Optimalization the temperature and time of soaking in instant rice making process

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Abstract. Rice (Oryza sativa L.) as the staple food for the Indonesian population with average consumption level reaching more than 25.35 million tons per year. Rice grain is usually processed into rice and consumed as a staple food by most Indonesian people. The process of preparing rice is still relatively for the dynamic community, then preparation of instant rice will support preparing rice more shorter. The purpose of this research is to optimize the temperature and time of soaking in optimal water level at the gelatinization stage in instant rice making process. The research method was applied with various temperature of soaking (40, 50 and 60°C) and time of soaking (10, 20, 30, 40, 50 and 60 minutes). The parameter was observed the rice water level used oven method. The result was at 40°C temperature treatment, showed 37% average of water level. At the 50°C temperature, showed 38% average water level, and treatment with 60°C temperature, showed 39% average water level. The time of soaking ranges 10 to 60 minutes. The average of water level between 35% to 40%. The best temperature of soaking is 40°C in 10 minutes with a number of water level about 33%.

1. Introduction
Rice (Oryza sativa L.) is a staple food for Indonesian people with consumption level reaching more than 25.35 million tons per year. Rice has a high carbohydrate content around 70-80%, protein 6-7% and a very low fat content (1-2%). The most important part of rice grain is endosperm with the main component of starch granules consisting many of amylose and amylopectin [1,2].

In general, rice grain was processed into rice and consumed as staple food by most Indonesian people. Rice grain in generally made by cooking rice used rice cooker or by pouring in water. Commonly rice is usually consumed warm because the taste, aroma and texture are preferred by consumers. When the rice is cold, the texture becomes harder because it experiences a retrogradation event [3]. The community need time about 30 minutes to process rice grain into rice. This is one of the main reasons for some people with increasingly tight work. It is requires cooking rice in a short time. The way to accelerate the process of processing rice grain into rice by the process of instant rice, in the context of the presentation product can be displayed in a faster time and can be consumed in a state of warm where the maximum can be made as an emergency [4].

When this constant food product develops rapidly, it follows the development of the hour food in the community that demands food products that are easy to consume, nutritious, easy to serve [4] and are useful for health.

In the recent year, instant food product following the development of the technology when consumers need food product easier to consume, contain more nutrition, easy to serve [4] and giving
more benefit increasing human healthy. The instant food product in the form drying or concentrate, soluble and easy to serve. Based the technology of the process making instant rice, it is known that the initial of water content, then purpose of this research is to optimize the temperature and time of soaking to obtain optimal water content at the stage of gelatinization process of making instant rice. The purpose of the research is to optimize the temperature and time of soaking in optimal water level at the gelatinization stage in instant rice making process.

2. Material and Methods

2.1. Tools
The tools was used in the research including : spatula, petridish, analytical scales, chemical glasses, measuring cup, waterbath, cast iron, dessicator and oven.

2.2. Material
The material was used in the research : clean water and local variety of solo rice from Enrekang Regency, South Sulawesi Indonesia.

2.3. Methods
The research method was applied with various temperature of soaking (40, 50 and 60 °C) and time of soaking (10, 20, 30, 40, 50 and 60 minutes). The parameter was observed the rice water level used oven method.

3. The research procedure
The rice sample weighed then flushing three times to clean sandy, soil and other impurities then drain it. After flushing, then added clean water with comparison (1:3) and time of soaking in 10, 20, 30, 40, 50 and 60 minutes. The process soaking of rice in the temperature 40, 50 and 60 °C. After soaking the rice continue to drying process. The drying process used oven in temperature 60 °C. The dried products analyze of their water level.

3.1. Water Level Determination [1]
The sample weighed as much as 3 g then put in petridish. Sample was dried in the oven with temperature 105°C at 6 hours then colding in dessicator at 15 minutes then weight it. The process of drying and weighing until achieve constant weight. The water level was counted used formula :

\[
\text{Water level (\%)} = \frac{\text{Initial weight (gram)} - \text{Final weight (gram)}}{\text{Initial weight (gram)}} \times 100\%
\]

3.2. Statistic Analysis
The research used Completely Random Design factorial with twice of replication. If number of treatment showed the different significant result continue to DUNCAN test.

4. Results and discussion

4.1. Relationship Between Temperature and Time of Soaking to Rice Water Level
It very necessary knowledge about processing of instant rice especially water level in the beginning then soaking in the variation of temperature (40, 50 and 60°C) and time of soaking (10, 20, 30, 40, 50 and 60 minutes). The rice water level before soaking process about 11.20% then increasing of water
level after soaking in the various treatment. Table 1 was showed the average number of water level in various temperature treatment and time of soaking.

**Table 1.** The Average Number of Water Level in Various Temperature Treatment and Time of Soaking.

| Time of Soaking (minutes) | Temperature  | Average |
|--------------------------|--------------|---------|
|                          | 40°C  | 50°C  | 60°C  |       |
| 10                       | 33.58 | 35.23 | 36.21 | 35.00 |
| 20                       | 36.43 | 37.40 | 38.43 | 37.42 |
| 30                       | 37.39 | 38.43 | 39.18 | 38.33 |
| 40                       | 37.65 | 39.11 | 39.29 | 39.68 |
| 50                       | 38.23 | 39.32 | 40.30 | 39.28 |
| 60                       | 39.15 | 40.41 | 40.49 | 40.01 |
| Average                  | 37.07 | 38.31 | 39.00 | 38.28 |

The different test result based Anova to rice water level was showed the temperature treatment and time of soaking significantly different in level 1%, then continue to Duncan test. The result of Duncan test was showed the rice water level has differences in every treatment. The relationship between temperature and time of soaking to rice water level was showed in Figure 1.

![Figure 1. The Relationship Between Temperature and Time of Soaking to Rice Water Level](image)

The main purpose of rice soaking is hydration water inside the grain through diffusion processes to reach the water content for starch gelatinization [5]. In this research, time of rice soaking ranges from 10 to 60 minutes used temperature 40°C containing 33 - 39% rice ranges water level. Soaking in temperature 50°C contain 35 - 40% rice ranges water level, then temperature 60°C contain 36 - 40%
rice ranges water level. The reason increasing the rice water level because the high temperature and time of rice soaking resulted the higher water level. According to Bello., *et al* state that the water absorption will increase in time of soaking then stop in the maximum capacity of absorption. The used of higher temperature increasing the water level. We assumed affect of hot temperature stimulating open of rice pores then more water enter into the rice endosperms [6]. Miah., *et al* explain that water absorption will increase for ideal water level with increasing time of soaking or temperature of soaking [5].

The average of water level in temperature treatment 40°C about 37%, then temperature 50°C the average of 38% water level and temperature treatment 60°C the average of 39% water level. The time of soaking in 10 until 60 minutes resulted the average of water level between 35% to 40%. The best water level in the research about 33%, duration of soaking 10 minutes used temperature 40°C, because in the starch gelatinization process need about 30 - 35% water level [7].

5. Conclusion
The average of water level in temperature treatment 40°C about 37%, temperature 50°C the average of 38% water level then temperature treatment 60°C the average of 39% water level. The time of soaking 10 until 60 minutes, the average of water level reaching between 35% until 40%. The temperature treatment in 50°C and 60°C at 10 until 60 minutes not the best treatment because the water level exceed the desired water content limit for gelatinization process, then temperature and time of soaking is 40°C in 10 minutes with 33.58 % water level.

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