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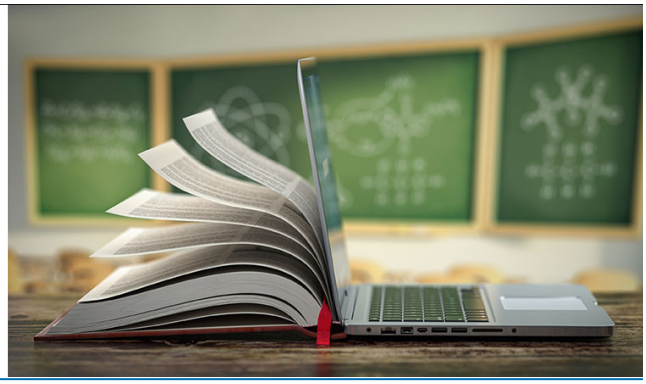

Effect of Glycerin as Plasticizer in Formulation of Grape Seed Oil (Vitis vinifera L.) Emulgel Peel-Off Mask

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Abstract. Grape seed oil (Vitis vinivera L.) is known to contain phenolic compounds with antioxidant properties that can be used as cosmetics, especially for skincare. A peel-off type of emulgel mask has been developed using grape seed oil as an active agent and glycerin as a plasticizer. This study was aims to determine the effect of glycerin as a plasticizer on the physical properties and stability of the grape seed oil emulgel mask formula during storage. The emulgel begins with the formation of an emulsion and then mixing with the Hydroxypropyl Methyl Cellulose (HPMC) gel base. The formulas were made in five various glycerin concentrations. Evaluation of organoleptic and the other physical characteristics were observed for 4 weeks at two temperatures (25 °C and 40 °C). Elongation and tensile strength tests were also evaluated due to the role of glycerin as a plasticizer. The statistical analysis on the physical stability showed that there were no significant differences for all formulas. The speed of drying the mask is in the range of 10-25 minutes. Elongation test results showed there was no significant difference between formulas, but a tensile strength gave significant differences. Based on the results of the above analysis, it can be concluded that the glycerin as a plasticizer has no significant effect on the properties and physical stability of the preparation, but has an effect on the attractiveness of the grape seed oil peel-off emulgel mask.

1. Introduction

Grape seed oil contains a high concentration of tannins, namely proanthocyanidin oligometrics, with 1000 times higher than other oils, also has high stability and potential antioxidant activity [1]. Cosmetic preparations to maintain cleanliness and facial skincare are to use face masks [2]. Face masks divided into four types: sheet masks, peel-off masks, rinse-off masks, and hydrogel [3]. The peel-off face mask has unique characteristics of using adhering film-forming polymers, which creates a cohesive elastic layer that can manually remove and leave no residue after complete drying. The firming effect of this formulation results in a clean skin sensation, providea a moisturizing, increasing effect of active compound due to the occlusive effect from the elastic polymer layer and minimizes pores [3], [4]. The advantage of this preparation is relatively more practical and when applied to the face it gives a transparent or semi-transparent layer.

The composition of the mask-emulgel consists of active substances, gelling agents, plasticizers, preservatives, emollients, surfactants, and solvents. Plasticizers are compounds that can change the physical properties of a preparation, non-volatile, and have a high boiling point [5]. The effect of the plasticizer in the peel-off mask emulgel preparation is when the process of peeling the mask from the

face after it dries becomes more elastic and does not crack. The role of plasticizers in increasing elasticity occurs by reducing the degree of hydrogen and increasing the distance between molecules of the polymer [6].

Glycerin or glycerol is a hydrophilic plasticizer and reduces the intermolecular forces when added to the biopolymer content at the correct level. It improves the mobility of polymer chains, a method widely used to enhance films' mechanical properties [7]. A variety of studies have recently centered on the use of glycerin as plasticizers of edible and/or biodegradable films [7]–[10].

This study aims to develop of grapeseed oil emulgel peel off mask formulation and evaluated the influence glycerin for the stability preparation and mask elasticity. Based on the previous study was reported that glycerin as a plastisizer with a concentration of 20% in the dosage form of the peel-off gel mask can provide the greatest firmness and elasticity of the mask and very easy to remove.

2. Method

Materials: Grapeseed oil (GSO) obtained from PT. Darjeeling Sembrani Aroma. Hydroxypropylmethylcellulose (HPMC) 2208, glycerin, butylated hydroxytoluene (BHT), methylparaben, tween 80, span 80, and aquadest obtained from Bratacochem.

Preparation of emulgel: The first step in this study was the preparation of oil-in-water (O/W) emulsion and then mixing in a gel base. The emulsion component is grapeseed oil as the oil phase and a mixture of surfactant Span 80- Tween 80 which is made by heating at a temperature of 70° - 75°C. The gel base was formed after a Hydroxy methyl propyl cellulose (HPMC) was dispersed in water. The emulsion is mixed with a gel base slowly and gradually glycerin and other components are added. The mixture is stirred until a homogeneous mass and an emulgel are formed, and the process is carried out at room temperature. Five formulas were made by varying the concentration of glycerin, and without glycerin (**TABLE 1**).

Table 1. Formula of GSO peel-off mask emulgel with varying plasticizer concentration

Materials	Concentration (%)				
	F1	**F2**	**F3**	**F4**	**F5**
GSO	3	-	3	3	3
Glycerin	-	20	10	20	30
HPMC	3	3	3	3	3
Methylparaben	0,1	0,1	0,1	0,1	0,1
BHT	0,1	0,1	0,1	0,1	0,1
Tween 80	1,26	1,26	1,26	1,26	1,26
Span 80	3,74	3,74	3,74	3,74	3,74
Aquadest ad	100	100	100	100	100

Evaluation and physical stability test: Evaluation of all the formulas includes its organoleptic, homogeneity, and other physical characteristics. The effect of glycerin as a plasticizer was observed through the strong tensile strength and elongation degree that produced by the preparation.

Statistically analysis: Data pH and viscosity during storage were statistically analyzed using Kruskal-Wallis to determine whether there was a difference between formulas, and Tukey test was conducted to determine any significant differences between formulas.

3. Results and Discussion

The peel-off emulgel mask physically did not change significantly during storage for 4 weeks at 25 °C and 40 °C. The preparation remained homogeneous, did not change phase, and had a pH value according to skin pH, namely 5.82-6.50. Observation effects during storage for 28 days can be seen in **FIGURE 1** and **FIGURE 2**. The decline in pH for topical dosage form is still below an appropriate range [11]. Based on the statistical analysis of pH data on formula and time, it was found that p-value > 0.05 at both temperatures indicated no significant difference between concentrations at each variation of glycerin and storage time.

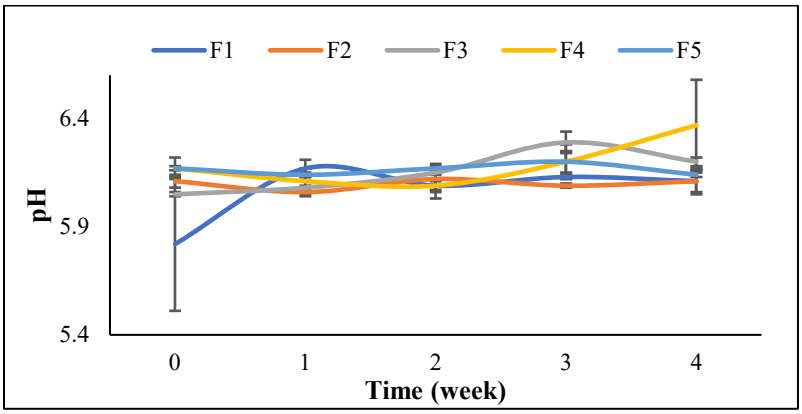

Figure 1. GSO peel-off mask pH graph during storage at 25 °C

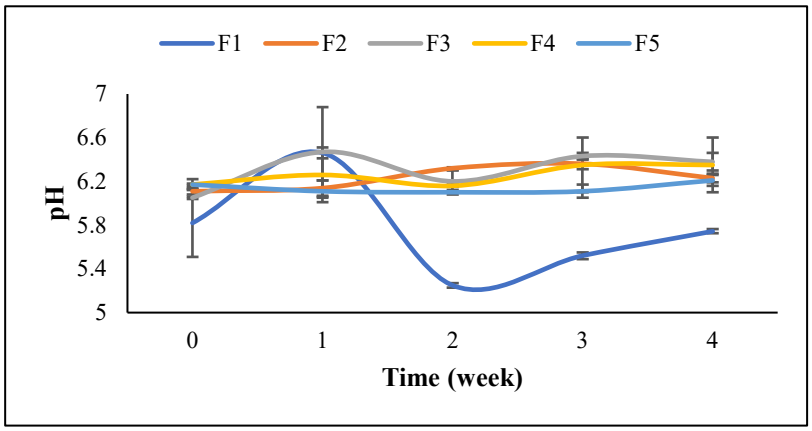

Figure 2. GSO peel-off mask pH graph during storage at 40 °C

The spreadability of semisolid preparations on the skin surface according to the reported studies was in the range of 5-7 cm in diameter and the resulting maser peel off values were 5.80-7.7 cm. Glycerin affects the dispersibility of the mask which can be seen from the increase in distribution when the glycerin concentration is increased. This is presumably due to a decrease in the consistency of the preparation, but it is still able to stick to the surface of the face for a certain time.

Measurement of viscosity effects can be seen in **FIGURE 3** and **FIGURE 4**. The viscosity value changes but is not significant with the variation in the concentration of glycerin used. Based on the statistical analysis of viscosity data on the formula and time, it was found that p-value > 0.05 at both temperatures showed no significant difference between the concentration at each variation of glycerin and storage time.

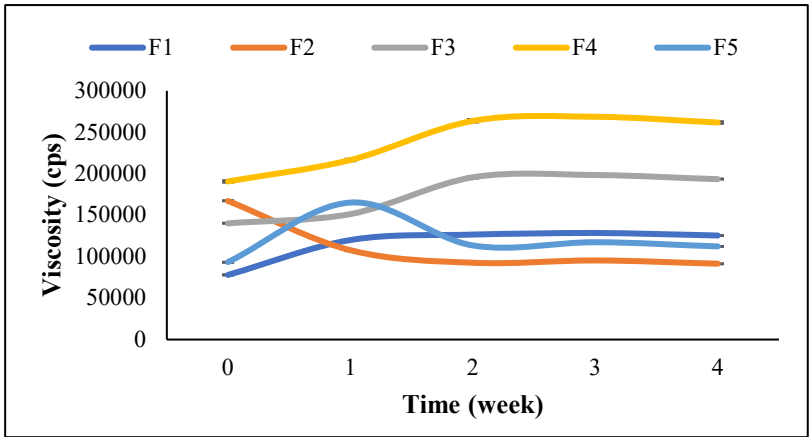

Figure 3. Viscosity graph of GSO peel-off mask during 25 °C storage

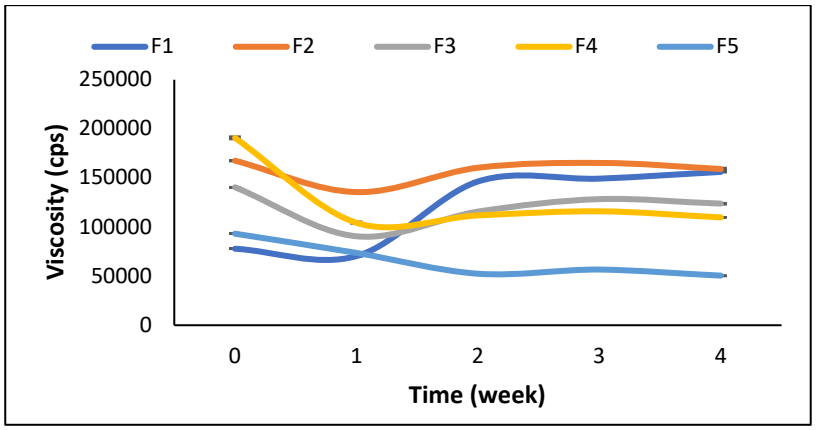

Figure 4. Viscosity graph of GSO peel-off mask during 40 °C storage

Evaluation of the drying time of the preparation to form a film-layer on the skin surface was obtained for 10-20 minutes for formulas containing glycerin, but formulas without glycerin obtained a very fast drying time of 5 minutes. The drying time criterion fulfills the requirements for masks, which is less than 30 minutes [12]. The increase in glycerin concentration caused the mask to dry out longer, presumably due to the nature of glycerin which can hold water on the surface and cover evaporation so that the mask will last longer.

The effect of glycerin plasticizer can be seen from the tensile strength value and the percentage elongation of the mask film-layer. The elongation of the edible film shows the degree of elongation of the layer when it is stretched until it breaks. The greater the elongation value indicates the film layer that is not easily torn. Based on theory, enhancement the concentration of plasticizer will increase the percentage of elongation formed so that the film layer becomes stronger. Tensile strength is a force to achieve maximum tension in each unit area of the film to stretch or extend. The greater the tensile strength, the better the edible film at resisting mechanical damage. The thickness variations that formed can affect the measurement of mechanical properties, i.e., tensile strength and plasticization [13].

The result of this study showed that the emulgel with a glycerin concentration of 20% -30% tended to reduce the elongation of the film formed. It could be caused of the saturation point has been passed so that the excess plasticizer molecules are in a separate phase outside the polymer phase and reduce intermolecular forces between polymer chains on the preparation, causing freer chain movement and increasing the elasticity of the preparation.

Based on two parameters, elongation and tensile strength (**FIGURE 5**) showed that were not significantly different for elongation but significantly different for tensile strength. The best elongation value is 263.33% and a tensile strength is 46.75 kg / cm^2, for the formula with a 10% glycerin concentration.

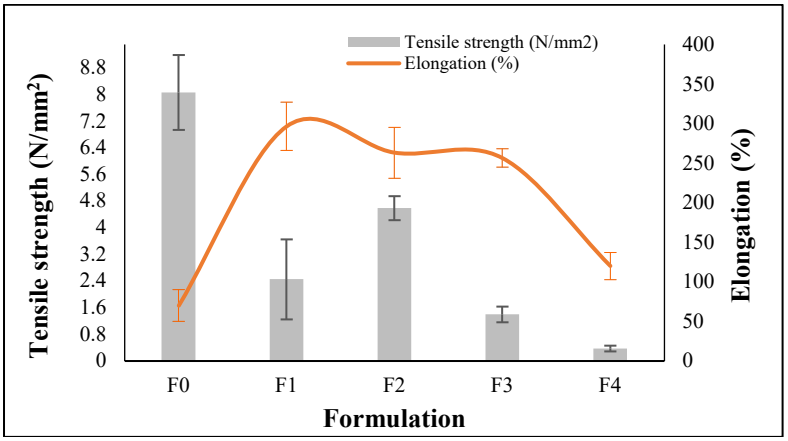

Figure 5. Graph of tensile strength and elongation of GSO peel-off mask

4. Conclusions

Grape Seed oil can be formed as an emulgel peel off mask on the face with the addition of glycerin as a plasticizer and gives physical results that meet the criteria.

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