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Determination Sunscreen Potential of Grapeseed Oil (Vitis Vinifera) in Cream Preparation with Combination of Oxybenzone and Octyl Methoxycinammate by in Vitro Method

Iis Sundari[a]*, Chrismis Novalinda Ginting[b], Linda Chiuman[c], I Nyoman Enrich Lister[d]

[a]*Master of Biomedical Science, Faculty of Medicine, University of Prima Indonesia, Medan, North Sumatera, Indonesia*

[b, c]*Faculty of Medicine, University of Prima Indonesia, Medan, Indonesia*

[d]*Department of Physiology, Faculty of Medicine, University of Prima Indonesia, Medan, North Sumatera, Indonesia*

[a]*Email: iissoen9694@gmail.com*

Abstract

Grapeseed oil is usually used in cosmetic industry, as anti dandruff, anti microba, antioxidant and sunscreen. The main compound of grapeseed oil is flavonoid, such as proantocyanidine and alfa tocopherol which can protect skin from the impact of ultraviolet radiation. The purpose of this study was to evaluate the influence of adding grapeseed oil to increase the effectiveness of sunscreen preparations containing the combination of oxybenzone and octyl methoxycinamate by measuring the SPF (Sun Protecting Factor) value as its parameter. The preparation was made in 5 formulas such as F1 (blank), F2 (2% oxybenzone and 5% octyl methoxycinammate), F3 (1% GSO), F4 (5% GSO), F5 (10% GSO) combine with 2% oxybenzone and 5% octyl methoxycinammate in each formulas. Evaluations conducted on cream homogeneity, pH, and determining the SPF value of the preparations in vitro method by using spectrophotometer UV-Vis. Then, value of SPF will be tested in One Way Anova and continued with Post Hoc Tukey. The evaluation results showed that all samples were homogen, in range 6.87 – 6.93 pH, and the average SPF value from each formula were: F1 9.23; F2 22.32; F3 26.16; F4 26.95; and F5 27.44. F1 can be used optimally as sunscreen with maximal protection category while F2, F3, F4, F5 were in ultra protection category.

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* Corresponding author

From the result of statistic tests, there was a significant difference on the SPF value between F1 and F2, while in F3, F4, and F5 there is no significant difference on value. In conclusion, the addition of grapeseed oil can increase the SPF value but not significantly between each formula combined with oxybenzone and octyl methoxycinammate in cream preparations.

Keywords: Sunscreen; Grape seed oil; SPF (Sun Protecting Factor); Oxybenzone; Octyl Methoxycinammate.

1. Introduction

Sun is a source of light and energy for human. Behind its benefits, the sun has UV radiation that could harm our skin, especially in equatorial region [1].

Sunlight can cause skin discoloration to turn black, skin burn, or even increase the risk of skin cancer. Skin cancer incident in US recorded 4,9 million cases in 2007-2012. In Indonesia, skin cancer ranks third after uterine cancer and breast cancer.

Skin cancer is found 5.9-7.8% of all types of cancer per year [2,3]. A product that can protect human skin from UV rays is a sunscreen. Recently, the development of sunscreen of sunscreens has led to the use of natural materials because they are more easily accepted by the public [4].

The substances contained in grape seed oil have many benefits in cosmetic formulations. The main compounds are flavonoids, including proantocyanidins, antocyanidins, flavonols and alpha tocopherol [5]. Based on these description, grapeseed oil has the potential to be sunscreen.

2. Material and method

2.1. Material

1,3-butylen glycol, distilled water, Alcohol 96%, Stearic acid, Disodium Edetat, Trietanolamin, Petrolatum, Setil alcohol, Gliceryl monostearat, Natrium metabisulfit, Nipagin, and grape seed oil.

2.2. Instrument

Laboratory glassware, UV-Vis spectrophotometer (Shimadzu UV 1800), analytical balance (Boeco Germany), pH meter (Hanna Instrument), dropper pipette, conductor meter, aluminium foil, parchment paper, tissue paper, mortars, stamfer, spatula and water bath.

2.3. Cream formulation

Cream preparations are made based on a standard formula that has been modified using a basic type of oil cream in water.

Table 1: Cream formulation

Ingredients	Concentration (%)				
	F1	**F2**	**F3**	**F4**	**F5**
Grapeseed oil	-	-	1	5	10
Oxybenzone	-	2	2	2	2
Octyl methoxycinammate	-	5	5	5	5
Cream base	100	93	92	88	83
1,3-butylen glycol	7	7	7	7	7
Trietanolamin	1	1	1	1	1
Disodium edetat	0.05	0.05	0.05	0.05	0.05
Petrolatum	5	5	5	5	5
Setil alcohol	6	6	6	6	6
Stearic acid	3	3	3	3	3
Glyceryl Monostearate	3	3	3	3	3
Natrium metabisulfit	0.1	0.1	0.1	0.1	0.1
Nipagin	0.1	0.1	0.1	0.1	0.1
Water	ad 100	ad 100	ad 100	ad 100	ad 100

2.4 Homogenity Test

Homogenity test is done by rubbing the preparation on an object glass or the other transparent material, the preparation have to show a homogenous arrangement and there no visible granules.

2.5 pH Test

Determination of the pH is done by using a pH meter. The expected pH result is according to the skin's ph which is between 4,5 to 6,5.

2.6 Determination of SPF Value

Measurement of the SPF value of a sunscreen preparation can be done in vitro by determining the characteristic of sunscreen absorption using spectrophotometric analysis of the results of the dilution of the sunscreen tested with spectrophotometer. SPF value is calculated using Mansur's equation because it specifically calculates the absorbance at the UVB wavelength. The sample absorption spectrum was obtained using a UV-Vis spectrophotometer at 290-400 nm wavelength with 96% alcohol as blank, absorption values were recorded at interval of 5 nm at 290 to 320 nm wavelength and intervals of 10 nm to wavelength 320-400 nm. The absorbance value obtained is multiplied by EE x I for each interval. EE x I values for each interval can be seen

in table 2. The amount of EE x I obtained was multiplied by correction factor, finally the SPF value obtained from the sample tested.

$$SPF = CF \times \sum_{290}^{320} \times Abs \times EE \times I$$

Note :

CF = Correction factor

EE = Erythemal Effect

I = Sun Intensity Spectrum

Abs = Sample absorbance

Table 2: EE x I value

Wavelength (nm)	**EE x I**
290	0,0150
295	0,0817
300	0,2874
305	0,3278
310	0,1864
315	0,0839
320	0,0180
Total	1

2.7 Data Analysis

Each formula is tested for six times. To find out the significant difference in SPF values between formulas, a statistical test was conducted using ANOVA (Analysis of Variance) method with the SPSS (Statistical Package for the Social Science) program and followed by Post-Hoc Tuckey Test.

3. Results and Discussion

3.1 Sunscreen Making

The color of the sunscreen produced in formula 1 is white and formula 5 (with the addition of Oxybenzone and Octyl methoxycinamic and various concentration of grapeseed oil) are white.

3.2 Homogenity test

From the experiments conducted on all sunscreen cream formulas, coarse granules were not obtained on the glass. From these results it can be concluded that the cream is homogenous.

3.3 pH Test

The pH test results for each preparation are listed in table 3.

Table 3: pH test results

Formula	**pH**			
	I	**II**	**III**	**Rata-rata**
F1	6,8	7	6,9	6,90
F2	6,9	6,9	6,9	6,90
F3	7	6,9	6,8	6,90
F4	6,8	6,9	6,9	6,87
F5	7	6,9	6,9	6,93

Based on table 3, it can be seen that the pH range is in accordance with the normal pH of the skin which is between 4,5 to 7. So, the product has no negative risk for the skin.

3.4 SPF Value

The average results of SPF value are listed in table 4.

Table 4: Average results of SPF Values and its category

Formula	**SPF Value**						**SPF average results**	**SPF Category**
F1	9,16	9,08	9,31	9,33	9,29	9,23	9,23	Maximal
F2	21,07	22,79	22,78	22,57	22,38	22,35	22,32	Ultra
F3	26,54	26,97	26,63	25,62	25,56	25,63	26,16	Ultra
F4	26,9	27,78	26,94	27	26,31	26,76	26,95	Ultra
F5	27,17	27,38	27,28	27,79	27,82	27,22	27,44	Ultra

From table 4, we can concluded that sunscreen based on grapeseed oil is good to used because it is able to provide an ultra protective effect against sun exposure.

3.5 Post Hoc Test

The Post Hoc Test, SPF Value and SPF Category results are listed in table 5.

Table 5: The Post Hoc Test, SPF Value and SPF Category

Cream Formulation		Sig.	SPF Average Results	SPF Category
F1	F2	.000	9,23	Maximal
	F3	.000		
	F4	.000		
	F5	.000		
F2	F1	.000	22,32	Ultra
	F3	.000		
	F4	.000		
	F5	.000		
F3	F1	.000	26,16	Ultra
	F2	.000		
	F4	.056		
	F5	.001		
F4	F1	.000	26,95	Ultra
	F2	.000		
	F3	.056		
	F5	.391		
F5	F1	.000	27,44	Ultra
	F2	.000		
	F3	.001		
	F4	.391		

Based on the Post-Hoc test results using the Tukey method, there are differences in the SPF value between each formula by adding grape seed oil in different concentrations. F5 with a grape seed oil concentration of 10% gives highest average SPF value when compared to other formulas which is 27,44. From the Post-Hoc Test result, F5 did not differ significantly from f4 which was marked by significance value >0,05. This is due to the unstable performance of grape seed oil in high concentrations, so that when the oil concentration is increased, the oil component does not provide a significant response or does not differ significantly [6].

4. Conclusion

Based on the results of this study, it can be concluded that adding grape seed oil in various concentrations gives a difference in the increase of SPF values on sunscreen preparations combined with oxybenzone and octyl methoxycinamic but not significantly between each formula.

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