

Original Research Article
**Study of Physical and Chemical Composition
and Quality of *Hoplias malabaricus* and
Leporinus friderici (Bloch, 1794) Fillet Collected
in Pirativa River -Santana-AP**

ABSTRACT

Aims: The purpose of this research was to perform the physical and chemical study of the composition and the quality of the fillet of *Hoplias malabaricus* (Traíra) and *Leporinus friderici* (Bloch, 1794) collected in Pirativa River-Santana-AP.

Study design: This study was chosen in the areas on the banks of river Pirativa in anthropized and non-anthropized areas in the town of São Raimundo, at coordinates N 00 02'08,9 "W 051 15 '32.3" in the municipality of Santana-AP.

Place and Duration of Study: the research was conducted in Pharmacognosy and Phytochemical Laboratory of the Pharmacy Course from January to September 2014, and in the Fish Processing Laboratory of the Federal University of Amapá (UNIFAP), July September 2014.

Methodology: The physical and chemical parameters adopted in this research were: pH, humidity, Waste from Incineration (Ash), Lipids and Total Volatile Bases. All the tests were carried out according to standards in the Adolfo Lutz Institute.

Results: The yield values were 48.30 and 46,632% respectively for *Hoplias malabaricus* (Traíra) and *Leporinus friderici* (Aracu). Regarding the physical and chemical parameters, both species *Hoplias malabaricus* (Traíra) and *Leporinus friderici* (Aracu) presented, respectively, pH 6.80 and 7, moisture 70.004 ± 4.57 and $2.44 \pm 65.55\%$, ash 2.88 ± 0.74 and ± 3.50 1:51%, lipid values of 10:50 and 11.90% indicating high molecular weight lipids, and volatile bases ± 0.01 1.76 ± 1.69 and 0:03.

Conclusion: Attention should be paid to the proper packaging and treatment of fillet, because external factors, from the fish catch to the market of its by-products, influence the quality and nutritional value.

Keywords: Physical Chemistry. Fish. *Hoplias malabaricus*. *Leporinus friderici*.

1. INTRODUCTION

The importance of fish in the diet is due to its high content of protein and essential amino acids, and good protein digestibility of his flesh (90-98%), which is higher than beef and pork. Fish is a highly perishable food because of its complex chemical composition, pH close to neutrality, high water activity, high content of nutrients easily usable for the microorganisms, the unsaturated lipid content, the enzymatic action and the high metabolic activity of the microbiota (ASHIE, et al, 1996).

In fact there is no disagreement with the visible qualities of fish as raw material, however, as occurs with other foods, it can act as a carrier of disease-causing pathogens (APHA, 2001), because they have, fresh or chilled, intrinsic characteristics that are essential to the development and survival of many pathogens, such as pH close to neutrality, high

water activity in the tissues (not less than 0.98), and high amount of nutrients available (FRAIZER; WESTHOFF, 1993; MARTINS et al., 2002).

Most often the poor handling, storage and transportation of fresh fish greatly contributes to the quality loss and even deterioration of the fish landed. In Brazil, where the situation is precarious in almost all fish landing sites, the traditional practices of passage of fresh fish through one or more intermediaries, on its trip from fisherman to the final consumer, also contributes decisively to the loss of quality and deterioration of fresh fish offered to consumers in street fairs, markets, fishmongers and supermarkets of the country. Changes that most characterizes the deterioration of fish are those related to odor and flavor, determining the improper state for consumption, since they affect the condition of edibility (ORDÓÑEZ, 2005).

Data related to the chemical composition of fish flesh are important in the product conservation and preparation processes, while the data relating to yield identifies the amount of edible part and nutrients that make up the fillet. From yield the producer can plan the amount of fish will be needed to deliver to the slaughter.

The standardization of filleting techniques and the definition of economically feasible size are parameters that need to be established for obtaining higher fillet yields. Therefore, there is a need for studies to evaluate the processing yields, as well as the percentages of by-products that may be used for industrialization, in function of the fish slaughter weight (SOUZA et al., 2001).

Both species *Leporinus friderici* (Aracu-head-fat or three pints), belonging to Anostomidae family, and *Hoplias malabaricus* (Traíra), of the Erythrinidae family, are considered long distances migratory in Brazilian river basins, and predominate in lotic environments, performing reproductive upward migration and trophic downward migration (RÊGO et al., 2008). Moreover, species were chosen due to some peculiar characteristics, as great acceptance of these fish by the consumer market and to being found in abundance in the rivers, dams and lakes distributed throughout the state of Amapá. Therefore, the aim of this research was perform the study of the physico-chemical composition and of the quality of the fillet of *Hoplias malabaricus* (Traíra) and *Leporinus friderici* (Bloch, 1794) collected in Pirativa river, Santana-AP.

2. MATERIALS AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

2.1 Field of study

57 This study was conducted in the areas along the river Pirativa in anthropized and non-
58 anthropized areas of the city of São Raimundo, with coordinates N 00 02'08.9" W 051 15'
59 32.3", in the municipality of Santana-AP, as shown in Figure 1.

60 **Figure 1 - Location of the area of study - collection points - Santana/ AP.**



61
62 Source: GoogleMaps.2012.

63 2.2 Obtaining of fish

64 The fish were obtained in Pirativa River in both disturbed and intact areas in the city
65 of Pirativa-Santana-AP, duly informed to the competent bodies. The fish were used in three
66 states: young, developing and adult. Specimens were captured in a traditional way with
67 fishing nets, and gillnets, and were after identified, measured and classified for cataloging.

68 2.3 Study of yield

69 In the Laboratory of Processing and Fish Technology of the Amapá State University
70 the obtained specimens were weighed: total weight (TW) with the aid of electronic precision
71 scale accurate to 0.001 g, eliminating the excess water, and measured the standard length
72 (SL), between the end forward of the muzzle and the lower perimeter of the caudal
73 peduncle, using a tape according to Crepaldi et al. (2008).

74 Then the fish filleting was performed, process in which were removed the head, the
75 viscera, skin, cervical, carcass and then the fillet of tambaqui and pintado according as
76 recommended by Souza (2002), seeking the method which gives a higher yield of the
77 referred fish. After the above procedure, they were weighed separately for yield calculation.
78 The analyzes were performed in triplicate.

79 In order to avoid individual differences the yield of cuts, the procedure were performed
80 by a single person as proposed by Burkert (2008).

81 Then, they were washed to remove any element that is not derived from the raw
82 materials and which can had eventually been obtained during processing, in accordance

with the standards proposed by Brazil (1997). Subsequently, they were stored in polypropylene recipients. To prevent the formation of ice crystals on the surface of the fillets, the recipients were covered by plastic bags.

Thus, one can get values of the Whole Fish Gutted (W.F.G), the Fillet Yield (F.Y.) and by-products. Were considered as by-products some fish parts as: fins, skin, head, bones and spine. The ventrecha was considered as part of the fillet.

The yield calculations were performed as proposed by Burkert (2008), and thus the assessed yields were: yield of by-products and fillet yield. For this purpose the formulas described below were used:

$$\% \text{ byproducts} = \frac{\text{By-products weight}}{\text{Total weight of fish}} \times 100$$

$$\% \text{ fillet} = \frac{\text{Fillets wieght}}{\text{Total weight of fish}} \times 100$$

2.4 Physical and chemical analysis

The physical and chemical parameters adopted in this research were: pH, Humidity, Waste from Incineration (Ash), lipids and total volatile bases. All the tests were carried out according to standards of Adolf Lutz Institute (2008).

3. RESULTS AND DISCUSSION

From the analysis of data, the fillet average yields were 48.30 and 46.632 %, respectively, for *Hoplias malabaricus* (Traíra) and *Leporinus friderici* (Aracu). Similar fillet yield results were determined by Santos et al. (2001) to traíra with a value of 44.33 ± 9.51 .

The filleting method also influences the yield for the species *L. friderici* (Aracu-fat-head or three pints) and *H. malabaricus* (Traíra), with differences in the form of skin removal and the type of cutting head (decapitation). In the first case, removing the skin with pliers and then the fillet, one obtains the largest fillet yield (36.67%), compared to filleting then removing the skin with the aid of a knife (32, 89%) (Souza et al., 1999). The results found in this study for the fillet yield are in agreement to the research of Souza et al (1999).

According to Pinheiro (2006) several factors influence the yield of filleting, among which mainly include the degree of mechanization, filleting method (skin or fillet order of removal, removal or not the head and fins, type of cut made on Beheading) and, the most important, skill of who performs filleting.

The values determined in the physical and chemical analysis of fillet composition of *Hoplias malabaricus* (Traíra) and *Leporinus friderici* (Aracu) are shown in Table 1.

Table 1 Chemical composition of the fillet samples of *Hoplias malabaricus* (Traíra) and *Leporinus friderici* (Aracu).

Parameters	<i>Hoplias malabaricus</i>	<i>Leporinus friderici</i>
pH	6.80	7.00
humidity (% m/m)	70.004±4.57	65.55±2.44
ash (% m/m)	2.88±0.74	3.50±1.51
lipids (% m/m)	10.50	11.90
Total volatile bases (mg N/%)	1.76±0.01	1.69±0.03

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118 The hydrogenionic potential (pH) values found for *Hoplias malabaricus* (traíra) is 6.8
 119 and the *Leporinus friderici* (aracu-comum ou piau-três pintas) 7, samples showed value of
 120 pH greater than 6.5 on the inner flesh, being outside the limits recommended by RIISPOA
 121 (BRASIL, 1952). This regulation proposes a pH limit for various species, but some species of
 122 fish after “rigor mortis” already have high values pH, which can even be equal to or greater
 123 than 6.5, after the end of the experiment. This fact suggests that the pH is not always an
 124 appropriate tool for quality control, since it may be associated with increased resistance to
 125 capture by using fishing nets, decomposition and oxidizing action of amino acids and urea,
 126 fish species, type of microbial load, handling, packaging and excessive use of
 127 polyphosphates after filleting.

128 The measured pH values exceeded the limit set by federal law to *Hoplias*
 129 *malabaricus* (traíra) and *Leporinus friderici* at 4.6% and 7.7% respectively, thereby good use
 130 of fishing techniques and reduction of stress when the fish is caught, are suitable for the
 131 maintenance of pH of the fish internal flesh (BRASIL, 1997).

132 Determined moisture values were 70.004 ± 4.57 and 65.55 ± 2.44% to *Hoplias*
 133 *malabaricus* (traíra) and *Leporinus friderici* (piauí-três pintas) do not comply with the
 134 standards required by RIISPOA which states that the moisture content does not exceed
 135 more than 35%. The high degree of moisture found in both species, influence directly on a
 136 lower shelf life, because high levels of water activity gives a conducive environment to
 137 proliferation of microorganisms and associated enzymatic actions that may modify its natural
 138 properties. These results are similar to those of the survey by Santos et al., (2001) in the
 139 study of the chemical composition and fillet yield of Traíra, in which average values found for
 140 moisture was 77.71. In the study of Burket et al. (2008) the determined average values of
 141 64.83 ± 2.35 of moisture of the side fillet of *Pseudo platystoma* sp (surubins) fed with three
 142 different commercial food are close to fillet yield values of *Leporinus friderici* (piauí-three
 143 pints) found in this search.

144 The fixed mineral residue determined for the species were 2.88 ± 0.74 and 3.50 ±
 145 1.51 to *Hoplias malabaricus* (traíra) and *Leporinus friderici* (piauí-três pintas), respectively.
 146 According to Contreras-Guzmán (1994), Machado and Lin (2009). report that the fraction of

147 ash in freshwater fish shows variations in amounts ranging from 0.90 to 3.39%. These
148 values are consistent with those found in Traíra and Piau-three pints. In the nutritional
149 sense, the fish meat is a rich and valuable source of nutrients, such as calcium (Ca) and
150 phosphorus (P), and also provides reasonable quantities of sodium (Na), potassium (K),
151 manganese (Mn), copper (Cu), iron (Fe) and iodine (I) (SIMÕES et al., 2007).

152 The values found in the extraction of lipids to *Hoplias malabaricus* (Traíra) and
153 *Leporinus friderici* (piau-três pintas) were 10.5 and 11.9%, respectively. But the residue
154 obtained in the extraction are not comprised only by lipids, but for all compounds that, under
155 the conditions of the determination, can be extracted by the solvent, therefore becomes
156 necessary a more rigorous analysis for qualitative determination in identifying and hence its
157 quantification. For Cecchi (2003), the lipid content can vary greatly depending on the type of
158 food, and fish have values of 0.1% to 20%. Lipids are highly energetic organic compounds.

159 According Jacquot (1961) cited Torres et al., (2012) fish of the same species,
160 depending on the capture site, can get different ratings based on their fat. He also classifies
161 the fish as thin when the determined maximum fat content is 2.5% and semi-fat when these
162 levels are in the range of 2.5% to 10%. Thus, the species fall within the semi-fat rating.

163 The fat of fish is nutritionally important, because it is a natural source of unsaturated
164 fatty acids; however, it may have an inverse relationship with the conservation time if it's
165 packaged in inadequate conditions (COSTA et al., 2008). According to some authors, the
166 fish generally are more palatable before spawning, this period in which the fish deposit more
167 fat and glycogen to be used as energy sources (COSTA, 2005; MENDONÇA, 2007;
168 POLESE, 2009).

169 The Volatile Tertiary Nitrogen Bases (N-BVT) and Trimethylamine (TMA) is a
170 parameter recommended by national law for assessing the degree of freshness of fish and
171 fish products, but the limit established for this parameter does not seem to be suitable for all
172 kinds of fish. It was assumed the limits below 30 mg N-BVT/100g meat to BVT and 4 mg N-
173 TMA/100g meat to tertiary volatile bases, according to the Technical Regulation of Industrial
174 and Health Inspection of Animal Products – RIISPOA (BRASIL, 1952). The results are in
175 accordance with the standard set, as the values are lower, allowing a long period of storage
176 and preservation of nutritional value, slowing the actions of antioxidants, enzyme activities
177 and microorganisms.

178 Several countries, such as Brazil, Germany, Argentina and Australia, have adopted
179 this parameter to freshness criteria. However, the use of this parameter for freshwater fish is
180 questioned, because they have minimal amounts of trimethylamine oxide, which yields by
181 microbial action trimethylamine. Thus, unlike the saltwater fish, freshwater fish usually have
182 low values of BVT (GOMES, 2006).

4. CONCLUSION

The studied species have high nutritional value which ensures a good quality steak conservation and of their physicochemical properties, thus the research is confirming and highlighting these species that are commonly consumed by traditional communities and marketed in fairs of fish, since they are part of the daily diet, that is, serve as food and ensure the survival of these populations.

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