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Effect of Noni Fruit (Morinds citrifolia L.) on Blood Glucose Levels of Male Diabetic Rattus Norvegicus Rats

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Abstract

Diabetes is a persistent metabolic disorder characterized by disruptions in both insulin secretion and action, leading to heightened blood glucose levels (hyperglycemia). Noni fruit, rich in antioxidant compounds like flavonoids and alkaloids, is thought to possess anti-diabetic properties. This study aimed to assess the influence of administering 500 mg/kgBW of noni fruit on the glucose levels of Wistar rats induced with diabetes using 150 mg/kgBW of alloxan. Blood sampling followed a post-test only group method conducted before terminating the mice. The study involved 33 mice divided into three groups: a negative control group, a positive control group induced with diabetes for 3 days, and a treatment group induced with diabetes followed by a 14-day administration of noni fruit extract. The normality test revealed a non-normal distribution with a p value <0.05. Additionally, the Kruskal-Wallis test resulted in a p value <0.05, signifying the impact of noni fruit administration on the blood glucose levels of rats. The Mann-Whitney U test indicated a p value > 0.05 between the positive control group and the treatment group. Despite the absence of a significant difference in glucose levels between the two groups, the study concluded that administering noni fruit at a dose of 500 mg/kgBW could influence the blood glucose levels of mice.

Introduction

Diabetes is a chronic condition characterized by hyperglycemia which is increasingly becoming a global concern because its prevalence continues to increase globally ((Antara et al., 2018). Based on data from the World Health Organization in 2019, around 284,049 diabetes-related deaths were recorded (WHO, 2020). In 2021, the prevalence of diabetes will reach 537 million cases in the age range 20-79 years, with Indonesia ranking fifth highest in the world with 19.5 million people suffering from diabetes (IDF, 2021).

Diabetes can cause a number of serious complications, including heart problems, brain disorders, eye problems, cerebrovascular disease, non-alcoholic steatohepatitis (NAFLD), erectile dysfunction, and nerve problems (WHO, 2019). Although diabetes therapy generally involves the use of pharmacological drugs to achieve stable blood sugar levels, the use of synthetic drugs often causes significant side effects. Therefore, there is a need to develop alternative treatment approaches using natural ingredients that are likely to have minimal side effects (Verma et al., 2018).

Indonesia, with its abundant natural resources, has the potential to develop herbal medicines as alternative treatments. The Indonesian Ministry of Health supports efforts to develop herbal

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medicines from natural resources (KEMENKES, 2022). One plant that attracts attention in the context of disease treatment is the noni plant. Noni contains secondary metabolite compounds such as flavonoids and alkaloids, which are known to have potential as anti-diabetic agents (Singh et al., 2022). Based on the data above, researchers want to conduct research on the effects of noni fruit on the blood glucose levels of rats induced by diabetes.

Methods

The methodology and design implemented in this study conform to a true experimental approach utilizing a post-test only control group design. Glucose samples were collected individually, specifically during the surgical procedure preceding the termination of mice. Although the initially calculated number of mice using Federer's formula was 27, a total of 33 mice were employed to accommodate unforeseen circumstances.

The mice samples were chosen randomly and subsequently allocated into three groups: the negative control group, receiving standard food only; the positive control group, induced with diabetes using alloxan at 150 mg/kg/BW for 3 days; and the treatment group, induced with diabetes and later administered noni fruit extract at a dosage of 500 mg/kg/BW. After treatment, the experimental animals will be given initial anesthesia using ketamine at a dose of 20-40 mg/kgBW to relieve pain. Next, blood samples will be taken using a syringe of 2 ml each to be checked for fasting blood sugar where previously the mice had fasted for 12 hours. The mice will then be euthanized through an exsanguination process and transported to the incinerator room for disposal.

Results and Discussion

The research findings revealed that mice with diabetes exhibited elevated glucose levels compared to those fed a regular diet. The data employed a ratio scale, and a normality test indicated non-homogeneity ($p<0,05$). The Kruskal-Wallis test yielded a p-value 0.023 ($p<0.05$), signifying that administering 500 mg of noni fruit had a significant impact on mouse blood glucose levels. Subsequent Mann Whitney U tests indicated no substantial difference in glucose levels between the positive control group and the treatment group, suggesting potential inaccuracies in dosage and administration duration of the extract.

The statistical findings presented previously provide evidence supporting the anti-diabetic potential of secondary metabolic compounds contained in noni fruit, including alkaloids and flavonoids. The potential of flavonoids in noni fruit to lower blood sugar levels is due to its protective role in pancreatic beta cells, protecting these cells from damage caused by free radical compounds (Wijayanti and Qomariyah, 2023). Apart from that, noni fruit also contains proxeronin, which is a precursor to xeronine, which is a type of alkaloid known to have antioxidant properties because it acts as an electron booster against free radical compounds (Hasan et al., 2021).

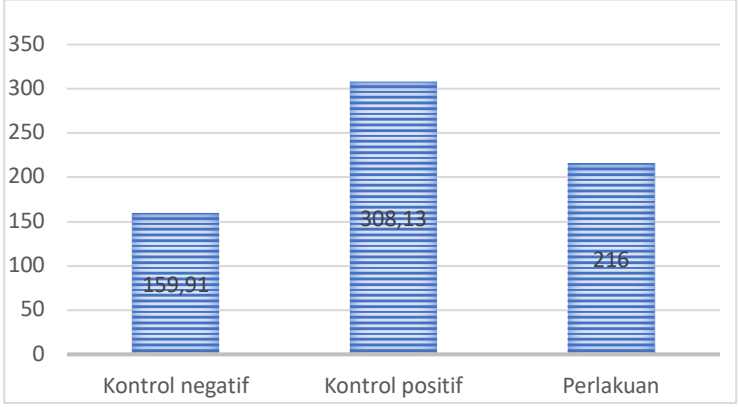

Figure 1. Average Fasting Blood Sugar Levels (mg/dl)

Conclusion

From the results of the research that has been carried out, it can be concluded that giving alloxan 500 mg of noni fruit can have the effect of reducing blood glucose levels in rats induced by diabetes by administering alloxan 150 mg, although statistically there is no significant effect on glucose levels between the positive control group and the treatment group. on the results of the Mann Withney U test. It is recommended for future researchers to develop the potential of noni fruit for other health problems by using different doses or different durations of administration and by using other parts of the noni plant which also have great potential.

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