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# TEST OF THE EFFECTIVENESS OF BATAK ONION (ALLIUM CHINENSE G. DON.) ETHANOL EXTRACT ON CREATININE AND UREUM LEVELS OF WHITE RATS (RATTUS NORVEGICUS) INDUCED BY ETHYLENE GLYCOL

**Muhammad Gafra Shafa Harahap[1], Ibnu Hafiz[2], Mhd Bayu Azhari[3]**
SMA IT Al-Fityan School Medan[1,2,3]
*Correspondence Email: gafraharahap55@gmail.com[1], ibnuhafiz11@gmail.com[2], bayuazhari123@gmail.com[3]

**Abstract**

The kidneys are excretory organs whose function is to remove metabolic waste in the form of toxic substances from the body. Ethylene glycol is a chemical that if consumed in the body can cause damage to the kidneys. Batak onion (Allium chinense G. Don.) is a herbal plant and food typical of North Sumatra which is believed to have health benefits for the body. The aim of this research was to determine the effect of Batak onion ethanol extract on creatinine and urea levels of white rats induced by ethylene glycol. This research used a Completely Randomized Design (CRD) with 25 white rats divided into 5 treatment groups, namely the negative control group was given food and drink, the positive control was induced by 0.75% ethylene glycol, treatment 1 was induced by 0.75% ethylene glycol and extract. Batak onion ethanol was 250 mg/kg BW, treatment 2 was induced by 0.75% ethylene glycol and Batak onion ethanol extract was 500 mg/kg BW and treatment 3 was induced by 0.75% ethylene glycol and Batak onion ethanol extract was 750 mg/kg BW. The data obtained was analyzed statistically using one way Anova with Duncan's follow-up test. The results obtained by Batak onion ethanol extract had an effect on creatinine levels (p = 0.000) and urea levels (p = 0.000) in white mice. Giving Batak onion ethanol extract at a dose of 750 mg/kg BW and ethylene glycol for 30 days was the most effective dose in reducing creatinine and urea levels in white rats.

***Keywords: Batak Onions, Ethylene Glycol, Creatinine, Ureum***

## INTRODUCTION

Kidney disease is a physiological disorder/disease with various causes and generally ends in chronic kidney failure which is characterized by an irreversible decrease in kidney function (Cahyani et al., 2022). Based on data from the World Health Organization (WHO), in 2018 the prevalence of deaths from chronic kidney disease sufferers was 5-10 million every year and has become one of the health problems of the world's population today (Syahputra et al., 2022). In Indonesia, the number of chronic kidney failure sufferers in 2018 reached 713,783 people, where the largest number came from West Java province, followed by the provinces of North Sumatra, South Sumatra and Riau (Efendi et al., 2021). There are several factors that cause kidney failure, such as heredity, hypertension, diabetes, immune diseases and one of them is poisoning with substances originating from food and medicines (Siregar, 2020).

If ethylene glycol enters the body, it will cause organ dysfunction, one of which is the kidneys. One of the initial indicators for detecting impaired kidney function can be done by examining creatinine and urea levels. The mechanism of ethylene glycol damages the kidneys through the formation of free radicals as a result of the formation of kidney stones. Kidney stones that form will cause oxidative stress in cells due to the excessive number of free radicals that cannot be reduced by antioxidants in the body. Cell damage caused by free radicals can be minimized with antioxidants from outside the body that come from plants. One plant that has antioxidant properties is the Batak onion (Ningsih et al., 2021).

Batak onion (Allium chinense G. Don) is one of the food plants that is widely consumed by the people of North Sumatra, especially the Batak ethnic group, who usually use this plant as a

food additive in cooking spices, vegetables and as medicine (Naibaho et al., 2017) . It is believed that the contents of Batak onion extract can be used as traditional medicine, but the public still lacks knowledge about the compounds contained therein and their benefits for organ health. The results of phytochemical screening of Batak onion extract content carried out by Rubiatik et al., (2015) showed the presence of secondary metabolite compounds in the form of flavonoids, stereoids, terpenoids and saponins. This is supported by research from Sulistia et al., (2021), the content of secondary metabolite compounds in Batak onions can repair kidney damage due to diabetes mellitus. Other research also states that Batak onion ethanol extract has an effect on improving the histopathology of the liver and pancreas of white mice in a model of diabetes mellitus (Butar-Butar et al., 2022; Rahmah et al., 2021).

Due to the potential medical value of Batak onions, the danger of toxic effects caused by ethylene glycol for body health, this research aims to determine the effect of ethanol extract of Batak onions on the creatinine and urea levels of white rats induced by ethylene glycol.

## LITERATURE REVIEW

### KIDNEY

The kidneys are organs that play a role in maintaining the stability of fluids, electrolytes and acid bases in the body. Apart from that, the kidneys also have the main function of filtering blood and excreting metabolic waste in the form of urea, creatine, ammonia and absorbing toxic substances that enter the body (Jannah & Budijastuti, 2022). The glomerulus is part of the kidney nephron which functions as a filtering process (filtration) such as protein and blood cells while waste, fluid and small molecules will pass into the kidney tubule (Rani et al., 2022). The other parts of the renal nephron are the proximal tubule and distal tubule. The proximal tubule functions as a place for reabsorption of molecules that the body still needs, such as glucose and amino acids. The distal tubule functions as a secondary urine collection site (augmentation). Secondary urine containing hydrogen, sodium, creatinine, toxins and drugs will be excreted through the kidney pertubules to the bladder (Ginting et al., 2022). Examination of kidney abnormalities can be carried out by clinical chemistry examination such as examination of creatinine and urea levels and observation of kidney histopathology. Measuring creatinine and urea levels is one way to diagnose kidney disease (Nuroini & Wujayanto, 2022). Meanwhile, according to research results from Azhari et al (2022), there was an effect of administering toxic substances on the histopathology and diameter of the kidney glomeruli of white rats due to food coloring.

### ETHYLENE GLYCOL

Ethylene glycol's chemical structure is composed of two hydroxyl groups (-OH) and has quite high solubility in water and is widely used as an antifreeze and is an alcohol group compound (Panggabean, 2010). In the industrial world, ethylene glycol is mostly used as a material for making plastic, making paint, ink and glue (Laela & Hairunnisa, 2021). When consumed in the body, ethylene glycol will be metabolized in the liver into glycoaldehyde, glycolate, glycosylate and oxalate, the effects of these compounds will have an impact on depression of the nervous system and cause kidney failure (Ministry of Health of the Republic of Indonesia, 2016). Previous research also shows that ethylene glycol can cause damage to Bowman's renal capsule, tubular atrophy and the presence of microcrystal deposits in the renal glomerulus (Komansilan & Rumondor, 2022).

### BATAK ONION (Allium chinense G. Don.)

Batak onions have narrow, green leaf morphology, white bulbs and a plant height of 50 cm. According to the Integrated Taxonomics Information System (ITIS), the taxonomy of the Batak onion plant is Kingdom: Plantae, Division: Tracheophyta, Class: Magnoliopsida, Order: Liliaceae,

Family: Amarylidaceae, Genus: Allium L., Species: Allium chinense G. Don. Batak onions are still in the same tribe as Liliaceae, which are medicinal plants and food plants that are often found in North Sumatra, especially in the Aek Popo and Tongging Situnggaling areas. In Indonesia, Batak onions are usually used as a mixture of pickles and arsik. However, as time goes by, Batak onions are also widely used in dishes to stir-fry chicken, fish or meat (Nasution, 2014). Chinese people usually use this plant to treat anti-aggregation diseases, cardiac asthma and angina pectoris (Aqila, 2021).

## METHOD

### Data source

The research design used in this study was a Completely Randomized Design (CRD) and was an experimental study using 25 male white Wistar rats (Rattus norvegicus) weighing 150-200 grams. The number of treatment groups was five treatment groups and five repetitions. Determining the number of repetitions for each treatment follows Federer's (1963) formula, namely $(n-1)(t-1) \geq 15$. The treatments given to each group are as follows:
Negative Control (KN): Eating and Drinking (Days 1-30)
Positive Control (KP): Ethylene Glycol 0.75% + Feed (Days 1-30/Morning)
Treatment 1 (P1): Ethylene Glycol 0.75% (Morning) + Batak Onion Ethanol Extract 250 mg/kg BW (Afternoon) + Feed (Days 1-30)
Treatment 2 (P2): Ethylene Glycol 0.75% (Morning) + Batak Onion Ethanol Extract 500 mg/kg BW (Afternoon) + Feed (Days 1-30)
Treatment 3 (P3): Ethylene Glycol 0.75% (Morning) + Batak Onion Ethanol Extract 750 mg/kg BW (Afternoon) + Feed (Days 1-30)

### Tool

Test tube, beaker glass, aluminum oil, measuring cup, spatula, petri dish, watch glass, measuring flask, dropper pipette, blood serum tube, blood serum tube holder, hematocrit, organ bottle, cotton, tissue, gloves, label paper, gastric sonde, syringe, analytical balance, rat cage, rat feeder, rat drinker, centrifuge, micropipette, cuvette, tup, incubator, UV-VIS spectrophotometer, vacuum rotary evaporator, filter paper, jar, black cloth, blender and filter .

### Material

Batak onion, ethylene glycol, 96% ethanol, 1% FeCl reagent, H2SO4, magenesium, HCl, bouchardat, maeyer, salkowsky, lieberman-bourchard, distilled water, 96% alcohol, DPPH powder, methanol, CMC 0.5% NaOH, acid pyrvate, phosphate buffer, sodium hypochlorite, creatinine and urea standard kit, NBF 10%, chloroform, feed and drink.

### Work procedures

The first work procedure carried out was making Batak onion ethanol extract, phytochemical screening test, antioxidant activity test of Batak onion ethanol extract, inducing ethylene glycol and Batak onion extract into experimental animals, taking blood to measure creatinine and urea levels. Induction of 0.75% ethylene glycol was carried out in the morning then followed by induction of Batak onion ethanol extract for 30 days.

### Data Processing and Analysis Methods

Data from measurements of creatinine and urea levels were analyzed statistically using the SPSS one way Anova application. If a p value <0.05 was obtained, then continued using the Duncan test to see which dose of extract was most effective on creatinine and urea levels in white mice.

## RESULTS AND DISCUSSION

### Effect of Ethanol Extract of Batak Onion (Allium chinense G. Don.) on Creatinine and Ureum Levels of White Rats Induced by Ethylene Glycol

Table 1. Results of examination of creatinine and urea levels

| Group | Creatinine (mg/dl) ± SD | P Value | Urea (mg/dl) ± SD | P Value |
|---|---|---|---|---|
| Negative Control (KN) | 0.96 ± 0.15a | | 17.60 ± 1.14a | |
| Positive Control (KP) | 1.76 ± 0.11d | | 38.20 ± 1.92c | |
| Treatment 1 (P1) | 1.58 ± 0.08c | 0,000 | 29.80 ± 1.48d | 0,000 |
| Treatment 2 (P2) | 1.54 ± 0.11c | | 25.60 ± 1.34c | |
| Treatment 3 (P3) | 1.34 ± 0.11b | | 21.80 ± 1.30b | |

Information : SD (Standard Deviation), Negative Control (Feed and Drink), Positive Control (0.75% Ethylene Glycol and Feed), Treatment 1 (0.75% Ethylene Glycol + Batak Onion Ethanol Extract 250 mg/kg BW + Feed), Treatment 2 (Ethylene Glycol 0.75% + Ethanol Extract of Batak Onions 500 mg/kg BW + Feed) and Treatment 3 (Ethylene Glycol 0.75% + Ethanol Extract of Batak Onions 750 mg/kg BW + Feed)

Based on the results of the one way Anova test on the creatinine levels of white mice, a significance level value was obtained (p = 0.000), meaning that giving ethylene glycol and ethanol extract of Batak onions for 30 days had an effect on creatinine levels of white mice (p = 0.000), meaning that giving ethylene glycol and ethanol extract Batak onions for 30 days had an effect on creatinine levels in white rats (p<0.05). The Duncan test results showed that the negative control group (0.96 ± 0.15) was significantly different from the positive control group (1.76 ± 0.11). This shows that induction of 0.75% ethylene glycol can increase creatinine levels in white mice. The value of serum creatinine levels in male white mice is 0.7 – 1.3 mg/dl (Rozi et al., 2017). The negative control group (0.96 ± 0.15) was significantly different from treatment group 1 (1.58 ± 0.08), treatment 2 (1.54 ± 0.11) and treatment 3 (1.34 ± 0.11). ) but in treatment group 1 (1.58 ± 0.08) it was not significantly different from treatment group 2 (1.54 ± 0.11). The value that is close to the negative control is treatment 3. These results indicate that giving Batak onion ethanol extract for 30 days has an effect on creatinine levels in white rats. The most optimal dose of Batak onion ethanol extract for white rat creatinine levels is a dose of 750 mg/kg BW.

The results of the one way Anova test on the ureum levels of white mice obtained a significance level value (p = 0.000), meaning that administration of ethylene glycol and ethanol extract of Batak onions for 30 days had an effect on the urea levels of white mice (p<0.05). The Duncan test results showed that the negative control group (17.60 ± 1.14) was significantly different from the positive control group (38.20 ± 1.92). These results indicate that induction of 0.75% ethylene glycol can increase urea levels in white mice. Normal rat urea levels are 15.0 – 21.0 mg/dl (Anggi et al., 2021). The negative control group (17.60 ± 1.14) was significantly different from treatment group 1 (29.80 ± 1.48), treatment 2 (25.60 ± 1.34) and treatment 3 (21.80 ± 1.30). ). The value that is close to the negative control (17.60 ± 1.14) is treatment group 3 (21.80 ± 1.30). This shows that administration of Batak onion ethanol extract at a dose of 750 mg/kg BW is the most optimal dose for white ureaemia levels.

Increased levels of creatinine and urea cause a decrease in the glomerular filtration rate. The inability of the glomerulus to filter (filtrate) creatinine and urea normally out of the body will cause an increase in creatinine and urea levels in the blood of mice. Glomerular damage is caused by free

radicals which can cause oxidative stress in glomerular cells and tissue. Cell damage caused by ethylene glycol takes the form of proximal tubular necrosis and accumulation of CaOx monohydrate crystals in urine and tissues which is a sign of kidney failure (Fitriani & Amalia, 2023).

The results of phytochemical screening and antioxidant activity tests of Batak onion ethanol extract contain secondary metabolite compounds and have antioxidant properties. Antioxidants are compounds that can reduce free radicals by preventing the oxidation of fatty acids in cell membranes and stopping the free radical chain reaction so as to prevent cell damage. The antioxidant compounds in Batak onion ethanol extract are able to reduce free radicals which can damage glomerular cells, thus reducing creatinine and urea levels in mice. Research from (Putri et al., 2019) shows that administering ethanol extract of basil leaves which contains antioxidant compounds can reduce creatinine and white ureaemia levels.

## Conclusion

1. Ethanol extract of Batak onion (Allium chinense G. Don.) has an effect on creatinine levels in white rats. The dose of Batak onion ethanol extract that is effective in reducing creatinine levels is 750 mg/kg BW.
2. Ethanol extract of Batak onion (Allium chinense G. Don.) has an effect on urea levels in white rats. The dose of Batak onion ethanol extract that is effective in reducing urea levels is 750 mg/kg BW.
3. Further research is needed on the levels of Suproxide Dismutase (SOD) and Malondialdehyde (MDA) to determine the levels of antioxidants and free radicals in white mice before and after treatment.
4. It is necessary to carry out research on histopathological images to determine the toxic effects of ethylene glycol and ethanol extract of Batak onions on cells and kidney tissue of white rats.

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