Hasil review artikel JFSK

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2 attachments (1 MB)

2032-5195-Reviewer A.pdf; 2032-5195-Reviewer B.pdf;

Yth. Mbak Nia
di tempat

Selamat malam,
Berikut saya sampaikan hasil review artikel yang mbak submit ke JFSK. Keputusannya adalah artikel tersebut harus direvisi. Silakan dapat direvisi secepatnya dan diunggah kembali melalui sistem. Terimakasih.

Salam,
Michael
Managing Editor JFSK

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Reviewer A:

Originality of the paper:
Good

Appropriateness of title/topic:
Excellent

Appropriateness to J Pharm Sci Community:
Excellent

Is the abstract appropriate?:
Good

Are the keywords appropriate?:
Excellent

Appropriate research design/methodology
:
Good

Relevance discussion:
Good

Valid conclusions:
Excellent

Clear, coherent, and well-written manuscript
:
Good

Appropriate literature citations:
Good

Quality of figures and tables:
Good

Overall quality of the paper:
Good

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Reviewer B:

Originality of the paper:
Good

Appropriateness of title/topic:
Fair

Appropriateness to J Pharm Sci Community:
Good

Is the abstract appropriate?:
Poor

Are the keywords appropriate?:
Good

Appropriate research design/methodology
:
Fair

Relevance discussion:
Fair

Valid conclusions:
Poor

Clear, coherent, and well-written manuscript
:
Poor

Appropriate literature citations:
Fair

Quality of figures and tables:
Good

Overall quality of the paper:
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FORMULATION LIPID NANOPARTICLES AND SILVER NANOPARTICLES TEMPEH EXTRACT: REVIEW ON PHYSICAL PROPERTIES AND PARTICLE SIZES

ABSTRACT

The nanoparticle preparation became one of the technologies chosen to improve the effectiveness of drug delivery. This research aims is to formulate lipid nanoparticle gel formulations with tempeh extract as active substances and silver nanoparticle gel formulations with tempeh extract as bioreductor with a review of physical properties and particle size. Lipid nanoparticles were made from soy lecithin phospholipids by heating at 60^0C and sonication method for 30 minutes then the active ingredient of tempeh extract was added just before sonication. Silver nanoparticles were made by adding bioreductor tempeh extract to $AgNO_3$ solution at 90^0C for 30 minutes. Tempeh extract is used in this study as an active ingredient in lipid nanoparticles and reductant in silver nanoparticles because tempeh is an authentic Indonesian food ingredient that is easily found and is known to have the main content of isoflavones which functions to help wound healing. Gel preparations were chosen to increase the acceptability and stability of lipid nanoparticles and silver nanoparticles. The results of particle size testing and physical properties were then statistically tested with the F T-test at a 95% confidence level. The average particle size of tempeh extract lipid nanoparticles is the same as the average particle size of silver tempeh extract nanoparticles with a value of P = 0.21. The average viscosity of tempeh extract lipid nanoparticles gel is the same as the average viscosity of silver tempeh nanoparticles gel with a P P-value of 0.59. The average spreadability of tempeh extract lipid nanoparticles gel is greater than the average spread ability of silver nanoparticles gel of tempeh extract with a value of P P-value = 0.99. The average pH value of tempeh extract lipid nanoparticles was higher than the average pH value of silver tempeh extract nanoparticles with P P-value = 0.98.

Keywords: *lipid nanoparticles; silver nanoparticles; tempeh extract; physical properties; gel; particle size*

ABSTRAK

Sediaan nanopartikel menjadi salah satu teknologi yang dipilih untuk meningkatkan efektivitas penghantaran obat. Penelitian ini bertujuan untuk melakukan formulasi sediaan gel nanopartikel lipid dengan ekstrak tempe sebagai zat aktif dan formulasi sediaan gel nanopartikel perak dengan ekstrak tempe sebagai bioreduktor dengan tinjauan terhadap sifat fisis dan ukuran partikel. Nanopartikel lipid dibuat dari fosfolipid lesitin kedelai dengan metode pemanasan pada suhu 60^0C dan metode sonikasi selama 30 menit kemudian bahan aktif ekstrak tempe ditambahkan sesaat sebelum dilakukan sonikasi. Nanopartikel perak dibuat dengan penambahan bioreduktor ekstrak tempe pada larutan $AgNO_3$ pada suhu 90^0C dengan lama pembuatan 30 menit. Ekstrak tempe digunakan dalam penelitian ini sebagai bahan aktif pada nanopartikel lipid dan pada nanopartikel perak sebagai reduktor. Tempe merupakan bahan makanan asli Indonesia yang mudah ditemui dan diketahui memiliki kandungan utama isoflavon berfungsi untuk membantu penyembuhan luka. Sediaan gel dipilih untuk meningkatkan akseptabilitas dan stabilitas sediaan nanopartikel lipid dan nanopartikel perak. Hasil pengujian ukuran partikel dan sifat fisis lalu diuji secara statistik dengan uji T pada taraf kepercayan 95%. Rata-rata ukuran partikel nanopartikel lipid ekstrak tempe sama dengan rata-rata ukuran partikel nanopartikel perak ekstrak tempe dengan nilai P = 0,21. Rata-rata viskositas gel nanopartikel lipid ekstrak tempe sama dengan

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rata-rata viskositas gel nanopartikel perak ekstrak tempe dengan nilai P = 0,59. Rata-rata daya sebar gel nanopartikel lipid ekstrak tempe lebih besar dibandingkan dengan rata-rata daya sebar gel nanopartikel perak ekstrak tempe dengan nilai P = 0,99. Rata-rata nilai pH gel nanopartikel lipid ekstrak tempe lebih tinggi dibandingkan dengan rata-rata nilai pH gel nanopartikel perak ekstrak tempe dengan nilai P = 0,98.
Kata kunci: *nanopartikel lipid; nanopartikel perak; ekstrak tempe; sifat fisis; gel; ukuran partikel*

INTRODUCTION

Nanoparticles are one of the technologies developed to increase the effectiveness of drug delivery (Latarissa 2017). Nanoparticles have the advantage to penetrate the space between cells and ~~it~~ is able to increase the contact surface area. Nano-sized particles have unique physical properties because they have the possibility to be combined with a variety of technologies so that they are expected to produce a more effective drug delivery system (Martien *et al.* 2012). Nanoparticles can be made with certain colloidal formation systems, one example is liposomes that are made using soy lecithin (Dwiastuti, Noegrohati, and Istyastono 2016). Another method of making nanoparticles is to use metals then reduced with certain materials to form nanoparticles, one example is silver nanoparticles using $AgNO_3$ solution added with certain reducing agents (Sileikaite *et al.* 2006).

Lipid nanoparticles are made through the formation of soy lecithin phospholipid nano liposomes by heating and sonication methods (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016). Soy lecithin contains unsaturated fatty acids. It has good penetration in the skin and high compatibility in the body (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016). Lipid nanoparticles can combine lipophilic and hydrophilic properties in preparations (Dwinna 2010).

Silver nanoparticles are produced through a method of mixing $AgNO_3$ solution (Tatang Wahyuni, Doni Sugiyama 2011) and certain bioreductors (Muliadi *et al.* 2015). Bioreductors are extracts of natural substances that can act as reductors (Jain D *et al.* 2009). The success of silver nanoparticle formation can be known shortly after manufacture by measuring the maximum wavelength using UV-Vis spectrophotometry (Jain, Arora, *et al.* 2009).

Tempeh extract on lipid nanoparticles is used as an active substance, while tempeh extract on silver nanoparticles is used as a bioreductor. Tempeh extract is known to have the main content of isoflavones derived from flavonoid compounds that function as wound healers (Park *et al.* 2011). In this research, lipid nanoparticles and silver nanoparticles were formulated to review the physical properties between the two preparations. Lipid nanoparticles were developed as topical preparations because they have good penetration

ability (zur Mühlen *et al.* 1998) (Jafar *et al.* 2015), whereas silver nanoparticles were developed as topical preparations because they have anti-bacterial ability (Ariyanta 2014) so they can be developed in preparations wound healing preparations (Ariyanta 2014) and anti-acne (Septyarin 2017). The development of these two preparations needs to be carried out a review of particle size and physical properties as seen from the parameters of viscosity, dispersion, and pH. This preparation is expected to be an alternative choice of drug dosage forms, especially topical preparations for various expected pharmacological effects, for example~~:~~ wound healing and anti-acne preparations. Therefore, this study aims to formulate lipid nanoparticle gel formulations with tempeh extract as active substances and silver nanoparticle gel formulations with tempe extracts as bioreductors with a review of physical properties and particle size.

METHOD

Materials

~~Material~~ The material used in this study were: soybean lecithin (Sigma-Aldrich), distilled water, tempeh with three days fermentation under the brand name “Muchlar”, $AgNO_3$, Carbopol, Propylenglycol, Triethanolamine, and Glycerin.

Instrumentation

Instruments used in this study were a blender, ultra turax, sonicator, hotplate magnetic stirrer, particle size analyzer (HORIBA Scientific, Japan), Spectrophotometer UV-VIS (Shimadzu, JAPAN), Viscosimeter Rheosys.

Procedure

a. Preparation of Tempeh Extract

   Tempeh used in the manufacture of tempeh extract is tempe with three days fermentation under the brand name "Muchlar". Tempeh is cut 5 cm long and 6.5 cm wide and 1 cm thick. Tempeh extract ~~is~~ was made with the ratio of tempeh and aqua dest which is 1: 2. Tempeh weighed 300 grams then added 600 mL of distilled water and then heated to a temperature of 90^0C and then maintained so that the temperature remained 90^0C for 30 minutes, then the extract cooled to a temperature of 30^0C then filter with filter paper.

b. Preparation of Lipid Nanoparticles with Tempe Extract as an Active Substances

   Lipid nanoparticles are made by weighing soybean lecithin by 12 grams and then minimized by mortar and stamper. The refined soy lecithin was then homogeneously dispersed in 200 mL of aqua bidest at 60^0C. The soy lecithin dispersion was then

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blended at high speed for sixty seconds. The soy lecithin suspension was maintained at 60^0C and then homogenized with ultraturax for one minute on 4 scales. Furthermore, soy lecithin suspension was put in the bath sonicator together with tempeh extract as much as 80 mL. The sonicator bath is set to a temperature of 60^0C for 30 minutes (Dwiastuti, Noegrohati, Istyastono, *et al*. 2016).

c. Preparation of Silver Nanoparticles with Tempeh Extract as Bioreductor

Silver nanoparticles were made by weighing 0.034 grams of silver nitrate ($AgNO_3$) dissolved in 200 mL aquabidest (1mM) silver nitrate solution. The silver nitrate solution is then heated with a hotplate to a temperature of 90^0C. After the silver nitrate solution at 90^0C, it is added with tempeh extract 80 mL and kept at 90^0C while stirring with a magnetic stirrer for 30 minutes (Ramadon and Mun'im 2016) (Ariyanta 2014).

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d. Preparation of Gel and Physical Properties Testing

Tabel 1. Gel Formula used

Formula	
R/ Carbopol 3% b/v	50 gram
Propylene glycol	30 gram
Glycerin	60 gram
Triethanolamine (TEA)	2,4 gram

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The preparation of this formula began with the swelling of carbopol. It is made in 100 mL lipid nanoparticles or 100 mL silver nanoparticles with 3 grams of carbopol then left to stand for 24 hours. After 24 hours, weighing 3 grams of carbopol 3% w/v as much as 50 grams and adding TEA to the mortar and stirring until homogeneous for about 5 minutes. Next, put the mixture of carbopol and TEA into the blender and add propylene glycol and glycerin and then mixing with a blender for three minutes at low speed.

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1. Scattering Test.

The scatter power test is carried out 24 hours after manufacture by weighing one gram of gel and placed in the middle of a large round glass. On top of the gel is placed another round glass and ballast with a total weight of 125 grams then allowed to stand for one minute and note the spread diameter.

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2. Viscosity Test.

The viscosity test was carried out 24 hours after making the gel using the Rheosys Merlin VR model.

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3. pH test.

The pH test is carried out 24 hours after the gel is made using a pH-meter. The pH test begins with weighing one gram of gel and then dissolving it in 10 mL aqua dest. Furthermore, the pH meter is inserted into the aqua dest and then put into a gel then the pH meter will show the pH value.

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e. Wavelength Testing of Silver Nanoparticles.

Measurement of the maximum wavelength is one of the initial steps to determine whether silver nanoparticles are formed or not. The indicator of silver nanoparticles is the wavelength with maximum absorbance in the range of 400 - 450 nm (Ariyanta 2014) (Ayu 2015).

f. Particles Size Testing of Lipid Nanoparticles and Silver Nanoparticles.

This measurement is done by conducting a particle size analyzer (PSA) test in the medicine and food laboratory of the Faculty of Mathematics and Natural Sciences, Islamic University of Indonesia.

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g. Data analysis

Particle size data and physical properties test results obtained in this study were then performed statistical tests with the R computational statistical program. The ~~T~~ T-test used to find out whether there are significant differences in physical properties results between lipid nanoparticle with silver nanoparticles preparations.

RESULTS AND DISCUSSION

Tempeh extract contains a lot of isoflavones has a function as a wound healing (Danciu *et al*. 2012). Tempeh extract is made with water solvent so that the tempeh extract can be used as a bioreductor in the formation of silver nanoparticles. One of the bioreductor requirements in the formation of silver nanoparticles is a water-soluble extract. That is expected to dissolve and react with $AgNO_3$ solution. While in the addition of lipid nanoparticles, tempeh extract functions as an active substance.

Physical Appearance of Tempeh Extract Lipid Nanoparticles and Tempeh Extract Silver Nanoparticles

Lipid nanoparticle preparations made in this study had a description of a turbid white color and unique smelled of soy lecithin. Turbid white color formed because of colloidal dispersion. The silver nanoparticle preparations in this study had a clear ~~reddish~~ reddish-

brown color and unique smelled of tempeh extract. Clear ~~reddish~~ reddish ~~-~~brown in a aqueous solution formed from excitation. It is caused by reduction of silver ion; which indicated formation of silver nanoparticle (Jain, Daima, *et al.* 2009). This physical appearance of difference nanoparticle preparation and gel nanoparticle is presented ~~on~~ in figure 1 and 2.

(a) (b)

Figure 1. Tempeh Extract Nanoparticle Preparation
(a) Lipid Nanoparticles; (b) Silver Nanoparticles

(a) (b)

Figure 2. Gel Nanoparticle
(a) Lipid Nanoparticle; (b) Silver Nanoparticle

The Particle Size of Tempeh Extract Lipid Nanoparticle and Tempeh Extract Silver Nanoparticles

The lipid nanoparticles formation can be known after the Particle Size Analyzer (PSA) test have been done. The formation of silver nanoparticles can be known immediately after making by measuring the maximum wavelength using UV Vis spectrophotometer. If the wavelength is between 400 - 450 nm, it means that silver nanoparticles are known (Maharini *et al.* 2017). This is one of the advantages of silver nanoparticles compared to lipid nanoparticles, namely the success of the preparation formulation can be immediately known ~~immediately~~ after manufacture.

In this study, wavelength measurements were made after 24 hours of storage. The average wavelength measurements of silver nanoparticles with three replications after 24 hours of storage at room temperature were obtained 406 nm. The results of these wavelength measurements indicate that silver nanoparticles can be formed using the extract of tempeh as bioreductor at a temperature of 90^0C and 30 minutes (Sari Purwo Ismaya *et al.* 2017).

PSA test was conducted to determine the size of lipid nanoparticles (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016) and silver nanoparticles. PSA test results are shown in ~~table~~ Table 2.

Table 2.
Particle Size Analyzer (PSA) result

Replication	Tempeh Extract Nanoparticle Lipid (nm)	Tempeh Extract Silver Nanoparticles (nm)
Replication 1	129,00	128,10
Replication 2	124,00	87,00
Replication 3	124,20	69,20
Average	130,03 ± 6,41	94,76 ± 30,20

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The measurement results in table 2 shown that the silver nanoparticle formula could produce particle sizes less than 100 nm, while the lipid nanoparticle formulas produce sizes more than 100 nm. Analysis with ~~T~~ T-test at 95% confidence level obtained ~~p~~ p-value of 0.21, thus the average particle size of tempeh extract lipid nanoparticles was the same as the average particle size of tempeh extract silver nanoparticles.

Physical Properties of Tempeh Extract Lipid Nanoparticles Gel and Tempeh Extract Silver Nanoparticle Gel Preparations

Preparation of tempeh extract lipid nanoparticles and tempeh extract silver nanoparticles were tested for physical properties with parameters including: viscosity, spread ability, and pH value. Physical test results of lipid nanoparticle gel and silver nanoparticle gel preparations showed physical properties test results with pH parameters. The results of the physical properties test were followed by an analysis of the ~~T~~ T-test with a 95% confidence level to see differences in physical properties of the two preparations.

Table 3.
Viscosity, Spread ability, and pH Value Result

Parameter	Lipid Nanoparticle	Silver Nanoparticle	*p value*	Statistical Result
Viscosity	4,02 ± 0,20	4,22 ± 0,33	0,59	Not Significantly Different
Spread ability	4,37 ± 0,11	4,05 ± 0,02	0,99	Not Significantly Different
pH	7,70 ± 0,10	7,33 ± 0,05	0,98	Not Significantly Different

The results of testing the viscosity response (table 3) after 24 hours of preparation of lipid nanoparticles and tempeh extracts of silver nanoparticles indicated no different results. This result is strengthened by the results of statistical tests using the ~~T~~ T-test. The statistical results showed ~~p~~ p-value is 0.59~~,~~ so that it can be said that the viscosity of the two preparations that are not significantly different.

The similar analysis results were also found in the spread–ability (table 3) and pH response of lipid nanoparticle gel and tempeh extract silver nanoparticles. Statistical tests with the ~~T~~ T-test obtained that the ~~p~~ p-value of the spread-ability test is 0.99 and the ~~p~~ p-value of the pH test is 0.98. It can be said that the spread–ability and pH of the preparations resulting from the formulation of lipid nanoparticles and silver nanoparticles of tempeh extract have no significantly different results. This result can be obtained because the amount of gelling agent and humectant used for the preparation of gel nanoparticle lipid and silver nanoparticle gel preparations uses the same amount. The physical properties of gel preparation are influenced by the gelling agent and humectants used in the formulation.

CONCLUSIONS AND RECOMMENDATIONS

Lipid nanoparticle formulation with an active ingredient of tempeh extract was carried out by 60^0C heating method and 30 minutes of sonication. Silver nanoparticle formulation with tempeh extract as bioreductor was carried out by 90^0C heating method and 30 minutes making time. The average particle size, viscosity, spread–ability and pH value of tempeh extract lipid nanoparticles is similar ~~with~~ to the average particle size of tempeh extract silver nanoparticles.

Suggestion from this research is that it is necessary to optimize the temperature and duration of manufacture in the manufacture of lipid nanoparticles and silver nanoparticles and qualitative and quantitative tests of flavonoid compounds in tempeh extract.

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~~FORMULATION~~ LIPID ~~NANOPARTICLES~~ AND SILVER NANOPARTICLES GELS FORMULATION OF TEMPEH EXTRACT: REVIEW ON PHYSICAL PROPERTIES AND PARTICLE SIZES

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ABSTRACT

The nanoparticle preparation became one of the technologies chosen to improve the effectiveness of drug delivery. This research aims ~~is~~ to prepare~~formulate~~ lipid nanoparticle gel formulations with tempeh extract as active substances and silver nanoparticle gel formulations with tempeh extract as bioreduction~~tor~~ with a review of physical properties and particle size. Lipid nanoparticles were made from soy lecithin phospholipids by heating at 60^0C and sonication method for 30 minutes then the active ingredient of tempeh extract was added just before sonication. Silver nanoparticles were made by adding bioreduction~~or~~ tempeh extract to $AgNO_3$ solution at 90^0C for 30 minutes. Tempeh extract is used in this study as an active ingredient in lipid nanoparticles and reductant in silver nanoparticles because tempeh is an authentic Indonesian food ingredient that is easily found and is known to have the main content of isoflavones which functions to help wound healing. Gel preparations were chosen to increase the acceptability and stability of lipid nanoparticles and silver nanoparticles. The results of particle size testing and physical properties were then statistically tested with the T-test at a 95% confidence level. The average particle size of tempeh extract lipid nanoparticles is the same as the average particle size of silver tempeh extract nanoparticles with a value of P = 0.21. The average viscosity of tempeh extract lipid nanoparticles gel is the same as the average viscosity of silver tempeh nanoparticles gel with a P-value of 0.59. The average spreadability of tempeh extract lipid nanoparticles gel is higher~~greater~~ than the average spread-ability of silver nanoparticles gel of tempeh extract with a value of P-value = 0.99. The average pH value of tempeh extract lipid nanoparticles was higher than the average pH value of silver tempeh extract nanoparticles with P-value = 0.98.

Keywords: *lipid nanoparticles; silver nanoparticles; tempeh extract; physical properties; gel; particle size*

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ABSTRAK

Sediaan nanopartikel menjadi salah satu teknologi yang dipilih untuk meningkatkan efektivitas penghantaran obat. Penelitian ini bertujuan untuk melakukan formulasi sediaan gel nanopartikel lipid menggunakan~~dengan~~ ekstrak tempe sebagai zat aktif dan formulasi sediaan gel nanopartikel perak menggunakan~~dengan~~ ekstrak tempe sebagai bioreduktor ~~dengan tinjauan terhadap sifat fisis dan ukuran partikel~~. Nanopartikel lipid dibuat dari fosfolipid lesitin kedelai dengan metode pemanasan pada suhu 60^0C dan metode sonikasi selama 30 menit kemudian bahan aktif ekstrak tempe ditambahkan sesaat sebelum dilakukan sonikasi. Nanopartikel perak dibuat dengan penambahan bioreduktor ekstrak tempe pada larutan $AgNO_3$ pada suhu 90^0C dengan lama pembuatan 30 menit. Ekstrak tempe digunakan dalam penelitian ini sebagai bahan aktif pada nanopartikel lipid dan pada nanopartikel perak sebagai reduktor. Tempe merupakan bahan makanan asli Indonesia yang mudah ditemui dan diketahui memiliki kandungan utama isoflavon berfungsi untuk membantu penyembuhan luka. Sediaan gel dipilih untuk meningkatkan akseptabilitas dan stabilitas sediaan nanopartikel lipid dan nanopartikel perak. Hasil pengujian ukuran partikel dan sifat

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fisis lalu diuji secara statistik dengan uji T pada taraf kepercayan 95%. Rata-rata ukuran partikel nanopartikel lipid ekstrak tempe sama dengan rata-rata ukuran partikel nanopartikel perak ekstrak tempe dengan nilai P = 0,21. Rata-rata viskositas gel nanopartikel lipid ekstrak tempe sama dengan rata-rata viskositas gel nanopartikel perak ekstrak tempe dengan nilai P = 0,59. Rata-rata daya sebar gel nanopartikel lipid ekstrak tempe lebih besar dibandingkan dengan rata-rata daya sebar gel nanopartikel perak ekstrak tempe dengan nilai P = 0,99. Rata-rata nilai pH gel nanopartikel lipid ekstrak tempe lebih tinggi dibandingkan dengan rata-rata nilai pH gel nanopartikel perak ekstrak tempe dengan nilai P = 0,98. Disimpulkan bahwa (menjawab tujuan)

Kata kunci: *nanopartikel lipid; nanopartikel perak; ekstrak tempe; sifat fisis; gel; ukuran partikel*

Pay attention to the order of abstracts:
Background (concise, to answer why nanoparticles are made? And why is it used tempeh?)
Purpose:
Method:
Results:
Conclusion

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INTRODUCTION

Nanoparticles are one of the technologies developed to increase the effectiveness of drug delivery (Latarissa 2017). Nanoparticles have the advantage to penetrate the space between cells and areit able to increase the ~~contact~~ surface area contact. Nano-sized particles have unique physical properties because they ~~have the possibility to~~can be combined with a variety of technologies. ~~so that t~~They are expected to produce a more effective drug delivery system (Martien *et al.* 2012). Nanoparticles can be made with ~~certain~~ specific colloidal formation systems, and one example is liposomes that are made using soy lecithin (Dwiastuti, Noegrohati, and Istyastono 2016). Another method for ~~of making~~preparation of nanoparticles is to use metals then reduced with ~~certain~~ specific materials to form nanoparticles~~,~~; one example is silver nanoparticles using $AgNO_3$ solution added with ~~certain~~ specific reducing agents (Sileikaite *et al.* 2006).

Lipid nanoparticles are made through the formation of soy lecithin phospholipid nano liposomes by heating and sonication methods (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016). Soy lecithin contains unsaturated fatty acids. It has excellent~~good~~ penetration in the skin and high compatibility in the body (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016). Lipid nanoparticles can combine lipophilic and hydrophilic properties in preparations (Dwinna 2010).

Silver nanoparticles are produced through a method of mixing $AgNO_3$ solution (Tatang Wahyuni, Doni Sugiyama 2011) and certain bioreductors (Muliadi *et al.* 2015). Bioreductors

Commented [Office7]: The phrase soy lecithin phospholipid nano liposomes appears to be confusing. Consider re-writing

are extracts of natural substances that can act as reductors (Jain D *et al.* 2009). The success of silver nanoparticle formation can be known shortly after manufacture by measuring the maximum wavelength using UV-Vis spectrophotometry (Jain, Arora, *et al.* 2009).

Tempeh extract on lipid nanoparticles is used as an active substance, while tempeh extract on silver nanoparticles is used as a bioreductor. Tempeh extract is known to have the main content of isoflavones derived from flavonoid compounds that function as wound healers (Park *et al.* 2011). In this research, lipid nanoparticles and silver nanoparticles were formulated to review the physical properties between the two preparations. Lipid nanoparticles were developed as topical preparations because they have good penetration ability (Zzur Mühlen *et al.* 1998) (Jafar *et al.* 2015)., whereas sSilver nanoparticles were developed as topical preparations because they have the anti-bacterial ability (Ariyanta 2014). T so they can be developed in preparations for wound healing preparations (Ariyanta 2014) and anti-acne (Septyarin 2017). The development of these two preparations needs to be carried out a review ofreviewed for particle size and physical properties as seen from the parameters of viscosity, dispersion, and pH. This preparation is expected to be a an alternative choice of drug dosage forms, especially topical preparations for various expected pharmacological effects, for example,: wound healing and anti-acne preparations. Therefore, this study aims to formulate lipid nanoparticle gel formulations with tempeh extract as active substances and silver nanoparticle gel formulations with tempeh extract as bioreductors with a review of physical properties and particle size.

METHOD

Materials

The mMaterial used in this study were: soybean lecithin (Sigma-Aldrich), distilled water, tempeh with three days fermentation under the brand name "Muchlar", $AgNO_3$, Carbopol, Propylenglycol, Triethanolamine, and Glycerin are obtained from…….

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Instrumentation

Instruments used in this study were a blender, ultra turax, sonicator, hotplate magnetic stirrer, particle size analyzer (HORIBA Scientific, Japan), Spectrophotometer UV-VIS (Shimadzu, JAPAN), Viscosimeter Rheosys.

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Procedure

a. Preparation of Tempeh Extract

The tempeh extract was prepared by tempeh Tempeh used in the manufacture of tempeh extract is tempe with three days fermentation under the brand name

"Muchlar". Tempeh wasis cut 5 cm long and 6.5 cm wide and 1 cm thick. Tempeh extract wasis made with the ratio of tempeh and aquadest, which is 1: 2. Three hundred grams of tempeh was added into 600 mL of distilled water, then heated to a temperature of 900C. Maintained the temperature remained 900C for 30 minutes, then the extract cooled to a temperature of 300C then filter with filter paperTempeh weighed 300 grams then added 600 mL of distilled water and then heated to a temperature of 90^0C and then maintained so that the temperature remained 90^0C for 30 minutes, then the extract cooled to a temperature of 30^0C then filter with filter paper.

–The lipid nanoparticle of tempeh extract as the active substance was prepared Preparation of Lipid Nanoparticles with Tempe Extract as Active Substances

b.c. Preparation of Silver Nanoparticles usingwith Tempeh Extract as Bioreductor

Silver nanoparticles were made by weighing 0.034 grams of silver nitrate ($AgNO_3$) dissolved in 200 mL aquabidest (1mM) silver nitrate solution. The silver nitrate solution wasis then heated with hotplate to a temperature of 90^0C. Then,After the silver nitrate solution at 90^0C, it wasis added with tempeh extract 80 mL and kept at 90^0C while stirring with a magnetic stirrer for 30 minutes (Ramadon and Mun'im 2016) (Ariyanta 2014).

c.d. Preparation of Gel and Physical Properties Testing

Tabel 1. Gel Formula of…..(describe to deatail)used

Formula	
R/ Carbopol 3% b/v	50 grams
Propylenglycol	30 grams
Glycerin	60 grams
Triethanolamin (TEA)	2,4 grams

The preparation of this formula began with the swelling of carbopol. It wasis preparedmade in 100 mL lipid nanoparticles or 100 mL silver nanoparticles with 3 grams of carbopol then left to stand for 24 hours. ThenAfter 24 hours, weighing 3 grams of carbopol 3% w/v as much as 50 grams and adding TEA to the mortar and stirring until homogeneous for about 5 minutes. Next, put the mixture of carbopol and TEA into the blender and add propylene glycol and glycerin and then mixing with a blender for three minutes at low speed.

1. Scattering Test.

The scatter power test wasis carried out 24 hours after manufacture by weighing one gram of gel and placed in the middle of a large round glass. On top of the gel

wasis placed another round glass and ballast with a total weight of 125 grams then allowed to stand for one minute and note the spread diameter.

2. Viscosity Test.

The viscosity test was carried out 24 hours after preparingmaking the gel using the Rheosys Merlin VR model.

3. pH test.

The pH test is carried out 24 hours after the gel preparedis made using a pH-meter. The pH test begins with weighing one gram of gel and then dissolving it in 10 mL aquadest. Furthermore, the pH meter is inserted into the aquadest and then put into a gel, then the pH meter will show the pH value.

d.e. Wavelength Testing of Silver Nanoparticles.

Measurement of the maximum wavelength is one of the initial steps to determine whether silver nanoparticles are formed or not. The indicator of silver nanoparticles is the wavelength with maximum absorbance in the range of 400 - 450 nm (Ariyanta 2014) (Ayu 2015).

e.f. Particles Size Testing of Lipid Nanoparticles and Silver Nanoparticles.

This measurement is done by conducting a DLS particle size analyzer (PSAHoriba SZ 100, Japan) test in the medicine and food laboratory of the Faculty of Mathematics and Natural Sciences, Islamic University of Indonesia.

f.g. Data analysis

Particle size data and physical properties test results obtained in this study were then performed statistical tests with the R computational statistical program. The T–test used to find out whether there are significant differences in physical properties results between lipid nanoparticle with silver nanoparticles preparations.

RESULTS AND DISCUSSION

Tempeh extract contains a lot of isoflavones withhas a function as a wound healing (Danciu *et al.* 2012). Tempeh extract wasis preparedmade with water solvent so that the tempeh extract can be used as a bioreductor in the formation of silver nanoparticles. One of the bioreductor requirements in the formation of silver nanoparticles is a water-soluble extract. That is expected to dissolve and react with $AgNO_3$ solution. While in the addition of lipid nanoparticles, tempeh extract functions as an active substance.

Physical Appearance of Tempeh Extract Lipid Nanoparticles and Tempeh Extract Silver Nanoparticles

The description of l~~L~~ipid nanoparticle preparations ~~made in this study had a description of~~was a turbid white color, and unique smelled of soy lecithin. The t~~T~~urbid white color formed because of colloidal dispersion. The silver nanoparticle preparations ~~in this study~~ had a clear reddish-~~-~~brown, ~~color~~ and unique smelled of tempeh extract. Clear reddish-~~-~~brown in the aqueous solution formed from excitation. The reduction of silver ion causes it; which indicated the formation of silver nanoparticle (Jain, Daima, et al. 2009). This physical appearance of difference nanoparticle preparation and gel nanoparticle is presented in figure 1 and 2.~~It is caused by reduction of silver ion; which indicated formation of silver nanoparticle (Jain, Daima, *et al*. 2009). This physical appearance of difference nanoparticle preparation and gel nanoparticle is presented on figure 1 and 2.~~

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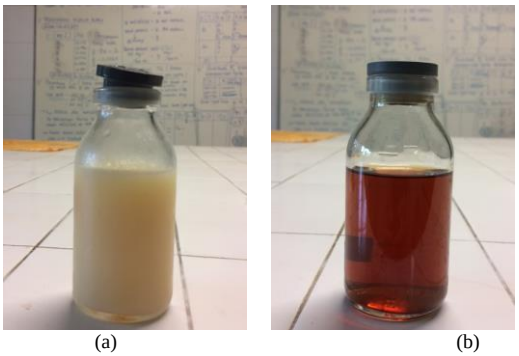
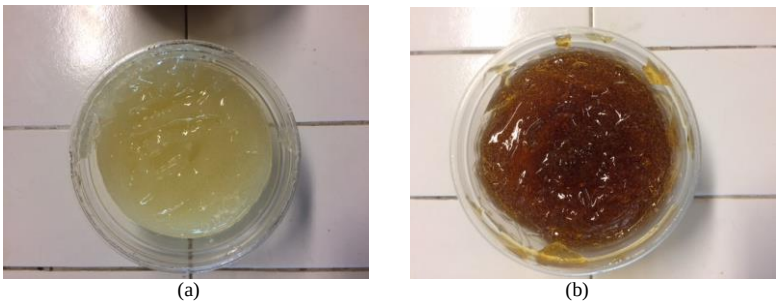


(a) (b)

Figure 1. Tempeh Extract Nanoparticle Preparation
(a) Lipid Nanoparticles; (b) Silver Nanoparticles



(a) (b)

Figure 2. Gel Nanoparticle
(a) Lipid Nanoparticle; (b) Silver Nanoparticle

The Particle Size of Tempeh Extract Lipid Nanoparticle and Tempeh Extract Silver Nanoparticles

The lipid nanoparticles formation can be known after the Particle Size Analyzer (PSA) test have been done. The formation of silver nanoparticles can be recognizedknown immediately after making by measuring the maximum wavelength using UV Vis spectrophotometer. If the wavelength is between 400 - 450 nm, it means that silver nanoparticles are known (Maharini *et al.* 2017). This is one of the advantages of silver nanoparticles compared to lipid nanoparticles, namely the success of the preparation formulation can be immediately known immediately after manufacture.

In this study, wavelength measurements were made after 24 hours of storage. The average wavelength measurements of silver nanoparticles with three replications after 24 hours of storage at room temperature were obtained 406 nm. The results of these wavelength measurements indicate that silver nanoparticles can be formed using the extract of tempeh as bioreductor at a temperature of 90^0C and 30 minutes (Sari Purwo Ismaya *et al.* 2017).

PSA test was conducted to determine the size of lipid nanoparticles (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016) and silver nanoparticles. PSA test results are shown in table 2.

Table 2.
Particle Size Analyzer (PSA) result of……..(detail)

Replication	Tempeh Extract Nanoparticle Lipid (nm)	Tempeh Extract Silver Nanoparticles (nm)
Replication 1	129,00	128,10
Replication 2	124,00	87,00
Replication 3	124,20	69,20
Average	130,03 ± 6,41	94,76 ± 30,20

The measurement results in table 2 showedn that the silver nanoparticle formula could produce particle sizes less than 100 nm, while the lipid nanoparticle formulas produce sizes more than 100 nm. Analysis with T-test at 95% confidence level obtained a p-value of 0.21. Thus the average particle size of tempeh extract lipid nanoparticles was the same as the average particle size of tempeh extract silver nanoparticles. Why? Give an explanation by comparing with other related references…

Physical Properties of Tempeh Extract Lipid Nanoparticles Gel and Tempeh Extract Silver Nanoparticle Gel Preparations

Preparation of tempeh extract lipid nanoparticles and tempeh extract silver nanoparticles were tested for physical properties with parameters including: viscosity, spread ability, and pH value. Physical test results of lipid nanoparticle gel and silver nanoparticle gel preparations showed physical properties test results with pH parameters. The results of the

physical properties test were followed by an analysis of the T test with a 95% confidence level to see differences in physical properties of the two preparations.

Table 3.
Viscosity, Spread ability, and pH Value Result of……(n=3/number of replication)

Parameter	Lipid Nanoparticle	Silver Nanoparticle	*p value*	Statistical Result
Viscosity (unit?)	4,02 ± 0,20	4,22 ± 0,33	0,59	Not Significantly Different
Spread—ability (unit?)	4,37 ± 0,11	4,05 ± 0,02	0,99	Not Significantly Different
pH	7,70 ± 0,10	7,33 ± 0,05	0,98	Not Significantly Different

The results of ~~testing~~ the viscosity testing~~response~~ (table 3) after 24 hours of preparation of lipid nanoparticles and tempeh extracts of silver nanoparticles indicated no different results. This result is strengthened by the results of statistical tests using the T-test. The analytical results showed p-value is 0.59 so that it can be said that the viscosity of the two preparations that are not significantly different~~The statistical results showed p-value is 0.59, so that it can be said that the viscosity of the two preparations that are not significantly different~~. Why? Give an explanation by comparing with other related references…

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The similar analysis results were also found in the spread-ability (table 3) and pH response of lipid nanoparticle gel and tempeh extract silver nanoparticles. Statistical tests with the T-test obtained that the p-value of the spread-ability test is 0.99, and the p-value of the pH test is 0.98. It can be ~~said~~ explained that the spread-ability and pH of the preparations resulting from the formulation of lipid nanoparticles and silver nanoparticles of tempeh extract have no significantly different results. This result can be obtained because the amount of gelling agent and humectant used for the preparation of gel nanoparticle lipid and silver nanoparticle gel preparations uses the same amount. The physical properties of gel preparation are influenced by the gelling agent and humectants used in the formulation. Why? Give an explanation by comparing with other related references

CONCLUSIONS AND RECOMMENDATIONS

Lipid nanoparticle formulation with the active ingredient of tempeh extract was carried out by 60^0C heating method and 30 minutes of sonication. Silver nanoparticle formulation with tempeh extract as bioreductor was carried out by 90^0C heating method and 30 minutes making time. The average particle size, viscosity, spread-ability and pH value of tempeh

extract lipid nanoparticles is similar to~~with~~ the average particle size of tempeh extract silver nanoparticles.

Suggestion from this research is that it is necessary to optimize the temperature and duration of manufacture in the manufacture of lipid nanoparticles and silver nanoparticles and qualitative and quantitative tests of flavonoid compounds in tempeh extract.

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Notes:

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LIPID AND SILVER NANOPARTICLES GELS FORMULATION OF TEMPEH EXTRACT

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Received August 10, 2019; Accepted November 21, 2019

ABSTRACT

Tempeh extract is used in this study as an active ingredient in lipid nanoparticles and reductant in silver nanoparticles because tempeh is an authentic Indonesian food ingredient and is known to have the main content of isoflavones. Gel preparations were chosen to increase the acceptability and stability of lipid and silver nanoparticles. This research aim is to formulate lipid nanoparticle gel formulations with tempeh extract as active substances and silver nanoparticle gel formulations with tempeh extract as bioreduction. Lipid nanoparticles were made from soy lecithin phospholipids by heating at 60˚C and sonication method for 30 minutes then the tempeh extract was added just before sonication. Silver nanoparticles were made by adding tempeh extract to $AgNO_3$ solution at 90˚C for 30 minutes. The average particle size of tempeh extract lipid nanoparticles was 130.03 nm and silver nanoparticle was 94.76 nm. The average viscosity of tempeh extract lipid nanoparticles gel was 4.02 d.Pa.s and silver nanoparticles was 4.22 d.Pa.s. The average spreadability of tempeh extract lipid nanoparticles gel was 4.37 cm and silver nanoparticles is 4.05 cm. The average pH value of tempeh extract lipid nanoparticles was 7.70 and silver nanoparticles was 7.33.

Keywords: gel; lipid nanoparticles; particle size; silver nanoparticles; tempeh extract

INTRODUCTION

Nanoparticles are one of the technologies developed to increase the effectiveness of drug delivery (Latarissa 2017). Nanoparticles have the advantage to penetrate the space between cells and it able to increase the surface area contact. Nano-sized particles have unique physical properties because they can be combined with a variety of technologies. They are expected to produce a more effective drug delivery system (Martien *et al.* 2012). Nanoparticles can be made with specific colloidal formation systems, and one example is liposomes that are made using soy lecithin (Dwiastuti, Noegrohati, and Istyastono 2016). Another method for preparation of nanoparticles is to use metals then reduced with specific materials to form nanoparticles, one example is silver nanoparticles using $AgNO_3$ solution added with specific reducing agents (Sileikaite *et al.* 2006).

Lipid nanoparticles are made through the formation of soy lecithin phospholipid nano-liposomes by heating and sonication methods (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016). Soy lecithin contains unsaturated fatty acids. It has excellent penetration in the skin and high compatibility in the body (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016). Lipid nanoparticles can combine lipophilic and hydrophilic properties in preparations (Dwinna 2010). Silver nanoparticles are produced through a method of mixing $AgNO_3$ solution (Tatang Wahyuni, Doni Sugiyama 2011) and specific bioreduction (Muliadi *et al.* 2015). Bioreduction are extracts of natural substances that can act as reductant (Jain D *et al.* 2009). The success of silver nanoparticle formation can be known shortly after manufacture by measuring the maximum wavelength using UV-Vis spectrophotometry (Jain, Arora, *et al.* 2009).

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Tempeh extract on lipid nanoparticles is used as an active substance, while tempeh extract on silver nanoparticles is used as a bioreduction. Tempeh extract is known to have the main content of isoflavones derived from flavonoid compounds that function as wound healers (Park *et al.* 2011). In this research, lipid nanoparticles and silver nanoparticles were formulated to review the physical properties between the two preparations. Lipid nanoparticles were developed as topical preparations because they have good penetration ability (zur Mühlen *et al.* 1998) (Jafar *et al.* 2015). Silver nanoparticles were developed as topical preparations because they have the anti-bacterial ability (Ariyanta 2014). It can be developed in preparations for wound healing preparations (Ariyanta 2014) and anti-acne (Septyarin 2017). The development of these two preparations needs to be reviewed for particle size and physical properties as seen from the parameters of viscosity, dispersion, and pH. This preparation is expected to be a choice of drug dosage forms, especially topical preparations for various expected pharmacological effects, for example: wound healing and anti-acne preparations. Therefore, this study aims to formulate lipid nanoparticle gel formulations with tempeh extract as active substances and silver nanoparticle gel formulations with tempeh extract as bioreduction with a review of physical properties and particle size.

METHODS

Materials

The material used in this study were: soybean lecithin (Sigma-Aldrich), distilled water, tempeh with three days fermentation under the brand name "Muchlar", $AgNO_3$, Carbopol, Propylenglycol, Triethanolamin, and Glycerin are obtained from "Bratachem".

Instrumentation

Instruments used in this study are, particle size analyzer (HORIBA Scientific, Japan), Spectrophotometer UV-VIS (Shimadzu, JAPAN), pH meter, and Viscosimeter Rheosys (Model: Merlin VR).

Preparation of Tempeh Extract

The tempeh extract was prepared by tempeh with three days fermentation under the brand name "Muchlar". Tempeh was cut 5 cm long and 6.5 cm wide and 1 cm thick. Tempeh extract was made with the ratio of tempeh and aquadest which is 1: 2. Three hundred grams of tempeh was added into 600 mL of distilled water, then heated to a temperature of 90˚C. Maintained the temperature remained 90˚C for 30 minutes then the extract cooled to a temperature 30˚C then filter with filter paper.

Preparation of Lipid Nanoparticles of Tempeh Extract as the Active Substances

Lipid nanoparticles were made by weighing soybean lecithin by 12 grams and then minimized by mortar and stamper. The refined soy lecithin was then homogeneously dispersed in 200 mL of aquabidest at 60˚C. The soy lecithin dispersion was then blended at high speed for sixty seconds. The soy lecithin suspension was maintained at 60˚C and then homogenized with ultraturax for one minute on 4 scale. Furthermore, soy lecithin suspension was put in the bath sonicator together with tempeh extract as much as 80 mL. The sonicator bath is set to a temperature of 60˚C for 30 minutes (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016).

Preparation of Silver Nanoparticles Using Tempeh Extract as Bioreduction

Silver nanoparticles were made by weighing 0.034 grams of silver nitrate ($AgNO_3$) in 200 mL aquabidest (1mM) silver nitrate solution. The silver nitrate solution was heated to a temperature of 90˚C. Then it was added with tempeh extract 80 mL and kept at 90˚C while stirring 600 rpm for 30 minutes (Ramadon and Mun'im 2016; Ariyanta 2014).

Preparation of Gel and Physical Properties Testing

The preparation of this formula began with the swelling of carbopol. It was prepared in 100 mL lipid nanoparticles or 100 mL silver nanoparticles with 3 grams of carbopol for 24 hours. Then, 3 grams of carbopol 3% w/v as much as 50 grams and added TEA to the

mortar and stirred until homogeneous for about 5 minutes. Next, put the mixture of carbopol and TEA into the blender and add propylene glycol and glycerin and mixing or three minutes at low speed.

Table I. Gel Formula of Lipid and Siver Nanoparticles Gel

Ingredients	Formula
R/ Carbopol 3% b/v (gram)	50
Propyleneglycol (gram)	30
Glycerin (gram)	60
Triethanolamin (TEA) (gram)	2,4

Scattering Test. The scatter power test was carried out 24 hours after manufacture by putted one gram of gel and placed in the middle of a large round glass. On top of the gel was placed another round glass and ballast with a total weight of 125 grams then allowed to stand for one minute and note the spread diameter. *Viscosity Test.* The viscosity test was carried out 24 hours after preparing the gel using the Rheosys cone and plate Merlin VR model. *pH test.* The pH test carried out 24 hours after the gel prepared using a pH-meter. The pH test began with putted one gram of gel and then dissolved it in 10 mL aquadest. Furthermore, the pH meter inserted into the aquadest and then putted into a gel then the pH meter will show the pH value.

Wavelength of Silver Nanoparticles.

Measurement of the maximum wavelength is one of the initial steps to determine silver nanoparticles. The indicator of silver nanoparticles is the wavelength with maximum absorbance in the range of 400-450 nm (Ariyanta, 2014; Ayu 2015).

Particles Size of Lipid Nanoparticles and Silver Nanoparticles.

This measurement is done by conducting a DLS particle size analyzer (Horiba SZ 100, Japan).

Data analysis

Particle size data and physical properties test results obtained in this study were then performed statistical tests with the R computational statistical program. The T test used to find out whether there are significant differences in physical properties results between lipid nanoparticles with silver nanoparticles preparations.

RESULTS AND DISCUSSION

Tempeh extract contains a lot of isoflavones with a function as a wound healing (Danciu *et al.* 2012). Tempeh extract was prepared with water solvent so that the tempeh extract can be used as a bioreduction in the formation of silver nanoparticles. One of the bioreduction requirements in the formation of silver nanoparticles is a water-soluble extract. That is expected to dissolve and react with $AgNO_3$ solution. While in the addition of lipid nanoparticles, tempeh extract functions as an active substance.

Physical Appearance of Tempeh Extract Lipid Nanoparticles and Tempeh Extract Silver Nanoparticles

The description of lipid nanoparticle was a turbid white color and unique smelled of soy lecithin. The silver nanoparticle preparations had a clear-reddish-brown and unique smelled of tempeh extract. Clear-reddish-brown in the aqueous solution formed from excitation. The reduction of silver ion causes it; there are indicated the formation of silver nanoparticles (Jain, Daima, *et al.* 2009). This physical appearance of difference nanoparticle preparation and gel nanoparticle is presented in Figure 1 and 2.

The Particle Size of Tempeh Extract Lipid Nanoparticle and Tempeh Extract Silver Nanoparticles

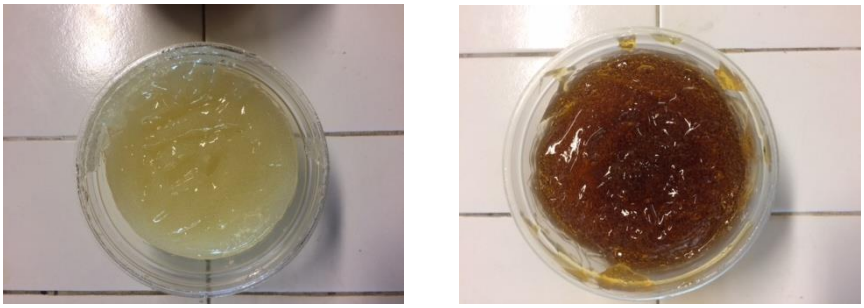
The lipid nanoparticles formation can be known after the Particle Size Analyzer (PSA) test have been done. The formation of silver nanoparticles can be recognized immediately by measuring the maximum wavelength using UV Vis spectrophotometer. If the wavelength is between 400 - 450 nm, it means that silver nanoparticles are known (Maharini *et al.* 2017). This is one of the advantages of silver nanoparticles compared to lipid nanoparticles, namely the success of the preparation formulation can be known after manufacture.

In this study, wavelength measurements were made after 24 hours of storage. The average wavelength measurements of silver nanoparticles with three replications after 24 hours of storage at room temperature were obtained 406 nm. The results of these wavelength measurements indicate that silver nanoparticles can be formed the extract of tempeh as bioreduction at a temperature of 90^0C and 30 minutes (Sari Purwo Ismaya *et al.* 2017).

PSA test was conducted to determine the size of lipid nanoparticles (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016) and silver nanoparticles. PSA test results are shown in Table II.

The measurement results in Table II showed that the silver nanoparticle formula could produce particle sizes less than 100 nm, while the lipid nanoparticle formulas produce sizes more than 100 nm. Tempeh Extract in lipid nanoparticle as an active substance make colloidal dispersion could not be form completely so that affect particles size. Tempeh extract in silver nanoparticle will act as bioreductor in silver nitrate and could produce nanoparticle. Analysis with T-test at 95% confidence level obtained p-value of 0.21. Thus the average particle size of tempeh extract lipid nanoparticles was the same as the average particle size of tempeh extract silver nanoparticles and not significantly different. This phenomena could be happen because in silver nanoparticle extract tempeh will initiate reduction reaction of silver nitrate and reduce particle size, but in lipid nanoparticle, particle will be reduce by the reaction of colloidal dispersion from soy lecithin (Dwiastuti, Noegrohati, Istyastono, *et al.* 2016).

Figure 1. Tempeh extract nanoparticle preparation of lipid nanoparticles (a) and silver nanoparticles (b)



(a) (b)

Figure 2. Gel nanoparticle of lipid nanoparticle (a) and silver nanoparticle (b)

Table II. *Particle Size Analyzer* (PSA) result of Lipid and Silver Nanoparticles with Tempeh Extract

Replication	Tempeh Extract Nanoparticle Lipid (nm)	Tempeh Extract Silver Nanoparticles (nm)
Replication 1	129,00	128,10
Replication 2	124,00	87,00
Replication 3	124,20	69,20
Average	130,03 ± 6,41	94,76 ± 30,20

Table III. Viscosity, Spread ability, and pH Value Result of Lipid and Silver Nanoparticles

Parameter	Lipid Nanoparticle	Silver Nanoparticle	*p value*	Statistical Result
Viscosity (d.Pa.s)	4,02 ± 0,20	4,22 ± 0,33	0,59	Not Significantly Different
Spread ability (cm)	4,37 ± 0,11	4,05 ± 0,02	0,99	Not Significantly Different
pH	7,70 ± 0,10	7,33 ± 0,05	0,98	Not Significantly Different

Physical Properties of Tempeh Extract Lipid Nanoparticles Gel and Tempeh Extract Silver Nanoparticle Gel Preparations

Preparation of tempeh extract lipid nanoparticles and tempeh extract silver nanoparticles were tested for physical properties with parameters including: viscosity, spread ability, and pH value. Physical test results of lipid nanoparticle gel and silver nanoparticle gel preparations showed physical properties test results with pH parameters. The results of the physical properties test were followed by an analysis of the T-test with a 95% confidence level to see differences in physical properties of the two preparations.

The results of the viscosity testing (Table III) after 24 hours of preparation of lipid nanoparticles and tempeh extracts of silver nanoparticles indicated no different results. This result is strengthened by the results of statistical tests using the T-test. The analytical results showed p-value is 0,59 so that it can be said that the viscosity of the two preparations that are not significantly different. Viscosity is influenced by the carbopol composition, because carbopol acts as gelling agent that will form gel-forming matrix (Maheswara 2008). The carbopol composition of Lipid Nanoparticle Gel and Silver Nanoparticle Gel have same composition, thus the result of the viscosity testing are not significantly different

The similar analysis results were also found in the spread ability (Table III) and pH response of lipid nanoparticle gel and tempeh extract silver nanoparticles. Statistical tests with the T-test obtained that the p value of the spread ability test is 0.99 and the p-value of the pH test is 0.98. It can be explained that the spread ability and pH of the preparations resulting from the formulation of lipid nanoparticles and silver nanoparticles of tempeh extract have no significantly different results. This result can be obtained because the amount of gelling agent and humectant used for the preparation of gel nanoparticle lipid and silver nanoparticle gel preparations uses the same amount. The physical properties of gel preparation are influenced by the gelling agent and humectants used in the formulation. Carbopol act as gelling agent and Propylene glycol act as humectant. Gelling agent will form gel-forming matrix. Humectant will maintain the stability of dosage form by absorbing moisture from the environment and reducing the evaporation of water from the preparation. Because of that, spread ability and viscosity will influence dominantly by carbopol and propylene glycol will influence the stability of dosage form (Maheswara 2008).

CONCLUSIONS

Lipid and silver nanoparticles of tempeh extract can be formulated and the average

particle size of lipid nanoparticles was 130.03 nm and silver nanoparticle was 94.76 nm. The average viscosity of lipid nanoparticles gel was 4.02 d.Pa.s and silver nanoparticles was 4.22 d.Pa.s.. The average spreadability of lipid nanoparticles gel was 4.37 cm and silver nanoparticles is 4.05 cm. The average pH value of tempeh extract lipid nanoparticles was 7.70 and silver nanoparticles was 7.33.

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