

FIRST RECORD ABOUT YIELD AND MOISTURE OF COBIA SUBMITTED TO SALTING PROCESS

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Abstract - With cobia's (*Rachycentron canadum*) farming by off-shore system in Brazil, the development of salting methods that enable elaboration of top quality products, may be a manner to aggregate value to the fish. This research evaluated the yield and moisture for the *R. canadum*, when it was submitted to different procedures and salinity concentrations during the mixed salting process at two forms of presentation: split in half and sliced-refrigerated. The major yield was 48.79% for the sliced fishes with 15% of salinity, while on the treatment of the split in half fish at 40% of salt, the yield was 45.95%. The split in half fish, treated with 20% of salinity, suffered deteriorative process. The fishes presented initial moisture of 70.53%, being reduced to 34.74% on the split in half form with 40% of salt, and 66.41% and 64.67% on the sliced form at 10% and 15% of salt, respectively. This research verified that the mixed salting process of cobia is efficient for the sliced products, such as for those ones split in half on a traditional manner, with 40% of salinity, being an alternative to entrepreneurs and communities.

Keywords: *Rachycentron canadum*, process, fish.

PRIMEIRO REGISTRO SOBRE RENDIMENTO E UMIDADE DO BEIJUPIRÁ SUBMETIDO A SALGA

Resumo - Com o cultivo de beijupirás *Rachycentron canadum* em sistema *off-shore* no Brasil, o desenvolvimento de métodos de salga que proporcionem a elaboração de um produto de qualidade pode ser uma forma de agregar valor a este pescado. O presente trabalho avaliou o rendimento e a umidade do *R. canadum*, quando submetido sob a forma espalmada e postejada refrigerada a diferentes processamentos e concentrações de salinidade na salga mista. O maior rendimento foi de 48,79% para peixes postejados com 10% de salinidade, enquanto que no tratamento espalmado a 40% de sal, o rendimento foi de 45,95%. Os pescados espalmados tratados com 20% de salinidade sofreram processo deteriorativo. Os peixes apresentaram umidade inicial de 70,53%, sendo reduzida a 34,74% na forma espalmada com 40% de sal, e 66,41% e 64,67% na forma de posta a 10% e 15% de sal respectivamente. O presente trabalho comprovou que a salga mista do beijupirá é eficiente tanto para os produtos postejados refrigerados bem como naqueles espalmados na forma tradicional, com 40% de salinidade, sendo portando, uma alternativa para empresários e comunidades.

Palavras-chave: *Rachycentron canadum*, processamento, pescado.

INTRODUCTION

Throughout the last 50 years, the persistent activity of fishery in the ocean has interfered with the marine ecosystems, bringing on huge ecological changes and reducing dramatically several stocks of fish (Ward & Myers, 2005). The mariculture arose as an alternative to supply the commercial demand and preserve natural stocks of fishes, crustaceans and mollusks, for the implementation of this activity generates employment and income, increasing the productivity of coastal areas, stimulating the fishes' productive chain and reducing the extractive pressure over the explored resources (Sanches, et al, 2008).

The specie *Rachycentron canadum*, known as cobia or scaled shark, show a rapid growth, reaching around 6 and 8 kg over one year of captivity. This specie gets together many admirers interested on its capture (Chang, 2003), due to its flesh of good quality and characteristic of sportive fish.

Although its farming in cages is an important segment of technological innovation concerning the oceanic aquaculture, approximating the governmental policies to the entrepreneurial aquaculture (Rangel, 2006), it is necessary technologies for enabling its productive chain by implementation of new forms for the product, attracting the consumers, aggregating value and increasing its shelf life period, providing alternatives to the entrepreneurs such as to the traditional coastal communities.

The salting process demonstrates to be an important alternative for retarding or even blocking the bacterial activity on the fish, preserving it. The principle of salting process consists in the partial elimination of the moisture which is present into the fish flesh and its partial substitution by salt (Machado, 1984, 1994).

The aims of this research were to determine the yield and moisture content in cobia samples submitted to the mixed salting process at different percentages of salinity and two forms of presentation: split in half (or flattened) and sliced-refrigerated, being an innovative form of presenting the salted fish.

MATERIAL AND METHODS

The experiment was conducted at the Laboratory of Food Rodolpho Krutman, located at the Department of Rural Technology (DTR), in the Federal Rural University of Pernambuco (UFRPE).

Eight specimens of cobia with average weight of 2.65 kg and average length of 61,89 cm were used. The individuals were washed in chlorinated water at 2ppm, being, later, eviscerated and beheaded. After that, they were immersed during 5 minutes into a brine at 3%, in the sense of removing rests of blood and other impurities (Machado, 1994).

For the mixed salting process, four treatments were used, containing two fishes each of them, being two treatments with individuals split in half on a traditional format (20% and 40% of salt) and two with sliced-refrigerated individuals (10% and 15% of salt) (Table 1).

Table 1. Type of treatment, Percentage of salt (NaCl) and code of the treatments used on the mixed salting process of the *R. canadum*

Type of treatment	Percentage of NaCl	Code
Split in half	20%	TE20
Split in half	40%	TE40
Sliced	10%	TP10
Sliced	15%	TP15

The period of cure was five days for all treatments, with the fishes keeping immersed into the own brine formed with the intramuscular water exuded throughout the cure. The individuals split in half remained at the environment temperature, while the sliced ones, due to its lower saline concentration, were placed on refrigerated temperature (-1°C).

The drying process for the split in half salted fish was executed into a lab oven at a temperature of 55°C, throughout a period of 24 hours. The yield was determined by the difference of weight between the fresh fish and the final product, while the moisture was determined by the system of infrared drying, via the equipment GEHAKA, at a temperature of 130°C.

RESULTS AND DISCUSSION

The advantages of the mixed salting process are the prevention against the fat oxidation by atmospheric oxygen during the salting process, the possibility of adjustments of the salt concentration and the moderated dehydration of the product (Moraes, 2007).

During the period of cure, on the TE20 treatment, occurred the loss of the fish, perceived by formation of fungi colonies and by its sensorial characteristics, probably on account of the elevated speed of deterioration when compared to the one related to the penetration of the salt that was lower due to the salt sparseness, furthermore this kind of treatment has been performed at the environment temperature. The TE20 specimens were discarded just after the period of cure. The fish preservation at these conditions constitutes a point of maximum importance in the developing countries, on account of their deficiencies concerning the installation for storage under refrigeration (Shenderyuk & Bylowski, 1990).

The losses during the TE40 treatment were higher after the evisceration process, being the final yield of 45.95% (Table 2). It was expected that the TE20 yield was higher than the TE40 one,

however, its saline concentration was insufficient for maintaining the fishes preserved during the period of cure at the environment temperature, forbidding, thus, this kind of comparison.

There was not deterioration at the sliced treatment, even for those ones that received a quantity below 20% of salt, with the refrigeration contributing to the fish preservation. The treatments TP10 and TP15 showed a major percentage of yield, respectively 49.30% and 48.79% (Table 2), for bypassing the drying process.

Table 2. Yield of the treatments performed during the mixed salting process of *R. canadum*

Weight (Kg)	TP10 (Kg)	TP15 (Kg)	TE40 (Kg)	Yield TP10 (%)	Yield TP15 (%)	Yield TE40 (%)
Initial Weight	5,00	4,56	4,81	-	-	-
Eviscerated Weight	-	-	3,73	-	-	77,55
Eviscerated/Beheaded Weight	-	-	3,08	-	-	64,03
Split in Half Weight	-	-	3,08	-	-	-
Sliced Weight	2,58	2,34	-	55,13	51,32	-
Salted Weight	2,47	2,23	2,58	95,54	48,79	53,64
Salted/Dry Weight	-	-	2,21	95,54	-	45,65
Final Yield	-	-	-	49,30	48,79	45,95

At the mixed salting and drying processes of beheaded, desquamated and split in half mullet (*Mugil curema*) were verified the following yields: 38.13% for the treatment with 30% of salinity and 41.25% for the ones treated with 20% of salt (Santos, 2009). Lima et al (2005) verified yields of 57,7% for wet salting process at 15% of salinity, 52.6% for wet salting with 30% of salinity and 46.2% for mixed salting process with samples of Streaked prochilod (*Prochilodus scrofa*). At the salting and drying processes of the red porgy (*Pagrus pagrus*), using the whole fish, only eviscerating it, the yield was 30.6% (Machado, 1984).

The ranges of yield for the fishes are too extensive, considering there are several ways to process the fish (fillets, slices, split in half, beheaded and eviscerated). The highest yields appear when the fish is only eviscerated, while the lowest ones appear for more sophisticated processes, like the slicing and filleting processes. The difference may be explained by differences related to the chemical composition of the species discussed at this work.

According to Ogawa & Maia (1999) one of the reasons for the rapid deterioration of the fish flesh is the elevated concentration of intramuscular water, thus, to determine the moisture content for a fish product, it is an activity of extreme importance. The initial moisture for the *R. canadum*, *in natura*, was 70.53%. At the TE40, after the drying process, the moisture was reduced to 34.74%, within the standards established by the RDC nº 12 (BRASIL, 2001). At TP10 and TP15, the final values of moisture were 66.41% and 64.67%, respectively (Table 3).

Table 3. Moisture content for *R. canadum* submitted to the mixed salting process during four treatments

Treatment	Moisture content (%)
<i>In natura</i>	70,53
TE40	34,74
TP10	66,41
TP15	64,67

A product with moisture content around 35 to 45% resists well to the development of fungi and bacteria, depending on the quantity of salt into the muscle of the fish (Waterman, 1976). Santos (2009) obtained values of moisture for the mullet (*M. curema*) ranging from 47.81% (treatment with 30% of salt) till 55.87% (treatment with 20% of salt). At natural drying, Oliveira et al. (2008), during the improvement process with dry salting of mandim (*Arius spixii*), verified moisture content of 40.31%, while Machado (1984) obtained 39% of moisture after the drying and salting processes of whole-eviscerated red porgy (*P. pagrus*).

CONCLUSIONS

Concerning the split in half fish, the saline concentration of 20% was insufficient for preserving the product at the environment temperature. The split in half salted fish at saline concentration of 40% showed good sensorial characteristics.

The sliced treatments (TP10 and TP15) presented yields closer to each other, being TP15 the one with the lowest yield. Both of them showed higher moisture content, which was already expected on account of bypassing the stage related to the drying process, being the sliced-refrigerated form a new option for attracting the consumers.

Observing the yield and moisture content, the salted *R. canadum* may be explored by the markets such split in half (salinity of 40%) as sliced-refrigerated, being an alternative for aggregating value to the specie alluding the entrepreneurs such as the artisanal fishery, increasing its shelf life.

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