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THE CHEMICAL COMPOSITION OF THE STINGRAY, *DASYATIS MARGARITA*, (GUNTHER, 1890), FOUND IN THE NIGERIAN INSHORE WATERS.

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ABSTRACT

The chemical composition of the sting ray, Dasyatis margarita, was determined and compared to *Tilapia zilli*, *Clarias lazera* , *Pseudotholithus typus* and *P. senegalensis* which are highly priced and more acceptable fishes in the Nigerian local markets.

It was found that the sting ray, *Dasyatis margarita*, with its low market acceptability and unattractive nature was found to be more nutritionally valuable than the highly priced and acceptable *T. zilli* , *C. lazera*, *P. typus* and *P. senegalensis*, with 23.3% and 2.7% protein and ash content values respectively. Other aspects of the nutritional viability of the sting ray to enhance its eventual acceptability in the Nigerian markets are also discussed.

INTRODUCTION

Dasyatis margarita is an unattractive cartilaginous fish, belonging to the family Dasyatidae, order Myliformis and sub-order Batoidea (Irvine, 1947). It is known to be the most abundant of the ray species encountered in the Nigerian inshore waters, contributing well over 70% of the total ray resources (Oyebanji, 1990). Jacquote and Creach (1950) reported that, of the 20,000 known fish species, only about 350 – 400 of them, mostly marine, have been subjected to chemical analysis. The choice of species for chemical analysis had usually been limited to those of commercial importance, thus, a picture of the nutrient components of the fish as a whole had not so far been achieved over the years. (Vinogradov, 1953).

Many analysis, according to Cowey et al (1972), have been done on fish <as purchased > (after being caught commercially and stored in ice for several days). The composition of the components as ascertained by Harold et al (1976), can alter considerably under such condition either chemically, by bacteria action or by the leaching of the constituents by the melting ice (Paul and Southgate, 1978).

Various important factors that may affect the chemical composition of fish and other food products including the various methods of analysis and sources of errors have been critically reviewed by Brown, (1957), Jacobs (1958), Cowey (1975, Tressler and Lemon (1976), Oyeleke (1984), Brown (1987) , and Ringo and Nilsen (1987) .

Dasyatis margarita (the sting ray), along with the other sharks and rays, command very low market value as compared to the bony fishes caught in the Nigerian coastal waters (Ogunmoroti, 1988). It is therefore hoped that the results of this study might enhance the market acceptability of this species.

MATERIALS AND METHODS

Samples of *D. margarita*, the sting ray, were collected from different zones labelled A – E, in the Nigerian inshore waters as shown in figure 1. The chemical composition of the samples vis a vis protein, moisture, fats, lipids, and ash were carried out along with those of some commercially important and tasty fresh water fish species (*Tilapia zilli* and *Clarias lazera*) and some commerciable marine fish species (*Pseudotolithus typus* and *P. senegalensis*) caught in the Nigerian coastal waters.

1. **For the Moisture content Determination**, Oyeleke (1984) method was used and the percentage moisture content was thus calculated using the below formula :

Moisture % = Loss in weight during drying is equal to the moisture content of the original fresh sample.

$$= \frac{\text{Loss in weight due to drying}}{\text{Weight of Fresh sample taken}} \times 100$$

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

Where :

W1 = The weight of empty dry petri - dish only.

W2 = Weight of the dry petri-dish + weight of fresh fish sample (5g) together.

W3 = Final weight of the W3 after complete drying of the fish sample was attained (i.e. after 18hours of oven drying at 60°C).

2. **The protein content** was determined from the dried moisture-free fresh sample of the specimen using the Macro – Kjeldahl (1846) method as reviewed by Oyeleke (1984). From the Nitrogen content got from this method, the crude protein values of the specimens were then calculated using the formula below :

Crude Protein % = N_2 % X 6.25 factor.

3. **The fat content** of the specimen was determined using the universally accepted Soxhlet Continuos Extraction and Reflux Condenser method as reviewed by Oyeleke (1984). The Solvent Extractor used for the fat determination was Petroleum Ether 60^0 - 80^0

4. For the ash content Determination, 5g weight of the fresh fish sample taken from the trunk region and free from scales and bones, was placed in a porcelain crucible whose weight was already noted and heated in a muffle furnace at 560°C.

The heating lasted for 22 hours before the fresh fish sample was completely ashed. Triplicate determination were done for each sample of the species; vis a vis *D. margarita*, *T. zillii*, *C. lazera*, *P. typus* and *P. senegalensis* before the average ash content was derived.

Ash content calculations:

$$\text{Ash (\%)} = \frac{\text{Weight of Ash}}{\text{Weight of fresh fish sample}} \times 100$$

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

Where:

W1 = Weight of the dry porcelain crucible only

W2 = Weight of fresh fish sample used (5g) + weight of the dry porcelain crucible together.

W3 = Final weight got by weighing the dry porcelain crucible + sample (5g) after complete ashing in the muffle furnace at 560°C for 22hrs.

RESULTS

The moisture, protein, mineral and fat contents are shown in Fig. 2 a, b, c and d respectively. *D. margarita* has a higher protein and ash content than any other species examined.

Table 1: Average chemical composition of *D. margarita* flesh compared with those of *Tilapia zillii* and *Clarias lazera* (fresh water species), *Pseudotolithus typus* and *P. senegalensis* (marine water species).

Species	Average Chemical Composition (%)			
	Moisture (Water)	Protein	Ash	Fat
D. margarita	72.8	23.9	2.7	0.2
Tilapia zillii	73.8	19.3	0.9	3.5
C. lazera	75.6	20.2	2.0	1.7
Pseudotolithus typus	75.9	20.3	2.4	1.2
P. senegalensis	75.7	20.4	2.6	1.1

DISCUSSION

According to Jacquote and Creach (1950), lack of sufficient proteins of high nutritional value is one of the most wide spread, nutritional deficiencies in many tropical countries of the world. The results of the comparative chemical composition of the sting ray and the other 4 commercially important freshwater and marine fish species analyzed are shown in Table1 and Fig.2a, b, c, and d respectively. The results indicate that *D. margarita* was of higher nutritional value in terms of protein and ash content than *Tilapia zilli* and *Clarias lazera* which are the commercially important and highly accepted fresh water fish species, *P. typus* and *P. senegalensis* which are the marine fish species analyzed.

The higher percentage protein recorded for the sting rays than the other fresh water and marine species could be as a result of its high preference for shrimps as its main diet as reviewed by Oyebanji and Kumolu-Johnson (Unpublished). Paul and Southgate (1978), had previously remarked that shrimps in general are known to be very high in protein value.

Ash is a measure of the mineral content of food items, and according to the results of this chemical composition analysis, it was found to be generally higher in the *D. margarita* , *P. typus* and *P. senegalensis* which are the marine fish species examined than in *T. zilli* and *C. lazera* which are fresh water fishes as shown in the Table 1 and Fig. 2a, b, c and d respectively. This could be associated with the influence of the marine environment which is known to have some high level of mineral ions over the food items utilized by these marine fishes. However, *D. margarita* is of low fat content when compared with *T. zilli* in particular, *C.lazera, P. typus*, and *P.senegalensis* in general.

The sting ray is reported to command a very low market value than the bony fishes in general as reported by Ogunmoroti (1988). This could be attributed to the odor imparted by the high urea content of the fish blood as reported earlier by Greenwood (1975). Its rather abnormal dorsoventrally flattened shape, unpalatable taste of the flesh including the cultural background of the consumers in Nigeria could be other factors for the stingray's low acceptability in the local. Although, some of the local fish consumers accept the sting ray more when smoked than fresh, as it is presumed that the smoking must have detoxicated the fish off the urea odor and taste. It is hoped that the knowledge of relatively high level protein and ash in *D. margarita* would influence a positive change of attitude towards its consumption in Nigeria.

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