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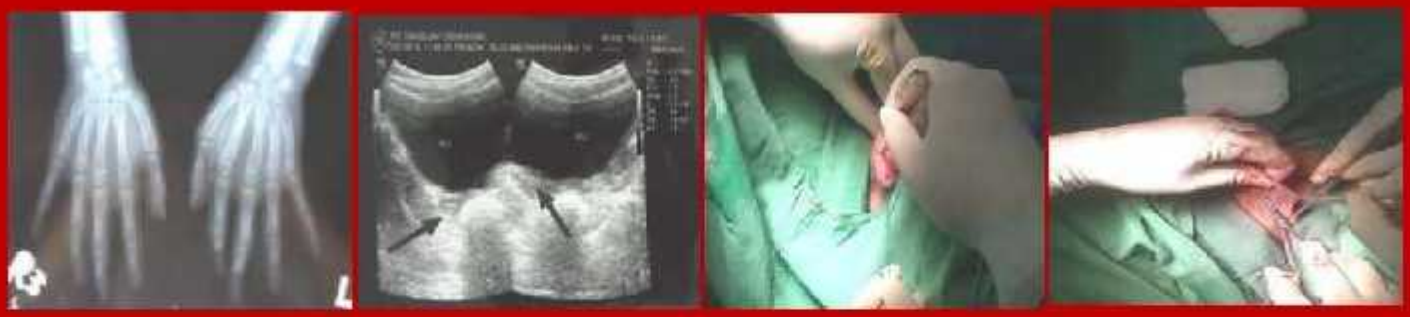

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Abstract

Bali Medical Journal (BMJ), PRINT-ISSN 2089-1180 and E-ISSN 2302-2914 is an international and peer-reviewed journal published quarterly in print and online by Sanglah General Hospital in collaboration to Indonesian Physician Forum and Indonesia College of Surgeon, Bali-Indonesia which was founded in 2011. The Journal aims to bridge and integrate the intellectual, methodological, and substantive diversity of medical scholarship, and to encourage a vigorous dialogue between medical scholars and practitioners. The Journal welcomes contributions which promote the exchange of ideas and rational discourse between practicing educators and medical researchers all over the world.

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Management of childhood glaucoma (CG) is chalanging. In Saudi Arabia pediatric population, goniotomy and trabeculectomy are rarely successful.[1] Trabeculectomy has been reported to have a lower success rate in children compare with adults.[2,3]

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BALI MEDICAL JOURNAL (BMJ)

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CONTENTS

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Antihypertensive and Antioxidant Potential of Purple Sweet Potato Tuber Dry Extract in Hypertensive Rats

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Background: Purple sweet potato tuber extract in liquid form, shown to lower blood pressure of hypertensive rats and hypertensive patients. Liquid dosage form, increasingly unstable when stored for long periods, thus it is necessary to find a more stable dosage form. The objective of this research was to prove that dry extract of purple sweet potato tuber has the same effects with liquid extract in hypertensive rats. **Method:** The is a randomized pre-test and post-test control group design study. Thirty hypertensive model rats were divided into 5 groups (6 animals for each group). Group 1 was treated as a control group. Group 2 to group 5 were treated as treatment groups. Treatment groups were given liquid extract at a dose of 3 ml, dry extract with the dose of 200 mg, dry extract that stored in a certain time with a dose of 200 mg and given a mixture of dry extract with a carrier substance (capsule formula) with a dose of 200 mg, respectively, for 4 weeks. Variables observed were blood pressure, SOD and MDA level of the blood. **Results:** The results showed that the group given the purple sweet potato tuber extract lowers blood pressure were significantly in liquid extract or dry extract ($p < 0.01$). The group that was treated with capsule formula showed more decrease in blood pressure than dry extract group ($p < 0.01$). The similar results happened on MDA and SOD level in blood. **Conclusions:** Thus, it can be concluded that dried extract of purple sweet potato tubers has the same effectiveness with liquid extract, both as an antihypertensive and also antioxidant. Capsules formula is more effective than liquid extract and dry extract.

Keywords: Dry extract, purple sweet potato, tuber, antihypertensive, antioxidant, hypertensive.

DOI: 10.15562/bmj.v5i2.217

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INTRODUCTION

Today, people tend to use traditional herbs as an alternative medicine. Herbal medicine based from plants have been developed and empirically used to treat and prevent a variety of diseases including cardiovascular diseases. Hypertension is one cardiovascular disease which has high incident that cause illness and death. Epidemiological studies prove that regularly eating fruits and vegetables that contain flavonoids, can reduce cardiovascular disease through antioxidant effects.[1] Flavonoids from various plants can improve vascular endothelial function,[2] through the improvement of the availability of nitric oxide (NO), which can lower blood pressure.[3-5]

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Purple sweet potato tuber contains high anthocyanin pigments,[6] which is a flavonoid that has been proven to be an antioxidant in vitro[7-9] and in vivo.[10-12] It can also lower blood pressure in animals and patients with hypertension.[13,14] Research conducted in patients with mild to moderate hypertension proved that purple sweet potato tuber extract in liquid dosage forms, lower blood pressure with efficacy comparable to captopril.[15]

The downside of purple sweet potato tuber extract liquid dosage form, increasingly unstable when stored for long periods. Extract in liquid form often changes in color and flavor when stored for more than one week at room temperature, so it is necessary to find alternatives that is more stable and easily stored with the same effectiveness with a liquid form. Research about purple sweet potato tuber extract in a dry form hasn't been held, and it is expected to have effectiveness that is comparable to the liquid extract. To prove these allegations, laboratory tests were conducted using an

experimental model of hypertensive rats treated with dry extract of purple sweet potato tubers for 4 weeks.

MATERIALS AND METHODS

Animal and Experimental Design

Wistar male rats (150 – 200 g), 3-4 months old, were obtained from Animal House Facility of Gadjah Mada University, Yogyakarta, Indonesia, were used in this study. All rats were maintained under standard laboratory conditions at temperature of 25 ± 2°C, 50 ± 15% relative humidity and normal photoperiod (12-hours light-dark cycle). Commercial pellet diet and water were provided ad libitum for those animals. The usage of these animals were approved by Institutional Animal Care and Use Committee of the Faculty of Medicine, Udayana University, Bali, Indonesia.

A total of 30 Wistar rats were divided into 5 group (6 rats per group) as follows. Group 1: The control group: consists of rats treated with NaCl at a dose of 2% of rat body weight/day for 4 weeks. Group 2: The treatment 1 group: consists of rats treated with NaCl at a dose of 2% of rat body weight and 3 ml/day liquid extract of purple sweet potato tuber for 4 weeks. Group 3: The treatment 2 group: consists of rats treated with NaCl at a dose of 2% of rat body weight and 200 mg of new dry extract of purple sweet potato tuber for 4 weeks. Group 4: The treatment 3 group: consists of the rats treated with NaCl at a dose of 2% of rat body weight and 200 mg/day of old dry extract of purple sweet potato tuber for 4 weeks. Group 5: The treatment 4 group: consists of the rats treated with NaCl at a dose of 2% of rat body weight and 200 mg/day of capsulated formula of dry extract of purple sweet potato tuber for 4 weeks.

Blood Pressure Monitoring

One weeks before treatment, all rats systolic blood pressure was measured, using tail-cuff plethysmography (sphygmomanometer S-2 Ser. N09208, Hugo Sachs Electronic, Germany). These data were used as pre-test data. The next measurements of the systolic blood pressure were done after one day of treatment and continued by every 4 days' measurement until 4 weeks of treatment.

Materials Testing

Purple sweet potato tubers obtained from farmers, washed with clean water and then peeled. Once peeled sweet potato is cut crosswise with a thickness of 2.0-2.5 cm. Sweet potato chunks are mixed with water at a ratio of 1 kg of sweet potato plus 1 liter of water and then blended and filtered through three layers of gauze. The liquid obtained from the filtration is boiled for thirty minutes. This liquid extract is ready to be used in the research. To obtain dry extract, the liquid extract is dried with oven. The dry extract in the solid form, pulverized and ready to be used in the research. Formula capsules are made by mixing dry powder with wheat powder in the ratio 1:1.

Blood Examination

Blood taken via retro orbital plexus of all rats at baseline and after treatment for 4 weeks'. Blood samples at baseline used for the examination of MDA, and at the end of the study for the examination of MDA and SOD. MDA for examination by thiobarbituric acid reactive substances (TBARS) and SOD method total antioxidant status *Randox* kit.

RESULT

Systolic blood pressure at baseline was similar in all groups of rats. (p> 0.01). During the study, systolic blood pressure was evaluated every four days. The results showed an increase in blood pressure in all groups of hypertension rats, but in the control group there was a significant increase in blood pressure (p <0.01). In extract of purple sweet potato tuber group, the increase of blood pressure is significantly lower than the control group (p <0.01). Dry extract and liquid extract gives nearly equal results (p> 0.01). Capsule formula extracts shows decreasing blood pressure effect significantly different compared to other treatments (p <0.01) Comparison of the average systolic blood pressure for all the experimental animals are presented in Figure 1.

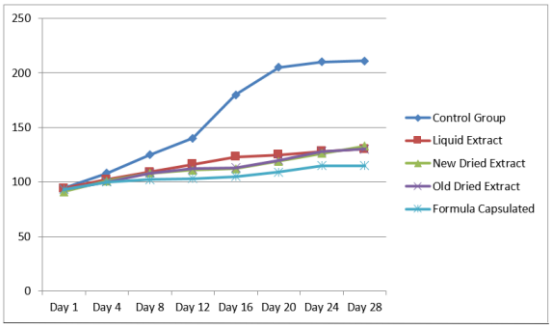

Figure 1
Comparison of Average Systolic Blood Pressure of Rats

Control group was a group of rats given high doses of NaCl every day, as a model of hypertension. Liquid extracts group was a group of rats given high doses of NaCl and Liquid extract purple sweet potato tuber at a dose of 3 ml every day. The new dry extract group was a group given high dose of NaCl and dry extract of purple sweet potato tubers, for 4 weeks.

Old dry extract group was a group given high dose of NaCl and dry extract of purple sweet potato tubers stored for 3 months. Formula capsulated group was a group given high dose of NaCl and dried extract of purple sweet potato tubers prepared

in a mixture with a carrier (wheat germ commercial / oat) in the ratio 1: 1

The result of baseline MDA was similar in all groups (p> 0.01). The average MDA in each group: 1.02; 1.05; 1.12; 1.13; and 1, 21 respectively. After treatment for 4 weeks, MDA levels significantly increased in all groups (p <0.01). The average levels of MDA after treatment for 4 weeks were 6.66; 3.85; 3.10; 3.05 and 2.57 for the control group, liquid extract, new dried extract, old dry extract, and capsule formula. The liquid extracts group, dry extracts, and capsules formulas significantly reduce levels of MDA. Comparison of pre- and post- test of MDA levels are presented in Figure 2

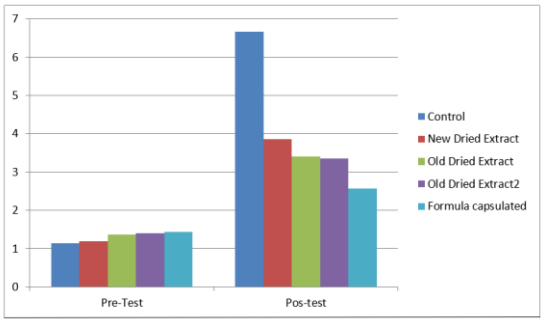

Figure 2
Comparison of Average Blood MDA Level of Rats

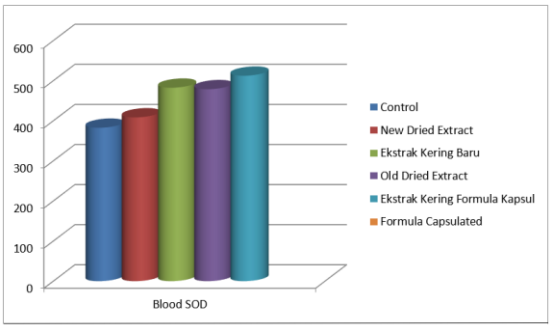

Figure 3
Comparison of Average Blood SOD Level of Rats

SOD levels in blood after 4 weeks' treatment, showed a significant increase in all treatment groups compared to the control group (p <0.01). The average levels of SOD after treatment for 4 weeks were 382.73; 408.58; 482.30; 470.50 and 512.48 U/grHb, respectively for the control group, liquid extract, new dried extract, old dry extract, and capsule formula. The group of liquid extracts, dry extracts, and capsules proven to raise levels of SOD in blood significantly. Comparison of blood SOD levels are presented in Figure 3

DISCUSSIONS

The results showed that the extracts in liquid extract and dry extract of purple sweet potato tubers have similar antihypertensive and antioxidant effects. This results proves that the drying process had no effect on the pharmacological efficacy of the active components contained in a liquid extract of purple sweet potato tubers. Thus meaning that efficacious of anthocyanin as an antioxidant is stable even trough heating process. A similar research conducted by Zhao and Li, that anthocyanin contained in the purple sweet potato tubers are very stable in low pH and is very stable in heating.[16]

The results also showed that blood pressure of purple sweet potato tubers in a capsule formula group was lower than the dry extract. The antioxidant effects of capsules are also stronger than the liquid and dry extract. The average MDA from control until capsule group: 1.02; 1.05; 1.12; 1.13; and 1, 21. After 4 weeks' treatment, increase of MDA levels was significantly different in all groups (p <0.01). The average levels of MDA after treatment for 4 weeks in all group were 6.66; 3.85; 3.10; 3.05 and 2.57 for the control group, liquid extract, new dried extract, old dry extract, and capsule formula respectively. Apparently all groups significantly differ (p <0.01). The result showed that group of liquid extracts, dry extracts, and capsules formulas can significantly reduce levels of MDA, but MDA of capsule formula group is significantly lower than other treatment groups. Thus, proving that the capsule formula is more effective in lowering MDA and decreasing the oxidative stress than other extract.

An antioxidant material, can reduce oxidative stress to enhance endogenous antioxidants like SOD. In this research, there is an increase of SOD in blood after purple sweet potato tubers extract treatment. The SOD levels in blood increased after 4 weeks' treatment. SOD level in blood rise significantly in all treatment groups compared with the control group (p <0.01). The average SOD levels in blood after 4 weeks, respectively 382.73; 408.58; 482.30; 470.50 and 512.48 U/grHb, for the control group, liquid extract, new dried extract, old dry extract, and capsule formula. Formula capsule group SOD levels in blood after 4 weeks of treatment showed the highest results (512.48 U/grHb). The difference is statistically significant. It is proven that the antioxidant ability of dry extract is higher than the liquid extract, and the capsule formula had the most powerful antioxidant effect. This is probably caused by the capsule which maintain a lower pH so the anthocyanin will be more stable.

CONCLUSIONS

Dried extract of purple sweet potato tubers can lower blood pressure and decrease the oxidative stress in hypertensive rat's models, similar to the liquid extract.

Purple sweet potato tuber dry extract packaged in capsules, have better effectiveness than the dry extract.

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