Effect of Oleic Acid and Propylene Glycol Enhancer Enhancer on Physical Properties and Veil Activity Solar On Carrot Extract Lotion Preparation (*Daucus carota* L.)

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Abstract : Carrots contain β carotene which can function as an antioxidant which has the ability to fight singlet oxygen and interact with free radicals. Carrot extract lotion is formulated with a variety of oleic acid and propylene glycol enhancers which are used to increase or decrease skin impermeability. The research objective was to determine the effect of the addition of oleic acid and propylene glycol enhancers on the physical characteristics and effects on the sunscreen activity of carrot extract (Daucus carota L.) lotion. The solvent used in the extraction of 96% ethanol. The research was carried out by making differences in the concentration of oleic acid and propylene glycol in each formula, namely FI (10 oleic acid), F II combination (5% oleic acid and 5% propylene glycol) and F III (10% propylene glycol). Physical characteristics test includes organoleptic (shape, smell, color), homogeneity test, pH test, adhesion and spreadability test. Extraction obtained from wet simplicia amounted to 7500 gr to 580 g after drying then into a thick extract of 67.3 g with a yield of 11.60%. The results were analyzed by SPSS, the results showed normal and homogeneous distribution, namely p> 0.05. The results of the SPF test showed p> 0.05 which meant that the distribution was normal Cendekia Journal of Pharmacy STIKES Cendekia Utama Kudus P-ISSN 2559 – 2163 E-ISSN 2599 – 2155 Vol. 2, No. 1, Agustus 2020 http://cjp.jurnal.stikescendekiautamakudus.ac.id 2 and the homogeneity test was p 0.05 and continued with the Tukey test with a confidence level of 95%.

Key words: Carrot, Lotion, Enhancer of oleic acid and propylene glycol, physical characteristics

INTRODUCTION

Carrots (Daucus carota L.) is a plant that is very easy to grow all year round in the rainy season and dry season, a type of bush-shaped bulbous vegetable plant (shrub) that can grow upright with a height of 30 cm-100 cm (Cahyono, 2002). One of the plants that has the potential to have SPF activity is the carrot plant, it is known that carrot tubers contain phenol and flavonoid groups that have chromophore groups so that they can ward off ultraviolet radiation. Sunscreen is a substance or material that can protect the skin from exposure to ultraviolet radiation. The effectiveness of sunscreen preparations is based on the determination of the Sun Protection Factor (SPF) value which shows the ability of sunscreen products to protect the skin from UV exposure (Rusita & Indiarto, 2017). To protect the skin from exposure to UV dinar, preparations are made in the form of lotions, lotions are semi-solid preparations that are applied to the body, contain one or more dissolved or dispersed medicinal ingredients in suitable basic ingredients and formulated as emulsions in water in oil and oil emulsions in water (Mardikasari *et al*., 2017) The use of enhancers or also called penetration enhancers, In a preparation plays a role in increasing skin permeability and reducing skin impermeability. The types of enhancers used are oleic acid and propylene glycol (Rahmawati, Sugihartini & Yuwono.2017). Sunscreen preparations often contain SPF which indicates the sunscreen's ability to protect the skin. SPF values can be determined using a spectrophotometer in vitro and can also be in vivo. The SPF value is a comparison of the Minimum Erythema Dose (DEM) on human skin protected by sunscreen with DEM without protection (Zulkarnain, Ernawati & Sukardani 2013).

METHODS

Types of research

The type of research used is experimental research. In the analysis study, the effect of the addition of enhancer oleic acid and propylene glycol on the physical properties and activity of sunscreen in the preparation of carrot extract lotion (Daucus carota L.) was tested using the UV-Vis Spectrophotometer.

Population and Sample
The population used was a population of carrot plants from Bandungan, Semarang Regency, Central Java, then the addition of oleic acid enhancers and propylene glycol to the physical properties and activity of sunscreen in the preparation of carrot extract lotion (Daucus carota L. The sample used in this study was a carrot (Daucus carota L.) type chantenay that was ready to harvest with a size of 15 cm-20 cm.

Time and Place
The research was conducted from February-March 2020. The research site was conducted at the Pharmaceutical Technology Laboratory of STIKES Cendekia Utama Kudus.

Materials and Tools
Carrot tubers (Daucus carota L.), Sethy alcohol, Stearic acid, Triethanolamine, Glycerin, Methyl Parabens, Propylene Parabens, Aquadest, Oleic Acid Enhancer, Propylene Glycol Enhancer. Maceration vessels, cup cups (herma), measuring cups (herma), measuring gourds (herma), water baths, volume pipettes, Eyela N-1000 rotary evaporator, Shimadzu UV mini 1240 UV-Vis spectrophotometer, and analytical scales. cuvette, watch glass, set of dispersion test equipment, set of adhesion test equipment.

Data Collection Techniques
1. Plant Determination : Plant determination is carried out at the Biosystematics Ecology Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, Diponegoro University, Semarang. By submitting samples in the form of whole plants, from the leaves, tubers and roots of the carrot plant.
2. Carrot Extraction : Carrots are sorted then washed and shredded and then dried, dried samples are extracted by maceration, the obtained maserrate is concentrated until the solvent has evaporated, the extracts obtained are then weighed by weight.
3. Making Lotion Preparations : Lotion is made by the melting method where the ingredients are divided into two parts, namely oil-soluble materials (oil phase) and water-soluble materials (water phase). Materials in the oil phase include ceyl alcohol, stearic acid, oleic acid put into porcelain cups and heated to a temperature of 600C. Then the materials that belong to the water phase are triethanolamine, methyl paraben, propylene glycol are also dissolved in aquadest and heated at the same temperature. Then the oil phase and the water phase are mixed and stirred until homogeneous. After the cold lotion is inserted, the carrot extract is stirred until the mixture is homogeneous.
4. Test the Physical Properties of Lotion Preparations
a). Organoleptic Test : The organoleptic test includes the shape, color, and smell that are visually observed, which is carried out by observing changes in the shape, smell, and color of the lotion preparation.
b). Homogeneity Test : The homogeneity test is carried out by applying the preparation on a piece of transparent glass, the preparation will show a homogeneous arrangement.
c). pH test : PH testing is done by dipping the pH meter into a lotion preparation, then measured with a pH meter. Lotion meets the pH requirements of a skin moisturizing product if it ranges from 4.5 – 8.0.
d). Dispersion Test : A total of 0.5 ml of lotion is placed in the center of the device with a diameter of 15 cm, the other glass is placed on it and left for 1 minute. Then the diameter of the spreading lotion was measured, then 50 grams, 100 grams, 250 grams of additional load were added, let it sit for 1 minute and measured the diameter of the spreading lotion. This is done repeatedly until a constant spread diameter is obtained, the treatment is repeated 3 times.
e). Adhesive Strength Test : The Adhesive Strength Test is carried out by placing lotion (in moderation) on a glass object that has been determined in a predetermined area. Place another glass object on top of the lotion, pressing with a weight of 1 kg for 5 minutes. Glass objects are attached to the tool. Release the weight of 100 g and record the time until the two glass objects come off f). In vitro SPF test: 1 gr of lotion dissolved in 10 ml of PA ethanol. After that, a test absorption curve is made with a wavelength between 290-320 nm with an interval of 5 nm. The results of absorbance are recorded and then the SPF value is calculated using the Mansur formula.

$$SPF_{spectrophootometric} = CF \times \sum_{290}^{320} EE\,(\lambda) \times I\,(\lambda) \times Abs\,(\lambda)$$

Where:
EE : erythemal effect spectrum
I : solar intensity spectrum
Abs : absorbance of sunscreen products
CF : correction factor

Data Analysis

The SPF test data and the parameters of the physical properties of the lotion were analyzed by normality test and homogeneity test. If the sample < 50 the sample uses shaphiro wilk and if the sample > 50 uses kolmogrov smirnov. If the results of the normality and homogeneity test show normal and homogeneous distributed results, then it is continued with parametric tests using One Way Annova statistical analysis, but if the results are not normally distributed and not homogeneous, then continue with non-parametric tests using kruskall wallis analysis with SPSS.

RESULTS AND DISCUSSION

Table 1. Results of observation of organoleptic test, homogeneity test and pH test of lotion

Formula	Color	Texture	Shape	Smell	pH
F1	Brownish orange	Soft, homogeneous	Semi solid	Distinctive carrot smell	7
F2	Brownish orange	Soft, homogeneous	Semi solid	Distinctive carrot smell	7
F3	Brownish orange	Soft, homogeneous	Semi solid	Distinctive carrot smell	7
F1 base	White	Soft, homogeneous	Semi solid	Distinctive carrot smell	7
F2 base	White	Soft, homogeneous	Semi solid	Distinctive carrot smell	7
F3 base	White	Soft, homogeneous	Semi solid	Distinctive carrot smell	7

Based on table 1 of the organoleptic test, preparations were obtained in the form of semi solid, brownish-yellow color, suitable for carrot extract and have a characteristic carrot smell. The purpose of the homogeneity test is to see and find out if active substances and additives are well mixed in lotion preparations (Dewi & Wirahmi, 2019). Based on the results obtained that each formula shows homogeneous results and because there are no coarse grains visible, this shows that the concentration of the base and extract does not affect the homogeneity of the carrot extract lotion.

Based on the results in table 1 all formulas have the same pH of 7, this can be interpreted that the base in each formula does not affect the pH value of the lotion preparation. The pH requirement in the standard is in the range of 4.5-8 (Mulyani, Ariyani, & Rahmi 2018). If the pH is acidic, there will be irritation to the skin and if the pH is alkaline, the skin becomes scaly.

Table 2. Dispersion Test

Formula	S.D. ± Stickiness Test
F1	5,200 ± 0,200
F2	5,866 ± 0,125
F3	6,350 ± 0,304
F1 base	5,550 ± 0,150
F2 base	5.916 ± 0,1208
F3 base	6,566 ± 0,104

The dispersion test was carried out to determine the ability of the sample in the form of lotion preparations to spread on the surface of the skin when applied. The spreadability requirement for lotion is 5-7 cm in diameter (Dominica & Handayani, 2019). The results of the dispersion test on the F1 base

lotion were 5,550 cm in diameter, the F2 base was 5,916 cm in diameter and the F3 base was 6,566 cm in diameter, while in F1 it was 5,200 cm in diameter, F2 was 5,866 cm in diameter and F3 was 6,350 cm in diameter. The data was then tested on SPSS to determine its normality and homogeneity and obtained the results of the normality test F1= 1.000, F2= 0.463, F3= 0.463, base F1= 1.000, base F2= 0.780, base F3= 0.157 The data showed the normality test p> 0.05.

The one-way anova statistical test uses the data test generated by p< 0.05 which means significant data means that in all formulations there is a difference in the content and the result is that F1 has a smaller dispersion value because in the base there is 5% oleic acid the preparation is thicker so the dispersion is small, while in F2 there is a combination of 5% oleic acid and 5% propylene glycol so that the dispersion is greater than F1. in F3 where propylene glycol is present as much as 10% can affect the viscosity so that the preparation becomes thinner compared to F1 and F2 and will increase the dispersibility value in the lotion preparation.

Table 3. Adhesion Test

Formula	S.D. ± Stickiness Test
F1	3,326 ± 0,057
F2	2,160 ± 0,110
F3	1,123 ± 0,126
F1 base	5,373 ± 0,116
F2 base	4,393 ± 0,146
F3 base	2,440 ± 0,055

This study has the adhesion of the lotion has met the requirements for the adhesion test on the lotion preparation, which is not less than <4 seconds (Ulaen, Banne, & Suatan 2012) because in the lotion formulation the results were obtained at F1 = 3.326 minutes, F2 = 2.160 minutes and F3 = 1.123 minutes, while in the formulation of the carrot extract lotion base the results were obtained at F1 = 5.373 minutes, F2=4,393 minutes and F3=2,440 minutes. From the data obtained in the SPSS test, the normality test was obtained with the results of the P value

F1=0.567, F2=1.000, F3=0.694, F1=0.668 base, F2 base=0.736 and F3 base=0.702 which means p>0.05 value means that the data is normally distributed and the homogeneity test is obtained a result of 0.566 which shows p>0.05 which means homogeneous data then the data is continued with the one way annova test with the follow-up test of the data generated by p<0.05 which means that the data shows significant results meaning that the data has a significant difference in each Lotion formulas have different adhesion, because the addition of variations and combinations of oleic acid and propylene glycol enhancers used in each formula affect their adhesion. In accordance with research from (Kurniawan, Sugihartini, & Yuwono 2018) stated that, the results of the comparison of the combination of propylene glycol enhancer and oleic acid in the adhesion test were opposite because the higher the level of consistency of oleic acid in the preparation, the longer the adhesion of the lotion to the skin.

Table 4. SPF Value Activity Test

Formula	Average SPF Value
F1	5,154 ± 0,068
F2	5,231 ± 0,125
F3	5,101 ± 0,079
F1 base	-0,123 ± 0,015
F2 base	-0,671 ± 0,004
F3 base	-0,919 ± 0,002

The results of the SPF value measurement can be found that carrot extract lotion has an SPF value of F1 of 5.154, F2 of 5.231, and F3 of 5.101 while the F1 base is -0.113, the F2 base is -0.671 and the F3 base is -0.919 which means that the base does not affect the SPF value of 5 is included in the medium protection category because the SPF value is in the average range of 4-6 (Prasiddha et al, 2016).

CONCLUSION

The combination of the enhancer of oleic acid and propylene glycol exerts an effect on the characteristics of the physical properties of the lotion preparation of carrot extract. The addition of oleic acid enhancer and propylene glycol had no effect on the activity of carrot extract sunscreen lotion.

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