UNDERGRADUATE THESIS

TEST OF ANTIOXIDANT ACTIVITIES IN PEEL OFF MASK FORMULATION FROM RED RICE *(Oryza rufipogon* Griff) EXTRACT

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PHARMACY DEPARTMENT

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ABSTRAK

UJI EFEKTIFITAS ANTIOKSIDAN FORMULASI MASKER PEEL OFF EKSTRAK BERAS MERAH *(Oryza rufipogon* Griff)

Pitaloka Uswatun Hasanah

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Beras merah memiliki senyawa yang berpotensi sebagai antioksidan disebabkan oleh kandungan antosianin suatu pigmen yang memberi warna merah yang terdapat pada lapisan pericarp hingga lapisan luar endosperm beras merah. Tujuannya untuk mengetahui seberapa banyak aktivitas antioksidan ekstrak beras merah dengan perhitungan IC50 dibandingkan vitamin C, mengetahui hasil uji karakteristik masker peel off, dan seberapa banyak aktivitas antioksidan pada formulasi masker peel off ekstrak beras merah dengan perhitungan IC50. Metode ekstraksi pada penelitian ini menggunakan maserasi, dan pengujian antioksidan pada ekstrak beras merah dan masker peel off ekstrak beras menggunakan metode DPPH dengan menggunakan spektrofotometri Uv-Vis.

Hasil penelitian menunjukkan bahwa aktivitas antioksidan ekstrak beras merah menghasilkan nilai IC50 sebesar 23,31 µg/mL sedangkan aktivitas antioksidan vitamin C nilai IC50 sebesar 33,92 µg/mL. Hasil uji karakteristik formulasi masker peel off ekstrak beras merah meliputi uji fisik sediaan berwarna merah pudar sampai merah tua hampir hitam, berbau propilengglikol dan etanol, berbentuk semisolid dan sangat lengket. Hasil uji pH 6,5 – 6,9, uji waktu mengering 11.47 – 12.17 menit, uji viskositas 2001 - 4960 cps, dan uji daya sebar 4,03 - 4,38 cm. Aktivitas antioksidan pada formulasi masker peel off ekstrak beras merah dengan perhitungan IC50 pada F1 sebesar 64,24 µg/mL, F2 sebesar 116,11 µg/mL, dan F3 sebesar 276,83 µg/mL.

Kata kunci : Aktivitas antioksidan, Ekstrak beras merah, Formulasi, Masker peel off

ABSTRACT

TEST OF ANTIOXIDANT ACTIVITIES IN PEEL OFF MASK FORMULATION FROM RED RICE *(Oryza rufipogon* Griff) EXTRACT

Pitaloka Uswatun Hasanah

36.2015.7.1.2272

Red rice has compounds which potential as antioxidants due to the anthocyanin content of a pigment that gives red color found in the pericarp layer to the outer layer of red rice endosperm. The aim is to determine the antioxidant activity of red rice extract (Oryza rufipogon Griff) by calculating IC_{50} then to vitamin C, characteristic test results of peel off mask, and antioxidant activity in the formulation of peel off red rice extract mask (Oryza rufipogon Griff) with IC_{50} calculation. The extraction method in this research utilized maceration, and antioxidant testing on red rice extract and peel off rice extract mask using DPPH method using Uv-Vis spectrophotometry.

The results showed that the antioxidant activity of red rice extract produced an IC_{50} value of 23.31 µg / mL while the antioxidant activity of vitamin C IC_{50} value was 33.92 µg / mL. The characteristic test results of the formulation of red rice peel extract mask formulation include a physical test of the preparation of faded red to a dark red almost black, smelling of propylene glycol and ethanol, semisolid and very sticky. The test results were pH 6.5 - 6.9, the drying time test was 11.47 - 12.17 minutes, the viscosity test was 2001 - 4960 cps, and the spread test was 4.03 - 4.38 cm. Antioxidant activity in the formulation of red rice extract peel off mask with IC_{50} calculation in F1 was 64.24 µg / mL, F2 was 116.11 µg / mL, and F3 was 276.83 µg / mL.

Keywords: antioxidant activity, red rice extract, formulation, peel off mask

DECLARATION

I hereby,

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I hereby declare that this thesis originally belonged to myself and did not belong to other researchers for different levels. Furthermore, this thesis previously published, except for some parts with original references.

Otherwise, if it is found that this thesis contains plagiarism, I was prepared to be ceased academically.

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STATEMENT OF ELIGIBILITY
FOR UNDERGRADUATE THESIS EXAMINATION

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CHAPTER 1

PRELIMINARY

1.1 Background

Activities of daily life under the blazing sun can cause skin problems in the face and if not treated well cause problems such as dead skin cells, inhibits the production of collagen, the formation of wrinkles on the face or on the skin (Rahim, 2014). The skin is an organ that covers the entire human body, and has the power to protect against external influences, and becomes a supporter of the appearance of someone who must be cared for, maintained, and maintained so that the skin feels healthy and well-maintained (Wirajayakusuma, 1998). Skin is an organ that can cause a problem because of some adverse effects such as air pollution and sun exposure. The sun's rays are exposed to cause the radical formation of Reactive Oxygen Species in the skin.

Reactive Oxygen Species (ROS) is one that is on the surface of the skin as singlet oxygen which attacks cell membranes and forms new Reactive Oxygen Species. Skin damage due to oxidation reactions on the skin caused by DNA damage by Reactive Oxygen Species. Free radicals are defined as a molecule, atom or several atoms which have one or more unpaired electrons in their outer orbitals. Molecules or atoms in free radicals are unstable and easily form new compounds if, this reaction will continue in the body and if not stopped it will cause various diseases (Muchtadi, 2009). Antioxidants are compounds to neutralize free radicals function to protect the body from disease by binding to free radicals and reactive molecules that can damage cells (Budiarti, 2014). Antioxidants are believed to be able to counteract free radicals by preventing damage to DNA because oxidation reactions in the human body and antioxidants can delay or prevent premature aging (Tjandrawinata, 2011).

Cosmetics are preparations or pharmaceutical ingredients used on the outside of the body such as skin, nails, teeth, etc. The function is to change appearance, cleanse, eliminate body odor or smell body and maintain the body (BPOM, 2011). The main purpose of cosmetics in the use of modern society is to increase self-interest, increase self-confidence, cleanse, protect skin and hair caused by pollution and sunlight, and can prevent premature aging (Septiani, 2011)

Peel off masks contain antioxidants made from natural ingredients to treat the skin, especially in the face. Peel off gel mask is a preparation to provides benefits such as relaxing facial muscles, cleanse and refresh, moisturize, and soften facial skin (Agnia, 2015). HPMC (Hydroxypropyl Methylcellulose) is a filmmaker which use commonly combined with other filmmakers, HPMC films are good and acceptable but have disadvantages that are slightly brittle and rough surfaces. PVA is a film forming has advantages with a smooth and not brittle surface but has disadvantages, namely in a single use can produce a sticky film (Remalya, 2016).

Allah S.W.T has created this nature for all creatures, especially in humans with various kinds of plants that have the benefits of each - many and various kinds of plants that have medicinal properties. Some of the blessings of Allah S.W.T have been listed in the book of Allah, the Qur'an which must be used and studied by a Muslim who is His servant. In the Quranic proposition in As - Syu'ara verse 7 which reads:

أَ وَلَمْ يَرَوْا إِلَي الأَرْضِ كَمْ أَنْبَتْنَا فِيْهَا مِنْ كُلِّ زَوْجٍ كَرِيْمٍ (٧)

«And did they not pay attention to the earth, how much did we grow on the earth various kinds of good plants?» (As-Syua›ara 7).

Red rice has high antioxidant activity (Dwiyanti, 2013). Red rice has a sunblock activity against UVA and UVB radiation (Suda, 2013). Both of these effects are caused by the anthocyanin content of a pigment which gives the red color found in the pericarp layer to the outer layer of red rice endosperm. Anthocyanin is a component of the polyphenol derivative

flavonoids (Indrasari, 2010). According to the background, the researcher will conduct this research.

1.2 Problem Formulation

Formulation of the problem in this study are:

1. How much antioxidant activity of red rice (Oryza rufipogon Griff) extract with the calculation of IC_{50}compared to vitamin C?
2. How are the characteristic results of the red rice *(Oryza rufipogon* Griff*)* extract peel off mask formulation?
3. How much antioxidant activities in the formulation of the red rice (Oryza rufipogon Griff) extract peel off mask with IC_{50} calculation?

1.3 Research Purpose

In this study the objectives are as follows:

1. Knowing how much the antioxidant activity of red rice *(Oryza rufipogon* Griff*)* extract with the calculation of IC_{50} compared to vitamin C.
2. Knowing the characteristic test results of the red rice (*Oryza rufipogon* Griff*)* extract peel off mask formulation.
3. Knowing how much antioxidant activity in the formulation of peel off red rice *(Oryza rufipogon* Griff*)* extract mask with IC_{50} calculation.

1.4 Benefits of Research

1.4.1 Theoretical Benefits

The results of this study are expected to provide scientific information to determine the antioxidant activity of the active ingredient of red rice in the peel off mask formulation.

1.4.2 Practical Benefits

This research can provide many benefits, especially in the field of cosmetics in the form of masks that are currently circulating rapidly in the market, and provide benefits to the cosmetics of natural

materials. Making red rice has superior benefits not only in the field of food but in the cosmetics field. The preparation of peel off mask from red rice extract can improve the quality of products that are not less superior with other mask preparations in which become trending among the community, especially for women. Making the peel off red rice extract mask as a formulation mask is useful to help repair skin degenerative diseases due to UV light and prevent premature aging.

CHAPTER 2

LITERATURE REVIEW

2.1 Previous Research

The following research related to the effect of red rice in producing antioxidant activities such as research conducted by (Dwiyanti, 2013) with the title "Antioxidant Activities of Commercial Red Rice and Black Rice Extracts and Processed Products". This study uses extraction methods from red rice and black rice and extraction using rice-making methods. This antioxidant activity test was carried out by maceration method with methanol and the determination of antioxidant activity of the extract was carried out by the DPPH radical method (2,2-diphenyl-1-picrylhydrazyl) and invisible ray instruments. The results of research showed antioxidant activity of red rice extract 94,14 %, black rice extract 48.77%, red rice (cormorant) 89.93%, red rice (rice cooker) 89.44%, black rice (cereal) 31.46%, black rice (rice cooker) 31.46 % of the results of this study researchers can conclude that the antioxidant activity of red rice extract is greater than the extract of red rice activity, the activity of black rice extract is greater than the activity of black rice extract, and the best antioxidant activity processing technique in extraction process is utilize cormorant techinique.

The following study states that high anthocyanin levels in red rice, conducted by (Abdullah, 2017) with the title "Increasing the Level of Anthocyanin of Red Rice and Black Rice through Biofortification" states that red rice and black rice through biofortification have high levels of anthocyanin which have antioxidants which can overcome degenerative diseases such as cancer, hypertension, and diabetes.

The following research in making peel off masks using ingredients from PVA (polyvinyl alcohol) and HPMC (Hydroxyl propyl methyl cellulose) such as the research conducted by (Wulansari, 2017) entitled "Optimization of Formula Mask Red Rice Ethanolic Gel Extract (Oryza

sativa L.) as an Antioxidant Preparation "states that the type of optimization research using the simplex lattice design method, where the composition of HPMC and PVA varied in 8 formulas can affect the formulation of peel off mask in terms of gelling agent which helps mask formulations easy to peel and clean without water so in this study with the results of the optimum formula from the preparation of peel off gel mask of red rice ethanolic extract with a comparison of the composition of HPMC: PVA of 0.25 (2 grams): 0.75 (13.75 grams) having an IC_{50} of 9,1567µg/ mL.

The following research uses methanol as a solvent in making extracts and making peel off masks, among others, research conducted by (Batubara, 2016) with the title "The Potency of White Rice *(Oryza sativa),* Black rice *(Oryza sativa L.indica)*, and Red rice *(Oryza nivara)* as antioxidant and Tyrosinase Inhibitor "states methanol with IC_{50} values in this study was lower than the solvent n-hexane and ethyl acetate was concluded with the principle of the parameters which indicate antioxidant activity that is when the substance has a high antioxidant will have IC_{50} values are low, so methanol is better applied to show antioxidant activity.

2.2 Theoretical Foundation

2.2.1 Red Rice Plants

The classification of red rice according to (Tjitrosoepomo, 2004) is as follows:

Kingdom	: Plantae
Subkingdom	: Tracheobionta
Superdivision	: Spermatophyta
Division	: Magnoliophyta
Classification	: Liliopsida
Subclass	: Commelinidae
Order	: Poales
Familia	: Poaceae

Genus : Oryza

Species : *Oryza rufipogon* Griff

Synonym : *Oryza nivara* S.D Sharma & Shastry

Figure 1. Red Rice Plants

Red rice has a red color and it is caused by anthocyanin pigments found in the outer layer of red rice (Maekawa, 1998). Indonesia country has a variety of local red rice with each nutrient content different according to the place of growth (Roesmarkam, 2002). The research conducted by (Hadi, 2013) with the title "Study of Red Rice Morphology in the Surakarta Region" states that red rice in the Surakarta region has a fiber root type which includes root lengths ranging from 6.6 - 12.8 cm, plant height 35 - 56.3 cm, stem length 12,6 - 29,6 cm, diameter 0,3 - 0,6 cm, round rod, midrib length 12,3-15,5 cm, slippery stem surface, green stem color young to dark, leaf length 30-48.2 cm, leaf width 0.5 - 1 cm, surface color of the leaves to light green to dark, the color of the surface of the yellowish green leaves and light green, the leaf regeneration system is parallel, the location is final, number plantation flowers 45 - 96 units, oval flower shape, hairy grain surface, number of crop grain 9 - 248 units, brownish grain color, brownish red seed color, hairless seed surface.

Red rice has advantages in taste, mellow, and it is function for human body. The benefits of red rice in health include prevent food and nutritional deficiencies, curing vitamin A deficiency and vitamin B.

The anthocyanin content in red rice can be believed to prevent diseases such as cancer, cholesterol, and coronary heart disease. Red rice has a source of protein and minerals such as selenium which helps increase endurance, a source of B vitamins that can nourish nerve cells and the digestive system, and high fiber content so as to prevent constipation. In addition, rice also contains carotenoids, phenolics, alkaloids, nitrogen, organosulfur compounds, flavonoids, anthocyanins, coumarin, and tannins (Noppawat, 2015). Red rice has high antioxidant activity (Dwiyanti, 2013). Red rice has a sunblock activity against UVA and UVB radiation (Suda, 2013). Both of these effects are caused by the anthocyanin content of a pigment which gives the red color found in the pericarp layer to the outer layer of red rice endosperm. Anthocyanin is a component of the polyphenol derivative flavonoids (Indrasari, 2010). According to the verse Al - Qur'an about red rice are as follows:

وَ آيَةٌ لَّهُمُ الْاَ رْضُ الْمَيْتَةُ اَحْيَيْنَاهَا وَ اَخْرَجْنَا مِنْهَا حَبًّا فَمِنْهُ يَأْكُلُوْنَ

(يس : ٣٣)

«*And a sign (the greatness of God or the power of God) for them is dead earth (barren or dry). We turn on the earth and we remove it from the seeds for them to eat (Yaasin: 33) «.*

2.2.2 Extraction

According to the Farmakope book Edition V, extracts are concentrated preparations obtained by extracting active substances from vegetable or animal simplicia using suitable solvents, then almost all solvents are evaporated and the remaining period is treated so that they meet the prescribed standards. Extraction is a process of separating the content of chemical compounds from plant and animal tissues. Before extraction, the ingredients are usually dried first and then smoothed to the appropriate specific smoothness.

The principle of the extraction method is the transfer of the component of the substance into the solvent, where the displacement begins to occur in the interface layer which then breaks into the solvent (Maulida, 2010). Extraction can be done in various ways including the following:

a. Cold way

- Maserati

  Maserati is an extraction process at room temperature using a solvent for several days with a process of the process several times and extracts separated by filtration (Ditjen POM, 2000). The procedure is repeated one or two times more with fresh solvents. Maserati (for extracting liquids), fine powder or coarse powder as a medicinal plant which contacts with solvents stored in a closed container for a certain period with repeated stirring until the solute, maceration method is the most suitable method used for thermolabil compounds (Tiwari, et al, 2011).

  The advantage of maceration is the right process where the smooth material allows it to be soaked in menstruation until it permeates and softens the cell arrangement so that substances that are easily dissolved will dissolve and the loss is in need of large quantities of solvents, long run time and imperfect transmission (Ansel, 1989).

- Percolation

  Percolation is extraction utilize a new solvent until it is perfect at room temperature. The working principle of this procedure is the simplicia which is inserted into the percolator and added solvent is flowed from above by passing through the simplicia so that the solute flows down and is accommodated. This method is slow and requires a lot of solvents (Ditjen POM, 2000).

b. Hot way

- Soxhlet

  Soxhlet is extraction using absolute new solvents which are generally carried out with special tools so continuous extraction occurs with the number of solvents relatively constant in the presence of cooling back (Ditjen POM, 2000).

- Reflux

  Reflux is extraction with a solvent at the temperature of its boiling point, for a certain time and the amount of solvent is limited, relatively constant in the presence of reverse cooling. Generally, the process is repeated several times at the first residue to 3-5 times so that it can include a perfect extraction process (Ditjen POM, 2000).

- Infusion

  Infusion is an extraction uses water solvents at a water bath temperature (infusion vessel is immersed in boiling water handlers with a measured temperature of 96-98^{0}C) for a certain time (15-20 minutes) (Ditjen POM, 2000).

- Dekok

  Dekok is infused at a longer time (> 30^{0}C) and temperatures up to the boiling point of water (Ditjen POM, 2000).

- Digesti

  Digesti is kinetic maceration extraction at a higher temperature than room temperature, which is generally carried out at temperatures of 40-50^{0}C (Ditjen POM, 2000).

c. Various other extraction techniques

- Continuous extraction

  Continuous extraction is the extraction process carried out repeatedly with different solvents or recirculating the solvent and the process is arranged several times. This extraction

process is conducted to increase efficiency (number of solvents) and is designed for large quantities of material which is divided into several extraction vessels (Ditjen POM, 2000).

- Supercritical carbon dioxide

  Extraction with the use of supercritical for extraction of simplicia powder and carbon dioxide gas are commonly applied. Removal of this solvent is easy so that almost all extracts are immediately obtained (Ditjen POM, 2000).

- Ultrasonic extraction

  Ultrasonic vibrations (> 20,000 Hz) provide an effect on the extract process with the principle of increasing cell wall permeability, and generating spontaneous waves as dynamic stress and generating interphase fractions. Hsil extraction depends on the vibration frequency, the capacity of the equipment and the length of the ultrasonication process (Ditjen POM, 2000).

- Extraction of electrical energy

  Electrical energy is used in the form of electric fields, magnetic fields and electric discharges which can speed up the process and increase yields which principally cause spontaneous bubbles and spread velocity pressure waves (Ditjen POM, 2000).

2.2.3 Antioxidants

Antioxidants are substances that neutralize free radicals so that atoms with unpaired electrons get an electron pair. Antioxidants function to neutralize free radicals and protect the body from various diseases including degenerative diseases in the elderly such as arteriosclerosis. Many antioxidant compounds contained in vegetables, seeds, and fruits. Antioxidants to prevent oxidation or neutralize oxidized compounds by donating hydrogen or electrons (Silalahi, 2006).

According to (Winarsih, 2007) the mechanism of action of antioxidants is divided into 3 parts, as follows:

1) Primary antioxidants work to prevent the formation of new free radicals by converting free radicals into molecules which radically decreases before free radicals react, for example, superoxide dismutase (SOD), glutathione peroxidase and metal binding proteins.
2) Secondary antioxidants by breaking chains that function to capture free radicals and prevent chain reactions, for example, secondary group antioxidants are vitamin C, tocopherol, beta-carotene, phenol groups.
3) Tertiary antioxidants are groups by repairing damage cells and tissues caused by free radicals, for example, methionine sulfoxide reductase enzyme.

The source of antioxidants is divided into 2 parts, namely: natural antioxidants and synthetic antioxidants (Droge, 2002). And here is an explanation of the meaning:

1) Natural antioxidants obtained from the extraction of natural materials which are isolated from plants which generally contain phenolic or polyphenolic compounds which can be in the form of flavonoids, synamic acid derivatives, coumarin, organic acids. The flavonoid group has antioxidants which include flavones, flavonols, isoflavones, catechins, and chalcones.
2) Synthetic antioxidants derived from chemical reaction synthesis materials. Compounds including synthetic antioxidants, namely butyl hydroxy anisole (BHA), butyl hydroxy toluene (BHT), propyl gallate, butyl hydroxyquinone, and tocopherol.

The peel-off mask can be made from natural ingredients that contain antioxidant compounds to help the treatment of facial skin. Antioxidants are substances that can neutralize free radicals to protect the human body from disease by binding to free radicals and molecules

that can relatively damage cells (Budiarti, 2014).

According to (Winarsih, 2007) there are two kinds of antioxidants encompasses endogenous and exogenous. Endogenous antioxidants are a number of proteins and enzymes synthesized in the body to ward off free radicals in the body, while exogenous antioxidants are derived from food sources. The antioxidant defense system in cells can reduce it from free radicals.

2.2.4 Peel Off Mask

Cosmetics are materials or preparations intended for use on the outside of the human body (epidermis, hair, nails, lips, and external genital organs),or teeth and oral mucous membranes that aimed to clean, smell, change appearance, or improve body odor , or protect and maintain the body (BPOM, 2011). The main goal of cosmetics in modern society is to maintain personal hygiene, increase attractiveness through makeup, increase self-confidence, protect skin and hair from ultraviolet damage and pollution and prevent premature aging (Septiani, 2011). Peel off mask are skin care cosmetic preparations in the form of gels or pastes that are applied to the skin of the face. After being applied to the skin for a certain amount of time, the carrier contained in the mask preparation will evaporate to make the mask dry out and a transparent layer of elastic film will be formed so it can be exfoliated when it has dried. The way the peel-off gel mask works is to remove the dirt and the epidermis that has died or black spots that will be lifted when exfoliated (Agnia, 2015).

The peel-off mask has several benefits including able to relax facial muscles, cleanse the face, refresh facial skin, moisturize facial skin and soften facial skin (Vieira, 2009). Gel shaped masks have the such as easilly to use, to rinse after use, and easily cleaned. In addition, it can also be removed or released like an elastic membrane (Harry, 1993).

2.2.5 Formulation of Masks Peel Off

Peel off gel mask is a preparation that provides benefits such as able to relax facial muscles, cleanse and refresh, moisturize, and soften facial skin (Anjani, 2013). The most commonly used materials for making peel off mask formulations are PVA and HPMC. Hydroxypropyl Methylcellulose is a good filmmaker and acceptability, but its use is often combined with other film formers because the HPMC properties are slightly brittle and the surface is rough. Polyvinyl Alcohol produces films with a smooth has smooth surface, but in a single use produces a sticky film (Remalya, 2016).

1) PVA (Polyvinyl Alcohol)

PVA is a very attractive polymer, mainly because of the many characters that are in accordance with the desired polymer character, especially in the pharmaceutical and biomedical fields. PVA has a simple chemical structure with irregular hydroxyl groups (Peppas, 2000).

PVA is a substance typically tasteless, odorless, biodegradable and biocompatible. Able to dissolve in water, while polyvinyl alcohol can also dissolve in ethanol but, cannot dissolve in organic solvents (Ogur, 2005). Polyvinyl Alcohol (PVA) is classified as a synthetic polymer and is a homopolymer of ethanol. PVA utilized to form film layers on peel off gel face masks in a concentration range of 2.5- 17.5% (Beringhs, 2013). The concentration of polyvinyl alcohol is 10%- 16% (Lachman L., 2007).

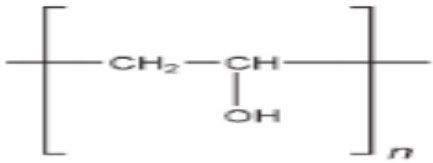


Figure 2. Polyvinyl Alcohol

2) HPMC (Hydroxypropyl Methylcellulose)

HPMC is a derivative of methylcellulose. HPMC is used as an emulsifying agent, suppressor agent, and as a stabilizing agent in topical preparations such as gel and ointments. HPMC as a protective agent to prevent water droplets and particles from merging or agglomeration, thus inhibiting the formation of sediments (Rowe R. , 2005)

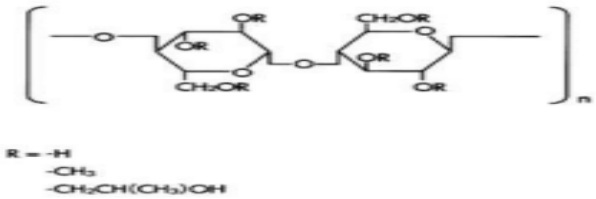


Figure 3. Hydroxypropyl Methylcellulose

HPMC has the characteristics of white powder or granules, has no odor and taste, it is difficult to dissolve in ether, ethanol or acetone. Can easily dissolve in hot water and will immediately clot and form colloids. Able to maintain evaporation of water so widely used in several applications of cosmetic products and other pharmaceutical products (Sofwan, 2011).

3) Propyleneglycol

Propyleneglycol (C3H8O2) is a clear, colorless, thick, odorless, sweet liquid and has a slightly sharp taste resembling glycerin. Propyleneglycol is soluble in acetone, ethanol, chloroform, glycerin, and water. Soluble in 6 parts ether, and insoluble in light mineral oil or fixed oil, but will dissolve some essential oils (Rowe, 2009). This solvent is commonly used for antimicrobial preservatives, disinfectants, humectants, plasticizers, solvent, and stabilizers. Propyleneglycol as a humectant with the usual concentration is 15% (Rowe, 2009).

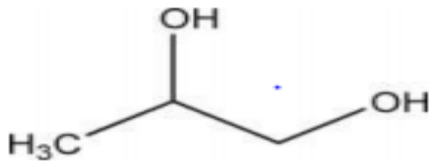


Figure 4. Propyleneglycol

4) Methylparaben

According to Farmakope book edition III, Methylparaben (C8H8O3), the description of fine crystal powder, white, almost odorless, has no taste, rather talented, followed by a thick, additives or preservatives. Methylparaben is widely used as an antimicrobial preservative in cosmetics, food products and in pharmaceutical preparation formulations. Methylparaben can be used alone or in combination with other parabens or with other antimicrobial substances. In cosmetic preparations, methylparaben is a preservative that frequently used (Rowe, 2009).

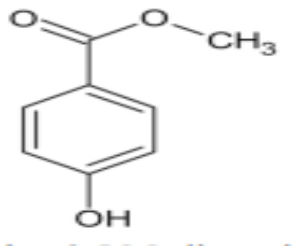


Figure 5. Methylparaben

5) Propylparaben

According to Farmakope book edition III (RI, 1979), Propylparaben (C10H12O3) describes white crystal powder, odorless, tasteless. The usefulness of propylparaben as preservatives. Propylparaben is widely used as an antimicrobial preservative in cosmetics, food products, and pharmaceutical formulation preparations. Propylparaben shows antimicrobial activity between pH 4-8. The efficacy of preservatives decreases with increasing

pH due to Parabens are more active agai a. Propylparaben is also more a ed to gram-negative bacteria (R

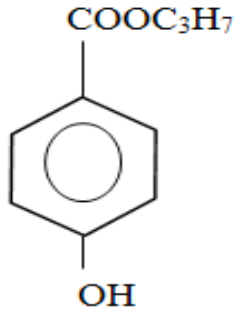


Figure 6. Propylparaben

6) Ethanol

Ethanol is synonymous with alcohol, ethyl alcohol, ethyl hydroxide, grain alcohol, methylcarbinol. Ethanol (C2H6O), a clear, colorless, slightly volatile description, has a distinctive odor and a burning sensation. Ethanol can be used as an antimicrobial, solvent and disinfectant. In making cosmetics peel off ethanol masks act as solvents (Rowe, 2009). Ethanol will give a cold feeling when the peel off mask is applied to the facial skin so that it can create a comfortable feeling and can speed up the drying process (Rahim, 2014).

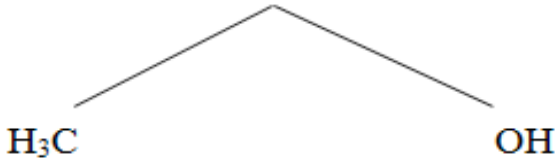


Figure 7. Ethanol

7) Methanol

According to Farmakope book edition III (RI, 1979), Methanol (CH3OH) describes a colorless, clear, distinctive odor. Methanol is a solvent, coolant, fuel. Methanol is known as methyl alcohol. Methanol is used as a solvent in the extraction process.

2.2.6 Test of Mask Preparation Peel Off

1) Test Antioxidant Activity with DPPH Method

According to Indonesian Farmakope book Edition IV, a UV-VIS spectrophotometer is a device used to measure how many are

produced from the chemical interactions between electromagnetic radiation and molecules or atoms of a chemical in the UV-VIS region. If a molecule or atom is subjected to electromagnetic radiation at the appropriate frequency the energy will be increased and the occurrence of energy absorption by molecules. Electronic transitions will increase molecular energy from the ground state to one or more excited energy levels (Gandjar, 2007).

The DPPH method is a simple method for testing samples having antioxidant abilities. The DPPH method can be used for samples in solution form. The principle is odd electron in DPPH molecules gives maximum absorption at a wavelength of 517 nm which is purple. The purple color will change to a weak yellow color when the odd electron pairs with a hydrogen atom given an antioxidant compound. This color change is based on chemical balance reactions (Muchtadi, 2009)

The DPPH method provides information on the reactivity of compounds tested with a stable radical. The antioxidant activity test uses the DPPH method because the test is simpler, easier, faster, and sensitive and requires only a small amount of sample liquid (Muchtadi, 2009).Antioxidant activity can be seen through IC_{50}. IC_{50} (inhibitory concentration), which is the concentration of an antioxidant, causes 50% DPPH to lose the character of free radicals or a concentration of antioxidants that give a 50% reduction in damping. The principle of substances that have high antioxidant activity, if the IC_{50} value is low (Molyneux, 2004)

2) Physical Test Preparation with Organoleptic Observation

Tests of physical or organoleptic testing were carried out by observing changes in the shape, color, and odor of the peel off mask preparation (Septiani, 2011)

3) Test preparation with pH

The pH measurement of preparation is carried out using a

pH meter tool. The pH of the gel preparation must be in accordance with the pH of the skin, which is 4.5 - 6.5 (Tranggono, 2007). Good gel pH is 4.5 - 8 (SNI, 1996).

4) Test Preparation with Drying Time

1 gram peel off mask is applied to the skin of the arm 7 cm long and 7 cm wide. Then the speed of drying is calculated to form a film layer from the peel off gel mask using a stopwatch (Pertiwi, 2012). Drying time range is accordance with the time range of products have been circulating in the market is 10-20 minutes (Sunarmi, 2016).

5) Test Preparation with Viscosity Test

A total of 100 ml of the gel was put into a 250 ml beaker glass and the viscosity was measured by Haake Viscometer. Thus, the spindle was set and the speed to be applied (Septiani, 2011). The viscosity requirements in the preparation of peel off gel masks or gel preparations are 2000-4000 cps (Sunarmi, 2016).

6) Test of Preparation using the Spread Test

As much as 1 gram of peel off mask is placed on top of the graph paper coated with transparent plastic and covered with other transparent plastic and measured in diameter from five vertices. The 19-gram load is placed on top of the gel layer, allowed to stand for 1 minute and note the spread gel diameter. The 20-gram load is added to the gel and left for 1 minute and recorded the gel diameter that spreads. The 20-gram load is added to the gel until the maximum load is above the gel weighing 99 grams, and every time it is added to the gel and allowed to stand for 1 minute the gel diameter is spread out. A graph of the relationship between load and gel area is made (Voight, 1994). The dispersion test parameters in a good gel preparation are between 5-7 cm (Voight, 1994).

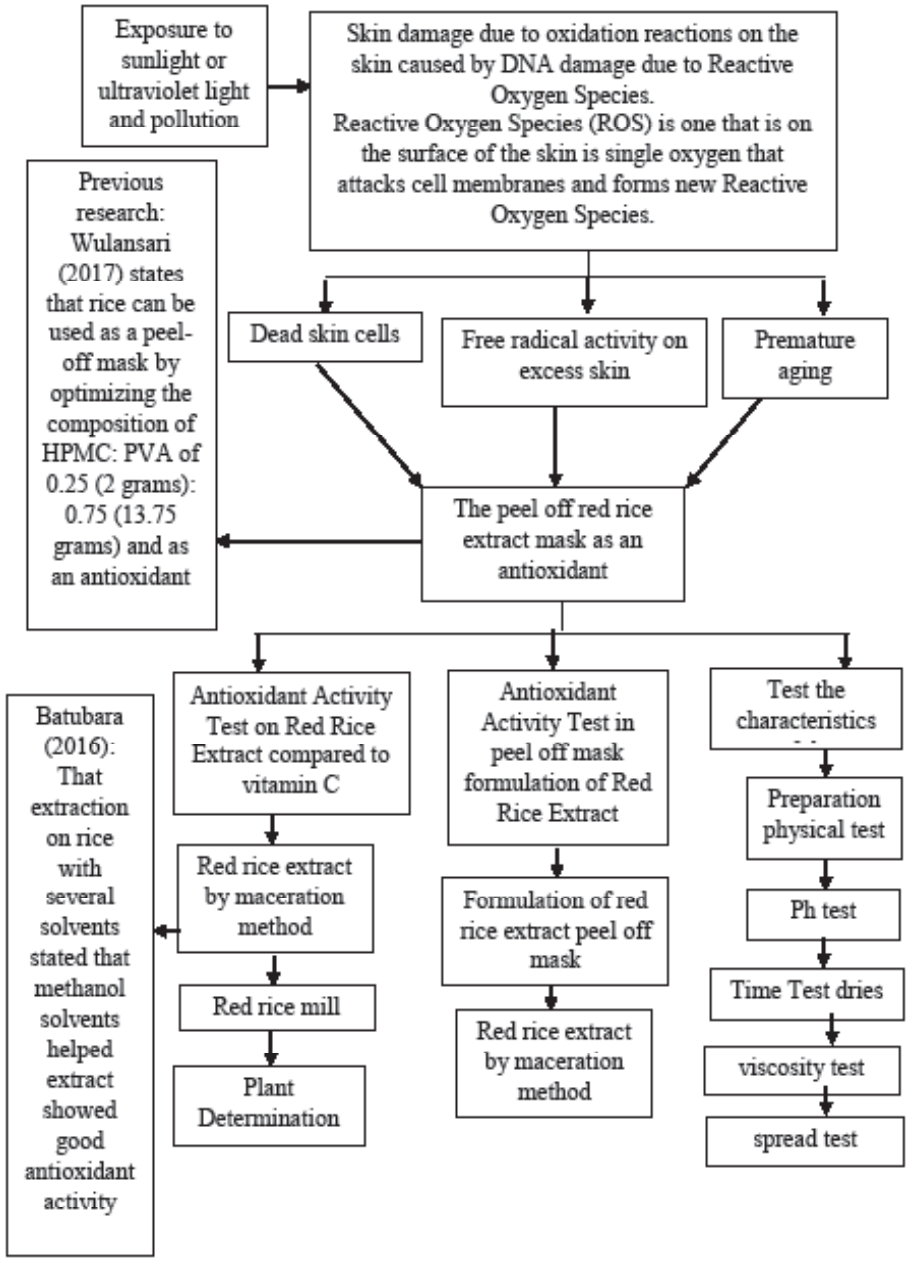
2.3 Halal Product Analysis

Provisions on the use of cosmetics and recommendations for the use of halal cosmetics based on the (MUI, 2013) said:

1) The use of cosmetics for legal ornamental purposes may be on condition: the materials used are halal and holy, indicated for interests that are permissible in *syar' i* and not harmful.
2) The use of cosmetics in (to be consumed or entered into the body) which is made from unclean is unlawful.
3) The use of external cosmetics (topical or not into the body) that use unclean or unclean ingredients other than pork is permitted with the condition that purification is done after use *(tathir syar' i)*.
4) The use of cosmetics which merely function as *tahsiniyyat*, there is no *rukhshah* (lightening) to make use of cosmetics which are *haram*.
5) The use of cosmetics functions as a drug having legal provisions as medicine, which refers to fatwa related to the use of drugs.
6) Cosmetics products containing ingredients made using genetically engineered microbes that involve pig genes or human genes are illegal. Cosmetics that use materials (raw, active or supplementary) from derivatives of halal animals (in the form of fat or other) which are not known how the slaughter of the law is *makruh tahrim,* so it must be avoided.
7) Cosmetics that use unknown microbial materials whether the microbial growth media from pigs, should be avoided until there is clarity about the halal and purity of the ingredients

The use of ethanol and methanol solvents in cosmetics where the ethanol and methanol solvents from the *non-khamar* industry (not the alcoholic beverage industry) are legal, if not harmful to non-medical. The use of ethanol and methanol solvents in the cosmetics produced by the *khamr* (alcoholic beverages) industry is illegal (MUI, 2013).

2.4 Conceptual Framework



CHAPTER 3

RESEARCH METHODS

3.1 Time and Place of Research

The research was concuducted in the Pharmacy Technology laboratory, Universitas Darussalam Gontor Pharmacy Study Program and Integrated Chemistry laboratory, University of Darussalam Gontor Agricultural Industrial Technology Study Program. The duration of the study was 3 months starting from January 2018 to March 2019.

3.2 Research Tools and Materials

The tools deployed during the research are analytical scales (Hauser Wiggen), blender (Philips), beaker glasses (Pyrex), filter paper, label paper, aluminum foil, cling wrap, stirring rod, beaker (Iwaki), funnel, pumpkin Erlenmeyer (Iwaki), drip pipette, measuring flask, measuring cup (Pyrex), test tube (Iwaki), UV VIS spectrophotometer (Thermo Scientific Genesys), water bath, petri dish, watch glass, pH meter (pHNep), rotary evaporator (Eyela), magnetic stirrer, viscometer (Viscolead). The materials needed during this research are red rice, ethanol 96%, methanol, PVA, HPMC, propyleneglycol, Methylparaben, Propylparaben, aquades, and DPPH, vitamin C.

3.3 Trial Design

This study included experimental research in the laboratory. Then the formula design in it is as follows:

Table 1. Formulation Design

Composition	Formulation (%)			Function
	F1	F2	F3	
Red rice extract	3 x IC_{50}	6 x IC_{50}	9 x IC_{50}	Active substance
PVA	12	12	12	Gelling agent and film forming
HPMC	4	4	4	Viscosity enhancer
Propyleneglycol	15	15	15	Humectants
Methylparaben	0,2	0,2	0,2	Preservatives
Propylparaben	0,1	0,1	0,1	Preservatives
Etanol 96%	10	10	10	Solvents
Aquadest	Ad 100	Ad 100	Ad 100	Solvents

Description: F1: Formulation 1, F2: Formulation 2, F3: Formulation 3.

3.4 Research Procedure

3.4.1 Plant Determination

Red rice will be taken from the village area of Sidoharjo, Sragen, Central Java. The determination test of red rice based on taxonomy will be tested at the Pharmacy-Biology Laboratory of Gadjah Mada University. Determination serves to avoid an error in the use of materials that will be examined or used in a study. The results of the determination obtained using simplicia namely Red Rice Plant. The results of determination can be seen in appendix 1.

3.4.2 Making Red Rice Thick Extract

Red rice is mashed with fine grinding using a blender (Philips), then extracted by maceration by using 500 grams of red rice powder methanol (1: 3). According to (Batubara, 2016), that extraction on rice with several solvents stated that methanol solvents helped extract showed good antioxidant activity. The filtrate obtained from each maceration were concentrated with a rotary vacuum evaporator at 60^0C until the thick filtrate were obtained. Evaporation is carried out

by rotary vacuum evaporator at 60^0C aims to recover methanol which is separated from the extract with the possibility of decomposition of chemical compounds due to the heat of evaporation process. Then the rather thick filtrate is placed on the water bath so the thick extract is obtained and then dried by being put into the freezer to remove any remaining solvent.

The extraction results shown simplicia produced a thick extract of 15.0203 grams. Soaking is influenced by the desired water content of the initial and final ingredients. Soaking can be seen from where the higher the water content in the material, the final weight produced will be even higher (Desrosier, 1988). Based on these data it can be seen that the yield of red rice extract with the result of Immersion calculation as follows:

$$\text{Immersion} = \frac{\text{Thick extract weight Berat}}{\text{Red rice powder weigh}} \times 100$$

$$\text{Immersion} = \frac{15.0203}{500} \times 100\ \%$$

$$= 3.00\ \%$$

3.4.3 Antioxidant Activity Test for Extracts Using the DPPH Method

Making a DPPH solution. Considering the DPPH 5 mg solution then added with 100 ml of methanol solvent in the measuring flask so that the DPPH solution has a concentration of 50 ppm.

Making sample solutions. How to make red rice extract with a concentration of 1000 ppm (5 ppm, 10 ppm, 15 ppm, 20 ppm) by weighing 10 mg added 10 ml of methanol to a measuring flask then stirring until homogeneous, then making a sample concentration of 5

ppm by taking 25 µl (0.025 ml) added 5 ml methanol solvent to the measuring flask, 10 ppm taken 50 µl (0.0050 ml) added 5 ml methanol solvent to the flask, 15 ppm taken 75 µl (0.075 ml) added 5 ml methanol solvent to the measuring flask, 20 ppm taken 100 µl (0.100 ml) was added 5 ml of methanol solvent in a measuring flask.

Making a comparison solution. Made a 500 ppm mother liquor by weighing 5 mg of vitamin C solution and then dissolving with 10 ml of methanol in a measuring flask and stirring until homogeneous. Furthermore, variations in the concentration of 2 ppm, 4 ppm, 6 ppm, 8 ppm were made.

Measurement of antioxidant power. Determination of the maximum wavelength or antioxidant testing by piping 2 ml of the sample solution from various concentrations and then added 2 ml of DPPH solution then incubating for 30 minutes. Thus, the sample reading to measure the absorbance at a wavelength of 517 nm. Then calculate% inhibition:

$$\% \text{ inhibition} = \frac{(\text{absorbance of control} - \text{absorbance of sample})}{\text{absorbance of control}} \times 100\%$$

After absorbance data and inhibition, data were obtained when a linear regression equation was made between the known series of concentrations of red rice extract, vitamin C and inhibition, then IC_{50} (X) data analysis was sought. The IC_{50} value is obtained after immersing from the total DPPH, the IC_{50} value is obtained from a linear line equation from the y-axis, it will get the value of x as the IC_{50} value (Tristantini, 2016). A compound concluded to be an antioxidant very strong if the IC_{50} value is less than 50, strong (50-100), moderate (100-150), and weak (151-200). The smaller the IC_{50} value the higher the antioxidant activity (Badarinath, 2010).

3.4.4 Making Red Rice Extract Peel Off Mask

The preparation of the peel off face mask began by dissolving the extract in 96% ethanol gradually until the extract dissolves completed. Then in a separate place, PVA is developed with warm distilled water (80 derajat Celcius) until it expands perfectly, then homogenized (container A). HPMC is developed in cold distilled water with constant stirring until the HPMC expands (container B). In other containers (container C), dissolve methylparaben and propylparaben in propylene glycol. Then mix container B and container C in a row into container A and stir until homogeneous. Extraction that has been dissolved gradually with 96% ethanol, then stir it again until homogeneous, then add distilled water to add 100 ml and stir again until homogeneous

3.4.5 Evaluation of Prepared Mask of Peel Off Red Rice Extract

1. Preparation of Physical Test

   Physical test preparation or organoleptic testing is done by observing changes in the shape, color, and odor of the peel off mask preparation (Septiani, 2011).

2. pH test

   The pH measurement of preparation is conducted using a pH meter tool. The pH of the gel preparation must be in accordance with the pH of the skin, which is 4.5 - 6.5 (Tranggono, 2007). Good gel pH is 4.5 - 8 (SNI, 1996)

3. Drying Time Test

   1 gram peel off mask is applied to the skin of the arm 7 cm long and 7 cm wide. The speed of drying is calculated to form a film layer from the peel off gel mask using a stopwatch (Pertiwi, 2012). Drying time range is in accordance with the time range of products that have been circulated in the market is 10-20 minutes (Sunarmi, 2016)

4. Viscosity Test

   A total of 100 ml of the gel was put into a 250 ml beaker glass and the viscosity was measured by Viscometer 6R Haake, the spindle was set and the speed to be used (Septiani, 2011). Viscometer used is viscolead with L3 and Rpm 30 spindles for viscosity checks. The viscosity requirements in the preparation of peel off gel masks or gel preparations are 2000-4000 cps (Sunarmi, 2016).

5. Spread Test

   As much as 1 gram of peel off mask is placed on top of the graph paper has been coated with transparent plastic and then covered with other transparent plastic and measured in diameter from five vertices. The 19-gram load is placed on top of the gel layer, allowed to stand for 1 minute and note the spread gel diameter. The 20-gram load is added to the gel and left for 1 minute and recorded the gel diameter that spreads. The 20-gram load is added to the gel until the maximum load is above the gel weighing 99 grams, and every time it is added to the gel and allowed to stand for 1 minute the gel diameter is spread out. A graph of the relationship between load and gel area is made (Voight, 1994). The dispersion test parameters in a good gel preparation are between 5-7 cm (Voight, 1994).

3.4.6 Antioxidant Activity Test for Mask Peel Off Red Rice Extract

A total of 25 mg of the preparation was dissolved with methanol in a 25 ml volumetric flask then stirred until homogeneous to make a 1000 ppm mother liquor. Thus, several solutions to the preparation concentration from the mother liquor 1000 ppm with concentration (5, 10, 15, 20 ppm) were made. Mix 2 ml of each preparation solution with 2 ml of DPPH 0.1 mM in methanol, then homogenize and store in a dark room for 30 minutes. Furthermore, the absorbance of the solution is measured at a wavelength of 517 nm using a UV-VIS

spectrophotometer (Kharisma, 2014). Then calculate% inhibition:

$$\% \text{ inhibition} = \frac{(\text{absorbance of control} - \text{absorbance of sample}) \times 100\%}{\text{absorbance of control}}$$

After absorbance data and inhibition, data were obtained when a linear regression equation was made between the known series of concentrations of red rice extract, vitamin C and inhibition, then IC_{50} (X) data analysis was sought. The IC_{50} value is obtained after immersing from the total DPPH, the IC50 value is obtained from a linear line equation from the y-axis, it will get the value of x as the IC_{50} value (Tristantini, 2016). A compound as antioxidant is very strong if the IC_{50} value is less than 50, strong (50-100), moderate (100-150), and weak (151-200). The smaller the IC_{50} value the higher the antioxidant activity (Badarinath, 2010)

3.5 Data Analysis

Tests of antioxidant activity on extracts and red rice can be seen from the results of IC_{50} which previously carried out absorbance data and inhibition data from linear regression equations utilizing *Microsoft Excel*. The characteristic results in red rice are based on descriptive analysis by examining all the yield characteristics according to the parameters specified.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Results of Antioxidant Activity Test of Red Rice Extract and Vitamin C

Test of antioxidant activity of red rice extract with DPPH method obtained data made with linear regressions curves between % inhibition and the concentration of red rice extract where x defined as the concentration and value y defined as % inhibition so that the regression equation can be obtained with the following data in Table 2, as follows:

Table 2. Data on% inhibition and IC_{50} value of red rice extract.

Concentration (ppm)	Absorbance Red Rice Extract	% inhibition Red Rice Extract	**IC_{50} Value**
5	0.344	0	23. 31 µg/ mL
10	0.266	22.67	
15	0.266	22.67	
20	0.196	43.02	

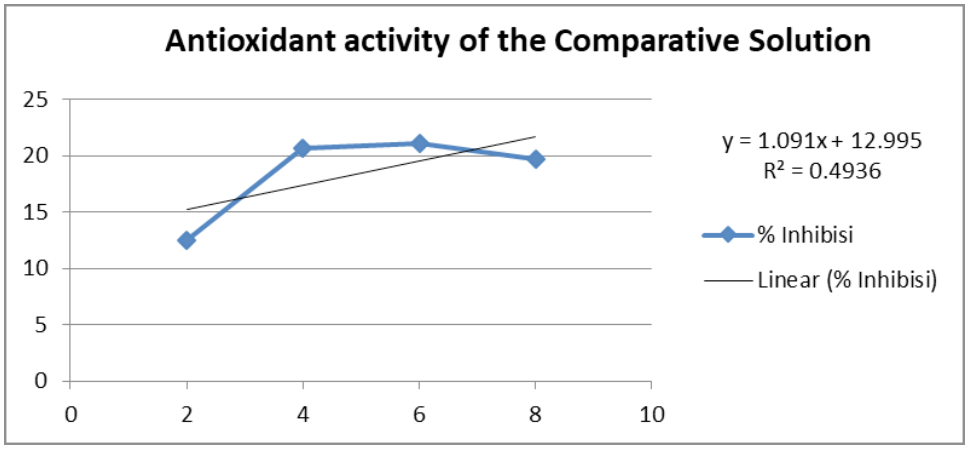
The parameter used to determine antioxidant activity is the IC_{50} value. A compound would a very powerful antioxidant if the IC_{50} value is less than 50 µg / mL, strong if the IC_{50} value is 50-100 µg / mL, moderate if the IC_{50} value is 100-150 µg / mL, weak if the IC_{50} value is 150-200 µg / mL, and IC_{50} values 200-1000 µg / mL were declared to be less active but could still have potential as an antioxidant (Molyneux, 2004). The IC_{50} value is the concentration of extract needed in antioxidant testing on the DPPH method. So that the value 50 is substituted to be the value of y so that it will get the value x as the IC_{50} value. In the red rice extract data obtained IC_{50} value of 23.31 µg / mL <50, it was stated that antioxidant activity was very strong as staled in Appendix 2.

The results of this study found that IC_{50} values in red rice extract were 23.31 µg/ mL which means the antioxidant activity in red rice extract was very strong. Antioxidant activity is defined as an inhibitor of oxidation by reacting with reactive free radicals to form un r eactive free radicals which become relatively stable so antioxidant compounds are able to delay or inhibit oxidation reactions in the body (Molyneux, 2004)

Testing of antioxidant activity was also carried out on vitamin C as a comparison of antioxidant activity in red rice, with data as follows:

Table 3. Data on %Inhibiton and Value IC_{50} Vitamin C

Concentration (ppm)	Absorbance Vitamin C	% inhibition Vitamin C	IC_{50} value
2	0.441	12.5	33.92 µg/ mL
4	0.400	20.63	
6	0.398	21.03	
8	0.405	19.64	



The IC_{50} value is a calculation of the value needed in antioxidant testing on the DPPH method. So that the value 50 is substituted to be the value of y so that it will get the value x as the IC_{50} value. In the data of vitamin C with a linear regression equation that is y = 1.091x + 12.995 with a correlation of R2 = 0.4936 from the linear curve produces an IC_{50} value of 33.92 µg / mL <50 is a very strong antioxidant Appendix 2.

Antioxidant red rice extract was indicated by IC_{50} results of 23.3106 µg / mL, and Vitamin C antioxidants were shown with the results of 33.92 µg / mL. Vitamin C has antioxidant activity because Vitamin C is a pure compound that has antioxidant potential, while red rice thick extract also has antioxidant properties because it has compounds such as carotenoids, phenolics, alkaloids, nitrogen, flavonoids, anthocyanins, coumarin, alkaloids, and tannins (Noppawat, 2015).

4.2 Results of the Characteristics of the Test Results of the Peel Off Red Rice Extract Mask

1. Physical Test Results of Prepared Mask for Red Rice Extract Peel Off

The physical test of the preparation of peel off red rice extract mask by observing the color, smell and shape of the preparation. Physical tests can be seen in the following table:

Table 4. Results of Preparation Physical Test Parameters

Formulation Masker Peel Off	Preparation Physical Test Parameters		
	Color	Smell	Shape
F1	Faded Red	Smell of propyleneglycol smelly rice which is strong and has a slight odor of ethanol	Semisolid and is very sticky
F2	Red	The smell of propyleneglycol smelly rice which is rather strong and has a slight odor of ethanol	Semisolid and is very sticky
F3	The dark red is almost black	The smell of mixed rice smell of propylene glycol which is not too strong is almost dominant to the smell of red rice and a little smell of ethanol	Semisolid and is very sticky

Observation of the physical test of the preparation of peel off red rice extract mask from the three formulas showed that the peel off mask was semisolid and it is very sticky. This is caused by the PVA base that functions as a gelling agent produces films with a smooth surface, and is not brittle but in a single use produces a sticky film (Remalya, 2016). The PVA base is added by HPMC which functions as viscosity and film-forming enhancer, so the film formation in the preparation of the peel off mask formulation is very good and sticky. According to (Luna, 2015) red rice has amylose and amylopectin compounds which are the main components of starch constituents. The higher the amylose content, the more rice is sticky. So the semisolid properties are due to the presence of the sticky PVA, HPMC and amylose compounds and amylopectin compounds.

The three formulations of the peel off mask produced smelled of propylene glycol which was quite strong and smelled of ethanol. This is because the composition in the peel off mask containing 15% propylene glycol which has a distinctive odor and ethanol used in the composition of this preparation has a high concentration of 10%. The F1 formula has a slightly faded red color due to the smallest concentration of red rice extract, which is 0.069% and the color on F3 has a dark red almost black color because it has a high extract concentration level from the three preparations of peel off masks which are 0.207%. The color difference in red rice is red because has anthocyanin content which causes the formation of red color (Indrasari, 2010).

2. pH Test Results Preparation of Red Rice Extract Peel Off Mask

The pH test on a peel-off mask is used to determine the acidity or base level of preparation so it can be safely used. The pH test results can be seen in the following table:

Table 5. Results pH Test Parameters

Formulation Mask Peel Off	pH Test Parameters			Average
	1	2	3	
F1	6.5	6.6	6.4	6.5
F2	6.8	6.4	6.7	6.6
F3	6.9	6.8	7	6.9

The acidity of the preparation is analyzed by measuring the pH of a preparation. The results of pH measurements for each formula of peel off red rice extract from 3 repetitions in each formulation obtained a pH value of 6.5 - 6.9. Good pH gel parameters are 4.5 - 8 (SNI, 1996). In all formulations, the average pH ranged from 6.5 to 6.9 means the pH in each formula of peel off masks was match the requirements for topical preparations based on standards determined by the Indonesian National Standard Agency. The pH requirements for gel preparations and peel off masks must be in accordance with the skin's normal pH of 4.5 - 6.5 (Tranggono, 2007) pH measurement in the preparation of peel off mask should be considered because if the mask has a pH that is too alkaline it will cause the skin to dry out, whereas if the pH is too acidic it will cause skin irritation (Djajadisastra, 2004).

Based on the data above, it can be seen that the concentration of red rice extract is increased affect the pH value to decrease (acid). This is because red rice has many acidic compounds contained in phenol compounds and have potential antioxidants. An investigative study evaluate the comprehensive nature of red rice was validated that aleurone contained essential phenols such as ferulic acid, and caffeic acid (Batubara, 2016). Red rice also has gamma-aminobutyric acid (Indrasari, 2010).

3. The Time Test Results of Drying the Preparation of the Red Rice Extract Peel Off Mask

The drying time test is a test performed on the peel off mask. The drying time test results can be seen in the following table:

Table 6. Result of Driying Time Test

Formulation Mask Peel Off	Drying Time Test Parameter			Average
	1	2	3	
F1	12	11.58	12	11.86
F2	12.18	12.16	12.17	12.17
F3	11.45	11.47	11.49	11.47

Testing for drying time is a primary test for mask peel off on the skin surface which aims to determine the formation of film layers and the drying time of the film layers. The time range dried on peel off mask products on the market such as the Vienna brand, which is between 10-20 minutes with the time range on the Vienna brand which is 12.57 minutes. On the three formulas with 3 repetitions for the time observation test to dry, ie with a span of 11.47 minutes - 12.17 minutes. The test results show that the drying time of all peels off mask formulations from F1, F2, and F3 is still in the drying time range which is in line with the product range that has been circulating in the market, 10-20 minutes (Sunarmi, 2016). But the best drying time is shown in F3 because it is faster when it dries.

Based on the data above, it can be seen that the higher the concentration of red rice used, the faster the drying time. This caused by the water content in red rice. According to the study (Nugraha, 2018) the decrease in water content in red rice in South Konawe and Kolaka was due to the method of drying and grain reversal carried out by several farmers so as to reduce starch levels in rice.

4. **Preparation of Viscosity Test Results of Red Rice Extract Peel Off Mask**

The viscosity test aims to determine the viscosity properties of a preparation. The results of the viscosity test can be seen from the following table:

Table 7. Results of Viscosity Test Parameter

Formulation Mask Peel Off	Viscosity Test Parameter			Average
	1	2	3	
F1	2001	2000	2004	2001 cps
F2	3332	3359	3360	3339 cps
F3	4956	4964	4960	4960 cps

The viscosity test aims to determine the magnitude of a viscosity value on preparation to express the amount of resistance of a liquid to flow. The viscosity test carried out on the peel off the mask using a viscometer namely Viscolead with L3 and Rpm 30 spindles so that the viscosity values of the three formulations yielded an average value between 2001 cps to 4960 cps. The viscosity requirements in the preparation of peel off gel masks or gel preparations are 2000-4000 cps (Sunarmi, 2016). In the viscosity test according to the requirements of the peel off gel mask, defined as F1 and F2.

Viscosity is a parameter to shows the ability of starch to be made into thick paste or gel after the heating and cooling process (Nugraha, 2018). Factors that influence the level of viscosity in flour are caused by the high amylose content and fat content in red rice. Viscosity is positively correlated with amylose and fat content so the higher the amylose content and fat the higher the viscosity (Lin, 2011). In the viscosity test, the preparation of the peel off F1 mask has the highest viscosity followed by F2 and F3. This is because the more concentration of red rice extract is used, the more amylose and amylopectin so that the viscosity value is higher. Amylose and amylopectin are the main components of starch constituents (Luna, 2015).

5. Preparation Spread Test Results of Red Rice Extract Peel Off Mask

The spread test of peel off red rice extract is a process to find out the spread of the peel off the mask when applied to the skin. The spread test results can be seen in the following table:

Table 8. Results the Spread Power Test Parameter

Formulation Mask Peel Off	the Spread Power Test Parameter			Average
	1	2	3	
F1	4.3 cm	4.48 cm	4.36 cm	4.38 cm
F2	3.68 cm	4.32 cm	4.1 cm	4.03 cm
F3	4.02 cm	4.34 cm	4.26 cm	4.21 cm

The dispersion test parameters in a good gel preparation are between 5-7 cm (Voight, 1994). The spread of peel off red rice extract mask with an average of 4.03 cm - 4.38 cm is not in accordance with the spread test parameters. This is because the red rice extract is applied too much, causing the preparation spread below the standard. According to (Luna, 2015) red rice has amylose and amylopectin compounds which are the main components of starch constituents. The higher the amylose content, the more rice is sticky. Therefore, if the concentration of red rice extract gets higher, it will become stickier and thicker so that the dispersion power will be lower.

4.3 Results of Antioxidant Activity of Mask Peel Off Red Rice Extract

Based on the statistics and calculation of IC_{50} values (Appendix 3) the results of the antioxidant activity formulation of the peel off red rice extract mask are as follows:

Table 9. Results of IC_{50} Value of Mask Peel Off Red Rice Extract

Formulation	IC_{50} Value
F1	64.24 µg/mL
F2	116.11 µg/mL
F3	276.83 µg/mL

The parameters for determining the antioxidant activity in a compound are seen from the IC_{50} value. A compound is have very strong antioxidant activity if the IC_{50} value is less than 50 µg / mL, strong if the IC_{50} value is 50-100 µg / mL, moderate if the IC_{50} value is 100-150 µg / mL, it is weak if the IC_{50} value is 150-200 µg / mL, and IC_{50} values 200-1000 µg / mL were declared to be less active but could still have potential as an antioxidant (Molyneux, 2004). In F1 the IC_{50} value obtained was 64.24 µg / mL so that it could be stated to have strong antioxidant activity, F2 with an IC_{50} value of 116.11 µg / mL was stated to have moderate activity as an antioxidant, and F3 with an IC_{50} value of 276.83 µg / mL is declared to be less active but can still be an antioxidant potential. Red rice has anthocyanin content which is a pigment that gives red color found in the pericarp layer to the outer layer of red rice endosperm. Anthocyanin is a component of flavonoids derived from polyphenols (Indrasari, 2010). This anthocyanin functions as an antioxidant (Dwiyanti, 2013) and functions as sunblock against UVA and UVB radiation (Suda, 2013).

The results of the previous study indicate that the peel off Formulation I (FI) mask has the highest antioxidant activity, followed by F2 and F3. This conclude the more the concentration of red rice extract used in the mask formulation will cause the antioxidant activity to decrease because the higher the concentration of red rice extract, the more the color changes in the formulation of the peel off mask. According to (Sompong, 2011) different color changes in rice have an effect on antioxidants because the hydrogen donation activity on DPPH radicals involves many compounds in rice including anthocyanins, phenolic acids and so on. The color of red rice caused by thought to produce anthocyanins or other compounds that cause red. Anthocyanin is a red pigment contained in pericarp and tegmen (skin layer) of rice and in each grain (Nugraha, 2018).

The peel-off gel mask is a preparation that provides benefits such as being able to relax facial muscles, cleanse and refresh, moisturize, and soften the facial skin. Peel off masks containing antioxidants made from natural ingredients can help treat the skin, especially in the face (Anjani, 2013). Antioxidants are compounds that neutralize free radicals and it is function to protect the body from disease by binding free radicals and reactive molecules that can damage cells (Budiarti, 2014). The workings of antioxidants on free radicals are by working to inhibit oxidation by reacting with reactive free radicals to form unreactive free radicals that become relatively stable so antioxidant compounds are able to delay or inhibit oxidation reactions in the body (Molyneux, 2004) counteracting free radicals with preventing damage to DNA due to oxidation reactions in the human body (Tjandrawinata, 2011). Skin damage due to oxidation reactions to the skin caused by DNA damage Reactive Oxygen Species. Reactive Oxygen Species (ROS) is one that is on the surface of the skin is single oxygen that attacks cell membranes and forms new Reactive Oxygen Species (Muchtadi, 2009). The antioxidant compound here is the formulation of peel off red rice extract mask and it's reactive free radical is DPPH.

4.4 Halal Product Analysis

The use of external cosmetics (topical or not into the body) that use unclean or unclean ingredients other than pork is permitted with the condition that purification is done after use (*tathir syar' i)*. The use of ethanol and methanol solvents in cosmetics where the ethanol and methanol solvents from the *non-khamar* industry (not the alcoholic beverage industry) are legal, if not harmful to non-medical. The use of ethanol and methanol solvents in the cosmetics produced by the *khamr* (alcoholic beverages) industry is illegal (MUI, 2013). Methylparaben and Propylparaben are preservatives derived from fruits, according to BPOM levels do not exceed from 0.4 - 0.8% (BPOM, 2011).

Analysis	Type Analysis	Halal	Non Halal	Information
Alat	Analytical Scales	√	-	-
	Rice grinder	√	-	-
	Blender	√	-	-
	Beaker Glasses	√	-	-
	Stirring Rod	√	-	-
	Chemical Glass	√	-	-
	Funnel	√	-	-
	Erlenmenyer	√	-	-
	Drop Pipette	√	-	-
	Measuring Cup	√	-	-
	Rotary Evaporator	√	-	-
	Waterbath	√	-	-
	Magnetic Stirrer	√	-	-
	Uv Vis Spectrophotometry	√	-	-
	Petri Cup	√	-	-
	pH meter	√	-	-
	Viscolead	√	-	-
	Red Rice	√	-	-

Material	Methanol	√	-	Methanol has gone through an evaporation process.
	Ethanol 96%	√	-	Ethanol has gone through an evaporation process (MUI, 2013)
	PVA	√	-	This polymer is obtained synthetically with monomer raw materials derived from petroleum (MUI, 2013).
	HPMC	√	-	Cellulose-based polymers come from plants (MUI, 2013).
	Propyleneglycol	√	-	-
	Methylparaben	√	-	Preservatives derived from fruits, according to (BPOM, 2011), levels do not exceed from 0.4 - 0.8%.
	Propylparaben	√	-	According to (BPOM, 2011), the level does not exceed 0.4 - 0.8%..
	Aquades	√	-	-
	DPPH	√	-	-
	Vitamin C	√	-	-
	Plant Determination	√	-	-
	Red rice mill	√	-	-

Research Process	**Antioxidant test for red rice extract**	√	-	-
	Making red rice extract peel off mask	√	-	-
	Evaluation of peel off mask preparation	√	-	-
	Antioxidant test for red rice extract peel mask	√	-	-

The use of external cosmetics (topical or not for the body) that use unclean ingredients other than pork is permitted with the condition that purification is done after use (tathir syar' i). The utilization and methanol solvents in cosmetics where are the ethanol and methanol solvents from the non-khamar ndustry (not the alcoholic beverage industry) are legal, if not harmful to non medical. The use of ethanol and methanol solvents in the cosmetics produced by the khamr (alcoholic beverages) industry in legal (MUI, 2013). Methylparaben and Propylparaben are preservatives derived from fruits, according to BPOM leevels do not exceed from 0,4% - 0,8% (BPOM, 2011).

CHAPTER 5

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusion

1. Antioxidant activity of red rice extract produced an IC50 value of 23.31 µg / mL while the antioxidant activity of vitamin C IC50 value was 33.92 µg / mL.
2. Characteristic test results of the formulation of red rice peel extract mask covering the physical test of the preparation of faded red to almost dark red, smelling of propylene glycol and ethanol, semisolid and very sticky. The test results were pH 6.5 - 6.9, the drying time test was 11.47 - 12.17 minutes, the viscosity test was 2001 - 4960 cps, and the spread test was 4.03 - 4.38 cm.
3. Antioxidant activity in the formulation of red rice extract peel off mask *(Oryza rufipogon Griff)* with IC50 calculation in F1 was 64.24 µg / mL, F2 was 116.11 µg / mL, and F3 was 276.83 µg / mL.

5.2 Suggestions

Further research needs to be done for example:

1. Further research is needed on the distance of storage of red rice extract with peel off mask preparations
2. Stability test needs to be held to determine the level of stability of the preparation.
3. Futher research is needed test the elasticity of the preparation to find out the elastic level of the preparation of the peel off mask.
4. Futher research is needed test chemical compounds to find out the chemical compounds contained in red rice extract which have antioxidant activity to prevent skin damage.

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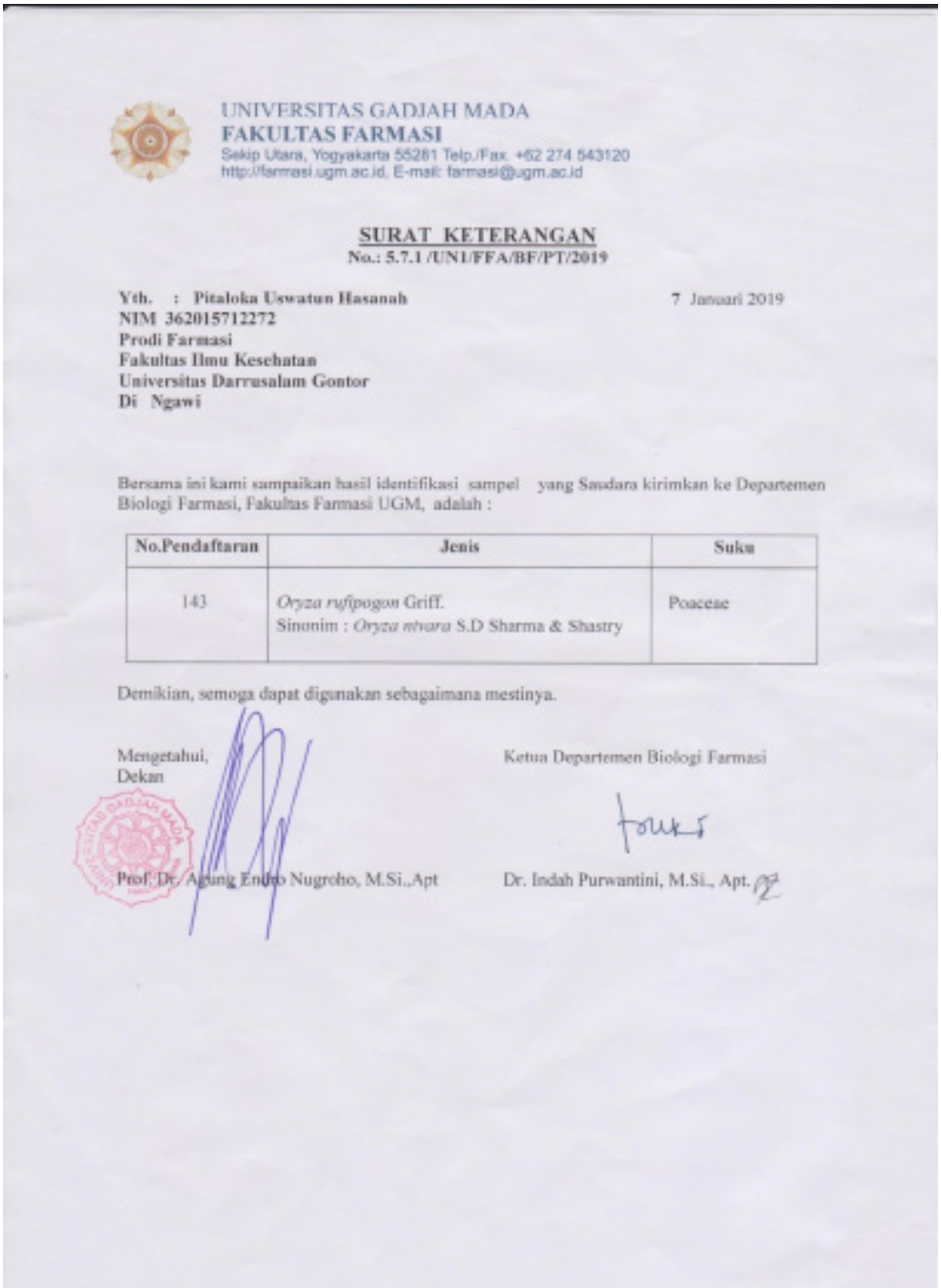
APPENDICES

Appendix 1. Results of Plant Determination



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SURAT KETERANGAN
No.: 5.7.1 /UN1/FFA/BF/PT/2019

Yth. : Pitaloka Uswatun Hasanah 7 Januari 2019
NIM 362015712272
Prodi Farmasi
Fakultas Ilmu Kesehatan
Universitas Darrusalam Gontor
Di Ngawi

Bersama ini kami sampaikan hasil identifikasi sampel yang Saudara kirimkan ke Departemen Biologi Farmasi, Fakultas Farmasi UGM, adalah :

No.Pendaftaran	Jenis	Suku
143	*Oryza rufipogon* Griff. Sinonim : *Oryza nivara* S.D Sharma & Shastry	Poaceae

Demikian, semoga dapat digunakan sebagaimana mestinya.

Mengetahui,
Dekan

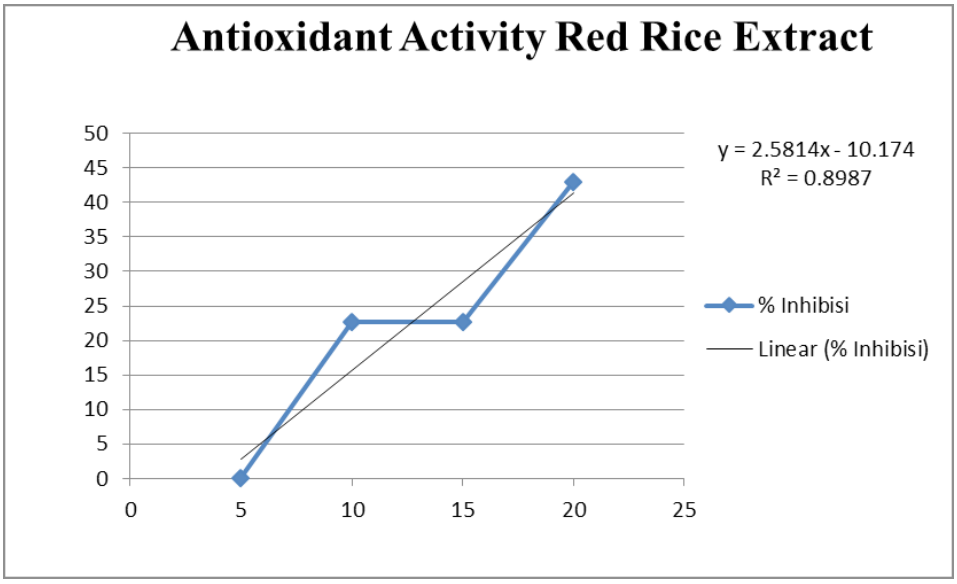
Prof. Dr. Agung Endro Nugroho, M.Si.,Apt

Ketua Departemen Biologi Farmasi

Dr. Indah Purwantini, M.Si., Apt.

Appendix 2. Calculation of IC_{50} values in Red Rice Extract and Vitamin C

Static Antioxidant Activity and Calculation of IC50 value of Red Rice Extract



Information :
X-axis: concentration (ppm)
Y-axis:% inhibition

From the picture above, we get a linear regression equation that is y = 2.5814x - 10.174 with a correlation R2 = 0.8987 from a linear curve which is then used to calculate the IC_{50} (x) value:

y = (which results from linear regression equation)

y = 2.5814x – 10.174

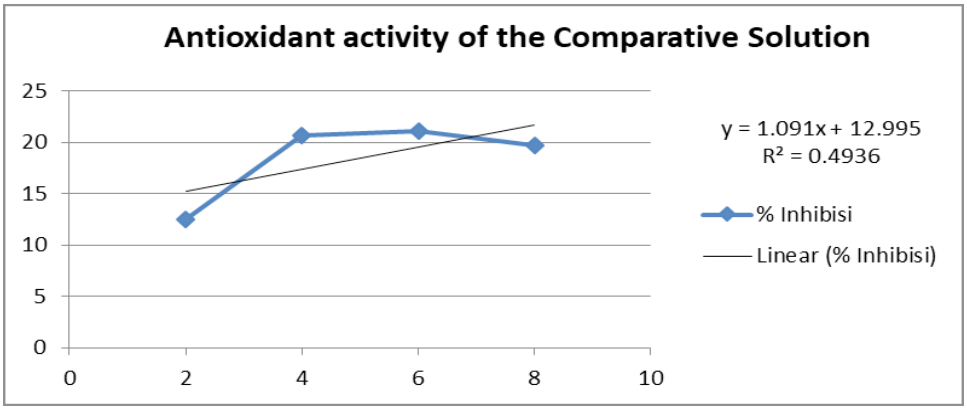
50 = 2.5814x – 10.174

2.5814x = 50 + 10.174

x = 50 + 10.174/2. 5814

x = 23.3106

Static Antioxidant Activity and Calculation of IC_{50} Vitamin C values



Information :
X-axis: concentration (ppm)
Y-axis:% inhibition

From the picture above, we get a linear regression equation that is y = 1.091x +12.995 with a correlation R2 = 0.4936 from a linear curve which is then used to calculate the IC_{50} (x) value:

y = (which results from linear regression equation)

y = 1.091x + 12.995

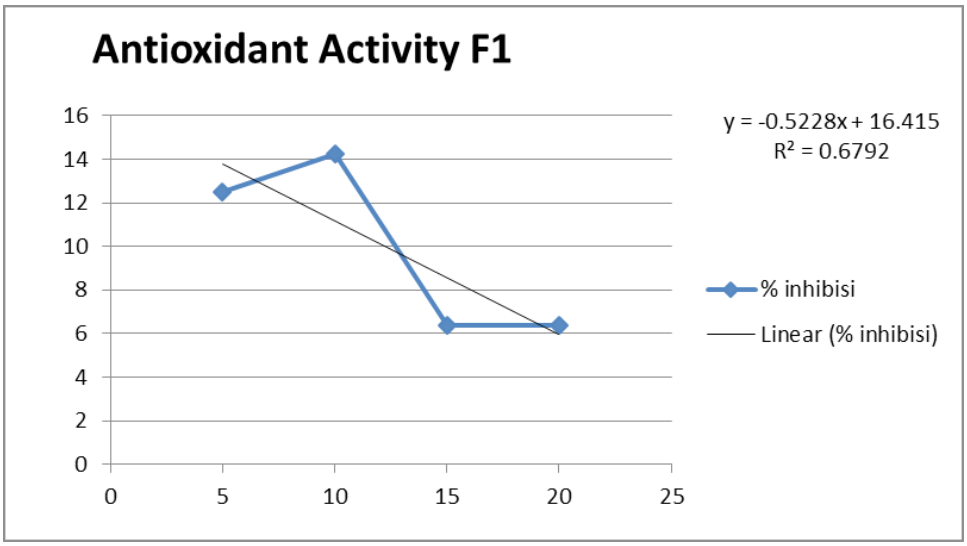
50 = 1.091x + 12.995

1.091 = 50 – 12.995

x = 50 – 12.995/1.091

x = 33.92

Appendix 3. Calculation IC_{50} on Red Rice Extract Peel Off Mask Static Antioxidant Activity and Calculation of IC_{50} F1 values



Concentration (ppm)	Replication 1	Replication 2	Average	%Inhibition	IC50 values
5	0.589	0.589	0.589	12.48	64.24 µg/mL
10	0.590	0.564	0.577	14.26	
15	0.673	0.588	0.630	6.39	
20	0.673	0.588	0.630	6.39	

Information :

X-axis: concentration (ppm)

Y-axis:% inhibition

From the picture above, we get a linear regression equation that is y = -0.5228x + 16.415 with a correlation R2 = 0.679 from a linear curve which is then used to calculate the IC_{50} (x) value:

y = (which results from linear regression equation)

y = -0.5228x + 16.415

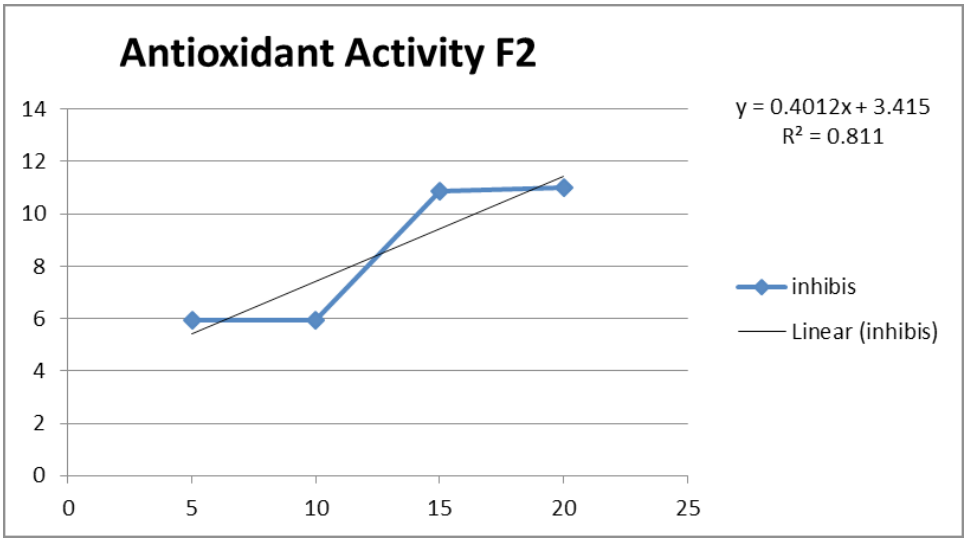
50 =-0.5228x + 16.415

0.5228x = 50 – 16.415

x = 50 – 16.415/0.5228

x = 64.24

Static Antioxidant Activity and Calculation of IC_{50} F2 values



Concentration (ppm)	Replication 1	Replication 2	Average	%Inhibition	IC50 values
5	0.633	0.633	0.633	5.94	116.11 µg/mL
10	0.633	0.633	0.633	5.94	
15	0.583	0.616	0.600	10.85	
20	0.583	0.615	0.599	10.99	

Information :

X-axis: concentration (ppm)

Y-axis:% inhibition

y = (which results from linear regression equation)

y = 0.4012x + 3.415

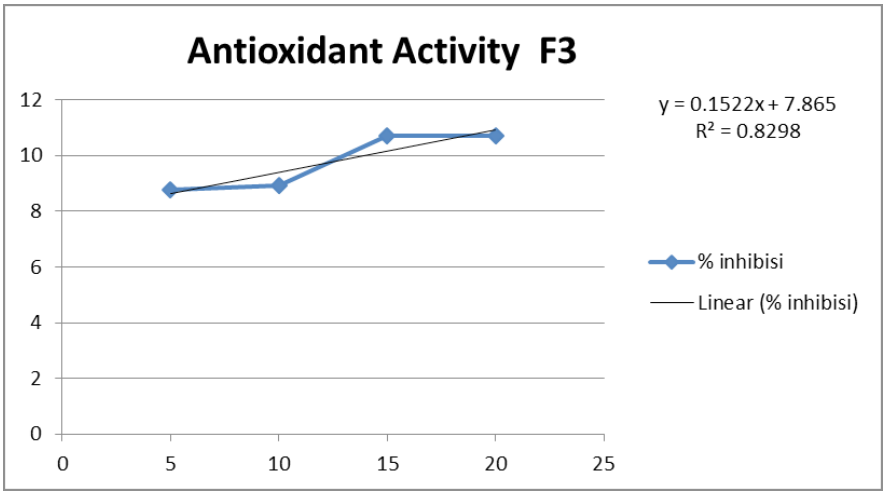
50 = 0.4012x + 3.415

0.4012 = 50 – 3.415

x = 50 – 3.415/0.4012

x = 116.11

Static Antioxidant Activity and Calculation of IC_{50} F3 values



Concentration (ppm)	Replication 1	Replication 2	Average	%Inhibition	IC50 values
5	0.629	0.599	0.614	8.76	276.83 µg/mL
10	0.629	0.598	0.613	8.91	
15	0.573	0.629	0.601	10.70	
20	0.573	0.629	0.601	10.70	

Information :

X-axis: concentration (ppm)

Y-axis:% inhibition

y = (which results from linear regression equation)

y = 0.1522x + 7.865

50 = 0.1522x + 7.865

0.1522 = 50 – 7.865

x = 50 – 7.8650.152

x = 276.83

Appendix 4. Research Process

Immersion Extraction

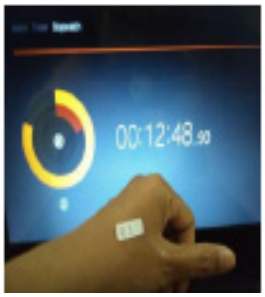
Filtrate Extract

Rotary Evaporator

Research Materials

pH Test

Viscocity Test



Driying Time Test

Spread Test

Antioxidant Activity Test for Red Rice Extract and Mask peel off