Properties and Benefits of Soap Prepared Using Extra-Virgin Olive Oil

SC 415

Norihito Kishimoto and Ayako Kashiwagi
Central Institute of Olive and Health Sciences, Shodoshima Healthyland Co., Ltd.
Kagawa, Japan

Introduction:

Natural skin surface has an acidic pH (< 5) and is covered by a fine, slightly acidic film known as the acid mantle because maintaining an acidic pH improves the functions of the permeability barrier [1]. Washing causes changes to the skin surface pH, and the extent of change depends on the pH of the cleanser. The use of alkaline soaps increases the skin surface pH to above 6, which in turn can rupture the physiologically protective acid mantle, disturb resident skin microflora, and deactivate epidermal enzymes. Olive oil can be used as a facial oil to relieve dry skin, soften skin texture, retain skin moisture, and nourish the skin without interfering with natural skin function. Cold process soap prepared using 100% olive oil is known as “castile soap” [2], which is a natural body wash suitable for those with sensitive or dry skin, as it has a pH lower than that of regular soaps manufactured using foaming agents, petroleum oil, or animal fat. Therefore, castile soap is considered the mildest of all soaps. Previous studies have demonstrated that no significant differences exist in some physical and chemical properties of castile soaps prepared using edible and non-edible (rancid) olive oil [3]. However, the functional features of the soaps remain unclear. The objective of the present study was to evaluate the properties of castile soaps prepared using extra-virgin olive oil (EVOO) and rancid olive oil as a substitute for fatty materials and to examine the effect of EVOO on the pH of the skin surface after washing with an alkaline soap.

Materials & Methods:

●Cold process soap making

EVOO vs **Rancid olive oil**

Cold saponification

Castile soaps

●Determination of the skin surface pH

The skin surface pH was determined using a pH meter with a flat glass electrode (MJ-120A, Sato Shouji Inc., Kanagawa, Japan) after hand washing with the soaps. The center of the dorsum of the hand was used as the test site.

●Determination of functional properties of the manufactured soap samples

Lathering power: a soap sample (0.2 g) was dissolved in tap water. The resultant soap solution (25 mL) was added to a 50 mL measuring cylinder; then, the top of the cylinder was covered with parafilm. **A foaming ability test** was performed by shaking (10 times) the solution in the cylinder. The time course of the foaming layer in the cylinder was recorded. **Emulsification tests**: the abovementioned soap solution (1 mL) was added to an equal volume of olive oil in a test tube with an inner diameter of 1.1 cm and then vortexed vigorously for 30 s. The time course to obtain an emulsified layer in the test tube was recorded. Washing tests were performed as follows: a colored puff (1 cm^3) was added to the soap solution (50 mL), and the mixture was stirred at room temperature. Stripping of the color from the puff was observed and recorded over time.

Results & Discussion:

1. Effect of olive oil quality on some functional properties of castile soap

To evaluate the quality of olive oil on the properties of castile soap, EVOO and non-edible olive oil were used to produce castile soap samples. The acidity and peroxide values of non-edible found to exceed the standard values of EVOO (Table 1). Results from comparative studies on the functional properties (lathering, emulsifying, and washing abilities) of the soap samples are depicted in Fig. 1.

Table 1 Chemical characterization of extra-virgin olive oil (EVOO) and rancid olive oil

Analytical parameters	EVOO	Rancid olive oil	*IOC limits
Acidity (%)	0.27	1.02	≤0.80
Peroxide value (meqO_2/kg)	10.5	20.3	≤20.0
K270	0.183	0.080	≤0.22

*International Olive Council

The lathering power of the EVOO soap sample was 1.23 times higher than that of the rancid olive oil soap sample (Fig. 1A). In the case of the EVOO soap sample, the time to maintain 80 % of foam height was 60 min, which was 30 times longer than that observed for the rancid olive oil soap sample. The emulsifying power of the EVOO soap sample was 1.24 times higher than that of the rancid olive oil soap sample (Fig. 1B). The retention time of 80 % height of the emulsified layer in the case of the EVOO soap sample was 30 min, which was 1.5 times longer than that of the rancid olive oil soap sample. The applied red lipstick on the puff treated with the EVOO soap solution almost disappeared after 6 h (Fig. 1C); however, it took 20 h to strip off the color using the rancid olive oil soap sample. Thus, the washing power of the EVOO soap sample was 3.3 times higher than that of the rancid olive oil soap.

Overall, comparative studies of the functional properties of the soap samples showed that the lathering, emulsifying, and washing powers of the EVOO soap samples were significantly higher than those of the rancid olive oil soap sample, suggesting the use of high quality olive oil to produce improved castile soap.

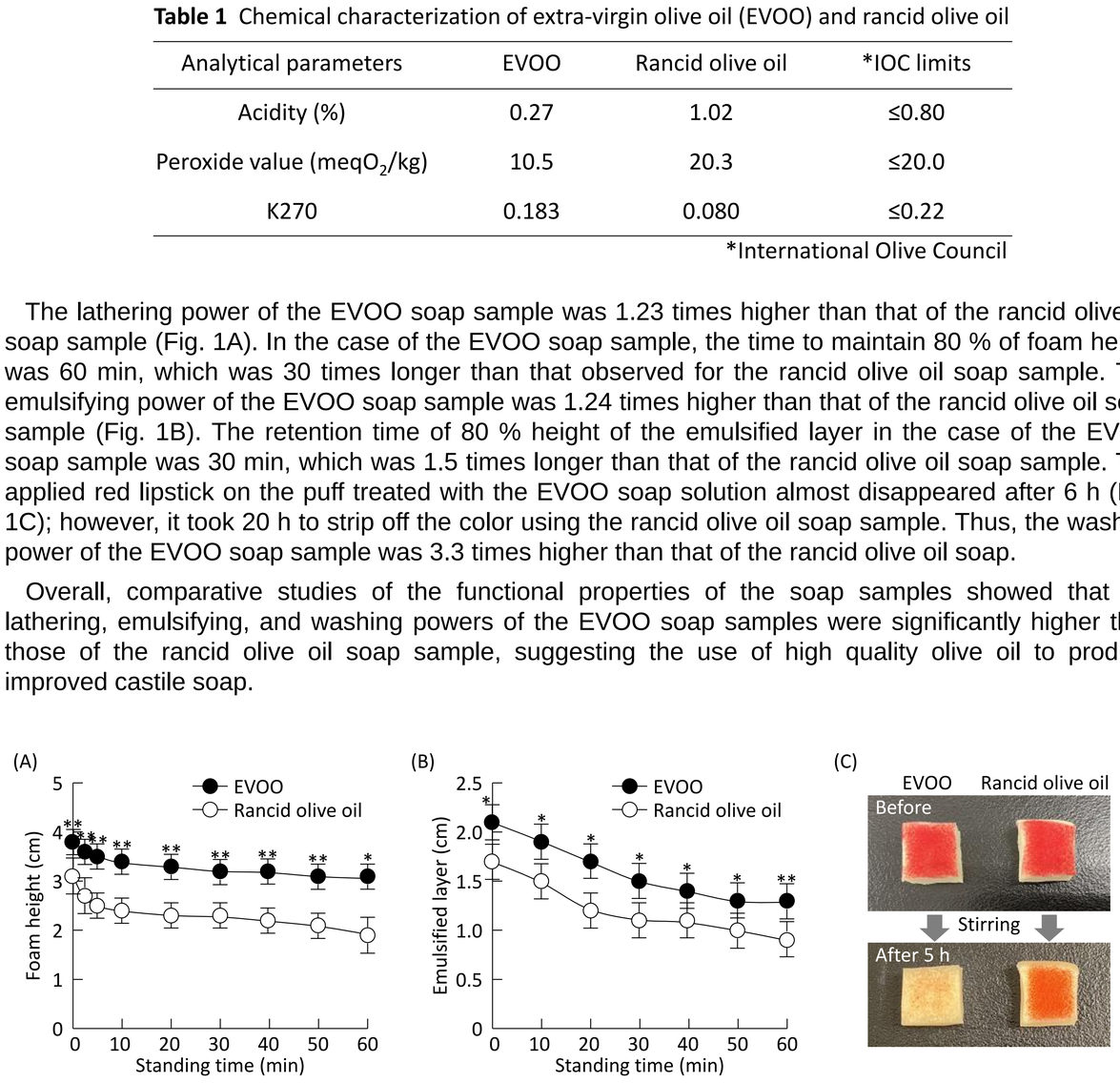

Fig. 1 Comparison of functional properties of soap samples prepared using extra-virgin olive oil (EVOO) and rancid olive oil. Time course of foam height (A), height of emulsified layer (B), and washing power (C) when using the EVOO and rancid olive oil soap samples. The asterisks on the EVOO soap mean values indicate a significant difference from the mean values of the rancid olive oil soap at the same time point (*p < 0.05, **p< 0.01; Student’s t-test).

2. Effect of olive oil in the EVOO soap on skin surface pH

The effect of olive oil in the EVOO soap on the pH of the skin surface after hand washing was examined by comparing the manufactured soap sample with a commercial palm oil-based soap. The pH values of the aqueous solutions obtained by dissolving the EVOO soap sample and the commercial soap were 9.7 and 10.1, respectively. The baseline pH value of the skin surface was 4.9 in either case. After hand washing with the EVOO soap sample and the commercial soap, the skin surface pH increased to 6.2 and 6.6, respectively. Subsequently, the rate of decrease of the recovery curves of the skin surface pH was tracked over 8 h (Fig. 2A). The skin surface pH returned to its baseline value after 6.5 h of the use of the EVOO soap sample, whereas the pH remained elevated (pH = 5.3) after 8 h of the use of commercial soap. The differences from 0.5 to 8 h were statistically significant. Using the EVOO soap sample showed faster recovery of the skin surface pH than that of the commercial soap.

3. Effect of applying olive oil to the skin after washing with an alkaline soap on skin surface pH

The recovery curve of the skin surface pH was examined after applying EVOO to the hands washed with the commercial soap. Compared with that when commercial soap was used alone, the recovery curve of the skin surface pH rapidly decreased when EVOO was applied to the hands washed with the commercial soap. The skin surface pH returned to its initial value after 7 h (Fig. 2B); therefore, application of EVOO onto the hands washed with the commercial soap was effective in recovering the basal skin surface pH.

Washing the skin with an alkaline soap affects the hydration status by decreasing fat content of the skin surface, leading to dry and squamous skin [4]. Using the EVOO soap sample or applying EVOO after hand washing with a commercial alkaline soap improve the recovery of the skin surface pH by increasing hydration of the skin barrier [5].

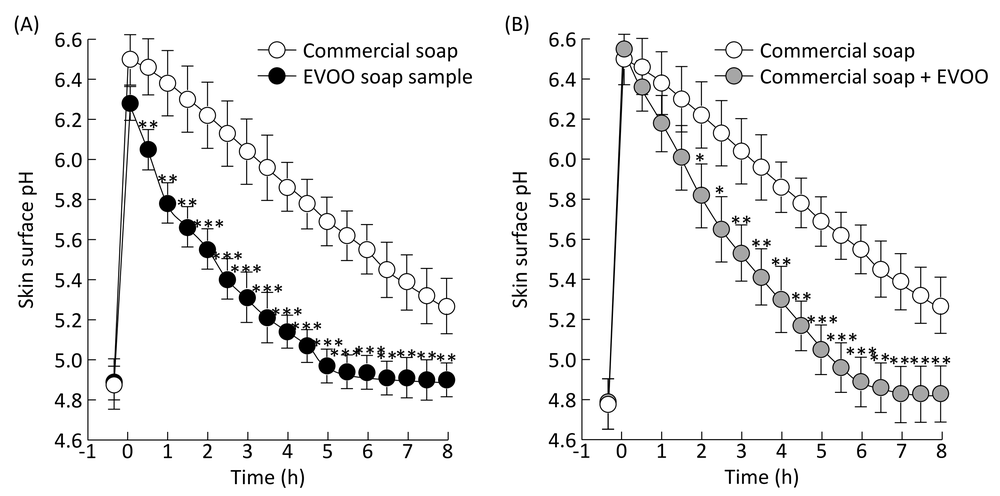

Fig. 2 Skin surface pH changes after hand washing commercial and extra-virgin olive oil (EVOO) soap samples. (A) Skin surface pH changes after hand washing with the commercial and EVOO soap samples. (B) Skin surface pH changes when the commercial soap was used alone and when EVOO was applied onto the hands washed with the commercial soap. Asterisks on the application of EVOO (commercial soap) mean values indicate a significant difference from the no application (commercial soap) mean values of the same time point (*p < 0.05, **p< 0.01, **p<0.001; Student’s t-test).

Conclusions:

Castile soap should be prepared from high quality olive oil for ideal functional features, such as lathering, emulsifying, and washing abilities. Washing the skin using castile soap or applying olive oil onto the hands washed with alkaline soap can aid the natural skin surface pH to revert to its original value, which is imperative for maintaining healthy skin.

References:

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