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Nutritional quality of shrimp *Litopenaeus vannamei* byproducts meal

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Introduction

The use of alternative food to those traditionally used in commercial diets is a growing demand from the aquaculture sector. At the same time, the processing industries seek technologies to use waste from seafood processing in order to minimize their environmental impact and add value to byproducts. The shrimp *Litopenaeus vannamei* is the principal seafood produced by Brazilian Northeast aquaculture and its processing generates lot of byproducts (50% of total biomass) that could be used as diet ingredient for aquatic organisms. The aim of this study was to prepare a shrimp byproducts meal and evaluate its nutritional quality.

Material and methods

Shrimp byproducts (120 kg) were obtained from a seafood processing industry of Ceará, Brazil. The marine shrimp head and carapace were washed with chlorinated water, drained, homogenized in electric grinder and dried in a forced air circulation oven at 60 °C for 24 hours. After drying, the material was weighed, minced with knife mill, sieve hole of 1.5 mm diameter, packed in polyethylene bags and stored in a freezer (- 20 ° C). The nutritional quality was determined by analysis of crude protein (CP), essential amino acids, ether extract (EE), fatty acids, mineral matter (MM), Calcium (Ca), Phosphorus (P), Iron (Fe), Copper (Cu) and Zinc (Zn).

Results

The meal showed high protein content with 55.18% CP. The protein quality was evaluated by its essential amino acids profile: 3.43 % for lysine, 1.05 % for methionine, 2.05 % for methionine+cysteine, 1.74 % for threonine, 2.80 % for arginine, 2.42 % for phenylalanine, 1.09 % for histidine, 1.97 % for isoleucine, 3.09 % for leucine, 0.50 % for tryptophan and 2.54 % for valine. EE levels summarizing 6.25 %, of saturated fatty acids and 1.56 % of polyunsaturated fatty acids (PUFA). Linoleic acid (ω-6) showed a content of 0.80 % and arachidonic acid showed 0.08 % content. There was no detection of linolenic (ω-3), eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids. The MM showed levels of 19.00 %, 5.44 % of Ca and 1.23 % of P, higher than recommended for fish feed (15.00 % MM and 0.75 % P). Cu (70.08 $mg.kg^{-1}$) and Fe (80.79 $mg.kg^{-1}$) attend more than 100 % of the fish requirements, while Zn (71.97 $mg.kg^{-1}$) provides 90.52 %.

Table 1. Protein and amino acid levels of the byproducts shrimp meal and commercial fish meal.

Nutrient (%)	Byproducts shrimp meal	Commercial fish meal*
CP	55.18	54.44
Lysine	3.43	4.04
Methionine	1.05	1.40
Met + Cysteine	1.74	0.60
Tryptophan	0.50	0.27
Arginine	2.80	3.42
Histidine	1.09	1.15
Isoleucine	1.97	2.24
Leucine	3.09	3.79
Phenylalanine	2.42	2.20
Threonine	1.74	2.17
Valine	2.54	2.87

* FURUYA (2010).

Table 2. Ether extract (EE) and fatty acids levels of the byproducts shrimp meal and commercial fish meal.

Nutrient (%)	Byproducts shrimp meal	Byproducts tilapia meal*
EE	7.98	-
Linoleic acid (ω-6) (C18:2n6)	0.80	14.99
Arachidonic acid (C20:4n6)	0.08	7.30
Docosahexaenoic (DHA) (C22:6n3)	-	5.02

* GALAN (2010).

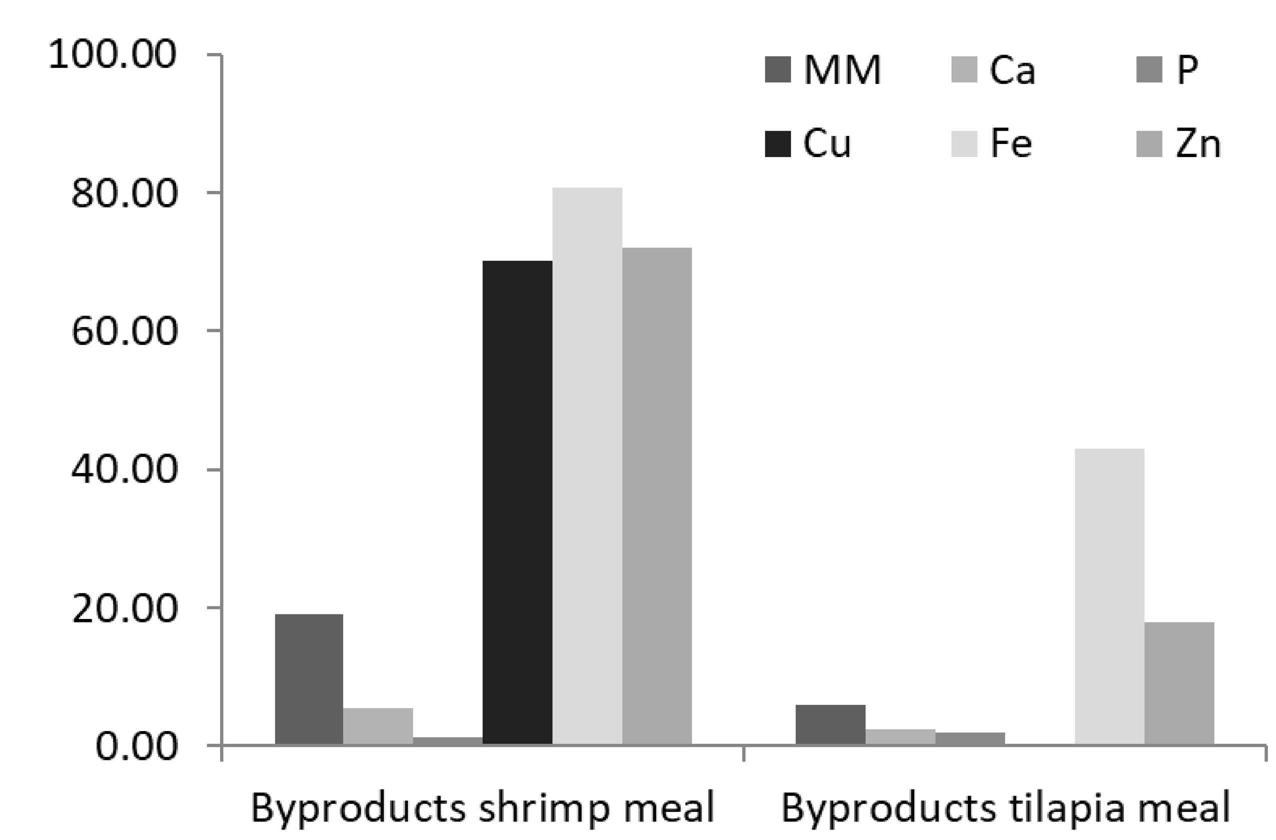

Figure 1. Minerals levels (%) of the byproducts Shrimp meal and byproducts tilapia meal (OJEWOLA and UDOM, 2005).

Conclusion

the shrimp byproducts meal was not a good source of long chain fatty acids (EPA, DHA and arachidonic), which are ω-3 and ω-6 precursors, but showed a good nutritional quality protein, which provides good levels of essential amino acids. However, it has a high mineral content, a factor which may limit its inclusion in commercial diets. Future researches should be to carry out to assess the levels of shrimp byproducts meal inclusion in diets for fish.

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