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"Value-Added of Herbs and Phytotherapy : Challenges for the 21st Century"

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Mineral and electrolyte analysis of *Manihot utilissima* and *Carica papaya* Leaves: a Prospect of Anti hypotension Agent

Nugrahaningsih WH [1]*, Lisdiana [1], Eling Purwantoyo [1]

Abstract

Introduction: The prevalence of orthostatic hypotension is high. Management of orthostatic hypotension included A-F, that are Abdominal compression, Boluses of Water, Bed Up, Counter maneuvers, Drug, Education, Exercise, Fluid and salt. *Carica papaya* and *Manihot utilissima* leaves were not allowed to eat by hypertension patient because they are assumed to have ability in elevate blood pressure. The hypothetic of this phenomenon is *Carica papaya* and *Manihot utilissima* prospect as anti-hypotension agent. The aim of research was to analyze mineral and electrolyte of *Carica papaya* and *Manihot utlissima* leaves. **Materials and Methods**: *Manihot utilissima* and *Carica papaya* leaves were prepared in extract, simplisia and fresh leaves. ICP (induction coupled plasma) analysis was used to identify mineral and electrolyte content. **Results**: Mineral and electrolyte content (mg) per 100 gr *Manihot utilissima* extract : Na (14.75), K (1112), Fe (63.37), Zn (40.24), Al (46.67), Rb (16.87), Ba (16.25) and Cu (8.38). Mineral and electrolyte content (mg) per 100 gr *Carica papaya* extract: Na (21.73), K (574.5), Fe (320.6), Zn (33.22), Al (45.02), Rb (13.78), Ba (12.91) and Cu (1.48). **Conclusions**: Based on the sodium and potassium content, *Manihot utilissima* and *Carica papaya* leaves have potency as anti-hypotension agent.

Keywords: *Manihot utilissima*; *Carica papaya*; mineral and electrolyte; blood pressure, hypotension

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1. Introduction

Blood pressure depends on cardiac output and peripheral resistance. Many factors influence the value of blood pressure included diet, physical activity, toxins, drug and psychosocial. Orthostatic hypotension is defined as a sustained reduction in systolic blood pressure of at least 20 mm Hg or diastolic blood pressure of 10 mm Hg from the supine to standing position. The definition orthostatic hypotension according to the updated consensus statement by the European Federation of Neurological Societies (Freeman, 2011), The prevalence of orthostatic hypotension about 10-33% (Low & Tomalia, 2015). The prevalence of orthostatic hypotension is high in the elderly and depends on the characteristics of the population studied, such as age, use of medications, and comorbidities known to be associated with this problem. Orthostatic hypotension predicts mortality in middle-aged adults. This association is only partly explained by traditional risk factors for cardiovascular disease and overall mortality (Rose et al, 2006).

Many genetic variants have been suggested that partly contribute to the variation of blood pressure response to postural change. Past studies indicate that genes on chromosome 13q and 18q are possibly associated with systolic blood pressure response to postural change (North, 2004; Pankow, 2005). Robert (2002) identified 3435T alleles of *ABCB*1 gene as a predictor specific side effect of nortriptyline which caused major clinical problems for more than five patients was postural hypotension. Some mitochondrial DNA mutations are also associated with idiopathic orthostatic hypotension (Schwartz, 1999)

Management of orthostatic hypotension included A-F ways, that are **A**bdominal compression, Boluses of Water, **B**ed Up, **C**ounter maneuvers, **D**rug, **E**ducation, **E**xercise, **F**luid and salt. Counter maneuvers i.e. toe-raisin; leg-crossing and contraction; thigh muscle co-contraction; bending at the waist; slow marching in place and leg elevation. Salt supplementation help raised blood pressure of orthostatic hypotension patient. (Figueroa, 2010; Low & Tomalia, 2015).

. *Carica papaya* has a wide range of pharmacological activities. The whole plant has its own medicinal value. The leaves of papaya plants contain alkaloids Carpinine, carpaine, vitamin C and E (Aravind, 2013). The studies supports the popular claim of the use of *Carica papaya* leaves in treating Dengue Fever by increasing platelet counts and alleviating symptoms (Ahmad 2011).

Carica papaya and *Manihot utilissima* leaves are vegetables commonly eaten by Javanese people. But, both of *Carica papaya* and *Manihot utilissima* leaves not followed eaten by hypertension patient. Javanese people believe that *Carica papaya* and *Manihot* utilissima leaves can increase blood pressure. The hypothetic based on that phenomena are *Carica papaya* and *Manihot utilissima* leaves can increase blood pressure hypotension patient.

2. Materials and Methods

Preparation of plant

2.1. *Manihot utilissima* and *Carica papaya* leaves were prepared in extract, simplisia and fresh. All materials were obtained from Unnes's garden. Preparation of samples was conducted at Laboratory of Biology Universitas Negeri Semarang

Preparation of extract

One kilogram of *Manihot Utilissima* and *Carica papaya leaves* were dried in oven at temperature 50^0C. We got 262 gram of *Manihot utilissima* and 375 gram of *Carica papaya* dried leaves (simplisia). The dried leaves were blended up into flour, and then add distilled water until it reaches a volume of 525 mL (*Manihot utilissima*) and 750 mL (*Carica papaya*). The suspension were stirred for 30 minutes and incubated at room temperature for five days. The supernatant were evaporated at rotary evaporator and were dried in oven at temperature 50^0C.

ICP (Induction Coupled Plasma) Assay

2.2. Extract and simplicia of *Manihot utilisssima* and *Carica papaya* were digested before ICP analysis. One gram solid samples were digested with additions of 5 mL aqua regia (mixture of hydrochloric acid (HCl) and nitric acid (HNO_3) in ratio 2:3). The digestates were heated at low temperature until it becomes clear. The digestates were diluted by addition hydrochloric acid until it reaches 100 mL, and were analyzed by ICP. The blank and working standards were first run followed by the samples. Each sample was analyzed twice, and the data reported as a mean of the analyzed samples. All process of ICP analysis conducted at Laboratory of Chemistry Universitas Negeri Semarang.

3. Results and Discussion

ICP analysis identified and detected trace metals content in *Carica papaya* and *Manihot utilissima* leaves. The analysis gave high value of each mineral in both plants. The detail of the result of ICP analysis was shown at table 1 and table 2.

Table 1. Mineral and electrolyte content per 100 gr *Manihot utilissima*

	Value of mineral and electrolyte (mg/100 g)		
	Extract	Simplicia	Fresh leaves
Na	14.75 ± 0.148	14.48 ± 0.062	1.52 ± 0.152
K	1112 ± 9.5	854.4 ± 11.75	72.28 ± 1.497
Fe	63.37 ± 0.348	22.82 ± 0.128	0.73 ± 0.010
Zn	40.24 ± 0.205	13.11 ± 0.032	0.15 ± 0.006

Al	46.67 ± 0.418	9.09 ± 0.132	0
Rb	16.87 ± 0.151	31.49 ± 0.195	12.84 ± 0.665
Ba	16.25 ± 0.181	40.70 ± 0.222	0.17 ± 0.004
Cu	8.38 ± 0.032	2.26 ± 0.002	0

Table 2. Mineral and electrolyte content per 100 gr *Carica papaya*

	Value of mineral and electrolyte (mg/100 g)		
	Extract	Simplicia	Fresh leaves
Na	21.73 ± 0.517	26.83 ± 0.530	12.5 ± 0.592
K	574.5 ± 10.24	1033 ± 12.7	140.7 ± 1.96
Fe	320.6 ± 3.63	32.26 ± 0.371	1.09 ± 0.005
Zn	33.22 ± 0.293	5.58 ± 0.068	0
Al	45.02 ± 0.725	34.10 ± 0.404	0
Rb	13.78 ± 0.276	16.62 ± 0.440	12.84 ± 0.206
Ba	12.91 ± 0.112	11.00 ± 0.113	0.13 ± 0.012
Cu	1.48 ± 0.008	3.04 ± 0.022	0

Sodium, potassium and iron were main constituent of samples related blood pressure. Sodium, potassium and iron contents of the *Carica papaya* leaves were found in this study, more than in raw papaya in previous study (Aravind et.al., 2013). Dickson, et al. (2012) found the high potassium of plant extract of *Manihot utilissima* (3220 mg per 100 gr), but the contents of sodium and iron were low.

It is generally accepted that high sodium intake raises the arterial blood pressure. The physiology of salt intake in the development of hypertension is complex. The lack of the ability of the human kidneys to fully excrete excess sodium is one of the major mechanisms in the association between salt intake and blood pressure (Meneton, 2005). Sodium helps in elevating blood pressure with retention of fluids and increasing of blood volume. The blood pressure needs a volume of blood to pump it that is given by the heart. It is known as cardiac output. Thus, an increasing plasma volume leads to elevated blood pressure.

Population studies have demonstrated an association between dietary sodium chloride and blood pressure. (Tzoulaki, 2012). High dietary salt is estimated to contribute in the increase prevalence of hypertension on a population basis. Dietary modifications that lower blood pressure are reduced salt intake, caloric deficit to induce weight loss, moderation of alcohol consumption (among those who drink), increased potassium intake, and consumption of an overall healthy diet, based on the DASH (Dietary Approaches to Stop Hypertension) diet. Opposite with the hypertension, patient with hypotension may need more salt to elevate blood pressure. Hypotension patient need volume expansion with increased fluids and salt intake, supplemented in some cases with low dose fludrocortisones (Low & Singer, 2008). A study has shown that increased salt intake is associated with increases in plasma volume (El-Sayed, 1996).

Potassium intake influenced peripheral resistance and blood pressure. The effect of potassium intake on blood pressure has been investigated in rat and human. Potassium depletion decreased blood pressure in rat. The decrease of blood pressure in these rats is associated with a decrease in peripheral vascular resistance and impaired pressure response to angiotensin II. Potassium depletion elevated blood pressure in normotensive and hypertensive ingesting normal sodium (Krishna, 1990). Potassium also modified sympathetic activity, but it is not known whether these changes causally related to changes in blood pressure.

There are an association between red blood cell and blood pessure. The association probably mediated by whole blood viscosity. Low level of red blood cell count caused decreasing whole blood viscosity and then lowering cardiac output. Low cardiac output lead decreasing of blood pressure. Iron as a main ingredient of red blood cell can indirectly affect to blood pressure.

Both of *Manihot utilissima* and *Carica papaya* contained amount of sodium, potassium and iron. Thus, the materials were predicted raising the blood pressure. The evidence based of hypotensive agent from herbal, especiallty *Manihot utilissima* and *Carica papaya* leaves, has not been published. This is preliminary study and need more extended experiment to prove the effect *Manihot utilissima* and *Carica papaya* leaves on blood pressure.

4. Conclusions

2.3. Based on sodium, potassium and iron contents, *Manihot utilissima* and *Carica papaya* leaves have a potency as anti-hypotensive agent. It is proposed more extended experiment to know the effect of *Carica papaya* and *Manihot utilisima* on blood pressure.

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