

The Effect of Antihypertensive of Tali's Bamboo Shoot Ethanol Extract (*Gigantochloa apus* (Schult. & Schult.F.)) to Male White Rats Sprague Dawley

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Abstract—Tali bamboo shoot is one of plants empirically used by the society as antihypertensive. Chemical compounds such as flavonoid, phenolic, saponins and tannins contained in Tali bamboo shoot are suspected to have antihypertensive effect. This research aimed to determine the effective dose of Tali bamboo shoot ethanol extract as a prevention of blood pressure increase in male rats with hypertension using Tail Cuff method to male rats *Sprague Dawley*. Rats were divided into 5 groups: negative control group (CMC Na 1%), positive control group (Hydrochlorothiazide), Tali bamboo shoot ethanol extract group with dose of 40 mg/kg rat body weight, dose of 80 mg/kg rat body weight group, and dose of 160 mg/kg rat body weight group. Tali bamboo shoot ethanol extract of dose 40 mg/kg is the most effective to decrease blood pressure to male white rats *Sprague-Dawley* compared to other extract doses.

Keywords: *dose, hypertension, tali bamboo shoot*

I. INTRODUCTION

Hypertension is one of the main risk factors for heart disorders. Besides, hypertension can result in kidney failure or cerebrovascular disease which is responsible for high medical costs. Data of World Health Organization (WHO) in 2013 revealed that there were 9.4 million people out of 1 billion people worldwide who died of cardiovascular disorders due to hypertension. The prevalence of hypertension in Indonesia among respondents aged 18 years and over was found to be 25.8 percent [1].

Long-term consumption of synthetic drug can cause undesirable side effects, such as coughing, hypotension, acute kidney failure and hyperkalemia [2]–[5]. Tali bamboo root contain compounds of saponin, flavonoid and tannin. Compounds assumed to reduce blood pressure are flavonoid and the plant trees in all regions of Indonesia so it is easy to obtain and is usually cooked as a vegetable [6]. Flavonoid compounds have biological activity as a diuretic by inhibiting the reabsorption of Na⁺, K⁺ and Cl⁻ resulting in

an increase in electrolytes in the tubules so that diuresis occurs, which will reduce blood pressure [7].

This study used prednisone and NaCl induction methods to increase rats' blood pressure. Blood pressure measurement is performed using Tail Cuff method by a tool called CODA®. This method is used to determine systolic and diastolic blood pressure. This method does not require surgery. It is very accurate. It can be used for measuring large numbers of laboratory animals and to prove whether the content and administration of ethanol extract of bamboo shoots (*Gigantochloa apus* (Schult. & Schult.f.) Kurz ex Munro) was able to suppress the blood pressure of mice during the treatment process [8].

II. METHOD

Materials

Sample used in this study was tali bamboo root, prednisone 1.5 mg / kg and NaCl 150 mg / kg. The chemicals given in the positive control were hydrochlorothiazide and the negative control was CMC Na 1%. The material used to clean the injection is aquadest. Test animals used in this study were male Sprague-Dawley rats aged 2-3 months with body weight of 150-300 gram.

Tools

Beaker glasses, volume pipette, oven, rotary evaporator, stir bar, measuring cup, 100 ml white bottle, dark glass bottle, blender, 60 mesh-sized sieve, aluminium foil, electric scales, Moisture Balance, Sterling-Bidwell set of tools, mortars, stamper, oral sonde and Blood Pressure Analyzer (CODA).

Making Extraction

The tali bamboo root in powder form were weighed as much as 500 g, then it was extracted by maceration method using 70% ethanol as much as 3750 ml for five days with repeated stirring. Next maceration was filtered using gauze and filter paper. Then the pulp was rinsed with the remaining

1250 ml of solvent and left for two days. The filtrate from all samples were then evaporated using a device called a vacuum rotary evaporator.

Blood Pressure Measurement

Blood pressure measurement was performed by Tail Cuff method using a blood pressure analyzer. This device works by inflating the Cuff until it reaches blood pressure above systolic blood pressure, so that the pulse disappears then the Cuff pressure is reduced slowly. When blood pressure reaches below the systolic pressure, the pulse will reappear. This method of measurement is in accordance with the way of measuring blood pressure using a sphygmomanometer in humans. The measurement principle of *Volume Pressure Recording tail cuff*, automatically measures six physiological parameters quickly and simultaneously namely: systolic blood pressure, diastolic blood pressure, average pressure, heart rate, tail blood flow and tail blood volume [9], [10].

Antihypertensive Effectiveness Testing

Rats were weighed, grouped, and acclimatized for one week at the study site for adaptation to the environment. Male white rats were placed in a clean and well ventilated cage, and given the standard food and drink consumption for rats. After being acclimatized, rats were first fasted for 12 hours and their blood pressure was measured as initial blood pressure (T0), then they were induced with prednisone 0.01% with a volume of 3 ml / 200 g BW and 1.5% NaCl with a volume of 2 ml / 200 g BW orally for 21 days. Measurement of rat blood pressure was done during

prednisone induction and NaCl on day 7 (T1), induction of day 14 (T2), induction of day 21 (T3), measurements were made on the tail of rats. Then in each group was given 1% CMC Na (negative control), hydrochlorothiazide (positive control) once a day, tali bamboo root extracts of 8 mg / 200 g BW rats, 16 mg / 200 g BW rats and 32 mg / 200 g BW orally once a day for 21 days and continued by the induction of prednisone and NaCl during therapy. Measurement of rat blood pressure was done during therapy on day 28 (T4), therapy day 35 (T5), and therapy day 42 (T6).

III. RESULTS AND DISCUSSION

The process of extracts making in this study use maceration method, because this method is very easy, no need to use special tools and special skills. This maceration method is assumed effective to use to avoid damage to active substances that cannot stand of heating [11]. Prednisone and NaCl induction were used to increase blood pressure in rats significantly and constantly through its activation mechanism of Renin Angiotensin Aldosterone System (RAAS) and fluid retention [12], [13]. Blood pressure measurement was performed by Tail Cuff-method using a tool called CODA®. This method is used to determine systolic and diastolic blood pressure[5], [13]. This method of measurement was in accordance with the way of measuring blood pressure using a sphygmomanometer in humans. The results of systolic and diastolic blood pressure measurements can be seen in table 1 and 2.

Table 1. Mean of systolic blood pressure with the time of each treatment

Group	T0 (mmHg)	T1 (mmHg)	T2 (mmHg)	T3 (mmHg)	T4 (mmHg)	T5 (mmHg)	T6 (mmHg)
I (CMC Na)	111,40±17,0	126±5,52	127,80±3,70	140,2±4,71	150±9,87	154±6,44	161,2±10,61
II (105,4±9,39	122±7,58	134±11,66	148,4±7,46	129,4±4,33	120,6±3,78	115±3,39
III	102±7,90	126,2±7,52	134,2±7,39	142,4±4,39	139±3,93	133,4±3,57	129±2,54
IV	99,4±5,81	126,4±8,64	134,8±10,13	142,2±5,35	140±4,12	137±4,0	136,4±5,59
V	104±6,85	123±6,59	130,2±6,68	147,2±7,69	147±11,78	145±11,85	140,2±10,47

given therapy, this decrease was greater than in groups III, IV,

The results showed that the treatment group that was given talli bamboo root extract at a dose of 40 mg / KgBW had a higher decrease in systolic blood pressure compared to other extract doses, the treatment group given the highest dose had a small decrease in blood pressure compared to the treatment group given a dose the smallest. In group I (CMC 1%) from T0 to T6 the mean systolic blood pressure remained high, this is because the administration of CMC had no effect in reducing blood pressure. In group II, there was an increase in T1 to T3 after prednisone and NaCl were induced, then blood pressure dropped at T4 to T6 after being

and V because group II was a positive control namely hydrochlorothiazide drug. In group III, there was an increase in T1 to T3 after prednisone and NaCl were induced, then blood pressure dropped at T4 to T6 after being given therapy, this decrease was greater than in group IV or V. Group IV had an increase in T1 to T3 after being induced prednisone and NaCl, then blood pressure dropped at T4 to T6 after being given therapy, this decrease was greater than in group V and in group V there was an increase in T1 to T3 after being induced by prednisone and NaCl, then blood pressure dropped at T4 to T6 after being given therapy [14].

Table 2. Mean of dyastolic blood pressure with time for each treatment.

Group	T0 (mmHg)	T1 (mmHg)	T2 (mmHg)	T3 (mmHg)	T4 (mmHg)	T5 (mmHg)	T6 (mmHg)
I	79,60±14,38	83,2±7,32	92,2±9,03	104±4,18	106,8±11,18	115,6±4,72	121,8±10,52
II	72±6,59	79,6±7,70	96±13,09	104,8±5,58	87,4±8,26	83,4±4,82	78,2±2,94
III	67,4±8,29	83,6±4,15	87,2±3,34	105,8±6,90	92,8±8,75	92,4±5,94	89,8±3,49
IV	71,2±6,61	85,6±8,11	90,2±6,09	107,8±5,49	100,4±7,50	97,2±9,20	94,8±8,7
V	72,6±9,20	78,8±5,89	85,2±7,22	116,6±12,25	113,4±13,84	112,2±15,27	106±12,70

The table 1 and 2 shows that group III (Extract 40 mg / kg) has an increase in systolic blood pressure at T1 to T3 and then decreases at T4 to T6 whereas in group IV (Extract 80 mg / kg) there is an increase in blood pressure at T1 up to T3 and have decreased at T4 to T6. Group V (Extract 160 mg / kg) experiences an increase in blood pressure at T1 to T3 and decreases at T4 to T6. Tali bamboo root extract with dose of 40 mg / Kg BW, 60 mg / KgBW, 80 mg / KgBW can provide a decrease in systolic and diastolic blood pressure due to the presence of flavonoid compounds that have biological activity as a diuretic [15]. The active ingredient in bamboo root that can reduce blood pressure is BSP (Bamboo Shoot Peptide) because of its diuretic and vasodilation effect, which can reduce hypertension [6], [7], [16]. Because the main compound contained in starfruit leaf extract is better extracted when given in small doses. Group III (dose I 40 mg / KgBW) is the most effective dose to reduce blood pressure compared to Group IV (Dose 80 mg / KgBW) and group V (dose 160 mg / KgBW) this is because the main compound contained in starfruit leaf powder extraction is better when given in small doses.

IV. CONCLUSION

The results of this study suggest that ethanol extract of tali bamboo shoot (*Gigantochloa apus* (Schult. & Schult.f.) Kurz ex Munro) at a dose of 40 mg / BW is the most effective dose in reducing the blood pressure of male Sprague-Dawley white rats.

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