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by Widya Rudiana Wulandari

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W/O/W type lotion formulation of "arum manis" mango (*Mangifera indica L.*) peel as antioxidant

Widya Rudiana¹, Wulandari¹, Lilies Wahyu Ariani¹

¹ Department of Pharmacy, Sekolah Tinggi Ilmu Farmasi Yayasan Pharmasi Semarang, Indonesia

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ABSTRACT

Arum manis mango peel contains compounds, namely flavonoids. Flavonoid compounds act as natural antioxidants. The weakness of flavonoid compounds is that they are not stable to the influence of high temperature and light intensity, so that the arum manis mango peel extract is made in the form of lotion type W/O/W. This study aims to determine the physical characteristics and stability of the W/O/W type emulsion form optimum formula in double emulsion preparations and lotion preparations, determine the stability of W/O/W type lotion preparations during storage using the cycling test method and determine the IC50 value in the optimum formula. Lotion preparation type W/O/W. The optimum formula for double emulsion type W/O/W is found in formula 5 with a ratio of primary emulsion: secondary emulsion (80%:20%) with span 80 (10%) and tween 20 (5%) concentrations while the optimum formula for lotion preparations found in formula 3 with a ratio of double emulsion type W/O/W: lotion base (80%:20%) with a concentration of stearic acid (5%), cetyl alcohol (2.5%) and glycerin (10%). In the antioxidant activity of lotion preparations, the IC50 value was 136.543 ppm and the stability test on the cycling test method had an unstable form.

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1. Introduction

The skin of arum manis mango fruit (*Mangifera indica L.*) contains active compounds, namely flavonoid compounds, alkaloids, tannins, saponins and steroids / terpenoids [1], [2]. Flavonoids have the disadvantage that they are unstable to the influence of high temperature and light intensity so that they are easily oxidized [3]. Based on the weakness of flavonoid compounds in arum manis mango peel extract (*Mangifera indica L.*) which is

¹Corresponding Author:

Wulandari,
Department of Pharmacy,
Sekolah Tinggi Ilmu Farmasi Yayasan Pharmasi Semarang, Indonesia,
Plamongan Sari, Pedurungan, Kota Semarang, 50192, Indonesia.
Email: wulandari@stifar.ac.id
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unstable to the influence of high temperature and light intensity, arum manis mango peel extract (*Mangifera indica L.*) will be made in the form of a W/O/W type lotion preparation.

The selection of double emulsions of type W/O/W is also based on the properties of flavonoid compounds that are polar when formulated in the form of topical preparations that cannot penetrate the skin, namely in the stratum corneum layer because it has non-polar properties so that the arum manis mango peel extract (*Mangifera indica L.*) cannot enter the stratum corneum layer [4]. The primary emulsion (W/O) has the ability to protect the active substances in its system against the external environment so that the arum manis mango peel extract (*Mangifera indica L.*) which is in the internal water phase of the double emulsion will be protected by an oil membrane that limits the internal and external water phases. In secondary emulsions (O/W) when applied to the skin layer has the property of being easily washed with water so that it can cause a sense of comfort at the time of use, besides that the secondary emulsion makes it easy (O/W) is also relatively non-polar so that when applied to the skin crush, because the secondary emulsion (O/W) is relatively non-polar, flavonoid compounds that are in the internal water phase can enter the corneal statum layer and flavonoid compounds can penetrate the stratum layer Corneum

2. Method

The object of this study is the physical characteristics of double W/O/W type emulsions and lotion preparations of arum manis mango peel extract (*Mangifera indica L.*), as well as testing their antioxidant activity and stability in the optimum formula.

Variabel in this study is a double emulsion concentration consisting of a ratio of primary emulsion : secondary emulsion (70% : 30%) and (80% : 20%) with span concentration of 80 (5%-20%) and tween 20 (5%-20%) and the comparison component of lotion preparations consisting of a double emulsion of type W/O/W (60%-90%) : lotion base (10%-40%), with stearic acid concentration (3%-10%), cetyl alcohol (2%-5%), and glycerin (3%-10%).

The ingredients used are arum manis mango peel simplicia (*Mangifera indica L.*), 96% ethanol, span 80, paraffin liquidum, aquadest, tween 20, stearic acid, cetyl alcohol, methyl paraben, propyl paraben, glycerin, triethanolamin, methylen blue, DPPH powder, ethanol p.a and methanol p.a as well as reagents for phytomyomic screening.

The tools used are glassware (Pyrex), mortar and stampher, water bath, UV lamp 254 nm, adhesion test equipment, spread power test equipment, pH meter (Hanna Instrument pH 210 Microprocessor), viscometer (Brookfield DV-I Prime), stopwatch, UV-VIS spectrophotometer, hoptplate, binocular microscope and optilab.

The extract manufacturing procedure is arum manis mango peel powder (*Mangifera indica L.*) weighed as much as 200 grams and masked 3 x 24 hours using 96% ethanol solvent with a powder ratio: solvent (1: 5).

The procedure for determining the total flavonoid content is weighed 25 mg of extract, dissolved in 25 mL of ethanol, so that a concentration of 1000 ppm is obtained. From the solution piped 1 mL then added 1 mL of AlCl₃ 2% solution and 1 mL of potassium acetate 120 mM. The sample is incubated for an hour at room temperature. Absorbance was determined using the UV-Vis spectrophotometry method at a maximum wavelength of 435 nm [5]. Calculation of Total Flavonoid Levels can be calculated by the Equation (1).

$$F = \frac{C \times V \times Fp}{M} \quad (1)$$

Information :

- F = Flavonoid total
- C = Quercetin equivalence (mg/L)
- V = Total volume of ethanol extract (L)
- Fp = Dilution factor
- M = Sample Time (g)

Table 1. Design of double emulsion formula type w/o/w arum manis mango peel extract (*Mangifera indica L.*)

Ingredienst	F1(%)	F2 (%)	F3 (%)	F4(%)	F5(%)	F6(%)	F7(%)	F8(%)
Primer emulsion								
Extract of Arum manis Mango pell	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Span 80	20	15	15	10	10	15	10	5
Liquid paraffin	45	45	45	45	45	45	45	45
Aquadest	Ad	Ad	Ad	Ad	Ad	Ad	Ad	Ad
	100	100	100	100	100	100	100	100
Second emulsion								
Primer emulsion	70	70	70	70	80	80	80	80
Tween 20	15	10	25	20	5	10	15	10
Aquadest	Ad	Ad	Ad	Ad	Ad	Ad	Ad	Ad
	100	100	100	100	100	100	100	100

The double emulsion manufacturing procedure is made with two parts, the first part is the manufacture of a primary emulsion using a hoplate at a temperature of 40°C with a stirring speed of 700 rpm for 30 minutes. The second part is the manufacture of a secondary emulsion using a hoplate at a temperature of 40 °C with a stirring speed of 400 rpm for 15 minutes.

Measurement of the efficiency of double emulsion absorption type W/O/W arum manis mango peel extract (*Mangifera indica L.*) can be calculated using the following Equation (2).

$$\text{Absorption efficiency} = \frac{A - B}{A} \times 100\% \quad (2)$$

Information :

- A : Total flavonoid levels
- B : W/O/W type double emulsion content

Table 2. Formulation design of lotion preparation type w/o/w arum manis mango peel extract (*Mangifera indica L.*)

Ingredienst	F1(%)	F2 (%)	F3 (%)	F4(%)
Double emulsion w/o/w extract of arum manis mango pell	0,1	0,1	0,1	0,1
Stearic acid	10	10	5	3
Cetil alcohol	5	5	2,5	2
Methyl paraben	0,1	0,1	0,1	0,1
Prophyl paraben	0,1	0,1	0,1	0,1
Glycerin	10	5	10	3
Triethanolamine	0,17	0,17	0,17	0,17
Oleum rosae	Qs	Qs	Qs	Qs
Aquadest	Ad 40	Ad 40	Ad 40	Ad 40

The manufacture of lotion preparations is the initial stage by making a lotion base, the oil phase ingredients are heated on a hotplate at a temperature of 70°C, then mixed with the water phase and stirred until homogeneous, then the lotion base is added with a double emulsion preparation type W/O/W arum manis mango peel extract (*Mangifera indica L.*) according to the components in the optimum formula and heated using a hotplate at a temperature of 40°C at a stirring speed of 700 rpm, Wait until the preparation is homogeneous and lotion preparations are formed.

Determination of % inhibition on antioxidant activity test. IC50 value The percentage of inhibition is the percentage that indicates the activity of the radical. The percentage of inhibition against DPPH radicals from each concentration of the sample solution can be calculated by the Equation (3).

$$\% \text{ Inhibisi} = \frac{\text{Absorbance control} - \text{Absorbance sample}}{\text{Absorbance control}} \times 100\% \quad (3)$$

Data Analysis on the parameters of the optimum formula of double emulsions includes organoleptic tests, emulsion type, pH and viscosity. Determination of the optimum formula of double emulsions and the efficiency of absorption based on descriptive. The optimum formula parameters of lotion preparations include organoleptic assays, homogeneity, emulsion type, Ph, viscosity, adhesion and dispersion. Determination of the optimum formula of lotion preparations based on descriptive The results of the stability test are parametric tested, namely the one sample T-Test. The antioxidant activity test was analyzed with the lambert-beer law equation that is $Y = bx + a$.

3. Results and Discussion

Based on the results of the calculation of % randemen obtained a value of 39.10%. The ethanol-free test results showed that the mango peel extract was arum manis (*Mangifera indica L.*) It does not contain ethanol which is characterized by not smelling of bananas and not forming a red color of framboos. The phytochemical screening results of arum manis mango peel extract (*Mangifera indica L.*) positively contain flavonoid compounds, alkaloids, saponins, steroids, and tannins.

In the results of the thin layer chromatography affirmation test (KLT), the alkaloid compound test was shown by the presence of brown stains with an Rf value of 0.88, flavonoid compound tests with the same stain color as the quercetin standard, namely yellow [6] with an Rf value of 0.33 while the standard Rf of quercetin was obtained 0.38, the steroid compound test was shown by the presence of a green stain with an Rf value of 0.83, the saponin compound test is indicated by the presence of a yellowish-green color stain with an Rf value of 0.85 and the tannin compound test is indicated by a blue-black stain with an Rf value of 0.94. After the KLT affirmation test, a total flavonoid measurement was obtained with a value of 25.4606 mgQE / g.

The results of the physical characteristics test of double emulsion preparations of type W/O/W, in the organoleptic test of formula design 1-8 has a liquid texture, milky white and homogeneous color, the emulsion type test in the formula 1-8 design has an emulsion type W/O/W, the pH test in the formula design 1-8 according to the skin pH of 4-6 [5] and

the viscosity test in the formula 1-8 design has a different average this can be caused because the greater the span value of 80, the Oil phase droplets will be more stable. From the test results of the physical characteristics of double emulsion preparations of type W/O/W obtained the optimum formula, which is found in the design of formula 5 with a ratio of primary emulsion concentration: secondary emulsion (80%: 20%) with a span concentration of 80 (20%) and tween 20 (20%), where the design of formula 5 has a stable W/O/W double emulsion type form, stability can be compared with the theory where water droplets are trapped in a larger oil droplet then dispersed back in water phase. The double emulsion form of W/O/W type can be seen in Figure 1.

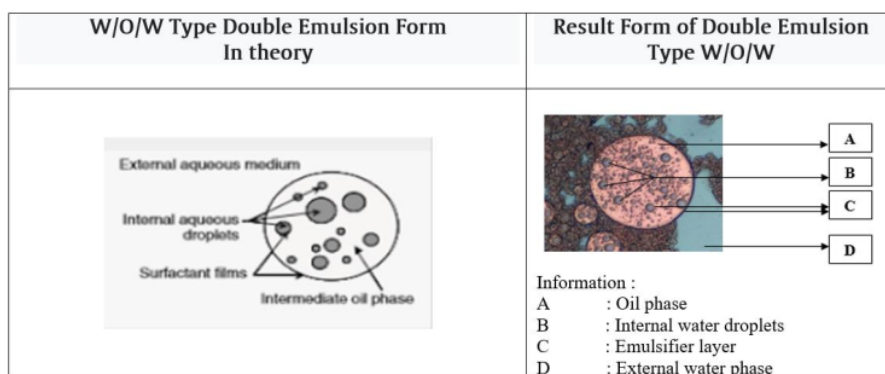


Figure 1. W/O/W type double emulsion form

The optimum formula of the double emulsion preparation type W/O/W of arum manis mango peel extract (*Mangifera indica L.*) has a digestibility efficiency value of 59.08% which means it meets the requirements of USP 32-NF of 2007 [6]. The test requirement for the efficiency of absorption in topical preparations is 50-100%.

The results of the physical characteristics test of lotion preparations, in the organoleptic test the design of formula 1-4 has a semi-solid texture, milky white color and has a rose smell, the homogeneity test in the formula 1-4 design has a homogeneous shape, the W/O/W emulsion type test in the formula 1 design and formula 2 has a single emulsion type, namely the O/W type, this is due to the concentration of the lotion base in formula 1 and formula 2 more while in formula 3 and formula 4 have a double emulsion type, namely type W/O/W, the pH test in the design of formula 1-4 is still within the range of pH value requirements for topical preparations, namely 4.5-6.5 [7], the viscosity test in the formula 1-4 design is still within the range of viscosity value requirements, namely 2000-50000 cPs [7], the adhesion test in the formula 1-4 design does not meet the requirements of the adhesion test, which is less than 4 seconds [8] this is related to the viscosity value the lower the viscosity value, the smaller the adhesion value and the scatter power test in the formula 1-4 design in formula 1 and formula 2 does not enter the range in the dispersion power requirement, which is 5-7 cm [9] while formula 3 and formula 4 are included in the range in the dispersion power requirements, this can be caused because the smaller the concentration of the added lotion base, the greater the spread power value because the lotion preparation is more liquid.

From the test results of the physical characteristics of the optimum formula lotion preparation, it is found in the formula 3 design with a ratio of double emulsion

concentration type W/O/W: lotion base (80% : 20%) with a concentration of stearic acid (5%), cetyl alcohol (2.5%) and glycerin (10%), where formula 3 has a stable W/O/W emulsion type form, namely water droplets trapped in larger oil droplets which are then dispersed again in the water phase.

The optimum formula of lotion preparation type W/O/W extract of arum manis mango peel (*Mangifera indica L.*) in the antioxidant activity test with the DPPH method obtained an IC value of 50 of 136,563 ppm, from that the lotion preparation has a very weak ability, where the IC value of 50 preparations >200 ppm [10].

The optimum formula of lotion preparation type W/O/W arum manis mango peel extract (*Mangifera indica L.*) on the stability test with the cycling test method can be concluded that the preparation is unstable when compared to the physical characteristics test before stability testing is carried out because the results of the pH, viscosity and dispersal power tests after the cycling test have decreased while in the spread power test after Cycling tests have increased

4. Conclusion

The test results of the physical characteristics and shape stability of the optimum formula W/O/W type emulsion on the double emulsion preparation of arum manis mango peel extract (*Mangifera indica L.*) are contained in the formula 5 design. The test results of the physical characteristics and stability of the optimum formula W/O/W type emulsion form on the lotion preparation type W/O/W arum manis mango peel extract (*Mangifera indica L.*) are contained in the formula 3 design. The results of the stability test on lotion preparations of type W/O/W of arum manis mango peel extract (*Mangifera indica L.*) have an unstable shape. Test results of antioxidant activity of lotion preparations type W/O/W extract of arum manis mango peel (*Mangifera indica L.*) with an IC50 value of 136,543 ppm

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