

Proximate composition of several fish from Jatigede Reservoir in Sumedang district, West Java

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Abstract. The aim of research is to determine the nutritional contents of fishes in the Jatigede Reservoir, the research uses survey method from November 2016 to October 2017. Sample collecting is done in the Wado district and Jatigede district. Samples are identified by its species and the nutritional contents are determined. The analyzed parameter includes water content, ash content, crude fiber content, protein content, fat content and carbohydrate content. Research shows that the nutritional contents of 13 species of fish vary. The water contents ranges between 67.50 % to 77.75 %, the highest percentage found in *Chana striata*. Ash contents ranges between 1.25 % to 4.87 %, the highest percentage found in *Rasbora argyrotaenia*. Crude fiber percentage cannot be found. Protein ranges between 14.43% to 21.93 %, the highest percentage found in *Chanos chanos*. Fat ranges 0.72 % to 6.86 %, the highest percentage found in *Hampala macrolepidota*. Carbohydrate ranges between 0.12 % to 2.64 %, the highest percentage found in *Osteochillus vittatus*.

1. Introduction

The fish found in the Jatigede Reservoir are derived from the indigenous fish of Cimanuk River, as well as fish deliberately stocked by the Ministry of Fisheries and Marine for specific purposes. Fish from the Cimanuk River consist of *Barbodes balleroides*, *Barbodes gonionotus*, *Osteochillus* sp, *Osteochillus vittatus*, *Rasbora argyrotaenia*, *Diplocheilichthys pleurotaenia*, *Tor duorensis*, *Cyprinus carpio*, *Hampala macrolepidota*, *Mystacoleucus marginatus*, *Chana striata*, *Mystus gulio*, *Oreochromis niloticus*, *Tilapia mozambica*, *Trichogaster pectoralis*, *Liposarcus pardalis*, and *Mastacembelus erythrotaenia*. Fishes that were intentionally stocked are fishes that already inhabited the Cimanuk River and were restocked, such as *Osteochillus haseltii*, *Barbodes gonionotus*, *Barbodes balleroides*, *Tor duorensis*, *Cyprinus carpio*, and *Oreochromis niloticus*. Additionally, new fishes that previously did not inhabit the Cimanuk River were also stocked, such as *Barbodes orphoides*, *Pangasius hypophthalmus*, *Chanos chanos*, *Stenoparingodon iddella*, and *Helostoma teminkii*.

The number and species of fish stocked to Jatigede Reservoir in October 2015 to December 2015 numbered to 3,355,600 fish; in January 2016 to July 2016 5,240,000 fish; and again on 30th August 2016 to the amount of 2,105,000 fish. In the framework of World Water Day on April 27th 2017, 550,000 fish consisting of 1,000,000 *Pangasius hypophthalmus* fishes, 500,000 *Cyprinus carpio* fishes, 2,000,000 *Oreochromis niloticus* fishes, 350,000 *Helostoma teminkii* fishes, 200,000 *Barbodes* sp fishes, 650,000 *Osteochillus haseltii* fishes, and 250,000 *Chanos chanos* fishes were stocked.

The consumption level of fish in West Java in 2015 was only 27 kg per capita per year, meaning that it is still far from the ideal consumption of the World Health Organization (WHO) standard [1]. The



Governor of West Java has utilized Jatigede Reservoir as a new center of fish production as a means to increase the fish consumption of West Java citizens. Capture fishery is the utilization system used at the Jatigede water reservoir.

Fish is one of the food commodities and is a source of protein and fat from the waters. The chemical composition of fish meat consists of water, ash, fat, carbohydrates, vitamins, and minerals, whose composition varies greatly between one fish species to the other. The differences in the chemical composition of fish meat for both the amount and the constituent components are due to the environmental and biological factors of the fish. Biological factors which are commonly called intrinsic factors are factors derived from the type of fish such as the species or class, age and sex of fish [2]. The species or class of fish is very influential on the difference in the composition of fish meat; each type of fish has a different kind of chemical composition in its meat. Age also affects the chemical component, the older the fish, the more fat content it will tend to have. Additionally, gender is closely related to gonad maturity; while an actively moving fish encourages it to find enough food to meet its energy needs. Habitats also affect the composition of meat; predatory fish will be different from plant-eating fish. Environmental factors that affect the nutritional composition of fish meat include the source of food. Based on the above description, research on the composition of nutrition in the fish inhabiting Jatigede Reservoir is necessary.

2. Methodology

Fish identification was carried out by using books by [3,4,5,6,7,8,9,10,11]. The types of fish taken as samples to analyze nutritional content were fish caught during the research. Samples were taken randomly from the catch of fishermen. The nutrient parameters analyzed were moisture content, ash, crude fiber, protein, fat, and carbohydrates. The analysis methods used: were the Oven Method for water and ash content, the Kjeldhal Method for protein content, and the Soxhlet Method for fat content. The work procedure of analysis refers to the guidelines of [12]. Carbohydrate content is determined by difference with the calculation = $100\% - (\% \text{ water} + \% \text{ ash} + \% \text{ fat} + \% \text{ protein})$. Food standardization was referenced from the book by [13,14]. The composition of 100 gram material of fresh fish is 76 % water content, 17 % protein, and 4.5 % fat [13]. The composition of 100 gram material fresh fish, is 70 % to 85 % water content, 15 % to 25 % protein, 0.5 % to 7 % fat, 0.1 % to 1 % carbohydrate, and 0.1 % to 4 % ash [14]. The analysis was conducted at the Laboratory of Animal Feed Technology at the Faculty of Animal Husbandry of Padjadjaran University and at the laboratory of the Faculty of Agricultural Industrial Technology of Padjadjaran University.

3. Result and discussion

The results of the nutritional composition measurements consisting of water content, ash, protein, fat, and carbohydrates from 13 species of fish found in Jatigede Reservoir are as follows: The nutritional composition of *Barbodes*, *Barbodes balleroides*: 67.50 % water content, 4.36 % ash, 19.30 % protein, 6.54 % fat and 2.30 % carbohydrate. *Barbodes gonionotus*: 76.53 % water content, 3.63 % ash, 14.43 % protein, 5.37 % fat and 2.04 % carbohydrate. The research results of the Research Centre for Marine and Fisheries Product Processing and Biotechnology showed: 82 % water content, 1.5 % ash, 9.7 % protein, 5.1 % fat and 1.7 % carbohydrate. According to Muchtadi [2], 66% water content, 19 % protein, 13 % fat. The water content of *Barbodes gonionotus* fish that live in the Jatigede Reservoir is lower than the results from the Research Centre for Marine and Fisheries Product Processing and Biotechnology, but higher than the research result of [2]. The difference of water content in *Barbodes gonionotus* fish is caused by environmental factors associated with the osmoregulation process in the body of the fish. The levels of ash, protein, fat and carbohydrates of this particular fish found in Jatigede Reservoir was higher when compared to the research results of the Reserch Centre for Marine and Fisheries Product Processing and Biotechnology. The high levels of nutrients of *Barbodes* fish living in Jatigede Reservoir is caused by environmental factors, Cirata Reservoir is suspected to have food supplies in the form of detritus and other materials which is a source of quality feed and exists in huge numbers.

The composition of the fish nutrition of *Diplocheilichthys pleurotaenia* are as follows: 70.91 % water content, 4.73 % ash, 19.05 % protein, 2.89 % fat and 2.42 % carbohydrate. The nutritional composition of fish from the genus *Osteochyllus*, *Osteochyllus* sp is: 75.60 % water content, 3.24 % ash, 17.18 % protein, 3.59 % fat and 0.39 % carbohydrates. For *Osteochyllus hasseltii*: 70.35 % water content, 4.30 % ash, 18.63 % protein, 4.04 % fat and 2.64 % carbohydrate. In the case of Fish Hike: 73.30 % water content, 4.24 % ash, 17.67 % protein, 2.82 % fat and 1.97 % carbohydrate. The nutritional composition of the fish *Hampala macrolepidota*: 71.15 % water content, 2.21 % ash, 19.31 % protein, 6.86 % fat and 0.47 % carbohydrate. The nutritional composition of the *Rasbora argyrotaenia* fish: 70.80 % water content, 4.87 % ash, 19.88 % protein, 2.58 % fat and 1.87 % carbohydrate. Research results of the Research Centre for Marine and Fisheries Product Processing and Biotechnology measured the *Rasbora* fish protein level at 10 %, and fat at 3.2 %. Compared to these results, levels of *Rasbora* fish protein that inhabit Jatigede Reservoir are higher with a smaller fat content. The nutritional composition of *Mastacoleucus marginatus* was measured at: 75.93 % water content, 3.59 % ash, 15.64 % protein, 4.40 % fat and 0.74 % carbohydrate. When compared with the results from the Research Centre for Marine and Fisheries Product Processing and Biotechnology, the fish protein and fat content of *Mastacoleucus marginatus* found at Jatigede Reservoir is higher, because results from the Research Centre for Marine and Fisheries Product Processing and Biotechnology showed protein to be at 14.8 %, and fat 2.3 %.

Chanos chanos has the following nutritional composition: 74.22 % water content, 1.98 % ash, 21.93 % protein, 1.66 % fat and 0.21 % carbohydrate, while the research results of the Research Centre for Marine and Fisheries Product Processing and Biotechnology measured 75.85 % water content, 2.81 % ash, 21.49 % protein, 0.72 % fat and 0.11 % carbohydrate. Water content was found to be at 74.0 %, protein 20.0 %, fat 4.8 % [2]. When comparing research results of protein, fat and carbohydrate levels between the milkfish from Jatigede Reservoir, the Research Centre for Marine and Fisheries Product Processing and Biotechnology and Muchtadi R, the milkfish from Jatigede Reservoir measured higher. The nutritional composition of *Trichogaster pectoralis* from Jatigede Reservoir had a water content of 71.31 %, 3.73 % ash, 18.96 % protein, 4.18 % fat and 1.82 % carbohydrate. Protein content performed by the Agency for Biotechnology and Food Processing Marine and Fisheries was 8.79 %, indicating that the protein content of the Three Spot Gourami from Jatigede Reservoir is higher. The nutritional composition of *Oreochromis niloticus* from the Jatigede Reservoir is as follows: 76.81 % water content, 1.67 % ash, 18.75 % protein, 1.58 % fat and 1.19 % carbohydrate. The nutrition of *Chana striata* from the Jatigede Reservoir: 77.75 % water content, 2.85 % ash, 18.57 % protein, 0.72 % fat and 0.12 % carbohydrate. *Mystus gulio* from Jatigede reservoir: 75.95 % water content, 1.25 % ash, 16.90 % protein, 4.94 % fat and 0.96 % carbohydrate.

Water content is very influential on the quality of food, hence water content is often removed or reduced by means of evaporation or drying during food processing. Fish found in the Jatigede Reservoir with the lowest water content was obtained from *Barbodes balleroides* at 67.50 %, while the highest was obtained from *Chanos chanos* at 77.75 % (figure 1). The content of water in foodstuffs is an indication of food resistance against microbial attack, therefore the food to be processed should be dry so that resistance to microbial growth can be suppressed [13].

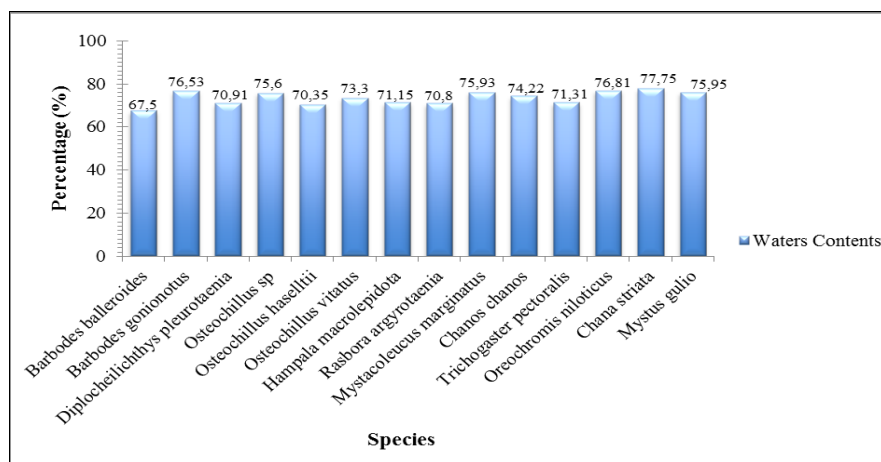


Figure 1. Water contents of fish in Jatigede reservoir.

Mystus gulio had the lowest ash level at 1.25 %, while the highest was *Rasbora argyrotaenia* at 4.87 % (figure 2). The high level of ash in *Rasbora argyrotaenia* comes from bones and scales, because the fish is rather small so every organ consisting of head, body, tail and scales were measured.

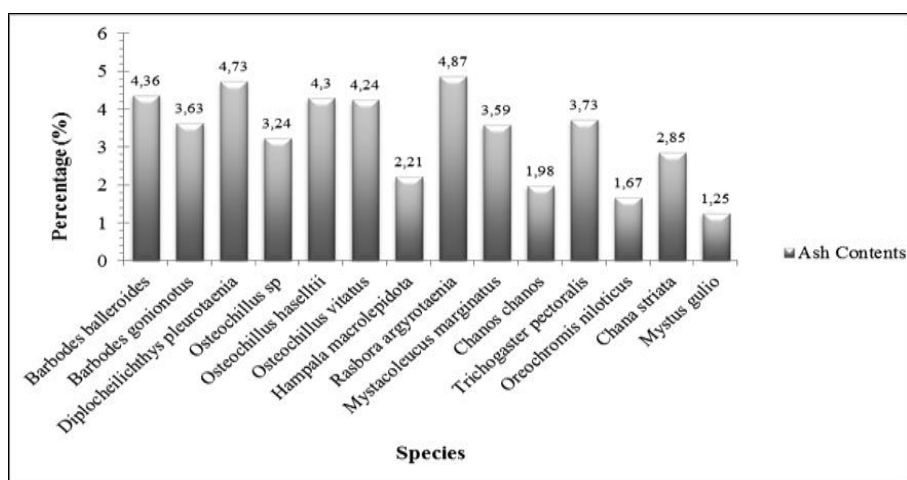


Figure 2. Ash contents of fish in Jatigede reservoir.

Barbodes gonionotus had the lowest protein level at 14.43 %, while the highest was found in *Chanos chanos* at 21.93 % (figure 3). Protein is a nutrient group that is very important in enzyme, antibody, and some hormone production.

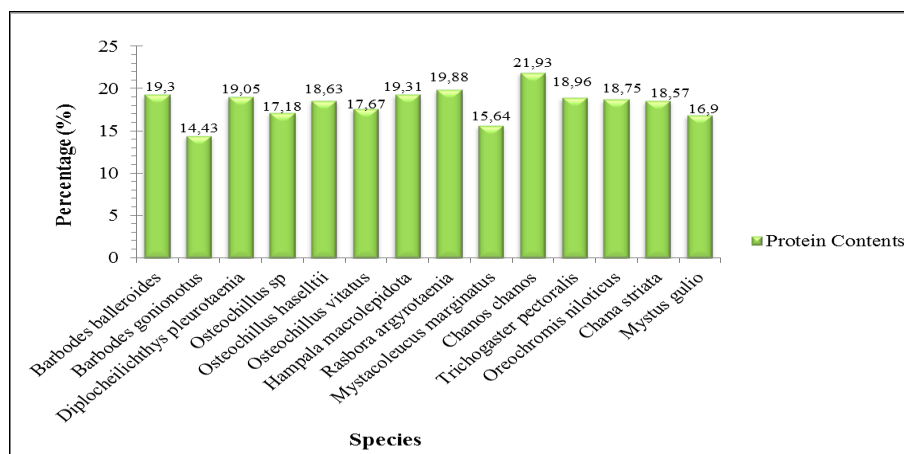


Figure 3. Protein contents of fish in Jatigede reservoir.

Hike fish had the lowest fat level at 0.72 %, while the highest was *Barbodes balleroides* at 6.52 % (figure 4). Each gram of fat consists of 2.25 times the calories from the total calorie made by one gram of protein of carbohydrate [13]. Fat acts as a supplier of some of the energy necessary to perform daily activities, and are also providers of fatty acids and a component of food taste and vitamins.

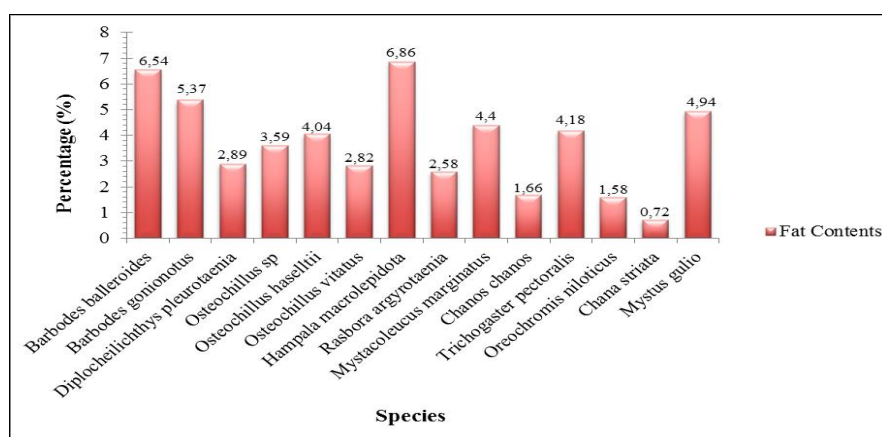


Figure 4. Fat contents of fish in Jatigede reservoir.

Chana striata had the lowest level of carbohydrate at 0.12 %, while the highest was measured in *Osteochillus hasseltii* at 2.64 % (figure 5). The low level of carbohydrate in Chana is caused by their main food source which comes from fish or is in the carnivore fish group. The high level of carbohydrate in *Osteochillus hasseltii* is because the fish is a herbivore.

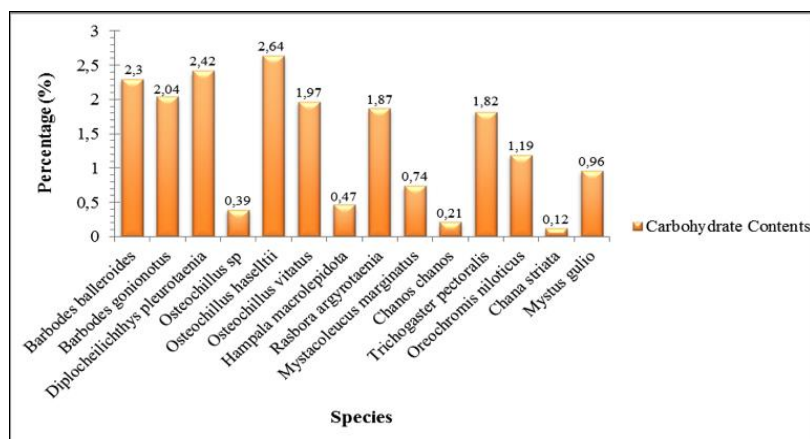


Figure 5. Carbohydrate contents of fish in Jatigede reservoir.

Silver barb, silver rasbora, spotted barb, milkfish, and three spotted gouramy that inhabit Jatigede Reservoir had a relatively higher protein level when compared to the same fish that were researched by the Research Centre for Marine and Fisheries Product Processing and Biotechnology, and [2], research results suggest that these are caused by environmental factors.

4. Conclusion

According to research results from 13 fish species that inhabit Jatigede, we can conclude that:

1. Fish that live in the Jatigede Reservoir contain good nutrients to be consumed as a food ingredient because it contains important substances for the body such as proteins, fats and carbohydrates. The levels of the nutrients are different for each species.
2. Silver Barb, Silver Rasbora, Spotted Barb, Milk Fish, and Three Spotted Gouramy that inhabit the Jatigede Reservoir had a relatively higher protein level when compared to the same fish that were researched by the Research Centre for Marine and Fisheries Product Processing and Biotechnology, and [2].

We suggest that further research needs to be done on complete nutrition content analysis including mineral and vitamin content.

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