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# Analog Rice from Gembili Tubers which Contain Various of Benefits: An Overview

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**ABSTRACT**

Gembili *(Dioscorea esculenta)*, has very good potential, one of which is that the tubers produced have many benefits, apart from being believed to contain high carbohydrates, gembili also contain calcium, potassium, iron and vitamin B6. Apart from being used as a simple food, gembili tubers can be used as an analogue of rice. This review aims to examine and find out the various benefits of gembili tubers, the combination of various agricultural ingredients in producing analog rice and the resulting characteristics. The method of making analog rice is done by extruder. Test how many studies include proximate tests, antioxidants, calcium, levels of fiber and amino acids. Based on several studies of analog rice that made from gembili with tubers 78%, protein content 8%, water content 7.9%, ash content 2-3.5%, fat content 0.5-1.2%, antioxidants 6162 ppm, fiber crude 10% and calcium 1.52%, each. The characteristics of rice is shape, texture, color, and taste to can be accepted by the community. Analog rice can be used as a substitute for rice.

## 1. Introduction

Rice is the staple food of Indonesian society which functions as a source of carbohydrates needed by the body. This source of carbohydrates makes people inseparable from rice, so that it has become a staple food for people not only in Indonesia but in several countries in Asia, both Southeast Asia, South Asia and East Asia [1]. Every year the people's need for rice continues to increase.


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Indonesia has great potential, one of which is having abundant natural resources as a source of vegetable carbohydrates, such as corn, tubers, and beans.

One of the food diversifications is analog rice, analog rice is artificial rice modified from various ingredients such as tubers, nuts or cereals which have a content and structure similar to real rice [2]. Analog rice can be made from a variety of materials, so it is hoped that this rice will be accepted by the community. In a study [2] which made analogue rice from daluga tubers *(Dioscorea esculenta)*, daluga is a plant that has tubers with a high carbohydrate content. Obtained rice analogous to the addition of Carboxymethyl Celulosa (CMC) can be used as an alternative to rice with a total carbohydrate of 83.44%. Similar to research conducted by (Septyaningsih et al., 2016) carbohydrate content was obtained from gembili tubers, where gembili is a plant that belongs to the Dioscoreceae family. The content of rice analogues can be adjusted to the raw materials used such as beans which contain rich in protein [4], a combination of Moringa leaves which are rich in antioxidants [5], contain low glycemic, as functional food. The manufacture of rice analogues is carried out using extrusion technology. The tool used is an extruder with the working principle of a frictional force when the dough is inserted into the machine then the screw will push the dough towards the printing die so that the rice comes out. And it is very important to pay attention to the preconditions, both temperature, ratio of ingredients and also the concentration of added food additives (BTP) used [1].

## 2. Materials and methods

In making analog rice there are several important things that must be considered so that the resulting analog rice has the expected nutritional content, one of which is the composition of the ingredients, both raw materials and food additives. Currently, functional rice has been developed from various ingredients. The materials used include ingredients containing starch, both tubers and nuts, food additives that function as emulsifiers that Glycerol Monostearate (GMS), Carboxy methyl Celulosa (CMC), alginate, carrageenan, oil as a lubricant, and water as a mixing medium. The tools is used in the process of making analog rice include basins, scales, gloves, spoons, and extruders.

The manufacturing process, in general, analog rice is produced through several stages, including the formulation stage, namely mixing raw materials with additional ingredients that support the physical and chemical properties of rice, preconditioning, namely the steaming process by maintaining temperature conditions and residence time in optimum conditions, extrusion, namely the molding process. the dough with an extruder machine, and finally drying, the rice is dried using an oven to obtain a compact and hard structure. The working principle of the extruder is that there is a frictional force between the dough and the screw which works when the dough is inserted through the barrel and then pushed towards the die press, so that the dough comes out in the form of grains of rice [6]

## 3. Results and discussion

### *3.1 Gembili*

Gembili *(Dioscorea esculenta)*, has very good potential, one of which is that the tubers produced have many benefits, apart from being believed to contain high carbohydrates, gembili also contain calcium, potassium, iron and vitamin B6 [7]. Gembili tubers are currently very much processed in the food industry, gembili tubers have a tart taste and are slightly sticky, when raw or unprocessed the appearance of the tubers tends to be baked oval in shape, the root surface of the roots is rough and purplish brown in color, and the tuber flesh is white. The starch found in gembili can be reprocessed into food additives such as emulsifiers and flour substitutes [8]. Gembili has a very high carbohydrate content, which is 31.30% and other constituents such as 1.10% protein, 0.20% fat 56% calcium in milligrams, and 4.00% vitamins, 14% [9]. Analog from gembili tubers have been widely produced and researched for their contents.

**Table 1.** Gembili tubers constituents of analog rice content

| Raw material | Analysis | Result | Source |
|---|---|---|---|
| Sweet tubers | Analysis of carbohydrate levels and protein content with the luff school method | Obtained carbohydrate content of 66.36%, 5.53% protein. It was concluded that it can be used as a substitute for rice. | [3] |
| Gembili tubers and turmeric flour | Analysis of food fiber content using multi- enzyme and antioxidant activity with the method RSA IC50 | Contains antioxi-dant food fiber 6162.7008 ppm and it. that it can be used as a new innovation for making instant rice. | [10] |
| Gembili | Test the content of proximate, calcium, fiber and amino acids | Moisture content 7.09%, ash content 5.43%, fat content 0.52%, | [11] |
| Seaweed flour, fish Bones (Kurisi, Payus, Patin | Proximate analysis, organoleptic test | Protein content 7.93% and carbo-hydrates 74.18%, Calcium 1.52%, crude fiber 2.43% food fiber | [12] |

| | |
|---|---|
| | 4.07% amino acids<br>6.006mg/ kg. |

### *3.2 Gembili Characteristics*

Carbohydrate content and its constituents in general, if summarized from several studies, namely carbohydrates 78%, protein content 8%, water content 7.9%, ash content 2-3.5% and fat content 0.5-1.2%. This content can meet the level of carbohydrate needs in rice, when compared to rice carbohydrates which are around 28-35% [7]. In addition to the price of gembili which is relatively cheap, gembili has also been widely cultivated, so that it is easy for people to process it, not only by burning, boiling, frying but also being modified into rice products, so that people's habit of consuming rice is irreplaceable.

In addition, analog rice from gembili tubers can be combined with various additional ingredients such as turmeric, it is interesting if people are much more practical in making instant yellow rice. Turmeric *(Curcuma Longa)* has an antioxidant content of 6162 ppm and 10.80% fiber content. It is proven that there are bioactive compounds contained in tuber and turmeric raw materials. These bioactive compounds help metabolic processes in the body. Component Include saponins, diosgenins, antioxidants and other free anti- radical compounds [13]. Consumption of analog rice in addition to maintaining food security as a substitute for rice, analog rice is also expected to be able to fulfill people's nutrition. In this case, gembili tubers can be combined with other ingredients which can be proven that these materials are able to meet existing nutritional deficiencies, [11], that there is the addition of fish bones from various types of fish such as kurisi fish, payus and starch, is proven that the calcium content of the rice produced is 1.52%. So that it does not only meet the need for carbohydrate intake, the need for calcium intake is also fulfilled.

The physical characteristics of analog rice that can be used as parameters for assessing or accepting rice for the community are color, aroma, taste, texture, and shape. Color is strongly influenced by raw materials in studies of making rice analogous to turmeric, the resulting color is very popular because it is able to give the impression that people enjoy it, the yellow color comes from turmeric pigment which is bright yellow. Texture is a physical characteristic of rice, in analog rice the expected texture is not sticky, not lumpy like porridge, the aroma is not flashy and pungent, the taste is not thick, not sweet and bitter. Gembili tuber rice has a bland and slightly bitter taste. These four parameters are very important in the orgnaoleptic test to determine public acceptance of analog rice.

## 4. Conclusions

Gembili tubers *(Dioscorea esculenta)* have very high potential when viewed from the benefits and uses in food and drug. Analog rice are made from gembili tubers has almost the same level of carbohydrates as rice, so it can be stated that gembili can be used as a substitute for rice. The content of analog rice can be adjusted according to the raw materials used.

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