A REVIEW OF ANTIOXIDANT POTENTIAL OF PURPLE SWEET POTATO (*Ipomoea batatas L.*): EFFICACY OF BIOACTIVE COMPOUND IN REDUCING HYPERTENSION

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Abstract: Hypertension is a frequent worldwide health concern and a well-known cardiovascular disease risk factor. This illness is dependent on medicines which can cause a long-term effect. In recent years, purple sweet potato has been employed as an anti-hypertensive agent to prevent cardiovascular disease due to antioxidant activity and anthocyanin content in purple sweet potato. This study determines the efficacy of antioxidant potential in purple sweet potato *(Ipomoea batatas L.)* in reducing hypertension. Bioactive agents such as phenolic and anthocyanin will act as antioxidants and anti-hypertensive. In particular, the maximum extraction of the total anthocyanin and phenolic contents has been done by the ethanol extraction technique. Antioxidant activity of purple sweet potato was determined by 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging activity and ferric reducing power activity (FRAP) assay. The findings show that anthocyanins compound in purple sweet potato has a hypotensive effect on lowering systemic blood pressure and malonaldehyde (MDA) levels in the blood. The role of antioxidant activity in purple sweet potato includes regulating the mechanism of imbalance between free radicals, the cycle of oxidative stress in the body and indicative of lipid oxidation or oxidative stress. Consequently, a further study should explore the significance of antioxidant-active chemicals from purple sweet potatoes to promote health benefits in plant-based foodstuffs and promote natural antioxidants.

Keywords: *Ipomoea batatas* L., purple sweet potato, anthocyanin, hypertension, natural antioxidant

1. Introduction

Purple sweet potato (*Ipomoea batatas* L.) which contains peonidin, pelargonidin and cyanidin were the phenolic compounds found that acts as antioxidants. Bioactive compounds in purple sweet potato are known as anthocyanin The action of free radical scavengers correlates the phenolic compounds found in purple sweet potato with their chemical activities to reduce the properties of electron-gating agents. Recent studies have reported that high anthocyanin content in purple sweet potatoes was more stable than strawberry, purple cabbage and other plants. Salawu et al. (2015) proved that purple sweet potato can achieve almost three times better its antioxidant activity than plant components. Studies by Pouvreau et al. (2018) stated that inflammation and oxidative stress are the critical factors associated with hypertension and diabetes type 2. Concerning this, a study has been done on the protective effects of anthocyanin extract from purple

sweet potatoes on MDA level of sample (rat) while determining the antioxidant capacity of purple sweet potato in reducing hypertension which is mainly caused by cardiovascular disease.

2. Discussion

Two major substances in purple sweet potatoes were anthocyanins and phenolic acids. Anthocyanins play a substantial anti-cancer effect through its antioxidant properties and anti-inflammatory activities to induce the cell proliferation inhibition, cell cycle arrest and apoptosis in specific cancer cells. Studies have shown that the main components of anthocyanin were cyanidin and peonidin that afford thermal and ultraviolet resistance and its antioxidant potential. While phenolic acids in purple sweet potato are chlorogenic, dicaffeoylquinic, caffeic and ferulic acid. Phenolic acids are very important in the human system as they are easily absorbed by the digestive tract walls which act as antioxidants and prevent cell damage. Phenolic content will determine its antioxidant effects in purple sweet potatoes. Tang et al. (2015) explained that value of phenolic content in purple sweet potato is 16.8±0.27 mg GAE/g is the highest while Wong and Tan (2020) reported that phenolic content ranged were from 279.76±24.78 µg GAE/g DW. Different anthocyanin content in purple sweet potatoes were recorded at different time and temperature as the highest was at 70°C heating temperature for 5 minutes with 215.08 mg/L with antioxidant activity of 90.63%.

Table 1. Total anthocyanin in purple sweet potato extract at different time and temperature.

Time	Heating Temperature		
	70ºC	80ºC	90ºC
5 mins	215.08 mg/L	181.01 mg/L	137.93 mg/L
10 mins	203.55 mg/L	175.00 mg/L	114.88 mg/L
15 mins	186.19 mg/L	148.28 mg/L	101.86 mg/L

Source: Dwiyanti et al. (2018).

The anthocyanin in purple sweet potato may act as an antioxidant in preventing oxidative stress due to the imbalance between free radicals. Thus, phenolic molecules are very crucial in protecting oxidative damage. Antioxidant activity of purple sweet potato can be measured by using 1,1-diphenyl-2-picryl-hydrazyl (DPPH) free radical scavenging activity of purple sweet potato based on the electron transfer mechanism with highest value of 27.8±0.34 µmol TE/g (Tang et al., 2015) while recent studies reported that purple sweet potato peel with 1.12±0.01 µmol TE/g is higher than purple flesh sweet potato with 0.24µmol TE/g. Antioxidant activity by ferric reducing power activity (FRAP) which turned ferric ion (Fe^{3+}) to ferrous ion (Fe^{2+}) formed. Zhu et al. (2010) reported that the highest FRAP assay of antioxidant purple sweet potato peel with 6.18±0.01 in Ea3-1 genotypes. Hypertension is a risk factor for cardiovascular disease where the blood pressure remains elevated for an extended period. The increment of hypertension cases is common in low-middle income nations due to lifestyle and food diet. Tsiropoulou et al. (2016) stated that oxidative stress which is an imbalance between pro-oxidants and antioxidants, causes endothelial dysfunction which results in vascular or tissue damage. Excessive ROS production resulted in protein oxidation and dysregulated cell signaling. In addition to inflammation, the processes of proliferation, apoptosis, and migration play a role in poor vascular function, cardiovascular remodeling, renal failure, immune cell activation, and sympathetic nervous system excitation in patients with hypertension. Herawati's findings are consistent with other studies that antihypertensive anthocyanin in purple sweet potato showed a reduction in oxidative stress. She

proved that rats given had a larger reduction in MDA levels in the blood, liver and renal system than rats given a purple sweet potato extract after 35 days of treatment.

Table 2. Malonaldehyde (MDA) levels in rats after 35 days of treatment.

Treatment group	Blood MDA (mmol/L)	Liver MDA (nmol/g)	Renal MDA (nmol/g)
Healthy	2.32±0.14[a]	3.55±0.23[a]	2.97±0.12[a]
Hyperglycemic	8.38±0.22[d]	9.61±0.18[d]	8.75±0.13[d]
Hyperglycemic + low dose APSP extract	3.52±0.11[c]	5.85±0.19[c]	4.17±0.17[c]
Hyperglycemic + high dose APSP extract	2.78±0.13[b]	4.36±0.12[b]	3.78±0.20[b]

Source: Herawati et al. (2020).

3. Conclusion

It can be concluded that the consumption of purple sweet potato significantly helps in reducing cardiovascular disease such as hypertension. Due to their antioxidant potential, including bioactive compounds, especially flavonoid (anthocyanin) and phenolic acids, indicated their effective potential and treatment in lowering the malonaldehyde (MDA) level in blood, liver and renal other than a reduction of oxidative stress and endothelial dysfunction. Future studies should explore the toxicological effects of using purple sweet potato as a natural antioxidant. Additionally, clinical trials on patients are needed to test the viability of purple sweet potato since recent studies on animals have raised some doubts.

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