# PROXIMATE ANALYSIS OF SELECTED FRESHWATER FISH IN KUANTAN, PAHANG

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## ABSTRACT

**Introduction:** The purpose of this study was to evaluate proximate composition of freshwater fish that are commonly consumed by Malaysians namely *Clarius batrachus* (*Keli*), *Oreochromis niloticus* (*Tilapia merah*), *Pangasius hypophthalmus* (*Patin*) and *Channa striata* (*Haruan*). **Methods:** The proximate composition of moisture, protein, fat and ash were measured according to method described by Association of Official Analytical Chemists (AOAC) 1990 with slight modifications. Data was analyzed using Analysis of Variance (ANOVA), with a significance level used for all tests was at 95% ($p<0.05$). **Results:** Our results showed that all four species of fish had the moisture contents between 71.1-81.2% with the lowest seen in *C. batrachus*. The protein contents were comparable between species ranging from 1.98-3.21%, although the values were significantly lower than those reported in other studies. The fat content was the highest in *C. batrachus* (10.38%) while the other species had comparable values ranging from 0.33-1.53%. No differences were seen in ash contents between all species with percentage ranging from 0.91-1.11%. **Conclusion:** The selected freshwater fish contain comparable proximate composition except for *C. batrachus* that had the lowest moisture and higher fat contents.

**KEYWORDS:** Freshwater fish, proximate analysis

## INTRODUCTION

Fish are cool-blooded animals that are found in three different habitats including freshwater, saltwater or both. These habitats are different based on several factors including temperature, light, pH, dissolved gases, dissolved salts in water, turbidity, alkalinity, and depth. Freshwater fish can be found in river, lake and pond (Helfrich & Neves 2009).

Fish are good sources of high quality protein, unsaturated fatty acids and other nutrients including vitamins and minerals that are beneficial to the human body (Ugoala, Ndukwe, & Audu 2009, Nurnadia, Azrina & Amin 2011, Babji, Nur'Aliah & Nurul 2015, Priatni et.al 2018). Interestingly, freshwater fish also contain beneficial polyunsaturated such as eicosapentaenoic acid (EPA) and docasahaexaenoic acid (DHA), although these were less common than that found in marine fish (Nur Airina & Jamaludin, 2012).

While many studies have been conducted to evaluate nutrient composition of freshwater fish, the available data may still be lacking. This is because different species, sub-species, maturity of fish contain different nutrient contents (Memon, Talpur, & Bhanger 2010). In fact, because the fish live in different geographical areas, any differences in ecosystem such pH, temperature, water quality can also affect their nutritional contents (Tilami et. al 2018). As such, our study aimed to investigate the proximate composition of selected freshwater fish that are found in Kuantan areas. Four species of freshwater fish namely *Clarias batrachus* (*Keli*), *Oreochromis niloticus* (*Tilapia merah*), *Pangasius hypophthalmus* (*Patin*), and *Channa striatus* (*Haruan*) were analyzed for their moisture, protein, fat and ash contents.

## METHODS

### Sample Preparation

In this study, four species of fish were purchased from several markets in Kuantan including *Pasar Besar Kuantan, Jeti Lembaga Kemajuan Ikan Malaysia (LKIM), Kuantan* and *Pasar Tani Kuantan*. The fish obtained were immediately transported in polystyrene boxes that contain ice to sustain freshness. Upon arrival at the food laboratory, Department of Nutrition Sciences, International Islamic University Malaysia, fish were washed, filleted, weighed. The samples were kept frozen at -20 ℃ until further analysis.

**Proximate analysis**

The proximate analysis was conducted in Food Analysis Laboratory at Department Nutrition Sciences, Kulliyyah Allied Health Sciences, International Islamic University Malaysia, Kuantan campus. The proximate analysis includes moisture, ash, fat, and protein, which is based on the Official Method of Analysis of AOAC International (1990) standard method. Each analysis was carried out in six replicates to ensure accuracy.

**Moisture content analysis**

Analysis of moisture was conducted using oven drying method in which 5g of sample was heated under 102°C for overnight. The dried sample was weighed until the constant weight obtained. The differences in weigh between pre and post drying were used to calculate the percentage of moisture content using the following formula:

$$Moisture\ content: \frac{Weight\ of\ fresh\ sample - weight\ of\ dry\ sample}{Weight\ of fresh\ sample} \times 100\%$$

**Ash content analysis**

Analysis of ash was conducted using dry-ashing method. Approximately 5g ofsample was put into muffle furnace at temperature of 450 – 550°C overnight until it turned into whitish or greyish ash. The ash was weight when it reached room temperature. The percentage of ash content is calculate usingthe following formula:

$$\text{Ash } \% = \frac{W3 - W1}{W2 - W1} \times 100$$

W1 = Weight of dry crucible

W2 = Weight of dry crucible with sample (after moisture analysis)

W3 = Weight of dry crucible and dried sample

**Crude protein content analysis**

Analysis of protein content was performed using Kjedhal method. About 3g of the sample was used in this study. The analysis of protein involved several processes including digestion, neutralization, distillation andtitration. The protein analyzer was

set with conversion factor of nitrogen 6.25. The percentage of protein was calculated automatically by the protein analyzer.

**Crude fat content analysis**

Analysis of fat was performed using Soxhlet 2050 machine. About 2g of sample was used in this study. The sample undergone certain processes and the extractionof fat was produced. The fat content was measured using the following formula:

$$\text{Fat, g/100g} = \frac{\text{Weight 2} - \text{Weight 1}}{\text{Weight of sample}} \times 100$$

Weight 1 = the weight of pre-dried empty extraction cups.

Weight 2 = the weight of extraction cups after extraction

**Statistical analysis**

The statistical analysis was performed using SPSS (version 12.0.1) software. The data was presented in the form of means and standard deviation for each type of fish. The results for the nutrient composition were analyzed using one-way analysis of variance (ANOVA), Tukey test, was used to observe significant differences between species. The significance level used for all the tests was at 95% ($p<0.05$).

**RESULTS**

Table 1 indicates proximate analysis of the four selected freshwater fish; *C. batrachus (Keli), O. niloticus (Tilapia merah), P. hypophthalmus (Patin), and C. striatus (Haruan)*. Our results show that moisture content of *C. batrachus* was significantly lower than the other three species ($p<0.001$). Similarly, *C. batrachus* had significantly thelowest protein content ($p<0.05$). On the contrary, *C. batrachus* had the highest fat content among all species studied ($p<0.001$). Meanwhile, ash content between the freshwater fish showed no significant differences.

Table 1: Proximate analysis of *C. batrachus, O. niloticus*, *P. hypophthalmus* and *C. striatus*.

| Scientific name | Local name | Component (%) | | | |
|---|---|---|---|---|---|
| | | **Moisture** | **Fat** | **Protein** | **Ash** |
| *C. batrachus* | *Keli* | 71.10 ± (5.86)$^{a}$ | 10.38 ± (2.83)$^{a}$ | 1.98 ± (0.46)$^{a}$ | 1.11 ± (0.11)$^{a}$ |
| *O. niloticus* | *Tilapia merah* | 79.47 ± (0.72)$^{b}$ | 0.72 ± (0.87)$^{b}$ | 2.75 ± (0.43)$^{b}$ | 1.04 ± (0.09)$^{a}$ |
| *P. hypophthalmus* | *Patin* | 81.12 ± (1.51)$^{b}$ | 1.53 ± (1.23)$^{b}$ | 2.75 ± (0.31)$^{b}$ | 0.91 ± (0.19)$^{a}$ |
| *C. striatus* | *Haruan* | 80.61 ± (0.54)$^{b}$ | 0.33 ± (0.44)$^{b}$ | 3.21 ± (0.43)$^{b}$ | 1.04 ± (0.05)$^{a}$ |
| | | $p<0.001$ | $p<0.001$ | $p<0.05$ | |

Values are given as Mean ± SD from six replicate determinations.
Different superscripts in the same column indicate significant different ($p<0.05$)

## DISCUSSION

Four species of freshwater fish namely *C. batrachus*, *O. niloticus, P. hypothalamus.,* and *C. striatus* were analyzed for their proximate composition. These species were chosen because they are readily available and popular among Malaysians.

In this study, moisture was the highest element in all fish consisting more than 70% of wet weight. A similar trend was also reported in a study by Ghassem et. al (2009) where moisture contents of the same fish ranged between 75.5-79.3%. Among the four species studied, we found that *C. batrachus* had the lowest moisture (71.1%) content. However, this content was slightly lower than values reported in other studies which ranged from 74-78%. Similarly, the moisture content of our *O. niloticus* (79.5%) was comparable to other studies by Wimalasena & Jayasuriya (1996) and Jabeen & Chaudry (2011) who reported values of 79.8% and 75.61%, respectively.

On the other hand, the protein contents of four species were significantly lower than the previous studies (Ghassem et. al 2009, Babji, Nur'Aliah & Nurul 2015). Factors such as different geographical areas, sub-species and seasons from which fish were analyzed could have different protein contents (Ghassem et. al 2009 & Paul et. al 2015). It was shown by Thammapat, Raviyan, & Siriamornpun (2010), the protein contents can also differ greatly between parts of the same fish ranging from 7-17%.

Fat content of *C. batrachus* was the highest (10.38%) among the four species studied. A similar content was also reported by Wan Rosli et.al (2012) in which *C. batrachus* contained 10.60% fat while several other studies reported much lower values ranging from 2-6% (Ghassem et. al 2009 & Paul et. al 2015). Meanwhile, the percentage of fat in our *O. niloticus* was also comparable to a value reported by Babji, Nur'Aliah & Nurul (2015) while *P. hypothalamus* had a lower percentage than values shown in Ghassem et. al (2009) and Wan Rosli et.al (2012). These variations in fat contents could be due to several factors such as different seasons, species, geographical region, age and maturity of the fish (Ghassem et. al 2009, Memon, Talpur, & Bhanger, 2010 & Paul et. al 2015). The parts of the fish used in the analysis can also have a significant impact on the fat content. Thammapat, Raviyan, & Siriamornpun (2010) reported that Asian catfish of various parts such as cranial-dorsal, caudal-dorsal and viscera had fat contents ranging from 3-93%. As for ash content, no significant difference between the four species of freshwater fish. The ash contents in our study were comparable to values reported by Ghassem et. al (2009) and Paul et. al (2015).

## CONCLUSION

In this study, water is the main composition in fish consisting to over two-third of their weight and this finding was in line with many other studies. The percentage of water is good indicator of its relative contents of energy, proteins and lipids. The higher the percentage of water in fish, the lower the energy density, protein and lipid contents. Our study showed that the percentage of protein in all four species were lower than previous studies. Meanwhile, fat content in *C. batrachus* was the highest indicating that the fish could be a good source of unsaturated fatty acids. Lastly, the percentage of ash in our four species was about 1% and this value was in agreement with several other studies. Differences in proximate composition between this study and other studies are expected because of variation in the fish characteristics and the sampling techniques. Factors such as age of fish, geographical areas, seasons, water quality, pH and temperature the fish live in can affect their nutritional contents. In fact, different parts of the fish used in the analysis also can have a significant impact on nutrient contents.

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## REFERENCES

Babji, A.S., Nur'Aliah D & Nurul, N.M. 2015. Nutritional value and potential of freshwater fish in rivers and mining pools of Malaysia. UTAR agriculture Science Journal. Vol 1 (4). Page 18-22.

Ghassem, M., Khoo, T.C., Feni, H.S., Babji, A.S., & Tengku Rozaina, T.M. (2009). Proximate composition, fatty acid and amino acid profiles of selected Malaysian freshwater fish. Malaysian Fisheries Journal. Vol (8): 1. Pages: 7-16.

Helfrich, L.A., & Neves, R.J. 2009. Freshwater fish biodiversity and conversation. Sustaining America's aquatic biodiversity. Virginia Cooperative Extension. Virginia State University. Publication 420-525

Jabeen, F., & Chaudry, A.S. (2011). Chemical compositions and fatty acid profiles of three freshwater fish species. Food Chemistry. Vol 125 (3). Pages 991-996

Memon, N.N., Talpur, F.N., & Bhanger, M.I. (2010). A comparison of proximate composition and fatty acid profile of Indus River fish species. International Journal of Food Properties. Vol 13(2). Pages: 328–337.

Nur Airina, M., & Jamaludin, M. (2012). Fatty Acids Composition of Selected Malaysian Fish. Sains Malaysiana. Vol 41(1). Pages: 81–94.

Nurnadia, A.A., Azrina, A & Amin, I. (2011). Proximate composition and energetic value of selected marine fish and shellfish from the west coast of peninsular MalaysiaInternational Food Research Journal. Vol 18 (1). Pages: 137-148.

Paul, B.N., Chanda, S., Sridhar, N., Saha, G.S., & Giri, S.S. (2015). Proximate and mineral composition of Magur (Clarias batrachus) and Singhi (Heteropneustes fossilis). Indian J. Anim. Nutr. Vol32(4). Pages: 453-456.

Priatni, S., Ratnaningrum, D., Kosasih, W., Sriendah, E., Srikandace, Y., Rosmalina, T., & Pudjiraharti, S. (2018). Protein and fatty acid profile of marine fishes from Java Sea, Indonesia. BIODIVERSITAS. Vol 19(5). Pages: 1737-1742.

Thammapat, P., Raviyan, P., & Siriamornpun, S. (2010). Proximate and fatty acids composition of the muscles and viscera of Asian catfish (Pangasius bocourti ). Food Chemistry. Vol 122(1). Pages: 223–227.

Tilami, S.K., Sampels, S., Zajíc, T., Krejsa, J., Másílko, J., & Mráz, J. (2018). Nutritional value of several commercially important river fish species from the Czech Republic. PeerJ. Page 1-20.

Ugoala, C., Ndukwe, G., & Audu, T. (2009). Fatty acids composition of some freshwater fish. *Nature Precedings*. https://doi.org/10.1038/npre.2009.3239.1

Wan Rosli, W.I., Rohana, A.A.J., Gan, S.H., Fadzlina, N.H., Rosliza, H., Helmy, H., Mohd, N.S., Mohd, I.I., Shaiful, B. I., Wan, M.W.B. & Kamarul, I.M. (2012). Fat content and EPA and DHA levels of selected marine, freshwater fish and shellfish species from the east coast of Peninsular Malaysia. Int. Food. Res. J. Vol 19 (3). Pages: 815-821.

Wimalasena, S., & Jayasuriya, M.N.S. (1996). Nutrient Analysis of Some Fresh Water Fish. J. Natn. Sci. Coun. Sri Lanka. Vol 24(1). Pages: 21–26.