

**Candidate for natural halal cosmetic ingredients: determination of total phenolic level and spf values from extract and purified extract seeds of *Swietenia mahagoni* Jacq**

**<sup>1</sup>Ardiana Marsha, <sup>1\*</sup>Diniatik, <sup>1</sup>Pri Iswati Utami**

<sup>1</sup>*Faculty of Pharmacy, Universitas Muhammadiyah Purwokerto,  
Jl. Raya Dukuwaluh Banyumas, Central Java, Indonesia  
email: diniatik@yahoo.com.au*

*Submitted: 18-03-2020*

*Reviewed: 18-04-2020*

*Accepted: 28-09-2020*

**ABSTRAK**

Sinar ultraviolet (UV) yang pada sinar matahari dapat beresiko menyebabkan pigmentasi, penuaan dini, kerutan, hingga kanker kulit. Penelitian ini dilakukan dengan memanfaatkan ekstrak etanol 70% dan ekstrak terpurifikasi biji mahoni (*Swietenia Mahagoni Jacq.*). Penelitian yang dilakukan adalah menentukan kadar fenolik total dengan mereaksikan larutan sampel dengan reagen folin-ciocalteu dan mengukur nilai absorbansinya pada panjang gelombang maksimal 749 nm. Pengukuran nilai SPF dilakukan menurut persamaan Mansur yang diukur absorbansinya pada panjang gelombang 290-320 nm. Pada penelitian ini dilakukan skrining fitokimia yang dilakukan untuk mengetahui senyawa yang terdapat pada ekstrak dan ekstrak terpurifikasi biji mahoni. Hasil yang diperoleh dari menghitung TPC (*Total Phenolic Content*) pada ekstrak etanol adalah 1,849mg GEA/gram, dan 2,517 mg GEA/gram pada ekstrak terpurifikasi. Nilai SPF yang diperoleh dengan konsentrasi 200ppm pada ekstrak etanol adalah  $0,66 \pm 0,008918$ , sedangkan nilai SPF ekstrak terpurifikasi adalah  $1,18 \pm 0,009386$ . Hasil skrining fitokimia ekstrak dan ekstrak terpurifikasi biji mahoni menunjukkan bahwa positif mengandung senyawa alkaloid, polifenol/tanin, flavonoid, terpenoid, dan saponin.

**Kata kunci:** biji mahoni, fenolik total, tabir surya, skrining fitokimia

**ABSTRACT**

Ultraviolet (UV) rays as a sun light can gave risk of causing; effect pigmentation, premature aging, skin Although cancer. This research was conducted by utilizing 70% ethanol extract and purified mahogany seed extract (*Swietenia mahagoni* Jacq.). The research was conducted to determine the total phenolic content of the sample solution by reacting with the Folin-Ciocalteu reagent and measuring the absorbance value at a maximum wavelength of 749 nm. The measurement of Sun Protection Factor (SPF) value is carried out according to the Mansur equation Whose absorbance is measured at a wavelength of 290-320 nm. In this study phytochemical screening was conducted to determine the compounds contained in the extracts and purified extracts of mahogany seeds. The results Obtained from calculating TPC (Total Phenolic Content) in ethanol extract Gallic Acid Equivalent (GEA) were 1.849 mg/g, and 2.517 mg GEA/gram in Purified extract. Obtained SPF value with a concentration of 200ppm in ethanol extract was  $0.66 \pm 0.0089$  while the SPF value of purified extract was  $1.18 \pm 0.0093$  Phytochemical screening results and purified mahogany seed extracts showed that positively contained alkaloid compounds, polyphenols/tannins, flavonoids, terpenoids, and saponins.

**Keywords:** mahogany seeds, total phenolics, sun protection factor, phytochemicals *screening*

## INTRODUCTION

Currently, the cosmetic products are growing, almost everyone uses a many variety of cosmetic products every day, but for Muslims need to consider with the ingredients that contained in these cosmetics are halal or the materials that are not allowed in Islam. According to the Law of the Republic of Indonesia number 33 of 2014 concerning the guarantee of halal products decides the law on the guarantee of halal products, article 1, paragraph 2 of the article states that halal products are products that are declared legal according to Islamic shariah. It is mentioned in chapter 20, paragraph 1 that material derived from plants is essentially halal, except intoxicating and / or endangering the health of those who consume it.

Indonesia is a tropical country that always exposed by the sun throughout the year, so the risk of skin damage caused by exposure to ultraviolet light (UV). UV rays can be beneficial to humans, but when exposed for too long can have a negative impact such as freckles, wrinkles, premature aging, and cancer of the skin (Sineke et al., 2016).

Sunscreen compound is a compound that can protect the skin from the effects of ultraviolet rays emitted from the sun (Sineke et al., 2016). According (Damogalad et al., 2013) division capability is divided into a minimum sunscreen (SPF 2-4), moderate (SPF 4-6), Extra (SPF 6-8), and Ultra (SPF >15). In particular phenolic flavonoid class of compounds has potential as a sunscreen (Shovyana and Zulkarnain, 18 C.E.).

Mahogany (*Swietenia mahagoni* Jacq.) is widely used both in the community until the seed timber. Mahogany seeds contain flavonoids, alkaloids, tannins, saponins and terpenoids (Ade Arinia Rasyad et al., 2012). Mahogany seeds have the ability as an antioxidant that can inhibit free radicals, cutting propagation chain, and improve radical damage (Wibawa et al., 2016). Based on the above description mahogany seeds have the potential of sunscreen and have a SPF value, but there have been no scientific studies to determine the potential of sunscreens and SPF value on mahogany seeds.

## MATERIALS AND METHOD

### Collected of Mahogany Seeds

Mahogany seeds (*Swietenia mahagoni* Jacq.) was purchased from the village Rawalo, Rawalo subdistrict, Banyumas, Central Java, Indonesia. This plant determinate in the Environmental Laboratory of the Faculty of Biology, Jendral Soedirman University, Purwokerto.

### Extraction and Purification

Extraction of mahogany seeds simplisia as much as 500 grams done by maceration method using ethanol 70%. Macerates are evaporated with vacuum rotary evaporator at temperature of  $\pm 50^{\circ}\text{C}$  to get a condensed extract.

urification of 5 grams condensed mahogany seeds extract performed using n-hexane by stirring an and repetition as much as 5 to 10 times until n-hexane look transparent, then precipitated purified extract was separated by removing the n-hexane and vaporized the remains of n-hexane on purified extract (Azizah and Salamah, 2013).

### Determination of Total Phenolic Content

Condensed extract and purified extract of mahogany seeds weigh each of the 10 mg and dissolved in 70% ethanol up to 10 mL. then each taken 0.5 mL, then add 2 mL of Folin- Ciocalteu reagent 10%, and then add 4 mL of sodium carbonate 1 M, then read the absorbance at the maximum wavelength (Mukund Manikrao Donglikar and Deore, 2016).

## Determination of SPF value

SPF value determination was conducted using the equation Mansur (Donglikar and Sharada, 2016):

$$\text{SPF} = \text{CF} \times \text{EE} (\lambda) \times \text{I} (\lambda) \times \text{absorbansi} (\lambda)$$

Information:

CF : Correlation factor (10)

EE : Efficiency erythema

I : Simulated sunlight spectrum

Abs : Absorbance value

## Phytochemical screening

Phytochemical screening was done using the tube method, the reagents Mayer for the detection of alkaloids, positive results indicated the deposition of white or cream-colored.  $\text{FeCl}_3$  1% reagent for detection of phenolic, positive results marked change in the color green, black, purple, or blue. HCl and Mg metal reagents for detection of flavonoids, marked positive results turned red. Lieberman- Burchard reagent for detection of steroids characterized by changes in the color purple, red, or orange. and terpenoids are marked with blue color. Saponins done by diluting with water and shaken, positive results indicated the existence of foam (Agustina et al., 2017).

Phytochemical screening carried out also by the method of TLC (Thin Layer Chromatography) with  $\text{GF}_{254}$  silica stationary phase, mobile phase ethyl acetate-methanol (7:3), and visualization of spots by spraying ethanolic  $\text{H}_2\text{SO}_4$  and vanillin-sulfuric acid for detection of steroids and terpenoids, positive results are marked in red to purple (Cruz et al., 2018).

## Data Analysis

The results of the SPF value of the extracts obtained were analyzed using analysis *paired sample t-test* using software IBM SPSS Statistics 20.

## Result and Discussion

### Extraction and Purification

Condensed extract of mahogany seeds obtained as much 66.99 g with a yield of 13.39%. and a purified extract obtained by 4.05 grams with a yield of 81% (Figure 1).



**Figure 1. Mahogany seed, ethanolic extract and purified extract.**

**Total Phenolic Content**

Determination of total phenolic levels was done by the spectrophotometric method. Gallic acid is used as a standard solution because it is a natural and stable phenolic which is included in a simple hydroxybenzoic acid derivative. The standard curve is made by looking for absorbance from the reaction results of 100 ppm gallic acid, 10% folin-ciocalteu reagent, and 2% sodium carbonate. Folin-ciocalteu reagents are used because phenolic compounds react with folin. Sodium carbonate is used for alkaline flavoring. When the solution is mixed then the phenolic compound which has a hydroxyl group reacts with the folin-ciocalteu reagent, and a blue color is formed which can become more concentrated, this shows the concentration of phenolate ions formed. The large concentration of phenolic compounds makes phenolic ions reduce heteropoly acid (phosphomolybdatfosfo-tungstat) into molybdenumtungstet complex, so that it forms a dense color (Sari and Noverda Ayuhecacia, 2017). Results of total phenolic content after 3 times replication on each extract, extract the seeds mahogany condensed with an average of 1.849mg GAE/g), and the purified extract is obtained with an average 2.51mg GAE/g (Table 1). The amount is equivalent to the phenolic content in gallic acid.

Table 1: Total phenolic content of Mahanoy seeds ethanol and putrified extract

Extract	absorbance			Average Phenolic Content
	1	2	3	(mg GAE/g extract) ±SD
ethanol	0.249	0.252	0.252	1.849±0.013
purified	0.344	0.343	0.345	2.517±0.066

**SPF value**

Table 2: SPF value of maha seeds ethanol and purified extract mahogany seeds

$\lambda$	Ethanol Extract			Purified Extract		
	1	2	3	1	2	3
290	0.085	0.084	0.083	0.149	0.148	0.151
295	0.075	0.073	0.075	0.136	0.136	0.137
300	0.071	0.07	0.071	0.127	0.127	0.129
305	0.066	0.065	0.067	0.115	0.116	0.117
310	0.060	0.059	0.061	0.105	0.106	0.107
315	0.058	0.056	0.059	0.101	0.101	0.102
320	0.052	0.051	0.053	0.099	0.099	0.100
SPF	0.664	0.653	0.670	1.174	1.179	1.192
Average of SPF Value	0.662			1.181		
$\pm$ SD	$\pm$ 0.009			$\pm$ 0.009		

SPF value were obtained after the measurement at a wavelength of 290-320 nm, the mahogany seeds condensed extract obtained an average SPF value was  $0.66 \pm 0.0089$  while the purified extract obtained an average SPF value  $1.18 \pm 0.0093$ . The results show that the SPF value of ethanol extract and purified extract of mahogany seeds with a concentration of 200 ppm has a level of protection that smaller than the range of SPF values for minimum protection of 2-4 (Mukund Manikrao Donglikar and Deore, 2016), so that more concentrations can be used high to get a better SPF value.

The results of the analysis of paired sample t-test on the extracts obtained significance value less than 0.05 which is 0.000. This shows that there are significant differences between condensed extract with the purified extract.

**Phytochemical screening**

Phytochemical screening results obtained are in accordance with previous research which states that extracts from mahogany seeds contain polyphenols / tannins, flavonoids, alkaloids, tannins, saponins, and terpenoids (Permata Dewi and Fauzana, 2017; Wibawa et al., 2016). Triterpenoids such as alkaloids, steroids or flavonoids, can be used as a cure for diabetes, menstrual disorders, skin disorders, malaria liver damage, anti-fungal, insecticide, anti-bacterial, and anti-virus (Widiyati, 2006). Results of screening in condensed extract and purified extract mahogany seeds showed that both contain the alkaloid compounds, phenol/ tannins, flavonoids, terpenoids, steroids and saponins. In the test TLC Rf values obtained on the condensed extract Rf 0.87 on vanillin- sulfuric acid reagent, and Rf 0.75 in ethanolic H<sub>2</sub>SO<sub>4</sub> reagent. While in the purified extract obtained Rf 0.9 in vanillin-sulfuric acid reagent, and Rf 0.93 on reagent H<sub>2</sub>SO<sub>4</sub>.

**CONCLUSION**

Total phenolic content of ethanolic extract got an average of 1.849mg GAE/g, whereas the purified extract got an average of 2.517mg GAE/g. The ethanol extract and purified extract mahogany seeds have the potential lower as a sunscreen. SPF value obtained from ethanol extract was 0.66, while the value of SPF on purified extract is 1.18. Results of phytochemical screening of mahogany seeds ethanolic extract and purified extract shows that there are alkaloids, phenolic / tannin, flavonoids, terpenoids, steroids and saponins.

## REFERENCES

- Ade Arinia Rasyad, Mahendra, P., & Hamdani, Y. (2012). Uji nefrotoksik dari ekstrak etanol biji mahoni (Swietenia Mahagoni Jacq.) terhadap tikus putih jantan Galur Wistar. *Jurnal Penelitian Sains*, 15(2C), 79–82. <https://doi.org/10.36706/jps.v15i2.100>.
- Agustina, W., Nurhamidah Nurhamidah, & Handayani, D. (2017). Skrining fitokimia dan aktivitas antioksidan beberapa fraksi dari kulit batang jarak (*Ricinus communis* L.). *Alotrop Jurnal Pendidikan Dan Ilmu Kimia*, 1(2), 117–122.
- Azizah, B., & Salamah, N. (2013). Standarisasi parameter non spesifik dan perbandingan kadar kurkumin ekstrak etanol dan ekstrak terpurifikasi rimpang kunyit. *Pharmaciana*, 3(1), 21–30.
- Cruz, P. H. G., Nuñez, R. L., C. A. Anulacion, N. A. G., K, I., Nolasco, E. J., Pallarca, R. M., & Waing, K. G. D. (2018). Insecticidal property and phytochemical screening of mahogany (*Swietenia macrophylla* King) leaves, barks and seeds as an alternative insecticide against fungi growing termites [*Macrotermes gilvus* (Hagen, 1858)]. *International Journal of Biology, Pharmacy and Allied Sciences*, 7(8), 1521–1528. <https://doi.org/https://doi.org/10.31032/IJBPAS/2018/7.8.4504>
- Damogalad, V., Edy, H. J., & Supriati, H. S. (2013). Formulasi krim tabir surya ekstrak kulit nanas (*Ananas comosus* L Merr) dan uji in vitro nilai sun protecting factor (SPF). *Pharmacon*, 2(2), 39–44.
- Mukund Manikrao Donglikar, & Deore, S. L. (2016). Synthetic and natural sunscreens: a review. *Pharmacognosy Journal*, 8(3), 171–179.
- Permata Dewi, A., & Fauzana, A. (2017). Uji aktivitas antibakteri ekstrak etanol biji mahoni (*Swietenia mahagoni*) terhadap *Shigella dysenteriae*. *Journal of Pharmacy and Science*, 1(1), 15–21. <https://doi.org/https://doi.org/10.36341/jops.v1i1.370>
- Sari, A. K., & Noverda Ayuhecara. (2017). Penetapan kadar fenolik total dan flavonoid total ekstrak beras hitam (*Oryza sativa* L) Dari Kalimantan Selatan. *Jurnal Ilmiah Ibnu Sina*, 2(2), 327–335. <https://doi.org/https://doi.org/10.36387/jiis.v2i2.112>
- Shovyana, H. H., & Zulkarnain, A. K. (18 C.E.). Stabilitas fisik dan aktivitas krim w/o ekstrak etanolik buah mahkota dewa (*Phaleria macrocarph*(scheff.) Boerl.) sebagai tabir surya. *Traditional Medicine Journal*, 2(2013), 109–117.
- Sineke, F. U., Suryanto, E., & Sudewi, S. (2016). Penentuan kandungan fenolik dan sun protection factor (spf) dari ekstrak etanol dari beberapa tongkol jagung (*Zea mays* L.). *Pharmacon*, 5(1), 275–283.
- Wibawa, A. A. C., Swantara, I. M. D., & Manurung, M. (2016). Potensi flavonoid ekstrak biji mahoni (*Swietenia mahagoni* Jacq) untuk menurunkan konsentrasi 8-OHdG pada urin tikus wistar jantan yang terpapar etanol. *Cakra Kimia (Indonesian E -Journal of Applied Chemistry)*, 4(2), 146–152.
- Widiyati, E. (2006). Penentuan adanya senyawa triterpenoid dan uji aktivitas biologis pada beberapa spesies tanaman obat tradisional masyarakat pedesaan Bengkulu. *Jurnal Gradien*, 2(1), 116–122.