



UDC 637; DOI 10.18551/rjoas.2023-03.17

FORMULATION AND NUTRITION OF BOBA TILAPIA FISH AND SEAWEED AS A GENERATION Z IMMUNE BOOST DRINK

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ABSTRACT

Boba is a filling or topping for drinks (tea, coffee, milk, fruit juice) sweet (sugar, brown sugar, honey) in the form of balls (bubble) or pearls (pearl) with a chewy and bouncy texture (QQ) and color black. Boba is made from tapioca flour mixed with sugar and then formed into small spheres and then boiled and then mixed with drinks. Boba drinks contain lots of sugar, carbohydrates and are high in calories which can cause obesity and diabetes in generation Z who really like the current boba drink. The lack of nutritional value in boba can have a negative impact on the health of the younger generation, especially generation Z, who is currently between 10-25 years old, are still in their productive age and have high mobility. They need food and drink intake that not only tastes good, is practical in how to consume it, looks attractive, but also contains nutrients that can maintain health and boost immunity. Therefore, it is necessary to add boba material that contains high nutritional value which can increase the protein content of boba, namely fish meat. Fish meat that can be used as a mixture for making boba is tilapia meat. Tilapia meat is white, not fishy, tastes delicious, has a soft texture, is easily separated from the skin and bones, has a high yield, low fat, is relatively inexpensive and is readily available all the time. Tilapia meat added in the form of coarse flour to make it easier to blend with other ingredients when making boba dough. In addition to adding tilapia meat, boba drink also needs to be added to seaweed as a source of fiber and its high antioxidant content is very good for counteracting free radicals. Seaweed which is added in the form of coarse gruel is intended to give a textural sensation to the resulting boba. There is not much research on boba, especially those that focus on the formulation and nutritional treatment of the resulting boba. It is important to formulate the addition of tilapia meat meal and seaweed pulp to produce the organoleptically preferred boba quality so that boba can be accepted by consumers and has better advantages than boba on the market in terms of its nutritional content, especially protein, fiber and high antioxidant content, can increase immunity, especially for gene Z. The aim of the study was to find out the best comparison formulation between tapioca flour, tilapia meat meal and seaweed pulp in the processing of tilapia seaweed boba in terms of proximate content, total sugar, elasticity, organoleptic, and TPC. The results showed that the resulting tilapia fish meal and seaweed slurry had good characteristics as raw materials for boba processing. Based on the test results on tilapia boba products with various comparisons of tapioca flour, tilapia fish meal and seaweed pulp, it was found that the best treatment was C1, the ratio of tapioca flour: tilapia fish flour: seaweed pulp = 37.5:12.5:50.

KEY WORDS

Boba, tilapia, seaweed, organoleptic properties.

Boba is a tapioca ball that is often used as a filling for bubble tea drinks. Bubble tea is a modern drink that is loved by children and young adults. This drink has been popular since the 1990s until now. There is almost no nutritional content in Boba Milk Tea, it's just that this drink is high in sugar so it is not good for the body if consumed too often. These drinks contain not only natural sugars, but also added sugars such as sucrose, fructose, galactose, and melezitose. Based on a 2017 study conducted by Jae Eun Min, David B. Green and Loan Kim, bubble milk tea has an average sugar content of 38 grams. This drink also



contains calories of 299 kcal for each portion. In fact, the American Heart Association states that added sugar intake should not exceed 150 kcal per day for women and 100 kcal per day for men. Excess sugar intake from boba drinks can pose a health hazard.

Large boba drink (946 ml) plus toppings such as jelly and pudding, the sugar content will be higher. One serving of this drink is equivalent to 250% of men's daily sugar needs and 384% of women's sugar needs. This amount exceeds the recommendation of the World Health Organization (WHO) which states that the daily sugar intake limit is 10% of total calories. As an illustration, if the calorie intake is 2,000 kcal, it means that sugar intake should not exceed 200 kcal. Excessive intake of sugar, especially added sugar, has been shown to increase the risk of type 2 diabetes. This risk can increase if there are indications of obesity, rarely do physical activity, smoke, and have sleep disorders.

The high sugar content and low nutritional content in boba need to be corrected by formulating boba. Until now, not many studies have examined boba, especially in terms of formulation, even though boba can be increased in nutritional content by adding fish meat as a high protein source so that the resulting boba also has a high protein content. One type of fish that can be used is tilapia.

Tilapia is nicknamed Waterfowl because farmed tilapia is a staple food in many parts of the world. Tilapia is believed to be a healthy source of protein, micronutrients and essential fatty acids. Tilapia is the most consumed and widely cultivated fish in China, India, Egypt, the Philippines, Indonesia, Thailand and Brazil. Tilapia grows fast and has a strong immune system. This fish is easy to cultivate and rich in nutrients.

Some of the uses of tilapia meat are as a basic ingredient for making food such as meatballs, tofu meatballs, ekado, empek-empek and into cendol drinks, (As Y, 2015). The famous tilapia cendol is cendol from Sleman with the name Dawet deNilia whose physical appearance is the same as cendol in general. The cendol is green in color and not too big in size, the texture is more chewy and not easily crushed, the cendol taste is bland and there is no fishy smell when drunk. For the sweet taste of brown sugar, it's not too much. There is also cendol from Cirebon which also uses tilapia as its basic ingredient, the cendol has a savory taste, no fishy smell and a slightly fibrous texture and is definitely high in protein. The use of tilapia meat as a drink is still limited to cendol, therefore it needs to be developed into a beverage product that is currently being favored by the younger generation, namely boba. In the manufacture of boba, other ingredients are also needed that can improve the texture and increase the nutrition of boba in terms of fiber and antioxidants, one of which is by adding seaweed.

Seaweed or better known as seaweed is one of the most abundant biological resources in Indonesian waters (Amaliah S., 2016). The diversity of seaweed in Indonesia is the largest compared to other countries. However, the use of seaweed in Indonesia, especially for industrial and health purposes, is still not optimal.

Seaweed is a high-fiber food. The fiber contained in seaweed is classified as water soluble fiber (Julyasih, 2010). Soluble fiber in water is easy to digest. This fiber resembles a jelly in the intestines that can lower total blood cholesterol and LDL levels. Increased fiber consumption was associated with a weight loss of 1.9 kg over 3.8 months (Murakami, 2007; Peters, 2011; Jensen, 2012; Fuji, 2013). Some of the uses of seaweed, one of which is seaweed porridge, healthy diet menus include cooking it into soup, salad, fruit ice and stir fry.

Substances found in tilapia meat and seaweed that can increase body immunity are needed by the young generation who have high mobility, are very busy and have a less varied diet, only like practical and fast food and sweet drinks.

Experts state that Gen Z has very different traits and characteristics from the previous generation. This generation is labeled as a boundary-less generation. Ryan Jenkins (2017) in his article entitled "Four Reasons Generation Z will be the Most Different Generation" for example states that Gen Z has different expectations, preferences, and work perspectives and is considered challenging for the organization. Gen Z characters are more diverse, global in nature, and have an influence on the culture and attitudes of most people. One thing that stands out, Gen Z is able to take advantage of technological changes in various aspects of their lives. The technology they use is as natural as they breathe. However, the



lack of Gen Z is the lack of attention to daily nutritional intake, they only care about foods that they like and tend to be sweet which contain a lot of sugar, therefore it is necessary to improve the nutritional level of Gen Z, one of which is through boba drinks which are expected to be a practical solution to meet their nutrition.

The purpose of the study was to obtain the best comparison formulation between tapioca flour, tilapia meat meal and seaweed porridge in the processing of seaweed tilapia boba as seen from the proximate test, total sugar, elasticity, organoleptic and TPC as well as to test the profile of amino acids, fatty acids and the type of sugar in boba with the best formulation.

METHODS OF RESEARCH

This research was conducted in the City of Banjarbaru and Banjar Regency to obtain raw materials for making boba tilapia seaweed products. Making boba is carried out in the PHP FPK ULM laboratory. Product testing at the Faculty of Fisheries, University of Lambung Mangkurat, accredited laboratories namely and Centers that can cooperate and support research such as the Cempaka Fishery Products Quality Testing and Monitoring Center Laboratory and the Banjarbaru Industrial Research and Standardization Center.

The tools used include boba-making equipment and proximate testing equipment (microjedahl, soxhlet, oven, furnace), total sugar (refractometer), elasticity (texture analyzer), organoleptic (score sheet, plastic plate, organoleptic table), TPC (colony counter), vitamin A (spectrophotometer), vitamin C (spectrophotometer), calcium (AAS), iron (AAS), phytochemical compounds (spectrophotometer screening of flavonoids, alkaloids, trepenoids/steroids, saponins, tannins), amino acid profile (HPLC), fatty acid profile (GC-MS), type of sugar (HPLC-RP), antioxidant activity (spectrophotometer), visual surface morphology (TEM), dietary fiber (dietary fiber).

The main ingredients used in this study to make boba products are tilapia meat obtained from Bauntung Banjarbaru Market, dried seaweed obtained from Kotabaru, tapioca flour, flavors, and dyes. In addition, chemicals are also used for each test of boba products.

The study was conducted in 3 groups: processing of tilapia meat meal; seaweed pulp processing; seaweed tilapia boba processing.

Tilapia Fish Meat Processing Procedure:

- Separate the meat (fillet) with the bones and skin of tilapia, then the meat is washed with running water until clean;
- Provision of lime juice as much as 1:10, namely 1 milliliter of lime juice for 100 grams of tilapia meat, then leave it for 5 minutes and then wash the meat again until clean;
- Steam fish meat at 100C for 30 minutes to soften the meat for easy shredding. At the time of steaming, it is given pandan leaves to remove the fishy smell of fish meat and to give it a distinctive pandan fragrance;
- Pressing fish meat using a press is intended to reduce water and fat content;
- Roasting the fish meat using a skillet over medium heat at around 70C for 1 hour while continuing to stir until the fish meat is dry;
- Flour the fish meat using a dry blender, sifting the tilapia meat flour is done so that the resulting flour is homogeneous and ready to be tested for its quality.

Seaweed Pulp Processing Procedure:

- Soaking a weight of dry seaweed using fresh water at room temperature with a ratio of 1:4, that is, 1 kilogram of dried seaweed is soaked in 4 liters of fresh water. Soaking is done 2 times. The first is for 24 hours using whitening water, then the second is soaked using fresh water for 24 hours. The soaking water is replaced every 4 hours until the seaweed swells and becomes soft again;
- Washing seaweed with running water until clean and then drained;
- Reducing the size by cutting about 3cm to facilitate smoothing, then mashed using a blender but not too soft. The seaweed porridge is then tested for quality.

Seaweed Tilapia Boba Processing Procedure:



- Mixing tilapia meat meal, seaweed porridge and tapioca flour according to the predetermined treatment until homogeneous;
- Boba dough printing in the form of small spheres such as pearls or bubble balls;
- Boiling the molded boba at a temperature of 100C for 10-15 minutes until the boba is cooked which is indicated by the presence of a floating boba;
- Drain the boba until there is no remaining cooking water. This is done so that the boba produced does not contain a lot of water which can affect the quality and durability of the boba. Furthermore, the boba is ready to be analyzed.

The experimental design used in this study was Factorial RAL using 3 factors, each of which had 3 combinations, each treatment was repeated 3 times to obtain 27 samples plus 3 boba samples on the market to become 30 samples.

Independent variable in this study was the boba formulation using 3 factors, namely tapioca flour (T), tilapia fish meal (N) and seaweed pulp (R), each of which was divided into 3 combinations. The research treatment is described as follows:

Tapioca Flour: Tilapia Fish Flour: Seaweed Porridge		
50: 37.5: 12.5 70ml	50: 25: 25 40ml	50: 12.5: 37.5 30ml
37.5: 50: 12.5 80ml	25: 50: 25 80ml	12.5: 50: 37.5 6ml
37.5: 12.5: 50 10ml	25:25:50 10ml	12.5: 37.5: 50 20ml

RESULTS AND DISCUSSION

This research produces an intermediate product in the form of tilapia fish meal and seaweed porridge which is then added with tapioca flour to be processed into tilapia boba. The results of the proximate test in Table 1, and phytochemical screening can be seen in Table 2.

Table 1 – Results of Proximate Testing of Tilapia Boba

Treatment	Proximate (%)					
	Code	Water	Ash	Proteins	Fat	Carbohydrate
50: 37.5: 12.5	A1	48.71	0.40	11.04	1.75	86.81
50: 25: 25	A2	50.27	0.65	19.49	2.10	77.76
50: 12.5: 37.5	A3	47.68	0.69	8.30	1.08	89.93
37.5: 50: 12.5	B1	49.15	0.48	13.35	1.70	84.47
25: 50: 25	B2	51.52	0.63	16.99	2.49	79.89
12.5: 50: 37.5	B3	55.11	0.71	17.65	2.76	78.88
37.5:12.5: 50	C1	51.08	0.51	8.16	1.99	89.34
25: 25: 50	C2	50.48	0.62	16.55	3.67	79.16
12.5: 37.5: 50	C3	52.19	0.89	19.82	2.12	77.17

Based on Table 1, the best value is the treatment with code C1 (37.5: 12.5: 50), namely seaweed porridge compared to tilapia fish flour and tapioca flour. The proximate results were 51.08 water content, 0.51 ash content, 8.16 protein content, 1.99 fat content and 89.34 carbohydrate content.

Table 2 – Phytochemical Screening Test Results

Treatment	Phytochemicals (%)					
	Code	Saponins (%)	Alkaloids (%)	Flavonoids (mg/ml QE)	Phenolic (mg/ml)	Triterpenoids (mg/ml)
Dried Seaweed	LR	2.50	6.86	0.15	2.13	367.80
Seaweed Porridge	BR	1.88	3.40	0.20	3.87	201.80
Tilapia Fish Meal	IT	1.38	0.93	0.20	2.67	256.80
Best Boba	BB	0.2 3	1.32	0.20	4.07	466.8 0



Based on the composition of the treatment, the best is C1 which is the ratio of tapioca flour: tilapia flour: seaweed porridge = 37.5: 12.5: 50 which is seaweed porridge compared to tilapia flour and tapioca flour, producing a texture and taste similar to boba on the market. Meanwhile, for other treatments, some of the textures did not blend and crumbled.

Based on the results of the phytochemical test of boba, the best saponins were 0.23%, alkaloids 1.32%, flavonoids mg/ml 0.20%, phenolic 4.07 mg/ml, triterpenoids 466.80 mg/ml, while the results of phytochemical screening of raw materials boba i.e. seaweed porridge and tilapia fish meal was higher than the resulting boba product.

CONCLUSION

The conclusion that can be drawn from the results of the study is that the tilapia fish meal and the seaweed produced have good characteristics as raw materials for boba processing. Based on the results of testing on tilapia boba products with various comparisons of tapioca flour, tilapia flour and seaweed porridge, it was found that the best treatment was C1 the ratio of tapioca flour: tilapia flour: seaweed porridge = 37.5: 12.5: 50.

ACKNOWLEDGMENTS

Acknowledgments are conveyed to LPPM ULM for research funding through DIPA Lambung Mangkurat University Fiscal year 2022 Number: SP DIPA – 023.17.2.677518/2022 dated November 17, 2021 in accordance with the Decree of the Chancellor of Lambung Mangkurat University Number: 458/UN8/PG/2022 dated March 28 2022.

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