

Antihypertensive Effect of Ethanol Extract of *Solanum sanitwongsei* Craib. Fruit in Hypertensive Wistar Rats

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Abstract: The Fruit of *Solanum sanitwongsei* has been used in southeast asia, especially in Indonesia and Thailand as traditional medicine. Ethanol Extract of *Solanum sanitwongsei* Craib, was evaluated its antihypertensive effect in hypertensive Wistar rats. Male Wistar rats were induced with sodium chloride 2.5% and metylprednisolone 1.5 mg/kg bw oral for 7 days. Hypertensive Wistar rats were given ethanol extract of solanum sanitwongsei for 7 days. Blood pressure elevation of the animals was significantly ($p < 0.05$) decreased by the ethanol extract of *Solanum sanitwongsei* at the dose levels of 100, 150 and 150 mg/kg bw, oral. Bisoprolol, as a standard drug beta blocker at the dose of 0.0714 mg/kg bw, oral showed significantly ($p < 0.05$) reduced in the elevated blood pressure.

Key words: *Solanum sanitwongsei*, antihypertensive effect, beta blocker.

Introduction

Hypertension is a silent killer disease. It is one of the leading cause of disability, mortality, and morbidity along the the population. It is the most common chronic disease in the world.^{1,2}

Hypertension is the cardiovascular disease who caused many cardiovascular pathologies including coronary artery disease, heart failure, atherosclerosis, renal insufficiency and myocardium infract.³

Most of antihypertensive drugs have efficacy but have side effects was dangerous. Recently attention has been focused to herbal medicine which are traditionally used as potential therapeutic agents in the prevention and therapy of hypertension.⁴

Solanum sanitwongsei commonly known as 'Inggir-Inggir' included in genus solanum. It is grown in Southeast Asia like Thailand, Indonesia, Phillipina and Malaysia. The fruit is used in folk medicine in the treatment of diabetes, cough.^{5,6}

Reportedly, ethanol extract of *Solanum sanitwongsei* had diuretic effect and increased electrolyte excretion, sodium and potassium in Wistar rats.⁷

There are no reports in the literature, to the best of our knowledge on the antihypertensive effect of *Solanum sanitwongsei*. Therefore, the objective of this study was to investigate the antihypertensive effect of ethanol extract of *Solanum sanitwongsei* fruit in sodium chloride and metylprednisolone induced by using SBP (Systole Blood Pressure), DBP (Diastole Blood Pressure), MAP (Mean Arterial Pressure) and HR (Heart Rate) as biomarkers.

Materials and Method

Plant Materials

Fruit of *Solanum sanitwongsei* was obtained from Buntu Kayu Village, Siantar City, Indonesia. It is dried in Pharmacology Laboratory of North Sumatera University (Medan, Indonesia) and the dried fruit was drilled to be powder. The plant was identified in Indonesia Institute of Science, Research Center for Biology, Bogor, Indonesia.

Preparation of plant extract

The dried powdered fruits of *Solanum sanitwongsei* were kept for maceration with distilled ethanol for 5 days. Extract was filtered through in vacuum evaporator, thicked extract.

Experimental animals

Male Wistar rats (150-200g) were purchased from Pharmacology Laboratory of North Sumatera University, Medan, Indonesia. They were housed in polypropylene cages in a controlled room temperature 25°C. The animals were maintained with standard pellet diet. The animals were acclimatized to laboratory condition for seven days before experiment. All studies were carried out using 5 rats in each group.

Chemical Instrument

Sodium chloride was purchased from Merck (Germany), metylprednisolone, 4 mg tablet and bisoprolol, 5 mg tablet was purchased from Dexa Medica, Bandung, Indonesia. Ultra Sonography Gel was purchased from local market. Four channel recorder powerlab (AD Instruments) system was used for the measurement of blood pressure.

Phytochemical evaluation

Ethanol extract of *Solanum sanitwongsei* was studied for its phytoconstituents such as alkaloid, steroid and triterpenoid, glycosides, tannis and flavonoids.⁸

Antihypertensive activity^{9,10}

Male wistar rats were induced with sodium chloride 2.5% and metylprednisolone 1.5 mg/kg bw for seven days. Hypertensive Wistar rats were divided into the 5 groups each groups had five animals. Animals in negative control only were measured its blood pressure without received treatment, positive control received bisoprolol treatment 0.0714 mg/kg bw and ethanol extract of *Solanum sanitwongsei* was administered orally at the dose levels of 50, 100 and 150 mg/kg bw. All treatment was given for 7 days. Blood pressure was measured from the first day until seventh day. Blood pressure was detected by tail vein used NIBP (Non invasive Blood Pressure) tool. Ultrasonography was lubricated on rat tail before the detector entered into the tail. Parameters of blood pressure are DBP, SBP, and HR was recorded on computer. MAP was calculated from formula of DBP and SBP levels. Bisoprolol 0.0714 mg/kg bw was used as a standard. Changes in blood pressure of treated groups were compared with normal blood pressure and negative control group.

Statistical Analysis

The results are expressed as the mean±SD for each group. Statistical differences were evaluated using a one way analysis of variance (ANOVA) followed by Post Hoc Test. Results were considered to be statistically significant at p<0,05.

Results

Phytochemical evaluation

The phytochemical evaluation of ethanol extract of *Solanum sanitwongsei* revealed the presence of alkaloids, glycosides, steroids, triterpenoids, flavonoids and tannins.

Cardiovascular parameters

SBP, DBP, MAP and HR were shown for the experimental groups [Table 1].

A significant ($p < 0.05$) increased in SBP, DBP and HR was observed when sodium chloride and methylprednisolone induced was compared with normotensive rats. But, treatment of ethanol extract of *Solanum sanitwongsei* (EESS) at the dosed 50, 100 and 150 mg/kg bw significantly ($p < 0.05$) decreased SBP, DBP and MAP levels.

Table 1: Effects of ethanol extract of *Solanum sanitwongsei* on cardiovascular parameters in sodium chloride and methylprednisolone-induced hypertensive rats.

	SBP (mmHg)	DBP (mmHg)	MAP (mmHg)	HR (/min)
Hypertensive	194±5.57	154.6±4.88	167.4±2.07	415±42.38
Hypertensive + EESS 50	185.4±4.39	153±5.48	163.2±4.97	413.6±41.72
Hypertensive + EESS 100	167.2±8.08	131.8 ± 3.70	143.2±2.17	409.6±26.33
Hypertensive + EESS 150	173,8±5.89	130.6±3.36	144.6±3.05	456.8 ± 30.43
Hypertensive + bisoprolol 0.0714	136.4±3.36	108.6±6.54	117.2±4.21	461±21.88
Normotensive	129.4±3.78	95±4.74	110.2±4.27	366.4±99.59

Values are expressed as Mean ± SD;

a = significant difference compared with control group ($P < 0.05$)

b = significant difference compared with hypertensive group ($P < 0.05$)

e = significant difference compared with control group ($P < 0.05$)

SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; MAP = Mean Arterial Pressure; HR = Heart Rate

EESS 50 = Ethanol Extract of *Solanum sanitwongsei* at dose 50 mg/kg bw; EESS 100 = Ethanol Extract of *Solanum sanitwongsei* at dose 100 mg/kg bw; EESS 150 = Ethanol Extract of *Solanum sanitwongsei* at dose 150 mg/kg bw

Discussion

Hypertension is a major factor of cardiovascular disease and high dietary salt intake has also been shown to contribute to its etiology and prevalence.¹¹

Use of corticosteroids caused increase response of adrenal cortex to produce cortisol. Increased of cortisol in blood indirectly will increased blood pressure. So, Combination between sodium chloride with methylprednisolone would increase blood pressure significantly and constant.¹²

Results of the present study indicate that the ethanol extracts of *Solanum sanitwongsei* significantly reduced the blood pressure in sodium chloride and methylprednisolone induced in rats. hypertensive rats treated ethanol extracts of *Solanum sanitwongsei* at the dose 100 and 150 mg/kg bw exhibited marked decrease in the SBP, DBP and MAP. But HR was not decreased by it. This result is similar to findings for hypertension using extract of *Solanum macrocarpum*, root of *Apium graveolens* and fruit of *Brucea javanica*. Furthermore, our finding showed that extract of *Solanum sanitwongsei* had diuretic effects, increasing the GFR, urine volume and urinary Na⁺ and K⁺ excretions.^{9, 10, 11}

There are no reports in the literature about the active compound of *Solanum sanitwongsei* and how its mechanism. However, our findings from the other plant showed alkaloids, triterpenoids and flavonoids is the most active compound who can decreased blood pressure. Isolation of triterpenoid from *Centella asiatica* leaves had antihypertensive effect in hypertensive rats.¹³ Alkaloids from *Heimia salicifolia* leaves had antihypertensive activity too.¹⁴ Rutin, kuersetin, solagenine 6- α - β -D kuinovopiranosida, solagenine 6- α -L ramnopiranosil are flavonoid compound which have antihypertensive activity. This compounds was content in *Solanum torvum* fruits.¹⁵ Mechanism of flavonoid has been known like: inhibit angiotensin release by inhibition

of angiotension converting enzyme. Angiotensin II is a potent vasoconstrictor leading to hypertension. Furthermore, flavonoids can inhibit beta reseptor in heart and prevent influks calcium into the cell.¹⁶

The results indicate that *Solanum sanitwongsei* have antihypertensive effect. This was evident from the reduced levels of the systolic blood pressure, diastolic blood pressure and mean arterial pressure. A Compound can be said as antihypertensive if it can reduced SBP and DBP <20 mmHg.¹⁷ Ethanol extract of *Solanum sanitwongsei* can reduced it. A reduction in SBP by 5 mmHg and DBP by 2 mmHg could reduce the risk of stroke by 14% and coronary heart disease by 8%.^{18,19} Thus, extract of *Solanum sanitwongsei* appears to contain natural product which can be used to manage hypertension. The results can further suggest the possible use of *S.sanitwongsei* as nutraceutical against increased blood pressure.

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