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Effect of Concentration Variation of Stearic Acid And KOH on Making And Characterization Of Emulsion With Coconut Oil As Raw Materials

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ABSTRACT

It has been studied a research about the effect of variations consentration of stearic acid and KOH on making and characterization of emulsions with coconut oil as raw materials. Emulsion composed of oil phase and water phase, and were made by the method of emulsification. Oil phase consist of coconut oil, stearic acid, cetyl alcohol, lanolin, and water phase consist of glycerin and distilled water, and added KOH concentration varied. To determine the effect of stearic acid on the properties of emulsions, the stearic acid is added with different concentrations. The resulting emulsion was determined physical and chemical properties include shape, color, texture, emulsion type, pH, viscosity and centrifugation test. The results show that, an increase in the concentration of stearic acid will cause in increase in viscosity and decrease in pH, and an increase in KOH concentration will affect the viscosity and pH of the emulsion. This means that the variation in the concentration of stearic acid and KOH in making and characterization of emulsions with coconut oil as raw materials, affect on physical and chemical properties of emulsion produced

Keywords : *concentration variation, stearic acid, KOH, physical and chemical properties, emulsion, coconuloil*

1. INTRODUCTION

Coconut oil is a triglyceride derived from coconut meat, contains ± 90% saturated fatty acids. The greatest percentage of saturated fatty acids found in coconut oil is lauric acid (44-51%), followed by myristic acid (17-18%), palmitic acid (8-10%), caprylic acid (8-9%), capric acid (5-8%), stearic acid (1-3%, and arachidict acid (0-1%) [1]. Most of the saturated fatty acids in coconut oil are medium-chain fatty acids (MCFA) with 10-12 carbon atoms. The research showed that MCFA found in coconut oil has a lot of health benefits. Coconut oil lauric acid, in the human body is converted into monolaurin which serves as antiviral, antibacterial, and antimicrobial [2]. MCFA coconut oil easily absorbed into the skin's layers, and can maintain skin elasticity and softness. Coconut oil is a natural lotion, to prevent the formation of free radicals and protect against free radicals [3]. Coconut oil is a good sunscreen, very good to prevent sunburn, especially if the oil is consumed. This oil has a Sun Protection Factor (SPF) of 4, can block 20% of ultraviolet radiation [4], and coconut oil is a natural sunscreen [5]. Because this oil has many benefits, so in recent years, coconut oil is favored by the people, not only for cooking but also used widely in the world of cosmetics for beauty

Cosmetics is a preparation used for purposes outside the human body, or teeth, or oral mucosa, especially to clean, perfume, change or improve appearance, and body odor or protect or maintain the body in a good condition [6]. Cosmetics sold in the market, mostly in the form of creams and lotions, which are included in the class of emulsions. Cosmetics used to soften, or to moisturize the skin can be made in the form of vanishing cream. Called vanishing cream, because it appears to vanish when spread on the skin. Vanishing cream is an emulsion of water and stearic acid. To have a moisturizing effect, it can be added Polyhydric alkcohol in the cream, such as glycerin, propylene glycol or polyethylene glycol [7]. External phase of cream is water, and added oils, fats or fatty acids. As emulsifiers are soaps or soap mixture of sodium, potassium or ammonia, and

always an oil-in-water emulsion. [8]. Soap as an emulsifier produced from the reaction of most of stearic acid with alkali or base added.

In the manufacture of vanishing cream, used stearic acid and alkali to produce stearic soap which functions as an emulsifier. Alkali used are carbonates, hydroxides or triethanol amine. Some early forms used carbonate or bicarbonate as the alkali. This release carbon dioxide during the production process resulting in foamy consistency. Some of the carbon dioxide will soon evaporate and a small portion remains in the cream, and it will appear on the surface, causing the cream to sink. To overcome this problem, it can be used alkaline hydroxide, and potassium hydroxide are commonly used in many creams formula [9]. Recently, on the market, it can be found a cosmetics in the form of vanishing cream containing stearic acid and KOH with different concentrations. Studies on the manufacture of vanishing cream also has a lot to do. A research in the formulation of moisturizing cream containing vegetable oil and paraffin oil, 4% stearic acid and 0.4% tri ethanol amine has been done. The resulting cream has a pH 6.8 for paraffin cream and 6.37 for coconut oil cream. The types of creams are oil in water (O /W) emulsion, and a stable cream [10]. Also, it has been studied a preparation of vanishing cream using stearic acid 24% and 1.35% KOH. The resulting creams have pH 6.7 to 6.8, and have the properties such as, pleasant, efective, easily washable [11].

Base on the above background, it can be found that, in vanishing cream formulation, can be added stearic acid and KOH on different concentration. To find out how the effect of stearic acid and KOH concentration on the properties of emulsion produced, it is necessary to do this research. The purpose of this research is to determine the effect of concentration variation of stearic acid and KOH on the physical and chemical properties of emulsion with coconut oil as raw materials.

2. STYLE OF MANUSCRIPT

2.1 Materials and Apparatus

The materials used in this study include coconut oil, stearic acid, cetyl alcohol, lanolin, glycerin (all quality materials for cosmetics) and distilled water.

The apparatus used in this research include, laboratory glassware such as beaker glass, measuring cups, mixing glass, watch glass, glass funnel, thermometer, electric stove, analytical scales, electric scales, pH meters, pH paper universal, tool for centrifuge and viscotester RION VT-04E.

2.2 Preparation of Emulsion

2.2.1 Preparation and characterization of emulsion with stearic acid concentration variation

In this research, emulsion prepared by, a certain amount of water phase in the beaker glass of 250mL was heated on the electric stove until it reaches a temperature of 70^0 C. Then, a certain amount of oil phase in the beaker glass of 500 mL was heated on electric stove until it reaches a temperature of 70^0 C, too. Emulsion formula contained in table 1. After that, the water phase is added to the oil phase while stirring, and added 1.5% KOH 50% gradually. Stirring was continued until the temperature of the mixture reaches a temperature of ± 35^0 C. The resulting emulsions were characterized to determine the physical and chemical properties include emulsion form, color, emulsion type, texture, pH, and viscosity. The results obtained are presented in Table 3, Figure 2, and Figure 3.

Table 1. Emulsion formula with various concentrations of stearic acid

Materials		Sample/by percent weight						
		1 a	2 a	3 a	4 a	5 a	6 a	7 a
Oil Phase :	Stearic Acid (w/w %)	2	4	6	8	10	12	14
	Coconut Oil (w/w %)	10	10	10	10	10	10	10
	Cetyl Alcohol (w/w %)	1	1	1	1	1	1	1
	Lanolin (w/w %)	1	1	1	1	1	1	1
Water Phase :	Glycerol (w/w %)	6	6	6	6	6	6	6
	Aquadest (w/w %)	78,5	76,5	74,5	72,5	70,5	68,5	66,5
Alkali :	KOH 50% (w/w %)	1,5	1,5	1,5	1,5	1,5	1,5	1,5

2.2.2 Preparation and characterization of emulsion with KOH concentration variation

By using formula in table 2, an emulsions are made by using procedure 2.2.1 above. The resulting emulsions were characterized to determine the physical and chemical properties include emulsion form, color, emulsion type, texture, pH, viscosity and centrifugation test. The results obtained are presented in Table 4, Figure 5, and Figure 6.

Table 2. Emulsion formula with various concentrations of KOH

Materials		Sample/by percent weight						
		1 a	2 a	3 a	4 a	5 a	6 a	7 a
Oil Phase :	Stearic Acid (w/w %)	10	10	10	10	10	10	10
	Coconut Oil (w/w %)	10	10	10	10	10	10	10
	Cetyl Alcohol (w/w %)	1	1	1	1	1	1	1
	Lanolin (w/w %)	1	1	1	1	1	1	1
Water Phase :	Glycerol (w/w %)	8	8	8	8	8	8	8
	Aquadest (w/w %)	69,5	69,25	69	68,75	68,5	68,25	68
Alkali :	KOH 50% (w/w %)	0,5	0,75	1	1,25	1,5	1,75	2

3. RESULTS AND DISCUSSION

3.1 Preparation and characterization of emulsion with concentration variation of stearic acid

In this study, it has been made and characterized 7 emulsions with different concentrations of stearic acid. The results are presented in Table 3, Figure 2, and Figure 3. From the data contained in Table 3, it can be seen that the addition of stearic acid with different concentrations affect the form of the resulting emulsion. If the concentration of stearic acid is small, hence, the resulting emulsion is very liquid and when added a high concentration of stearic acid, the resulting emulsion in the form of thick cream, and the type of resulting emulsions are oil-in-water (O/W) emulsion.

Table 3. The physical and chemical properties of emulsion, made with concentration variation of stearic acid

sampl e	Consentration of stearic acid (w/w %)	Emulsion form	color	texture	Emulsion type
1 a	2	Liquid lotion	White	Soft	O/W
2 a	4	Thick lotion	White	Soft	O/W
3 a	6	cream	White	Soft	O/W
4 a	8	cream	White	Soft	O/W
5 a	10	cream	White	Soft	O/W
6 a	12	Thick cream	White	Rough	O/W
7 a	14	Thick cream	White	Rough	O/W

This is because, in the process of making this emulsion, the reaction between stearic acid and KOH (potassium hydroxide) produce soap potassium stearate [12].

$$CH_3(CH_2)_{16}COOH + KOH \rightarrow CH_3(CH_2)_{16}COO^-K^+ + H_2O$$

Asam stearat potassium stearat

Figure 1. The reaction of stearic acid and KOH produce potassium stearate soap

The resulting potassium stearate soap serves as an emulsifier to stabilize the emulsion and it is an anionic surfactant [13]. Surfactants of which the molecules contain both hydrophilic and hydrophobic head group play an important role in the emulsification process [14]. Hydrophilic groups of potassium stearate, are polar groups, can be dissolved in the water phase, and hydrophobic groups in the form of long hydrocarbon chains, which can be dissolved in the oil phase. If the concentration of stearic acid is small, then the potassium stearate as an emulsifier, which is generally very low. Consequently, the water phase and the oil phase are emulsified by potasiuum stearate as an emulsifier is also only slightly, so that, the resulting emulsion diluted. In this process, the oil phase containing coconut oil, too. If the mixture contained KOH, may be, there will be a

reaction, between coconut oil and KOH produces soap and glycerine. The resulting soap, also an anionic surfactant and can serve as an emulsifier

Figure 2, shows that if the stearic acid concentration increases, the pH of the emulsion was decreased. This is due to the small stearic acid concentration, the concentration of KOH reacts too little, thus remaining more bases, a consequence of high emulsion pH. Conversely, the higher the concentration of stearic acid, required a lot of KOH, to reach the equivalent point. As a result, the pH of the emulsion to be small.

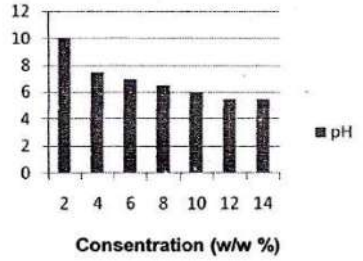

Figure 2. Effect of consentration variation of stearic acid on pH of emulsion

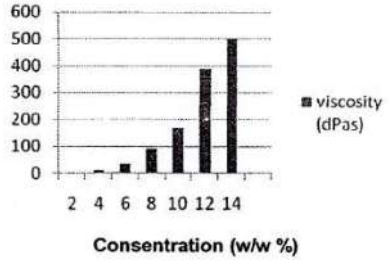

Figure 3. Effect of consentration variation of stearic acid on viscosity of emulsion

The results in Figure 3. shows that, the increase in the concentration of stearic acid causes an increase in the viscosity of the emulsion. It is caused by an increase in the concentration of stearic acid, there will be a change in the concentration of the internal phase, the oil phase and there will be changes in the concentration of emulsifier is formed, namely potassium stearate soap. By changing the phase and surfactant ratio will change the viscosity of the emulsion.

3.2 Preparation and characterization of emulsion with concentration variation of KOH

From the data contained in Table 4, it can be seen that the addition of KOH in different concentrations will affect the form of the resulting emulsion. If the concentration of KOH is small, hence, the resulting emulsion is very liquid and when added a high concentration of KOH, the resulting emulsion in the form of thick cream, the type of resulting emulsions are oil-in-water (O/W) emulsion, and all of the emulsions are stable emulsions.

This condition is probably caused by a slight amount of KOH, then the amount of potassium stearate as an emulsifier also slightly, as a result of internal phase (oil phase) and the external phase (water phase) are emulsified by the emulsifier too little, resulting in more dilute emulsion formed. However, if the KOH concentration increases, potassium stearate formed will also be many, as a result, will increase the amount of water phase and oil phase, which emulsified by the emulsifier. In this reaction will also occur the reaction between coconut oil (a triglyceride) and the KOH produces coconut oil soap and glycerol. Soap is formed can also serve as an emulsifier. The more KOH is added, it will be a growing number of stearic acid and coconut oil which can react with KOH so will be produced a soap (anionic surfactant) as an emulsifier in large numbers. The resulting emulsion will be more viscous (thick emulsion). The more surfactant is produced, as an emulsifier, the more the water phase and the oil phase, which is stabilized by an emulsifier, so the result is a stable emulsion.

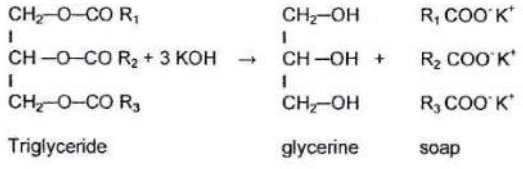

Figure 4. Reaction between triglyceride (coconut oil) and KOH produce soap [12]

Data pH in Figure 5. Shows, on the addition of KOH concentration of 0.75 to 1.5% w / w, no change of pH emulsion (pH constant). This is caused , in the emulsion is formed potassium stearate salt and stearic acid remaining resulting buffer solution.

Table 4. The physical and chemical properties of emulsion, made with consentration variation of KOH

sampl e	Consentration of KOH 50% (w/w %)	Emulsion form	color	texture	Emulsion type	Centrifugation test
1 b	0,5	Liquid cream	White	Soft	O/W	No separation
2 b	0,75	Liquid cream	White	Soft	O/W	No separation
3 b	1	Cream	White	Soft	O/W	No separation
4 b	1,25	Cream	White	Soft	O/W	No separation
5 b	1,5	Thick cream	White	Soft	O/W	No separation
6 b	1,75	Thick cream	White	Soft	O/W	No separation
7 b	2	Thick cream	White	Soft	O/W	No separation

If added to the emulsion in the slightly alkaline, pH will not change, because the OH ion from the base (KOH) will react with the weak acid buffer (stearic acid) in amounts equivalent, and forming the conjugate base of the weak acid. This way the [H +] buffer solution was virtually unaffected by the addition of small amounts of bases [14]. With the addition of alkali in large concentrations in the emulsion, the pH of the solution will increase, then it does not happen anymore buffer.

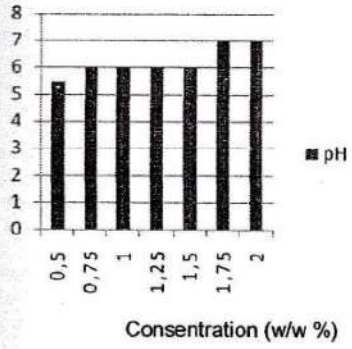

Figure 5. Effect of consentration variation of KOH on pH emulsion

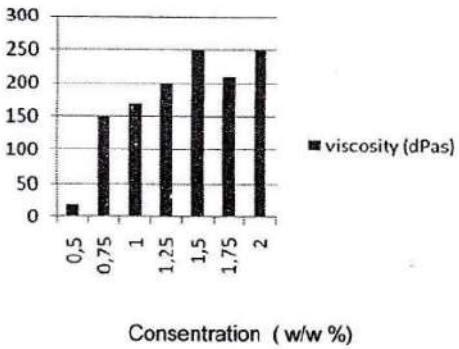

Figure 6. Effect of consentration variation of KOH on viscosity of emulsion

Figure 6. Showed that the concentration variation of KOH affect the viscosity of resulting emulsions. If the KOH concentration increases, the viscosity of emulsion also increased. This is because, with the increasing concentration of KOH, the stearic acid that reacts with KOH will also be increased, and the amount of potassium stearate as an emulsifier also increased. After the reaction between stearic acid, coconut oil with KOH, there will be a change in the concentration of internal phase (oil phase). The concentration of stearic acid, coconut oil and KOH is reduced, while the concentration of potassium stearate as an surfactant increased. This condition will cause a change in ratio of phase and surfactant, and will change the viscosity of the emulsion.

4. CONCLUTION

From the research, it can be concluded that icreasing the concentration of stearic acid can cause the increasing in viscosity and decreasing in pH of emulsion produced . Increasing the consentration of KOH cause increasing in viscosity and initially the pH constant, and then, occur increasing in pH of emulsion. This mean that variations in the concentration of stearic acid and KOH affects the physical and chemical properties of emulsion produced

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REFERENCES

[1] F. Shahidi, 2005, *Bailey's Oil and Fat Products*, sixth edition, six volume set, John Wiley & Sons, Inc.
[2] M. G. Enig, *Coconut : In Support of Good Health in the 21 st Century*, http://www.apcc. sec.org. , [25 Nopember 2009].
[3] B. Setiaji, 2005, *Menyingkap Keajaiban Minyak Kelapa Virgin*, Pusat Pengolahan Kelapa Terpadu, Yogyakarta
[4] L. MCCoy, 2011, *Coconut : Man's Best Friend*, Health, 8
[5] Farnham, *Experience The Healing Power of .... Sunshine*, www.allabouthealth wellness.com, [1 Nopember 2011]
[6] BPOM RI, 2003, *Keputusan Kepala BPOM RI tentang Kosmetik*, BPOM, Jakarta.
[7] T. Mitsui, 1998, *New Cosmetic Science* , first edition, Elsevier, Amsterdam
[8] A. Young, 1972, *Practical Cosmetic Science*, Second edition, Mills & Boon Limited, London
[9] J. Bennett, 2012, *Vanishing Cream*, cosmeticsandskin.com [8 September 2012].
[10] F. O. Oyedeji, and I. E. Okeke, 2010, Comparative Analysis of Moisturizing Creams from Vegetable Oils and Paraffin Oil, *Res. J. Applied Sci* 5, 3, 157-160.
[11] K. Das, R. Dang, M. U. Machale, U. Re, and Lalitha, Br, 2012, Evaluation for safety assessment of formulated vanishing cream containing aqueous Stevia extract for topical application, *Ind. J. of Novel Drug Delivery*, 4 [1], 43-51
[12] H. Meislich, j. Sharefkin, H. Nechamkin, and G.J. Hademenos, 2010, *Organic Chemistry*, fourt edition, Mc Graw-Hill Companies, New York.
[13] L. L. Schramm, 2005, *Emulsions, Foam, and Suspensions*, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim.
[13] T. F. Tadros, 2009, *Emulsion Science and Technology*, Wiley-VCH Verlag CombH & Co. KGaA, Weinheim.
[14]. J. L. Rosenberg and E. Jasjfi, 1992, *Kimia Dasar*, edisi keenam, Penerbit Erlangga, Jakarta

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