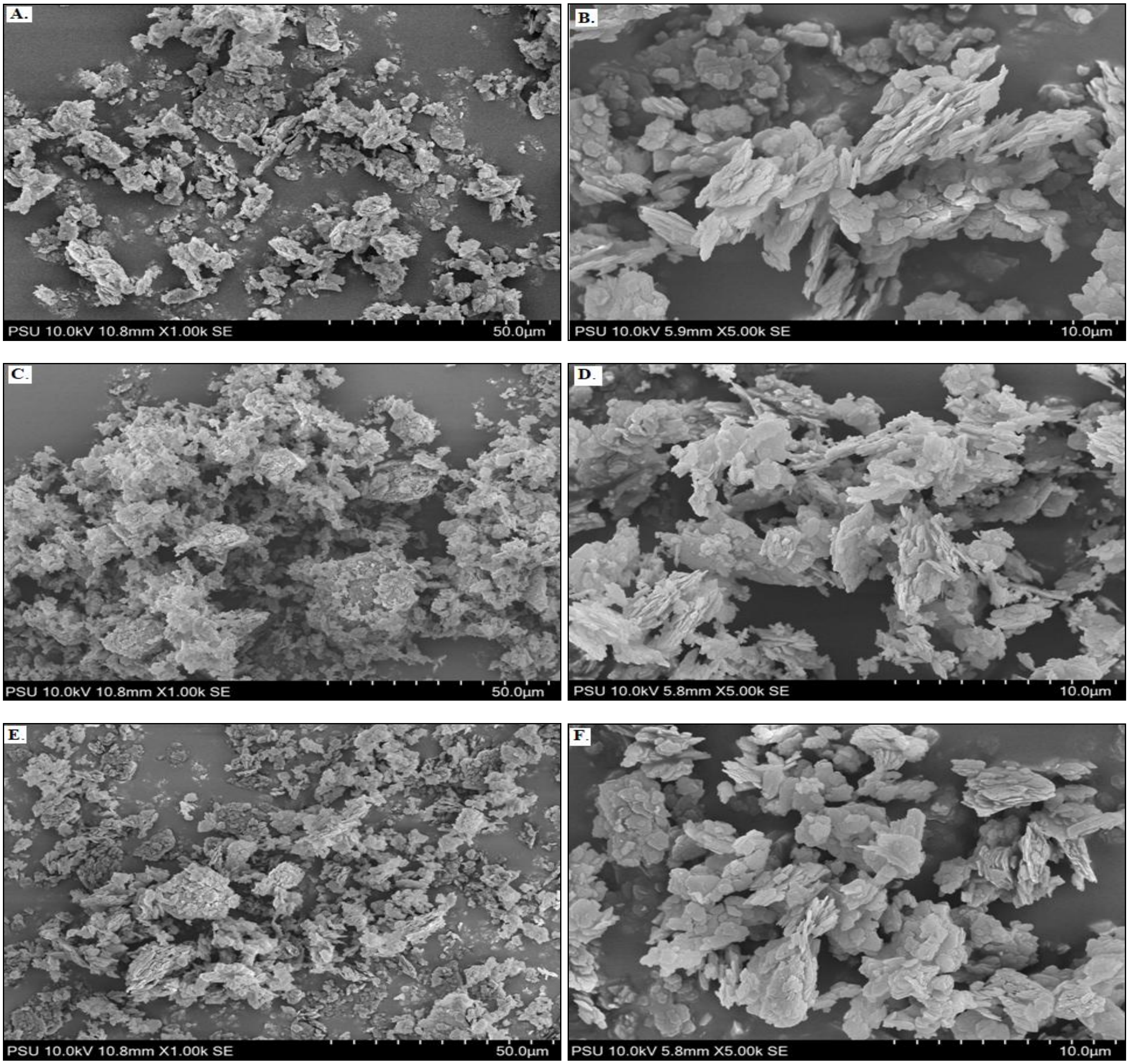

FIG. 2: SEM IMAGES OF (A) KAOLIN, 1000X; (B) KAOLIN, 5000X; (C) RED CLAY, 1000X; (D) RED CLAY, 5000X; (E) GREEN CLAY, 1000X; (F) GREEN CLAY, 5000X

Morphologies of colored clay structures were explored by SEM. The images are shown in **Fig. 2**. It was found that at 1000x magnification, kaolin showed aggregation of small particles **(Fig. 2A).** At high magnification, 5000x **(Fig. 2B),** kaolin displayed irregular shapes with rather smooth surface. Interestingly, layered sheets of kaolin were noticeably observed, similar to the work of Kgabi and Ambushe [18]. The sizes of kaolin were various, ranging from 266 nm to 1.88µm. For red clay, aggregation of particles was found at low magnification **(Fig. 2C).** At high magnification **(Fig. 2D),** red clay structure showed heterogeneous shapes and sizes (159 nm to 2.72 µm) with flaky layers. Based on the SEM images **(Fig. 2E, F),** green clay displayed flaky layered structures with different shapes and sizes (126 nm to 2.22 µm). As seen from the SEM images, three colored clays possessed similar layered sheet structures with various shapes and sizes.

According to **Table 2**, the pH values of colored clays measured as suspension states were ranking from 8.59 to 8.99. They were in weak basic pH range (pH 7.1-10). The significant differences in the pH values were obtained ($p<0.05$), possibly due to the different mineral composition. Red clay had the lowest pH value whereas white clay (kaolin) possessed the highest pH value.

Appearance, pH and Effectiveness of Facial Cleansers: Eight formulations (F1 to F8) of colored clays were prepared: F1 to F4 containing red clay, F5 to F8 containing green clay (see **Table 1**). After that, the preparations were investigated for their appearances and pH values. For freshly prepared cleansers, the formulations F1 to F4 display dark red color with fine particles (see **Fig. 3**). The formulations F1 and F2 containing foaming tea (surfactant) had darker shades of red color and coarser particles than those of the formulations F3 and F4 which contained sodium cocoyl isethionate. The green clay containing formulations, F5-F8, exhibited green color as shown in **Fig. 3**. Similarly, the formulations with foaming tea also showed coarser particles in comparison with the formulations F6, and F7 with sodium cocoyl isethionate. All formulations had fresh, herbaceous odor of tea tree oil. It was noted that the formulations with green clay possessed stronger scent than those with red clay. After 60 days-storage at ambient temperature, the colors of the stored formulations were slightly different from those of the freshly prepared. When keeping the samples at high temperature of 45±2°C, (75% RH) at the same period of time, the formulations which contained foaming tea (F1, F2, F5 and F6) showed slight differences in colors. However, the colors of the formulations containing sodium cocoyl isethionate (F3, F4, F7 and F8) were found to be the same. For both conditions, the scents of all stored formulations were weaker, possibly due to the evaporation of tea tree oil, or the adsorption of the essential oil onto the clay surfaces. An adsorption between certain essential oils and clays has been reported [19]. In addition, the aggregation of powder particles was observed. Nevertheless, they were easily broken up into fine powder particles after shaking.

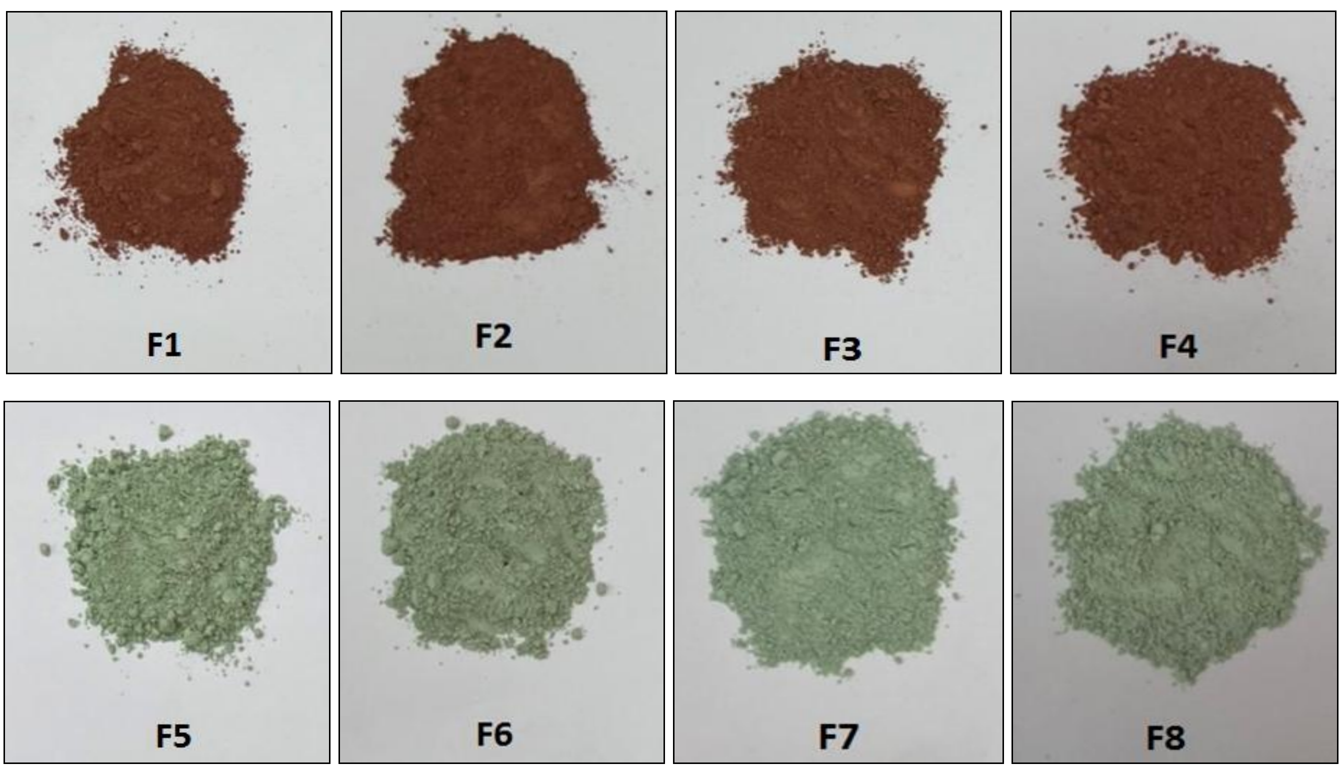

FIG. 3: APPERANCES OF FORMULATIONS F1 TO F8 WHICH CONTAINED RED CLAY (F1 TO F4) OR GREEN CLAY (F5 TO F8)

Apart from naked eyes observation, a spectrophotometer was employed to measure the colors of the cleanser formulations. Using the CIELAB color system, L*, a* and b* values of the cleansers at different conditions are shown in **Table 3**. The differences in these color values at different conditions were calculated as ΔE, as summarized in **Table 4**.

TABLE 3: COLOR VALUES OF FACIAL CLEANSERS BASED ON THE CIELAB SYSTEM

Formulation	L*			a*			b*		
	Freshly prepared	Ambient	45°C	Freshly prepared	Ambient	45°C	Freshly prepared	Ambient	45°C
F1	5.24	7.10	3.92	6.47	3.86	3.70	4.91	3.34	3.17
F2	3.76	6.85	6.60	4.49	3.69	3.39	3.49	3.26	2.97
F3	2.96	6.88	6.69	3.51	4.04	3.63	2.86	3.37	3.13
F4	3.05	6.75	6.33	3.70	3.63	3.34	2.88	3.21	4.04
F5	8.88	12.43	12.92	-1.82	-0.49	-0.24	4.58	4.3	4.29
F6	10.29	12.45	10.86	-1.75	-0.94	-0.87	5.09	4.24	4.49
F7	9.78	12.77	12.30	-2.16	-1.17	-1.27	4.77	3.95	3.99
F8	10.50	13.33	12.05	-2.16	-1.12	-1.70	4.57	3.81	4.06

Note: F1 to F4, red clay: F1, 10% foaming tea; F2, 20% foaming tea; F3, 10% sodium cocoyl isethionate; F4, 20% sodium cocoyl isethionate; F5 to F8, green clay: F5, 10% foaming tea; F6, 20% foaming tea; F7, 10% sodium cocoyl isethionate; F8, 20% sodium cocoyl isethionate

From **Table 3**, the formulations F1 to F4 which contained red clay had positive values of L*, a* and b* in all conditions. While the formulations F5 to F8 showed negative a* values which indicated green clay. The absolute values of all green clay-formulations were smaller than that of the single green clay (-5.14), resulting from the additive ingredients incorporated into the formulations. All eight formulations showed different L*, a* and b* values. Unlike naked eye observation, the small differences in color shades of the formulations were noticeably revealed by the CIELAB system.

TABLE 4: ΔE OF FACIAL CLEANSERS BASED ON THE CIELAB SYSTEM

Formulation	$\Delta E = \sqrt{(L_1^*-L_2^*)^2+(a_1^*-a_2^*)^2+(b_1^*-b_2^*)^2}$		
	Freshly prepared-Ambient	Freshly prepared- 45 °C	Ambient - 45 °C
F1	3.57	3.68	0.29
F2	3.20	3.09	0.49
F3	3.99	3.74	0.51
F4	3.76	3.54	0.97
F5	3.97	3.23	0.89
F6	1.94	1.07	1.61
F7	3.25	2.78	0.48
F8	3.11	1.70	1.43

Note: F1 to F4, red clay: F1, 10% foaming tea; F2, 20% foaming tea; F3, 10% sodium cocoyl isethionate; F4, 20% sodium cocoyl isethionate; F5 to F8, green clay: F5, 10% foaming tea; F6, 20% foaming tea; F7, 10% sodium cocoyl isethionate; F8, 20% sodium cocoyl isethionate

The differences in colors, ΔE, between freshly prepared preparations and the formulations kept at two storage conditions were 1.07 - 3.99 (**Table 4**), suggesting significant changes in colors of the cleansers. When compared the formulations kept in ambient and high temperature conditions, ΔE values were lower, ranking from 0.29 to 1.61. In conclusion, changing colors was found for the formulations stored at these conditions for 60 days. It was possibly due to the interaction among the ingredients used in the current study. Tea tree oil may be adsorbed onto the surfaces of colored clays, thereby changing the color shades of the formulations. According to **Table 5**, the pH ranges of the freshly prepared formulations were 5.68 to 6.52. The stored formulations had pH values between 5.12 to 6.42. All formulations exhibited more acidic pH values when compared with those of single colored clay (see **Table 2**), suggesting the effect of other ingredients on the pH values. As a result, these pH values were more suitability for skin application [20]. When compared the pH values between freshly prepared formulations and the formulations kept at ambient temperature for 60 days, the statistical difference was found (Paired T-test, $p<0.05$). Similarly, the pH values of freshly prepared cleansers significantly differed from those of formulations stored at 45°C ($p<0.05$).

TABLE 5: pH VALUES OF FACIAL CLEANSERS

Formulation	pH (Mean ± SD, n=3, where n is number of samples)		
	Freshly prepared	Ambient	45 °C
F1	6.52±0.05	6.42±0.08	5.28±2.68
F2	6.06±0.03	5.94±0.08	5.12±0.80
F3	6.23±0.03	6.14±0.02	5.90±1.99
F4	5.85±0.06	5.67±0.08	5.53±1.57
F5	6.40±0.09	6.25±0.09	5.34±2.79
F6	6.02±0.01	5.87±0.02	5.18±2.50
F7	6.21±0.09	6.01±0.07	5.65±1.70
F8	5.68±0.03	5.57±0.03	5.25±1.87
p-value	<0.05*	<0.05*	<0.05*

Note: *Statistical difference in the same group (One-Way ANOVA analysis, $p<0.05$); F1 to F4, red clay: F1, 10% foaming tea; F2, 20% foaming tea; F3, 10% sodium cocoyl isethionate; F4, 20% sodium cocoyl isethionate; F5 to F8, green clay: F5, 10% foaming tea; F6, 20% foaming tea; F7, 10% sodium cocoyl isethionate; F8, 20% sodium cocoyl isethionate

The foaming ability of the powder cleansers was investigated by cylinder shake method and the results are summarized in **Table 6**. It was found that the foaming abilities of the formulations which contained the synthetic surfactant, sodium cocoyl isethionate (F3, F4, F7 and F8) were significantly superior to those of the formulations containing the natural surfactant, foaming tree (F1, F2, F5 and F6) ($p <0.05$). Nevertheless, there were no significant differences in the foaming abilities of the formulations with 10% (F1, F3, F5 and F7) and 20% surfactants (F2, F4, F6 and F8). Increasing the amount of surfactants used may show marked differences. However, high percentage of surfactants may cause skin irritation. Notably, the formulations containing green clay appeared to have higher foaming volume than the formulations with red clay did (F5 > F1; F6 > F2; F7 > F3 and F8 > F4).Yet, no statistical differences were detected. After 60 days of storage, the foaming efficacy of the powder cleansers was statistically lower for both conditions when compared with the freshly prepared formulations (Paired T-test, $p<0.05$).

TABLE 6: FOAMING ABILITY (FOAM VOLUME) OF FACIAL CLEANSER SAT 1 MIN AFTER SHAKING

Formulation	Foam volume (ml) (Mean ± SD, n = 3, where n is number of samples)		
	Freshly prepared	Ambient	45 °C
F1	64.00±5.29	67.00±6.08	64.33±2.08
F2	72.67±2.31	73.33±5.77	64.33±3.21
F3	84.33±5.03	75.00±0.00	70.67±2.08
F4	84.67±7.64	84.33±7.51	77.67±0.58
F5	75.33±6.11	68.33±2.52	67.33±3.06
F6	85.33±7.64	76.00±3.00	64.33±2.52
F7	88.33±2.89	71.33±3.21	53.00±2.65
F8	90.00±0.00	81.33±8.62	64.00±1.73
p-value	<0.05*	<0.05*	<0.05*

Note: *Statistical difference in the same group (One-Way ANOVA analysis, $p<0.05$); F1 to F4, red clay: F1, 10% foaming tea; F2, 20% foaming tea; F3, 10% sodium cocoyl isethionate; F4, 20% sodium cocoyl isethionate; F5 to F8, green clay: F5, 10% foaming tea; F6, 20% foaming tea; F7, 10% sodium cocoyl isethionate; F8, 20% sodium cocoyl isethionate

Lipstick and liquid foundation were used for testing the cleansing property of the formulations. The cleansing effectiveness of the cleanser was evaluated by observing its ability to remove the makeup residues on the test areas of petri dishes. The results are present in **Table 7**. For the freshly prepared formulations, higher scores were obtained from the formulations containing synthetic sodium cocoyl isethionate (F3, F4, F7 and F8). The cleansing properties of these facial cleansers were relatively better than those of the foaming tea containing cleansers (F1, F2, F5, and F6). Interestingly, the results of cleansing measurement were in accordance with those of foaming analysis. It can be speculated that the cleansing property was somewhat related to the foaming ability of the formulations. The amounts of surfactants used (10% w/w and 20% w/w) did not appear to affect the cleansing properties of the freshly prepared formulations. Overall, the cleansing abilities of the formulations containing red clay (F1, F2, F3, F4) did not clearly differ from those containing green clay (F5, F6, F7, F8). The cleansing property (removing property) of the powder cleansers tended to govern majorly by the type of the surfactant used. When the formulations were stored at ambient temperature or at 45 °C for 60 days, the cleansing abilities were found to be markedly lower than those of the freshly prepared formulations.

TABLE 7: CLEANSING ABILITY (REMOVING PROPERTY) OF FACIAL CLEANSERS

Formulation	Freshly prepared	Ambient	45 °C
F1	+++	+	+
F2	+++	++	++
F3	++++	++	++
F4	++++	+++	+++
F5	++	+	+
F6	+++	++	++
F7	++++	+++	++
F8	++++	++++	+++

Note: F1 to F4, red clay: F1, 10% foaming tea; F2, 20% foaming tea; F3, 10% sodium cocoyl isethionate; F4, 20% sodium cocoyl isethionate; F5 to F8, green clay: F5, 10% foaming tea; F6, 20% foaming tea; F7, 10% sodium cocoyl isethionate; F8, 20% sodium cocoyl isethionate + represents ability to remove the makeupona test area of petri dish +++++= Excellent; ++++= Good; +++ = Moderate; ++ = Poor; + = Very poor.

It was noted that there were no obvious differences in foaming and cleansing properties between red clay and green clay. The current results implied that the composition (elements) of each colored clay did not play a part in these abilities. It is generally recognized that each colored clay has its own benefits to the skin [5, 7]. Other advantages of color clays should be explored in the future.

CONCLUSION: Cleansing is a routine activity to remove unwanted materials or makeup residues on skin surface. Typically, commercial facial cleansers are produced in liquid dosage forms, which are easily contaminated by microbial and inconvenient to carry. In the current work, we formulated dry powder cleansers using colored clays, green and red clays, as main ingredients. The prepared facial powder cleansers were found to be useful for cleansing makeup residues. The ability to remove the makeup tended to depend on the type of surfactant used. In this case, sodium cocoyl isethionate (a synthetic surfactant) was superior to foaming tea (a natural surfactant). The color shades of clays and surfactant concentrations were not evidently associated with the foaming and cleansing properties of the formulations. The makeup removing ability of the powder cleansers appeared to directly relate to the foaming property. Under storage conditions: ambient and 45°C for 60 days, the formulations exhibited lower foaming and cleansing abilities in comparison with the freshly prepared formulations.

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