IJHESS
International Journal of Health, Economics, and Social Sciences
PUBLISHER: Universitas Muhammadiyah Palu
ISSN: 2685-6689
SINTA 2

# Efficacy Test of Akway Wood Extract (*Drimys piperita*) on Glucose-Induced Blood Glucose Levels of Mice (*Mus musculus*)

**Wa Siti Arabiya[1], Lukman Hardia[1]*, A. M. Muslihin[1]**
[1]Pharmacy Study Program, Faculty of Pharmacy, Universitas Pendidikan Muhammadiyah Sorong, Sorong, Indonesia
***Corresponding author:** Lukman Hardia, lukman@unimudasorong.ac.id

## ABSTRACT

**Background:** Hyperglycemia is the main characteristic of glucose metabolism disorders and encourages the search for natural materials with antihyperglycemic activity. Akway wood (*Drimys piperita*) is a typical Papuan plant that has the potential to be developed as a source of bioactive substances.

**Objective:** This study aims to evaluate the effectiveness of akway wood extract (AWE) on the blood glucose levels of glucose-induced mice (*Mus musculus*).

**Methods:** Experimental research was conducted using a negative control group (Na-CMC), a positive control (glycenchlamide 0.013 mg/20 gBB), and an akway wood extract group (AWE) at doses of 100, 200, and 400 mg/kgBB. Blood glucose levels were observed on days 7 and 14. Data were analyzed using ANOVA followed by LSD test at a significance level of $p < 0.05$.

**Results:** On day 7, AWE 100 and 400 mg/kgBB differed significantly compared to positive controls ($p = 0.003$ and $p < 0.001$), while AWE 200 mg/kgBB did not differ significantly ($p = 0.071$). On day 14, AWE 400 mg/kgBB showed a significant difference to positive control ($p < 0.001$), while AWE 100 and 200 mg/kgBB showed $p = 0.032$ and 0.129, respectively.

**Conclusion:** Akway wood extract showed antihyperglycemic activity in mice, especially at a dose of 400 mg/kgBB during the observation period.

**Keywords:** Akway; Antihyperglycemic; Blood Glucose; *Drimys piperita*; Glucose Induction

**ARTICLE IDENTIFIERS**

**ORIGINAL ARTICLE**
**Vol. 8 No. 4, 2026**
**Pages: 1308-1315**
**DOI: 10.56338/ijhess.v8i4.12277**

**ARTICLE HISTORY**

**Received:** 21 September 2026
**Revised:** 28 October 2026
**Accepted:** 12 November 2026

CC BY-SA 4.0

## INTRODUCTION

Diabetes mellitus (DM) is one of the chronic metabolic diseases with an increasing global health burden. This condition is characterized by chronic hyperglycemia due to impaired insulin secretion, insulin action, or both, which can further lead to organ damage and microvascular and macrovascular complications. Data *from the International Diabetes Federation* (IDF) shows that by 2024, around 589 million adults aged 20–79 years will be living with diabetes worldwide, and this number is projected to increase to around 853 million by 2050 if there is no effective intervention (Genitsaridi et al., 2026). Selain prevalensinya yang tinggi, sebagian besar penderita diabetes belum terdiagnosis sehingga berisiko mengalami komplikasi akibat paparan hiperglikemia yang berlangsung lama (Genitsaridi et al., 2026; Ong et al., 2023) . This condition shows the need to develop diabetes control strategies that are effective, safe, affordable, and can be developed from local biological resources.

The control of hyperglycemia is one of the main goals in diabetes therapy. Various antidiabetic drugs have been developed to improve insulin sensitivity, stimulate insulin secretion, inhibit carbohydrate absorption, or modulate glucose metabolism. However, the need for new therapeutic sources remains high because the effectiveness of therapy can be influenced by individual responses, side effects, cost, and long-term use needs. In this context, medicinal plants are one of the important sources in the search for antidiabetes candidates because they contain a wide variety of secondary metabolites that can work through multiple biological targets simultaneously. Reviews of Indonesian medicinal plants show that at least 229 species from 70 families have been reported to be ethnopharmacologically used to aid in the treatment of diabetes, but many plants still do not have adequate preclinical evidence and pharmacological mechanisms (Arifah et al., 2022) . This shows that the exploration of local Indonesian medicinal plants still has great opportunities for the development of antidiabetic agent candidates.

One of the local plants that is interesting to research is akway (*Drimys piperita* Hook.f.), an aromatic plant from the Winteraceae family found in the Papua region. Akway has long been used by local people as a medicinal plant and has a variety of biological activities related to its secondary metabolite content. Research on *D. piperita* shows the existence of a group of phenolic, flavonoid, and terpenoid compounds. Akway leaf ethyl acetate extract is reported to have a total phenol content of 33.25 mg EAG/g extract and flavonoids of 3.05 mg EQ/g extract, with several major terpenoid components such as caryophyllene, isopatchoulane, humulene, linalool, and other terpenoid compounds (Mambrasar et al., 2019). A broader study of the genus *Drimys* also shows the presence of various secondary metabolites and biological activity in several species in the genus, including *D. piperita (Oshiro & De Souza, 2023).* The existence of these phenolic, flavonoid, and terpenoid compounds provides a scientific basis for exploring the potential of akway as a source of bioactive substances. Pharmacologically, the flavonoid and polyphenol groups have strong relevance to the control of hyperglycemia. Flavonoids can affect glucose metabolism through several mechanisms, including inhibiting the enzymes α-glucosidase and α-amylase, increasing glucose uptake through the AMPK and IRS/PI3K/AKT pathways, improving insulin sensitivity, and reducing oxidative and inflammatory stress (Fania et al., 2023; Hardia, Akrom, Hidayati, et al., 2025; Hardia et al., 2024; Lam et al., 2024; Sok Yen et al., 2021). Systematic studies of flavonoids as α-glucosidase and α-amylase inhibitors have also shown that some flavonoids have inhibitory activity against both enzymes, which could theoretically slow down carbohydrate hydrolysis and lower blood glucose increases after carbohydrate intake (Hardia, Akrom, Hidayati, et al., 2025; Hardia, Akrom, Sulistyani, et al., 2025; Sari et al., 2022). In addition, various natural ingredient compounds such as flavonoids, terpenoids, alkaloids, saponins, and polyphenols have been reported to have antidiabetic potential through mechanisms that include increased insulin secretion or sensitivity, inhibition of glucose absorption (Fabanyo et al., 2023; Rahayu et al., 2023) , modulation of glucose metabolism, and reduction of oxidative stress (Fei et al., 2024; Rana et al., 2026). Thus, the akway phytochemical profile provides biological rationale for testing antihyperglycemic activity in vivo.

The potential of Indonesian medicinal plants as a source of antidiabetic candidates is also supported by various preclinical studies. Arifah et al. report that Indonesia has a wealth of medicinal plants traditionally used for diabetes and emphasize the need for validation through preclinical research, phytochemistry, toxicology, and clinical trials (Arifah et al., 2022). Other research shows that plant extracts rich in polyphenols can provide antidiabetic effects through decreased blood glucose, improved insulin resistance, increased insulin release, as well as decreased oxidative stress (Krawczyk et al., 2022). Studies of Southeast Asian medicinal plants have also shown that a number of plant extracts have strong α-glucosidase inhibitory activity and that several bioactive compounds identified have the potential to be developed as antidiabetic candidates (Benjamin et al.,

CC BY-SA 4.0

2024). The findings strengthen the rationality of the use of Indonesia's biodiversity, including Papuan endemic plants, in the search for natural material candidates for hyperglycemia control.

Evidence that directly points to the antihyperglycemic activity of akway is becoming available. Research by Tuturop et al. in 2026 shows that akway leaf extract (*Drimys cf. piperita*) has antihyperglycemic activity in white mice. Administration of the extract at doses of 100, 200, and 400 mg/kgBB showed activity to decrease blood glucose levels, with a dose of 200 mg/kgBB resulting in the highest decrease of 54.24%, even slightly higher compared to glycenclamamide of 51.15%. The extract also showed the presence of flavonoids, alkaloids, tannins, and saponins based on phytochemical screening (Tuturop et al., 2026). These findings are important preliminary evidence that akway has the potential to provide antihyperglycemic effects in vivo. However, the study used leaf parts, while information on the efficacy of wood/bark of akway (*D. piperita*) on blood glucose levels is still very limited. In fact, wood or bark can have a different secondary metabolite profile and active compound composition compared to leaves.

Based on this description, research on akway wood extract has important value because it can expand pharmacological evidence regarding the use of *D. piperita* as a natural source of antidiabetic ingredients. Previous studies on akway show the presence of bioactive compounds and biological activity, while recent evidence on leaf extract shows the presence of antihyperglycemic effects in vivo (Cepeda et al., 2018, 2019; Tuturop et al., 2026). However, there is insufficient evidence on the efficacy of akway wood extract (*Drimys piperita*) in lowering blood glucose levels in white mice (*Mus musculus*). Differences in plant parts, extraction methods, phytochemical composition, and dosage have the potential to result in differences in pharmacological activity. Therefore, this study was conducted to test the efficacy of akway wood extract (*Drimys piperita*) as an antidiabetic in white mice (*Mus musculus*), by evaluating changes in blood glucose levels after the administration of the extract. The results of the study are expected to provide preliminary preclinical evidence regarding the potential of akway wood as a source of natural materials that can be further developed as candidates for antidiabetic agents.

## METHODS

### Experimental Section

This research is a laboratory experimental study using mice as test animals. The research was carried out from May to July 2026 at the Pharmaceutical Laboratory, Universitas Pendidikan Muhammadiyah Sorong.

### Plant Collection and Identification

Samples of *Drimys piperita* stem bark were collected from Manokwari, Sorong, West Papua in April 2026.

### Experimental Animals

A total of 25 healthy adult mice weighing 25–30 g were acclimatized for seven days in natural light–dark cycle conditions to allow the animals to adapt to the laboratory environment. During the acclimatization period, the test animals were given laboratory standard feed and clean drinking water ad *libitum*. Drinking water was changed periodically to maintain its cleanliness and quality. All research procedures involving test animals were carried out in accordance with applicable ethical guidelines and received approval from the Research Ethics Committee of the Makassar College of Pharmaceutical Sciences with Approval Number 06.035/KOMETIK/STIFA/VI/2026.

### Preparation of Extracts

The bark of *the Drimys piperita* stem was collected and dried in an oven at 50 °C. The dried sample is then made into a powder and extracted using methanol as a solvent in a ratio of 1:4. The mixture is left for 3 × 24 hours in a closed container and protected from direct light, then occasionally stirred and filtered. After the extraction process is complete, the extract is evaporated using a *rotary evaporator* at 50 °C until a thick extract is obtained. The extract yield is then calculated and recorded (Muslihin et al., 2025; Tuturop et al., 2026).

### Antihyperglycemic Test

A total of 25 male rat experimental animals were divided into five treatment groups consisting of five test animals per group. Group I: Negative Control (Na-CMC 0.5%), Group II: Glibenclamid (0.013 mg/20 g BW, po), Group III: Drimys piperita (100 mg/kgBW, oral), Group IV: Drimys piperita (200 mg/kgBW, oral), and Group V: Drimys piperita (300 mg/kg BW, oral).

CC BY-SA 4.0

The mice were given glucose orally for three consecutive days to trigger hyperglycemia. After glucose administration, the mice were left for 30 minutes, then fasting blood glucose levels were measured as glucose levels after glucose induction. Before blood draws, the animals were not fed for 18 hours but were still given drinking water.

Drimys piperita stem extract was administered daily for 14 consecutive days according to the dosage for each treatment group. Blood glucose measurements were carried out on the 1st, 7th, and 14th days after the administration of the extract. Then, the blood glucose levels of the rats were measured using the GOD-PAP method on UV-Vis spectrophotometry with a wavelength of 546 nm (Jelina et al., 2026).

### Measures and Data Analysis

All research data were analyzed using IBM SPSS version 25 for the Mac OS operating system. The bivariate analysis used was One-way ANOVA to compare data between the control group and the intervention group, followed by the LSD test which was used to compare pre- and post-test data in each group. The results were then presented as an average of SD ±. A p-value < 0.05 was inferred to be statistically significant.

## RESULTS

**Table 1.** Differences in pre and post-test blood glucose levels between groups

| Variable | Control - (Na. CMC) | Control + (Glibenclamide dose 0.013 mg/ 20g BW, po) | Group-I (AWE 100 mg/KgBW, po) | Group-II (AWE 200 mg/KgBW, po) | Group III (AWE 400 mg/KgBW, po) | p-value |
|---|---|---|---|---|---|---|
| **Pret-test** | 206.4±11.28 | 186.2±19.36 | 198.4±17.29 | 229.8±29.17 | 211.0±18.33 | 0.032* |
| **Post-test** | | | | | | |
| Day 7 | 222±8.97 | 134.6±20.11 | 176±9.90 | 189.2±45.0 | 214.2±22.11 | <0.001* |
| Day 14 | 226±6.16 | 119±18.37 | 150.80±12.52 | 167.4±39.21 | 229.8±26.03 | <0.001* |
| **Post-test (Δ%)** | | | | | | |
| Day 7 | -7.75±5.93 | 27.90±5.12 | 10.99±5.94 | 18.38±11.13 | -1.77±9.55 | <0.001* |
| Day 14 | -9.75±6.44 | 36.30±5.09 | 23.81±5.66 | 27.73±9.88 | -9.32±12.94 | <0.001* |

**Notes**: Values are expressed as Mean ± SD, n = 5, **Δ%** = % Difference between pre-treatment and post-treatment, *p < 0.05 One-way ANOVA, AWE = Akway wood extract

The analysis showed significant differences in blood glucose levels between groups at the pre-test (p=0.032), as well as on days 7 and 14 (both p<0.001). In the treatment group, Akway wood extract (AWE)100 and 200 mg/kgBW showed a decrease in glucose, while AWE 400 mg/kgBW showed a smaller change. A positive control of glibenclamide also showed a decrease in glucose, while a negative control of Na-CMC showed an increase in glucose levels.

**Table 2.** Comparison of antihyperglycemic efficacy between the control group and the treatment group

| Measurement Time | Groups | | p-value | 95% CI (Lower±Upper) |
|---|---|---|---|---|
| **Day 7** | **Control + (Glibenclamide dose 0.013 mg/20g BW, po)** | Group-I (AWE 100 mg/KgBW) | 0.003* | 6.49±27.33 |
| | | Group-II (AWE 200 mg/KgBW) | 0.071 | -0.89±19.94 |
| | | Group-III (AWE 400 mg/KgBW) | <0.001* | 19.26±40.10 |
| | **Control - (Na. CMC)** | Group-I (AWE 100 mg/KgBW) | 0.001* | -29.16±-7.32 |
| | | Group-II (AWE 200 mg/KgBW) | <0.001* | -36.55±-15.71 |
| | | Group-III (AWE 400 mg/KgBW) | 0.246 | -16.39±4.44 |

CC BY-SA 4.0

| Measurement Time | Groups | | p-value | 95% CI (Lower±Upper) |
|---|---|---|---|---|
| Day 14 | Control + (Glibenclamide dose 0.013 mg/20g BW, po) | Group-I (AWE 100 mg/KgBW) | 0.032* | 1.22±23.75 |
| | | Group-II (AWE 200 mg/KgBW) | 0.129 | -2.70±19.82 |
| | | Group-III (AWE 400 mg/KgBW) | <0.001* | 34.36±56.88 |
| | Control - (Na. CMC) | Group-I (AWE 100 mg/KgBW) | <0.001* | -44.82±-22.29 |
| | | Group-II (AWE 200 mg/KgBW) | <0.001* | -48.75±-26.22 |
| | | Group-III (AWE 400 mg/KgBW) | 0.938 | -11.69±10.84 |

**Notes: LSD** = *Least Significant Difference*, which is *a post hoc* test to find out significantly different pairs of groups after ANOVA analysis shows differences between groups. **CI** = *Confidence Interval* (95% confidence interval). **Control (+)** = positive control and **Control (−)** = negative control. Comparison data are presented with **a 95% CI.** The difference is considered significant if $p < 0.05$ and is denoted by (*).

The results of the LSD test showed that on day 7, AWE 100 mg/kgBW and AWE 400 mg/kgBW differed significantly compared to positive controls (p=0.003 and p<0.001, respectively), while AWE 200 mg/kgBB did not differ significantly (p=0.071). Compared to negative controls, AWE 100 and 200 mg/kgBW showed significant differences (p=0.001 and p<0.001), while AWE 400 mg/kgBW was not significantly different (p=0.246). On day 14, a similar pattern was seen, with AWE 100 mg/kgBB significantly different from positive controls (p=0.032) and AWE 400 mg/kgBW was very significant (p<0.001), while AWE 200 mg/kgBW was insignificant (p=0.129). Against negative controls, AWE 100 and 200 mg/kgBB differed significantly (both p<0.001), while AWE 400 mg/kgBW was insignificant (p=0.938).

## DISCUSSION

The results showed that administration of Akway wood extract (AWE) produced different antihyperglycemic responses according to dose and time of observation. Based on the LSD test, on day 7, AWE 100 and 400 mg/kgBB differed significantly compared to positive controls (p=0.003 and p<0.001), while AWE 200 mg/kgBB showed no significant difference (p=0.071). Against negative controls, significant differences were found in AWE 100 and 200 mg/kgBW (p=0.001 and p<0.001), but not in AWE 400 mg/kgBW (p=0.246). On day 14, AWE 100 and 400 mg/kgBW still showed significant differences in positive controls, while AWE 200 mg/kgBW did not differ significantly. Against negative controls, only AWE 100 and 200 mg/kgBB showed significant differences (both p<0.001). These findings suggest that AWE's antihyperglycemic response does not increase linearly with dose increase, with a more consistent response at doses of 100–200 mg/kgBW.

The findings are in line with the research of Tuturop et al. (2026), which reported the antihyperglycemic activity of Akway leaf extract (*Drimys cf. piperita*) in mice. In the study, a dose of 200 mg/kgBB resulted in a reduction in glucose of 54.24%, while a dose of 400 mg/kgBW resulted in a lower decrease of 45.85%. The researchers reported that a dose of 200 mg/kgBW provided the highest response in the model used (Tuturop et al., 2026). The consistency of the pattern is interesting because the current study uses wood extract, while Hardia and colleagues' research uses Akway leaf extract. Thus, the results of both provide an indication that different parts of the Akway plant may have glucose-control-related activities, but these effects cannot be considered identical due to differences in plant parts, hyperglycemic induction design, duration of observation, and extract administration protocol. The study by Hardia et al. used glucose solution induction for 7 days and glucose measurements up to 150 minutes after treatment.

Phytochemically, these activities can theoretically be related to the presence of Akway bioactive compounds. Research on *Drimys piperita* reports the presence of phenolics, flavonoids, and various terpenoid components in leaf extracts. Recent literature suggests that flavonoids can affect glucose regulation through several mechanisms, including inhibition of α-glucosidase and α-amylase, increased insulin sensitivity, stimulation of glucose uptake, and modulation of oxidative stress and the PI3K/AKT pathway (Liu et al., 2025). However, this mechanism in Akway wood extract cannot be ascertained based on blood glucose data alone, so further research is needed in the form of identification of active compounds and molecular mechanism testing. The pattern of decreased effectiveness at a dose of 400 mg/kg BW is also noteworthy. The dose-response

CC BY-SA 4.0

relationship in plant extracts is not always linear because extracts are a mixture of various secondary metabolites that can have synergistic as well as antagonistic effects. The recent literature also emphasizes the need for standardization of extracts, dosage, and safety evaluation before preclinical results of medicinal plants are translated into clinical use (Li et al., 2025).

Thus, the results of this study strengthen the preclinical evidence regarding the potential of Akway as a source of antihyperglycemic candidates, while suggesting that increasing doses does not necessarily result in increased effects. These findings are consistent with the publication of Hardia et al. (2026), in particular the presence of a better response at medium doses compared to doses of 400 mg/kgBW (Hardia et al., 2026) .

## CONCLUSION AND IMPLICATIONS

Akway wood extract (AWE) showed significant antihyperglycemic effects, especially at doses of 100 and 200 mg/kgBW, which differed significantly compared to negative controls on days 7 and 14 ($p<0.001$ on day 14). However, the effect did not show a dose-dependent pattern because the dose of 400 mg/kgBW did not differ significantly from negative controls nor showed consistency compared to lower doses.

These results suggest that AWE has the potential to be developed as a candidate for antihyperglycemic natural materials, with a response seen at doses of 100–200 mg/kgBW. Further research needs to focus on the standardization of extracts, identification of active compounds, dose optimization, as well as testing of mechanisms of action and safety to strengthen the preclinical evidence before moving on to further research.

### Limitations and Future Research

This study has several limitations that need to be considered in the interpretation of the results. First, the study used a mouse animal model, so the results obtained cannot be directly generalized to humans. The response of glucose metabolism in mice can be different from the physiological and pharmacological responses in humans. Second, the study focuses on changes in blood glucose levels as the main parameter of antihyperglycemic effectiveness. Other biochemical and molecular parameters that can provide more in-depth information about the mechanism of action of the extract, such as insulin levels, lipid profiles, oxidative stress, as well as the expression of proteins or genes related to glucose regulation, have not been comprehensively evaluated. Third, the study used akway wood extract as a whole, so the contribution of each active compound or group of secondary metabolites to antihyperglycemic activity could not be determined. Standardization of extracts based on marker compounds is also important to ensure consistency of biological activity between batches of extracts. Fourth, the dose ranges used, namely 100, 200, and 400 mg/kgBW, provide information on response at several dose levels, but do not yet fully describe the dose–response relationship pharmacologically. Further research with a wider dose range and a greater number of dosing points is needed to better determine effective dosage and dose-response characteristics. Fifth, the 14-day observation period provides information on the effects of the extract in the short term, but is not sufficient to describe the effectiveness and safety of use in the long term.

Further research needs to be directed at the standardization of akway wood extract (*Drimys piperita*) through phytochemical characterization and identification of active compounds that have the potential to play a role in antihyperglycemic activity. Chromatographic analysis, such as HPLC or LC-MS/MS, can be used to obtain the chemical profile of the extract and determine marker compounds that can be used in standardization. Subsequent studies also need to evaluate the pharmacological mechanisms of extracts through the measurement of parameters related to glucose homeostasis, including insulin, HOMA-IR, lipid profiles, oxidative stress, carbohydrate metabolism enzyme activity, as well as molecular pathways related to glucose transport and utilization. In addition, studies with longer administration periods are needed to evaluate long-term effectiveness and safety, including hematological examinations, liver function, renal function, and histopathological examinations of target organs. Dose-response studies and pharmacokinetic studies are also needed to determine the relationship between dose, extract exposure, and antihyperglycemic response. Once adequate preclinical evidence is obtained regarding the effectiveness, safety, and standardization of extracts, further research can be directed to formulation development and clinical evaluation in stages.

Thus, follow-up research is expected not only to confirm the effect of lowering blood glucose levels of *D. piperita*, but also to explain the bioactive compounds, mechanisms of action, dose–response relationships, safety, and potential development of akway as a candidate for antihyperglycemic natural materials.

CC BY-SA 4.0

## DECLARATIONS

**Ethics approval:** All experimental procedures involving animal subjects were conducted in accordance with established ethical guidelines and were approved by the Research Ethics Committee of the Makassar College of Pharmacy (Approval No. 06.035/KOMETIK/STIFA/VI/2026).

**Funding and Statement:** No funding

**Author contributions:** All authors contributed to the conception and design of the study, data collection, data analysis, interpretation of the results, and preparation and revision of the manuscript. All authors have read and approved the final version of the manuscript

**Acknowledgements:** The authors would like to express their sincere gratitude to the Laboratory of Pharmacology and Toxicology, Faculty of Pharmacy, Universitas Pendidikan Muhammadiyah Sorong, for providing the necessary facilities and technical support to conduct this research. We also acknowledge the invaluable assistance of the laboratory staff for their contributions during the experimental procedures and data collection. Special appreciation is extended to all colleagues who provided constructive feedback and academic discussions that significantly improved the quality of this manuscript.

## REFERENCES

Arifah, F. H., Nugroho, A. E., Rohman, A., & Sujarwo, W. (2022). A review of medicinal plants for the treatment of diabetes mellitus: The case of Indonesia. *South African Journal of Botany*, *149*, 537–558. https://doi.org/https://doi.org/10.1016/j.sajb.2022.06.042

Benjamin, M. A. Z., Mohd Mokhtar, R. A., Iqbal, M., Abdullah, A., Azizah, R., Sulistyorini, L., Mahfudh, N., & Zakaria, Z. A. (2024). Medicinal plants of Southeast Asia with anti-α-glucosidase activity as potential source for type-2 diabetes mellitus treatment. *Journal of Ethnopharmacology*, *330*, 118239. https://doi.org/https://doi.org/10.1016/j.jep.2024.118239

Cepeda, G. N., Lisangan, M. M., Roreng, M. K., Permatasari, E. I., Manalu, D. C., & Tanlain, W. (2018). Free Radical Scavenging Activity and Reducing Power of Akway (Drimys piperita Hook. f.) Bark Extracts. *Jurnal Aplikasi Teknologi Pangan*, *7*(4), 168–173. https://doi.org/10.17728/jatp.3239

Cepeda, G. N., Lisangan, M. M., & Silamba, I. (2019). Aktivitas antibakteri minyak atsiri kulit kayu akway (Drimys piperita Hook. f.) pada beberapa tingkat konsentrasi, keasaman (pH) dan kandungan garam. *Jurnal Aplikasi Teknologi Pangan*, *8*(4), 149–154. https://doi.org/https://doi.org/10.17728/jatp.4692

Fabanyo, S. H., Hardia, L., Muslihin, A. M., Bayu Budiyanto, A., & History, A. (2023). Phytochemical and Fuctional Group of Akway Bark (Drymis sp.). *Jurnal Promotif Preventif*, *6*(6), 976–982. https://doi.org/https://doi.org/10.47650/jpp.v6i6.1165

Fania, V., Hardia, L., & Astuti, R. A. (2023). Testing the Antihyperglycemic Potential of the Ethanol Extract of Papuan Ants' on Mencit (Myrmecodia pendans) on Mencit (Mus musculus). *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, *7*(2), 189–197. https://doi.org/10.22437/jiituj.v7i2.31654

Fei, Z., Xu, Y., Zhang, G., Liu, Y., Li, H., & Chen, L. (2024). Natural products with potential hypoglycemic activity in T2DM: 2019–2023. *Phytochemistry*, *223*, 114130. https://doi.org/https://doi.org/10.1016/j.phytochem.2024.114130

Genitsaridi, I., Salpea, P., Salim, A., Sajjadi, S. F., Tomic, D., James, S., Thirunavukkarasu, S., Issaka, A., Chen, L., Basit, A., Luk, A. O. Y., Ma, R. C. W., Mbanya, J.-C., Ramachandran, A., Wild, S. H., Duncan, B. B., Boyko, E. J., & Magliano, D. J. (2026). 11th edition of the IDF Diabetes Atlas: global, regional, and national diabetes prevalence estimates for 2024 and projections for 2050. *The Lancet Diabetes & Endocrinology*, *14*(2), 149–156. https://doi.org/10.1016/S2213-8587(25)00299-2

Hardia, L., Akrom, A., Hidayati, T., & Sulistyani, N. (2025). Evaluation of Herbal Honey with Black Cumin and Curcuma xanthorriza as an Antioxidant Supplement for Stunting Prevention. *Journal of Public Health and Pharmacy*, *5*(1), 42–53. https://doi.org/10.56338/jphp.v5i1.5549

Hardia, L., Akrom, A., & Sulistyani, N. (2024). Correlation between hemoglobin levels and incidence of stunted children in Sorong Regency. *Bali Medical Journal*, *13*(3), 1403–1406. https://doi.org/https://doi.org/10.15562/bmj.v13i3.4956

Hardia, L., Akrom, A., Sulistyani, N., Sun, S., & Hidayati, T. (2025). A 90-day intervention study of honey-black cumin and Curcuma xanthorrhiza supplementation on hematological profiles in stunted children. *Pharmaciana*, *15*(2), 197–209. https://doi.org/10.12928/pharmaciana.v15i2.30300

Hardia, L., Fabanyo, S. H., Budiyanto, A. B., Muslihin, A. M., Rossardy, M. D., Irwandi, I., & Watora, W. (2026). Efficacy of Akway (Drymis sp.) Bark Extract in Restoring Hemoglobin Levels: A Preclinical Study in a Sodium Nitrite-Induced Anemia Mice Model. *Farmasains : Jurnal Farmasi Dan Ilmu Kesehatan*, *11*(1), 56–65. https://doi.org/10.22219/farmasains.v11i1.44062

Jelina, J., Lolok, N., & Dewi, C. (2026). Uji Aktivitas Ekstrak Etanol Ubi Jalar Ungu (Ipomoea batatas L) Sebagai Antidiabetes Melitus Pada Mencit yang Diinduksi Aloksan. *Jurnal Pharmacia Mandala Waluya*, *5*(1), 543–550. https://doi.org/10.54883/jpmw.v5i1.595

CC BY-SA 4.0

Krawczyk, M., Burzynska-Pedziwiatr, I., Wozniak, L. A., & Bukowiecka-Matusiak, M. (2022). Evidence from a Systematic Review and Meta-Analysis Pointing to the Antidiabetic Effect of Polyphenol-Rich Plant Extracts from Gymnema montanum, Momordica charantia and Moringa oleifera. In *Current Issues in Molecular Biology* (Vol. 44, Number 2, pp. 699–717). MDPI. https://doi.org/10.3390/cimb44020049

Lam, T.-P., Tran, N.-V. N., Pham, L.-H. D., Lai, N. V.-T., Dang, B.-T. N., Truong, N.-L. N., Nguyen-Vo, S.-K., Hoang, T.-L., Mai, T. T., & Tran, T.-D. (2024). Flavonoids as dual-target inhibitors against α-glucosidase and α-amylase: a systematic review of in vitro studies. *Natural Products and Bioprospecting*, *14*(1), 4. https://doi.org/10.1007/s13659-023-00424-w

Li, E., Maunder, A., Liu, J., Pandey, C., Cave, A., O'Fee, A., & Ee, C. (2025). The efficacy and safety of herbal medicines for glycaemic control and insulin resistance in individuals with type 2 diabetes: an umbrella review. In *BMC Complementary Medicine and Therapies* (Vol. 25, Number 1). BioMed Central Ltd. https://doi.org/10.1186/s12906-025-05059-7

Liu, M., Liu, C., Zhaxi, P., Kou, X., Liu, Y., & Xue, Z. (2025). Research Progress on Hypoglycemic Effects and Molecular Mechanisms of Flavonoids: A Review. *Antioxidants*, *14*(4). https://doi.org/10.3390/antiox14040378

Mambrasar, H. E. D., Cepeda, G. N., & Lisangan, M. M. (2019). Penapisan Fitokimia dan Kapasitas Antibakteri Minyak Eteris Daun Akway (Drymis piperita Hook f.). *Agritechnology*, *2*(2), 63. https://doi.org/10.51310/agritechnology.v2i2.44

Muslihin, A. M., Hardia, L., & Maulana, F. (2025). Antianemic Activity of Anamirta cocculus Hydro-Ethanol Extract against Sodium Nitrite-Induced Anemia in Rats. *Tropical Journal of Natural Product Research*, *9*(7), 3188–3191. https://doi.org/10.26538/tjnpr/v9i7.44

Ong, K. L., Stafford, L. K., McLaughlin, S. A., Boyko, E. J., Vollset, S. E., Smith, A. E., Dalton, B. E., Duprey, J., Cruz, J. A., Hagins, H., Lindstedt, P. A., Aali, A., Abate, Y. H., Abate, M. D., Abbasian, M., Abbasi-Kangevari, Z., Abbasi-Kangevari, M., Abd ElHafeez, S., Abd-Rabu, R., … Vos, T. (2023). Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *The Lancet*, *402*(10397), 203–234. https://doi.org/10.1016/S0140-6736(23)01301-6

Oshiro, M. C., & De Souza, I. A. (2023). Drimys (Cataia, Canelo, Quiebra-Muelas): Uma Revisão Literária Sobre Sua Fitoquímica, Atividades Biológicas, Farmacológicas E Toxicológicas. *Arquivos de Ciências Da Saúde Da UNIPAR*, *27*(6), 2225–2253. https://doi.org/10.25110/arqsaude.v27i6.2023-008

Rahayu, D., Hardia, L., Program, M., Farmasi, S., Terapan, F. S., Pendidikan, U., Sorong, M., Farmasi, P. S., Terapan, F. S., Pendidikan, U., & Sorong, M. (2023). *Uji efek Hipoglikemik Ekstrak Buah Merah (Pandanus conoideus L .) terhadap Menci (Mus musculus)*. *01*(01), 38–45.

Rana, A., Choudhary, P., Taneja, N. K., Dhewa, T., Aluko, R. E., & Samtiya, M. (2026). Plant-based bioactive compounds as anti-diabetic agents: A concise review. *Next Research*, *9*, 101771. https://doi.org/https://doi.org/10.1016/j.nexres.2026.101771

Sari, D. R., Husodo, S. B., & Mutakim. (2022). Phytochemical and Bioactive Compounds Extracted from Akway Plant [Drymis beccariana Gibbs & Drymis piperita Hook.f] from Anggi Sub-district of Pegunungan Arfak. *Jurnal Kesehatan Papuasia*, *8*(1), 102–113. https://doi.org/https://doi.org/10.46703/jurnalpapuasia.Vol8.Iss1.295

Sok Yen, F., Shu Qin, C., Tan Shi Xuan, S., Jia Ying, P., Yi Le, H., Darmarajan, T., Gunasekaran, B., & Salvamani, S. (2021). Hypoglycemic Effects of Plant Flavonoids: A Review. *Evidence-Based Complementary and Alternative Medicine*, *2021*(1), 2057333. https://doi.org/https://doi.org/10.1155/2021/2057333

Tuturop, R. E., Muslihin, A. M., & Hardia, L. (2026). In-Vivo Study of the Potential of Akway Leaf Extract (Drimys cf. piperita) as an Antihyperglycemia. *Journal of Pharmaceutical and Sciences*, *9*(2), 1718–1724. https://doi.org/10.36490/journal-jps.com

CC BY-SA 4.0