Effect of Heat Source on the Physio-Chemical Evaluation and Sensory Evaluation of African Catfish (*Clariasgariepinus*)

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Abstract:-**The effect of two heat source on the physio-chemical evaluation and sensory evaluation of African catfish (*Clariasgariepinus*) was evaluated. A total of fifty *Clariasgariepinus* with mean weight 250±25g were caught from the fish farm. The fish were gutted, washed thoroughly with water to remove slime and blood; thereafter, the dressed weights were taken. The fish were transferred into a basket for proper draining of water prior to smoking. Smoking was conducted using charcoal in a traditional smoking kiln for a period of one hour and electric oven, during which turning over of the fish was done at intervals to achieve a uniform smoking. The heat sources to be use for this study are charcoal and electric oven. Cooking loss was determined, organoleptic assessmentwas evaluated and proximate analysis was conducted on the nutrient composition using a standard procedure. Data were analysed using descriptive statistic and ANOVA at $\alpha_{0.05.}$ The electric oven heat source catfish had the highest cooking loss compared to the charcoal heat source catfish. The charcoal heat source catfish was more preferred than electric oven heat source catfish in terms of colour, texture, tenderness and juiciness than the electric oven heat catfish. There was significant difference (P>0.05) in proximate composition of catfish smoked with two different heat source and fresh catfish. The charcoal heat source and electric oven heat source catfish were significantly same in crude protein 56.28% and 54.96% respectively but higher than fresh catfish. Similar trend was observed for the ether extract. The moisture content of fresh catfish was higher (71.85%) than both charcoal heat source and electric oven heat catfish with 11.14% and 11.69% respectively. The results obtained from this study showed that charcoal possessed good potential as fuel for smoking African catfish without inhibiting the nutrients and consumer acceptability, hence, recommended for fish smoking than electric oven heat source.**

Keywords: **catfish, charcoal heat source, electric heat source, physio-chemical, sensory evaluation**

I. INTRODUCTION

The most important and the cheapest source of animal protein is fish. It provides 22% of the protein intake in Sub-Sahara Africa (FAO, 2003). But fish is a highly perishable commodity that undergoes spoilage as soon as it is harvested. Once spoilage set in, the odour/flavor, texture, colour and sometimes the chemical composition changes (Gupta and Gupta, 2006).

Prevention of microbial spoilage of fish may be achieved by different preservation methods such as smoking, drying, freezing, salting and use of modified atmospheric storage, (Awan and Okaka, 1985; Gupta and Gupta, 2006).

The African catfish, *Clariasgariepinus*, is easily cultured in Nigeria and of great economic interest. It is generally considered to be one of the most important tropical catfish species for aquaculture. It is a slow–moving omnivorous predatory fish, which feeds on a variety of food items from microscopic zooplankton to fish half its length or 10% of its own body weight. African catfish is of very high demand in the middle belt and north east of Nigeria on account of their tasty flesh (Aremu 2008 and Buton 1979 . The species are very popular with fish farmers and consumers, and they command a very high commercial value in Nigeria markets Diyaware M. Y.(2007) and Ayinla OA 1990).

The aim of the present study was to seek the efficiency of traditional smoking methods usingcharcoal heat sources and electric oven on physio-chemical evaluation and sensory evaluationof African catfish (*Clariasgariepinus*).

II. MATERIALS AND METHODS

2.1 Experimental station

This study was carried out at the processing laboratory of Animal Production Department, University of Jos, Jos Plateau state, Nigeria.

2.2 Experimental design

A total of fifty *Clariasgariepinus* with mean weight 250±25g were caught from the fish farm. The live weights were taken using digital weighing balance. The fish were gutted, washed thoroughly with water to remove slime and blood; thereafter, the dressed weights were taken.The fish were transferred into a basket for proper draining of water prior to smoking. They were also covered with a muslin cloth to prevent dust and flies.

2.3 Smoking Process

Smoking was conducted using charcoal in a traditional smoking kiln for a period of one hour and electric oven, during which turning over of the fish was done at intervals to

achieve a uniform smoking. The fish was covered with carton to retain heat from the smoke and prevent contamination by dust and flies. After the hot smoking, the smoked products were removed from the kiln and allowed to cool at room temperature before they were weighed to determine the moisture loss.

2.4 Heat sources

The heat sources to be use for this study are:

1. Charcoal
2. Electric oven

2.5 Cooking Loss

Cooking loss was determined according to the procedure described by Mahendraker*et. al.* (1988). Cooking loss was calculated using:

Cooking loss % = weight of sample before cooking - weight of sample after cooking X 100

weight of sample before cooking

2.6 Organoleptic Assessment

Smoked fish were submitted to ten trained test panel to evaluate the sensory qualities such as texture, taste, aroma and colour. These parameters were assessed on a nine (9) points hedonic scale (9 = excellent; 8 = very good; 6 = good; 4 = fair; 2 = poor and 0 = bad) according to Afolabi*et al.*, (1984). Panelists filed in a single line to assess the smoked products were requested to mask their mouth with water after tasting each sample to avoid bias in judgment/evaluation.

2.7 Proximate Analysis

Proximate analysis was conducted on the nutrient composition of flesh of smoked fish such as crude protein, Fat, Ash and Moisture were determined using standard procedure of A.O.A.C. (2000). ‘

2.8 Statistical Analysis

Data were subjected to descriptive analysis and one-way analysis of variance (ANOVA) at 5% level of significance. Where significant differences occurred, means were separated with Duncan multiple range test SAS (2010).

III. RESULTS

Figure 1 shows the cooking loss of catfish smoked with two heat source. The electric oven heat source catfish had the highest cooking loss compared to the charcoal heat source catfish.

The sensory evaluation of catfish differently smoked with two heat source was represented in Figures 2 to 7. The charcoal heat source catfish was more preferred than electric oven heat source catfish in terms of colour and texture but with least flavour. The charcoal heat source catfish is more tender and juiciness than the electric oven heat catfish. In general, the panelists preferred the charcoal heat source catfish most than electric oven heat source catfish.

Table 1 shows the proximate composition of catfish smoked with two different heat source and fresh catfish. There was significant difference (P>0.05) in proximate composition of catfish smoked with two different heat source and fresh catfish. The charcoal heat source and electric oven heat source catfish were significantly same in crude protein 56.28% and 54.96% respectively but higher than fresh catfish. Similar trend was observed for the ether extract. The moisture content of fresh catfish was higher (71.85%) than both charcoal heat source and electric oven heat catfish with 11.14% and 11.69% respectively.

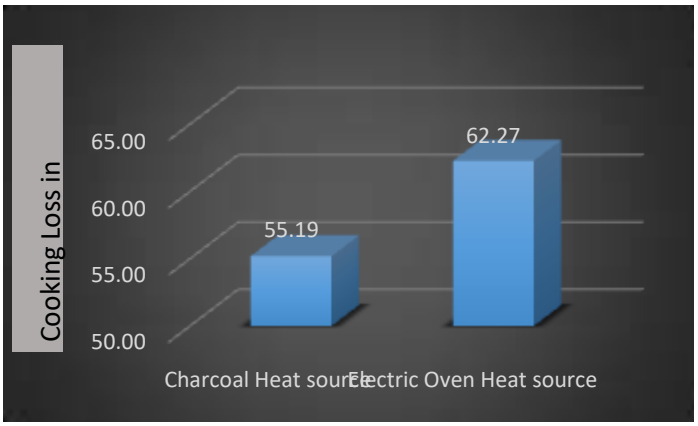

Figure 1: Cooking loss of catfish smoked with two heat source

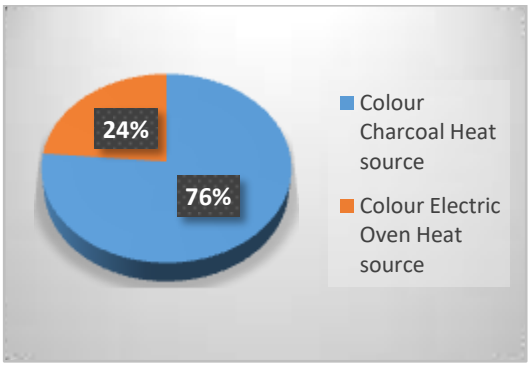

Figure 2: Colour of catfish smoked with two heat source

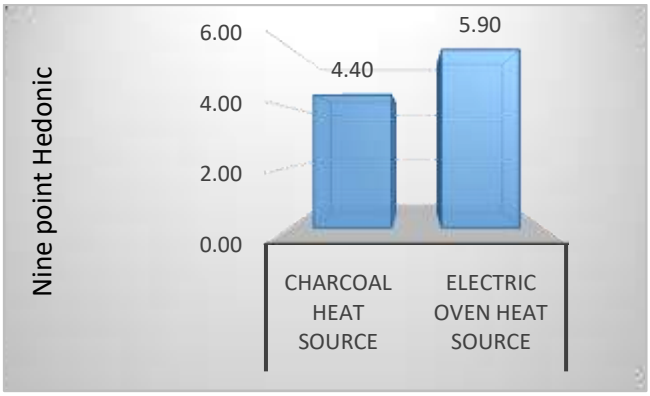

Figure 3: Flavourof catfish smoked with two heat source

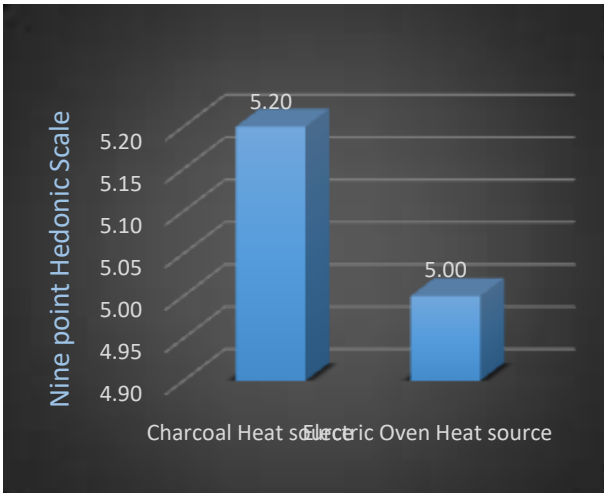

Figure 4: Texture of catfish smoked with two heat source

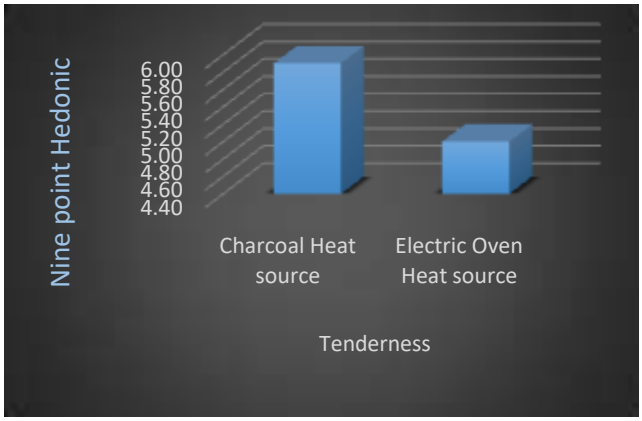

Figure 5: Tenderness of catfish smoked with two heat source

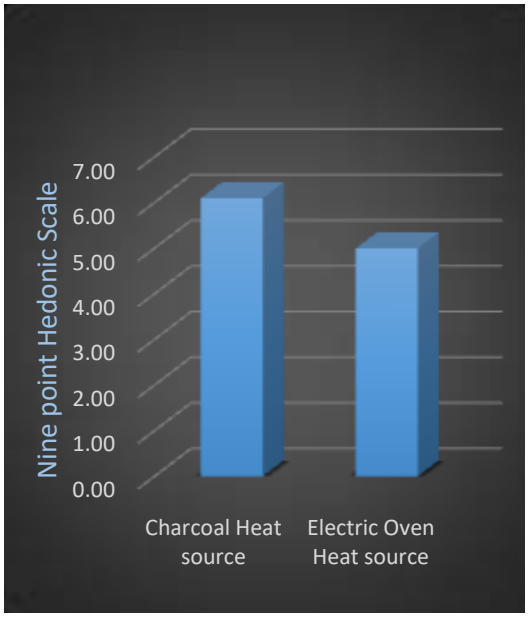

Figure 6: Juiciness of catfish smoked with two heat source

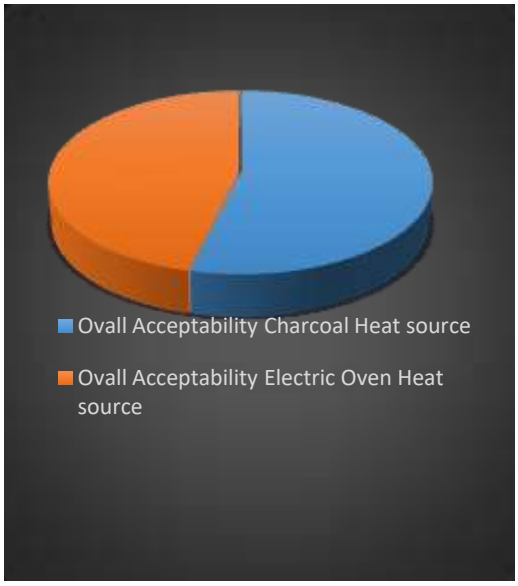

Figure 7: Overall Acceptability of catfish smoked with two heat source

Table 1: Proximate composition of catfish smoked with two heat source

Parameters	Charcoal heat source Catfish	Electric Heat source Catfish	Fresh carfish	SEM
Crude Protein	56.28a	54.96a	17.39b	6.38
Ash	3.46	3.35	1.86	0.38
Ether Extract	13.39a	13.47a	3.93b	1.80
Moisture content	11.67b	11.98b	71.07a	10.07

IV. DISCUSSION

The cooking loss are the losses observed during cooking of food which determined the tenderness, and juiciness Oshibanjo D.O (2017). The difference observed in this study could be due to higher temperature and time of smoking in electric oven heat source.

Many factors influence the quality of smoked fish products including the properties of fish flesh, maturity, age, sex, seasonal variations and factors involved in the smoking procedure such as wood type, composition of smoke, temperature, humidity, velocity and density of the smoke Simko P. (2005). Phenolic and carbonyl compounds contribute towards taste in smoked fish (Maga J. A and Fopajuwo O. O (1986) and Martinez*et al.* (2009). Specific volatile compounds in particular phenolic compounds have been related to the different smoking techniques which directly influence the sensory characteristics of smoked fish (JónsdóttirR, Olafsdóttir G, Chanie E and Haugen J.E 2008) Organoleptic properties of smoked foods are decisively influenced by composition of the smoke and nature of wood involved. The colour of meat is the first impression the consumers build for themselves which is also one of the sensory properties that influence a consumer to purchase a

product Oshibanjo D.O (2017). In this study, colour was more preferred in catfish smoked with charcoal heat source than electric heat source. Similar, trend was observed for other sensorial parameters measured. This result obtained in this study was in agreement with the result obtained by Oduor-Odote*et al.* (2010). The result obtained could be due to the presence of phenolic compounds have been related to the different smoking techniques which directly influence the sensory characteristics of smoked fish.

The protein range from 17.39 to 56.28% in this report is in agreement with the reported work on catfish OgbonnayaC, and Ibrahim M.S. (2009). The protein content obtainedobtained by using charcoal heat source agrees with the 56.9% reported for Tilapia quineensis(Aremu*et al*. 2007). The ether extract content for the sample smoked with charcoal is highly comparable with 13.89% obtained for electric oven smoking however, it is lower than the reported values of 19.80% to 23.90% for smoked Clariasgariepinus from Lagos State University (Nigeria) fish pond and Badagry market, respectively Kumolu–Johnson C.A, and Ndimele P. E. (2001). The fresh catfish had the highest moisture content of in this report. The ash content of show no significant differences among the treatment which is not in agreement with 5.14% obtained using electric oven smoking reported by (Aremu*et al*. 2013) was the highest while the sample smoked with sawdust had the lowest ash content.

V. CONCLUSION

The results obtained from this study showed that charcoal possessed good potential as fuel for smoking African catfish without inhibiting the nutrients and consumer acceptability, hence, recommended for fish smoking than electric oven heat source.

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