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Cosmetic Activities of Peels and Seeds of *Salacca wallichiana* Extract

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Abstract

The aim of this research was to determine cosmetic activities of peels and seeds of *Salacca wallichiana* by using maceration with various solvents; including water, 95% ethanol, acetone, and dichloromethane. The 95% ethanol seed extract possessed the highest phenolic content of 76.23 ± 0.03 mg GAE/g extract and flavonoid content of 86.29 ± 0.04 mg QE/g extract and antioxidant activity tested by DPPH(IC_{50} 26.26 ± 0.01 µg/mL), ABTS (IC_{50} 28.58 ± 0.02 µg/mL), and FRAP (47.08 ± 0.07 mg TE/ g extract). For the peel extracts, acetone extract exhibited the highest phenolic of 465.23 ± 0.33 mg GAE/g, flavonoid content of 222.86± 0.08 mg QE/g and also antioxidant (DPPH IC_{50}, 9.23 ± 0.00 µg/mL, ABTS IC_{50} 12.85 ± 0.01 µg/mL, and FRAP 401.02 ± 0.54 g TE/ g extract.

Keywords: Cosmetic Activity, Peel, Seed, *Salacca wallichiana*

Introduction

Salacca wallichiana widely distributes in Asia-tropical zones, is classified as a plant in the palm family with spine-covered and coarse scaly slightly longish shape. *S. wallichiana* is commonly known as Trat sweet rakum palm in Thailand. *Salacca* spp., such as *Salacca zalacca* (snake fruit) peel contain many bioactive compound which was alkaloid, caffeic acid, catechin, chlorogenic acid, flavonoid, gallic acid, linalool, phenol, rutin, saponin,and tannin (Girsang, et al., 2019; Suica-Bunghez, et al., 2016)

which bioactive compound found in *S. zalacca* peel is a potential ecological antioxidant. *Salacca edulis* (salak plum) peel contain caffeic acid, chlorogenic acid, ferulic acid, gallic acid, quercetin, and rosmarinic acid (Kanlayavattnakul, et al., 2013) which it had antioxidant activity. However, biological activity of the seed and peel of *S. wallichiana* has never been presented

Consumption of *S. wallichiana* fruits leave seed and peel in the fruit season which are a nuisance to the environment as a solid waste. Therefore, investigation of these seed and peel waste as natural source for cosmetic active ingredient extraction is very attractive. The purpose of this independent study is extraction to determine antioxidant activity of *S. wallichiana* seed and peel extracts for applying in cosmetic products.

Research objective

1. To extract phenolic compound from *S. wallichiana* seeds and peels by using water, 95% ethanol, acetone, and dichloromethane.
2. To determine total phenolic content and total flavonoid content of *S. wallichiana* seed and peel extracts.
3. To determine the antioxidant activity of *S. wallichiana* seed and peel extracts.

Scope of study

Extraction of phenolic and flavonoid from *S. wallichiana* seeds and peels and determination of bioactive compounds, phenolic and flavonoid, and antioxidant activity of *S. wallichiana* peel and seed extracts.

Literature review

Salacca wallichiana, commonly called rakum palm, is an evergreen palm tree family (Arecaceae) which is found in Malaysia, Myanmar, Sumatra island, Thailand, and Vietnam. *S. wallichiana* is a creeping and tillering palm with very spiny leaves. The shape of *S. wallichiana* fruit is slightly longish and has a spine-covered and coarse scaly snakeskin. The skin has a red, orange-red, or dark red color.

The studies of cosmetic activity of *S. wallichiana* peels and seeds had only 2 researches which studied on chemical constituents. Researchers reported that peel

extract contained β-sitosterol (Ragasa, et al., 2018) and seed extract contained β-sitosterol, triacylglycerols and linoleic acid (Ragasa, et al., 2016). From the previous studies, there were not enough information to do experimental design so it had to do a further data collection on *Salacca* spp.

In studies of *Salacca* spp., Kanlayavattnakul, et al. (2013) report that *S. edulis* peel which extracted by maceration with 70% ethanol, had biological activities of antioxidants (IC_{50} DPPH = 8.870 ± 0.030 µg/mL, IC_{50} ABTS = 22.479 ± 0.152 µg/mL, and EC of FRAP = 1.848 ± 0.020 µg/mL). *S. zalacca* seeds had bioactive compound of quercetin which was capable of antioxidant activity (IC_{50} DPPH = 377.1 ± 0.025 µg/mL) (Yodsai, et al., 2019). For *S. zalacca* peels, researchers reported that they had biological activities of *S. zalacca* had antioxidant which determined by using DPPH radical scavenging assay (Suica-Bunghez, et al., 2016; Yodsai, et al., 2019), and anti-aging which determined by molecular docking (Girsang, et al., 2019). In study of molecular docking, bioactive compounds of *S. zalacca* were binding toward proteins of skin aging process As a result, chlorogenic acid binding affinity towards MMP-1 was -9.4 kcal/mol. The quantitative of bioactive compound and biological activity.

Research Methodology

1. *Salacca wallichiana* Seeds and Peels Preparation

S. wallichiana peel and seed were hot air dried in hot air oven at 50°C and ground together into fine powder.

2. Extraction of Bioactive Compound

Twenty grams of seeds and peels were separately macerated in 200 mL of solvents: water, 95% ethanol, acetone or dichloromethane with orbital shaker at 150 rpm for 24 hours. The sample was filtrated and then the filtrates were evaporated by rotary evaporator to dry.

3. Determination of Total Phenolic Content

Total phenolic content was determined by Folin–Ciocalteu method adapted from Kumar, et al. (2008). Various concentrations of gallic acid or proper amounts of extracts were pipetted into the test tube then adjusted volume to 1.25 mL with distilled water and followed by 0.25 mL of Folin-Ciocalteu reagent then 1.5 mL of

sodium carbonate solution. The mixture was incubated at ambient temperature for 30 minutes. Then the absorbance at 765 nm was measured. The total phenolic content was expressed as gallic acid equivalents (GAE) per gram of plant extract.

4. Determination of Total Flavonoid Content

Total flavonoid content was determined by aluminium chloride colorimetric assay adapted from Kumar, et al. (2008). Various concentrations of the quercetin or proper amounts of extracts were pipetted into the test tube and adjusted the volume to 3.7 mL with distilled water. The mixture was incubated at room temperature for 5 minutes. Then, 1 mL sodium hydroxide was added and incubated at ambient temperature for 8 minutes. Then, the absorbance at 415 nm was measured. The total flavonoid content was expressed as quercetin equivalents (QE) per gram of plant extract.

5. Antioxidant Capacity Assay

1) DPPH Radical Scavenging Activity Assay

Antioxidant capacity was determined by DPPH radical scavenging assay adapted from Shao, et al. (2014). Various concentrations of trolox or extracts were pipetted into the test tube and adjusted its volume to 1 mL with 95% ethanol and followed by 2 mL DPPH. The mixture was incubated in the dark at room temperature for 30 minutes. Then the absorbance at 517 nm was measured. The result was expressed as the concentration giving 50% inhibition (IC_{50}, µg/mL).

2) ASTB Radical Scavenging Activity Assay

Antioxidant capacity was determined by ABTS radical scavenging assay adapted from Thaipong, et al. (2006). Various concentrations of trolox or extracts were pipetted into the test tube and then adjusted its volume to 1 mL with potassium phosphate buffer and followed by 2 mL ABTS reagent. The mixture was incubated at ambient condition in the dark for 30 minutes. The absorbance at 734 nm was measured. The result was expressed as the concentration giving 50% inhibition (IC_{50}, µg/mL).

3) FRAP Radical Scavenging Activity Assay

Antioxidant capacity was determined by FRAP radical scavenging assay adapted from Thaipong, et al. (2006). Various concentrations of trolox or proper amounts of extracts were pipetted to the test tube and then adjusted its volume to 1.5

mL of acetate buffer and followed by 1.5 mL of FRAP reagent. The mixture was incubated at 37°C for 30 minutes. Then the absorbance at 573 nm was measured. The equivalent concentration of *S. wallichiana* peel and seed extract was calculated by using a standard curve.

Result and discussion

1. Extraction of bioactive compound from *S. wallichiana*

The extraction of *S. wallichiana* was used maceration process. The highest yield was found in water extracts of 13.84 ± 0.45 and 12.37 ± 0.84 % (w/w) for peels and seeds, respectively. Dichloromethane extracts showed the lowest yield of 0.36 ± 0.03 and 1.21 ± 0.16 % (w/w) for peels and seeds as shown on Figure 1.

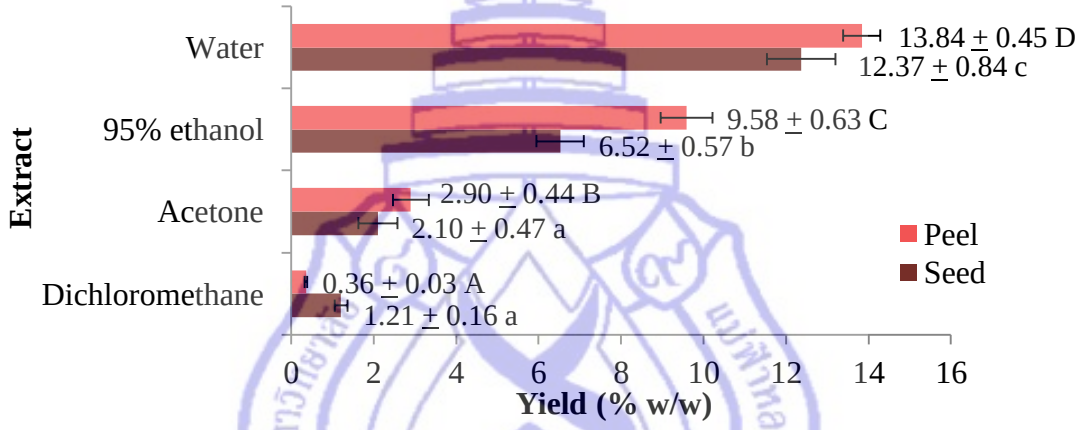

Figure 1 Extraction yield of *S. wallichiana* peel and seed extracts, value with different letters indicate significant difference

2. Total phenolic content

S. wallichiana seed and peel extracts were determined total phenolic content by Folin-Ciocalteu technique. The highest phenolic content was detected in acetone peel extract (465.23 ± 0.33 mg GAE/g) while the lowest phenolic content was discovered in dichloromethane peel extract (8.99 ± 0.02 mg GAE/g) as shown on Figure 2. According to the results, it shown that the solvent systems and part of use affected to total phenolic content. The best solvent system was acetone for peel extract and 95% ethanol for seed extract, and acetone peel extract had the highest total phenolic content.

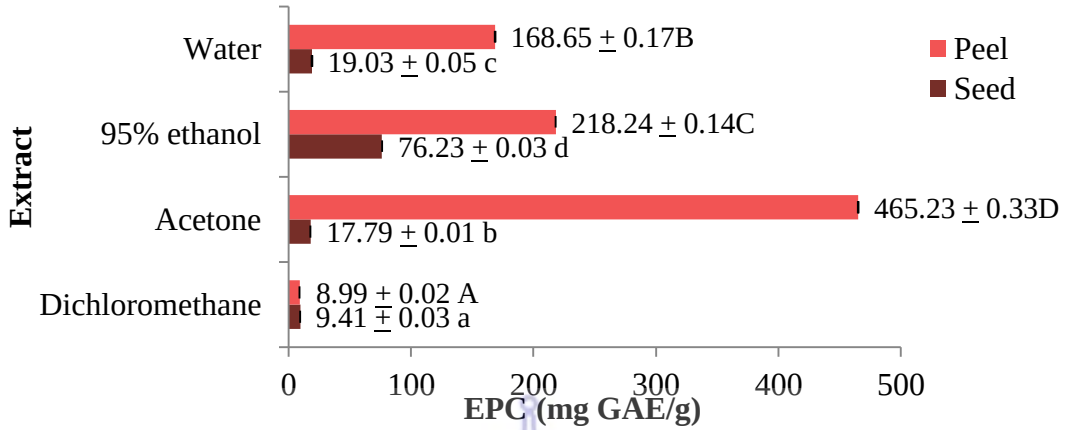

Figure 2 Total phenolic content of *S. wallichiana* peel and seed extracts, value with different letters indicate significant difference.

3. Total flavonoid content

S. wallichiana seed and peel extracts were determined total flavonoid content by aluminium chloride colorimetric assay. From figure 3, the highest flavonoid content was detected in acetone peel extract (222.860 ± 0.079 mg QE/g). The dichloromethane seed extract contained the lowest flavonoid content of 13.12 ± 0.04 mg QE/g. According to results, the acetone and 95% ethanol were best solvent system of flavonoid content for peel and seed extracts, respectively. Moreover, acetone peel extract had the highest total flavonoid content.

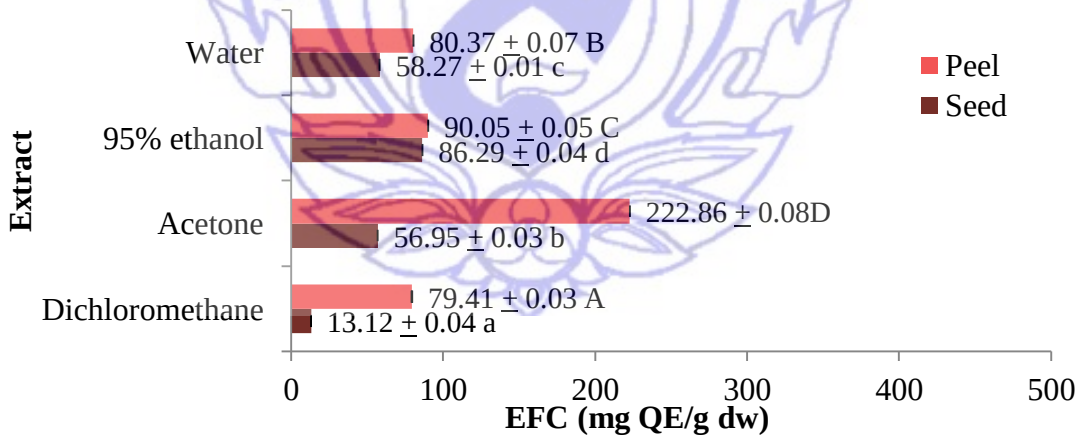

Figure 3 Total flavonoid content of *S. wallichiana* peel and seed extracts, value with different letters indicate significant difference.

4. DPPH Radical Scavenging Activity

S. wallichiana peel and seed extracts were determined antioxidant activity by DPPH radical scavenging assay. The trolox had 2.00 ± 0.00 µg/mL of IC_{50} DPPH. The highest IC_{50} DPPH was discovered in acetone peel extract (9.23 ± 0.00 µg/mL). The lowest IC_{50} DPPH was found in dichloromethane seed extract (227.583 ± 0.060 µg/mL) According to results, the best solvent system for peel and seed extracts was acetone and 95% ethanol, respectively. When comparing the efficacy of DPPH radical scavenging activity between peel and seed extracts with Trolox, the peel and seed extract were less efficient than the Trolox.

S. zalacca seed extract had IC_{50} DPPH of 377.1 ± 0.025 (Yodsai, et al., 2019) so it had lower antioxidant inhibition than all of *S. wallichiana* seed extract. IC_{50} DPPH of 70% ethanol *S. edulis* peel extract was 8.870 ± 0.030 µg/mL (Kanlayavattnakul, et al., 2013). *S. zalacca* peel extract had IC_{50} of 141.9 ± 0.023 (Yodsai, et al., 2019). The *S. wallichiana* peel extract from this study had higher antioxidant activity than the *S. zalacca* peel extract but lower than *S. edulis* peel extract.

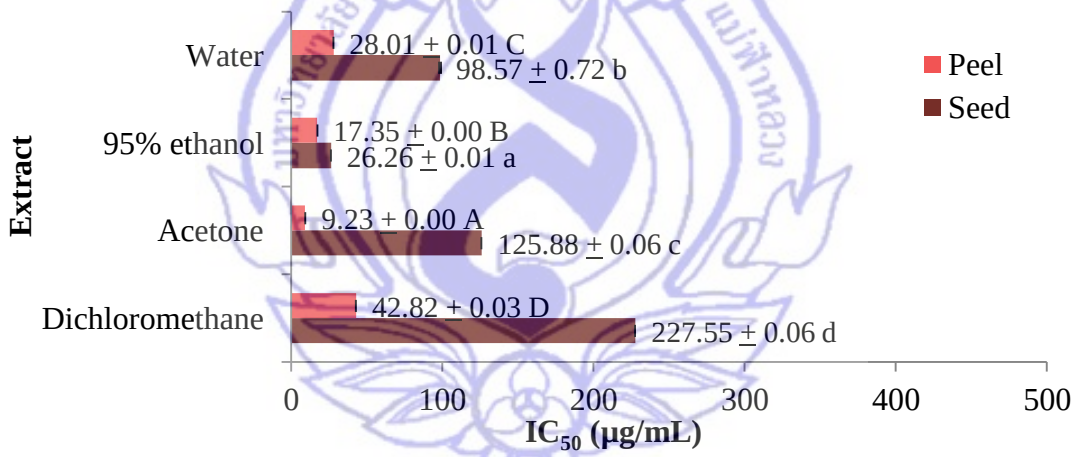

Figure 4 DPPH radical scavenging activity of *S. wallichiana* peel and seed extracts, value with different letters indicate significant difference.

5. ABTS Radical Scavenging Activity

S. wallichiana peel and seed extracts were determined antioxidant activity by ABTS radical scavenging assay. The IC_{50} ABTS of trolox was 4.48 ± 0.00 µg/mL. The acetone extract contained the highest IC_{50} ABTS (12.85 ± 0.01 µg/mL) while the

lower IC_{50} of ABTS was found in dichloromethane seed extract (108.413 ± 0.076 µg/mL) as shown on Figure 5. According to results, the best solvent system of peel extracts was acetone and seed extracts was and 95% ethanol. Moreover, acetone peel extract had the highest IC_{50} ABTS. When comparing the ability of ABTS radical scavenging activity between peel and seed extracts with Trolox, the peel and seed extracts were less ability than that of standard Trolox.

IC_{50} ABTS of 70% ethanol *S. edulis* peel extract was 22.479± 0.152 µg/mL, (Kanlayavattnakul, et al., 2013) so it had lower antioxidant activity than *S. wallichiana* peel extract.

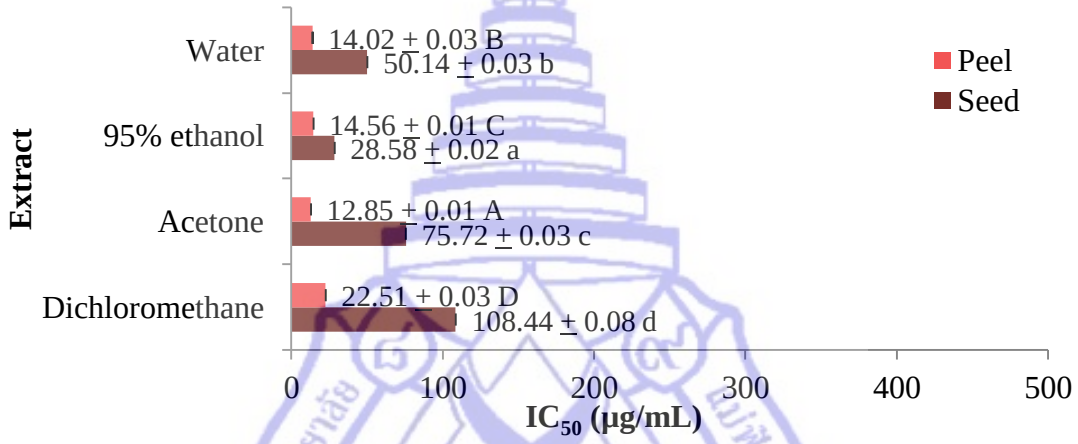

Figure 5 ABTS radical scavenging activity of *S. wallichiana* peel and seed extracts, value with different letters indicate significant difference.

6. FRAP Radical Scavenging Activity

S. wallichiana peel and seed extracts were determined antioxidant activity by FRAP assay. The highest content of FRAP activity was found in acetone peel extract (401.02 ± 0.54 mg TC/g). The lowest content of FRAP activity of peel extracts was detected in dichloromethane seed extract of 17.07 ± 0.01 mg TC/g as shown on Figure 6. According to results, the best solvent system of FRAP activity was acetone for peel extract and 95% ethanol for seed extract, and acetone peel extract had the highest FRAP activity. Equivalent concentration of FRAP of 70% ethanol *S. edulis* peel extract 1.848 ± 0.020, (Kanlayavattnakul, et al., 2013) so it had lower FRAP activity than *S. wallichiana* extract.

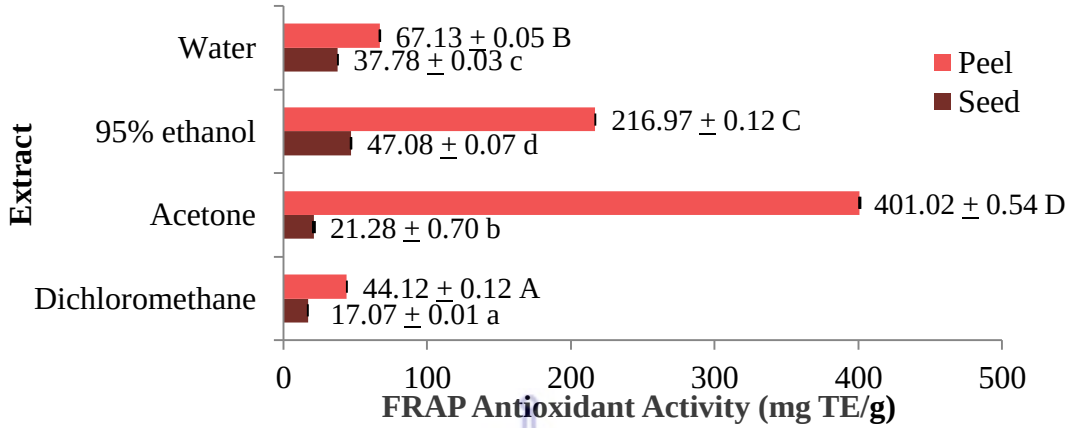

Figure 6 FRAP activity of *S. wallichiana* peel and seed extracts, value with different letters indicate significant difference.

Conclusion

Water extract of *S. wallichiana* provided the highest yield of 13.84 ± 0.45 and 12.37 ± 0.84 % (w/w) for peels and seeds, respectively. The 95% ethanol *S. wallichiana* seed extract showed the highest total phenolic content of 76.228 ± 0.027 mg GAE/g and the highest flavonoid content of 86.293 ± 0.039 mg QE/g, respectively. The highest phenolic and flavonoid content of *S. wallichiana* peel extract was found in acetone extract which were 465.231 ± 0.326 mg GAE/g and 222.860 ± 0.079 mg QE/g.

The 95% ethanol *S. wallichiana* seed extract showed the highest antioxidant activity when tested with DPPH (IC50 = 26.270 ± 0.008 µg/mL), ABTS (28.578 ± 0.020 µg/mL), and FRAP (47.077 ± 0.074 g TE/ g) and follow by water, acetone, and dichloromethane extracts.

Suggestion

1. The *S. wallichiana* extract should be determined in further biological activity e.g. tyrosinase inhibitory activity, anti-microbial activity, anti-inflammatory activity, and collagenase inhibitory activity.

2. The chemical composition of *S. wallichiana* extract should be analyzed by HPLC.

3. The *S. wallichiana* extract should be further determined its stability and solubility.

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