

Evaluation of the Effectiveness of Renggak Leaf Extract (*Amomum dealbatum* Roxb.) as an Antihyperuricemic in Mice

Uji Efektivitas Ekstrak Daun Renggak (*Amomum dealbatum* Roxb.) Sebagai Antihiperurisemia Pada Mencit

Fitriwati Sovia ^{a*}, Rosita Al-Adawiyah ^a, Tri Puspita Yuliana ^a

^aPharmacy Study Program, Faculty of Health, Hamzanwadi University.

*Corresponding Authors: fitriwatisovia@hamzanwadil.ac.id

Abstract

Background: Hyperuricemia, resulting from excessive uric acid levels, can trigger chronic inflammation and increase the risk of gout. Conventional therapies such as allopurinol are associated with adverse effects, highlighting the need for natural alternatives. *Renggak* leaves (*Amomum dealbatum* Roxb.), an endemic plant from Lombok rich in flavonoids, have potential as xanthine oxidase inhibitors but remain underexplored. **Objective:** To evaluate the antihyperuricemic effect of *renggak* leaf extract in male white mice, determine the optimal dosage, and compare its efficacy with allopurinol. **Methods:** This study employed a pretest-posttest control group design. Hyperuricemia was induced using chicken liver juice administered for 14 days. The animals were divided into five groups: negative control (1% CMC-Na), positive control (allopurinol 10 mg/kg BW), and three extract-treated groups (50, 250, and 500 mg/kg BW), which received the extract for 21 days. **Results:** All extract doses significantly reduced uric acid levels ($P < 0.05$). The 500 mg/kg BW dose was the most effective (44.54% reduction), showing no significant difference compared to allopurinol (48.52%; $p = 0.490$). The effect is presumed to occur through xanthine oxidase inhibition by flavonoids. **Conclusion:** *Renggak* leaf extract, particularly at a dose of 500 mg/kgBW, shows potential as an alternative therapy for hyperuricemia with efficacy comparable to allopurinol. However, further studies such as toxicity tests, pharmacokinetic evaluations, and clinical trials are needed to validate its broader application.

Keywords: Hyperuricemia, *Amomum dealbatum*, Flavonoids, Effective Dose, Herbal Therapy.

Abstrak

Latar Belakang: Hiperurisemia, akibat kadar asam urat berlebihan, memicu peradangan kronis dan risiko gout. Terapi konvensional seperti allopurinol memiliki efek samping, sehingga perlu alternatif alami. Daun renggak (*Amomum dealbatum* Roxb.), tumbuhan endemik Lombok yang kaya flavonoid, berpotensi sebagai inhibitor xanthine oxidase namun belum banyak diteliti. **Tujuan:** Mengevaluasi efek antihiperurisemia ekstrak daun renggak pada mencit putih jantan, menentukan dosis optimal, serta membandingkan efektivitasnya dengan allopurinol. **Metode:** Penelitian menggunakan desain *pretest-posttest control group* dengan induksi hiperurisemia menggunakan jus hati ayam selama 14 hari. Lima kelompok terdiri atas kontrol negatif (CMC-Na 1%), kontrol positif (allopurinol 10 mg/kgBB), dan tiga kelompok ekstrak (50, 250, 500 mg/kgBB) yang diberikan selama 21 hari. **Hasil:** Semua dosis ekstrak menurunkan asam urat secara signifikan ($P < 0,05$). Dosis 500 mg/kgBB paling efektif (penurunan 44,54%), tidak berbeda signifikan dengan allopurinol (48,52%; $p = 0,490$). Efek ini diduga melalui inhibisi xanthine oxidase oleh flavonoid. **Kesimpulan:** Ekstrak daun renggak, terutama pada dosis 500 mg/kgBB, berpotensi sebagai terapi alternatif hiperurisemia dengan efektivitas yang setara dengan allopurinol. Namun, diperlukan penelitian lanjutan seperti uji toksisitas, farmakokinetik, dan uji klinis untuk validasi aplikasinya secara lebih luas.

Kata Kunci: Hiperurisemia, *Amomum dealbatum*, Flavonoid, Dosis Efektif, Terapi Herbal.



Copyright © 2020 The author(s). You are free to : **Share** (copy and redistribute the material in any medium or format) and **Adapt** (remix, transform, and build upon the material) under the following terms: **Attribution** – You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use; **NonCommercial** – You may not use the material for commercial purposes; **ShareAlike** – If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. Content from this work may be used under the terms of the a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International \(CC BY-NC-SA 4.0\) License](https://creativecommons.org/licenses/by-nc-sa/4.0/)

Article History:

Received: 10/01/2025,
Revised: 26/04/2025,
Accepted: 26/04/2025,
Available Online: 02/06/2025.

QR access this Article



<https://doi.org/10.36490/journal-jps.com.v8i2.747>

Introduction

Hyperuricemia is a health condition defined by high uric acid levels in blood, which usually occurs without signs and symptoms in the early stages [1]. When uric acid levels rise above normal levels (7.0 mg/dL for men and 6.0 mg/dL for women), it can form crystals and nest in the body's tissues, especially the joints, kidneys, and soft tissues. An increase in these crystals can cause chronic inflammation and result in *gout*, a form of arthritis [2,3].

Globally, the number of gout cases was estimated to be 41.22 million in 2017, and the incidence and health burden of gout worldwide will continue to increase. The WHO expects the mortality due to gout to increase by 55% by 2060 [4]. Gout is also highly prevalent in Southeast Asia. In Taiwan, the gout prevalence is 4.74%, and the hyperuricemia incidence in the elderly is 36% [5]. Joint diseases, gout included, are significant health issues in Indonesia. Based on the 2018 Basic Health Research, the prevalence of joint diseases diagnosed by doctors was 7.3%. This shows that joint disorders, including gout, are community health problems [6].

The principal medication available for the reduction of uric acid concentrations in the blood is Allopurinol, which works by inhibiting the enzyme xanthine oxidase [7]. Though it is often well tolerated with few side effects, long-term use may induce hypersensitivity reactions, liver dysfunction, and gastrointestinal symptoms [8]. Therefore, finding alternative, natural, safe, and effective treatments remains a significant challenge in managing hyperuricemia.

Indonesia has vibrant biodiversity and has excellent potential for medicinal plants that can be utilized as alternative therapies. In Lombok, the community usually combines the use of traditional and synthetic medicines [9]. One plant showing tremendous potential is renggak (*Amomum dealbatum* Roxb.) from Lombok Island. Its leaves contain flavonoids, which are naturally occurring compounds with antioxidant effects. These flavonoids are assumed to inhibit the activity of the enzyme xanthine oxidase and, as a result, lower uric acid levels [10]. This study investigates the effectiveness of renggak leaf extract as an alternative antihyperuricemic therapy.

A detailed exploration of flavonoid mechanisms is essential. Flavonoids, particularly quercetin and rutin, inhibit XOD, disrupting purine metabolism into uric acid. They also mitigate oxidative stress and inflammation linked to hyperuricemia [11]. Understanding these mechanisms strengthens the study's scientific foundation.

Research Methods

This study is a laboratory experiment with a pretest-posttest design with a control group. Its purpose is to determine the effect of administering the extract leaves of reggae (*Amomum dealbatum* Roxb.) as an antihyperuricemic in white male mice (*Mus musculus*).

The study samples were male white mice (*Mus musculus*) selected using purposive sampling based on defined inclusion and exclusion criteria. The male mice enrolled in this study were between 2 and 3 months of age and weighed between 20 and 30 g. Mice that bleed, are stressed, or die during the study are excluded.

The research was conducted from October to December 2024 in the Phytochemistry Laboratory for extraction and the Pharmacology Laboratory for animal testing at the Pharmacy Study Program, Faculty of Health, Hamzanwadi University.

Materials and Apparatus

The primary raw material in this study is renggak leaves (the third to fifth positions of the plant's shoots) in Bornong Village, Aikmel District, East Lombok Regency. Yellow or damaged leaves were removed to ensure the quality of the research materials. The rest of the materials used in this study were 96% ethanol, 1% CMC-Na, allopurinol, chicken liver, aquadest, and phytochemical screening reagents, namely, Mayer's reagent, Dragendorff's reagent, 1% FeCl₃, HCl solution, and magnesium.

This study also utilized many equipment devices, such as an analytical balance, beakers, blenders, glass jars, graduated cylinders, stirring rods, filter paper, porcelain dishes, gloves, 1 mL disposable syringes, vacuum rotary evaporators, and water baths. An Autocheck device for measuring uric acid using a special uric acid strip was used.

Extraction Procedure

The process starts by taking 500 g of dried renggak leaves were ground into simplicia powder, which was weighed and put in the glass jar. The simplicia powder was extracted by the maceration method, macerating it in 96% ethanol. The jar was then tightly sealed and left for 5 days, and stirred occasionally to ensure the active compounds in simplicia are extracted. After maceration, the extract was evaporated with a rotary evaporator (50°C) to a thick concentrate. The prepared concentrated extract was boiled in the water bath, and the concentrated extract was calculated, and the percentage yield was calculated.

Phytochemical screening

Flavonoid Test: A total of 0.1 g of extract was dissolved in 5 ml of distilled water, then 0.1 g of Mg powder was added, followed by concentrated HCl. A positive result is indicated by the appearance of red, yellow, or orange colors [12].

Alkaloid Test: 0.1 g of extract was dissolved in 5 ml of distilled water and divided into two test tubes containing Meyer's reagent. The test is considered positive if white or yellow precipitates are formed. Dragendorff's reagent was then added, and the test is positive if a reddish-brown precipitate forms [13].

Tannin Test: A total of 0.1 g of extract was dissolved in 5 ml of distilled water, and 1-2 drops of 1% FeCl₃ solution were added. A positive result is indicated by the formation of green, purple, blue, or black colors [14].

Saponin Test: A total of 0.1 g of extract was dissolved in 5 ml of distilled water, then 1-2 drops of 2N HCl were added, and the mixture was shaken for 5 seconds. The test is positive for saponins if stable foam forms [12].

Animal treatment

Twenty male white mice (*Mus musculus*) were used in this study and induced with hyperuricemia through the administration of chicken liver juice for 7-14 days. Chicken liver juice was chosen based on previous studies demonstrating its effectiveness in increasing uric acid levels in a relatively short period. Chicken liver contains high purine content, which is metabolized into uric acid, mimicking the dietary causes of hyperuricemia in humans. After induction, the uric acid levels of the mice were measured to validate their hyperuricemic condition. The mice were then divided into five treatment groups: a negative control (1% CMC-Na), a positive control (allopurinol), and three groups receiving renggak leaf extract at doses of 50 mg, 250 mg, and 500 mg per kilogram of body weight. Urine samples were collected on days 16, 18, and 21 and analyzed for uric acid levels to assess the reduction trend.

The Medical and Health Research Institute Faculty of Medicine ethics committee at Universitas Al-Azhar Mataram approved all test animal procedures, and the approval number was 012/EC-02/FK-06/UNIZAR/I/2024.

Data analysis

The Data were analyzed with SPSS software to test the differences in uric acid levels between the various groups. Normality was checked, and the data were tested for distribution before further analysis. Data were analyzed using one-way ANOVA, and for normally distributed data, followed by Tukey's post-hoc test. The Kruskal-Wallis test was performed as an alternative to analyze non-normally distributed data. The threshold for significance was $p < 0.05$ with a 95% confidence level. Furthermore, to evaluate the

antihyperuricemic efficacy, the percentage reduction of uric acid level was computed by the following formula.

$$\% \text{ Reduction} = \frac{k_a - k_b}{k_a} \times 100\%$$

Note:

k_a = Uric acid level after induction

k_b = Uric acid level after treatment

Results and Discussion

Phytochemical screening

Table 1 presents the results of the phytochemical screening of renggak leaf extract (*Amomum dealbatum*). All tested compounds showed positive results, with the presence of secondary metabolites. These findings support its potential as a pharmacological agent.

Table 1. Extraction and Phytochemical Screening Results

Parameters	Observation Results	Remarks
Percentage yield	26,2%	Good
Phytochemical Screening		
Flavonoids	Dark yellow color	+
Alkaloids	White precipitate	+
	Brown precipitate	+
Tannins	Green color	+
Saponins	Foam formation	+

Extraction is a method of separating specific compounds from a material by utilizing their solubility in a solvent. One of the most commonly used extraction techniques is maceration. [15]. This study employed the maceration process to extract renggak leaves using 96% ethanol as the solvent. The selection of 96% ethanol was based on its properties, such as being more selective, non-toxic, having good penetration ability into cell walls, and being capable of dissolving polar, semi-polar, and non-polar compounds [16,17]. The yield obtained was 26.2%, which is categorized as good since it exceeds 10%. This aligns with the theory stating that a good yield generally exceeds 10%, indicating a maximum extraction result [18]. The percentage yield reflects the efficiency of the extraction process, with higher values indicating greater recovery of compounds from the crude drug material (*simplicia*) [19].

Phytochemical screening revealed the presence of flavonoids, alkaloids, tannins, and saponins in the renggak leaf extract. These findings are consistent with research conducted by Mustariani & Hidayanti [20], which reported that renggak leaves contain these secondary metabolite compounds. These compounds significantly contribute to the pharmacological effect of antihyperuricemic. Flavonoids, as the primary compound, inhibit the activity of the enzyme xanthine oxidase (XOD), a key player in the metabolism of purines into uric acid. Furthermore, flavonoids act as antioxidants, protecting tissues from oxidative damage caused by uric acid accumulation [21].

The extract's tannin content also supports its therapeutic effect. Tannins possess anti-inflammatory properties that can reduce inflammation triggered by monosodium urate (MSU) crystals. Saponins further support tissue regeneration, promoting faster recovery from urate crystal-induced damage. Alkaloids, though present in smaller amounts, may provide mild analgesic effects, aiding in discomfort relief associated with hyperuricemia [22]. The synergistic action of these secondary metabolites supports the potential of renggak leaf extract as an effective antihyperuricemic agent [10].

Chicken Liver Juice Induction Results

Induction of hyperuricemia in animal models is a fundamental approach for assessing the efficacy of antihyperuricemic agents. This study used chicken liver juice as the induction method due to its high purine content, which is metabolized into uric acid. This approach closely simulates diet-induced hyperuricemia in humans.

Before induction, the mice's uric acid levels were below the instrument's detection threshold (<1.4 mg/dL). To induce hyperuricemia in the animal model, 0.5 mL of chicken liver juice was administered per 20 g of body weight for 14 consecutive days. The results of the mice's uric acid levels after the chicken liver juice induction are shown in Table 2.

Table 2. Uric Acid Levels Before and After Chicken Liver Juice Induction

Group	Before Induction	After Induction	
		Day 7 (mg/dL)	Day 14 (mg/dL)
Negative Control	Not Detected	3.35±0.44	5.70±0.89
Positive Control	Not Detected	3.45±0.54	6.08±0.81
50mg/kg Body Weight	Not Detected	3.43±0.40	5.95±0.88
250mg/kg Body Weight	Not Detected	3.55±0.60	6.10±0.78
500mg/kg Body Weight	Not Detected	3.60±0.54	6.13±0.70
Sig. (P)	-	0.959	0.942

The levels of uric acid across groups were higher than the normal range for mice (0.5–1.4 mg/dL) [23]. Mice have lower levels of uric acid than humans, because they produce uricase, an enzyme that converts uric acid into allantoin, a water-soluble compound that can easily be excreted [24]. The uric acid level increases, confirming the successful chicken liver juice induction.

The initial induction period of 7 days was chosen based on the study by Fitriya & Muharni [25], which demonstrated that chicken liver could quickly increase uric acid levels in test animals. However, to ensure consistent hyperuricemic conditions across all groups and to allow for more accurate assessment of the treatment effects on uric acid levels, the induction period was extended to 14 days. The result showed no significant difference in the uric acid level between the treatment groups after being given chicken liver juice ($p > 0.05$). This ensured all groups had reached a uniform degree of hyperuricemia, allowing for a consistent baseline to evaluate therapeutic efficacy. Using this approach guarantees that the study results are valid and comparable, so changes in uric acid levels following treatment directly manifest the effects of the intervention.

Another commonly used induction method is potassium oxonate, an inhibitor of the uricase enzyme that prevents uric acid degradation, leading to increased uric acid levels. While potassium oxonate is widely applied in hyperuricemia studies, it induces hyperuricemia through enzyme inhibition rather than dietary purine metabolism [26]. This distinction is essential, as potassium oxonate may not fully replicate diet-induced hyperuricemia in humans. Dietary-based models, such as chicken liver induction, are a more relevant approach for evaluating antihyperuricemic agents.

Effectiveness of Uric Acid Reduction in Mice After Treatment

After 21 days of treatment, the uric acid levels in mice decreased in all treatment groups compared to the negative control. The most significant decrease was observed in the group with the 500 mg/kg body weight extract dose, followed by the 250 mg/kg body weight dose, and the lowest decrease was observed in the 50 mg/kg body weight dose. In contrast, the negative control group showed increased uric acid levels, while the positive control group (allopurinol) recorded the most significant decrease. Figure 1 shows the uric acid levels on days 16, 18, and 21, with a trend of increasing reduction as the treatment duration increased, especially in the groups with higher extract doses.

Renggak leaf extract on day 16 measurements of uric acid levels was ineffective in significantly lower uric acid levels. One explanation for that difference could be the time the extract's active compounds took to achieve therapeutic concentrations in the mice's bodies. On days 18 and 21, uric acid levels were significantly lower for the positive control group, followed by the high-dose renggak leaf extract group. The decrease in the positive control group can be explained by XOD inhibition, the reduction of purine synthesis, and the biotransformation of allopurinol into oxypurinol, which has a longer elimination time [27].

The trend of greater reductions with longer treatment durations suggests cumulative uric acid-lowering effects. Table 3 summarizes the overall decrease in uric acid levels following treatment, including reduced mg/dL and reduction rate (%).

The negative control group did not decrease uric acid levels (uric acid increased, 0.98 mg/dL after treatment)—a study by Umboh et al. [28], where treatment with 1% CMC Na doesn't provide a therapeutic effect of uric acid reduction. The negative control group acts as a checkpoint to ensure that any effect observed

in the treatment groups is through the interventions administered and not due to any other factors that could otherwise confound the results and validation of the study. For the negative control group, the increase in uric acid levels might have been attributable to the diet of pellets provided to mice, which contained purines, leading to increased uric acid levels in the negative control group mice. Lamanasa et al. [29], reported that the ingredients added to the mouse pellets could increase the concentration of uric acid in the blood. The negative control group, without therapeutic intervention, continued to grow its uric acid levels.

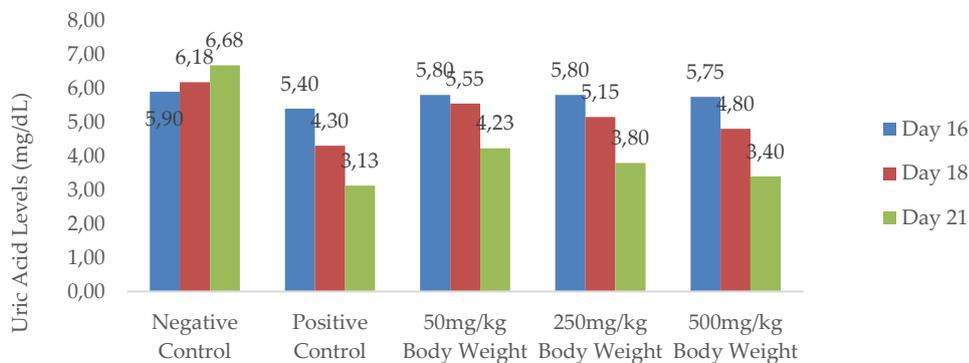


Figure 1. Graph of Uric Acid Levels After Treatment

Table 3. Percentage Effectiveness of Uric Acid Reduction

Group	Day 14 (mg/dL)	Day 21 (mg/dL)	Reduction (mg/dL)	Reduction Effectiveness (%)
NC	5.70	6.68	(-) 0,98	(-) 17.19
PC	6.08	3.13	2.95	48.52
D50	5.95	4.23	1.72	28.91
D250	6.10	3.80	2.30	37.70
D500	6.13	3.40	2.73	44.54
Sig. (P)	0.942	0.000	-	-

Note: (-) = Increase, NC = Negative Control, PC = Positive Control (Allopurinol), D50, D250, D500 = Doses of 50 mg/kg body weight, 250 mg/kg body weight, and 500 mg/kg body weight.

On the contrary, the 500 mg/kg BW group of renggak leaf extract showed a reduction of uric acid level by 44.54%, approaching the effectiveness of allopurinol (48.52%). This means that the active ingredients in the extract, especially flavonoids, have a high inhibitory activity on xanthine oxidase. The 250 mg/kg BW dose was also effective with a 37.70% decrease, while the 50 mg/kg BW dose was less effective (28.91%). Setyowati et al. [22] reported that quercetin and rutin are flavonoid compounds that can reduce uric acid levels by preventing XOD activity from converting xanthine to uric acid. By lowering uric acid levels, it can inhibit the production of monosodium urate (MSU) crystals that lead to gouty arthritis and its accompanying inflammation and pain [11]. The comparative effectiveness of different doses demonstrates a linear relationship between the amounts of active components and the magnitude of uric acid lowering.

Post Hoc Analysis

A post hoc test was performed to analyze differences in uric acid levels among groups after treatment. Table 4 compares uric acid levels between groups.

Post hoc test results by group indicate significant ($p < 0.05$) differences between the negative control group and the remaining treatment groups, suggesting that treatment groups significantly reduced uric acid levels. It showed no difference ($p = 0.490$) compared with the positive control for 500 mg/kg BW, proving it was as effective as allopurinol. This lends weight to the case for the dose as the optimum to achieve a substantial drop in uric acid levels. In contrast, the 50 mg/kg BW dose had noticeable differences compared to the positive control, with the value of ($p=0.002$), which shows that it was less effective. This difference between doses might be explained by the fact that all critical inhibitory compounds are present in the lower dose but not in the lower concentration required to inhibit xanthine oxidase optimally.

Table 4. Comparison of Uric Acid Levels Between Groups After Treatment

Post Hoc Test	Difference in Uric Acid Levels (mg/dL)	Sig.(P)
NC vs PC	3.55	0.000
NC vs D50	2.45	0.028
NC vs D250	2.88	0.001
NC vs D500	3.28	0.000
PC vs D50	1.10	0.002
PC vs D250	0.67	0.059
PC vs D500	0.27	0.490
D50 vs D250	0.43	0.091
D50 vs D500	0.83	0.007
D250 vsD500	0.40	0.201

Note: vs = versus, NC = Negative Control, PC = Positive Control (Allopurinol), D50, D250, D500 = Doses of 50 mg/kg body weight, 250 mg/kg body weight, and 500 mg/kg body weight

Doses of 250 mg/kg BW have intermediate efficiency, as it was significantly more effective than 50 mg/kg BW ($p=0.091$) but still less effective than 500 mg/kg BW. The dose-response data highlight this dose-dependent effect, suggesting that increased extract treatment correlates with more effective uric acid reduction. Within doses, it was also demonstrated that the 500 mg/kg BW dose was significantly favored over lower doses ($p=0.007$). The observed pharmacological enhancement of renggak leaf extract is due to increased active compound concentration. Widyastiwi et al. [24], demonstrated that an extract dose of 500 mg/kg BW is more effective than lower doses to reduce uric acid levels. Thus, more potent doses of renggak leaf extract can reduce uric acid levels, making renggak leaf extract a potential alternative therapy to reduce uric acid levels, with efficacy comparable to allopurinol at a dose of 500 mg/kg BW. A comparison with other plants with antihyperuricemic effects was included based on literature review findings.

The effectiveness of renggak leaf extract is comparable to other plants with antihyperuricemic effects. Compared to other natural products with antihyperuricemic potential, renggak leaf extract demonstrates comparable effectiveness. For instance, *Syzygium polyanthum* (bay leaf), *Annona muricata* (soursop leaf), and *Pandanus amaryllifolius* (pandan leaf) have been reported to exhibit antihyperuricemic properties. These extracts reduce uric acid levels through mechanisms such as xanthine oxidase inhibition and enhanced renal excretion [26, 30, 31]. The 500 mg/kgBW dose of renggak leaf extract exhibited a strong antihyperuricemic effect, comparable to conventional treatments like allopurinol, reinforcing its potential as a natural therapeutic candidate. Compared to these plants, renggak leaf extract demonstrates promising potential as a natural antihyperuricemic agent, warranting further clinical investigation.

Although the promising potential of renggak leaf extract is evident, safety considerations are also crucial. High doses of herbal extracts may harm vital organs like the liver and kidneys. Active compounds such as flavonoids and alkaloids could exert hepatotoxic or nephrotoxic effects if not properly regulated [32]. Prolonged use may also cause oxidative stress or impaired organ function. Therefore, further toxicity studies are necessary to evaluate its long-term safety, emphasizing liver enzymes, kidney function, and histopathological changes.

Conclusions

Amomum dealbatum Roxb. (renggak leaf) extract showed promising antihyperuricemic effects, with the 500mg/kgBW dose lowering uric acid levels by 44.54%, nearly matching allopurinol's effectiveness (48.52%). The 250 mg/kgBW dose also performed well, reducing levels by 37.70%, while the 50 mg/kgBW dose had a weaker effect. These results suggest that renggak leaf extract has strong potential as a natural option for managing hyperuricemia. However, more research is needed, including toxicity tests, pharmacokinetic studies, and clinical trials, to ensure it's safe and effective for human use.

Conflict of Interest

The authors have no conflicts of interest related to the publication of this article. We assure you that all results and interpretations of this study are based only on data and scientific analysis, without any external interference or influence.

Acknowledgment

This research was funded by Hamzanwadi University's Internal Decentralized Grant for the Fiscal Year 2024, Grant number 056/UH.P3MP/Ktr./2024. This grant was offered as part of the university's faculty support for academic research.

References

- [1] Pangala GB, Mahendra AN, Made Jawi I, Wayan N, Dewi S. Ekstrak Etanol Bawang Hitam (*Allium sativum* L.) Menurunkan Kadar Asam Urat Mencit Jantan Model Hiperurisemia. *Jurnal Medika Udayana*. 2022;11(8):89-93. <https://doi.org/10.24843.MU.2022.V11.i8.P17>.
- [2] Fitriani R, Azzahri LM, Nurman M, Nizar M, Hamidi S. Hubungan Pola Makan Dengan Kadar Asam Urat (Gout Arthritis) Pada Usia Dewasa 35-49 Tahun. *Jurnal Ners*. 201AD;5(1):20-27. <https://doi.org/10.31004/jn.v5i1.1674>.
- [3] Zuriati Z, Suriya M. Efektivitas Pemberian Jus Nenas Dalam Menurunkan Kadar Asam Urat. *Jurnal Ilmu Kesehatan*. 2020;4(2):101-105. <https://doi.org/10.33757/jik.v4i2.294.g130>.
- [4] Mattiuzzi C, Lippi G. Recent Updates on Worldwide Gout Epidemiology. Vol 39. Springer; 2020. <https://doi.org/10.1007/s10067-019-04868-9>.
- [5] Mulyasari A, Dieny FF. Faktor Asupan Zat Gizi Yang Berhubungan Kadar Asam Urat Darah Wanita Postmenopause. *Journal of Nutrition College*. 2015;4(2):232-242. <https://doi.org/10.14710/jnc.v4i3.10088>.
- [6] Kementerian Kesehatan Republik Indonesia. Laporan Nasional Riskesdas 2018.; 2018. Accessed January 5, 2025. <https://repository.badankebijakan.kemkes.go.id/id/eprint/3514/1/Laporan%20Riskesdas%202018%20Nasional.pdf>.
- [7] Kristiani RD, Rahayu D, Subarnas A. Aktivitas Antihiperurisemia Ekstrak Etanol Akar Pakis Tangkur (*Polypodium feei*) Pada Mencit Jantan. *Bionatura: Jurnal Ilmu-ilmu Hayati dan Fisik*. 2013;15(3):156-159. Accessed January 11, 2025. <https://jurnal.unpad.ac.id/bionatura/article/view/7578>.
- [8] Alatas H. Penatalaksanaan Hiperurisemia Pada Penyakit Ginjal Kronik (CKD). *Herb-Medicine Journal*. 2021;4(1):1-19. <https://doi.org/10.30595/hmj.v4i1.5805>.
- [9] Ihsan EA, Sovia F, Ewisa Oktresia E, Puspita Yuliana T, Ardyati S, Rafsanjani A. Combination of Traditional Medicine and Synthesis Medicine Therapy for Hypertension and Diabetic Patients. *Pharmaceutical Journal of Indonesia*. 2021;18(01):199-206. <https://doi.org/10.30595/pharmacy.v18i1.9348>.
- [10] Nufus NH. Analisis Fitokimia dan Uji Potensi Ekstrak Buah Renggang (*Amomum Dealbatum*) Sebagai Pestisida Nabati Terhadap Jamur *Pyricularia oryzae* dan Bakteri *Xanthomonas oryzae*. *Bioscientist : Jurnal Ilmiah Biologi*. 2020;8(1):115-125. <https://doi.org/10.33394/bioscientist.v8i1.2661>.
- [11] Liu F, Bai Y, Wan Y, et al. Mechanism of flavonoids in the treatment of gouty arthritis (Review). *Mol Med Rep*. 2024;30(2):132-2024. <https://doi.org/10.3892/mmr.2024.13256>.
- [12] Nugrahani R, Andayani Y, Hakim A. Skrining Fitokimia Dari Ekstrak Buah Buncis (*Phaseolus Vulgaris* L) Dalam Sediaan Serbuk. *Jurnal Penelitian Pendidikan IPA*. 2016;2(1). <https://doi.org/10.29303/jppipa.v2i1.38>.
- [13] Muthmainnah R, Amalia L, Hernawati D, Ika Putri D, Sriwahjuningsih, Nurkamilah S. Pelatihan Penggunaan Alat Laboratorium dan Pengenalan Praktikum Biologi Sederhana bagi Guru Biologi dan Siswa. *Sasambo: Jurnal Abdimas (Journal of Community Service)*. 2023;5(2):382-391. <https://doi.org/10.36312/sasambo.v5i2.1190>.
- [14] Agustina W, Handayani D. Skrining Fitokimia Dan Aktivitas Antioksidan Beberapa Fraksi Dari Kulit Batang Jarak (*Ricinus Communis* L.). *Jurnal Pendidikan dan Ilmu Kimia*. 2017;1(2):117-122.

- [15] Nurhaliza S, Gemantari BM, Febriani Y. Antioxidant Activity Screening of *Callophyllum inophyllum* Linn Seed Fractions. *Healthy-Mu*. 2023;7(1):13-18. <https://doi.org/10.35747/hmj.v7i1.576>.
- [16] Yulianingtyas A, Kusmartono B. Optimasi Volume Pelarut dan Waktu Maserasi Pengambilan Flavonoid Daun Belimbing Wuluh (*Averrhoa bilimbi* L.). *Teknik Kimia*. 2016;10:58-64. <https://doi.org/10.33005/tekkim.v10i2.539>.
- [17] Wendersteyt VN, Wewengkang SD, Abdullah SS. Antimicrobial Activity Test Of Extracts And Fractions Of Ascidian *Herdmania Momus* From Bangka Island Waters Likupang Against The Growth Of *Staphylococcus aureus*, *Salmonella typhimurium*, and *Candida albicans*. *Pharmac*. 2021;10(1):706-712. <https://doi.org/10.35799/pha.10.2021.32758>.
- [18] Fatimah, Mulyani S, Dwiloka B. Rendemen, Swelling Power, Kadar Air, Total Padatan Terlarut, dan Warna Tepung Ubi Jalar Madu Dengan Variasi Substitusi Filler Maltodekstrin. *Journal of Nutrition College*. 2022;11(4):337-345. <https://doi.org/10.14710/jnc.v11i4.33348>.
- [19] Kusuma AE, Aprileili DA. Pengaruh Jumlah Pelarut Terhadap Rendemen Ekstrak Daun Katuk (*Sauropus androgynus* L. Merr). *SITAWA : Jurnal Farmasi Sains dan Obat Tradisional*. 2022;1(2):125-135. <https://doi.org/10.62018/sitawa.v1i2.22>.
- [20] Mustariani BAA, Hidayanti BR. Skrining Fitokimia Ekstrak Etanol Daun Renggak (*Amomum dealbatum*) dan Potensinya Sebagai Antioksidan. *SPIN*. 2021;3(2):143-153. <https://doi.org/10.20414/spin.v3i2.4029>.
- [21] Hardiningtyas SD, Purwaningsih S, Handharyani E. Aktivitas Antioksidan dan Efek Hepatoprotektif Daun Bakau Api-api Putih. *JPHPI*. 2014;17(1):80. Accessed January 7, 2025. <https://journal.ipb.ac.id/index.php/jphpi/article/view/8140/6389>.
- [22] Setyowati AD, Mubarak ZR, Irawan A, Solihat I. Uji Kadar Flavanoid Daun Salam (*Eugenia polyantha* W) Sebagai Studi Awal Obat Asam Urat. *JIPTEK*. 2023;4(2):25-28. <https://doi.org/10.32493/jiptek.v4i2.30430>.
- [23] Kusuma AM, Wahyuningrum R, Widyati T. Aktivitas Antihiperurisemia Ekstrak Etanol Herba Pegagan Pada Mencit Jantan Dengan Induksi Kafein. *PHARMACY*. 2014;11(1):62-74. <https://doi.org/10.30595/pji.v11i1.852>.
- [24] Widyastiwi, Nurliyanda F, Roseno M. Aktivitas Antihiperurisemia Ekstrak Etanol 96% Rimpang Temu Giring (*Curcuma heyneana* Val.) Pada Mencit Jantan Yang Diinduksi Kalium Oksonat dan Jus Hati Ayam. *Majalah Farmasi dan Farmakologi*. 2022;26(2):52-56. <https://doi.org/10.20956/mff.v26i2.20283>.
- [25] Fitrya, Muharni. An Antihyperuricemia Effect of Ethanol Extract of Tunjuk Langit Rhizome (*Helminthostachys zaylanica* Linn Hook) on Swiss Male Mice. *Traditional Medicine Journal*. 2014;19(1):14-18. Accessed January 11, 2025. <http://repository.unsri.ac.id/id/eprint/24245>.
- [26] Muhtadi, Suhendi A, W N, EM S. Uji Praktikum Antihiperurisemia Secara In Vivo Pada Mencit Putih Jantan Galur Balb-c Dari Ekstrak Daun Salam (*Syzygium polyanthum* Walp) dan Daun Belimbing Wuluh (*Averrhoa bilimbi* L.). *Biomedika*. 2014;6(1):17-23. <https://doi.org/10.23917/biomedika.v6i1.283>.
- [27] Imbar AC, de Queljoe E, Rotinsulu H. Uji Aktivitas Antihiperurisemia Ekstrak Etanol Tumbuhan Suruhan (*Peperomia pellucida* L.Kunth) Terhadap Tikus Putih Jantan (Galur wistar) Yang Di induksi Kafein. *PHARMACON*. 2019;8(4):953-960. <https://doi.org/10.35799/pha.8.2019.29375>.
- [28] Umboh DY, de Queljoe E, Yamlean PVY. Uji Aktivitas Antihiperurisemia Ekstrak Etanol Daun Gedi Hijau (*Abelmoschus manihot* (L.) Medik) Pada Tikus Putih Jantan Galur Wistar (*Rattus norvegicus*). *PHARMACON*. 2019;8(4):878-887. <https://doi.org/10.35799/pha.8.2019.29365>.
- [29] Lamanasa AR, Hasim, Tuiyo R. Pengaruh Frekuensi Pemberian Pakan Otohime terhadap Pertumbuhan dan Kelangsungan Hidup Benih Ikan Kerapu Bebek di BPBILP Lamu Kabupaten Boalemo. *Jurnal Ilmiah Perikanan dan Kelautan*. 2014;II(1):4-8. <https://doi.org/10.37905/v2i1.1242>.
- [30] Abdulkadir W, Papeo DRP, Akuba J, Makkulawu A. Efek Antihiperurisemia Ekstrak Etanol Daun Pandan (*Pandanus Amaryllifolius*) Pada Mencit (*Mus Musculus*). *Journal Syifa Sciences and Clinical Research*. 2022;4(2):2022. <https://doi.org/10.37311/jsscr.v4i2.7719>.
- [31] Febrianti DR, Niah R. Analisis Kandungan Flavonoid dan Aktivitas Antihiperurisemia Ekstrak Etanol Daun Sirsak (*Anona muricata* L.) Pada Mencit Jantan Secara In Vivo. *Jiis (Jurnal Ilmiah Ibnu Sina)*. 2018;3(2):304-311. <https://doi.org/10.36387/jiis.v3i2.183>.
- [32] Adesina DA, Adefolalu SF, Jigam AA, Lawal B. Antiplasmodial effect and sub-acute toxicity of alkaloid, flavonoid and phenolic extracts of *Sida acuta* leaf on *Plasmodium berghei*-infected animals. *Journal of Taibah University for Science*. 2020;14(1):943-953. <https://doi.org/10.1080/16583655.2020.1790912>.