# EFFECT OF SMOKE-DRYING ON THE PROXIMATE COMPOSITION OF *Tilapia zillii, Parachanna obscura* AND *Clarias gariepinus* OBTAINED FROM AKURE, ONDO-STATE, NIGERIA

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**ABSTRACT**

***The proximate composition of fresh, smoked and deteriorated fish samples (Tilapia zilli, Parachanna obscura and Clarias gariepinus) were determined using standard methods of analyses. It was revealed that Tilapia zilli contained; moisture 4.11 - 67.33 %, protein 20.10 – 65.90 %, ash 3.41 – 14.64 %, fat 4.44 – 7.73 % and carbohydrate 4.72 – 11.89 %, Parachanna obscura had moisture 6.47 - 68.61%, protein 18.23 – 64.67%, ash 2.68 – 13.20 %, fat 3.55 – 8.87 % and carbohydrate 6.79 – 10.25 %, while Clarias gariepinus produced moisture 4.61- 56.99%, protein 17.21 – 68.05%, ash 4.82 – 15.32 %, fat 4.79 – 8.19% and carbohydrate 1.92 – 17.35%. It was observed that smoke drying methods increased the protein, ash and fat contents of the samples. The low fat content observed for the deteriorating sample might be due to rancidity with the resultant rancid odour.***

**Keywords:** *Tilapia zillii, Parachanna obscura, Clarias gariepinus,* Smoke-drying, Proximate composition

## INTRODUCTION

Among the good quality animal protein sources, fish is the most perishable. An estimated 50 % of the fish produced in the remote coastal settlements and hinterland perish before reaching the consumers, as a result of poor handling, preservation and processing practices adopted by the artisanal fishers, commercial fish farmers and fisheries entrepreneurs (Eyo, 1997). Spoilage set in because fish is susceptible to microbial and enzymatic deterioration and quality reduction occur, if proper steps are not applied to process the fish, (Emokpae, 1985). The fish loses its organoleptic characteristics and becomes progressively more unacceptable for human consumption. There are several ways of accessing quality of fish product, whether smoked, dried, frozen or canned, and these are physical examination, biochemical, microbiological, entomological and sensory methods (Clucas and Sutcliffe, 1981).

The process of fish drying involves the removal of moisture from fish flesh; this could be achieved through sun-drying, smoke-drying, application of pressure and use of absorbent pads. Sun drying is presumably the oldest method of fish preservation employing hot heat from sun and atmospheric air (Awoyemi and Eyo, 1998). The demerit of sun drying being the length of time it takes for drying. For better product, sun drying is supplemented with smoke drying. Smoke dried fish, if stored under good conditions can be kept for several months (Tobor, 1984). Dvorak and Vognarova (1965) reported that smoking caused some decrease in available lysine. The loss in available lysine may vary from 6 – 33 % at 25 $^{o}$C to 53 – 56 % at 40 $^{o}$C during hot smoking. Lysine reduction is directly proportional to the temperature and duration of smoking (Akande *et al.,* 1998). Clifford et al., (1980) reported a 25% loss of available lysine on the surface and a 12% loss at the center of hot smoked fish fillet. Other basic amino acids were reduced by 6.6% on the surface but remained unchanged at the center of hot smoked fish fillet.

## MATERIALS AND METHODS

The fish samples (*Tilapia zillii, Parachanna obscura* and *Clarias gariepinus*) were procured from the Ondo State Agricultural Development Project, (ADP) Akure. Processing of the fishes involved gutting, washing, hanging to drain the moisture, smoking and packaging.

**Fresh Sample:** A fresh flesh sample each from the three species was taken to the laboratory for the proximate analysis.

**Smoke Dried Sample:** All fish species were smoked whole in a kiln for between 4 – 10 days (depending on the species) using smoke from charcoal heated cooking pot. The fish samples were exposed to the same drying conditions. After drying, the fish samples were packed into different cellophane bags and stored on a shelf at room temperature and were observed for deterioration.

**Table 1: Proximate composition of fresh, dried and deteriorating samples of *Tilapia zillii, Parachanna obscura* and *Clarias gariepinus* from ADP ponds, Ondo State**

| Proximate parameters | Fresh | Dried | Deteriorating |
|---|---|---|---|
| | ***Tilapia zillii*** | | |
| **Moisture content** | 67.33 ± 0.60 | 4.11 ± 0.06 | 6.13 ± 0.03 |
| **Crude protein** | 20.10 ± 0.37 | 65.90 ± 0.96 | 63.12 ± 0.68 |
| **Ash** | 3.41 ± 0.04 | 14.64 ± 0.03 | 12.28 ± 0.06 |
| **Fat** | 4.44 ± 0.17 | 7.73 ± 0.08 | 6.58 ± 0.06 |
| **Carbohydrate** | 4.72 ± 0.08 | 7.62 ± 0.36 | 11.89 ± 0.32 |
| | ***Parachanna obscura*** | | |
| **Moisture content** | 68.61 ± 0.37 | 6.47 ± 0.04 | 9.54 ± 0.08 |
| **Crude protein** | 18.23 ± 0.47 | 64.67 ± 0.00 | 63.78 ± 0.01 |
| **Ash** | 2.68 ± 0.03 | 13.20 ± 0.04 | 11.25 ± 0.03 |
| **Fat** | 3.55 ± 0.19 | 8.87 ± 0.03 | 5.18 ± 0.08 |
| **Carbohydrate** | 6.93 ± 0.20 | 6.79 ± 0.01 | 10.25 ± 0.21 |
| | ***Clarias gariepinus*** | | |
| **Moisture content** | 56.99 ± 0.80 | 6.52 ± 0.09 | 4.61 ± 0.03 |
| **Crude protein** | 17.21 ± 0.41 | 68.05 ± 0.90 | 61.28 ± 0.01 |
| **Ash** | 4.82 ± 0.09 | 15.32 ± 0.02 | 11.59 ± 0.03 |
| **Fat** | 4.79 ± 0.08 | 8.19 ± 0.01 | 5.17 ± 0.02 |
| **Carbohydrate** | 16.19 ± 0.01 | 1.92 ± 0.08 | 17.35 ± 0.05 |

**Deteriorated Sample:** On week five, after deterioration has set in, another sample was taken from each of the three fish species for proximate analysis.

**Proximate Analysis:** Proximate analysis of the sample for moisture, fibre and fat were determined using the methods described by AOAC (1990). Nitrogen was carried out by the micro-kjeldahl method described by Pearson (1981) and the percentage Nitrogen was converted to Crude protein by multiplying by 6.25.

**Statistical Analysis:** All determinations were carried out in triplicate and data obtained analyzed for their central tendencies and variances using Statistical Package for Social Sciences (SPSS for Windows version 10).

## RESULTS AND DISCUSSION

It was observed that spoilage of fish flesh resulted from the action of enzymes and bacteria; this can be slowed down through the application of salt and removal of moisture to increase the shelf life of fish, (Connel, 1980).

The result of proximate composition of smoked fish samples showed that the crude protein level was higher than those of fresh sample and the deteriorating fish sample (Table 1). Doe and Olley (1983) reported that smoking resulted in the concentration of nutrients due to low residual moisture level. The gross difference in crude protein level of the fresh sample and dried sample across the species was substantial, *Tilapia:* 20.10 % and 65.90 %, *Channa:* 18.23 % and 64.67 % and *Clarias:* 17.21 % and 68.05 % respectively (Table 1).

At the deterioration, the crude protein of the fish samples was relatively lower when compared to the dried fish samples. Mould growth was observed on the fish samples during storage, part of the protein may have been used up by the mould for growth (Proctor, 1977). The decrease in crude protein at deterioration might be due partly to microbial and enzymatic breakdown and assimilation by mould. This was supported by Eyo (1983), who observed the same trend in the protein content of some fish species kept for longer period of time. The fat content of the three species when dried were higher than the fresh and deteriorating stages, which may be disadvantageous especially with regards to rancidity development during storage. The lower level of fat content observed for the deteriorating stage was due to loss to rancidity with the resultant rancid odour and offensive flavour.

The result showed that bacteria multiply when the fish samples were kept for longer period of time. Spoilage and development of bacteria in smoked fish is always due to improper handling of fish product either prior to smoking or after smoking.

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