



## Bubble Pearls Formulation from Red Yeast Rice as a Food that has an Anti-Cholesterol Effect

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DOI: 10.31080/ASMI.2024.07.1324

Received: November 14, 2023

Published: December 04, 2023

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### Abstract

Fermentation of red yeast rice produces the compound monacolin K, which has the benefit of lowering lipids. Based on its structure, monacolin K is similar to the cholesterol-lowering drug lovastatin, so red rice yeast is used as an anti-cholesterol. This research aims to create a bubble pearl formulation from red yeast rice as an anti-cholesterol food. Red rice is fermented with *Monascus purpureus* and extracted using maceration to produce red yeast rice extract. The bubble pearl food formulation is made with red yeast rice extract and infusion, which are varied with several concentrations. F<sub>1</sub> is 1 gram, F<sub>2</sub> is 1.5 grams, F<sub>3</sub> is 2 grams, F<sub>4</sub> is 2.5 grams, and F<sub>5</sub> is 3 grams. F<sub>5</sub> bubble pearl extract or infusion of red yeast rice is the best formulation because, from the evaluation results, it meets the requirements and has the same dark red and dark brown color as pearl bubbles on the market.

**Keywords:** Anti-cholesterol; Bubble Pearl; *Monascus* sp; Red Yeast Rice

### Introduction

Bubble pearl drink is very popular in big cities all over the world. Evidence of the popularity of this drink in the United States is in the Yelp search field with the keyword "bubble milk tea," which creates more than 500 lists of bubble milk tea sellers; this is only in the city of Los Angeles. Bubble pearl drink is a combination of drinks with high sales [1].

Bubble pearl is one of the ingredients in making bubble milk tea beverage products. Bubble pearl was first popularized in Asia in the 1990s, then became increasingly popular in the United States and Europe in the early 2000s [2]. Bubble pearl is made from a round-shaped top and a boiling process to give it a chewy ball that is added to cold or hot drinks [3]. Such as slushies, smoothies, coffee, tea, or other mixed drinks [4].

Bubble tea drinks contain a lot of fat, which can cause cholesterol to build up in the blood if consumed too often. This condition will increase the risk of heart disease and stroke [5]. Therefore, new breakthroughs are needed in making bubbles so that they are low in fat and safe for people who have cholesterol but like boba [6].

In nature, red yeast rice produced from various species of fungal, such as *Monascus floricornis*, *Monascus anka*, *Monascus pilous*, *Monascus ruber*, and *Monascus purpureus* [7]. The most common species used for red yeast rice production is *Monascus purpureus* Went [8]. This species is considered important in fermented products such as kaoliang wine in Asia, rice wine, red wine, and brown

rice. Mainly in Indonesia, Thailand, Japan, the Philippines, and China [9].

Red Yeast rice is a metabolite of the mold, so it is used for food coloring, which has advantages such as safe for consumption, color results can be mixed with other pigments, pigment results can be dissolved in water, and the color obtained is more stable and consistent [10]. Red Yeast rice is a fermented product that has the potential to be developed as an alternative to synthetic dyes and natural dyes in food products [11].

The results of the pigment produced by red yeast rice contain anthocyanin substances from the flavonoid group, which have strong antioxidants that can encourage increased body resistance [12]. In addition, the fermentation process can produce several secondary metabolites in the form of other polyketides, in the form of Monacolin K, which is identified with mevinolin or lovastatin, and other Monacolin compounds whose function is to become anticholesterol. Lovastatin is an anti-cholesterol used to reduce fat levels in the blood. The formation of lovastatin in red yeast rice can be processed into foods such as bubble pearls [13].

In addition to its function as an interpreter, red yeast rice also has the function of evoking flavor (flavoring enhancer) [14]. The ability of red yeast rice to give an increase in flavor that contains its oligo-peptide content during the fermentation process [15]. With the lovastatin content in red yeast rice, red yeast rice is one of the right ingredients to prevent high cholesterol caused by food. This makes researchers interested in conducting research entitled "Pro-

duction of bubble pearls from red yeast rice to prevent the cholesterol in the community and as Anticholesterol Functional Food.

## Materials and Methods

### Tools and materials

The tools used include 500 ml chemical glass (Pyrex), mesh no 40, spatel, oven, macerator, analytical balance (Starco), aluminum foil (WITA), blender (Philips), small basin, watch glass (HEBEI), steam dish, crepe plastic, filter paper, funnel, rotary evaporator (IKA), waterbatch (Biobase), spatula.

The material used in this study was the fungus *Monascus purpureus*, which came from the collection of the SF ITB microbiology laboratory. Other materials used are 96% ethanol, IR 64 rice, re-fined sugar, tapioca flour, aquadest, agar-agar, and red yeast rice extract.

### Preparation of red rice yeast fermentation and extraction

Put about 100 grams of red yeast rice into a sterilized Erlenmeyer. After that, inoculated with 3 ml of *Monascus purpureus* liquid. Incubate at a temperature of 27°C - 32°C for 14 days and limit shaking every day. After drying, blend the red yeast rice with a blender until it becomes a fine powder. The dry powder was extracted by maceration using 96% ethanol solvent with a solvent change of 3x24 hours. The filtrate is filtered and assembled with a rotary evaporator and water until a thick extract is obtained [16].

### Bubble pearl formulation

The formulation that is used as the bait for this research, bubble pearl, can be found in Table 1.

Ingredient	Formulation				
Tapioca Flour (g)	270	270	270	270	270
Sugar (g)	78	78	78	78	78
Extract/infusion (g)	1	1.5	2	2.5	3
Aquadest (ml)	100	100	100	100	100

**Table 1:** Formulation of Red Yesat Rice Bubble pearl.

### Bubble Pearl preparations production

The bubble pearl procedure of the solid fermentation of the *Monascus purpureus* is based on the modification of the previous study which was carried out [17]. First, mix the dry ingredients until smooth and add the extract or infusion of red yeast rice at 100°C, then stir until smooth. Next, form the dough into small balls, then boil it at 100°C for 23 minutes; the maturity of the bubble pearl is indicated by the formation of a clear layer on the surface of the bubble pearl; after the bubble pearl is cooked, drain, and cooled [18].

### Preparation evaluation

#### Organoleptic observation

Organoleptic observations are carried out with the five senses, including texture, smell or aroma, taste, and color with the naked eye.

### Preference test

The hedonic test is a test on organoleptic sensory analysis, which is useful in order to be able to see the magnitude of the difference in quality between a number of similar products by giving a score or assessment of certain properties of a product and in order to be able to see the level of difficulty of a product [19]. This test was carried out in related panelists who were randomly selected in the number of 15 people where approval had to be based on a health research code of ethics. This test was carried out only for one test; the known favorite parameters were in terms of the level of elasticity, aroma, and color felt by the panelists on the bubble pearl [20].

The range of scores in this assessment is a score of 4 to 1 as follows:

- I really like the product: 4
- Like the product: 3
- Kind of Like the product: 2
- Do not like the product: 1

### Data analysis

The test method of this research is a qualitative analysis, which refers to the answers to the questionnaires filled in by male and female respondents with an age range of 18 years and over. Data processing used the Kruskal-Wallis Test, and if there was a significant difference, it was continued using the Mann-Whitney Test.

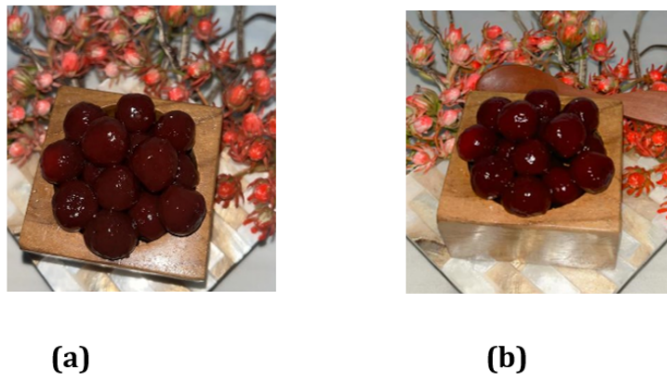
## Results and Discussion

In this study, red yeast rice was extracted using the maceration method. The maceration method was chosen because it is one of the simple extraction methods, has cheaper costs, and prevents damage to thermolabile compounds [21]. The purpose of this extraction is to separate or release secondary metabolites from *Monascus purpureus* in the form of dyes [22]. The yield obtained from red yeast rice extract was 11.72%.

The organoleptic test is a test method that utilizes the human senses which aims to evaluate a powder [23]. It was found that the results of organoleptic observations of simplicia powder and extracts of red yeast rice have physical characteristics, formulation in the form of powder, red in color, and a distinctive smell of red yeast rice. The extract of red yeast rice is thick, dark red, and has a distinctive smell of red yeast rice [24].

Additional ingredients used are tapioca flour as a filler, aquadest as a solvent, granulated sugar as a sweetener, and agar-agar. The bubble pearl yield from can be seen in Figure 1. The bubble pearl yield from the red yeast rice infusion [a] and the bubble pearl yield from the red yeast rice extract (b).

Rice and yeast ferment to create a novel chemical called monacolins, which has the advantage of reducing fats. Monacolin K, which



**Figure 1:** (a) Preparation of Bubble pearl infusion with red yeast rice (b) Preparation of bubble pearl extract of red yeast rice.

resembles lovastatin in structure, is one of the subtypes present in red yeast rice. This substance's primary mode of action is to inhibit HMG-CoA reductase, which is involved in regulating the production of cholesterol. Despite having identical structures, lovastatin and monte Carlin K have distinct pharmacokinetic and bioavailability profiles [23]. Pro-drug lovastatin is an inactive gamma-lactone that will be digested to produce an active, higher bioavailability version of  $\beta$ -hydroxyacid. On the other hand, the bioavailability of red yeast rice may be impacted by the ratio of monacolin K lactone to acid, which can range from 5% to 100%. In humans, lovastatin's active form has a 31% bioavailability, although monacolin K exhibits distinct pharmacokinetics. CYP450 hydrolyzes Monacolin K in the liver and small intestine [5].

Bubble pearl production using the extract/infusion of red yeast rice was then evaluated for physical properties of the preparation, including organoleptic tests (aroma, color, taste, and texture), and preference tests.

Based on the results of the evaluation of the organoleptic test preparations in this study, the bubble pearl color of the extract/infusion of red yeast rice produces a pink to dark red color [25]. For the aroma of bubble pearl, the more extracts or infusions of red yeast rice are added to the bubble pearl, the more distinctive the aroma is that of red yeast rice. This is supported by research [26]. Taste is the sensation of a collection of food temperature, aroma, texture, and also the taste itself. The more extracts or infusions of red yeast rice are added to the bubble pearl, the more distinctive it is to red yeast rice [27]. Next, Bubble pearl extract or infusion of red yeast rice produces a chewy bubble pearl texture from the interaction of the main ingredient (tapioca) and liquid during the processing and heating process. The reduction of tapioca flour greatly affects the texture of the resulting bubble pearl [18].

The preference test or hedonic test aims to see the likes or dislikes of consumers from the color, texture, aroma, and taste of the preparations made [28]. Preferred test results the extract or infusion of red yeast rice were carried out on 15 panelists to produce the most preferred Formulation V. Based on the research results,

Formulation V bubble pearl extract red yeast rice from color, texture, aroma, and taste is preferred (very like) because the color is darker red. F<sub>5</sub> bubble pearl infuse red yeast rice from color, texture, aroma, and taste is preferred (very much like) because the color is darker red.

Based on the results of the hedonic test of the formulation for bubble pearl extract and infusion of red yeast rice, using SPSS, for colors F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub>, texture, aroma, and taste in the 5 Formulations, there were no significant differences while for colors F<sub>4</sub> and F<sub>5</sub>, there were differences. Significant.

## Conclusion

Based on the research results, it was concluded that red yeast rice, which functions as an anti-cholesterol, can be processed into health foods such as bubble pearl, which has an anti-cholesterol effect. F<sub>5</sub> bubble pearl extract or infusion of red yeast rice is the best formulation because, from the evaluation results, it meets the requirements and has the same dark red and dark brown color as pearl bubbles on the market.

## Acknowledgements

We would like to thank the Dean and Head of Microbiology Laboratory Bakti Tunas Husada University Tasikmalaya.

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