

Purple sweet potato (*Ipomea Batatas P.*) as dentin hypersensitivity desensitization gel

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ABSTRACT

Background: Dentin hypersensitivity is a short sharp sense of pain in the teeth when exposed to excitatory stimulus. A total of 74% of world population experiencing dentin hypersensitivity. Home treatment topical desensitization is rarely found in Indonesia. The use of dentrifice is less practical because it must be done with regular brushing. Indonesia has abundant natural resources, one of which is purple sweet potato. Purple sweet potato (*Ipomea Batatas P.*) has highest potasium ions compared to other foodstuffs. Potassium ions can be a solution of dentin hypersensitivity by temporary blocking the suffix pulp nerve impulses. **Purpose:** The research objective was to determine the effectiveness of the 10% purple sweet potato extract gel of the dental pain threshold score. **Method:** An experimental study carried out by dental pain threshold score measurements using vitality tester into the teeth with gum recession. Samples included 32 respondents with a single blind and pre-post test control group design. They were divided into treatment group and negative control group. Paired T-test and Wilcoxon were used as data analysis. **Result:** The results showed dental pain threshold score increasing either in treatment group and negative control, although not as significant as in the treatment group. **Conclusion:** 10% purple sweet potato extract gel containing potassium ions is able to reduce the pain of dentin hypersensitivity.

Keywords: dentin hypersensitivity; potassium ion; purple sweet potato; desensitization

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INTRODUCTION

Sensitive teeth or dentin hypersensitivity has become one of the problems experienced by many people. The sensation of short and sharp pain in patients with dentine hypersensitivity can reduce their activity comfort that may impact on the productivity and welfare of the individuals.¹ Dentin hypersensitivity is a hidden complaint to the sufferer, but it should not be ignored because it doesn't fit the definition of healthy according to World Health Organization (WHO). Healthy according to WHO is not only the absence of disease in terms of physical, but also mental, and social well being of individuals.²

People with dentin hypersensitivity in the world reached 74%, while in Indonesia reached 45%.³ People with dentin hypersensitivity 67% of whom are women where at the age of 20-40 years are at greater risk of dentin hypersensitivity.⁴

Pain due to dentin hypersensitivity caused by the movement of fluids within the dentinal tubules. Triggers of dentinal fluid movement is the presence of external stimuli on the exposed dentin resulting pressure changes in the dentin and activates nerve fibers A delta in the pulp, causing sharp pain.⁵ Desensitization toothpaste is one of the ways that can be used by dentin hypersensitivity patient.⁶

The solutions already exist today through the invasive and non-invasive treatments. Gingivectomy is an invasive surgical treatment. In non-invasive treatment principle, the opened tubules is closed to block the hydrodynamic mechanism. Desensitization toothpaste containing potassium ion basic material which capable to block the stimulus (heat, cold, touch, and chemical) to the type A delta nerve to pain response.⁷ However, desensitization toothpaste is from synthetic material and less practical because it must be used regularly. Indonesia have a lot of natural ingredients

that have a high potassium content and also affordable at a time likes purple sweet potato. When utilized optimally, it can be a solution of dentine hypersensitivity and increase the farmers and national's income. The aim of this study was to find out the effectivity 10% potassium ions of purple sweet potato extract gel.

MATERIALS AND METHOD

This research is an experimental with single blind study design and pretest posttest control group design. The research took place at the Laboratory of Chemistry and Physiology Semarang State University and in the Faculty of Dentistry, Universitas Islam Sultan Agung.

10% purple sweet potato extract gel was made by mixing the extract of purple sweet potato with CMC-Na, nipagin, and sterile distilled water.

Purple sweet potato was washed and then squeezed with a press that the sap flowing in the shelter. Sap were then collected in the glass using a funnel. Sap was heated in the oven at 50° celcius to remove water.

Toxicity and inflammation test was carried out to 7 male wistar rats, as much as ±0,3 gram of 10% purple sweet potato extract gel was applied topically on the tooth surface and gingival tissue, it was left for 7 days. In the seventh day no inflammation sign was found on the gingival tissue and all of the male wistar rats was still alive.

The sample used was 32 female respondents 20-40 years old with gingival recession. The samples were divided into two groups, the group treated with 10% purple sweet potato extract gel and a negative control group treated with petroleum jelly.

Inform consent was done before the study started. The measurement of the threshold value of dental pain stimuli was done on a labial surface of normal teeth and sensitive teeth by using a vitality tester with moderate rate. The tip of vitality tester which had been smeared by toothpaste placed on a dried labial surface of cemento-enamel junction, hold the button to turned on the stimuli and released when the respondent felt short and sharp pain sensation. The result data obtained in this study were statistically analyzed by Paired t-test.

RESULTS

According to the research on 32 samples with application of 10% purple sweet potato extract gel as a treatment (Table 1). It shows in the post treatment category of treatment group is higher than the post treatment category in the control group.

Shapiro-Wilk test showed that pre treatment category in all groups (treatment and control) are normally distributed, and also in post treatment category of a control group ($p > 0.05$). Then, the pre and post treatment category of treatment group was analyzed by Wilcoxon nonparametric

Table 1. The average of pain threshold value in treatment and control group

Pain threshold value in control group		Pain threshold value in treatment group	
Pre Treatment	Post Treatment	Pre Treatment	Post Treatment
29.63 μ A	29.16 μ A	25.94 μ A	51.44 μ A

test, while the control group category before and after treatment were comparative tested by T-test.

There is a significant difference between the pre-test and post-test in the treatment group ($p = 0.01$). According to Paired t-test $p = 0.01$, because $p < 0.05$ it can be concluded there is a significant difference between the pre and post treatment in treatment group that showed significance value which is 0.05 (error tolerance limit), so that there is a difference between the pre and post treatment in control group.

DISCUSSION

Dentin hypersensitivity is a common painful sensation, which is rather difficult to treat in spite of the availability of various treatment options. The main principles of dentin hypersensitive treatment are dentinal tubule occlusion and nerve desensitization.⁷ According to hydrodynamic theory, dentine hypersensitivity occurs due to the excitatory stimulus resulting in fluid rapid movement in the dentinal tubules. The pressure changes result in sensitized of pulp nerve endings in dentin causing brief pain.⁸ Dentinal tubule occlusion was done to inhibit the fluid movement in the dentinal tubule.⁸ Calcium phosphate, strontium chloride, and calcium sodium phosphosilicate are some materials that are usually used as a tubule occlusion.⁹

Potassium ions is one of the material that could block the nerve impuls. In some research that was conducted to evaluate the efficacy of potassium, showed that 10% of potassium ions covered dentinal tubules by crystal formation.¹⁰ Potassium does not cause tooth color changes, does not irritate the gums, and does not damage the dentin, so it is a proper material to used as a desensitization.¹¹

Purple sweet potato that has been extracted and made into a gel formulation contain potassium ion that is the most commonly used active ingredients in desensitizing dentifrices.¹⁰ It had an effect to blocked myelinated A-fibers in odontoblast process of dentinal tubules. Increased in extracellular potassium allows for the large concentration to depolarize the nerve fibers. As a result, neural transmission will not occur following exposure to the stimulus and the patient will have no sensation of sensitivity or pain.⁹

Result of the research showed a significant value of dental threshold pain stimuli in the treatment group compared with control group. Respondents who have been treated by the application of 10% purple sweet potato

extract gel showed a greater effect on the value increased of dental threshold pain stimuli. It means that purple sweet potato extract gel could reduce the pain of dentin hypersensitivity.

Research that conducted by Orchardson *et al.*¹⁰ which evaluate the efficacy of potassium ion that contained in mouthwash and toothpaste showed that potassium produced a significant reduction in sensitivity to tactile and air stimuli. Potassium ion could help to reduce the duration and intensity of tooth sensitivity caused by dental bleaching according to some review of several research.¹¹

In conclusion, the present study was conducted to find out the effectivity 10% potassium ions of purple sweet potatoes extract gel. It was found that 10% purple sweet potatoes extract gel could reduce the pain threshold value of 32 respondent with dentin hypersensitivity.

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