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Total Phenolic, Flavonoid Content, and Antioxidant Activity of Ethanol Extracts and Flour from *Pereskia sacharosa* Griseb (Cactaceae) Leaves

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ABSTRACT: *Pereskia sacharosa* is an unconventional food plant found in several regions, especially in Indonesia. Traditionally, the leaves of this plant are used as medicine for pain, allergies, and fever. This study aims to identify several bioactive compounds from the ethanol extract and flour of *Pereskia sacharosa* through the maceration method using 80% and 96% ethanol. In addition, phytochemical and antioxidant activity tests were carried out. The total phenolic content in the 80% ethanol extract, 96% ethanol extract, and *Pereskia sacharosa* leaf flour was (34.83 ± 0.89 mg GAE/g, 30.04 ± 0.67 mg GAE/g, and 5.66 ± 0.23 mg GAE/g), respectively. The total flavonoid content in the 80% ethanol extract, 96% ethanol extract, and *Pereskia sacharosa* leaf flour was (17.05 ± 1.70 mg QE/g, 15.40 ± 0.93 mg QE/g, and 8.01 ± 0.58 mg QE/g), respectively. Statistical analysis showed a significant difference ($P < 0.05$) between the extract samples and the leaf flour sample. The antioxidant activity, measured by IC5 0 values, was moderate for the 80% ethanol extract (251.09 ± 0.02 ppm) and 96% ethanol extract (204.55 ± 0.10 ppm) of *Pereskia sacharosa* leaves. In contrast, the leaf flour exhibited weak antioxidant activity, with an IC_{50} value of 571.88 ± 0.18 ppm.

Keywords: antioxidant activity; ethanol extracts; flavonoid content; *Pereskia sacharosa*; phenolic content

INTRODUCTION

Bioactive compounds, which are secondary metabolites produced by plants, act in the body to promote good health. They are being studied for their potential in preventing cancer, heart disease, and other diseases. Among the various phytonutrients that plants can produce, phenolic compounds are particularly notable for their antioxidant properties (Gürbüz *et al*., 2018; Galanakis, 2017). Over the past decade, unconventional food plants (UFPs) have gained recognition as a potential addition to the food supply chain, particularly for enhancing the nutritional quality of diets in developing countries. UFPs are defined as plant species with one or more parts that have food potential but are not commonly used in daily consumption (Milião *et al*., 2022; Leal *et al*., 2018).

One of the plants that can be used as a functional food and for disease prevention is *Pereskia sacharosa* Griseb. The content and benefits of *Pereskia sacharosa* leaves (*Pereskia sacharosa* G.) have been identified as bioactive compounds, making them effective in treating various diseases, including fungal infections, headaches, inflammation, diarrhea, dysentery, stomach aches, skin irritation, allergies, fever, and musculoskeletal pain. (Quiroga *et al*., 2012; Hajdu & Hohmann, 2012). A previous study demonstrated that the extract of *Pereskia sacharosa* G. is believed to possess anti-tumor, anti-inflammatory, anti-rheumatic, and anti-ulcer properties (Malek *et al*., 2009). Recent studies showed that *Pereskia sacharosa* G. leaves have been used empirically by the public as an antihypertensive and able to reduce the central response to inflammation through the blood-brain barrier (Lusiyanti *et al*., 2017; Prado-Fernández *et al*., 2024).

Traditionally, the leaves of this plant are usually consumed by local residents, either raw as a vegetable or as a brew after being steeped (Malek *et al*., 2008). Sim *et al*., (2010) investigated the oral toxicity of this plant's leaves in mice, and no deaths or adverse effects were observed at the highest dose. This plant is commonly used as food, and there are no reports of its toxicity to humans or animals (Pinto & Scio, 2014). Additionally, *Pereskia sacharosa* leaf flour can be processed into a cracker biscuit product that is acceptable to panelists (Junaidi *et al*., 2021). The inclusion of seven-star leaf flour from *the Pereskia aculeata* species in sausage formulations can

increase the protein and fiber content of the sausages and improve sensory properties, particularly the color and texture (Sobrinho *et al*., 2015). Furthermore, the addition of *Pereskia aculeata* extract as a coagulating or emulsifying agent in fermented milk beverages results in a final product with higher protein content, chewiness, and stickiness (Amaral *et al*., 2018).

However, scientific research comparing the metabolite compounds in *Pereskia sacharosa* leaf extract and leaf flour is still lacking. Therefore, this study aims to determine the total phenolic content, flavonoid content, and antioxidant activity of the ethanol extract and flour from *Pereskia sacharosa* G. leaves.

MATERIALS AND METHODS

Materials

The materials used in this experiment were *Pereskia sacharosa* leaves (collected from Jabontegal Village, Pungging, Mojokerto, East Java, Indonesia). The chemicals used were ethanol, 2,2-diphenyl-1-picrylhydrazyl (DPPH), sodium carbonate (Na_2CO_3), gallic acid, quercetin, ascorbic acid, folin-ciocalteu reagent, sodium carbonate, and aluminum chloride ($AlCl_3$) obtained from Sigma-Aldrich (USA). The equipment used included a UV-Vis Spectrophotometer (Shimadzu, UV 1800 Type) and Rotary Evaporator (Buchi, Swiss).

Preparation of Pereskia sacharosa leaves

Approximately 3 kg of *Pereskia sacharosa* leaves were thoroughly washed with running water and dried with tissue paper. The leaves were then arranged on trays and dried in a dehydrator (cabinet dryer) for about 8 hours at a temperature of approximately 40 °C. The dried leaves were then ground into a fine powder using a grinding blender and sieved through a 60-mesh screen. The resulting powder was stored in sealed amber glass jars at room-temperature until further analysis (extraction) (Mohd-Salleh *et al*., 2020; Prado-Fernández *et al*., 2024).

Extraction of Pereskia sacharosa leaves by maceration

The extraction process of *Pereskia sacharosa* leaves refers to the modified method by Prado-Fernández *et al*., (2024); Lusiyanti *et al*., (2017); Sim *et al*., (2010). The extraction of *Pereskia sacharosa* leaves was carried out using the maceration method with varying concentrations of ethanol (80% and 96%). A total of 50 grams of *Pereskia sacharosa* leaf flour (PsGLF) was extracted in 500 mL ethanol at a ratio of 1:10 (w/v) for 3×24 hours at room temperature. The ethanol extract was then filtered using Whatman no. 1 filter paper. The resulting filtrate was concentrated using a rotary vacuum evaporator at a speed of 100 rpm and a temperature of 40 °C until the solvent disappeared completely, so that *Pereskia sachrosa* Extract (PsGE) was obtained. The concentrated extract was then weighed, and the % yield value was calculated. The extract was stored in an airtight container at 4 °C until further analysis.

Determination of total phenolic content (TPC)

Total phenolic content was measured using the Folin-Ciocalteu method adapted from Zulkipli *et al*. (2024) with slight modifications. Briefly, 200 µL of diluted flour and PSGE (1 mg/mL) were added to 1.5 mL of 10% Folin-Ciocalteu reagent. Then, 1.5 mL of 7.5% Na_2CO_3 solution was added. The mixture was stirred for 30 seconds and then incubated at room temperature for 45 minutes. Absorbance was measured using a spectrophotometer (Shimadzu, UV-1800 Type) at a wavelength of 765 nm after incubation. A calibration curve for the standard reference was created using gallic acid at concentrations ranging from 10-100 ppm. The analysis was performed in triplicate. Total phenolic content was reported as gallic acid equivalents per gram of sample (mg GAE/g).

Determination of total flavonoid content (TFC)

Total flavonoid content was measured using a modified method adapted from Zulkipli *et al*., (2024) and Chang *et al*., (2002). Briefly, 1000 µL of diluted extract and *Pereskia sacharosa* leaf flour (1 mg/mL) were added to 0.1 mL of 10% aluminium chloride, 0.1 mL of 1 M sodium acetate, and 2.8 mL of distilled water. The mixture was vortexed for 30 seconds, incubated at room temperature for 30 minutes, and then analyzed using a UV-Vis spectrophotometer at λ 415 nm. The analysis was performed in triplicate. A calibration curve was prepared using quercetin as the standard reference. The quercetin concentration range used was 20-100 ppm. Total flavonoid content was reported as quercetin equivalents per gram of sample (mg QE/g).

Radical scavenging activity on 1,1-diphenyl-2-picrylhydrazyl (DPPH)

The DPPH method was adapted from the procedures described by Sukweenadhi *et al*., (2020) and Zulkipli *et al*., (2024) with slight modifications. All samples were dissolved in ethanol and assayed in triplicate. Ascorbic acid was used as a positive reference standard. Briefly, each standard or sample solution from the leaves of *Pereskia sacharosa* G. was pipetted, and a 0.1 mM DPPH solution was added in a 1:1 ratio. The mixture was

vortexed for 30 seconds and then kept in the dark for 30 minutes. The decolorization of DPPH was measured after 30 minutes using a spectrophotometer (Shimadzu, UV-1800 Type) at an absorbance of 517 nm. The percentage of DPPH RSA is calculated based on the following equation:

$$\text{DPPH-RSA (\%)} = \left(\frac{Ac-As}{Ac}\right) \times 100\%$$

Where Ac is the absorbance of the control and As is the absorbance of the extract/standard.

The scavenging ability of the extracts is represented by the IC_{50} value, which is the concentration needed to scavenge 50% of DPPH radicals. This value is derived from the graph plotting scavenging activity (%) against sample concentration. A lower IC_{50} value signifies a stronger ability of the extract to act as a DPPH scavenger. Conversely, a higher IC_{50} value indicates a weaker scavenging activity.

Statistical analysis

The collected data were then statistically analyzed using IBM SPSS Statistics (Version 23). Statistical significance was evaluated with one-way ANOVA and Tukey's post-hoc test. A *p*-value of < 0.05 was considered statistically significant. Data are presented as mean ± standard error of the mean (SEM).

RESULTS AND DISCUSSIONS

Extraction yield of Pereskia sacharosa

Pereskia sacharosa Griseb leaves were extracted by maceration using 80% and 96% ethanol. Ethanol was chosen as the extraction solvent due to its numerous advantages over other organic solvents, including its relative safety and lower toxicity. As a protic organic solvent, ethanol has a polarity index value of 5.2 (Choung *et al*., 2014; Ermi Hikmawanti *et al*., 2021). The research results showed that extraction using 96% ethanol produced a much higher yield compared to 80% ethanol (Table 1). The high yield of the 96% ethanol extract was due to its polarity index, which is close to 5.2, resulting in it having the highest extraction yield (Aji *et al*., 2023). A solvent with this polarity index of 5.2 is capable of dissolving nearly all secondary metabolites, such as alkaloids, flavonoids, saponins, tannins, steroids, and terpenoids (Utami & Putri, 2020). The yield percentage was also confirmed by Lusiyanti *et al*., (2017), which was 21.45%, and Saad *et al*., (2015), which was 3.8% based on the initial weight of the sample. According to El Mannoubi, (2023), polar protic solvents (ethanol) provide better extraction results among all solvents used (methanol and acetone).

Total phenolic content of Pereskia sacharosa

Phenols are a major group of non-essential dietary components linked to the inhibition of atherosclerosis, cancer, and age-related degenerative brain disorders (Cheung *et al*., 2003). These compounds range from simple molecules like phenolic acids to highly polymerized compounds such as tannins. Previous reports have found a strong positive relationship between total phenols and antioxidant activity in many plant species (Muflihah *et al*., 2021; Amzad Hossain & Shah, 2015).

Figure 1 shows that the 80% ethanol extract of *Pereskia sacharosa* leaves has the highest total phenolic content compared to the 96% ethanol extract and *Pereskia sacharosa* leaf flour. Ethanol's polar hydroxyl group (-OH) and non-polar carbon (C2H5-) allow it to dissolve both polar and non-polar compounds (Hart *et al*., 2012). Increasing the water content in the solvent to 80% ethanol raised the Total Phenolic Content (TPC) from 30.04 ± 0.67 mg GAE per gram in the 96% ethanol extract to 34.83 ± 0.89 mg GAE per gram in the 80% ethanol extract. This suggests that a higher water composition in the solvent enables more polar compounds in the *Pereskia sacharosa* leaf to diffuse into the solvent, though it may reduce the extraction of non-polar compounds (Jitrangsri *et al*., 2020). *Pereskia sacharosa* leaf flour had the lowest total phenolic content at 5.66 ± 0.23 mg GAE per gram,

Table 1. Percentage of extraction yield of *Pereskia sacharosa* with variation of solvent concentration

Sample	Amount of dried leaves (g)	Amount of extract yield (g)	Percentage of yield (%)
Extract 80% Et-OH	50.00	5.93 ± 0.27^{a}	11.86 ± 0.53^{a}
Extract 96% Et-OH	50.00	7.22 ± 0.34^{b}	14.44 ± 0.68^{b}

Notes: Different letters in the same row are significantly different ($P < 0.05$)

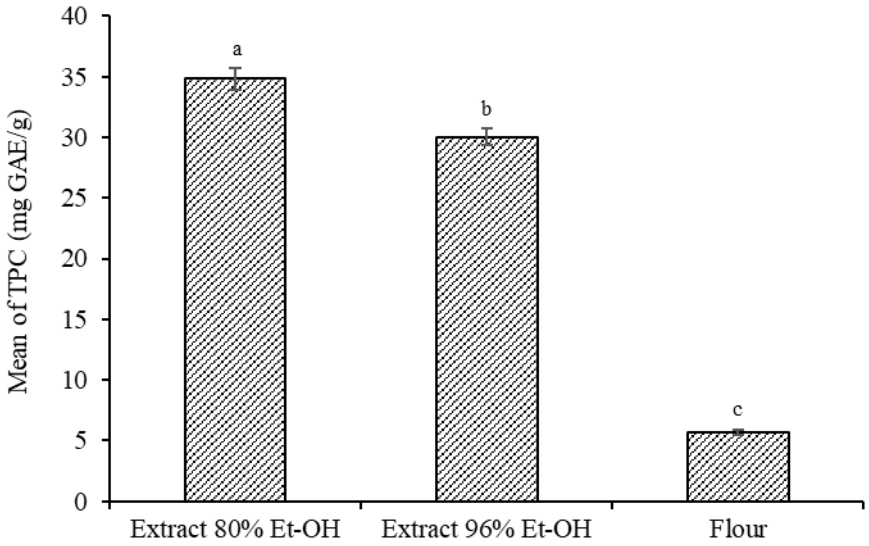


Figure 1. Total phenolic content of ethanolic extract and flour of *Pereskia saccharosa* leaves. Each value is presented as the mean ± standard deviation of three measurements from the same sample

likely due to differences in bioactive compound composition based on processing methods.

Total phenolic content results are still not able to show the content of compounds that are more specific in the extract obtained. Total flavonoid testing still needs to be done as a presumption for a more specific chemical group compound.

Total flavonoid content of ***Pereskia sacharosa***

Figure 2 shows that the total flavonoid content in 80% and 96% ethanol extracts of *Pereskia sacharosa* leaves is higher than in leaf flour. The lowest flavonoid content in *Pereskia sacharosa* flour indicates that the bioactive compounds have not been concentrated and may be bound to the cell matrix, making them difficult to access. This difference is also due to the ability of the solvent to dissolve flavonoids based on their polarity. Flavonoid compounds, being polar, are more soluble in polar solvents. Flavonoid compounds are divided into several types, each with a different polarity depending on the number and position of the hydroxyl groups, which affects their solubility in the solvent (Dias *et al*., 2021). The highest total flavonoids in the 80% ethanol extract indicate that the flavonoids in this extract have the same polarity as 80% ethanol. Therefore, 80% ethanol solvent produces the highest flavonoid content in *Pereskia sacharosa* leaf extract. The results of statistical tests showed a significant difference between the extract sample and the leaf flour sample ($P < 0.05$), indicating that the difference in treatment of *Pereskia sacharosa*

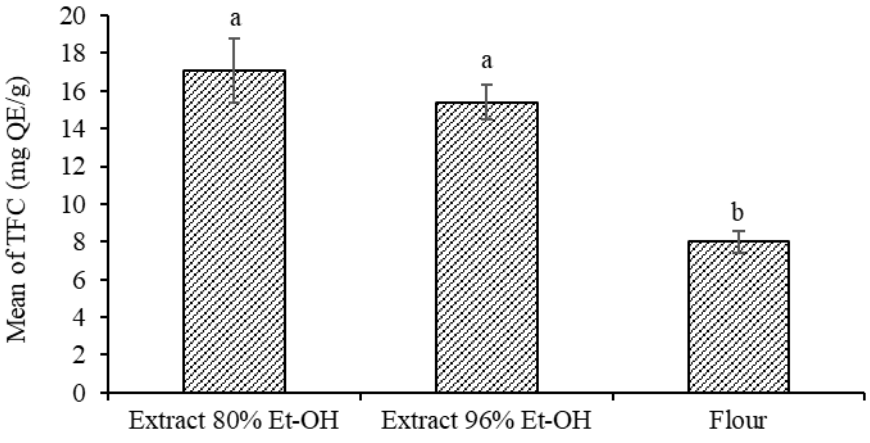


Figure 2. Total flavonoid content of ethanolic extract and flour of *Pereskia saccharosa* leaves. Each value is presented as the mean ± standard deviation of three measurements from the same sample

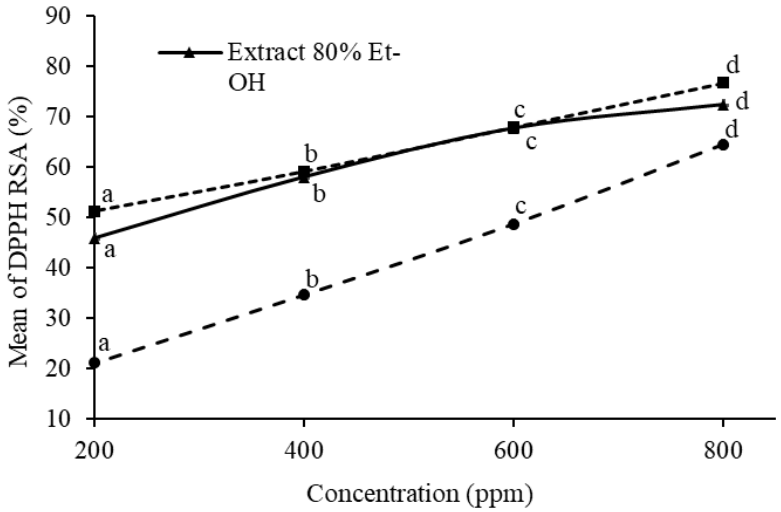


Figure 3. Scavenging effect of ethanolic extract and flour of *Pereskia sacharosa* leaves on DPPH radicals. Each value is presented as the mean ± standard deviation of three measurements from the same sample

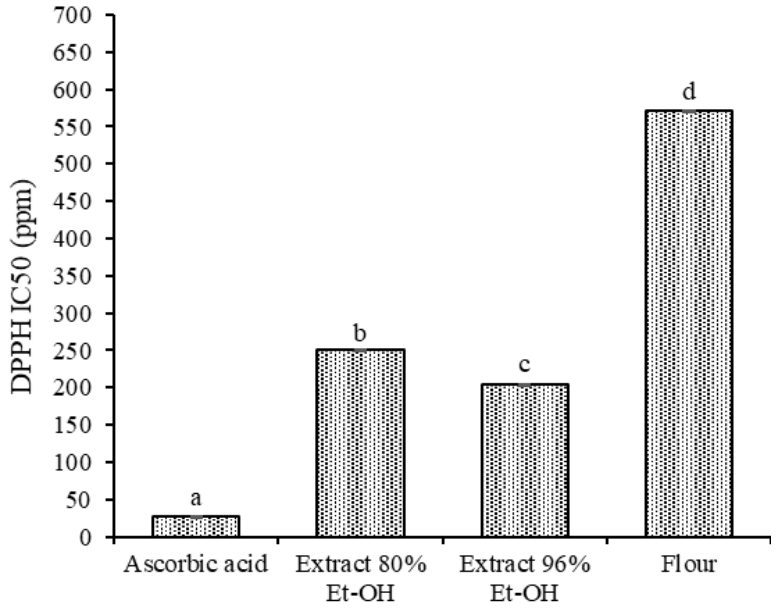


Figure 4. Graph of DPPH radical IC_{50} values for ethanolic extract and flour of *Pereskia sacharosa* leaves crude extract and standard at different concentrations. Each value is presented as the mean ± standard deviation of three measurements from the same sample

leaves resulted in variations in the total flavonoid content obtained.

Previous studies reported that one of the constituents of the flavonoid content in *Pereskia sacharosa* leaves is kaempferol, when quantified, was found to total 66.6 ng/g. In addition, other flavonoids such as naringenin, and glycosylated flavonoids such as quercetin galactoside and quercetin glucoside were also observed (Prado-Fernández *et al*., 2024).

Scavenging activity of Pereskia sacharosa

One of the mechanisms by which antioxidants prevent cell damage is through free radical scavenging. The DPPH free radical scavenging method is a colorimetric test that can quickly evaluate the radical scavenging capacity of specific compounds or extracts (Cheung *et al*., 2003). In its radical form, DPPH has a maximum absorption at 520 nm, which decreases when reduced by antioxidants. This change is observed as a color shift from purple to yellow in a spectrophotometer (Chang *et*

al., 2002). The efficacy of antioxidants is generally influenced by several factors, including their structural features, concentration, temperature, type of oxidation substrate, physical state of the system, and the presence of pro-oxidants and synergists (Munteanu & Apetrei, 2021).

Figure 3 shows that the higher the concentration of the sample solution, the lower the absorbance of the solution. Meanwhile, the higher the concentration of the solution, the higher the percentage of inhibition (%RSA). This occurs because the antioxidant activity increases with the higher concentration of the solution. In this study, *Pereskia sacharosa* leaf extract showed better antioxidant activity compared to *Pereskia sacharosa* leaf flour. The results are compatible with the findings of Hassanbaglou *et al*., (2012). All extracts showed low activity against BHA and α-tocopherol, which serve as reference antioxidant compounds.

Figure 4 shows that the IC_{50} values for the 96% and 80% ethanol extracts were 204.55 ± 0.10 ppm and 251.09 ± 0.02 ppm, respectively, while the IC_{50} value for *Pereskia sacharosa* leaf flour was 571.88 ± 0.18 ppm, which is categorized as weak. The IC_{50} value for vitamin C as a positive control was 27.13 ± 0.01 ppm, which is categorized as strong. The lower the IC_{50} value, the lower the concentration needed to reduce free radical activity, indicating better results. This variation in IC_{50} antioxidant activity is likely due to the role of phenolic and flavonoid compounds or other bioactive components in each sample that play an important role in counteracting DPPH free radicals by donating electrons or hydrogen to stabilize radicals. This finding aligns with several previous studies showing a positive correlation between total phenolic and flavonoid content and DPPH free radical scavenging ability in several plants (Muflihah *et al*., 2021). The higher the total phenolic and flavonoid content, the better the antioxidants (Ghasemzadeh & Ghasemzadeh, 2011).

Based on the study, the ethanol extract of *Pereskia sacharosa* leaves exhibits the highest total phenolic and flavonoid content, along with moderate antioxidant activity. A positive correlation between total phenolic and flavonoid content and antioxidant activity was observed. The limitation of the current study is that it only investigates the use of *Pereskia sacharosa* leaf extract and flour in pharmacological effects. Further research should be directed towards in vivo and in vitro studies to explore the broader utilization of this plant, authenticate its potential as a source of natural antioxidants, and validate its traditional use in various medicinal practices.

CONCLUSION

In conclusion, this study successfully measured the total phenolic content, total flavonoid content, and antioxidant activity (DPPH method) of *Pereskia sacharosa* leaves in the form of ethanol extracts (80% and 96%) and leaf flour. The results showed that the 80% ethanol extract had higher total phenolic and total flavonoid contents compared to the 96% ethanol extract and the leaf flour. Analysis of antioxidant activity revealed that the ethanol extract exhibited moderate activity (based on IC_{50} values), while the leaf flour showed weak activity. These findings provided important baseline information for the further development of *Pereskia sacharosa* as an easily accessible source of natural antioxidants.

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REFERENCES

Aji, N., Shirly Kumala, Esti Mumpuni, & Deni Rahmat. (2023). Perbandingan Aktivitas Tabir Surya Dan Antioksidan: Ekstrak Etanol 70% Dan 96% Dari Rimpang Bangle (*Zingiber montanum* (J.Koenig) Link ex A.,). *Medical Sains : Jurnal Ilmiah Kefarmasian*, *8*(2), 605–614. https://doi.org/10.37874/ms.v8i2.557

Amaral, T. N., Junqueira, L. A., Prado, M. E. T., Cirillo, M. A., de Abreu, L. R., Costa, F. F., & de Resende, J. V. (2018). Blends of *Pereskia aculeata* Miller mucilage, guar gum, and gum Arabic added to fermented milk beverages. *Food Hydrocolloids*, *79*, 331–342. https://doi.org/10.1016/j.foodhyd.2018.01.009

Amzad Hossain, M., & Shah, M. D. (2015). A study on the total phenols content and antioxidant activity of essential oil and different solvent extracts of endemic plant *Merremia borneensis*. *Arabian Journal of Chemistry*, *8*(1), 66–71. https://doi.org/10.1016/j.arabjc.2011.01.007

Chang, C.-C., Yang, M.-H., Wen, H.-M., & Chern, J.-C. (2002). Estimation of Total Flavonoid Content in Propolis by Two Complementary Colorimetric Methods. *Journal of Food and Drug Analysis*, *10*(3).

Cheung, L. M., Cheung, P. C. K., & Ooi, V. E. C. (2003). Antioxidant activity and total phenolics of edible mushroom extracts. *Food Chemistry*, *81*(2), 249–255. https://doi.org/10.1016/S0308-8146(02)00419-3

Choung, M.-G., Hwang, Y.-S., Lee, M.-S., Lee, J., Kang, S.-T., & Jun, T.-H. (2014). Comparison of extraction and isolation efficiency of catechins and caffeine from green tea leaves using different solvent systems. *International*

Journal of Food Science & Technology, *49*(6), 1572–1578. https://doi.org/10.1111/ijfs.12454

De Castro Campos Pinto, N., & Scio, E. (2014). The Biological Activities and Chemical Composition of Pereskia Species (Cactaceae)—A Review. *Plant Foods for Human Nutrition*, *69*(3), 189–195. https://doi.org/10.1007/s11130-014-0423-z

Dias, M. C., Pinto, D. C. G. A., & Silva, A. M. S. (2021). Plant Flavonoids: Chemical Characteristics and Biological Activity. *Molecules*, *26*(17), 5377. https://doi.org/10.3390/molecules26175377

El Mannoubi, I. (2023). Impact of different solvents on extraction yield, phenolic composition, in vitro antioxidant and antibacterial activities of deseeded Opuntia stricta fruit. *Journal of Umm Al-Qura University for Applied Sciences*, *9*(2), 176–184. https://doi.org/10.1007/s43994-023-00031-y

Ermi Hikmawanti, N. P., Fatmawati, S., & Asri, A. W. (2021). The Effect of Ethanol Concentrations as The Extraction Solvent on Antioxidant Activity of Katuk *(Sauropus androgynus* (L.) Merr.) Leaves Extracts. *IOP Conference Series: Earth and Environmental Science*, *755*(1), 012060. https://doi.org/10.1088/1755-1315/755/1/012060

Galanakis, C. M. (2017). Introduction. In: Nutraceutical and functional food components: Effects of innovative processing techniques. In C. M. Galanakis (Ed.), *Nutraceutical and Functional Food Components* (pp. 1–14). Academic Press. https://doi.org/10.1016/B978-0-12-805257-0.00001-6

Ghasemzadeh, A., & Ghasemzadeh, N. (2011). Flavonoids and phenolic acids: Role and biochemical activity in plants and human. *Journal of Medicinal Plants Research*, *5*. https://doi.org/10.5897/JMPR11.1404

Gürbüz, N., Uluişik, S., Frary, A., Frary, A., & Doğanlar, S. (2018). Health benefits and bioactive compounds of eggplant. *Food Chemistry*, *268*, 602–610. https://doi.org/10.1016/j.foodchem.2018.06.093

Hajdu, Z., & Hohmann, J. (2012). An ethnopharmacological survey of the traditional medicine utilized in the community of Porvenir, Bajo Paraguá Indian Reservation, Bolivia. *Journal of Ethnopharmacology*, *139*(3), 838–857. https://doi.org/10.1016/j.jep.2011.12.029

Hart, D. J., M. Hadad, C., Craine, L. E., & Hart, H. (Eds.). (2012). *Organic chemistry* (13. ed). Brooks, Cole Cengage Learning.

Hassanbaglou, B., Abdul Hamid, A., Roheeyati, A., Abdulamir, A., & Khatib, A. (2012). Antioxidant activity of different extracts from leaves of *Pereskia bleo* (Cactaceae). *Journal of Medicinal Plants Research*, *6*, 2932–2937. https://doi.org/10.5897/JMPR11.760

Jitrangsri, K., Chaidedgumjorn, A., & Satiraphan, M. (2020). Effect of ethanol percentage upon various extraction methods of peanut based on antioxidant activity with trans-resveratrol and total phenolic contents. *Pharmaceutical Sciences Asia*, *47*(2), 164–172. https://doi.org/10.29090/psa.2020.02.018.0056

Junaidi, Purwandari, U., & Faridz, R. (2021, July 26). *Prosiding Seminar Nasional Teknologi dan Industri Pangan Unisri "Peran Pangan Fungsional Berbahan Baku Lokal di Era Pandemi Covid-19" – UNISRI Press*. https://press.unisri.ac.id/prosiding-seminar-nasional-teknologi-dan-industri-pangan-unisri-peran-pangan-fungsional-berbahan-baku-lokal-di-era-pandemi-covid-19/

Leal, M. L., Alves, R. P., & Hanazaki, N. (2018). Knowledge, use, and disuse of unconventional food plants. *Journal of Ethnobiology and Ethnomedicine*, *14*(1), 6. https://doi.org/10.1186/s13002-018-0209-8

Lusiyanti, S., Katrin, K., Rissyelly, R., & Puspitasari, N. (2017). ACE Inhibitory Activity, Total Phenolic and Flavonoid Content of *Pereskia saccharose* Griseb. Leaves Extract. *Pharmacognosy Journal*, *9*(2), 285–287. https://doi.org/10.5530/pj.2017.2.49

Malek, S. N. A., Shin, S. K., Wahab, N. A., & Yaacob, H. (2009). Cytotoxic Components of *Pereskia bleo* (Kunth) DC. (Cactaceae) Leaves. *Molecules*, *14*(5), Article 5. https://doi.org/10.3390/molecules14051713

Malek, S. N. A., Wahab, N. A., Yaacob, H., Shin, S. K., Lai, H. S., Serm, L. G., & Rahman, S. N. S. A. (2008). Cytotoxic Activity of *Pereskia bleo* (Cactaceae) Against Selected Human Cell Lines. *International Journal of Cancer Research*, *4*(1), 20–27. https://doi.org/10.3923/ijcr.2008.20.27

Milião, G. L., de Oliveira, A. P. H., Soares, L. de S., Arruda, T. R., Vieira, É. N. R., & Leite Junior, B. R. de C. (2022). Unconventional food plants: Nutritional aspects and perspectives for industrial applications. *Future Foods*, *5*, 100124. https://doi.org/10.1016/j.fufo.2022.100124

Mohd-Salleh, S. F., Ismail, N., Wan-Ibrahim, W. S., & Tuan Ismail, T. N. N. (2020). Phytochemical Screening and Cytotoxic Effects of Crude Extracts of *Pereskia Bleo* Leaves. *Journal of Herbs, Spices & Medicinal Plants*, *26*(3), 291–302. https://doi.org/10.1080/10496475.2020.1729287

Muflihah, Y. M., Gollavelli, G., & Ling, Y.-C. (2021). Correlation Study of Antioxidant Activity with Phenolic and Flavonoid Compounds in 12 Indonesian Indigenous Herbs. *Antioxidants*, *10*(10), 1530. https://doi.org/10.3390/antiox10101530

Munteanu, I. G., & Apetrei, C. (2021). Analytical Methods Used in Determining Antioxidant Activity: A Review. *International Journal of Molecular Sciences*, *22*(7), Article 7. https://doi.org/10.3390/ijms22073380

Prado-Fernández, M. F., Magdaleno-Madrigal, V. M., Cabañas-García, E., Mucio-Ramírez, S., Almazán-Alvarado, S., Pérez-Molphe-Balch, E., Gómez-Aguirre, Y. A., & Sánchez-Jaramillo, E. (2024). *Pereskia sacharosa Griseb.* (Cactaceae) Prevents Lipopolysaccharide-Induced Neuroinflammation in Rodents via Down-Regulating TLR4/CD14 Pathway and GABAA γ2 Activity. *Current Issues in Molecular*

Biology, *46*(7), Article 7. https://doi.org/10.3390/cimb46070411

Quiroga, R., Meneses, L., & Bussmann, R. W. (2012). Medicinal ethnobotany in Huacareta (Chuquisaca, Bolivia). *Journal of Ethnobiology and Ethnomedicine*, *8*(1), 29. https://doi.org/10.1186/1746-4269-8-29

Saad, R., Asmani, F., Saad, M., Hussain, M., Khan, J., Kaleemullah, M., Othman, N. B., Tofigh, A., & Yusuf, E. (2015). *A New Approach for Predicting Antioxidant Property of Herbal Extracts*. *7*(1).

Sim, K., Nurestri, A. M., Sinniah, S. K., Kim, K. H., & Norhanom, A. W. (2010). Acute oral toxicity of *Pereskia bleo* and *Pereskia grandifolia* in mice. *Pharmacognosy Magazine*, *6*(21), 67–70. https://doi.org/10.4103/0973-1296.59969

Sobrinho, S. S., Costa, L. L., Gonçalves, C. A. A., & Campagnol, P. C. B. (2015). *Emulsified cooked sausages enriched with flour from ora-pro-nobis leaves (Pereskia aculeata Miller)*. http://www.ifrj.upm.edu.my/22%20(01)%202015/(46).pdf

Sukweenadhi, J., Yunita, O., Setiawan, F., KARTINI, Siagian, M. T., Danduru, nggreyni P., & Avanti, C. (2020). Antioxidant activity screening of seven Indonesian herbal extract. *Biodiversitas Journal of Biological Diversity*, *21*(5), Article 5. https://doi.org/10.13057/biodiv/d210532

Utami, L. A., & Putri, D. H. (2020). The Effect of Ethanol Solvent Concentration on Antimicrobial Activities The Extract of Andalas Endophytic Bacteria (Morus Macroura Miq.) Fermentation Product. *Eksakta : Berkala Ilmiah Bidang MIPA*, *21*(1), 1–6. https://doi.org/10.24036/eksakta/vol21-iss1/210

Zulkipli, N. N., Norasmadi, I. N. S., Lob, S., Wan Sembok, W. Z., Suhaimi, N. I., & Mubarak, A. (2024). Effect of Different Drying Methods on Retention of Colour, Total Phenolic Content, Flavonoid Content and Antioxidant Activity in *Pereskia bleo* Leaves. *Malaysian Applied Biology*, *53*(3), 83–93. https://doi.org/10.55230/mabjournal.v53i3.2956