ANALYSIS OF PRESERVATION EFFECTS ON THE CONCENTRATION OF IRON AND IODINE IN SELECTED FISH SPECIES

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ABSTRACT
The use of chemical and physical methods in the preservation of food items have been reported to have variable side effects. In this effort, the concentration of iron and iodine in preserved fishes (Papyrocranus Afer, Arius Latiscutatus and Lutjanus Agennes) were analysed in order to determine the effects of preservation method on the availability of iron and iodine using spectrophotometric method (spectrum 22) and AOAC 2000 respectively. Mean concentration of iron and iodine and percentage of iron and iodine lost to preservation reveal that the amount of iron and iodine lost to preservation method E, I, and M is very high compared to preservation method Q and U.

Key words: Iron, iodine, preservation, effect, fish

INTRODUCTION

Fish *(pisces)* is any non-tetrapod craniate that has gills throughout life and whose limbs, if any are in the shape of fins. Fishes are abundant in most bodies of water. They can be found in nearly all aquatic ecosystems from high mountain streams to the abyssal and even hadal depths of the deepest oceans. Fishes are important sources of nutrients in human diet (Helfman *et. al*., 2009). The nutritional composition of fish include: protein with high digestable fat, vitamins, macro/ micro elements and essential amino acids, (Suseno *et. al*., 2010; Stancheva *et. al*., 2010).

Iodine is an essential trace element of physiological importance in human nutrition. Sources of iodine include: sea food (sea fish and salt) cod liver oil and plantain etc., smaller amount occur in other food such as: cow milk, meat, egg, fruits, vegetables, cereals e.tc. Iodine promotes normal metabolism of cells and help in the conversion of food into energy. It is an integral part of thyroid hormone called thyroxine (T4) and triiodothyronine (T3) and its deficiency usually result in hypothyroidism symptoms of which are extreme fatigue, goiter, mental slowing, depression, and low basal body temperature (Philip and Lawrence, 2001).

Iron is one of the abundant elements and is an integral component of many protein and enzymes that maintain good health. Sources of dietary iron include red meat, lentil, beans, poultry, fish, leaf vegetable, tofu, chickpeas etc. In human, iron is an essential component of protein involved in oxygen transport, (John, 2001). Is also essential in the regulation of cell growth and differentiation, (John, 2001). Deficiency of iron limits oxygen delivery to cell resulting in fatigue, poor work performance and decreased immunity and physical activities (Finch and Heubers, 1982; Dallmen, 1986, Baynes and Bothwell, 1990).

Preservation of fish is the application of physical and /or chemical means in the prevention or delay of spoilage or deterioration of fish by insects, microbes, enzymes e.tc so as to preserve their physical structures with little or no change in nutritional value and food quality. Several methods have been employed in the preservation of fish, they are: salting, steaming, smoking, frying, canning, freezing e.tc.

The availability of nutrients, (vitamins, trace elements, carbohydrates, protein, fats and oils) in food items (including fish) varies with types and the method of processing/preservation (Roig *et. al*., 1995). Therefore, this research is aimed at evaluating the effects of preservation methods on the concentration of iron and iodine in selected fish species.

METHODOLOGY: Six fish samples of each species were used for the analysis as shown in table I below:

Table I: Three fish species showing eighteen samples with control and five preservation methods.

Fish sample / Preservation method	Reticulate knife fish *(Papyrocranus Afer)*	Rough-head sea cat fish *(Arius Latiscutatus)*	African red Snapper *(Lutjanus Agennes)*
Control **A**	B	C	D
Fried with groundnut oil **E**	F	G	H
Fried with palm oil **I**	J	K	L
Smoked **M**	N	O	P
Steamed **Q**	R	S	T
Salted **U**	V	W	X

Reticulate knife fish (*Papyrocranus Afer*) is a tropical fish found in Africa. It lives in fresh water of 6.5 to 7.5 pH and temperature range of 24 and 30^{0}C (Greenwood, 1988). The length and weight of the six samples (B, F, J, N, R and V) ranged from 40 to 43cm and 1.5 to 2.1kg respectively.

Rough-head sea cat fish (*Arius Latiscutatus*) is a ray-finned fish that is widely distributed in brackish and freshwater ecosystem of Eastern Africa and South to Southeast Asia (Schneider, 1990). The length and weight of the six samples (C, G, K, O S and W) varies between 50 and 54cm and 2 and 3.5kg respectively.
African red snapper (*Lutjanus Agennes*) is an African reef -associated, brackish and marine fish (Allen, 1985). The weight and length of the six samples (D, H, L, P, T and X) ranged between 3 and 3.5kg and 20 and 40cm respectively. These samples were preserved as shown in table I above.

1g of each sample was digested in acidic mixture prepared from 1:1 of nitric (HNO_3) and sulphuric (H_2SO_4) acid. The samples were heated until dissolution. After cooling the mixtures were made to 100mL with distilled water.

Analysis of Iron

In 100mL volumetric flask, 10mL of digested sample, 1mL of hydroxylammonium chloride solution and 3mL 1, 10 phenathroline solution were added. The resultant solution was buffered by adding 8mL sodium acetate to produce a red colour of ferrous 1, 10 phenathroline. After

Table II: Results showing the concentration of iron in $mg.g^{-1}$

Sample / preservation method	Reticulate knife fish *(Papyrocranus Afer)*	Rough-head sea cat fish *(Arius Latiscutatus)*	African red Snapper *(Lutjanus Agennes)*	$\bar{X}$-	% LOSS
A	18.20	14.00	11.00	14.0	
E	14.20	8.20	7.00	9.87	31.46
I	14.40	8.60	7.20	10.07	30.07
M	14.00	6.80	5.20	8.67	39.79
Q	16.20	12.20	8.20	12.20	15.28
U	16.00	12.00	6.80	11.60	19.44

Table III: Results showing the concentration of Iodine in $mg.g^{-1}$

Sample / preservation method	Reticulate knife fish *(Papyrocranus Afer)*	Rough-head sea cat fish *(Arius Latiscutatus)*	African red Snapper *(Lutjanus Agennes)*	$\bar{X}$-	% LOSS
A	0.55	0.58	0.75	0.63	
E	0.24	0.27	0.31	0.27	57.14
I	0.44	0.45	0.64	0.51	19.05
M	0.43	0.46	0.61	0.50	20.63
Q	0.46	0.48	0.61	0.52	17.46
U	0.62	0.66	0.54	0.61	3.17

The concentration of iron in table II above shows that sample B recorded higher concentration of iron ($18.20mg.g^{-1}$) than sample C and D with $14.00mg.g^{-1}$ and $11.00mg.g^{-1}$ respectively. Mean results also reveal variable reduction in concentration of iron after the application of these preservation methods. The order of retention of iron/percentage of iron lost after preservation show that method Q (12.20 $mg.g^{-1}$) [15.28%] > U (11.60 $mg.g^{-1}$) [19.44%] > I (10.07 $mg.g^{-1}$) [30.07%]> E (9.87 $mg.g^{-1}$) [31.46%] > M (8.67 $mg.g^{-1}$) [39.79%]. The recorded low mean concentration of iron in method M could be due to the relatively near complete removal of fluid from the samples. Conversely, the high mean concentration of iron in preservation methods Q and U compared to preservation to method E, I and M could be related to the presence of trace amount of iron in the steam water, while in salt method, the quantity of fluid leached from the samples is very small.

Generally, mean concentration of iron/ percentage of iron lost to preservation in table II also reveal that the various preservation temperature in method E, I, and M reduced the nutritive value of iron above 30% in the different fish species. However, it should be noted that the temperature of preservation breaks down cell structure more completely to elemental inorganic iron. (Sussi, *et. al*., 2003)

Similarly, the concentration of iodine in sample B, C and D in table III shows that *Lutjanus Agennes* recorded $0.75mg.g^{-1}$ while *Arius Latiscutatus* and *Papyrocranus Afer* have 0.58 $mg.g^{-1}$ and 0.55 $mg.g^{-1}$ respectively. Results in table III also shows the effect of preservation method on the concentration of iodine in the following order of iodine retention/the percentage of iodine lost to preservation: U (0.61 $mg.g^{-1}$) [3.17%] > Q (0.52 $mg.g^{-1}$) [17.46%] > I (0.51 $mg.g^{-1}$) [19.05%] > M (0.50 $mg.g^{-1}$) [0.63%] > (0.27 $mg.g^{-1}$) [57.14%]. Similarly, the percentage of iodine lost to preservation method E, I, M and is very high compared to preservation method U.

This high mean concentration of iodine in method U could be due to the presence of iodine in the salt.

CONCLUSION

The mean concentration of iron and iodine and percentage of iron lost to preservation methods in this effort shows that different preservation method have variable effects on the fish species. Generally, steamed, smoked and fried fish samples have relatively reduce concentration of iron and iodine however, the percentage of iron and iodine lost to salt method is very low when compared to other methods.

Since heat reduces the quantity of iron and iodine in variable proportion, cooking/ preservation heat and time of food items (fish, meat, vegetables, fruits e.tc.) containing these substances should be limited.

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OBSERVATIONS OF THE INSECT COMPLEX OF COWPEA (*VIGNA UNGUICULATA* (WALP) IN ABRAKA, A NON-COWPEA GROWING AREA, SOUTHERN NIGERIA.

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ABSTRACT
The Sudan Savannah, the drier northern Nigeria is the major belt for the cultivation of cowpea (*Vigna unguiculata* (L) Walp. The West and East of southern Nigeria, however, began its cultivation recently. The crop constitutes a main food for many Nigerians and because of this, the crop performance and all factors which are constraints to its production are being studied. Cowpea was cultivated in Abraka, a non-major cowpea cultivation region, during the early and late planting seasons of 2005 to study the insect pests spectrum (insect complex) which decimate the crop. Their relative abundance were also determined. The results indicated that in the early season, there were 8 insect orders; 25 families and 37 species. Coleoptera had the highest species 11, with relative abundance of 29.6%. Others were heteroptera, 8 species (21.6%), diptera, 5 species (13.5%), homoptera, 4 species (10.8%), orthoptera, 3 species (8.1%), hymenoptera, 3 species (8.1%), lepidoptera, 2 species (5.4%) and thysanoptera, 1 specie (2.7%). During the late season, coleoptera were the highest, 10 species (28.6%). Others were heteroptera, 9 species (25.7%), diptera, 4 species (11.4%), homoptera, 4 species (11.1%), orthoptera, 3 species (8.6%), hymenoptera, 2 species (5.7%), lepidoptera, 2 species (5.7%) and thysanoptera, 1 specie (2.9%). *Ootheca mutabilis* Sahl, *Aphis craccivora* Koch, *Megalurothrips sjostedti* Trybom, *Maruca vitrata* Fab and coreid bugs such as *Clavigralla tomentosicollis* Stal, *Anoplocnemis curvipes* Fab, *C. shadabi*, *Aspavia armigera* Fab, *Nezara virudula* L, *Mirperus jaculus* Thunb were the commonest major insect pests on cowpea at Abraka. More insect species occurred in the early season than late in the study area.

Keywords: Cowpea, insect pests, early/late seasons, Abraka, southern Nigeria.

INTRODUCTION
Cowpea (*Vigna unguiculata* (L.) Walp) has assumed a prominent position among the food crops cultivated in Africa and in particular in Nigeria. The grains are alternative source of cheap plant protein (Anderson, 1985; Alabi *et al*., 2003) for the low income group with the rising cost of fish, meat, eggs and milk. In some African communities, especially Nigeria, cowpea is consumed in various forms (Adams, 1984) by man when boiled with other food materials such as rice, corn and yam. Its other uses are in erosion control where it serves as cover crop (Okigbo, 1978), in soil fertility enhancement and fibre production (Rachie, 1985).

The large scale production of cowpea has been in the drier Northern Nigeria (Singh and Rachie, 1985; Emosairue *et al*., 2004). Recently however, its large-scale cultivation has extended to Southern Nigeria in the West and East (Ejiga, 1979; Federal Office of Statistics (FOS), 1995). Cowpea yield is however, low in Africa (Olatunde *et al*., 1991), especially in regions where no pest control measures are carried out (Singh and Jackai, 1985, Afun *et al*., 1991). The low yields have been attributed to losses from insect pests (Taylor, 1964) and diseases which attack and damage the crop in the field and storage. At every growth stage, the crop is attacked by several insect pests (Jackai *et al*., 1988). At the seedling stage, by the foliage beetle, *Ootheca mutabilis* Sahl. and cowpea aphid, *Aphis craccivora* Koch; at the early reproductive stage by the flower and flower bud thrips, *Megalurothrips sjostedti* Trybom; at the late reproductive stage by the legume pod borer, *Maruca vitrata* Fab and a spectrum of pod sucking bugs which include *Anoplocnemis curvipes*, *Clavigralla tomentosicollis* (Jackai and Daoust, 1986). To obtain good yield, cowpea farmers use various control measures. The application of insecticides for insect pests control has been the most reliable tool against cowpea pests in the field (Ayoade, 1975;