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Article Review

Review of Antihypertensive Activity of Purslane (*Portulaca oleracea* L.)

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Abstract

Hypertension is a chronic disease in which blood pressure in the arteries increases. Hypertension is a health problem that has a risk of causing other diseases such as coronary heart disease, kidney failure, nerve dysfunction and stroke. Plants such as purslane (*Portulaca oleracea* L.) are one of the plants that have benefits in treating disease. The purpose of the review article is to determine the potential of *P. oleracea* as an anti-hypertensive. This research is a Review Journal. The subject of this review is national and international articles indexed nationally and internationally in the last 10 years which discuss the antihypertensive ability of *P. oleracea* by classifying them based on the type of study and test model used in-vivo, the potential of the plant in lowering blood pressure, mechanism of action in treating hypertension, and specific chemical constituents responsible for anti-hypertensive activity. Based on the results of studies conducted on several journal articles, it can be concluded that *P. oleracea*: (1) exhibits promising antihypertensive properties through various mechanisms, including vasodilation, reduction of heart rate, and improvement of endothelial function; (2) Clinical trials and comparative studies indicate that it can significantly reduce systolic blood pressure, making it a potential natural adjunct in managing hypertension; (3) exhibits multiple mechanisms that can help manage hypertension, primarily through its antioxidant, anti-inflammatory, and lipid-regulating properties; (4) contains several bioactive compounds that contribute to its antihypertensive effects such as asperglaucide (ASP), oleracein E and oleracein L, omega-3 fatty acids, quercetin, and rutin.

Keywords: Antihypertensive; Blood pressure; *Portulaca oleracea* L; Purslane

1. INTRODUCTION

Hypertension or what is commonly referred to as high blood pressure is a chronic disease in which blood pressure in the arteries increases. Hypertension is also a health problem that has a risk of causing other diseases such as coronary heart disease, kidney failure, nerve dysfunction and stroke. Hypertension often causes no symptoms and can kill the sufferer silently, so it is called The Silent Killer.

Data from the World Health Organization or World Health Organization (WHO) in 2023 stated that there were 1.28 billion people suffering from hypertension and it is estimated that every year 9.4 million people die due to hyper-tension and complications [1]. The 2018 basic health survey (Riskesdas) shows an increase in the frequency of hypertension in Indonesia, namely 34.11% and this number is expected to become greater every year. According to South Sulawesi Provincial Health Service data in 2020, based on data from Regency/City, the highest prevalence was occupied by Makassar City with a total of 158,516 cases [2]. Most hypertension sufferers complain that the cost of treatment is expensive so using generic drugs is the best solution, but in practice as many as 2% of health facilities in Indonesia do not have adequate drugs. There is a need for other alternatives that utilize Indonesia's natural potential to develop natural drug therapy that has good effectiveness, is not burdensome and is safer for the Indonesian people [3].

Plants such as purslane (*Portulaca oleracea* L.) are one of the plants that have benefits in treating disease. Purslane, which comes from the Portulacae family, is a climbing ornamental plant that is easy to care for and grows quickly. Apart from being cultivated as an ornamental plant, the purslane can also be used as a medicinal plant, where the purslane has many benefits including curing skin rashes, sore throats, immunostimulants, anti-hepatitis B, natural antimicrobial, and disease medicine. degenerative diseases such as cancer, tumors, hypertension, diabetes, liver and Alzheimer's [4].

Purslane is a type of wild plant that grows anywhere, especially in sandy areas and soil. This plant is an annual herbaceous plant that lives in tropical climates and has the characteristics of fleshy purplish green stems with blunt leaf tips, has yellow flowers and has small seeds that are black when ripe and reddish brown when immature [5,6]. Research related to the use of purslane as a medicinal plant has been widely carried out, including, Jayanti (2022) researched the effects of ethanol extract of purslane on GDP and α-Amylase of Rats Alloxan-Induced Hyperglycemia [7], Yuniastri (2020) researched the antioxidant potential of purslane as a functional food [8], Andayani (2018) researched the anti-inflammatory effect of ethanol extract of purslane on carrageenin-induced edema in rats [9], Azizah (2023) in his book related the potential of the purslane plant as an anti-obesity medication [10] and many other studies.

Research on the effect of administering ethanol extract of purslane on reducing systolic and diastolic pressure in white rats with a model of hypertension is an interesting topic in the field of experimental research. The purslane has been known as a medicinal plant that has various properties, but research on the effect of administering purslane ethanol extract on reducing systolic and diastolic pressure in white mice with a model of hypertension is still very limited, so it is hoped that this review can provide new information about the potential use of purslane plants as an alternative medicine for hypertension.

2. MATERIALS AND METHODS

2.1. Material

International and national articles as literature sources are indexed on the sites SINTA (Science and Technology Index) and Scimago JR (Scimago Journal Ranking).

2.2. Instrument

Article search engine Google Scholer, Crossref, PubMed, Scopus, ScienceDirect and Elsevier.

2.3. Method

This research is a Review Journal. The subject of this review is national and international articles indexed nationally and internationally in the last 10 years which discuss the antihypertensive ability of purslane by classifying them based on the type of study and test model used in-vivo, the potential of the plant in lowering blood pressure, mechanism of action in treating hypertension, and specific chemical constituents responsible for antihypertensive activity. Search for articles based on the keywords antihypertension, purslane*, Portulaca oleracea* L., and blood pressure.

3. RESULT AND DISCUSSION

The purslane plant with the Latin name *Portulaca oleracea* L is a plant from the Portulacaceae family which has more than 120 different species. This plant is generally used in society as a vegetable, spice and medicine [9]. The characteristics of the purslane plant are that it has a round stem that grows partially or completely upright without producing roots and is located above the ground. It has single, thick, green leaves with reddish stems. The purslane is a plant that can be cultivated easily by having its seeds fall to the surface of the ground as they dry out, then the seeds grow by themselves. Apart from that, purslane is also a plant with flavonoids, phenols, saponins, alkaloids and glycosides [11].

Purslane plants based on their taxonomic structure are classified as follows [10]:

Kingdom : Plantae
Sub Kingdom : Tracheobionta
Division : Magnoliophyta
Class : Magnoliopsida
Sub Class : Caryophylidae
Ordo : Caryophyllales
Family : Portulacaceae
Genus : Portulaca
Spesies : *Portulaca oleracea* L.

Figure 1. Plant of *Portulaca oleracea* L.

Several studies show that the purslane plant has properties as a diuretic, antioxidant, anti-inflammatory, hypolipidemic, anticonvulsant, antimicrobial, etc. which are related to the chemical compounds contained in this plant such as flavonoids, alkaloids, omega-3 fatty acids. 3 and phenolic acids. Apart from that, traditionally purslane has been used by people throughout the world to cure various diseases such as skin diseases, fever, dysentery, diarrhea, bleeding, coughs, shortness of breath, kidney and liver diseases, and asthma [12].

Table 1. Classification of Purslane antihypertensives based on Study type and model methods.

Study Type	Model	Dosage	Result	Reference
Animal Study	Epinephrine-induced hypertension	27.5, 55, 110 mg/kg bw	Significant reduction in systolic and diastolic BP	[13]
Animal Study	Dexamethasone-induced hypertension	100, 200, 400 mg/kg/d	No prevention of SBP rise, increased heart rate at 400 mg/kg/d	[14]
Clinical Trial	T2DM patients	300 mg/day	Significant reduction in systolic BP	[15]
Animal Study	Renovascular hypertension	ASP treatment	Decreased MBP, improved endothelial function	[16]

In an animal model of hypertension induced by epinephrine, purslane ethanol extract at doses of 27.5, 55, and 110 mg/kg body weight (bw) significantly suppressed the increase in both systolic and diastolic blood pressure. The highest dose (110 mg/kg bw) showed effects comparable to propranolol, a standard antihypertensive drug [13]. Asperglaucide (ASP), a constituent of purslane, significantly decreased mean blood pressure in a renovascular hyper-tension model. It improved endothelial function and increased eNOS gene expression and protein levels, suggesting a potential role in managing hypertension [16]. A clinical trial involving patients with type 2 diabetes mellitus (T2DM) showed that purslane extract significantly reduced systolic blood pressure. This suggests that purslane could be a beneficial adjunct treatment for managing hypertension in diabetic patients [15].

Table 2. The potential of purslane in lowering blood pressure

Intervention	Outcome	Reference
Portulaca oleracea extract (12 weeks)	Significant reduction in systolic BP (-7.5 ± 5.0 mmHg)	[17]
Portulaca oleracea seeds (5 weeks)	Significant reduction in systolic BP (-3.33 mmHg)	[18]
Portulaca oleracea extract vs Valsartan	Effective reduction in systolic BP and heart rate	[15]

Studies have shown that purslane extract can significantly reduce systolic blood pressure. In a clinical trial, participants treated with purslane extract experienced a notable decline in systolic blood pressure compared to the placebo group (-7.5 ± 5.0 mmHg vs. -0.01 ± 0.3 mmHg, $P < .0001$) [1]. Another study reported a significant reduction in systolic blood pressure after consuming purslane seeds for 5 weeks (-3.33 mmHg vs. 0.5 mmHg, $P = 0.01$) [18]. The antihypertensive effects of purslane are likely due to its antioxidant properties, which help reduce oxidative stress markers and improve hemodynamic parameters [3]. The plant's ability to modulate nitric oxide (NO) levels and enhance antioxidant enzyme activities (such as superoxide dismutase and catalase) contributes to its cardiovascular benefits [15]. In a study comparing the effects of purslane extract, valsartan (a known antihypertensive drug), and vitamin E on hemodynamic changes, purslane extract was found to lower systolic blood pressure and heart rate effectively [15].

Table 3. Mechanisms of Action of Portulaca oleracea in Managing Hypertension

Mechanism	Description	Reference
Antioxidant and Anti-inflammatory	Reduces oxidative stress and inflammation, key factors in hypertension.	[17]
Endothelial Function Improvement	Activates AMPK/eNOS pathway, enhancing NO production for vasodilation.	[19]
Regulation of Lipid Profiles	Balances lipid levels, reducing risk factors for hypertension.	[17]
Anti-hyperlipidemic Effects	Inhibits hyperlipidemia, maintaining normal cholesterol and triglyceride levels.	[20]
Immunomodulatory Effects	Enhances Th1/Th2 and Treg/Th2 balances, reducing inflammation.	[21]
Potential Adverse Effects	May increase heart rate and SBP in certain conditions.	[14]

Purslane contains a variety of bioactive compounds such as flavonoids, terpenoids, and alkaloids, which contribute to their antioxidant and anti-inflammatory activities [1,2]. Purslane can balance lipid profiles, which is beneficial in managing metabolic syndrome, a condition often associated with hypertension. By lowering blood glucose and lipid levels, purslane helps in reducing the risk factors associated with hypertension [17]. These properties help in reducing oxidative stress and inflammation, which are key factors in the development and progression of hypertension. Purslane has been shown to improve endothelial function by activating the AMPK/eNOS signaling pathway. This activation leads to enhanced nitric oxide (NO) production, which is crucial for vasodilation and blood pressure regulation [19]. The reduction of endoplasmic reticulum (ER) stress and oxidative stress in the vasculature further supports its role in maintaining endothelial health [19]. The ethanolic extract of purslane leaves has demonstrated significant inhibition of dexamethasone-induced hyperlipidemia in rats, maintaining serum cholesterol and triglyceride levels near normal [20]. This effect is important as hyperlipidemia is a well-known contributor to hypertension. Purslane extract has been shown to modulate immune responses by enhancing the Th1/Th2 and Treg/Th2 balances, which may help in reducing inflammation-related hypertension [21]. It is important to note that while purslane has beneficial effects, it may also exacerbate hypertension in certain conditions. For instance, in dexamethasone-induced hyper-tensive rats, purslane extract was found to increase heart rate and did not prevent the rise in systolic blood pressure (SBP) [14]. This suggests that caution is needed when using purslane in hypertensive patients, especially those receiving glucocorticoids [14].

Table 4. Specific Chemical Compounds in Portulaca oleracea Contributing to Antihypertensive Effects

Compound	Effect	Mechanism	Reference
Asperglaucide (ASP)	Lowers blood pressure, improves endothelial function	Increases eNOS expression, reduces ROS/RNS production	[13]
Oleracein E and Oleracein L	Antioxidant activity reduces oxidative stress	Enhances superoxide dismutase and catalase activity	[22]
Hydroalcoholic Extracts	Reduces systolic blood pressure and heart rate, improves oxidative stress	Increases thiol concentration, superoxide dismutase, and catalase activities, decreases malondialdehyde	[21,23]
Omega-3 Fatty Acids, Quercetin, Rutin	Antioxidative properties, vascular health improvement	Reduces oxidative stress, improves vascular function	[24]

Asperglaucide (ASP) has been shown to significantly decrease mean blood pressure (MBP) in hypertensive rats. ASP improves endothelial function, increases endothelial nitric oxide synthase (eNOS) expression, and enhances vascular relaxation. It also reduces reactive oxygen and nitrogen species (ROS/RNS) production, which are associated with

hypertension [13]. Oleracein E and Oleracein L exhibit significant antioxidant activity, which can mitigate oxidative stress, a known contributor to hypertension. By enhancing the activity of antioxidant enzymes like superoxide dis-mutase and catalase, these compounds help reduce oxidative damage, potentially lowering blood pressure [22]. Studies have shown that hydroalcoholic extracts of Purslane seeds can reduce systolic blood pressure (SBP) and heart rate in animal models of induced hypertension. These extracts also improve oxidative stress markers by increasing thiol concentration and the activities of superoxide dismutase and catalase, while decreasing malondialdehyde levels [21,23]. These compounds are known for their antioxidative properties, which can help manage hypertension by reducing oxidative stress and improving vascular health [24].

4. CONCLUSION

Based on the results of studies conducted on several journal articles, it can be concluded that *Portulaca oleracea* L.:

1. Exhibits promising antihypertensive properties through various mechanisms, including vasodilation, reduction of heart rate, and improvement of endothelial function.
2. Clinical trials and comparative studies indicate that it can significantly reduce systolic blood pressure, making it a potential natural adjunct in managing hypertension.
3. Exhibits multiple mechanisms that can help manage hypertension, primarily through its antioxidant, anti-inflammatory, and lipid-regulating properties
4. Contains several bioactive compounds that contribute to its antihypertensive effects such as asperglaucide (ASP), oleracein E and oleracein L, omega-3 fatty acids, quercetin, and rutin.

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REFERENCES

1. WHO. *Global Report on Hypertension: the race against a silent Killer*. **2023**. https://who.int.
2. Susanti, S., Bujawati, E., Sadarang, R.A.I., Ihwana, D. Hubungan *Self Efficacy* dengan manajemen diri penderita hipertensi di Puskesmas Kassi-Kassi Kota Makassar Tahun 2022. *Jurnal Kesmas Jambi* **2022**, 6 (2), 48–58. https://doi.org/10.22437/JKMJ.V6I2.20540.
3. Kementrian Kesehatan RI. Riset Kesehatan Dasar. Badan Penelitian dan Pengembangan Kesehatan Kementrian Kesehatan RI: Jakarta, **2013**.
4. Irsal, R.A.P., Rosyidah, R.A. Kurnia, M.R.A., Aisyah, S.I. Nurcholis, W. Potensi senyawa antioksidan dari tanaman Krokot (*Portulaca grandiflora*): Narrative review. *Jurnal Farmamedika (Pharmamedika Journal)* **2023**, 8 (1), 25–35. https://doi.org/10.47219/ATH.V8I1.192.
5. Zhou, Y.X., Xin, H.L., Rahman, K., Wang, S.J., Peng, C., Zhang, H. *Portulaca oleracea* L.: A review of phytochemistry and pharmacological effects. *Biomed Res Int* **2015**, 2015. https://doi.org/10.1155/2015/925631.

6. Syed, S., Fatima, N., Kabeer, G. *Portulaca oleracea* L.: A mini review on phytochemistry and pharmacology. *International Journal of Biology and Biotechnology* **2016**, 13 (4), 637–641.
7. Jayanti, A.S.D., Sitasiwi, A.J., Isdadiyanto, S. Effect of Purslane (*Portulaca oleracea* L.) ethanol extract in alloxan-induced hyperglycemic rats (*Rattus novergicus* L.) blood glucose levels. *Jurnal Sain Veteriner* **2022**, 40 (3), 237–243. https://doi.org/10.22146/JSV.61937.
8. Yuniastri, R., Hanafi, I., Sumitro, E.A. Potensi antioksidan pada Krokot (*Portulaca oleracea*) sebagai pangan fungsional. *Jurnal Keteknikan Pertanian Tropis dan Biosistem* **2020**, 8 (3), 284–290. https://doi.org/10.21776/UB.JKPTB.2020.008.03.10.
9. Andayani, D., Suprihartini, E., Astuti, M. Efek antiinflamasi ekstrak etanol Krokot (*Portulaca oleracea* L.) pada udema tikus yang di induksi karagenin. *JPSCR: Journal of Pharmaceutical Science and Clinical Research* **2018**, 3 (1), 43. https://doi.org/10.20961/jpscr.v3i1.15108.
10. Azizah, R.N., Emelda, A., Asmaliani, I. Potensi tanaman Krokot (*Portulaca oleraceae*) sebagai bahan obat antiobesitas. Yayasan Pendidikan Cendekia Muslim: Solok, **2023**.
11. Nabilah, L., Dewanti, F.D., Koentjoro, Y., Tarigan, P.L. Respon macam pupuk terhadap pertumbuhan, hasil dan omega-3 pada tanaman Krokot (*Portulaca oleracea* L.). *Agro Bali: Agricultural Journal* **2023**, 6(3), 840–851. https://doi.org/10.37637/AB.V6I3.1290.
12. Husein, S.G., Sundalian, M., Husna, N. Review: Analisis komponen senyawa kimia Krokot (*Portulaca oleraceae* L. dan *Portulaca grandiflora* Hook). *Jurnal Sains dan Kesehatan* **2021**, 3 (2), 317–327. https://doi.org/10.25026/JSK.V3I2.278.
13. Aslan, M., Basralı, F., Ülker, P., Barut, Z., Yılmaz, Ç., Çeker, T., Özen, N., Öztüzün, A., Elpek, Ö. Effects of aurantiamide on a rat model of renovascular arterial hypertension. *Pflugers Arch* **2023**, 475 (10), 1177–1192. https://doi.org/10.1007/S00424-023-02850-8.
14. Miao, L., Zhou, C., Zhang, H., Cheong, M.S., Tan, Y., Wang, Y., Zhang, X., Yu, H., Cheang, W.S. *Portulaca oleracea* L. (Purslane) extract protects endothelial function by reducing endoplasmic reticulum stress and oxidative stress through AMPK activation in diabetic obese mice. *Antioxidants* **2023**, 12(12), 2132. https://doi.org/10.3390/ANTIOX12122132.
15. Wainstein, J., Landau, Z., Dayan, Y.B., Jakubowicz, D., Grothe, T., Perrinjaquet-Moccetti, T., Boaz, M. Purslane Extract and Glucose Homeostasis in Adults with Type 2 Diabetes: A Double-Blind, Placebo-Controlled Clinical Trial of Efficacy and Safety. *Journal of Medicinal Food* **2016**, 19 (2), 133–140. https://doi.org/10.1089/JMF.2015.0090.
16. Sutjiatmo, A.B., Azhari, F., Vikasari, S.N. Vasodilatation effects of *Portulaca oleracea* L. ethanol extract on animal models. *IOP Conf Ser Earth Environ Sci* **2022**, 1104 (1), 012015. https://doi.org/10.1088/1755-1315/1104/1/012015.
17. Jalali, J., Ghasemzadeh Rahbardar, M. Ameliorative effects of *Portulaca oleracea* L. (Purslane) on the metabolic syndrome: A review. *J Ethnopharmacol* **2022**, 299. https://doi.org/10.1016/J.JEP.2022.115672.
18. Esmaillzadeh, A., Zakizadeh, E., Faghihimani, E., Gohari, M., Jazayeri, S. The effect of Purslane seeds on glycemic status and lipid profiles of persons with type 2 diabetes: A randomized controlled cross-over clinical trial. *J Res Med Sci*, **2015**, 20 (1), 47.
19. Kim, K.-H., Park, E.-J., Jang, H.-J., Lee, S.-J., Park, C. S., Yun, B.-S., Lee, S.W., Rho, M.-C. 1-Carbomethoxy-β-carboline, derived from *Portulaca oleracea* L., Ameliorates LPS-mediated inflammatory response associated with MAPK signaling and nuclear translocation of NF-KB. *Molecules* **2019**, 24 (22), 4042. https://doi.org/10.3390/molecules24224042.
20. Askari, V.R., Rezaee, S.A., Abnous, K., Iranshahi, M., Boskabady, M.H. The influence of hydro-ethanolic extract of *Portulaca oleracea* L. on Th1/Th2 balance in isolated human lymphocytes. *J Ethnopharmacol* **2016**, 194, 1112–1121. https://doi.org/10.1016/J.JEP.2016.10.082.
21. Safaeian, L., Baniahmad, B., Esfandiari, Z., Alavi, S.A. *Portulaca oleracea* seeds extract does not prevent dexamethasone-induced hypertension in rats. *Journal of Herbmed Pharmacology* **2017**, 7 (1), 8–12. https://doi.org/10.15171/jhp.2018.02.
22. Roozi, H., Bojar, M.N.A., Eidi, V., Ali, K.N.R. Effects of oleracein E and oleracein L from *Portulaca oleracea* on cell survival, antioxidant and antidiabetic efficacy on beta-TC-6 pancreatic cell line. *Indian J Pharm Sci* **2019**, 81 (4), 681–689. https://doi.org/10.36468/PHARMACEUTICAL-SCIENCES.559.
23. Pakdel, R., Vatanchian, M., Niazmand, S., Beheshti, F., Rahimi, M., Aghaee, A., Hadjzadeh, M.A.R. Comparing the effects of *Portulaca oleracea* seed hydro-alcoholic extract, valsartan, and vitamin E on hemodynamic changes, oxidative stress

parameters and cardiac hypertrophy in thyrotoxic rats. *Drug Chem Toxicol* **2022**, 45 (1), 14–21. https://doi.org/10.1080/01480545.2019.1651330.

24. Karamalakova, Y., Petkova-Parlapanska, K., Hinkov, I., Vetskov, N., Georgieva, E., Nikolova, G. The effect of radiation preservation on macromolecule content, antimicrobial activity and radical - scavenging potential of *Portulaca oleracea* L. leaves extract. *Journal of Chemical Technology and Metallurgy* **2024**, 59(2), 243–249. https://doi.org/10.59957/JCTM.V59.I2.2024.2.