THE EFFECT OF ACTELLIC 25 EC ON MINERAL COMPOSITION ON CURED FRESH WATER FISH: *Heterobranchus longifilis, Heterotis niloticus* AND *Chrysichthys nigrodigitatus*

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ABSTRACT

A study to evaluate the effects of the preservative, Actellic 25 EC solution, on the mineral composition of the three freshwater fish species was carried out. Pieces of fish (samples) were analysed for mineral composition before and after traditional smoke drying and smoke drying after Actellic treatment. The investigations were carried out using fresh water fish, Heterobranchus longifilis, Heterotis niloticus and Chrysichthys nigrodigitatus. The result showed that Actellic 0.03 % solution greatly reduced the sodium content of the smoked dried fish species. Furthermore, Actellic 25 EC eroded the magnesium (Mg) content of C. nigrodigitatus and also reduced slightly the naturally high iron content of H. longifilis, H. niloticus and C. nigrodigitatus. The implications of these results are discussed.

Keywords: Actellic, Mineral, Freshwater fish

INTRODUCTION

The amino acid composition of fish protein compares favorably with the amino acid composition of milk, meat and egg. Some of the essential amino acids like lysine and methionine which are lacking in tuber-based or cereal-based diets are present at higher levels in fish than in meat (Borgstrom, 1962). This makes fish protein highly valuable in many developing countries like Nigeria where the staple diet consists of starchy foods like cassava, yam, potatoes, rice, sorghum and millet. The lack of sufficient live stock and fresh meat products in Southern part of Nigeria, makes fish production all the more essential (Ikeme, 1986; Nwuba, 1996 and Latunde-Dada, 1999).

Besides essential amino acids and proteins, fish, also contains fats, oils, carbohydrates and fibre. Fish is also a very good source of essential vitamins and minerals (Nwuba, 1996; Nwuba, 2002; Pearson 1976; Onukuozor, 1996). Nwuba (2002) has reported minerals in freshwater fish to include, phosphorus, magnesium, sodium, potassium and iron. This study focuses on the extent of buildup or erosion of these mineral elements by Actellic 25 EC solution.

Furthermore, the objective of this study is to note such effects and alert food scientists, nutritionists, dieticians, scientists, medical personnels and the fishers. The food scientist when equipped with such information will now know how to replenish the loss by addition of certain food supplements.

The fishers need be informed of the buildup or erosion of mineral nutrients in fish due to their processing methods through seminars and workshops. This knowledge will help them achieve sustainability in their occupation and reduced disorders/ailments arising from mineral deficiency.

MATERIALS AND METHODS

A total of 12 fresh *Heterobranchus longifilis* (Boulenger) 12 *Heterotis niloticus* (Clupisudis & Cuvier) and 20 *Chrysichthys nigrodigitatus* (Lacepede) were procured from a fish landing site at the bank of river Niger in Onitsha, Nigeria (Mariner" water side) (Figure 1). Each fish species was then cut into 108 pieces of about 96.84 $\pm$ 0.12 mg mean weight. This was divided into three treatment batches (I – III) of 36 pieces of each species samples per batch. The treatment of 36 pieces of fish per fish specie was replicated thrice. Fish samples in

batch I served as the control for mineral analyses of the fresh fish specimen. Fish samples in batch II were smoke dried only. While fish samples in batch III were washed thoroughly and submerged in 10 litres of Actellic 25 EC solution for 15 seconds and smoke dried for 6 hours. After which they were sprayed with ½ litre of Actellic 25 EC solution and sun dried for 3 hours. Samples from the three batches were taken and analysed for mineral components. The results from batches I to III were compared to determine the effect of the Actellic 25 EC solution on fish mineral composition.

Preservative: The insecticide solution, 0.03% Actellic 25 EC used in treating the fish samples in batch III was prepared by adding 12.0 ml of Actellic 25 EC to 10 litres of water.

Smoking Oven: A traditional smoke drying mud-oven of the dimension 120 cm x 60 cm x 30 cm (length, width and height) was used in the study. The same smoking oven and smoking process were adopted for fish pieces in batches II and III.

Mineral Assay: The fish samples were first solubilised by the wet-oxidation involving perchloric acid ($HCL0_4$) digestion. The filtered digested solution was used in the determination of minerals (AOAC, 1980).

Phosphorus (P) was determined colorimetrically by ascorbic acid method. The blue colour developed was read at 882 nm using a VP–10–12 spectrophotometer. Sodium (Na) and potassium (K) in the digest were determined using by flame photometry (AOAC, 1980). Iron (Fe) and Zinc (Zn) contents were determined using Atomic Absorption Spectrophotometer (AAS). Magnesium and calcium (Ca) contents were also determined (AOAC, 1980).

RESULT AND DISCUSSION

The mean values of percentage phosphorus, calcium, magnesium, sodium, potassium, iron and zinc contents of fresh, smoke dried and Actellic treated and smoke dried samples of *H. niloticus, H. longifilis* and *C. nigrodigitatus* are recorded as in Table 1.

Actellic 0.03 % solution treatment increased the phosphorus content mean value of *C. nigrodigitatus* greatly but slightly decreased phosphorus content of *H. longifilis* and *H. niloticus.* The calcium content was decreased in *H. longifilis a*nd *C. nigrodigitatus* but increased in *H. niloticus*. The mean calcium value in this work were 0.123 ± 0.001 % in *H. longifilis*, 0.12 ± 0.002 % in *H. niloticus* and 0.121 ± 0.001 % in *C. nigrodigitatus.* These mean values were not significantly different at P = 0.05 and agrees with the values recorded by Nwuba (2002).

The mean values of magnesium contents were 0.046 ± 0.0005%, 0.023 ± 0.0008 and 0.00 % in *H. longifilis, H. niloticus* and *C. nigrodigitatus* respectively. The statistical analyses showed significant difference at P > 0.05. The sodium content mean value of *C. nigrodigitatus* was almost eroded completely by Actellic 25 EC treatment. Iron content of cured fish using preservative was reduced when compared with the content in the fresh fish.

The mean value of potassium only increased in *H. longifilis* treated with Actellic. The mean potassium values were reduced in *H. niloticus* and *C. nigrodigitatus* treated with Actellic. The preservative was observed to retain the zinc contents of the three fish species used in this study. Thus confirming the results of Nwuba (2002).

In general, nutrient changes in food occur at several stages during harvesting, preservation, processing, distribution and storage. Heat processing does result in some losses of nutrients, particularly labile nutrients such as ascorbic acid. But modern heat processing equipment and techniques can minimize such losses. All heat treatments should be optimized for nutrient and quality retentions and microbial destruction (Uwaegbute and Ikeme, 1988).

Conclusion and Recommendation: The major discoveries in this study showed that:

- Actellic treatment eroded the magnesium content of *C. nigrodigitatus* by 100 %.
- Sodium content of *C. nigrodigitatus* was also eroded by approximately 98%.
- The mean value of iron content was decreased by approximately 99 %, in *C. nigrodigitatus.* Actellic treatment greatly increased the potassium content of *H. longifilis*.

In the light of the above information, it would appear that Actellic should be avoided in the preservation treatment of the fish *C. nigrodigitatus*. But if it happens to be the only available preservation, necessary steps could be

Table 1: Percentage mineral content of three fresh water fish species smoked dried after Actellic 25 EC dehydration treatment

	Fresh Fish			Smoke Dried Fish			Actellic Treated and Smoked Dried Fish		
	Heterobranchus longifilis	***Heterotis niloticus***	***Chrysichthys nigrodigitatus***	***Heterobranchus longifilis***	***Heterotis niloticus***	***Chrysichthys nigrodigitatus***	***Heterobranchus longifilis***	***Heterotis niloticus***	***Chrysichthys nigrodigitatus***
Phosphorus									
Range	0.044-0.005	0.059-0.064	0.065-0.068	0.033-0.39	0.048-0.05	0.055-0.057	0.022 – 0.024	0.05 – 0.055	0.06 – 0.616
Mean	0.047	0.061	0.036	0.036	0.049	0.066	0.23	0.52	0.154
SE	0.0011	0.0008	0.0011	0.0011	0.004	0.0004	0.0004	0.009	0.092
Calcium									
Range	0.25-0.29	0.035-0.05	0.2-0.25	0.22.25	0.05-0.06	0.07-0.09	0.12 – 0.126	0.11 – 0.125	0.119 – 0.124
Mean	0.272	0.043	0.22	0.233	0.053	0.083	0.123	0.12	0.0121
SE	0.0060	0.0021	0.0093	0.0042	0.0021	0.0032	0.0010	0.0022	0.001
Magnesium									
Range	0.094-0.097	0.552-0.0576	0.045-0.048	0.081-0.088	0.05-0.522	0.034-0.04	0.045 – 0.048	0.021 – 0.026	0.00
Mean	0.096	0.558	0.048	0.086	0.512	0.037	0.046	0.23	0.00
SE	0.0005	0.0037	0.0011	0.0011	0.0029	0.0010	0.0005	0.0006	0.00
Sodium									
Range	0.0021-0.0023	0.0018-0.003	0.0018-0.0024	0.0018-0.0024	0.0014-0.0015	0.042-0.0048	0.0021– 0.00023	0.0013 – 0.0015	0.00010– 0.00012
Mean	0.0022	0.0022	0.0051	0.0021	0.0014	0.0045	0.0022	0.0014	0.00011
SE	0.65E-05	0.0002	0.0001	9.55E-05	2.5E-05	8.33E-05	3.33E-05	4.94E-05	3.33E-06
Potassium									
Range	0.01111-0.011	0.0078-0.077	0.0102-0.0105	0.011-0.013	0.0077-0.008	0.0103-0.0104	0.125 – 0.44	0.0045 – 0.0047	0.0012 – 0.0014
Mean	0.011	0.030	0.0104	0.0118	0.0079	0.0103	0.13	0.0046	0.0013
SE	4.77E-05	0.014	4.47E-05	0.004	4.94E-04	1.54E-04	0.0022	4.01E-05	2.17E-05
Iron									
Range(x 10^5)	25.28	27.29	530-550	25-28	26.28	430-450	31 – 33	43 – 45	17 – 19
Mean (x 10^5)	27	28	540	27	27	440	32	44	18
SE(x 10^5)	0.583	0.4	3.74	0.51	0.374	40	0.074	0.316	0.447
Zinc									
Range(x 10^5)	4.9-55	45.55	4.8-5	2.8-55	3.3-4.4	5-5.5	5.5 – 5.6	5.0 – 5.5	5.5 – 6.0
Mean(x 10^5)	5.2	5.04	4.96	5.06	40	6.18	5.54	5.26	5.74
SE(x 10^5)	0.114	0.199	0.04	0.117	0.182	0.111	0.245	0.108	0.08

taken to replenish the loss of mineral nutrients in diets cooked with *C. nigrodigitatus.*

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