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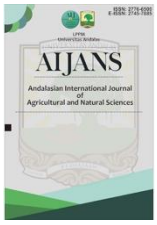

Article

The Optimum Condition for Total Carotenoid Extraction from Orange Sweet Potato

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Abstract

This study aimed to find the optimum conditions for extracting the carotenoid content in orange sweet potato in an applied application. The extracted carotenoids will be used as raw materials to produce rose-scented aromatic compounds (b-ionone). The extraction process was carried out on dry matter using maceration technique and using hexane as solvent. Other solvents such as methanol, ethanol, isopropanol and choloroform were also used to extract carotenoids from orange sweet potato. The use of wet samples and dry samples was also carried out in this study. The ratio of the solvent used with the material was 1:3. Based on the yield and spectrophotometric characterization, it was known that the extraction process with hexane solvent can extract carotenoid compounds from dry orange sweet potato powder if the extraction process is carried out 7 times.

INTRODUCTION

Aromatic compounds can be defined as aromatic compounds. It refers to a group of compounds with a benzene-like ring and exhibits chemical behavior different from that of aliphatic compounds. Some of them are β-ionone and dihydroactinidiolide (dhA). This compound is an isoprene-containing compound with a structure analogous to the cyclic structure of β-carotene [3]. In its use in the essential oil industry, β-ionone is a component capable of producing strong floral and fruity aromas at room temperature. Therefore, its use is widely used in personal care, cosmetics, laundry and households, especially the world perfume industry.

β-ionone compounds can be produced from carotenoids, it is necessary to extract carotenoids which are very wasteful in some agricultural products. Carotene can be taken from various natural sources [9]. One of them is red sweet potato. Carotenoids are natural substances that are very important and have properties that are soluble in fat or organic solvents but insoluble in water, which are a group of orange, red or yellow pigments. These compounds are found widely distributed in plants and fruits and are not produced by the human body [1]. The characteristics of carotenoids are sensitive to alkali and very sensitive to

air and light, especially at high temperatures, insoluble in water, glycerol and propylene glycol. Carotenoids are soluble in edible oils at room temperature.

Carotenoid extraction method is quite complicated because the nature of the components to be separated is sensitive to heat, has close boiling points, and has relatively low evaporation properties [2,10]. Therefore, it is necessary to study the extraction process of carotenoid compounds from agricultural products such as red sweet potatoes to be produced optimally so that they can be used for further b-ionone production processes.

EXPERIMENTAL SECTION

Materials

The research was conducted in the laboratory of Food and crop chemistry and biochemistry, Department of Crop Technology, Andalas University West Sumatera, Indonesia. The material of orange sweet potatoes was obtained from the local market. The solvents such as methanol, ethanol, isopropanol and choloroform with technical grade were used and purchased from the local market.

Instrumentation

The instrumentation used in the study were spectrophotometer, evaporation, flask, and sonication.

Procedure

The extraction process and analysis of carotenoid

The carotenoids in the sample were extracted using a maceration technique assisted by the use of a sonication process. The extraction process is carried out using several solvents. Polar and semi-polar solvents such as methanol, ethanol, isopropanol and hexane are used in wet samples. Hexane solvent was used for dry samples. For the dry based sample, the water content of the sample needs to be considered. The ratio of solvent and material is 1:3. The extraction process is carried out periodically, where once the maceration process assisted by sonication is carried out for 4 hours and followed by the maceration process without sonication for 20 hours. This extraction process is carried out until the orange color in the sample disappears. The extracted solvents were colected into a flask and the solvent was evaporated. The concentrated extract produced after the evaporation process was then characterized to see the profile of the resulting carotenoids. The characterization process carried out was the measurement of the yield and levels of carotenoids in the extract. Yield measurements were carried out using a gravimetric technique where the resulting extract was weighed and compared with the weight of the raw materials used. For the calculation of carotenoid levels, a spectrophotometer technique [5,6,8].

RESULT AND DISCUSSION

The raw material used in this research is sweet potato with orange flesh and reddish outer skin. Analysis of raw materials including analysis of water content, water content of powder, and yield of orange sweet potato powder. The results of the analysis of raw materials are preesnted in table 1.

Table 1. Orange Sweet Potato Raw Material Analysis Results

Parameter	Percentage
Water content of range sweet potato	67,66 ± 0,33
Water content of dried orange sweet potato powder	11,03 ± 0,53
Yield of dried orange sweet potato powder	17,35 ± 0,65

Based on the research that has been carried out, the average water content of orange sweet potato is 67.66 ± 0.330% (bb), this result is in accordance with research on the water content of sweet potato conducted [8] which is around 65.3- 82 %. Differences in water content in sweet potatoes are influenced by various factors such as variety, planting time, location and cultivation method [12]. The water content in this sweet potato should be reduced in order to facilitate the extraction process of carotene compounds.

In this study, it was found that the extraction process using a wet sample could not produce an optimum concentrated extract of carotenoids because the extract still contained water. The process of evaporation of water can not be done with a simple tool. Meanwhile, one of the objectives of this research is to find extraction conditions that can be done simply by the community. Therefore, the extraction process for dry samples is more emphasized in this study for the further activity.

Carotene was extracted from orange sweet potato using maceration method with hexane solvent using ultrasonic bath at 50°C. The extraction result was a concentrated carotenoid extract which is a mixture of carotene and lipophilic compounds soluble in hexane solvent. The concentrated carotenoid extract's redemen was obtain as 1,1 %. The carotene extraction was carried out repeatedly until all the color pigments in the orange sweet potato powder disappeared. In this study, the extraction was carried out up to 7 times the solvent replacement. The difference in the color of the extraction results in Figure 1 indicates that the carotene content of sweet potatoes is getting lower.

Fig. 1 The colour of hexane during carotenoid extraction from orange sweet potato.

The carotene content extracted from orange sweet potato was 138.85 ± 0.06 mg/ 100 g. This carotene content indicates that the percentage of carotene contained in the crude carotene extract is 11.94%. The results of carotene levels in this study were in the range of the results informed in previous researchs [7]. Regarding carotene levels of various sweet potato varieties, which ranged from 1 to 39.33 mg/100 g. The extraction process using an ultrasonic bath is considered an effective extraction method according [4,11] which states that the yield resulting from carotene extraction using the ultrasonic method is higher than

other methods. Differences in carotene levels in sweet potatoes can also be influenced by differences in genotype, growing environment, and technology in sweet potato cultivation.

CONCLUSION

The process of extracting carotenoids from orange sweet potatoes to obtain carotene extract which can be degraded to produce rose-aromatic aromatic compounds should be carried out using dry samples. The use of hexane solvent with the extraction process 7 times has been known to produce high extract yields.

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