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Photoprotective Activity Test of Ramania (*Bouea macrophylla* Griffith) Leaves Extracts 96% Ethanol and Methanol from South Kalimantan

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ABSTRACT

Indonesia's constant UV exposure highlights the need for effective and safe sunscreens. Ramania (*Bouea macrophylla* Griffith) leaves contain phenolic and flavonoid compounds with strong antioxidant activity, making them a promising natural photoprotective agent. This study aimed to evaluate the photoprotective activity of 96% ethanol and methanol extracts of ramania leaves through *in vitro* measurements of SPF, %Te, and %Tp using UV-Vis spectrophotometry at concentrations of 50-250 ppm. Phytochemical screening confirmed the presence of flavonoids, phenols, tannins, saponins, and steroids. The highest SPF values at 250 ppm were 17.62 for ethanol and 19.80 for methanol, both in the ultra protection category. At the same concentration, %Te values were 1.59% and 1.24%, classified as extra protection. Meanwhile, % Tp values were 20.74% (sunblock) and 43.46% (extra protection), respectively. These findings indicate that ramania leaves extract has strong potential as a natural sunscreen, especially at 200-250 ppm. Further studies on formulation stability and in vivo efficacy are recommended.

INTRODUCTION

Indonesia is a tropical country along the equator, receiving sunlight yearly. This condition increases the susceptibility of the Indonesian population to the adverse effects of ultraviolet (UV) radiation. Prolonged exposure to ultraviolet (UV) radiation may result in a range of skin disorders, including sunburn, hyperpigmentation, erythema, oedema, photosensitivity, and long-term effects such as premature skin ageing and an increased risk of skin cancer (Verma et al., 2024)

Sunscreens are skin protection products that function by absorbing, reflecting, or scattering UV radiation, thereby preventing its damaging effects on the skin (Avianka et al., 2022). The effectiveness of sunscreens is commonly evaluated through the SPF, which measures protection against UV-B radiation. However, to obtain a more comprehensive assessment, additional parameters such as %Te and %Tp are also utilised (Tenriugi & Syam, 2018).

Despite their crucial role in skin protection, most commercial sunscreens still contain synthetic active ingredients such as oxybenzone and octocrylene. Long-term use of these compounds has been reported to cause side effects, including irritation, allergic reactions, and even hormonal disruptions (Sari & Yani, 2021; Wiraningtyas et al., 2019). This has encouraged the development of natural-based sunscreens, which are considered safer and more skin-friendly. One such plant with potential photoprotective properties is ramania leaves.

Ramania leaves (Bouea macrophylla Griff.) a species prevalent in South Kalimantan, represent a time-honored local traditional medicine used for a range of ailments, notably metabolic disorders including diabetes (Ramadhani *et al*., 2025). It contains a variety of secondary metabolites, including flavonoids, phenolic compounds, tannins, saponins, steroids, and triterpenoids (Rudiana et al., 2018). These compounds possess high antioxidant activity, which can neutralise free radicals and absorb UV rays, making them

potential photoprotective agents (Donglikar & Deore, 2016, as cited in Salsabila, et al, 2023).

Previous studies have shown that ramania leaves extracts obtained through maceration exhibit very strong antioxidant activity, with IC^{50} values of 6.4 µg/mL in 96% ethanol extract (Rudiana et al., 2023) and 6.305 ppm in the methanol extract (Aiyuba et al., 2023). Therefore, this study uses UV-Vis spectrophotometry to evaluate the photoprotective potential of 96% ethanol and methanol extracts of ramania leaves through in vitro measurements of SPF, %Te, and %Tp.

METHODS

Materials and Tools

The materials used in this study consisted of ramania leaves (*Bouea macrophylla* Griffith), filter paper, 96% p.a. ethanol, 96% technical ethanol, methanol p.a, technical methanol, quercetin (positive control), aquadest, Mg powder, concentrated HCl, HCl 2N, gelatin 1%, FeCl3 1%, *Mayer*, *Dragendorff*, *Wagner*, and *Lieberman Burchard* reagents.

The tools used are glass tools, blenders, maceration vessels, evaporative cups, horn spoons, drip pipettes, rotary evaporators, cuvettes, analytical balances, waterbaths, micropipettes, mesh 40 sieves, and UV-Vis spectrophotometers.

Sample preparation

Ramania leaves (*Bouea macrophylla* Griffith) were collected from Guntung Manggis Subdistrict, Landasan Ulin District, Banjarbaru City, South Kalimantan. The plant determination was carried out at the Basic Laboratory of the FMIPA Lambung Mangkurat University, Banjarbaru, in November 2024. A total of 6 kg of young ramania leaves underwent wet sorting, washing, slicing, and drying using an oven at 40°C for approximately 24 hours, followed by dry sorting, grinding, and sieving with a 40-mesh sieve (Handoyo & Pranoto, 2020).

Sample Extraction Ethanol 96%

A total of 250 grams of ramania leaves simplicia powder was extracted by maceration using 2,500 mL of 96% ethanol as the solvent, with a simplicia-to-solvent ratio of 1:10. The extraction process was carried out 1x24 hours with three remacerations. Every 24 hours, the filtrate is filtered. Subsequently, the filtrate was replaced with an equivalent volume of the same solvent. The obtained filtrate was subjected to evaporation using a rotary evaporator at 50 °C, then further concentrated in a water bath until a constant weight was reached (Nguyen et al., 2022; Wahyuni et al., 2024; Wijianto et al., 2024).

Sample Extraction Methanol

A total of 250 grams of ramania leaves simplicia powder was extracted by maceration using 1,250 mL of methanol as the solvent, with a simplicia-to-solvent ratio of 1:5. The extraction process was carried out for 1 × 24 hours with two remacerations. Every 24 hours, the filtrate is filtered. Subsequently, the filtrate was replaced with an equivalent volume of the same solvent. The resulting filtrate was evaporated using a rotary evaporator at 50 °C, followed by concentration in a water bath until a constant weight was achieved (Conitaty et al., 2022).

Secondary Metabolite Identification

Alkaloids

0.5 grams of ramania leaves extract was dissolved in a solvent, and 2N HCl was added. The solution was divided into four portions: one as a control and the other three for alkaloid testing using Mayer's, Dragendorff's, and Wagner's reagents. A positive result is shown by the appearance of a white or yellowish-white precipitate with Mayer's reagent, a brown to orange precipitate with Dragendorff's reagent, and a brown precipitate with Wagner's reagent (Fitriyanti et al., 2024).

Flavonoids

A 0.5 gram sample was dissolved in 5 mL of distilled water and heated in a test tube for 5 minutes. Afterward, 2 mg of magnesium powder and 3 drops of concentrated hydrochloric acid were added. The solution was shaken, and any colour changes were observed. A shift to red, yellow, or orange in the amyl alcohol layer indicates the presence of flavonoids (Fitriyanti et al., 2024).

Phenols

A total of 0.5 grams of the sample was placed in a test tube, mixed with distilled water, and treated with a 1% $FeCl_3$ solution. A positive result is indicated by the formation of a dark brown or dark green coloration (Fitriyanti et al., 2024).

Saponins

An amount of 0.5 grams of ramania leaves extract was combined with 10 mL of warm distilled water, vigorously shaken for 30 seconds, and left to stand for 10 minutes. The presence of saponins is indicated by the formation of a stable foam, measuring 1–3 cm in height. To confirm, 2N HCl is added; if the foam remains stable, the presence of saponins is verified (Fitriyanti et al., 2024).

Steroids and Triterpenoids

The test was carried out by placing a few drops of extract on a watch glass, followed by the addition of chloroform and evaporation until dry. *Liebermann Burchard* reagent (acetic anhydride and concentrated sulphuric acid) was then added. The appearance of a red or purple colour indicates triterpenoids, while a blue or green colour indicates the presence of steroids (Akasia et al., 2021).

Tannins

A total of 0.5 grams of ramania leaves extract was dissolved in a solvent, followed by adding 2 mL of a 1% gelatin solution (prepared by dissolving 1 gram of gelatin in 100 mL NaCl solution). The presence of tannins is indicated by the formation of a slightly yellowish-white precipitate (Fitriyanti et al., 2024).

Photoprotective Activity of Quercetin, 96% Ethanol and Methanol Extracts of Ramania Leaves

A quercetin stock solution with a concentration of 1000 ppm was prepared by dissolving 25 mg of quercetin in 25 mL of analytical-grade methanol. Serial dilutions were subsequently carried out to obtain working solutions with concentrations of 10, 20, 30, 40, and 50 ppm in 10 mL of the same solvent (Pramesti, 2023). Test solutions were prepared at a concentration of 1000 ppm (50 mg in 50 mL). Serial dilutions were performed to obtain solutions containing 50, 100, 150, 200, and 250 ppm in 10 mL of each solvent. These procedures were conducted to measure absorbance in the wavelength range of 290–320 nm for determining the SPF. Meanwhile, the wavelength range of 292.5–317.5 nm was used to calculate the %Te, and the range of 322.5–372.5 nm was used to calculate %Tp. Measurements were carried out in triplicate, using each corresponding solvent as a blank at every 5 nm interval. The absorbance values obtained were recorded to calculate SPF, while the transmittance values were used to calculate %Te and %Tp (Pramesti, 2023). The SPF value was determined from the sample's absorbance data using the Mansur equation as follows:

$$SPF = CF \times \sum_{320}^{290} EE \times I \times (Abs)$$

Description:
CF = Correction Factor (10)
EE = Erythemal Effect Spectrum
I = Solar Intensity Spectrum
Abs = Absorbance of the sample
(Juliadi et al., 2023)

The %Te and %Tp were calculated using the following equations:

$$Te = T \times Fe$$

$$Tp = T \times Fp$$

Description:
T = Transmittance
Fe = Erythema flux
Fp = Pigmentationflux (Hanif et al., 2025)

RESULT AND DISCUSSION

Determination

Plant identification was conducted at the Basic Laboratory of FMIPA, Lambung Mangkurat University. The results confirmed that the specimen was ramania, belonging to the family *Anacardiaceae* and identified as the species *Bouea macrophylla*, with certification number 237a/LB. LABDASAR/X/2024.

Extract Yields of 96% Ethanol and Methanol Extracts of Ramania Leaves

Table 1. Yield of 96% Ethanol and Methanol Extracts of Ramania Leaves

Solvent	Sample Weight (g)	Extract Weigh (g)	Yield (%(w/w))
Ethanol 96%	250	35.91	14.37%
Methanol	250	44.30	17.72%

Yield calculation was conducted as an initial step to identify the effectiveness of solvents in extracting active compounds from the plant material. The extract yield data are presented in Table 1.

Phytochemical Screening

A phytochemical analysis was conducted to determine the types of secondary metabolites present in the extracts. The outcomes of this analysis are presented in Table 2.

Table 2. Phytochemical Screening Results of 96% Ethanol and Methanol Extracts of Ramania Leaves

Phytochemical Test	Solvent	
	96% Ethanol	Methanol
Alkaloids	(-)	(+)
Flavonoids	(+)	(+)
Phenols	(+)	(+)
Saponins	(+)	(+)
Steroids	(+)	(+)
Tanins	(+)	(+)
Triterpenoid	(-)	(-)

Description: (+): Contains the tested compound, (-): Does not contain the tested compound

The phytochemical screening results of both extracts, using 96% ethanol and methanol as solvents, showed similarities in the presence of flavonoids, phenols, saponins, tannins, and steroids and triterpenoids. However, a significant difference was observed in the alkaloid test results. The methanol extract showed positive results with all three alkaloid reagents *Mayer, Dragendorff*, and *Wagner*. In contrast, the 96% ethanol extract only yielded a positive result with *Dragendorff* reagent, while *Mayer* and *Wagner* reagents showed negative results.

Sun Protection Factor Value

SPF activity determination was conducted to evaluate the ability of the extracts to absorb ultraviolet (UV) radiation. Quercetin was used as a comparator in this test due to its well-known sunscreen activity. The results are presented in Table 3. The results of the sunscreen activity test demonstrated that both quercetin and ramania leaves extracts exhibited increasing UV protection in line with higher concentrations. Quercetin, used as a comparator, showed the highest SPF value of 15.97 at a concentration of 50 ppm, which falls under the ultra protection category. The 96% ethanol extract of ramania leaves reached a maximum SPF value of 17.62 at 250 ppm, while the methanol extract yielded an even higher SPF value of 19.80 at the same concentration, also categorized as ultra protection. Secondary metabolites, including flavonoids, phenolic compounds, saponins, steroids, and tannins, exhibit photoprotective potential owing to their capacity to absorb, reflect, and block ultraviolet (UV) radiation on the skin's surface. This activity is associated with their chemical structures, which generally contain aromatic rings or conjugated double bonds, enabling effective absorption of UVA and UVB radiation(Tesalonika et al., 2024).

Table 3. SPF Values of Quercetin, 96% Ethanol, and Methanol Extract of Ramania Leaves

Sample	Concentration (PPM)	SPF	Type of Protection
Quercetin	10	4.61	Moderate
	20	11.85	Maximal
	30	13.23	Maximal
	40	15.16	Ultra
	50	15.97	Ultra
96 %	50	5.59	Moderate
Ethanol	100	8.28	Maximal
Extract of	150	11.68	Maximal
Ramania	200	15.00	Maximal
Leaves	250	17.62	Ultra
Methanol	50	4.76	Moderate
Extract of	100	8.19	Maximal
Ramania	150	13.03	Maximal
Leaves	200	16.91	Ultra
	250	19.80	Ultra

Percentage of Erytema Transmission (%Te) and Pigmentary Transmission (%Tp) Value

The %Te values were measured at wavelengths ranging from 292.5 to 317.5 nm, while %Tp values were measured at 322.5 to 372.5 nm, each at 5 nm intervals. The %Te and %Tp values for quercetin and Bouea macrophylla Griffith leaves extracts are presented in Table 4. The percentages of %Te and %Tp represent the amount of ultraviolet (UV) radiation transmitted through the sunscreen that may contribute to erythema and skin pigmentation. Lower %Te and %Tp values indicate a higher efficacy of the sunscreen in providing skin protection(Widhihastuti et al., 2024). The results showed that quercetin, used as a positive control at a concentration of 50 ppm, exhibited a % Te of 0.85% and a %Tp of 0.34%. These values fall within the Sunblock category for UVB and UVA rays, indicating that quercetin possesses very high photoprotective activity. In the 96% ethanol extract of ramania leaves, the %Te value decreased with increasing concentration from 26.64% at 50 ppm to 1.59% at 250 ppm indicating enhanced protection, shifting from the tanning category to extra protection. The

%Tp value also decreased from 49.90% to 20.74%, suggesting improved protection against UVA radiation, moving from the tanning to the sunblock category.

Similarly, the methanol extract showed a decreasing trend in %Te from 30.27% at 50 ppm to 1.24% at 250 ppm, and %Tp from 83.05% to 43.46%, indicating an increase in protection level from tanning to extra protection. Based on these findings, both 96% ethanol and methanol extracts of ramania leaves demonstrate potential as natural sunscreen agents, particularly at concentrations of 200 and 250 ppm.

The results showed that the methanol extract had a lower erythema percentage (%TE) than the 96% ethanol extract, suggesting greater effectiveness in reducing UV-induced redness. This may be due to methanol's higher polarity, which enhances the extraction of phenolic and flavonoid compounds responsible for antioxidant and anti-inflammatory activity.

In contrast, the 96% ethanol extract produced a lower pigmentation percentage (%TP), indicating better protection against melanin formation. Ethanol's moderate polarity allows it to extract both polar and semi-polar compounds, yielding a balanced composition that supports photoprotection and skin tone stability.

These findings highlight that solvent polarity influences the types of bioactive compounds extracted, resulting in different photoprotective effects.

Table 4. Percentage of %Te and %Tp of Quercetin and Ramania Extract

Sample	Concentration (ppm)	%Te	Category	%Tp	Category
Quercetin	10	35.71	*Fast Tanning*	10.75	*Sunblock*
	20	7.82	*Suntan* Regular	2.47	*Sunblock*
	30	4.92	*Extra Protection*	1.30	*Sunblock*
	40	2.65	*Extra Protection*	0.44	*Sunblock*
	50	0.85	*Sunblock*	0.34	*Sunblock*
96 % Ethanol Extract of Ramania Leaves	50	26.64	*Tanning*	49.90	*Tanning*
	100	14.06	*Fast Tanning*	38.93	*Sunblock*
	150	6.09	*Suntan Regular*	31.14	*Sunblock*
	200	2.82	*Extra Protection*	22.56	*Sunblock*
	250	1.59	*Extra Protection*	20.74	*Sunblock*
Methanol Extract of Ramania Leaves	50	30.27	*Tanning*	83.05	*Tanning*
	100	13.56	*Tanning*	73.30	*Tanning*
	150	4.78	*Extra Protection*	59.84	*Suntan regular*
	200	2.18	*Extra Protection*	50.49	*Extra Protection*
	250	1.24	*Extra Protection*	43.46	*Extra Protection*

CONCLUSIONS

The 96% ethanol and methanol extracts of ramania leaves demonstrated potential as sunscreen agents. The highest SPF values were observed at a concentration of 250 ppm, with 17.62 for the ethanol extract and 19.80 for the methanol extract, falling under the ultra protection category. At 200 and 250 ppm concentrations, both extracts also exhibited %Te values classified as extra protection, with values of 1.59% and 1.24%, respectively. Meanwhile, at 250 ppm, the %Tp values were 20.74% for the ethanol extract (sunblock) and 43.46% for the methanol extract (categorized as extra protection). For future research, formulation stability tests and *in vivo* efficacy evaluations are recommended to support the development of ramania leaves extract as a natural photoprotective agent.

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AUTHORS' CONTRIBUTIONS

Conceptualization: NS, LA; Methodology: NS, LA; Validation: RS, RM, DRP; Formal Analysis: NS, LA; Investigation: NS, LA; Resources: NS, LA, RS; Data Curation: Writing - Original Draft: NS, LA; Writing - Review & Editing: NS, LA, RS; Visualization: NS, LA; Supervision: RS, RM, DRP; Project Administration: RS, RM, DRP Funding Acquisition: RS

CONFLICT OF INTERESTS

The author declares no conflict of interest.

ETHICAL CONSIDERATION

Ethical issues (including plagiarism, data fabrication, double publication, etc) have been completely observed by the author.

BIBLIOGRAPHY

Aiyuba, D. S., Rakhmatullah, A. N., & Restapaty, R. (2023). Uji Aktivitas Antioksidan Ekstrak Metanol Daun Ramania (Bouea macrophylla Griffith.) Menggunakan Metode DPPH. *Jurnal Surya Medika*, *9*(1), 81–87. https://doi.org/10.33084/jsm.v9i1.5150

Akasia, A. I., Nurweda Putra, I. D. N., & Giri Putra, I. N. (2021). Skrining Fitokimia Ekstrak Daun Mangrove Rhizophora mucronata dan Rhizophora apiculata yang Dikoleksi dari Kawasan Mangrove Desa Tuban, Bali. *Journal of Marine Research and Technology*, *4*(1), 16.

Avianka, V., Mardhiani, Y. D., & Santoso, R. (2022). Studi Pustaka Peningkatan Nilai SPF (Sun Protection Factor) pada Tabir Surya dengan Penambahan Bahan Alam. *Jurnal Sains Dan Kesehatan*, *4*(1), 79–88. https://doi.org/10.25026/jsk.v4i1.664

Conitaty, Y., Fitriyanti, & Hasymi, L. F. (2022). Uji Efektivitas Antibakteri Ekstrak Metanol Daun Ramania (Bouea macrophylla Griffith) Terhadap Bakteri Staphylococcus aureus. *Pharmacoscript*, *5*(2), 212–224.

Donglikar, M. M., & Deore, S. L. (2016). Sunscreens: A review. *Pharmacognosy Journal*, *8*(3), 171–179.

Fitriyanti, Tiara, Isabella, T., Abdi, M. A. N., Wahyunita, S., Sari, P. K., & Chandra, M. A. (2024). Pengaruh Perbedaan Pelarut Terhadap Aktivitas Antibakteri Ekstrak Daun Ramania (Bouea Macrophylla Griffith) Terhadap Bakteri Propionibacterium acnes. *Jurnal Ilmiah Farmasi Farmasyifa*, *7*(2), 204–215.

Handoyo, D. L. Y., & Pranoto, M. E. (2020). Pengaruh Variasi Suhu Pengeringan Terhadap Pembuatan Simplisia Daun Mimba (Azadirachta Indica). *Jurnal Farmasi Tinctura*, *1*(2), 45–54. https://doi.org/10.35316/tinctura.v1i2.988

Hanif, M. I., Pringgenies, D., & Setyati, W. A. (2025). *Aktivitas Antioksidan dan Fotoproteksi Ekstrak Kasar Bakteri Berpigmen Asosiasi Gastropoda Cassidula nucleus*. *28*(2), 265–276.

Juliadi, D., Shantini Suena, N. M. D., & Astya Putri, N. K. D. (2023). Penentuan Nilai Spf Krim Buah Jeruk Purut (Citrus Hystrix Dc.) Dengan Spektrofotometri UV. *E-Jurnal Medika Udayana*, *12*(9), 31. https://doi.org/10.24843/mu.2023.v12.i09.p07

Nguyen, Q. V., Huyen, B., Thi, B., Tran, M. Đ., Nguyen, M. T., Doan, M. D., Nguyen, A. D., Minh Le, T., Tran, V. C., & Pham, T. N. (2022). Impact of Different Drying Temperatures on In Vitro Antioxidant and Antidiabetic Activities and Phenolic Compounds of Wild Guava Leaves Collected in the Central Highland of Vietnam. *Natural Product Communications*, *17*(4).

Pramesti, S. (2023). Uji Aktivitas Tabir Ekstrak Metanol Daun Tandui (Mangifera rufocostata Kosterm.). *Skripsi*.

Rudiana, T., Fitriyanti, F., & Adawiah, A. (2018). Aktivitas Antioksidan dari Batang Gandaria (Bouea macrophylla Griff). *EduChemia (Jurnal Kimia Dan Pendidikan)*, *3*(2), 195.

Rudiana, T., Nurbayti, S., Ashari, T. H., Zhorif, S. A., & Suryani, N. (2023). Comparison of Maceration and Soxhletation Methods on the Antioxidant Activity of the Bouea macrophylla Griff Plant. *Jurnal Kimia Valensi*, *9*(2), 244–252.

Sari, N., & Yani, D. F. (2021). Uji Aktivitas Ekstrak Metanol Daun Kebiul (Caesalpinia bonduc L.) Sebagai Bahan Aktif Sediaan Tabir Surya. *Jurnal Pengelolaan Laboratorium Sains Dan Teknologi*, *1*(2), 77–83. https://doi.org/10.33369/labsaintek.v1i2.18333

Tenriugi, A., & Syam, I. K. (2018). Uji Potensi Tabir Surya dan Nilai Sun Protecting Factor (SPF) Ekstrak Jamur Tiram Putih (Pleurotus ostreatus) Secara In Vitro. *Jurnal Kesehatan Yamasi Makassar*, *2 (1)*, 10–17.

Tesalonika, L., Manurung, T. W., & Ariefin, M. (2024). Pemodelan Molekul untuk Pengaplikasian Senyawa Anti-UV dari Senyawa Kuersetin Menggunakan Pendekatan Semi Empiris. *Jurnal Sains Dan Edukasi Sains*, *7*(2), 128–135. https://doi.org/10.24246/juses.v7i2p128-135

Verma, A., Zanoletti, A., Kareem, K. Y., Adelodun, B., Kumar, P., Ajibade, F. O., Silva, L. F. O., Phillips, A. J., Kartheeswaran, T., Bontempi, E., & Dwivedi, A. (2024). Skin protection from solar ultraviolet radiation using natural compounds: a review. In *Environmental Chemistry Letters* (Vol. 22, Issue 1, pp. 273–295). Springer Science and Business Media Deutschland GmbH.

Wahyuni, A. S., Rahmawati, F. A. F., Wijianto, D. W., & Umniyyah, R. A. (2024). Effectiveness and Safety of Use of Biguanide and Sulfonylurea Drugs With Histopathological Analysis and Parameters of the Kidney, Liver and Pancreas in Alloxan-Induced Rats. *International Journal of Applied Pharmaceutics*, *16*(5), 108–113. https://doi.org/10.22159/ijap.2024v16s5.52469

Widhihastuti, E., Larasati, Dhatu, S., Priatmoko, S., & Rakainsa, Senda, K. (2024). Formulation And Sunscreen Activity of Cream Preparation From Iler Leaves Extract (Coleus scutellarioides (L.) Benth). *Indonesian Journal of Science*, *13*(1), 52–63.

Wijianto, D. W., Wahyuni, A. S., Iswanto, D., & Listiadewi, A. (2024). Evaluation of the Effectiveness of Metformin and Black Rice Ethanol Extract Combination in Reducing Blood Glucose Levels and Protecting Kidney, Liver, and Pancreatic Cells. *Tropical Journal of Natural Product Research*, *8*(6), 7410–7415. https://doi.org/10.26538/tjnpr/v8i6.11

Wiraningtyas, A., Sry, A., Ruslan, & Hasanah, U. (2019). Penentuan Nilai Sun Protection Factor (SPF) Dari Ekstrak Kulit Bawang Merah. *Jurnal Pendidikan Kimia Dan Ilmu Kimia*, *2 No. 01*, 34–43.

Yuana, W. T., Andiarsa, D., Suryatinah, Y., & Juhairiyah. (2016). Utilization of traditional medicinal plants anti diarrhea in Dayak Dusun Deyah in Muara Uya Tabalong. *JHECDs*, *2*(1), 7–13.