

Comparison of the Reduction of Uric Acid Level by Administration of Tempuyung (*Sonchus arvensis*) Leaf Extract and Breadfruit (*Artocarpus altilis*) Leaf Extract in Hyperuricemic Wistar Rats

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Abstract—Uric acid is a heterocyclic substance that comes from metabolic breakdown of purine compound in the body. A condition where there is a high uric acid level (>7 mg/dl) in the human body is called hyperuricemia. Some traditional plants that often be used as alternative of hyperuricemia drugs by Indonesian people are tempuyung leaf (*Sonchus arvensis*) and breadfruit leaf (*Artocarpus altilis*), both of them contain flavonoid as their active substance which is known to reduce uric acid level in the blood. This research is aimed to compare the influence of administration of tempuyung leaf extract and breadfruit leaf extract as the means of reducing uric acid in male white rats that are made hyperuricemia. This research is an experimental research with Pre and Post Test Control Group Design. The samples of this research were 24 male wistar rats that were divided into four groups randomly, they were positive and negative control groups, treatment group 1 and treatment group 2 which were respectively given dose of tempuyung leaf extract 80 mg/200 gr of BW and 0,75 gr/200 gr of BW of breadfruit leaf extract. The data was analysed by using paired T-test. The result is significant differences ($\alpha = 0,05 > p\text{-value} = 0,000$) of uric acid level before and after treatment were shown in both of treatment groups. Treatment group 2 however showed slightly higher average reduction of uric acid level compared to treatment group 1 (5,8690 vs 5,8600 respectively). In short, administration of breadfruit leaf extract (0,75 gr/200 gr of BW) was slightly more effective compared to tempuyung leaf extract (80 mg/200 gr of BW) in reducing uric acid level of white male Wistar rats.

Keywords: tempuyung leaf extract, breadfruit leaf extract, uric acid, hyperuricemia

I. INTRODUCTION

Hyperuricemia is a condition where there is an increase of uric acid level above normal level in the blood (>7 mg/dl). Hyperuricemia can happen because an increase in uric acid metabolism (over-production), a reduction in uric acid excretion (under-excretion), or the combination of both [1,2]. Risk factors of uric acid disease (gout arthritis) from happening can be divided into three groups, which are primary, secondary

and predisposition factors. Genetic influence can be included into primary factors. Uric acid over-production or under-excretion can be included into secondary factors along with obesity, diabetes mellitus, hypertension and kidney diseases. The causes of secondary risk factors are mostly because of our own lifestyle, for example excess purine intake, alcohol consumption or because of the effects from certain drugs consumption. Meanwhile predisposition risk factors are age, sex and climate.

Other than pharmacological treatment it is found that there are also herbal treatments for treating uric acid disorder or hyperuricemia, some of them are breadfruit (*Artocarpus altilis*) leaf extract and Tempuyung (*Sonchus arvensis*) leaf extract, other than that herbal therapies are proven to have less side effects compared to pharmacology treatments [3,4]. Flavonoid, anthocyanin and phenol are known to have antioxidant and anti-inflammatory function that in turn can reduce uric acid level in blood [5-7].

Researches that were done by Putri and Wibawa about 80 mg/200 gr BW (body weight) tempuyung leaf extract and 0,75 g/200 gr are said to be effective to reduce uric acid level. In those researches the result is still very narrow. Putri only test Tempuyung leaf extract while Hagi focused on breadfruit leaf extract. Though it can be concluded that both substances could reduce uric acid level in wistar rats, the question remains. Which one is more effective in reducing uric acid level, Tempuyung leaf extract or breadfruit leaf extract? Because of that the authors want to prove whether the conclusion in those two studies is true or false and also we want to compare which one of those two substances is more effective in reducing uric acid level [8-10].

II. METHOD

This research type is an experimental research with research design of pre-post-test with control group design which uses white rats (Wistar) that are made hyperuricemia as research objects, where in this study the rats are divided into 4

groups with 6 Wistar rats in each groups. Groups in this study are:

A. Negative Control Group

6 male white rats will be given standard food for 1 week, then we check the uric acid level of these rats, and then they will be given standard food + aquadest for 1 week.

B. Positive Control Group

6 male white rats will be given purine rich food for 1 week, then check the uric acid level of these rats and then they will be given standard food + aquadest for 1 week.

C. Treatment Group I

6 male white rats will be given purine rich food for 1 week, then check the uric acid level of these rats and then they will be given standard food + 80 mg/ 200 gr of BW tempuyung leaf extract for 1 week.

D. Treatment Group II

6 male white rats will be given purine rich food for 1 week, then check the uric acid level of these rats and then they will be given standard food + 0,75 gr/ 200 gr of BW breadfruit leaf extract.

III. RESULTS

TABLE I. AVERAGE REDUCTION OF URIC ACID LEVEL IN EACH GROUP

Groups	N	Average Uric Acid Level		Average Reduction
		Pretest	Posttest	
Negative Control	6	1,65	1,70	-0,05
Positive Control	6	8,07	8,16	-0,08
Tempuyung leaf extract	6	8,01	2,15	5,860
Breadfruit leaf extract	6	8,08	2,22	5,869

Based on table above it is shown that average uric acid level in negative control group before the treatment is 1,65 and after treatment is 1,70 with the uric acid level increase of 0,05. Meanwhile in positive control group before the treatment, uric acid level is on 8,07 and after treatment the average level increase to 8,16 with uric acid level increase of 0,08.

In treatment group I before the application of tempuyung leaf extract the uric acid level average is 8,01, while the average after application of tempuyung leaf extract is 2,15 with the reduction of 5,860. Treatment group II the average of uric acid level before application of breadfruit leaf extract is 8,08 whereas after the application the level reduce to 2,22 with the reduction of 5,869.

IV. DISCUSSION

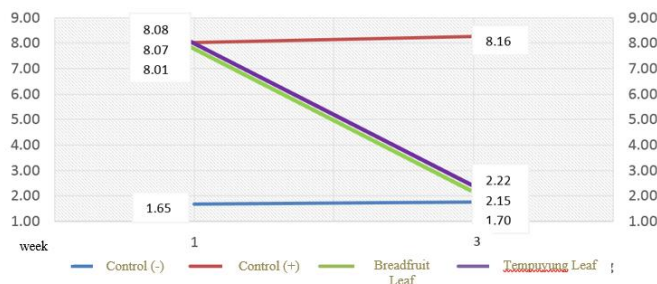


Fig. 1. Uric acid level reduction graph.

Flavonoid content that can be found in tempuyung leaf extract and breadfruit leaf extract is a component that is suspected to have huge influence towards the reduction of uric acid level [11]. Flavonoid works in uricostatic way by inhibiting xanthin oxidase enzyme. Other than flavonoid works by inhibiting lipo oxygenase enzyme so it can inhibit the inflammation or swelling in hyperuricemic cases [12]. Tempuyung leaf extract (*Sonchus arvensis*) has total flavonoid substance content in around 0,5% and has the biggest group derivate of apigenin-7-0-glucosyde and can reduce uric acid level in white male Wistar rats [13]. Meanwhile from the isolation of breadfruit (*Artocarpus altilis*) leaf extract with the total flavonoid content of 0,62%, flavonoid has the simpler derivate which is 2-geramil-2',4',3,4 tetrahidroksidihidrokalikon and 8-geranil-4',5,7-trihidroksiflavanon [14]. Activity from breadfruit leaf extract is slightly larger than tempuyung leaf extract in reducing uric acid level. This thing might happen because derivate of flavonoid substance that is inside breadfruit leaf is larger and more simple than tempuyung leaf extract so in turn it has larger potential to become anti-hyperuricemic agent [15].

But this reasoning can't answer another interesting finding that the authors found, breadfruit leaf extract indeed had slightly larger potential in reducing uric acid level (5,8690 vs 5,8600), but the dose that was being used for breadfruit leaf in the study is much larger than the one that was used by tempuyung (750 mg of breadfruit leaf extract vs 80 mg of tempuyung leaf extract).

Other than flavonoid, other phenolic content most notably anthocyanin and phenolic acid from both leaves have potential to reduce uric acid level. Phenol can function as antioxidant and can also act as scavenger for other wastes in the human body [16]. Total phenolic content in Tempuyung leaf is 420 ± 6,9 mg/gr meanwhile in breadfruit leaf it is around 144,16 mg/gr ± 17,98 mg/gr [17,18]. The one that needs to be underlined is, even though flavonoid content in breadfruit leaf is larger than tempuyung leaf but this thing is not linear with the total of phenolic content that is available in a particular plant. This thing is made available because when calculating total phenolic content, we have to include not only flavonoid but also tannin, anthocyanin, esculetin, scopoletin, etc. but if both simple and complex binding phenol is included in the total phenolic content, it can be inferred that flavonoid might not be the biggest contributors in phenol content of a particular plant.

V. CONCLUSION

Looking at the data above we can conclude that it is to be seen that breadfruit leaf has slightly higher uric acid reduction level compared to tempuyung leaf but when we compare it at the same dose, head to head tempuyung leaf has much higher uric acid reduction potential ability compared to the breadfruit leaf.

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