PROXIMATE ANALYSIS OF SELECTED MARINE FISHES IN KUANTAN, PAHANG

HANAPI MAT JUSOH, PhD (CORRESPONDING AUTHOR)
DEPARTMENT OF NUTRITION SCIENCES, KULLIYYAH OF ALLIED HEALTH SCIENCES, INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, JLN SULTAN AHMAD SHAH BANDAR INDERA MAHKOTA 25200 KUANTAN, PAHANG, MALAYSIA
hanapi@iium.edu.my

ILYANA ZAKIRA BINTI MD GUZALI
DEPARTMENT OF NUTRITION SCIENCES, KULLIYYAH OF ALLIED HEALTH SCIENCES, INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, JLN SULTAN AHMAD SHAH BANDAR INDERA MAHKOTA 25200 KUANTAN, PAHANG, MALAYSIA
tengkuyanazakira@yahoo.com

ABSTRACT

Introduction: Marine fish is a good of protein and fatty acids. The nutrient compositions of fish vary due to many factors including different species, maturity of the fish and geographical regions. Hence, this study aimed to analyse proximate composition of four marine fish that commonly consumed by Malaysian, namely Silver Pomfret, Black Pomfret, Yellowstripe Scad and Yellowtail Scad. **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 analysed using Analysis of Variance (ANOVA), with a significance level used for all tests was at 95%. **Results:** There were no differences in the percentages of fat and protein among the selected fish except for ash and moisture contents. Silver Pomfret and Yellowstripe Scad had significantly higher moisture contents than Black Pomfret, Yellowtail Scad ($p<0.05$). Yellowstripe Scad exhibited the lowest ash content among the selected fish species, with a significant difference only when compared to Silver Pomfret ($p<0.05$). **Conclusion:** While there was no significant variation in protein and fat content, this study highlights the differences in moisture and ash composition among the four fish species. Future studies could further investigate the mineral contents present in the ash.

KEYWORDS: Marine fish, proximate analysis

INTRODUCTION

Marine fish is one of the main sources of protein, essential fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), as well as vitamins and minerals that are crucial for sustaining health and supporting body function (Nurnadia et. al 2011, Babji et. al 2015 & Priatni et.al 2018). Indeed, it is recommended to incorporate fish into our daily diet, with an emphasis on consuming a diverse range of fish species, as outlined by the Ministry of Health (MOH, 2020).

Many consumers may not be aware that marine fish exhibit variations in nutritional contents. For this reason, fish selection is often influenced solely by factors such as availability, price, freshness, flavour, and physical characteristics (Nurnadia et. al, 2011). The nutrient composition of fish varies significantly depending on species, season, location, water quality, pH, size, body part, sex, and

maturity of the fish (Sonavane, 2017, Ghassem et. al 2009, Memon et. al 2010, Thammapat et. al 2010, Palani et. al 2014 & Paul et. al 2015). For example, a study on Pomfret fish showed higher protein content during the late post-spawning season compared to the early pre-spawning season (Nair & Suseela, 2000). Other studies have reported that n-6 fatty acids were higher at lower temperatures while protein content was higher at higher temperatures (Norambuena et. al 2016 & Castillo et. al 2017). Therefore, despite numerous studies examining the nutrient composition of marine fish, available data may still be incomplete due to various factors as described above.

Marine fish can be broadly categorized into two types: pelagic fish and demersal fish. Pelagic fish are mainly located near the sea's surface or at intermediate depths and primarily feed on plankton. In contrast, demersal fish reside on the sea bottom with benthic organism serving as their food source. According to Ackman (1989), fish can be classified into four groups based on their fat content: lean fish (<2%), low fat (2-4%), medium fat (4-8%) or high fat (>8%) (Nurnadia et.al., 2011). Marine fish such as Silver Pomfret (*bawal putih*), Black Pomfret (*bawal hitam*), Yellowstripe Scad (*selar kuning*) and Yellowtail Scad (*selar*) fall into the category of low-fat fish. In this study, we investigated these four fish, which are commonly found in Malaysia, to assess their moisture, protein, fat, and ash contents.

METHODS

Sample preparation

Four species of marine fish which are commonly consumed and found in Kuantan were selected. Silver Pomfret, Black Pomfret, Yellowtail Scad and Yellowstripe Scads were obtained from wet markets in *Pasar Pagi Kuantan* and *Lembaga Kemajuan Ikan Malaysia* (LKIM). It was confirmed by the vendors that the fish were caught from Kuantan coast. The fish were put into ice box during transportation from the market to the Food Preparation Laboratory to preserve the freshness and quality. Then, they were dissected to remove their skin, scale, and bones into fillet. They were further weighed, labelled into plastic and kept in the freezer at -22°C until further analysis.

Proximate analysis

The proximate analysis was conducted in the Food Analysis Laboratory, Department Nutrition Sciences, Kulliyyah Allied Health Sciences, International Islamic University Malaysia. The proximate composition namely moisture, fat, protein, and ash were determined according to the Official Method of Analysis of AOAC International as discussed in the following sections. Each analysis was carried out in three replicates to ensure accuracy.

Moisture analysis

Moisture content was analysed by oven drying method. First, empty crucibles with lids were dried in the oven at 105°C overnight. Then, the crucibles were cooled into a desiccator for 30 minutes. For each fish, 5g of samples was used and placed into the dried crucibles. The crucibles that contained samples were weighed and immediately put into the oven at 105°C overnight. After overnight drying, the crucibles were cooled into a desiccator for 30 minutes. This process was repeated until the constant weight was obtained. The differences in weight between pre and post drying were used to calculate the percentage of moisture content.

Crude protein analysis

The protein content was analyzed using the Kjeldahl method. The principle of the method involves digestion, neutralization, distillation, and titration to calculate the nitrogen content. Briefly, 3g of the sample was added into the digestion tubes followed by catalyst salts. About 12ml of concentrated

sulphuric acid was added into the tubes and swirled gently. Then, the digestion tubes were placed into digestion unit at 420°C for 90 minutes. Once completed, the tubes were cooled and transferred into the automated protein analyzer. 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 analysis

The fat content was analyzed using Soxhlet extraction method. Briefly, the extraction cups were placed into the oven at 105°C for one hour. Then, the cups were cooled in the desiccator and weighed. About 2g of sample was added into the dried cups followed by 70ml petroleum ether. The cups were placed into the automated fat extraction machine. Once completed, the extraction cups were dried into the oven at 105°C for one hour. In the final step, the cups were cooled in the desiccator and weighed. The fat content was measured using the following formula:

$$\text{Fat (g/100g)} = \frac{\text{Weight 2 – Weight 1}}{\text{Weight of Sample}} \times 100$$

Weight 1 = the weight of pre-dried empty extraction cups.
Weight 2 = the weight of extraction cups after extraction

Ash analysis

The ash content was analyzed using the dry-ashing method. Briefly, crucibles were dried in a muffle furnace at 550°C overnight. Then, the crucibles were cooled in the desiccator for 30 minutes and weighed. About 5g of sample was put into the dried crucibles and placed again into muffle furnace at 550°C overnight until the sample turned into whitish or greyish ash. Once completed, the crucibles were cooled in the desiccator and weighed. The percentage of ash content was calculated usingthe following formula:

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

W1 = Weight of dry crucible
W2 = Weight of dry crucible with sample (after moisture analysis)
W3 = Weight of dry crucible and dried sample

Statistical analysis

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

RESULTS

Table 1 indicates proximate analysis of the four selected marine fish; Silver Pomfret, Black Pomfret, Yellowtail Scad and Yellowstripe Scad. Our results show that the moisture content of Silver Pomfret and Yellowstripe Scad was significantly higher than that of Black Pomfret and Yellowtail Scad ($p<0.05$). Interestingly, Yellowstripe Scad displayed significantly lower ash content when compared to Silver Pomfret ($p<0.05$). However, this difference was not observed when comparing it to the other two fish. As

for fat and protein contents, there were no significant differences observed among all the fish species.

DISCUSSION

There were no significant differences in the fat percentage among the fish species. Silver Pomfret and Black Pomfret displayed fat contents of less than 1% which is slightly lower than those reported in other studies at 2.91% and 2.33%, respectively (Osman et. al 2001, Nurnadia et. al 2011). The variations in fish size used in the analysis could account for these differences. It is worth noting that fat is not uniformly distributed throughout a fish. The fish body may contain more fat compared to the flesh near the tail (FAO, 1995).

Similarly, the protein percentage did not show significant differences among the fish species. However, other studies have reported higher protein contents compared to our findings (Nurnadia et. al 2011, Priatni et. al 2018). The timing of fish catch, and analysis could contribute to the variation in protein contents. According to Nair & Suseela (2000), pre-spawning season can result in lower protein content in fish. In addition, starvation due to natural or physiological factor such as spawning, or migration can lead to reductions in both fat and protein contents (Boran & Karacam, 2011).

Furthermore, factors such as storage condition may also impact protein content. Samples stored at slow freezing temperature (-20°C) as in our study, can forms larger and irregular crystal that may deteriorate the surface of connective tissue. This could potentially lead to damage to the muscle tissues (Dawson et. al. 2018). Besides, slow freezing may only kill some of the pathogens, leading to protein denaturation when proteolysis is induced by enzymatic activities during psychotropic microbial growth (Gandotra, 2012).

Interestingly, our Silver Pomfret and Yellowstripe Scad exhibited higher water content compared the other two fish. A study by Nurnadia et. al 2011 reported a similar percentage of water for Silver Pomfret as observed in our study while Palani et.al (2014) found a slightly lower moisture content in Yellowstripe Scad. Furthermore, the ash content was the highest in Silver Pomfret but lowest in Yellowstripe Scad. Our findings were comparable to values reported in other studies (Nurnadia et al. 2011, Palani et. al 2014). Teame et. al (2016) stated that the variation in ash percentage could be due to differences in mineral content within the fish habitat, the physiological state of the fish or the ability of the fish to absorb elements from its diets. This highlights the fact that fish from different environments may contain varying mineral elements.

CONCLUSION

Apart from moisture and ash contents, there were no significant differences in protein and fat contents among the fish species studied. It is worth noting that our results exhibited lower protein and fat levels than those reported in several other studies. Such variations in the values are expected, as fish of the same or different species can have diverse nutrient compositions influenced by many factors including geographical areas, sub-species, seasons, water quality, pH, age, maturity, and part of the fish analyzed.

Table 1: Proximate analysis of Silver Pomfret, Black Pomfret, Yellowtail Scad & Yellowstripe Scad

English name	Local name	Component (%)			
		Moisture	**Fat**	**Protein**	**Ash**
Silver Pomfret	*bawal putih*	79.96 ± 3.60[a]	0.93 ± 0.39[a]	2.99 ± 1.05[a]	1.88 ± 1.01[a]
Black Pomfret	*bawal hitam*	73.10 ± 1.98[b]	0.39 ± 0.14[a]	2.61 ± 0.83[a]	1.26 ± 0.28[ab]
Yellowtail Scad	*selar*	75.50 ± 0.47[b]	0.54 ± 0.52[a]	2.68 ± 0.62[a]	1.70 ± 0.65[ab]
Yellowstripe Scad	*Selar kuning*	79.37 ± 0.45[a]	0.49 ± 0.47[a]	3.20 ± 1.12[a]	0.76 ± 0.22[b]

Values are given as Mean ± SD from three replicate tests

Different superscripts (*a* vs *b*) in the same column indicate significant different ($p<0.05$)

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