Produce Active Sunscreen Gel By Extracting Etil Acetate Fraction And Nanoparticles Fraction Etil Asetat From Jatropha Curcas Linn

Dewi Rahma Fitri, Partomuan Simanjuntak, Deni Rahmat

Abstract: The exposure to excessive and long lasting sun can cause adverse effects on the skin of erythema and even skin cancer. Jatropha curcas Linn is one of the plants that have potential substants to protect skin from the adverse effects of UV rays. Sunscreen preparations derived from ethyl acetate fractions of Jatropha leaves are made. Ethyl acetate fraction of Jatropha leaves has IC50 value of 43 ppm potency to be used as sunscreen preparation. To increase the value of SPF, the ethyl acetate fraction of Jatropha leaves is made in the form of nanoparticles formulated into gel preparation. Ethyl acetate fraction of Jatropha leaves was made in the form of nanoparticle extract using 0.2% chitosan and 0.1% NATPP with a 5: 1 volume ratio with ionic gelation method. The results obtained fulfill the requirements include spherical morphology, particle size 300.2 nm and potential zeta value 39.54 mV. Based on the result of this research, it can be concluded that ethyl acetate fraction and nanoparticle extract of ethyl acetate fraction of jatropha leaves can produce sunscreen gel using carbopol ultrez 10 (0,5%) as gelling agent with concentration of each active substance 0, 1% using a homogenizer tool at 200 rpm for 60 minutes. it has obtained value of SPF 7 for gel of ethyl acetate of Jatropha leaves and SPF value 12 for gel Nano extract of ethyl acetate fraction of Jatropha leaves.

Index Terms: chitosan, ionic gelation, SPF gel.

1. INTRODUCTION

Strong exposure of sunlight can cause erythema and sunburn, while excessive and prolonged exposure of sunlight can lead skin degeneration changes and skin cancers. These effects depend on solar intensity, frequency of irradiation, duration of irradiation, surface area of exposed skin, and the sensitivity of each individual to sun exposure [1,2]. One of the plants that can be extracted as an active sunscreen ingredient which has antioxidant activity is Jatropha curcas Linn. In addition, Jatropha curcas is not included in food crops, then its utilization as a cosmetic raw material is not expected to disrupt the stability of food prices. Studies on the antioxidant activity of the semipolar fraction of Jatropha curcas have been published. Research conducted by Windarwati showed that ethyl acetate fraction of methanol extract of Jatropha curcas has potential as antioxidant substance with free radical damping activity of 89.42% [3]. Jatropha leaves has enormous antioxidant potency of ethyl acetate fraction making it possible to provide protection against UV rays. Various researchs have been conducted to find out the benefits of nanoparticle development related to nanoparticle technology as a drug delivery system, giving the result that particle on a nanometer scale has a characteristic physical properties compared to larger size particles especially in improving the delivery quality of drug compounds. Another advantage of nanoparticle technology is its opportunity to be combined with other technologies, thereby allowing for a more perfect delivery system [4].

- *Dewi Rahma Fitri, Pertomuan Simanjuntak, Deni Rahmat*
- *Department of Pharmacy, Faculty of Science and Technology, Al Kamal Institute of Science and Technology*
- *Faculty of Pharmacy, Pancasila University*

The present study aimed to make, characterize the nanoparticles and prepare as gel preparation form of the Jatropha curcas Linn fraction of ethyl acetate fraction. It is hoped that the benefits of ethyl acetate fraction contained in Jatropha leaves can be further optimized since nanoparticles have more advantages as drug preparations than macro or micro particles.

2. MATERIALS, TOOLS, AND METHODS

2.1 Material

Jatropha leaves are obtained from community plantations in Parung area, Bogor. Ethyl acetate (Bratako), DPPH (Sigma), vitamin C (Sigma), methanol p.a (Sigma), ethanol 96% p.a (Sigma), chitosan (Biocitosan), NaTTP (Sigma), glacial acetic acid (Bratako). DMSO (Bratako), Tween 80 (Bratako), Aquadest (Bratako), TEA (Bratako), propylene glycol (Sigma), phenoxyetanol (Bratako), carbopol ultrez 10 (bratako).

2.2 Tools

pH meters, viscometer (brookfield), Transmission Electron Microscope (TEM), Particle Analyzer (Delsa Nano C), Analytical Scales (Mettler Toledo), homogenizer (IKA T25 digital ULTRA TURRAX), Freezer dryer, UV spectrophotometer-vis (Shimadzu UV-1800), Oven, microplate reader.

2.3 Extracting and ethyl setat fractions of jatropha leaves

1. Extraction

The extraction process was carried out by maceration with 70% ethanol solvent. Extraction procedure performed was as follows: as much as 1800 g of dried sample powder extracted using ethanol 70% (1:10) by soaking for 24 hours at room temperature (maceration way). The extract was separated from the solvent by rotary evaporator until viscous extract has formed.

2. Fractionation

The rough fractionation process is a partition process using an ethyl acetate and water solvent (3: 2). A total of 5 g of crude extract was partitioned by adding 50 ml of water and 150 ml of ethyl acetate solvent. shaken in separator flask, allowed to stand for 30-60 minutes and separated from the formed layer (bottom water, upper layer ethyl acetate layer). The process of addition of ethyl acetate in the water layer is repeated three times, and the obtained ethyl acetate coating is combined into one as the ethyl acetate fraction. the obtained-fraction is separated by the solvent using a rotary evaporator at a temperature of 50 ° C to produce viscous extract.

a. Examination of Extract Characteristics

1. Organoleptic

This test is done by observing the shape, color, smell and taste of the resulting extract.

2. Yield of extract

The yield of ethanol extract of Jatropha leaves was calculated by comparing the initial weight of the simplicia with the weight of the extract produced.

$$\%\ \text{the yield of extract weights} = \frac{\text{was produced}}{\text{initial weight of simplicia}} \text{x } 100\%$$

3. Drying losses

This examination is done by weighing 0.5 g extract inserted into a closed bottle that had previously been tied. Then, It is fed into the oven at 105 ° C for 30 minutes or until a relatively fixed weight is obtained .

$$\%\ \text{drying losses} = \frac{b - c}{b - a} \text{x } 100\%$$

description:

a = cup weight

b = sample weight and cup before drying in oven

c = sample weight and cup after drying in oven

4. Water content checking

Porcelain cup was dried at 105 ° C for 30 minutes then cooled at eksikator and weighed. In total of 2 g samples were inserted in a saucer and heated at 105 C for 5 h, then it was cooled in the indicator and weighed. This process was carried out until the weight obtained constantly for 3 times repetition.

5. Ash content checking

Porcelain cup was dried in an electric furnace at 600^0 C for 30 minutes. Then the cup was cooled inside the indicator for 30 minutes and calculated the empty weight. In total of 2 g sample was inserted into the cup, then discharged over the burning flame of Bunsen until It's smoke was disappeared. After the ash-white was formed, the ash-filled cup was lifted from the kiln, cooled in the indicator, then weighed. Examination of ash content was conduct as much as 3 times repetition.

$$\text{ash content } (\%) = \frac{B}{A} \text{x } 100\%$$

A = Sample weight (g)

B = Ash weight (g)

b. The preparation of extracted nanoparticles using ionic gelation method

1. Preparation of chitosan solution 1%

Chitosan 1 gram dissolved in 100 ml of 1% acetic acid solution by using magnetic stirrer. The method of preparation of 1% acetic acid is by mixing 1 ml glacial acetic acid in aquadest up to 100 ml

2. Preparation of chitosan solution 0.2%.

A total of 20 ml of 1% chitosan solution was fed into a glass beaker and then added 80 ml aquadest, stirring using a magnetic stirrer.

3. Preparation of a sodium tri-polyphosphate solution of 0.1%.

Sodium tri-polyphosphate of 0.1 g was dissolved in 100 ml aqua demineralisata by using a magnetic stirrer.

2.4 Nanoparticles extractions

The fraction of ethyl acetate of jatropha leaves was 50 mg then previously dissolved in 0.5 ml DMSO then dissolved in 10 ml NATPP 0.1% 10 ml. Furthermore, the mixture of extract and NATPP was dribbled slowly into 0.2% chitosan solution which had added 0.5 ml of Tween 80 using a magnetic stirrer until all the solutions of sodium tri-polyphosphate were discharged and nanoparticle solution was formed.

2.5 Characteristics of Nanoparticles extract

1. Morphological Test of nanoparticle extract.

The shape and morphology of Solid Lipid Nanoparticles (SLN) was observed using Transmission Electron Microscope (TEM). 3 drops of sample were dripped into a copper-wrapped carbon copper lattice. The results interpreted by TEM are images, then the image was magnified 80,000 times, 150,000 times, 200,000 times, and 500,000 times. The shape and morphology of particle size are used to prove that particles in the formula are already formed in nanoparticles.

2. Determination Size of Nanoparticle extract Particles.

Particle size of nanoparticle extract was observed using Particle Analyzer with Photon Correlation Spectroscopy (PSC) technique. The results obtained from Particle Analyzer are particle size data from the formula.

3. Determination of Zeta Potential value of nanoparticle extract

The potential zeta value of nanoparticle extract was determined using the Particle Analyzer tool Delsa Nano C. The Electrophoretic Light Scattering (ELS) method is applied in this analysis so that the electrophoretic mobility of the particles can be measured.

2.6 Test of SPF Nanoparticle ekstrak Value

a. Sample preparation

One gram of sample was carefully weighed and then put into a 10 ml measuring flask and diluted with 96% ethanol p.a. obtained a 1% mother liquor then made a solution with a concentration of 0.01%, 0.05%, 0.09%, 0.1% and 0.5% in a 10 ml measuring flask.

b. Calculation of SPF value

SPF value is calculated using the Mansur equation. The absorbance spectra of the sample were obtained by using UV-Vis spectrophotometer at wavelength of 290-320 nm using ethanol as blank. Absorption value is recorded every 5 nm interval from the wavelength of 290 to 320 nm. The value of absorption obtained is multiplied by EE x I for each interval. The value of EE x I per interval can be seen in the Equation Table. . The amount of EE x I obtained multiplied by final correction factor is obtained by the SPF value of tested sample. The calculation of the SPF value is performed using the Mansur equation:

$$\mathrm{SPF} = \mathrm{CF} \times \sum_{290}^{320} \mathrm{EE}\ (\lambda)\ \mathrm{x}\ \mathrm{I}\ (\lambda) \mathrm{x}\ \mathrm{Abs}\ (\lambda)$$

Description:

EE = The spectrum of erythema effects
I = Intensity of light spectrum
Abs = sample absorption
CF = Correction factor

a) Uptake value is measured at wavelengths of 290, 295, 300, 305, 310, and 320 nm
b) The value of absorption obtained is multiplied by the value of EE x I for each wavelength contained in the equation table.
c) result of the absorption product and EE x I are summed up
d) The sum then multiplied by the correction factor which value is 10 to get the SPF sample value.

3 Gel Formula

Table 1. *Gel Formulation*

Material	Concentration		
	Base	Nanoparticle extract	Etil asetat fraction
Active substance	-	0,1%	0,1%
Propylenglycol	10	10	10
Carbomer	0,5	0,5	0,5
TEA	0,5	0,5	0,5
Phenoxyetanol	0,1	0,1	0,1
Aquadest	Add100	Add 100	Add 100

2.7 Gel Evaluation

a. Organoleptic Test

The organoleptic test is performed to view the visual appearance of the dosage visually by observing the shape, color and scent of the preparations that have been made.

b. Homogeneity Test

Homogeneity test is performed to determine if the preparations have been made homogeny or not. The dosage is applied to the transparent glass where the preparations are taken 3 parts which are top, middle and bottom. Homogeneity is indicated by the absence of coarse grains.

c. pH test

pH test is performed to assess the acidity of the gel preparation to ensure that the gel preparation extracted does not harm and irritate human skin. The pharmaceutical preparations that meet the pH skin criteria are in the interval from 4.5 to 6.5.

d. Viscosity Test

Viscosity test were used to determine the viscosity of a dosage. Viscosity test performed using viscometer tool.

e. Spreading Power Test

The scattering test was performed to ensure gel equalization when applied to skin immediately after it was made. Gel was placed in the center of glass with a round tool (diameter = 16.5 mm). on top of the gel was placed another rounded glass or other transparent material and weighting until that the weight of glass round and weighs 200 grams, left for 5 minutes, then recorded the diameter of its spread.

f. SPF value of the gel preparation test

1. Sample preparation

One gram of sample was carefully weighed and then fed into a 25 ml measuring flask and diluted with 96% ethanol p.a.

2. Calculation of SPF value

SPF value was calculated using the Mansur equation. The absorbance spectra of the sample were obtained by using a UV-Vis spectrophotometer at a wavelength of 290-320 nm using ethanol as blank. The absorption value was recorded every 5 nm interval from the wavelength of 290 to 320 nm.

3. RESULTS AND DISCUSSION

3.1 EXTRACTION

The extraction process of active compound from dried samples of Jatropha leaves used maceration method, by immersion in a 70% ethanol solvent at room temperature. Maceration is conventional extraction technique in which the material is immersed in a solvent for a long time. Maceration is widely used in extraction techniques of natural material compounds because simple, inexpensive methods and equipment. This method does not require energy, produce well and selective extraction results, and widely applied to heat-resistant compounds. The extract obtained was separated from solvent by rotary evaporator until 390.9 gram of viscous extract was produced with the yield of 21.71% extract.

3.2 ETIL ACETATE FRACTIONS

The fraction of ethyl acetate of Jatropha leaves was obtained 30,25 gram with yield of 7.73%. The purpose of this process is to separate the compounds based on their polarity. The ethyl acetate solvent is a semipolar solvent which can dissolve the alkaloids and the aglycons. Calculation of the yield of partition of ethyl acetate solvent of jatropha leaves can be found in appendix 2.

3.3 ETHYL ACETATE FRACTIONS EXAMINATION OF JATROPHA LEAVES

Identification of ethyl acetate fraction of Jatropha leaves (Jatropa curcas Linn).

a. Organoleptic examination includes:
Shape: Thick
Color: greenish black
Scent: Typical of jatropha leaves, sharp

b. pH Examination
The fraction of ethyl acetate of jatropha leaves is pH 4.6.

c. Phytochemical Test
The results of phytochemical examination of ethyl acetate fraction of jatropha leaves can be seen in Table V.2

Table V.2 *Phytochemical Test*

No	Types of Examination	Examination Result
1	Tannin	+
2	Flavonoids	+
3	Phenolic	+
4	Saponin	-
5	Alkaloids	-

Based on phytochemical screening results, it shows that ethyl acetate fraction can work as antioxidant because it contains tannins and flavonoids and phenolic compounds that have UV B protection potential so that it can be continued in the next stage ie antioxidant test and SPF value determination

3.4 PREPARATION OF NANOEXTRACT ETHYL ACETAT FRACTION OF JATROPHA LEAVES

Preparation of nanoparticles in this study is using ionic gelation method. The ionic gelation method is the most common method of making nanoparticles by ionic gelation method using a magnetic stirrer [9]. The mixing of chitosan polymer and sodium tri-polyphosphate will produce the interaction between positive charge on chitosan amino group with negative charge of tri-polyphosphate. The addition of tri-polyphosphate aims to form ionic crosslinked intercellular chitosan bonds so that it can be used as an adsorbent material. Sodium tri-polyphosphate is considered the best crosslinking agent. The opposite force between chitosan and tri-polyphosphate can lead to spontaneous particle formation [10]. The addition of surfactant serves to stabilize the suspension of particles in the solution by preventing the incidence of clumping between particles. In the presence of surfactants, the chitosan particles in the solution will be enveloped and stabilized each other as the process of forming the nanoparticles will be more effective [11].

1. Determination of Chitosan concentration and sodium tri-polyphosphate.

The materials used in the preparation of nanoparticles are chitosan, sodium tri-polyphosphate, tween 80 as surfactants. In the early stages, there was determination of the concentration of chitosan solution used in the formula by conducting a preliminary experiment by making an empty nanoparticle formula without ethyl acetate fraction of jatropha leaves with 0.2% chitosan concentration with 50 ml volume and addition of tween 80 0,5% ml while the concentration of 0.1% sodium tri-polyphosphate as much as 10 ml dripped slowly into 0.2% chitosan solution using a magnetic stirrer tool. The result is a clear solution into a transparent translucent solution because apparently no micro particles are formed. The colloidal solution is formed with very fine particles after tri-polyphosphate is dropped into chitosan solution using a dropper The result of preliminary experiment in this research is in line with the previous research, it can be seen that in the preparation conditions of 0.2% chitosan concentration, 0.1% TPP concentration and the chitosan volume ratio of TPP is 5:1 [12]. The solution change from clear to transparent translucent to the preliminary experimental formula can be seen in Figure V.4

Figure V.4 *Results of Chitosan and NATPP Nanoparticle Preparation*

2. Nano extract process

50 mg of ethyl acetate leaf fraction of 0.5 ml DMSO to help soluble completely. 0.2% chitosan concentration solution with 50 ml volume was added tween 80 0,5% ml stirring using magnetic stirrer with medium speed for 30 min. Prepare 10 ml of sodium tri-polyphosphate as much as 10 ml mixed with soluble extract solution which is completely dissolved then the extract mixture with NaTPP drops slowly into 0.2% chitosan solution by using magnetic stirrer tool to form extract nanoparticles. The extracted nanoparticles obtained can be seen in Figure V.5.

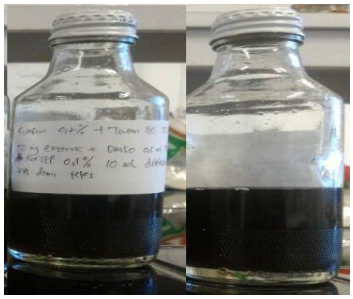

Figure V.5*. Nano extract*

3.5 EVALUATION OF NANO EXTRACT ETIL ASETAT FRACTIONI OF JATROPHA LEAVES

1. Particle Size

Modern particle calculations generally use image analysis or some type of particle calculation such as Particle Size Analyzer (PSA) analysis. The average particle size distribution by ionic gelation method can be seen in Table V.5 and Figure V.6

Table V.6. *Results of nanoparticle extract particle size*

Diameter (nm)	% polidispersitas (nm)	Polidispersitas index	% intensity
300,2	161,84	1,16	100,0

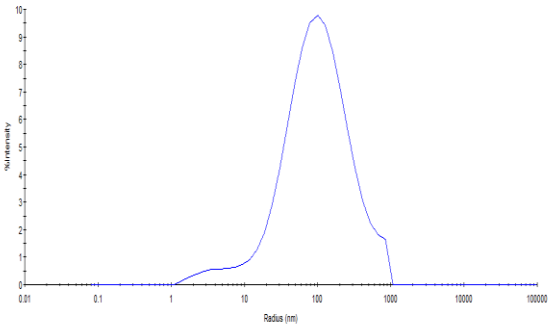

Figure V.6 *PSA test of Ethyl Acetate fraction from nano extract of jatropha leaves*

Nanoparticles are defined as solid particles of 10-1000 nm. Particles of size smaller than 300 nm can penetrate very easily and enter into individual cells. Nanotechnology can be defined as an activity that includes the design, production, and utilization of structures, equipment systems and materials by controlling the size and shape of materials on the atomic and molecular scale with material sizes less than 300 nm [13]. The results obtained were similar with the previous studies, namely the results of PSA analysis of chitosan-metformin size of 351.46 nm [14] and PSA extract-nanocitosan leaf of tapak dara has a size of 381.98 nm.

2. Potential Zeta

Zeta potential is measured to determine the stability of the colloids. Zeta potential is a measure of repulsive force between particles. Nanoparticles with potential zeta values greater than +/- 30 mV have been shown to be stable in suspense as surface charges that prevent aggregation. In this study using non ionic surfactant as a material to prevent agglomeration (aggregation). The surfactant group has a working mechanism of lowering the surface tension and can form a monomolecular film layer on the dispersed phase globule surface. The result of nanoparticle extract potential zeta test can be seen in Table V.7.

Table V.7 *Result of zeta potential Nano extract test*

Sample	Potensial Zeta
Nanoekstract	39,54

Potential zeta test results potential zeta value 39.54, this shows the extract of nanochitosan has good stability. The result of the zeta potential test has a positive surface charge. If the potential zeta value is higher, the more stable the colloidal nanoparticles are formed. This is related to the binding of the anionic group by long amine group of chitosan to maintain high electricity to prevent aggregation [16].

3. Shape and Morphology Observation

This observation used TEM tool. TEM test are presented in Figure V.7.

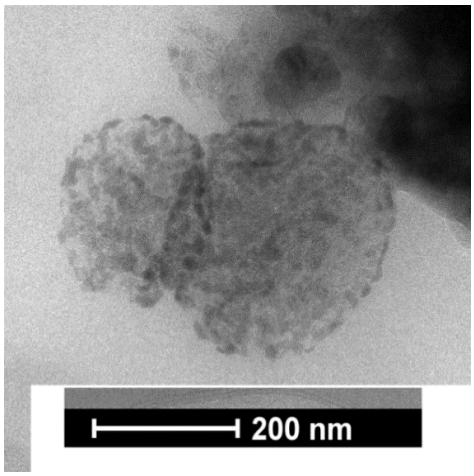

Figure V.7 *TEM Analysis*

The TEM test shows that the morphology of the preparation has an uniformly rounded shape. This indicates that the active substance is stable and protected by the emulgator.

3.6 THE RESULT OF SPF TEST FROM NANOEXTRACT ETHYL ACETAT FRACTION OF JATROPHA LEAVES

The result of SPF test of nanoparticle extract with several concentrations can be seen in Table V.8

Table V.7 *SPF value of Nanoparticle extract*

Wavelength (nm)	Absorption Value of Nanoparticle extract Ethyl Acetate fraction of jatropha leaves (Abs)					
	0,01 %	0,05%	0,09%	0,1%	0,5%	(EE x I) Abs
290	0,096	0,423	0,776	0,832	4	0.015
295	0,092	0,407	0,747	0,803	4	0.0817
300	0,089	0,397	0,731	0,785	3,866	0.2874
305	0,087	0,391	0,722	0,775	3,896	0.3278
310	0,086	0,390	0,719	0,775	3,915	0.1864
315	0,086	0,392	0,726	0,783	3,987	0.0839
320	0,085	0,396	0,733	0,793	3,981	0.018
∑ (EE x I) x Abs	0.087	0.394	0.727	0.782	3.911	
CF x (EE x I) Abs	0.87	3.94	7.27	7.82	39.11	
Nilai SPF	0.87	3.94	7.27	7.82	39.11	

The result of SPF nanoparticle extract test shows that the smallest concentration that can provide minimal protection is at 0.05% concentration with 3.95 power protection capability. The minimum SPF value between 2-4 can be used as a minimum sunscreen at a concentration of 0.05%. In this study used a concentration of 0.1% SPF value of 7.82 extra protection power. A better SPF value is 15 and when more than 15 are called Ultra [17].

3.7 GEL FORMULA

a. Formula Optimization

To determine the optimal carbopol concentration as a gelling agent, optimization of formula with variation of concentration of Carbopol Ultrez 10 0,5%, 0,75% and 1% was done. The results of the optimization formula can be seen in Table V.9.

Table V.9 *Gel Formula Optimization*

No	Material	F1 %	F2 %	F3 %
1	Carbopol ultrez	0,5	0,75	1
2	Propylenglycol	10	10	10
3	TEA	0,5	0,5	0,5
4	Phenoxyetanol	1	1	1
5	Aquadest	100	100	100

The formulation used formula from the sunscreen formula of Harrys Cosmetic. Using carbopol ultrez 10 as a gelling agent is appropriate because it is a gelling agent known as a good thickener, high viscosity, resulting in a clear, stable gel. From formula optimization resulted gel which have best consistency is F1. The gel preparation that is formed has a consistency not too thin and not too thick. In the gel formula F2 and F3 gel is produced that is too thick so it is feared when the use is difficult to reverse and takes a long time to homogeneous. To ensure the best formula, each formula is evaluated. The evaluation data of each formula shown in Table V.10.

Table V.10 *Gel Formula Evaluation*

No	Parameter test	F1	F2	F3
1	Organoleptic	Distinctive clear scent	Distinctive clear scent	Distinctive clear scent
2	Homogeneity	Homogen	Homogen	Homogen
3	pH	6,22	6,55	6,41
4	Spearing power	5,9	5,5	5,1
5	viscocity	medium	thick	thick

b. Gel Extraction Formula

Table V.11 *Gel Extraction Formula*

No	Material	F1%	F2 %	F3 %
1	Exstraction	-	-	0,1
2	Nanoextract	-	0,1	-
3	Carbopol ultrez 10	0,5	0,5	0,5
4	Propilenglycol	10	10	10
5	TEA	0,5	0,5	0,5
6	Phenoxyetanol	1	1	1
7	Aquadest	100	100	100

c. Evaluate SPF Gel Formula

The result of formulation and evaluation of SPF gel is presented in Figure V.9. and Table V.12.

Figure V.9 *SPF Gel Formula*

1. Organoleptis

Table. V.12 *Organoleptic Evaluation*

No	Formula	color	Scent	consistency
1	F1	clear	Distinctive scent	Thick-medium
2	F2	clear yellowish green	Distinctive scent	Thick-medium
3	F3	Clear brownish green	Distinctive scent	Thick-medium

Organoleptic evaluation results include color, scent and shape are shown in Table V.12. The results of the evaluation showed that the dosage colors produced by formulas I, II and III are clear, clear yellowish green and clear brownish green . The color difference of the dosage is influenced by the composition of the extract in each of the formulas. In the formula III the color of the darker (clear-brownish-green) gel than the formula II (clear yellowish green) is due to the formula II being a dry-extracted nano suspension in which there are additives of chitosan, NATPP and mixed solvents thereby affecting the color of the preparation. In terms of smell all the preparations do not have a significant scent difference. Although the three formulas contain different active ingredients, the formula II contains nanoparticle extracts in the manufacturing process using other additives. In formula III using an ethyl acetate fraction but the odor of ethyl acetate is not found in formula III. This is due to the scent of carbopol that dominates the scent of all three formulas. The uniform gel form is affected by gel preparation using homogenizer at the same rate of 200 rpm for 30 minutes.

2. Homogenity

Homogenity test of formula is shown Table V.13.

Table V.13 *Homogenity test*

Homogenity			
No	Formula	Color	Homogen
1	F1	Clear	Homogen
2	F2	Clear yellowish green	Homogen
3	F3	Clear brownish green	homogen

All three formulas have homogenity uniform. This is because all formulas are made by using a homogenizer tool with the speed of 200 rpm and same length of time for 30 minutes. Uniform treatment produces uniform gel. The three

formulas do not indicate the presence of air bubbles absorbed therein. This is influenced by the use of carbopol ultrez 10 previously dispersed in hot water until completely dispersed.

3. pH

The results of pH test of the preparation is shown in Table V.14.

Table V.14 *pH test of the preparation*

No	Formula	pH
1	F1	5.78
2	F2	5.57
3	F3	5.41

Topical preparations are not allowed to have a pH below 4 because it can irritate skin and does not allowed to have a pH above 7 because it cause dry skin.

4. Spreading power

The test of gel preparation spreading power is shown in table V.15.

Table V.15 *spreading power test of formula.*

No	Formula	100 g	200 g	average
1	F1	6,1	6,3	5,95
2	F2	7	7,3	6,55
3	F3	6,1	6,9	6,16

The result of SPF gel density measurements showed that the formula I, II and III produced ranged from 5.95 to 6.15. A well gel preparation has a spreading range of 5-7 cm [17] Spreading capacity indicates the ability of the preparation to spread when the dosage is applied to the skin. Spreading ability also affects ease and comfort when the dosage is aplied on the skin.

5. Viscosity

The results of the viscosity test and flow properties are presented in Table V.16

Table V.16. *Evaluation of viscosity test and flow properties of preparation.*

No	rpm	Formula					
		F1		F2		F3	
		ɳ	F	ɳ	F	ɳ	F
1	0.5	7360	330.602	7040	316.228	5760	258.732
2	2	2280	409.659	1960	352.163	1960	352.163
3	5	1072	481.529	1040	467.155	928	416.846
4	10	608	546.212	60.0	539.025	540	485.1225
5	20	356	639.643	348	625.269	308	553.399
6	20	354	636.0495	348	625.269	306	549.8055
7	10	604	542.6185	596	535.4315	536	481.529
8	5	1064	477.9355	1032	463.5615	928	416.846
9	2	2260	406.0655	1940	348.5695	1940	348.5695
10	0.5	7280	327.0085	6960	312.6345	5680	255.1385

description : ɳ : viskosity (mpas)
force (dyne/cm2)F

Based on the table above, it shown that the three formulas decreased viscosity when stirring with high RPM. This is because the higher t RPM, the lower the viscosity of the preparation (melt) as effect the easier the preparation to pour. Based on observation the viscosity of gel preparation have plastic flow properties. Plastic is a non-newton flow properties where the presence of friction force the dosage will flow with an ideal viscosity. In general, the preparation has a plastic flow properties in which the friction force applied is greater then the viscosity will decrease as effect it will flow easily from the tube and more easily spread on the skin surface.

3.8 THE VALUE OF SPF GEL PRAPARATION TEST

The SPF (Sun Protection Factor) determination was performed in vitro using a UV-Vis spectrophotometer. The method used calculation method developed by Mansur. The determination of SPF values was performed on a gel base preparation (FI), gel containing nanoparticle extracts of ethyl acetate fraction of Jatropha leaves (F II) and gel containing the ethyl acetate fraction of Jatropha leaves (F III) each with a concentration of 0.1%. The test results of SPF FI, F II, and F III values are shown in Table V.17

Table V.17 *Result of SPF preparations test*

No	Formula	SPF Value	UV Protection Power
1	F1	0.550389	Do not have UV Protection
2	F2	12.028585	Extra protection
3	F3	7.186278	Extra protection

From the measurements of SPF values on FI without active substances it performed that the value of SPF obtained is very low with the sunscreen dosage efficacy, it does not provide protection against the harmful effects of UV radiation. This indicates that FI cannot be used as a sunscreen preparation.

4. CONCLUSION

The result of measurement of SPF value on F II and F III can be seen that both gel provide extra protection against UV light. These results show that both gel preparations have protective effect against sunlight by in vitro testing. However, from the calculation of SPF value obtained that SPF F II value greater than SPF F III where F II has SPF value 12 and F III has SPF value 7. This is because F II contains nanoparticle extract where the size of extract particles at size of nanoparticles improves the effectiveness of UV protection.

REFERENCES

[1] Hadinoto, I., Soerarti, W., & Meity, C. T. Pengaruh pH terhadap efektivitas Sediaan Tabir Matahari dengan Bahan Aktif Etil Heksil P-Metoksisinamat dan Oksibenzon dalam Basis Hidrofilik Krim secara In-Vitro. Kongres Ilmial XIII Ikatan Sarjana Farmasi Indonesia. Kumpulan Makalah, Jakarta, 2000: 342-345.

[2] Taufikkurohmah, Titik. Sintesis P-Metoksisinamat dari Etil P-Metoksisinamat Hasil Isolasi Rimpang Kencur (Kaemferia galangal L) Sebagai Kandidat

Tabir Surya. Journal of Chemistry. 2005.5(3):193-198.

[3] Windarwati, Sri. Pemanfaatan Fraksi Aktif Ekstrak Tanaman Jarak Pagar (Jatropha curcas) Sebagai Zat Antimikroba dan Antioksidan Dalam Sediaan Kosmetik [tesis]. Bogor: Program Studi Teknologi Industri Pertanian Institut Pertania Bogor; 2011. 60-7

[4] Ronny Martien, Perkembangan Teknologi Nanopartikel sebagai Sistem Penghantaran Obat. Majalah Farmaseutik. 2012.8(1):133-144.

[5] Harborne, J.B. Classes and functions of secondary products from plants. 1999.

[6] Hari, E. I. dan Ijah, M. Proses dan Aplikasi Nanopartikel Kitosan sebagai Penghantar Obat. Squalen. Vol.6 No.1 Mei 2011. Hal 1-8.

[7] Mansur, L S., et al. Determination of Sun Protection Factor For Spectrophotometry. Rio de Janeiro: An. Bran. Dermatologhy. 1986.

[8] Rahayu, W. P. Kajian aktivitas antimikroba ekstrak dan fraksi rimpang lengkuas (Alpina galanga) terhadap mikroba patogen dan perusak pangan. [Disertasi] Program Pasca Sarjana Fakultas Teknologi Pertanian. Institut Pertanian Bogor: Bogor; 1999.

[9] BPPT. Pembuatan Partikel Nano Kitosan dengan Metode Gelasi Ionik Menggunakan Magnetic Stirrer. Tanggerang: Balai Pengkaji dan Penerapan Teknologi. 2010.

[10] Mohanraj VJ, Chen Y. Nanopaticles-A review. J.Pharmaceutical. 2006. hal.561-573.

[11] Permata, Dina Wijaya. Preparasi Nanopartikel Sambung Silang Kitosan-Tripoliposfat Yang Mengandung Ginsenosida [skripsi]. Jakarta:Jurusan Farmasi Universitas Islam Negri Jakarta; 2013.

[12] Mardliyati, etik., Sjaikhurrizal El Muttaqien., dan Damai Ria Setyawati. Sintesis Nanopartikel Kitosan Trypoly Phosphate Dengan Metode Gelasi Ionik: Pengaruh Konsentrasi Dan Rasio Volume Terhadap Karakteristik Partikel. Prosiding Pertemuan Ilmiah Ilmu Pengetahuan dan Teknologi Bahan Alam, Jakartta. 2012. hal 90-93.

[13] Winarno FG, Fernandez IE. Nanoteknologi bagi Industri Pangan dan Kemasan. Bogor (ID): M-Brio Press. 2010.

[14] Gufron M. Nanoenkapsulasi metformin dengan nanokitosan sebagai obat antidiabetes tipe II [skripsi]. Bogor: Fakultas Perikanan Dan Kelautan Institut Pertanian Bogor; 2013.

[15] Kurniawati, Nia. Enkapsulasi Nanokitosan Pada Ekstrak Daun Tapak Dara (Catharanthus roseus) Sebagai Antihiperglikemia [Skripsi]. Bogor: Fakultas Perikanan Dan Kelautan Institut Pertanian Bogor; 2014.

[16] Avadi, M.R., et all. Preparation And Characterization of Insulin Nanoparticles Using Chitosan and Arabic Gum with Ionic Gealtion Methode. Nanomedicine: Nanotecnology, Biology, and Medicine. 2010. 6. hal.58-63.

[17] Wasitaatmadja. Penuntun Ilmu Kosmetik Medik. Universitas Indonesia Press. Jakarta.1997.