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Smoke- Curing Indices of Some Frozen Fish Species Using Traditional Smoking Kiln in Abeokuta, Ogun State

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ABSTRACT

The preservative effect of the smoking process results from drying and the deposition in the flesh of natural wood-smoke chemicals. The smoke-curing indices of Hake – (*Merluccius sp*); Sardine – (*Sardinella sp*); Mackerel – (*Scomberomerus tritor)* and Herring – (*Sardinella maderensis*) were assessed using cut-out drum smoking kiln. The fishes were weighed before smoking and the weighing continued at 30 minutes intervals during smoking until constant weights for each fish species was attained. The temperature in the smoking kiln during smoking curing ranged between 40 – 70^0C, there was a continual and gradual loss of weight in Hake – (*Merluccius sp*); Sardine – (*Sardinella sp*); Mackerel – (*Scomberomerus tritor)* and Herring – (*Sardinella maderensis*) examined as the smoking time increases until a constant weight was reached at different times. Sardine – (*Sardinella sp*) had the highest smoking curing index of 62.5% and Hake – (*Merluccius sp*) was least with 43.75%. Thus, the shelf life of this fish species become enhanced at these levels of smoking which, enable the processors time before the sales of their products.

Keywords: Smoke-curing, Indices, Frozen Fish, Abeokuta.

Introduction

Smoking is a traditional fish preservation method which has been carried out for centuries. According to FAO (1970), indigenous processing techniques evolved because of local environmental conditions, availability of raw materials, preferences for taste, texture, colour and smell, social behaviour, and economics of production.

The traditional smoking techniques vary widely. The simplest form include placing fish in a pit containing smouldering grasses or wood, thus; cooking and

flavouring the fish which is usually charred and has a short shelf life (Akinyemi, 2000). Others include laying fish on racks contained in an oil drum or mud oven, or hung on bamboo sticks in the smoke of fire.

The preservative effect of the smoking process results from drying and the deposition in the flesh of natural wood-smoke chemicals. During smoking, the smoke from the burning wood contains a number of compounds which inhibit bacterial growth, while the heat from the fire causes drying and when the temperature is high enough the flesh is cooked, preventing both bacterial growth and enzyme activity (UNIFEM, 1993). The smoked product owes its storage life primarily to the drying and cooking processes, rather than the preservative value of the wood-smoke chemicals.

This study therefore, examined smoke-curing indices of Hake – (*Merluccius sp*); Sardine – (*Sardinella sp*); Mackerel – (*Scomberomerus tritor)* and Herring – (*Sardinella maderensis*) using cut-out drum smoking kiln.

Materials and Methods

Frozen fish species, Hake – (*Merluccius sp*); Sardine – (*Sardinella sp*); Mackerel – (*Scomberomerus tritor)* and Herring – (*Sardinella maderensis*) of same weights were selected from cartons of frozen fish from a cold room in Abeokuta. These fish samples were smoke cured using cut-out drum smoking kiln.

The fishes were weighed before smoking and the weighing continued at 30 minutes intervals during smoking until constant weights for each fish species was attained. The air temperature within the cut-out drum smoking kiln drying strata was measured using mercury in glass thermometer. The experiment was repeated five (4) times for each fish specie.

Statistical Analysis

The smoking-index was derived from:

$$K = \frac{T_t - T_0}{T_r} \times 100 \qquad (1)$$

Where; K = Smoke-curing index (%)

T_0 = Starting time for smoke-curing

T_t = Time of smoke-curing

T_r = Smoke-curing round (maxima) in the cultural context

Alongside other statistical packages including Microsoft Excel 97 and Statistical Package for Social Sciences (SPSS 10.0 for Windows).

Results and Discussion

The temperature in the smoking kiln during smoking curing ranged between 40 – 70^0C. As a result there was a continual and gradual loss of weight in Hake – (*Merluccius sp*); Sardine – (*Sardinella sp*); Mackerel – (*Scomberomerus tritor)* and Herring – (*Sardinella maderensis*) examined as the smoking time increases until a constant weight was reached at different times (Figures 1-4). Hake – (*Merluccius sp*) attained a constant weight of 0.24 kg in 150 minutes, while Sardine – (*Sardinella sp*) attained a constant weight of 0.23 kg in 240 minutes with Mackerel – (*Scomberomerus tritor)* attaining a constant weight of 0.24 kg in 240 minutes and Herring – (*Sardinella maderensis*) attained a constant weight of 0.32 kg in 180 minutes.

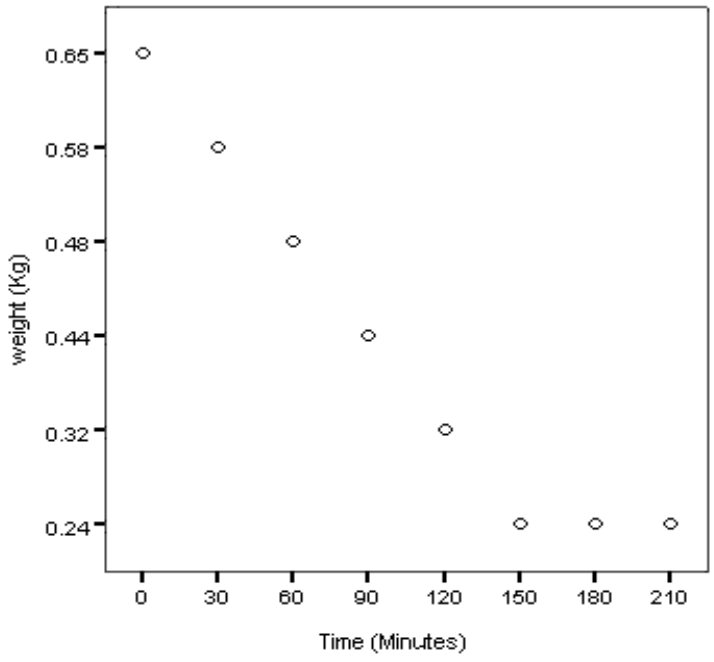

Fig 1: The Relationship Between Time and Weight of Smoked Hake

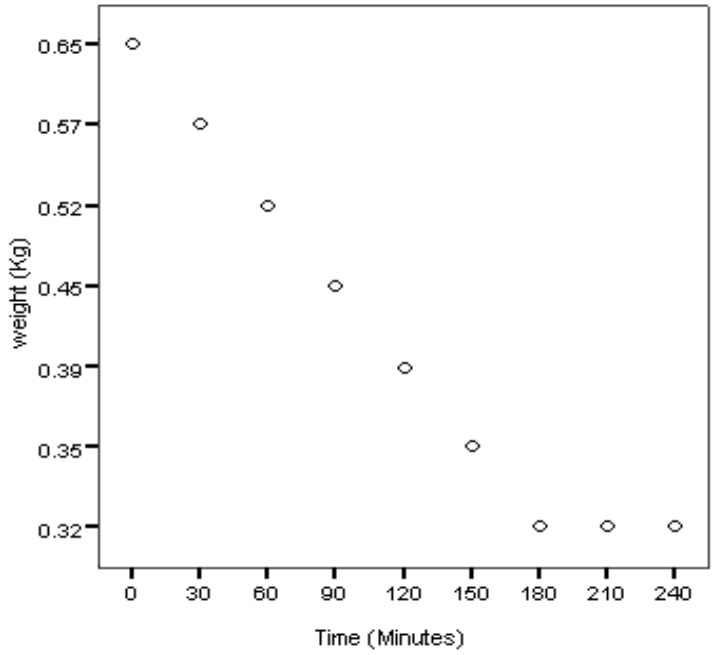

Fig 2: The Relationship Between Time and Weight of Smoked Herring

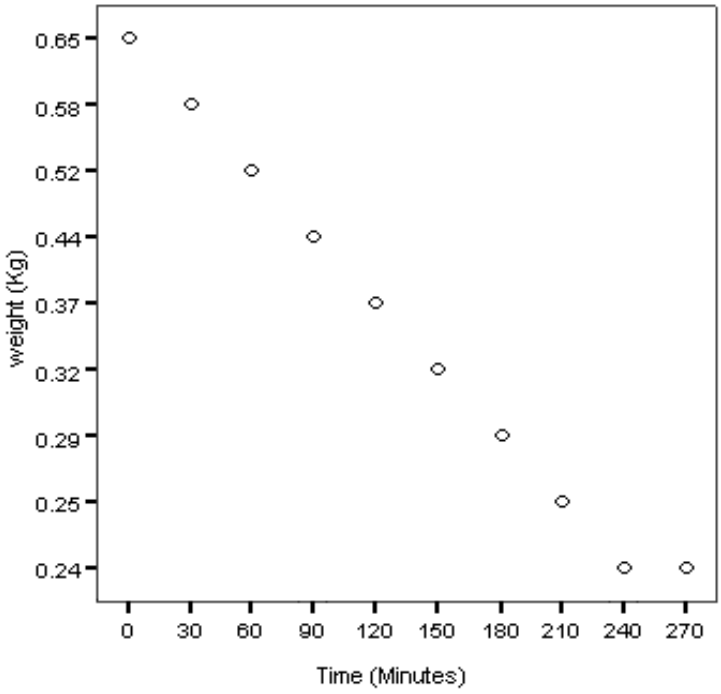

Fig 3: The Relationship Between Time and Weight of Smoked Mackerel

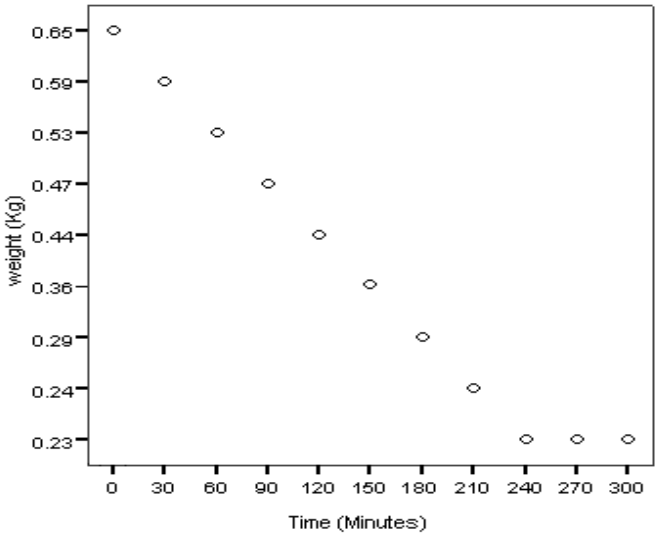

Fig 4: The Relationship Between Time and Weight of Smoked Sardine

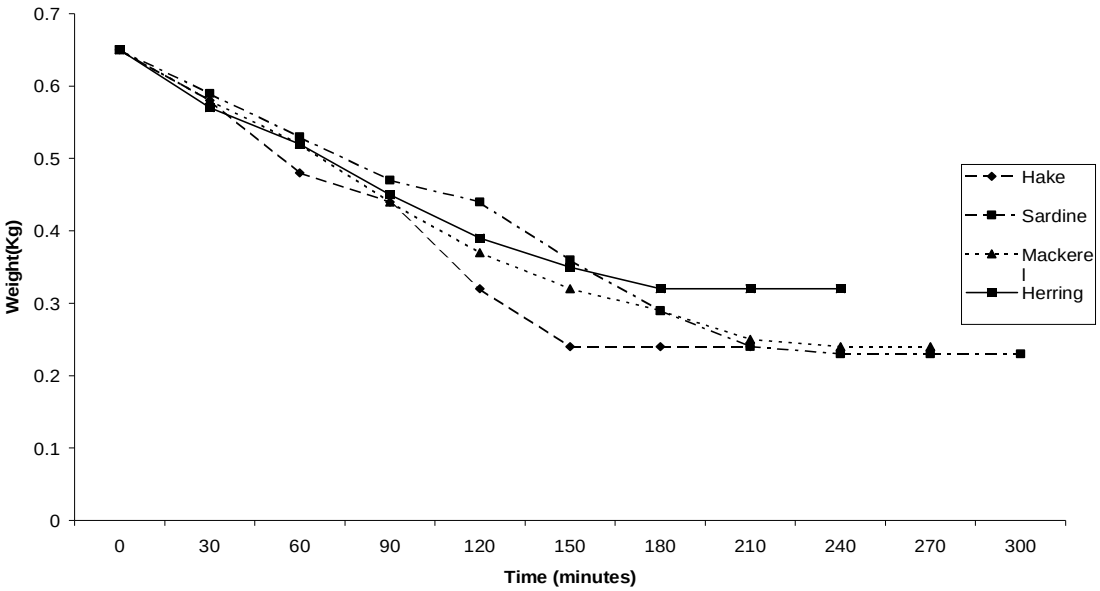

Fig.5: Weight variation of the smoked fish species

However, weight loss in Hake – (*Merluccius sp*) was fastest at an average of 0.192 kg/h followed by Herring – (*Sardinella maderensis*) 0.16 kg/h, Mackerel – (*Scomberomerus tritor)* 0.14 kg/h and Sardine – (*Sardinella sp*) 0.12 kg/h. These suggest that the water content of the fish species vary (ILO/FAO,1982), with a possible water activity graduating in an inversely proportional manner to rate of fish weight loss (Figure 5).

Table 1: Indices of Smoked Frozen Fishes

Fish Species	Hake – (*Merluccius sp*)	Sardine – (*Sardinella sp*)	Mackerel – (*Scomberomerus tritor)*	Herring – (*Sardinella maderensis*)
Smoke-curing index (%)	43.75	62.5	56.25	50

From Table 1, the indices of smoke curing of the frozen fishes revealed that an average of 8 smoking rounds were needed to effectively attain a constant weight which was the desired state for smoked fish by smoked fish processors in the study area. Nevertheless, Sardine – (*Sardinella sp*) had the highest smoking index of 62.5% and Hake – (*Merluccius sp*) was least with 43.75%. This shows that in smoking process the frozen fish species will attain desired smoking state in the order: Hake – (*Merluccius sp*), 3 h; Herring – (*Sardinella maderensis*), 3.5 h; Mackerel – (*Scomberomerus tritor),* 4.5 h and Sardine – (*Sardinella sp*), 5 h.

Thus, the shelf life of this fish species becomes enhanced at these levels of smoking which enables the processors' time before the sales of their products. It also allows consumers opportunity to exercise their preference for smoked fish.

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