

# The Effect of Concentration and Type of Soaking Media (Water, Alcohol, Salt, And Vinegar) on Decreasing Oxalate Levels (Washbility) in Porang

Bambang Sugiarto, Adhi Setyawan\*, Octavia Nurmalitasari, and RR Endang Sulistyowati

Department of Chemical Engineering, Universitas Pembangunan Nasional "Veteran" Yogyakarta

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### \*Corresponding Author:

Adhi Setyawan

Dep. of Chemical Engineering  
UPN "Veteran" Yogyakarta

Email:

adhisetawan100@gmail.com

## ABSTRACT

Porang tubers (*Amorphophallus oncophyllus*) contain very high rates of glucomannan and have many benefits in various fields of health, pharmaceutical, industrial, and food fields. Besides having great benefits, porang tubers contain calcium oxalate which causes itching if consumed directly, irritation and kidney stones. The purpose of this study was to make porang tubers free from oxalate content by using various concentrations and types of immersion media on porang. The types of immersion media are water, salt, alcohol, and vinegar. Oxalate rates were analyzed by permanganometric titration method. The results of the diced porang immersion in this study showed that water with a temperature of 70°C with an immersion time of 120 minutes, salt solution at a concentration of 14% with an immersion time of 90 minutes, alcohol with a concentration of 40% with a soaking time of 30 minutes, and vinegar with a concentration of 30% with an immersion time of 150 minutes is the optimal result. While the porang immersion with long slices obtained optimal results in water with a temperature of 50°C with an immersion time of 150 minutes, salt solution at a concentration of 14% with an immersion time of 150 minutes, alcohol with a concentration of 60% with an immersion time of 150 minutes, and vinegar acid with a concentration of 20% with an immersion time of 150 minutes. In the optimal results of the dice, the oxalate content in water immersion decreased by 2.4 %, salt solution decreased by 68.4%, alcohol decreased by 24.6%, and vinegar decreased by 11.8%. In the optimal results of the spring roll filling, the oxalate content in water immersion decreased by 2.4 %, salt solution decreased by 7.3%, alcohol decreased by 19.7%, and vinegar decreased by 11.8%.

**Keyword:** soaking media, oxalate levels, porang

## 1. INTRODUCTION

Porang (*Amorphophallus oncophyllus*) is a tuber-producing plant with the Araceae group native to Indonesia which grows wildly in the forest or in the yard and grows sporadically (Yuzammi, 2000). At this time porang tuber have started to be cultivated because they have the potential and prospects to be developed in Indonesia. In addition, this plant is also able to produce a high yield carbohydrate. Through proper handling and application, porang tubers can become assets that have high usability and selling value. This is because porang tubers contain high value glucomannans and can be used for various purposes kinds of processed products with high selling value (Raharjo, 2012). However,

knowledge regarding the processing of porang tubers is still limited. In general, porang tubers are exported in the form of fresh tubers or cassava or chips. Whereas porang tubers can be processed to produce porang flour which of course has a higher selling price tall.

Processing of porang tubers as food is usually made into chips first. Chips are slices of porang tubers. This porang chip has not been widely used because it still contains calcium oxalate (Ardhian, 2013). One of the potentials that can be developed in porang chips is its derivative product in the form of porang flour. Processing chips into flour aims for preserve and save room storage. Synthesis from flour allows the chips to be more flexible when utilized. The best yields of porang flour are yellowish cream to milky white (Setiani, 2017).

The main problem faced in processing porang tubers is that many people do not know the benefits of porang tubers and some consider porang tubers as a weed plant that has no benefits. In addition, the problem in processing porang tubers as food is the itching caused by the high oxalate content in porang tubers (Aldera, 2010). Therefore, before carrying out further processing as a food ingredient, it is necessary to reduce the oxalate rates contained in the porang tubers first formerly.

Oxalate compounds in tubers can be removed by several simple steps, including boiling and drying. Oxalate can also be removed by washing and soaking several times properly (Wardani and Handrianto, 2019). Oxalate in plants is stored in cell fluid plant good in form sour oxalate nor calcium oxalate. Porang tubers cause itching and irritation. Consuming food that still contains oxalate can cause crystallization in the kidneys and other health problems (Bhandari et al., 2005; Nakata, et al., 2003).

## 2. RESEARCH METHOD

### *Tools and Materials*

The tools used in this study include knives, signoras, balances analytics, pumpkin measure, glass measuring, burette, stative, funnel, erlenmeyer, glass beaker, thermometer, pipette drip, heater electricity, oven, pH meters. Meanwhile, the materials used include porang tubers, water, aquadest, alcohol (20, 30, 40, 50, and 60%), NaCl (6, 8, 10, 12, and 14%), vinegar (10, 15, 15, and 15). 20, 25, and 30%),  $\text{KMnO}_4$  0.1 N,  $\text{H}_2\text{SO}_4$  1 N.

### *Immersion Process*

At this immersion stage, you must prepare several concentrations and the type of media to be used as much as 1000 ml. First, prepare water with various temperature variations, namely 30, 40, 50, 60, and 70 °C by heating the water first and then transferring it to a container with porang tubers in it. The immersion was carried out for 2.5 hours, every 30 minutes a sample was taken for titration test and before taking the sample stir the soaking water. Second, preparing alcohol with various type variant concentration that is 20, 30, 40, 50, and 60% by diluting the available alcohol, which is 35% by using aquadest. The immersion was carried out for 2.5 hours, every 30 minutes a sample was taken for titration test and before taking the sample stir the soaking water. Third, prepare solution salt with various concentration variants, namely 6, 8, 10, 12, and 14% by weighing the salt and aquadest first and then the salt is dissolved with the previously weighed aquadest. The immersion was carried out for 2.5 hours, every 30 minutes a sample was taken for titration test and before taking the sample stir the soaking water. Fourth, preparing vinegar with various concentrations of 10, 15, 20, 25, and 30% with method dilute sour vinegar which available is 96% by using aquadest. Then after all types of immersion media are ready, it can be put into a container that has been prepared previously and contains 100 grams of porang tubers. The immersion was carried out for 2.5 hours, every 30 minutes a sample was taken for titration test and before taking the sample stir the soaking water.

### *Analysis of Oxalate Rates*

At the stage of analysis of oxalate rates, namely by means of permanganometry titration. This titration uses potassium permanganate ( $\text{KMnO}_4$ ) with a concentration of 0.1 N. The  $\text{KMnO}_4$  solution

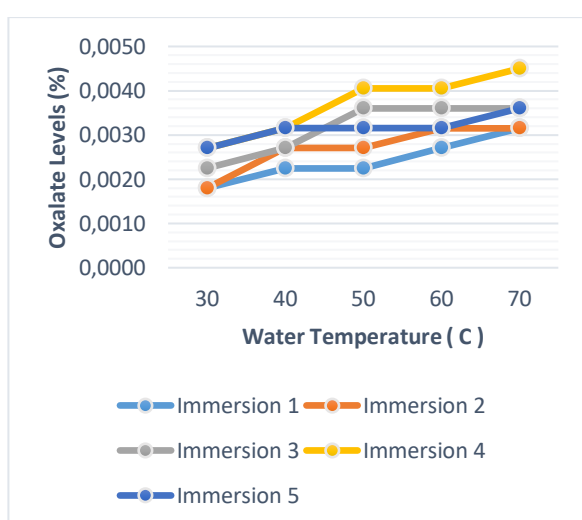
was first diluted from 1 N to 0.1 N using aquadest and then put into the burette. In this permanganometri titration assisted with 1 N sulfuric acid as a catalyst.

The water from the immersion in the previous stage was taken as much as 50 ml and then put into an erlenmeyer. Then 10 ml of 1 N sulfuric acid was added and heated to a temperature of reach 70 °C with heating electricity and start titrated as well as be at rest , how much  $\text{KMnO}_4$  is needed for the solution to change the color resembles the color of  $\text{KMnO}_4$  and that color endure.

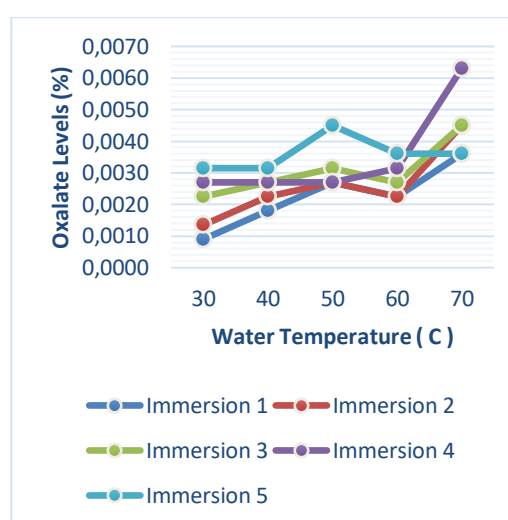
### 3. RESULTS AND DISCUSSION

#### *Effect of Various Temperature Variations of Water Immersion Media on Porang on Dice Shapes and Long Slices*

In water immersion of porang in dice and elongated shapes, experiments were carried out with variations in temperature of 30, 40, 50, 60, and 70 °C for 2.5 hours and every 30 minutes a sample was taken.



**Figure 1.** The diced porangs' oxalate levels in various temperatures



**Figure 2.** The long slices porangs' oxalate levels in various temperatures

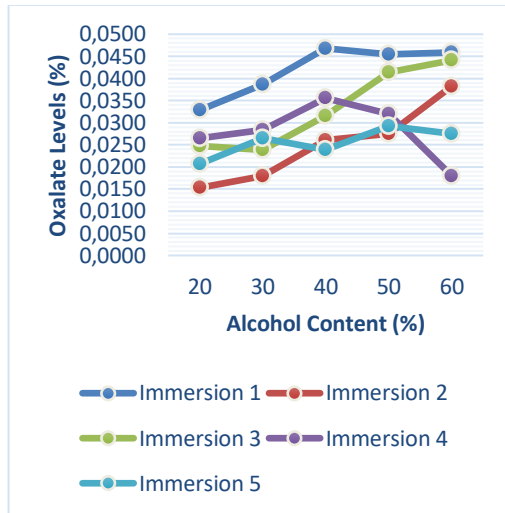
Based on the graph above, it was obtained that the oxalate content contained in diced porang in water immersion with various variations in temperature was the largest, namely at a temperature of 70 °C in the 4th immersion. This is because the greater the temperature and contact time, the greater the reduced oxalate. For the 4th immersion or for 120 minutes, it means that the reduced oxalate is maximal. Then obtained a decrease in oxalate rates by 2.37%.

While the acquisition of oxalate rates contained in porang in the form of long slices in water immersion with various temperature variations was the largest, namely at 50 °C the 5th immersion. This is because the greater the temperature and contact time, the greater the reduced oxalate. Then obtained a decrease in oxalate rates by 2.37%.

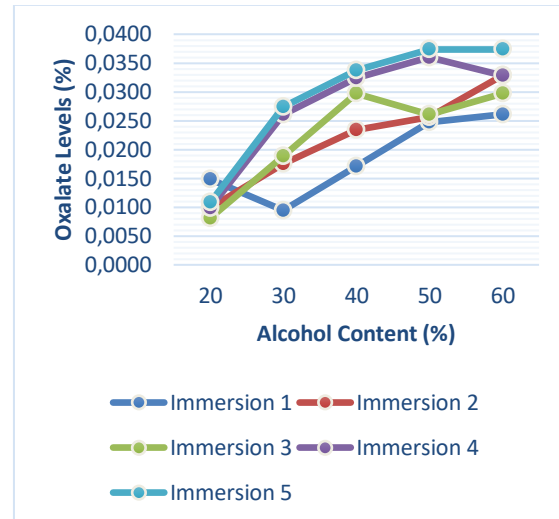
Can be compared based on the shape of the soaked porang, it is easier and faster to release the oxalate content in the porang in the form of diced pieces. This is because the dice form has a small surface area so that in the water immersion treatment with various temperature variations, the 4th immersion temperature of 70 °C gives the best effect.

### *The Effect of Various Concentrations of Alcoholic Solution Immersion Media on Porang on Dice Shapes and Long Slices*

In the alcohol immersion of porang in dice and elongated shapes, experiments were carried out with variations in temperature of 20, 30, 40, 50, and 60 % for 2.5 hours and every 30 minutes a sample was taken.



**Figure 3.** The diced porangs' oxalate levels in various alcohol concentration



**Figure 4.** The long slices porangs' oxalate levels in various alcohol concentration

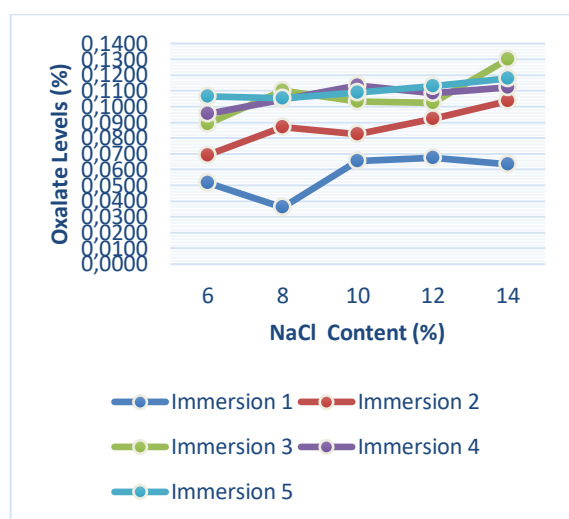
Based on the graph above, it was found that the oxalate content contained in diced porang in various concentrations of alcohol solution immersion with the greatest variation, namely at a concentration of 40% of the 1st immersion. This is because the greater the concentration and contact time, the greater the reduced oxalate. For the 1st immersion or for 30 minutes, it means that the reduced oxalate is maximal. Then obtained a decrease in oxalate rates by 24.6%.

While the acquisition of oxalate rates contained in porang in the form of long slices on immersion in an alcohol solution of various variations in concentration was greatest, namely at 60% of the 5th immersion. This is because the greater the concentration and contact time, the greater the reduced oxalate. Then obtained a decrease in oxalate rates by 19.65%

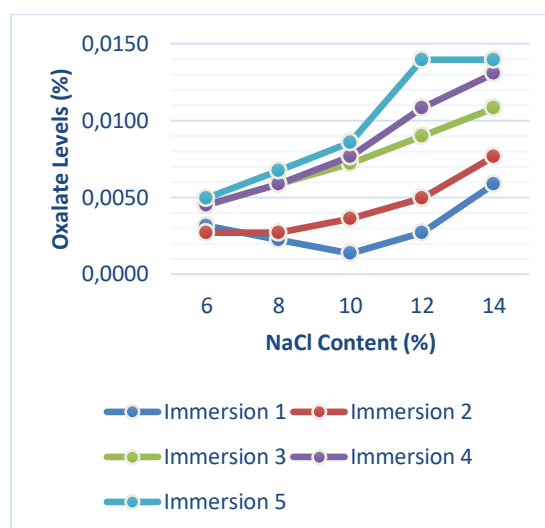
Can be compared based on the shape of the soaked porang, it is easier and faster to release the oxalate content in the porang in the dice. This is because the dice form has a small surface area so that in the water immersion treatment with various variations of this concentration, the concentration of 40% of the 1st immersion gives the best influence.

### *Effect of Various Concentrations of Salt Solution Soaking Media on Porang on Dice Shapes and Long Slices*

In the immersion of salt solution on porang in dice and elongated shapes, experiments were carried out with concentration variations of 6, 8, 10, 12, and 14% for 2.5 hours and every 30 minutes a sample was taken.



**Figure 5.** The diced porangs' oxalate levels in various NaCl concentration



**Figure 6.** The long slices porangs' oxalate levels in various NaCl concentration

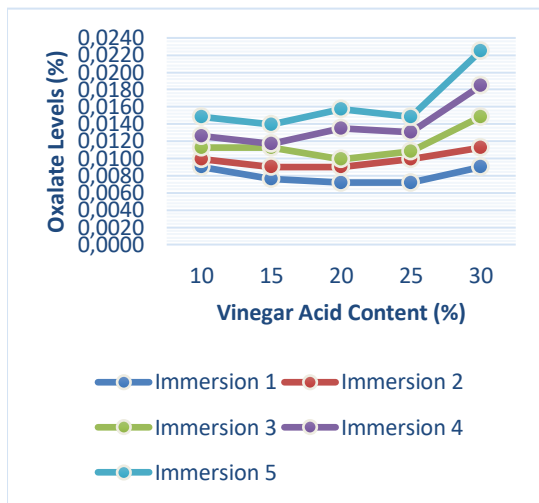
Based on the graph above, it was found that the oxalate content contained in diced porang in salt solution immersion in various concentrations was the largest, namely at a concentration of 14% in the 3<sup>rd</sup> immersion. This is because the greater the concentration and contact time, the greater the reduced oxalate. For the 3<sup>rd</sup> immersion or for 90 minutes, it means that the reduced oxalate is maximal. Then obtained a decrease in oxalate rates by 68.45%. Meanwhile, in the acquisition of oxalate rates contained in porang in the form of long slices in the salt solution immersion, the concentration variations were greatest, namely at 14% of the 5<sup>th</sup> immersion. This is because the greater the concentration and contact time, the greater the reduced oxalate. Then obtained a decrease in oxalate rates by 7.34%, which can be compared based on the shape of the soaked porang, it is easier and faster to release the oxalate content in the porang in the dice. This is because the dice form has a small surface area so that in the water immersion treatment, various variations of this concentration, the concentration of 14%, the 3<sup>rd</sup> immersion has an effect the best

#### *The Effect of Various Concentrations of Soaking Vinegar Acid Solutions on Porang on Dice Shapes and Long Slices*

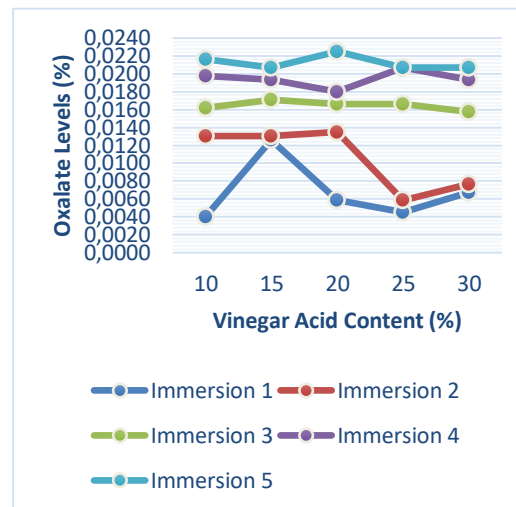
In the immersion of acetic acid solution on porang in dice and elongated shapes, experiments were carried out with concentration variations of 10, 15, 20, 25, and 30 % for 2.5 hours and every 30 minutes a sample was taken.

Based on the graph below, it was found that the oxalate content contained in diced porang in vinegar solution was soaked with the greatest variation in concentration, namely at a concentration of 30% of the 5<sup>th</sup> immersion. This is because the greater the concentration and contact time, the greater the reduced oxalate. Then obtained a decrease in oxalate rates by 11.84%.

While the acquisition of oxalate rates contained in porang in the form of long slices in salt solution immersion in various concentrations was the largest, namely at 20% of the 5<sup>th</sup> immersion. This is because the greater the concentration and contact time, the greater the reduced oxalate. Then obtained a decrease in oxalate rates by 11.84%, which can be compared based on the shape of the soaked porang, it is easier and faster to release the oxalate content in the porang in the dice form. This is because the dice form has a small surface area so that in the various water immersion treatments, the concentration of 30% of the 5<sup>th</sup> immersion has an effect the best



**Figure 7.** The diced porangs' oxalate levels in various vinegar acid concentration



**Figure 8.** The long slices porangs' oxalate levels in various vinegar acid concentration

#### 4. CONCLUSION

Based on the results of the research and discussion that we have done, the following conclusions are obtained:

- In water immersion with variations in temperature, the best results were obtained at a temperature of 70 °C for the 4<sup>th</sup> immersion (120 minutes) in the form of diced pieces. Then obtained a decrease in oxalate rates by 2.37%
- In the alcohol immersion with various concentrations, the best results were obtained at a concentration of 40% of the 1<sup>st</sup> immersion (30 minutes) in the form of diced pieces, lead to a decrease in oxalate rates by 24.63%
- In the immersion of saline solution with variations in concentration, the best results were obtained at a concentration of 14% of the 3<sup>rd</sup> immersion (90 minutes) in the form of diced pieces, lead to a decrease in oxalate rates by 68.45%
- In acetic acid immersion with various concentrations, the best results were obtained at a concentration of 30% of the 5<sup>th</sup> immersion (150 minutes) in the form of diced pieces, lead to a decrease in oxalate rates by 11.84%
- For the immersion media variable, the best immersion with a decrease in oxalate rates was found in the salt solution media.

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