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Research Paper

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Effect of Giving Date Fruit Extract (*Phoenix dactylifera* L.) as an Antioxidant on the Histopathology of Kidneys of Female Mice (*Mus musculus*) Exposed to Rhodamin B

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Abstract

This study aimed to evaluate the effect of date palm fruit extract (*Phoenix dactylifera* L.) as an antioxidant on the renal histopathology of female mice (*Mus musculus*) exposed to Rhodamine B. This research was a laboratory experimental study using a post-test-only control group design. Date palm fruit extraction was performed by the maceration method using 96% ethanol as the solvent. A total of fifteen female mice were divided into five groups, namely the healthy control group (K−), the positive control group treated with vitamin C (K+), treatment group I (1.75 mg/25 g BW), treatment group II (3.5 mg/25 g BW), and treatment group III (7 mg/25 g BW). The treatments were administered orally for 15 days. The observed parameters included renal histopathological features, particularly glomerular damage, tubular damage, and Bowman's space width. The results showed that date palm fruit extract affected renal damage induced by Rhodamine B exposure, with the dose of 1.75 mg/25 g BW showing lower cellular damage compared with the other treatment groups.

Keywords: date palm fruit, extract, kidney, Rhodamine B, antioxidant

Introduction

The development of the food industry and the increasing consumption of processed foods make the aspect of food safety even more important to pay attention to. Food colors are often the main attraction for consumers, so coloring agents are widely used to improve the appearance of products. Dyes used in food must comply with the provisions of safety, quality, and regulations for food additives so as not to pose health risks to the community [1].

Rhodamin B is a synthetic dye of the xanthene group that is generally used for industrial purposes, such as textile and paper dyes, so it is not intended as a food additive. The abuse of Rhodamin B in food is still a concern because this compound can enter the body through the consumption of contaminated food and has the potential to cause toxic effects if repeatedly exposed [1,2].

Exposure to Rhodamin B can trigger the formation of reactive oxygen species (ROS), disrupt the balance of endogenous antioxidants, and cause oxidative stress in tissues. Oxidative stress is a state when the production of free radicals is higher than the ability of the body's antioxidant system to neutralize it. This condition can damage lipids, proteins, and cell DNA, thus playing a role in the tissue damage process [3,4].

The kidneys are one of the organs that are susceptible to exposure to toxic substances because they play a role in blood filtration, excretion of metabolic residues, and the removal of foreign compounds from the body. Toxic substances carried in the bloodstream can accumulate in the nephrons and cause morphological changes, especially in the glomerulus, tubules, and Bowman's chamber. These histopathological changes can be used as an indicator of kidney damage due to xenobiotic exposure [5,6].

Antioxidants are needed to help suppress excessive oxidative reactions. Antioxidant compounds work through several mechanisms, including capturing free radicals, inhibiting lipid peroxidation chain reactions, chelating metal ions, and helping to maintain the cellular antioxidant defense system. Natural sources of antioxidants are mostly found in plants that contain phenolic compounds, flavonoids, carotenoids, and vitamins [3,4].

Dates (*Phoenix dactylifera* L.) are one of the natural ingredients that contain bioactive compounds, such as phenolics, flavonoids, carotenoids, vitamins, minerals, and fiber. Several recent studies show that dates have biological potential as a natural source of antioxidants because their phenolic and flavonoid content is able to act as free radical catchers [7,8].

Previous research by Rahma showed that date extract had an effect on the histopathological picture of the glomerulars of mice exposed to Rhodamin B, especially on the width of the Bowman space. The findings became the basis for developing further research focusing on the picture of kidney damage in female mice exposed to Rhodamin B and given date extract [9].

Methods

The tools used in this study are a mouse cage, a 3 cc spoit, a scalvel/scalpel, scissors, a 60 ml glass bottle, object

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glass, mortar and stemper, beaker glass, stirring rod, measuring flask, analytical balance, spatula, label, filter paper, baking sheet, aluminum foil, mouse probe, three-leg, gauze and bunsen, watch glass, scan dotslide microscope, Heidolph Instrument brand rotary evaporator, Memmert brand oven, Mettler Toledo brand moisture content analyzer.

The ingredients used in this study were female mice aged 3-4 months, rhodamin B (Tokyo Chemical Industry CO.,LTD.), dates, vitamin C (Tokyo Chemical Industry CO.,LTD), ethanol 96%, aquadest, CMC Na (10 g), Br 1 type mouse feed, Cleo brand mineral water, formalin 10%, chloroform, NS infusion, organ tube, butanol, ethyl acetate, chloroform, FeCl3, HCl, n-hexane, NaCl, gelatin, H2SO4. This research was carried out from September to October 2025 at the Pharmacognosy-Phytochemistry Laboratory and the Pharmacology Laboratory of the Diploma Three (D-III) Study Program, Sandi Karsa Polytechnic.

Population and research sample

The population used in this study was female mice (*Mus musculus*). The sample used in this study was a test animal of mice (Mus musculus) aged 2-3 months with a weight of 20-30 grams. The test material used in this study was Dates (*Phoenix dactylifera* L.Düssel).

Data Collection Techniques

Dates (*Phoenix dactylifera* L.) are selected that are ripe then the seeds are separated from the fruit. After cleaning, wet sorting is then washed using running water until clean. After that it is cut into small pieces, then dried in an oven at 500C, after which it is pollinated, and put in a tightly closed container and ready to be extracted.

A total of 150 grams of dried powder of dates (*Phoenix dactylifera* L.) are put into the maserator, then 96% ethanol solvent is added until the whole powder is submerged. The sample was soaked for the first 6 hours while stirring occasionally, then let it sit for 18 hours. The maserrate is separated by filtering. The refining process is repeated at least once using a 96% ethanol solvent with a volume half the volume of the solvent in the first filter. All the maserate is collected, then evaporated using a rotary evaporator until a thick extract is obtained. Yield is calculated as a percentage of the weight of the viscous extract to the weight of the simplicia powder used [10,11].

Extract Yield Calculation :

$$\%\ Rendement = \frac{Extract\ weight}{Simple\ matter\ weight}\ x\ 100\%$$

Test Animal Setup

The animals used were female mice (*Mus musculus*) aged 2-3 months with a weight of about 20-30 grams, in good health and had never received research treatment. Before treatment, the test animals were acclimatized for 7 days with the same environmental, feed, and drinking conditions. Test animals are fasted for 8-12 hours before a particular treatment as required by the procedure. The mice used were 15 and divided into 5 groups, each consisting of 3 mice [12].

Na-CMC Suspension Manufacturing 1%

Weighing as much as 1 g of Na-CMC, little by little is added to 50 mL of aquadest then stirred until a colloidal solution is formed and the volume is sufficient with aquadest up to 100 mL.

Table 1. Kidney Damage Score of Mice (*Mus musculus*)

Treatment Groups	Replication	S.GLO	S. TUB
Healthy Control	1	0	1
	2	0	1
	3	0	0
Average		**0,0**	**0,7**
Positive Control	1	4	4
	2	4	4
	3	4	4
Average		**4**	**4**
Date Fruit Extract 1.75 mg	1	0	1
	2	3	2
	3	3	2
Average		**2**	**1,7**
Date Fruit Extract 3.5 mg	1	2	2
	2	3	3
	3	3	3
Average		**2,7**	**2,7**
Date Fruit Extract 7 mg	1	3	3
	2	3	3
	3	4	4
Average		**3,3**	**3,3**

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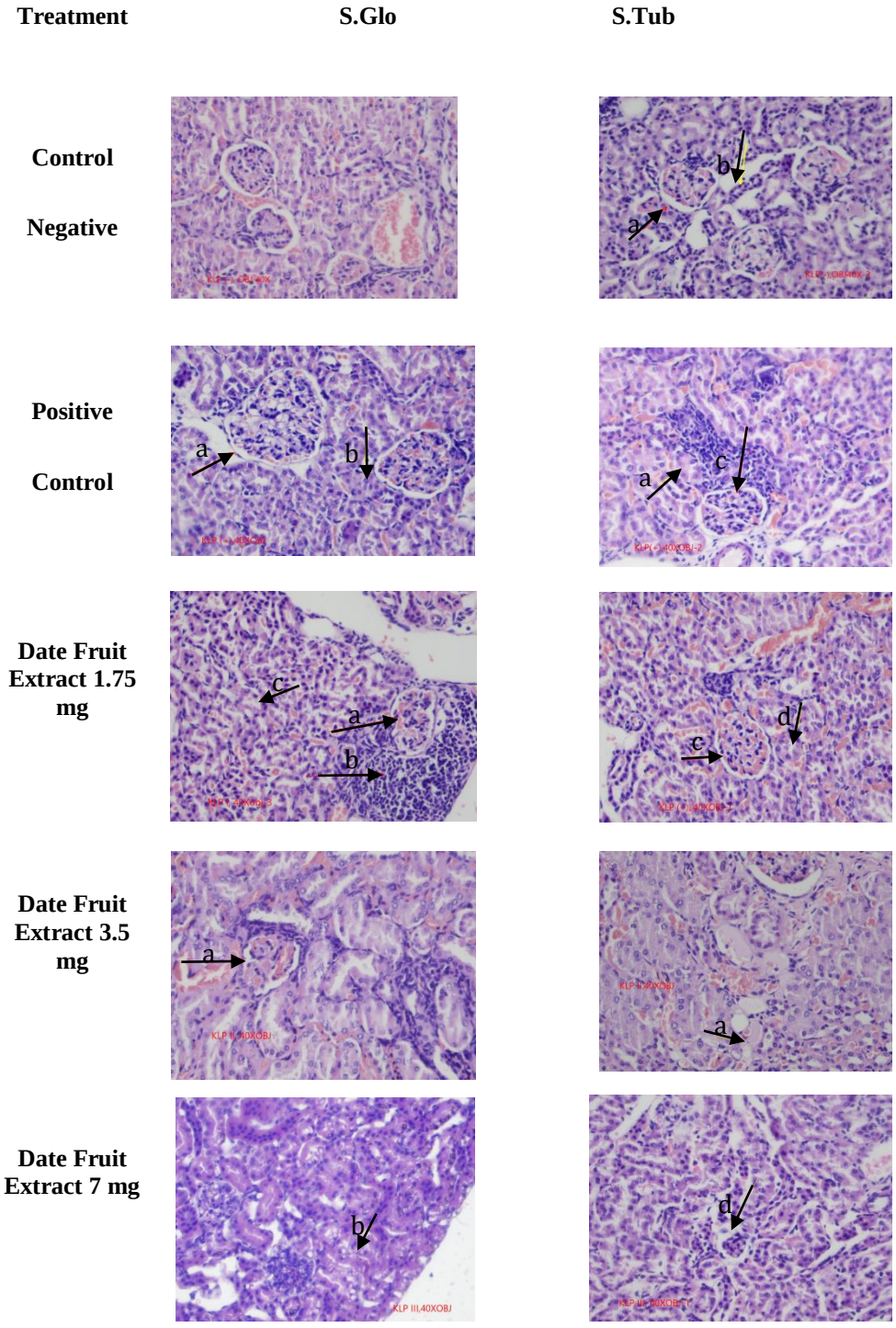

Figure 1. Histology of glomerular cells in mice after exposure to Rodhmin B (Magnification 400x). Description: (a) Glomerular hypertrophy, (b) erythrocyte infiltration, (c), Glomerular atrophy. Histological Tubules (H&E staining, 400x magnification) Description: (a) tubular protein deposits, (b) necrosis, (c) glomerular atrophy, (d) hydrophic degeneration.

Treatment of Test Animals

The mice were acclimatized for 1 week in the laboratory and divided into 5 treatment groups. Each group was labeled positive control (K+), negative control (K-), treatment 1 (P1), treatment 2 (P2), treatment 3 (P3). In the positive control (K+), female mice of the BALB/c strain were given rhodamin B at a dose of 0.08 mg/25gBB and vitamin C at a dose of 1.3 mg/25gBB orally, given routinely for 15 days. Negative control (K-) was that female mice of the BALB/c strain were given rhodamin B orally at a dose of 0.08 mg/day, administered routinely for 15 days. Treatment 1 (P1) was given rhodamine B with 0.08 mg/25gBB and date extract with a dose of 1.75 mg/25gBB orally, administration was carried out routinely for 15 days. Treatment 2 (P2) was given rhodamin B with a dose of 0.08 mg/25gBB and date extract at a dose of 3.5

PHARMACOLOGY AND HERBAL MEDICINE JOURNAL
PHMJ

mg/25gBB orally, administration was carried out routinely for 15 days. Treatment 3 (P3) was that female mice of the BALB/c strain were given rhodamin B with a dose of 0.08 mg/25gBB and date fruit extract with a dose of 7.00 mg/25gBB orally, administration was carried out routinely for 15 days. After treatment for 15 days, female mice of the BALB/c strain were then determined. Female mice of the BALB/c strain were surgically removed to take kidney organs, and glomerular kidney preparations were made. Observation of the glomerular hypopathology of the bowman chamber by measuring the narrowing of the bowman space with 4 fields of view using raster image software, then data analysis was carried out.

Operational Definition

1. Antioxidants are compounds that have the function of combating negative effects derived from free radicals
2. Rhodamin B is one of the synthetic dyes commonly used in the textile and paper industry
3. The glomerulus is a part of the kidney organ that plays a role in filtering waste substances and removing excess fluids and electrolytes from the body
4. The Bowman chamber is a sac located at the beginning of the tubule component of a nephron in the mammalian kidney

Data Analysis

The data from the research was analyzed using SPSS version 25.0. The normality and homogeneity test is carried out first. If the data are normally distributed and homogeneous, the analysis is followed by a one-way ANOVA at a 95% confidence level and a follow-up LSD test to see real differences between groups. If the data do not meet the parametric assumptions, the analysis can be used the Kruskal-Wallis nonparametric test and followed by the Mann-Whitney test.

Results and Discussion

This study was conducted in 2025 to determine the effect of giving date extract (*Phoenix dactylifera* L.) on the kidneys of female mice exposed to Rhodamin B. Date extract was given orally with dose variations of 1.75 mg/25 gBB, 3.5 mg/25 gBB, and 7 mg/25 gBB for 15 days. The observed parameters included histopathological changes of the glomerulars, tubules, and Bowman's space. This study used test animals of female mice (*Mus musculus*) aged 2-3 months. Mice are used because they have physiological characteristics suitable for early models of pharmacology and toxicology research, are easy to maintain, and their biological response has been widely used as a basis for testing the effects of natural materials [12,13].

Mice were induced with Rhodamin B as a source of toxic exposure before being treated with date extract. Rhodamin B can increase ROS formation and trigger oxidative stress. This condition can interfere with cell structures, including kidney tissue, because the kidneys play a role in the filtration and excretion of foreign compounds from the body [2,3,5]. Histological observations of mice showed damage to glomerular cells and tubules due to exposure to Rhodamin B. The highest average damage score was found in the group that received exposure to Rhodamin B without antioxidant protection, while the group given date extract showed a lower tendency to damage. This shows the potential protective effect of date fruit extract on kidney tissue.

The histological picture shows changes in kidney structure, including glomerular hypertrophy, glomerular atrophy, erythrocyte infiltration, and tubule changes. These changes can occur due to disruption of the oxidant-antioxidant balance, membrane lipid peroxidation, and cell damage due to ROS. Phenolic compounds and flavonoids in dates are thought to play a role in suppressing oxidative reactions through free radical capture mechanisms [3,4,7].

The protective effect of date extract is related to its bioactive content which has the potential to be a natural antioxidant. Phenolic compounds, flavonoids, and carotenoids can donate electrons or hydrogen atoms to stabilize free radicals. Thus, date extract has the potential to reduce glomerular and tubule damage due to exposure to Rhodamin B, although further research with a larger sample count and biochemical parameters such as malondialdehyde, SOD, catalase, and creatinine is still needed [4,8].

Conclusion

Based on the results of the research, data processing and discussion, it can be concluded that Date fruit extract (*Phoenix dactylifera* L.) has an effect on kidney damage, namely in the glomerular cells and tubules of female mice exposed to Rhodamin B. The dose group with the lowest cell damage was the 1.75 mg/25 gBB dose, with a glomerular cell damage rate of 25-50% and tubule cell damage ≤25%.

Supplementary Material

None

Author Contributions

SEK : Conceptualization, Methodology, Writing-Original Draft. **W** : Data Curation, Formal Analysis, Visualization. **AS** : Supervision, Funding Acquisition, Writing- Review & Editing.

Conflict of Interest

The authors have no financial conflicts of interest to declare.

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References

[1] Food and Drug Supervisory Agency of the Republic of Indonesia. Regulation of the Food and Drug Supervisory Agency Number 11 of 2019 concerning Food Additives. Jakarta: BPOM RI; 2019.

[2] Sulistina DR, Martini S. The effect of Rhodamine B on the cerebellum and brainstem tissue of *Rattus norvegicus*. Journal of Public Health Research.

PHARMACOLOGY AND HERBAL MEDICINE JOURNAL
PHMJ

2020;9(2):101-104.
3. Chaudhary P, Janmeda P, Docea AO, Yeskaliyeva B, Razis AFA, Modu B, et al. Oxidative stress, free radicals and antioxidants: potential crosstalk in the pathophysiology of human diseases. Frontiers in Chemistry. 2023;11:1158198.
[4] Gülçin İ. Antioxidants: a comprehensive review. Archives of Toxicology. 2025;99:1893-1997.
[5] Hall JE, Hall ME. *Guyton and Hall Textbook of Medical Physiology*. 14th ed. Philadelphia: Elsevier; 2021.
[6] MedlinePlus. *Kidney Diseases*. Bethesda: U.S. National Library of Medicine; 2025.
[7] AlFaris NA, AlTamimi JZ, AlGhamdi FA, Albaridi NA, Alzaheb RA, Aljabryn DH, et al. Total phenolic content in ripe date fruits (*Phoenix dactylifera* L.): a systematic review and meta-analysis. Saudi Journal of Biological Sciences. 2021;28(6):3566-3577.
[8] Fernández-López J, Viuda-Martos M, Sayas-Barberá E, Navarro-Rodríguez de Vera C, Pérez-Álvarez JA. Biological, nutritive, functional and healthy potential of date palm fruit (*Phoenix dactylifera* L.): current research and future prospects. Agronomy. 2022;12(4):876.
[9] Rahma K. Effect of Date Fruit Extract (Phoenix dactylifera L.) as an Antioxidant on the Histopathological Picture of the Glomerulus of Mice Exposed to Rhodamin B. Thesis. Makassar: Pancasanti University; 2019.
[10] Abubakar AR, Haque M. Preparation of medicinal plants: basic extraction and fractionation procedures for experimental purposes. Journal of Pharmacy & Bioallied Sciences. 2020;12(1):1-10.
[11] Zhang M, et al. Extraction and analysis of chemical compositions of natural products and plants. Separations. 2023;10(12):598.
[12] Rydell-Törmänen K, Johnson JR. The applicability of mouse models to the study of human disease. Methods in Molecular Biology. 2018;1940:3-22.
[13] Schoch CL, Ciufo S, Domrachev M, Hotton CL, Kannan S, Khovanskaya R, et al. NCBI Taxonomy: a comprehensive update on curation, resources and tools. Database. 2020;2020:baaa062.