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Research Article

# Formulation and Evaluation of Physical Properties of Scrub Containing Kasumba Turate (*Carthamus tinctorius* Linn.) Water Extract

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**ABSTRACT**: The flowers of the kasumba turate (*Carthamus tinctorius* Linn.) has the potential as an antioxidant because it contains flavonoid compounds that can ward off free radicals. This study proposes and evaluates a pharmaceutically stable scrub from kasumba turate water extract. This study used an experimental method by extracting kasumba turate using an infusion method. The scrub formulation is made using a variety of emulgators, namely anionic emulgator amin soap (stearic acid and triethanolamine), nonionic emulgator (span 60 and tween 80) and anionic emulgator detergent (sodium lauryl sulfate). Physical stability tests were conducted before and after the condition accelerated for 10 cycles covering organoleptic, homogeneity, pH and viscosity. All scrub preparations that have been tested meet the criteria of each test both before and after the conditions accelerated, but the viscosity measurement results show that the formula using anionic emulgator amin soap is more stable physically, so it can be concluded that the water extract kasumba turate can be made into a stable scrub formula.

**KEYWORDS**: Extract; emulgator; scrub; kasumba turate.

## 1. INTRODUCTION

Kasumba turate (*Carthamus tinctorius* Linn.) contains various active compounds such as flavonoids, alkaloids, saponins, terpenoids, tannins and anthraquinones, quinohalcones, glycosides, hydroxy safflower yellow A, N-(P Kumaroil) and serotonin which act as antioxidant compounds. The content of antioxidant compounds in kasumba turate, especially flavonoid compounds, has the ability as an antioxidant to transfer an electron or a hydrogen atom to a free radical compound by stopping the initial stage of the oxidation reaction so that flavonoids can inhibit lipid peroxidation and prevent tissue damage by free radicals and inhibit several enzyme activities (Yasir et al., 2021; Fawwaz et al., 2023). The effectiveness of kasumba turate flower antioxidants (expressed in $IC_{50}$) on water fraction is 77.43 µg/mL. The smaller the $IC_{50}$ value, the higher the antioxidant activity. This shows that the antioxidant activity of kasumba turate flower extract is a relatively strong antioxidant, so this kasumba turate flower has good antioxidant potential (Yasir et al., 2021). Therefore, kasumba turate flowers that have the potential as antioxidants are formulated in the form of a scrub using white glutinous rice flour as a scrub.

A scrub is a cosmetic that is added with a scrub in the form of coarse grains that act as a sander (abrasive) so that it can remove dead skin cells from the skin (epidermis) (Sari, 2021). The scrub used in this scrub formulation is white glutinous rice. White glutinous rice (*Oryza sativa* glutinosa) has an antioxidant content that can accelerate collagen production and plays a role in the process of removing dead skin cells due to the oxidation process (Allifa et al., 2020).

One of the factors that affects stability is the emulsifier. The emulsifier used in this scrub formulation is a synthetic emulsifier consisting of anionic soap amine, anionic detergent, and nonionic groups because it can form a monomolecular layer that can stabilize the emulsion by forming a single layer of molecules or ions that are adsorbed at the oil-in-water emulsion interface (Purnamasari et al., 2016).

Based on this, a scrub formulation has been carried out using a variety of emulsifiers. The purpose of this study was to obtain results from the formulation of a body scrub preparation containing water extract of kasumba turate (*Carthamus tinctorius* Linn.) which has good physical properties based on organoleptic parameters, homogeneity, pH and viscosity.

## 2. EXPERIMENTAL SECTION

### 2.1. Chemical

The research materials used include: kasumba turate flowers, distilled water, stearic acid, triethanolamine, tween 80, span 60, methyl paraben, propyl paraben, sodium lauryl sulfate, glycerin, cetyl alcohol and white glutinous rice flour.

### 2.2. Tools

The tools used include analytical scales, porcelain cups, glassware (Pyrex®), refrigerators, mixers, aluminum foil, stirring rods, horn spoons, iron spoons, filter paper, parchment paper, water baths, infusion pans, glass objects, glass dec, universal pH, volume pipettes, thermometers, hot plates, scrub containers and Brookfield viscometers.

### 2.3. Sample Collection and Processing

The sample used in this study was kasumba turate flowers (*Carthamus tinctorius* Linn.) taken in Bone Regency, South Sulawesi. The flower part was taken and then washed clean with running water. The leaves that had been washed clean were then dried. After being dried, they were weighed, and the extraction process was carried out.

### 2.4. Extraction

Kasumba turate flowers were extracted using the infusion method (hot method). The dried kasumba turate flower simplisia was weighed as much as 900 mg. After that, every 0.1 g was put into a 50 mL beaker containing 50 mL of measured aquadest and then covered with aluminum foil. Then, put into an infusion pan containing aquadest and boiling stones and wait until it boils. After boiling, the temperature was measured to 90 °C, then set the timer for 15 minutes. This was done 9 times. Furthermore, it was filtered using filter paper until a liquid extract was obtained.

### 2.5. Formulation

#### *2.5.1. Scrub cream with anionic emulsifier amin soap*

The ingredients are weighed according to the calculation results. The oil phase is made by melting stearic acid, propyl paraben, and cetyl alcohol at a temperature of 70 °C above a water bath while stirring. The water phase is made by melting methyl paraben, glycerin and triethanolamine in distilled water at a temperature of 70 °C while continuing to stir. Next, an emulsion is made by adding the oil phase into the water phase little by little, then stirring using a mixer until an emulsion is formed, and shaking is carried out intermittently for 2 minutes. After that, the measured water extract of kasumba turate is added and then remixed until homogeneous. After being homogeneous, white glutinous rice ground and sieved with a 30/40 mesh sieve is added and stirred until homogeneous (**Table 1**) (Purnamasari et al., 2016).

#### *2.5.2. Scrub cream with nonionic emulsifier*

The ingredients are weighed according to the calculation results. The oil phase is made by melting stearic acid, propylparaben, span 60 and cetyl alcohol at a temperature of 70 °C above a water bath while stirring. While stirring, the water phase is made by melting methylparaben and glycerin tween 80 in distilled water at 70 °C. Next, an emulsion is made by adding the oil phase into the water phase little by little, then stirring using a mixer until an emulsion is formed and shaking is carried out intermittently for 2 minutes. After that, the measured water extract of kasumba turate (*Carthamus tincotrius* L.) is added and then remixed until homogeneous. After being homogeneous, white sticky rice ground and sieved with a 30/40 mesh sieve are added and stirred until homogeneous (Purnamasari et al., 2016).

#### *2.5.3. Scrub cream with anionic emulsifier detergent*

The ingredients are weighed according to the calculation results. The oil phase was made by melting stearic acid, propylparaben, and cetyl alcohol at a temperature of 70 °C above a water bath while stirring. The water phase was made by melting methylparaben, glycerin and sodium lauryl sulfate into distilled water at 70 °C while continuing to stir. Furthermore, an emulsion was made by adding the oil phase into the water phase little by little, then stirring using a mixer until an emulsion was formed and shaking was carried out intermittently for 2 minutes. After that, the measured water extract of kasumba turate (*Carthamus tincotrius* L.) was added and remixed until homogeneous. After being homogeneous, white sticky rice ground and sieved with a 30/40 mesh sieve were added and stirred until homogeneous (Purnamasari et al., 2016).

**Table 1.** Composition of kasumba turate water extract scrub

| Formula | Concentration (%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Anionic Amin Soap | | | Nonionic | | | Anionic Detergent | | |
| | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 |
| Extract | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| White rice starch | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Stearic acid | 4 | 6 | 8 | 10 | 10 | 10 | 10 | 10 | 10 |
| Triethanolamine | 2 | 3 | 4 | - | - | - | - | - | - |
| Tween 80 | - | - | - | 3 | 4 | 5 | - | - | - |
| Span 60 | - | - | | 3 | 4 | 5 | - | - | - |
| Sodium lauryl sulfate | - | - | - | - | - | - | 0.25 | 0.30 | 0.35 |
| Methylparaben | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 |
| Propylparaben | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Glycerin | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Cetyl Alcohol | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Aquades | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

### 2.6. Evaluation

The scrub's stability was evaluated before and after the forced conditions at 5 °C (cold temperature) and 25 °C (room temperature) alternately for 12 hours each for 10 cycles. An organoleptic examination was carried out visually. Scrubs usually have a solid consistency (semi-solid).

### *2.6.1. Organoleptic evaluation*

Organoleptic includes texture, color and odor. The examination was conducted before and after accelerated conditions, including scrub standardization, non-rancid odor and non-liquid texture.

### *2.6.2. Homogeneity test*

Homogeneity testing was carried out using two object glasses, namely object glass and dec glass. Then, the object glass was smeared with scrub thinly and evenly covered with dec glass, and then the glass was observed visually.

### *2.6.3. pH measurement*

Determination of pH was carried out using universal pH. Indicator paper was inserted into the preparation and then waited for 10 seconds. Then, there will be a color change on the indicator paper. Furthermore, it was visually observed by matching it with a pH scale ranging from 0 to 14 on the indicator paper packaging.

### *2.6.4. Viscosity test*

Viscosity determination was carried out using a Brookfield viscometer at a speed of 50 rpm using spindles no. 05, 06 and 07. Three replications were carried out for each formula. Furthermore, the emulsion flow type was determined by measuring the viscosity of the preparation at various speeds, namely 2, 5, 10, 20, 50 and 100 rpm. Then, the speed was reversed from 100, 50, 20, 10, 5 and 2 rpm. From these data, the shear rate was calculated from the shear stress plotted to form a rheogram to determine the type of flow formed.

## 3. RESULTS AND DISCUSSION

Extraction is done by infusion method. Infusion is an extraction using polar solvents, namely water, to obtain polar active substances that can be optimally extracted. Compounds with the same polarity will be more easily attracted or dissolved by solvents with the same level of polarity. For example, flavonoid compounds in kasumba turate plants (*Carthamus tinctorius* L.) have polar properties, so polar solvents are needed (Yuliani and Dienina, 2015). In addition, the selection of extraction with the infusion method is based on the simple method and equipment used and the relatively faster manufacturing time. The formulation of the kasumba turate flower body scrub preparation was made as many as 9 formulas using different variations of emulsifiers and concentration variations, namely body scrub with anionic emulsifier of amine soap using stearic acid and triethanolamine with concentrations of 4% and 2% (body scrub formula 1), concentrations of 6% and 3% (body scrub formula 2), concentrations of 8% and 4% (body scrub formula 3), body scrub with nonionic emulsifier using a combination of span 60 and tween 80 with the same concentration, namely concentration 3% (body scrub formula 4), concentration 4% (body scrub formula 5), concentration 5% (body scrub formula 6) and body scrub with anionic detergent emulsifier using sodium lauryl sulfate with a concentration of 0.25% (body scrub formula 7), concentration 0.30% (body scrub formula scrub 8), concentration 0.35% (Formula scrub 9). This is done to determine which emulsifier produces the most pharmaceutically stable formula after a stability test.

Stearic acid and triethanolamine are some of the ingredients used as anionic emulsifiers of amine soap in the cream formulation process. Emulsifiers are surfactants that reduce the interfacial tension between oil and water, surrounding the dispersed droplets with a solid layer to prevent the dissolution of the distributed phase (Hasniar et al., 2015). The working mechanism of these two emulsifiers is to reduce the surface tension between the oil and water phases so that the two phases can mix. Stearic acid in scrub preparations can be used as an emulsifier if a base such as triethanolamine (TEA) or KOH is added so that some of the stearic acid turns into stearate salt (Mudhana and Pujiastuti., 2021).

The use of span 60 and tween 80 emulsifiers are nonionic emulsifiers because tween and span can reduce the oil/water interfacial tension and form a monomolecular film. Tween has hydrophilic properties, while span is lipophilic, so combining the two can stabilize the emulsion that generally contains oil and water (Kim, 2005). Then sodium lauryl sulfate is added, in this case as a detergent emulsifier, which has the advantage of cleaning the skin by reducing the interfacial tension and then forming a dirt surfactant complex (micellar layer), which will then be transported out of the surface so that it can increase the cleaning ability of preparation (Pradipta et al., 2009).

After being formulated, a physical stability test uses several parameters. Testing is carried out to see the physical characteristics and stability of the preparation. Some of the physical stability test parameters of the kasumba turate flower extract scrub formulation include organoleptic tests, homogeneity, pH (**Table 2**) and viscosity (**Table 3**).

**Table 2.** The results of organoleptic test observations of the body scrub formula with water extract of kasumba turate flowers before and after forced conditions.

| Formula | Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Before forced conditions | | | | After forced conditions | | | |
| | Aroma | Color | Consistency | pH | Aroma | Color | Consistency | pH |
| **F1** | Typical | Brownish yellow | Thick | 8 | Typical | Brownish yellow | Thick | 8 |
| **F2** | Typical | Brownish yellow | Thick | 8 | Typical | Brownish yellow | Thick | 8 |
| **F3** | Typical | Brownish yellow | Thick | 8 | Typical | Brownish yellow | Thick | 8 |
| **F4** | Typical | Pale-yellow | Thick | 6 | Typical | Pale-yellow | Thick | 5 |
| **F5** | Typical | Pale-yellow | Thick | 5 | Typical | Pale-yellow | Thick | 5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **F6** | Typical | Pale-yellow | Thick | 5 | Typical | Pale-yellow | Thick | 5 |
| **F7** | Typical | Yellow | Thick | 6 | Typical | Yellow | Thick | 7 |
| **F8** | Typical | Yellow | Thick | 7 | Typical | Yellow | Thick | 7 |
| **F9** | Typical | Yellow | Thick | 7 | Typical | Yellow | Thick | 7 |

The results of organoleptic testing showed that the nine scrub formulations had the same aroma and consistency, namely a distinctive aroma and thick consistency. Still, different colors were produced both before and after the forced conditions. Meanwhile, F1-F3 (Anionic Amin Soap) produced a brownish-yellow color, F4-F6 (Nonionic) produced a pale-yellow color, and F7-F9 (Anionic detergent) produced a yellow color.

This test was carried out before and after the forced conditions, where there was no significant change in the results of observations of aroma, color and consistency. The preparation remained the same as the initial results before the stability test. This shows that there is no interaction either in the emulsifier or other additional ingredients. Hence, the observation results show that the scrub formula is stable regarding visual observation.

**Table 3.** Evaluation of viscosity test of kasumba turate flower water extract body scrub formula before and after forced conditions.

| **Formula** | **Viscosity (cPs)** | |
|---|---|---|
| | **Before forced conditions** | **After forced conditions** |
| **F1** | 31.066 ± 0.2809 | 24.533 ± 3.257 |
| **F2** | 37.68 ± 0.524 | 44.266 ± 1.942 |
| **F3** | 69.333 ± 4.168 | 64 ± 2.306 |
| **F4** | 31.6 ± 4.779 | 25.866 ± 2.928 |
| **F5** | 35.466 ± 3.910 | 33.6 ± 2.749 |
| **F6** | 59.4 ± 4.413 | 20.773 ± 1.280 |
| **F7** | 30.266 ± 0.757 | 22.686 ± 0.441 |
| **F8** | 35.4 ± 0.721 | 23.333 ± 2.893 |
| **F9** | 41.133 ± 2.640 | 36.2 ± 2.306 |

The homogeneity test was conducted by placing the scrub preparation between 2 glass objects and visually observing whether any particles separated (not homogeneous) in the formula. Based on the observation results, it was obtained that the nine scrub preparations were homogeneous because they produced well-mixed preparations, which were indicated by the absence of coarse particles in the formula both before and after the forced conditions, so it can be concluded that the preparations were stable during the storage period. The power of hydrogen (pH) or acidity level aims to detect a substance's acid or base level according to a predetermined range.

## 4. CONCLUSION

Based on the research results, it can be concluded that the water extract of kasumba turate flowers (*Carthamus tinctorius* Linn.) can be formulated into a pharmaceutically stable body scrub. The nine formulas are stable based on the evaluation parameters of the body scrub preparation, namely organoleptic tests, homogeneity, and pH. The formula using anionic emulsifier soap amine (stearic acid and triethanolamine) has optimal stability and better pharmaceutical properties based on viscosity testing before and after forced conditions.

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