Antihypertensive Effects of Purslane (*Portulaca oleracea*) Extract in Animal Model of Hypertension

Afifah Bambang Sutjiatmo\*1, Suci Nar Vikasari\(^2\), Falna Bintussolihah\(^3\)

\(^1\)Faculty of Pharmacy, Universitas Jenderal Achmad Yani, Jl. Terusan Jenderal Sudirman, Cimahi 40533, West Java, Indonesia

*Corresponding author’s : afifah@lecture.unjani.ac.id

Abstract. Traditionally, purslane (*Portulaca oleracea*) is used as an antioxidant, anti-diarrhea, hemorrhoid medication, anti-hypertension, and blood circulation. This study aims to examine the antihypertensive effect of the ethanol extract of purslane in an animal model of hypertension with epinephrine induction. The ethanol extract of purslane was made in 50% ethanol solvent. The antihypertensive effect was tested by induction of epinephrine 0.25 mg/kg bw and systolic and diastolic blood pressure were measured non-invasively using the Kent Coda Scientific System. The dose of purslane ethanol extract were 27.5; 55, and 110 mg/kg bw, and propranolol 1.8 mg/kg bw was used as comparisons. The results showed that the ethanol extract of purslane at dose of 27.5; 55 and 110 mg/kg BW were able to suppress the increase in systolic and diastolic blood pressure when compared to controls (p<0.05). The antihypertensive effect of ethanol extract of purslane at a dose of 110 mg/kg bw gave the best results and was equivalent to propranolol (p> 0.05). It can be concluded that the ethanol extract of purslane had potential effect as an antihypertensive.

1. Introduction

Hypertension is a condition characterized by an increase in diastolic and systolic blood pressure above normal. Some of the factors that can cause hypertension are family history, unhealthy diet, high sodium diet, lack of exercise, alcohol consumption, smoking, obesity, stress and drug use.(1)

Purslane is a plant that has high nutritional value which is beneficial for health. Purslane can be used as an antiseptic, diuretic, anti-inflammatory skin, antibacterial, antifungal, antidiabetic, antioxidant, muscle relaxant and prevent heart disease.(2,3) Administration of aqueous extract of purslane in an animal model of diabetes induced by rosiglitazone showed its ability to reduce levels of glucose, triglycerides and LDL cholesterol in the blood. Purslane extract is also able to reduce systolic blood pressure in diabetic db/db mice.(4) In the antihypertensive effect assay of hydroalcoholic extract of purslane seed in dexamethasone-induced hypertension, it was shown that the extract could not prevent the increasing of systolic blood pressure. Oral administration of purslane extract also increased heart rate and decrease thymus weight.(5) Therefore, an experiment with other induction methods is needed to determine the antihypertensive effect of purslane. This study aims to examine the antihypertensive effect of the ethanol extract of purslane herb in epinephrine-induced animal models.

2. Material and Methods

This study was a preclinical experimental and conducted accordance to approval of the institutional ethics committee No. 4001/KEP-UNJANI/X/2017.
2.1. Sample collection and determination
Purslane (P. oleracea) herbs were collected from West Java province and the determination was carried out at the Herbarium Bandungense, Universitas Padjadjaran.

2.2. Processing, characterization and extraction
Purslane were washed, dried and mashed into powder, then stored in dry container as simplicia. The ethanol extract of purslane herbs was made using 50% ethanol using continuous extraction and thickening using a rotary evaporator. The viscous extract was dried at ±60°C. The yield of purslane herbs ethanol extract was ±7.18% w/w.

2.3. Antihypertension assay
In this study, antihypertension assay was done using epinephrine 0.25 mg/kg bw as inductor. The measurement of blood pressure was done indirectly in tail vein using Kent Scientific's CODA system. Male Wistar rats, 200-350 g, were obtained from Animal Laboratory of Bioscience and Biogenetic Research Group, Institut Teknologi Bandung. The animals were divided into 5 groups, each 5 animals, control, propranolol 1.8 mg/kg bw and ethanol extract groups at doses of 27.5; 55, and 110 mg/kg bw. Before testing, the test animals were fasted for ±18 hours. At the beginning of the experiment, diastolic and systolic blood pressure were measured, and then the animals were given the preparation according to the group. Thirty minutes after administration of the preparation, the animals were induced by epinephrine 0.25 mg/kg by ip. Diastolic and end systolic blood pressures were re-measured after thirty minutes of epinephrine administration. The results of blood pressure measurements were statistically processed using the Student-t test using SPSS 23.(6)

3. Results and Discussion
To ensure the quality of herbal medicines, the characteristics of the simplicia are determined. The characterisation included water content, total ash content and extractable matter. The determination of the ash content is carried out to determine the physiological ash (which comes from the plant itself) and non-physiology (which comes from extraneous compounds such as soil) present in the sample. Determination of extractable matter is carried out to determine the amount of active compounds that can be extracted.(7) The results showed that the simplicia characterization had water content ±8.00%, total ash content ±25.00%, water soluble content ±36.18% and ethanol soluble content ±12.99%.

In this assay, antihypertension evaluation of purslane extract was done using epinephrine induction and measurement of blood pressure was done indirect through the tail using Kent Scientific's CODA system. Epinephrine ia a sympathomimetic, it can increase the contracting effect of blood vessels so that peripheral resistance will rise and cause increasing of systolic and diastole blood pressure.(8) In this research, propranolol is used as comparator. Propranolol is an antihypertensive drug with a mechanism of action as a beta blocker (β-adrenergic) blocker. Propranolol acts on both β1 and β2 adrenergic receptors, which can cause a decrease in total cardiac blood output.(9,10) Blood pressure measurement is carried out indirect from tail vein using Kent Scientific's CODA system. Basic principle of this equipment on VPR (Volume Pressure Recording), which is cooperated with pressure transducer sensor The choice of this antihypertensive test method is because it can be used to measure diastolic blood pressure in conscious animals in the short or long term.(11) The parameters measured in this test are diastolic and systolic blood pressure, before and after administering the test preparation and induction of epinephrine 0.25 mg/kg bw. This experiment also calculated the increasing of diastolic and systolic blood pressure. The results of blood pressure measurements before and after giving the test preparation (control preparation, comparator propranolol 1.8 mg/kg bw and ethanol extract of purslane herbs at doses of 27.5, 55 and 110 mg/kg bw can be seen in Table 1 – 2.
Table 1. The results of the antihypertensive effect of the ethanol extract of purslane on diastolic blood pressure

| Groups              | Diastolic blood pressure (mmHg) at minute- | Difference (mmHg) | %inhibitor |
|---------------------|------------------------------------------|-------------------|------------|
|                     | 0            | 60                |             |
| Control             | 70.04±3.99  | 108.58±3.40       | 38.53       |
| Propranolol 1.8 mg/kg bw | 72.96±8.38  | 101.41±3.11*      | 28.45       |
| Extract 27.5 mg/kg bw| 73.49±8.19  | 100.60±12.44*     | 27.11       |
| Extract 55 mg/kg bw  | 68.56±2.73  | 97.32±11.63*      | 28.78       |
| Extract 110 mg/kg bw | 70.41±8.81  | 93.10±10.48*      | 22.70       |

n=4, *p<0.05 compared to control group using t-test

Table 2. The results of the antihypertensive effect of the ethanol extract of purslane on systolic blood pressure

| Groups              | Systolic blood pressure (mmHg) at minute- | Difference (mmHg) | %inhibitor |
|---------------------|------------------------------------------|-------------------|------------|
|                     | 0            | 60                |             |
| Control             | 108.88±6.50 | 149.97±5.64       | 41.10       |
| Propranolol 1.8 mg/kg bw | 117.25±9.42| 142.08±6.51       | 28.45       |
| Extract 27.5 mg/kg bw| 109.65±10.45| 139.92±18.08     | 30.27       |
| Extract 55 mg/kg bw | 102.40±5.26 | 134.95±14.28     | 32.55       |
| Extract 110 mg/kg bw| 105.46±8.11 | 128.64±8.03       | 23.18       |

n=4, *p<0.05 compared to control group using t-test

Based on tables 1 and 2, it is obtained data that the ethanol extract of purslane can prevent the increase in diastolic and systolic blood pressure in epinephrine induced animal models. The results showed that the extract was able to inhibit the increase in diastolic blood pressure by 25.37-41.10%, while propranolol inhibited by 26.17%. The results also showed the ability of the extract to inhibit the increase in systolic blood pressure by 20.81-43.59%, while propranolol was able to inhibit it by 30.78%.

The mechanism of action of herbs as an antihypertensive is related to their ability to reduce oxidative stress by decreasing inflammatory markers, inhibiting free radical formation, increasing nitric oxide bioavailability, increasing cellular antioxidant activity, and inhibition of ACE enzyme activity resulting in decreased Angiotensin II. Therefore, antioxidants of purslane effects is useful as hypretension therapy. The antioxidant effect of purslane was tested using the DPPH and ABTS radical scavenging activity and ferric reducing activity power assay. The compound contained in the purslane is thought to play an important role in the effect of purslane as an antioxidant. Purslane contain flavonoids, terpenoids, coumarins, alkaloids, sterols and various nutrients including calcium, magnesium, thiamin, riboflavin, nicotinic acid, vitamin C, carotene, vitamin E, fatty acids, omega-3, linolenic acid, oxalic acid.

4. Conclusion

The ethanol extract of purslane herbs at doses of 27.5, 55 and 110 mg/kg bw can prevent the increasing of diastolic and systolic blood pressure in animal model of hypertension induced by epinephrine 0.25 mg/kg bw. where the best results are shown by the ethanol extract at a dose of 110 mg/kg bw and equivalent to propranolol (p> 0.05). The ethanol extract of purslane had potential effect as an antihypertensive.

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