EFFECTS OF PRESERVATIVES ON THE PROXIMATE AND SENSORY ANALYSIS OF SMOKE-DRIED *Clarias gariepinus* DURING AMBIENT STORAGE

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ABSTRACT

The effect of food grade chemical and natural preservatives on the proximate and sensory analysis of smoked catfish *Clarias gariepinus* during six weeks ambient storage were determined. Eleven pre-smoking treatments were applied: 25% sodium chloride (NaCl) and 1% ascorbic acid for 1h; 25% NaCl and 1% ascorbic acid for 30mins; 3% sodium lactate for 30mins; 3% sodium lactate and ginger *(Zingiber officinale)* extract for 30mins; 5% sorbic acid for 30mins; 5% sorbic acid for 1h; 3% sodium lactate and *Tetrapleura tetraptera* extract for 30mins; 3% sodium lactate and Ethiopian pepper (*Xylopia aethiopica*) extract for 30mins; *Z. officinale* extract for 30mins; *X. aethiopica* extract for 30mins and *T tetraptera* extract for 30mins. The samples were smoked, cooled and packed for analysis at 0, 2, 4 and 6 weeks of ambient storage. The values of the proximate analysis ranged between 13.0-19.5%, 3.5-5.5%, 12.3-17.6% and 58.4-68.7% for moisture, ash, lipid and protein respectively. There were no significant change of proximate composition and sensory evaluation ($p<0.05$) within each treatment groups during the 6 weeks storage without refrigeration.

INTRODUCTION

Catfishes - *Clarias gariepinus*, *Heterobranchus longifilis* and *H. bidorsalis* are lean and highly nutritious food commodity with wide consumer acceptance. In Nigeria, catfish accounts for about 80% of aquaculture production. However, catfish like any other fish species, could result in significant economic loss due to its perishable nature, if adequate preservative techniques are not adopted (Clucas and Ward 1996). Various food preservation techniques have been utilized to improve the microbial safety and extend the shelf life of fish in general including freezing, chemical preservation, salting, and smoking (Nickelson *et al.*, 2001). Up to 70% of the total fish catch in developing countries is preserved by smoking (Clucas and Ward, 1996). Smoking usually extends the shelf life of fish due to the reduced moisture content and effects of imparted phenolic compounds (Efiuvwevwere and Ajiboye, 1996). In addition, during hot smoking, high heat results in direct microbial destruction (Nickelson *et al.*, 2001). Another shelf life-promoting strategy involves salting with sodium chloride or curing with chemical preservatives (Ravishankar and Juneja, 2000). Common food preservatives used for catfish include antibacterial and antifungal agents such as lactic acid (Fernandes *et al.*, 1998), sodium benzoate (Efiuvwevwere and Ajiboye, 1996), sodium lactate and sorbic acid (Antonia da Silva *et al.*, 2008) and antioxidants such as ascorbic acid to slow down lipid oxidation. Despite various types of smoking processes and added preservatives, subsequent microbial population change and storage stability were also determined by fish type, the quality of fish at smoking and post-smoking storage conditions. The impact of smoking, chemical and natural preservatives and different storage times at room temperature on the proximate and sensory quality of the smoked catfish (*Clarias gariepinus*) has not been reported.

MATERIALS AND METHODS

Fresh *C. gariepinus* (350 -500g) were collected from a private catfish processing fish farm Azemor Agribiz Ltd , Oyo state, Nigeria. All preservatives used are food grade and were purchased from local market. The samples were stunned using 160g of salt to 40kg of fish, dressed and randomly divided into twelve groups. Except for control (112), the other eleven groups were subjected to the following soaking treatments using preservative solutions: (T1) 25% sodium chloride (NaCl) and 1% ascorbic acid for 1h; (T2) 25% NaCl and 1% ascorbic acid for 30mins; (T3) 3% sodium lactate for 30mins (T4) 3% sodium lactate and ginger extract for 30mins; (T5) 5% sorbic acid for 30mins; (T6) 5% sorbic acid for 1h; (T7) 3% sodium lactate and aidan extract for 30mins; (T8) 3% sodium lactate and Ethiopian pepper extract for 30mins; (T9) ginger extract for 30mins; (T10) Ethiopian pepper extract for 30mins; (T11) aidan extract for 30 minutes. After soaking treatments, all catfish belonging to both treatment and control groups were loaded into the smoking kiln and slowly cooked for about five hours with charcoal at 160°C chamber temperature. After cooking, the fire was extinguished overnight. The next morning, the catfish were smoked with the addition of charcoal at a temperature of 180°C chamber temperature for eight hours. After smoking and cooling, all catfish of each group

were packed in polythene bags, sealed and kept in paper boxes at ambient (30-33°C) temperature. Samples were subjected to proximate and sensory analyses on 0, 2, 4 and 6 weeks of storage. Proximate analysis was determined as described by AOAC (1995). Twenty people were trained to make subjective judgments on the samples on 0, 2, 4, and 6 weeks storage. The samples were scored 10.0 (excellent), 8.0 (good), 6.0 (satisfactory), 4.0 (fair) and 2.0 (poor).

RESULTS AND DISCUSSION

Moisture level ranged between 13.0-19.5%. Moisture content of all treatments remained similar throughout 6 weeks of storage as presented in figure 1.The ash varied from 3.5-5.5% and there is no significant difference in ash within treatment groups as in figure 2.The lipid level ranged between 12.3-17.6% as shown in figure 3 and there is no difference at 5% within treatments. Smoked catfish is lean, which makes it a very good diet. Smoked catfish contain a good percentage of protein, the protein varied from 58.4- 68.7% and no significant difference in protein level for all samples as presented in figure 4. No sample of smoked catfish was scored below satisfactory. The sensory evaluation as presented in figs. 5-9 showed that preservatives and storage for six weeks have no effect on the quality (consumer acceptability) of the catfish samples.

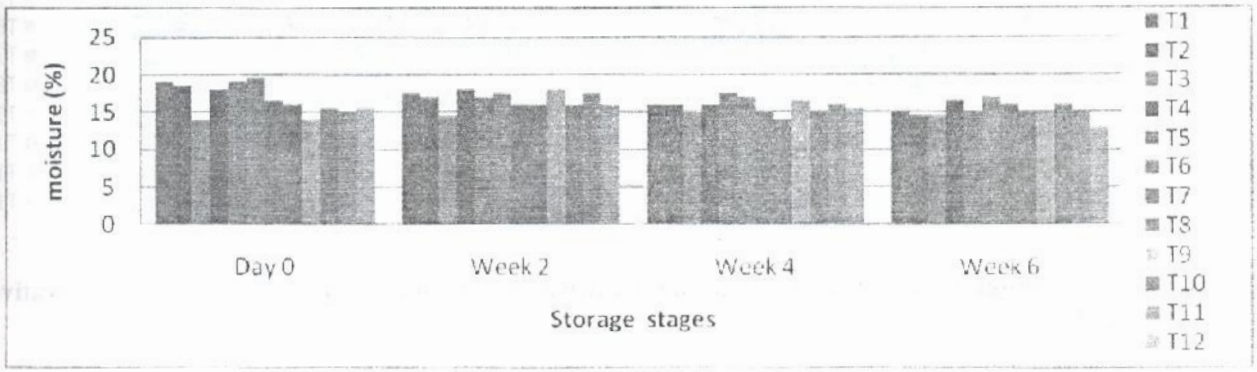

Figure1: Change in moisture of smoked catfish during storage as affected by preservative treatments

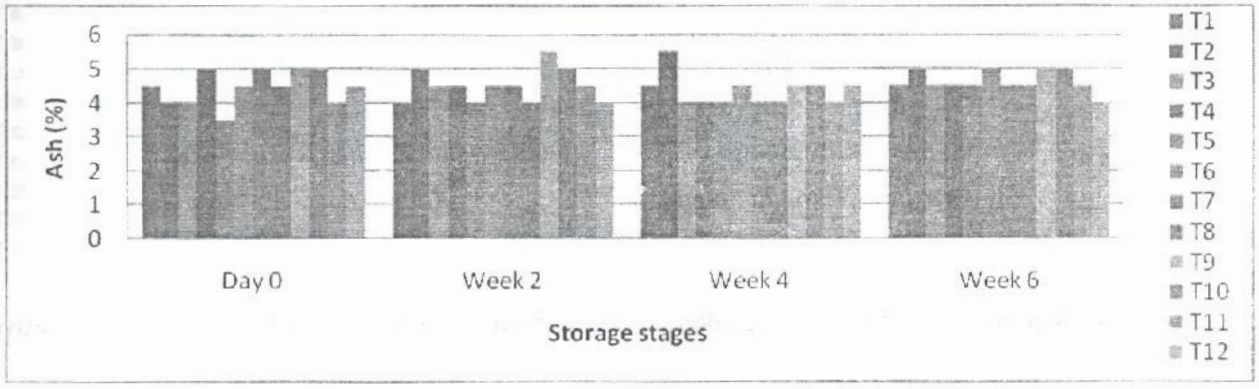

Figure 2: Change in ash of smoked catfish during storage as affected by preservative treatments

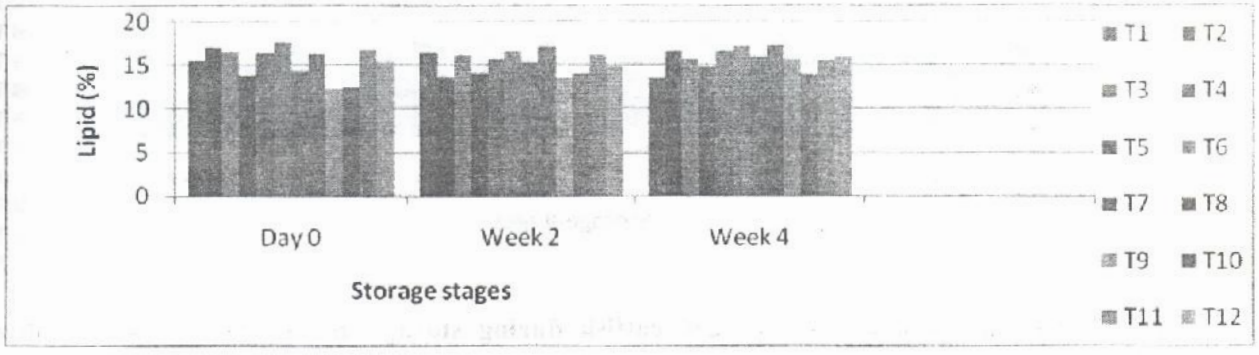

Figure 3: Change in lipid of smoked catfish during storage as affected by preservative treatments

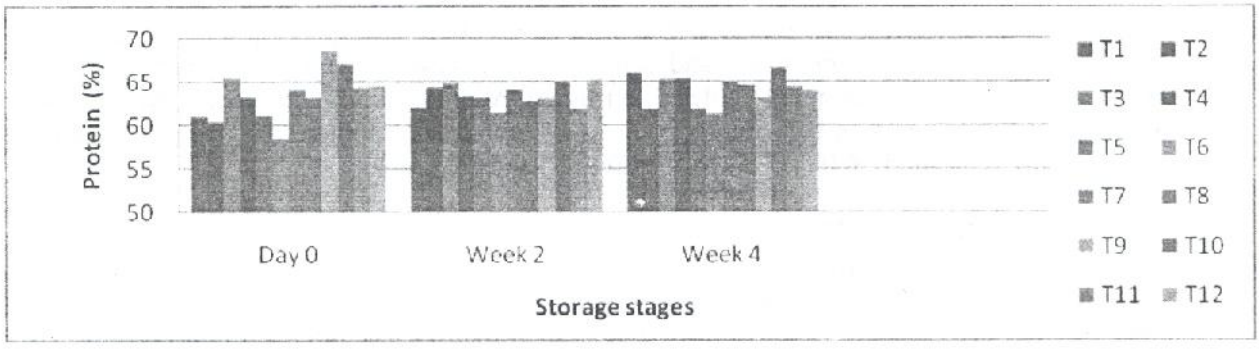

Figure 4: Change in protein of smoked catfish during storage as affected by preservative treatments

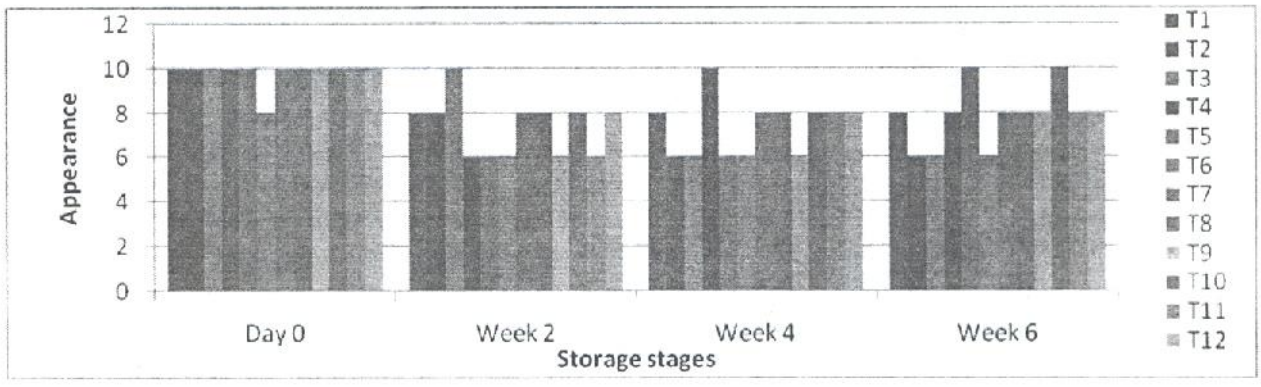

Figure 5: Change in appearance of smoked catfish during storage as affected by preservative treatments

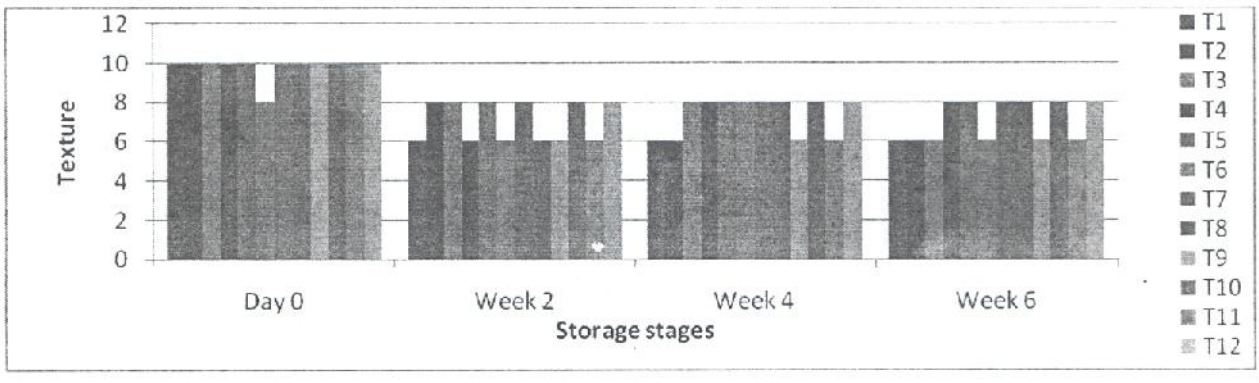

Figure 6: Change in texture of smoked catfish during storage as affected by preservative treatments

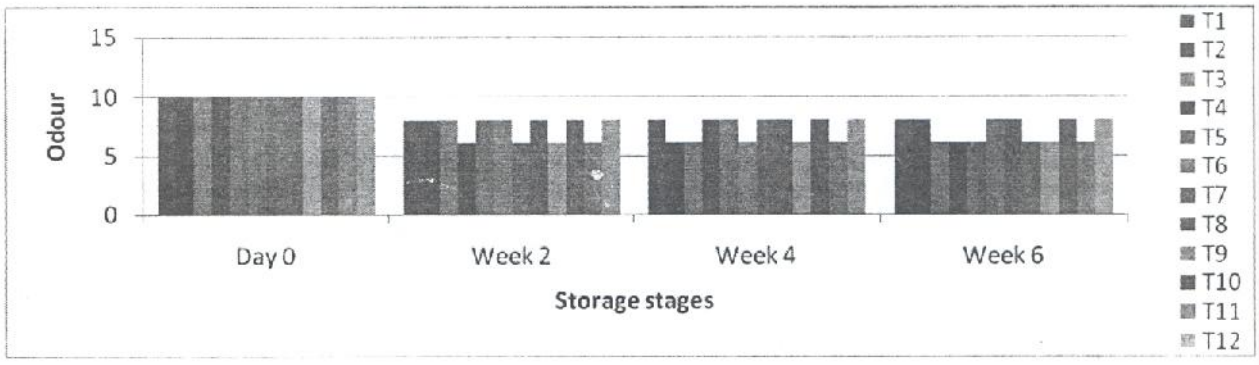

Figure 7: Change in odour of smoked catfish during storage as affected by preservative treatments

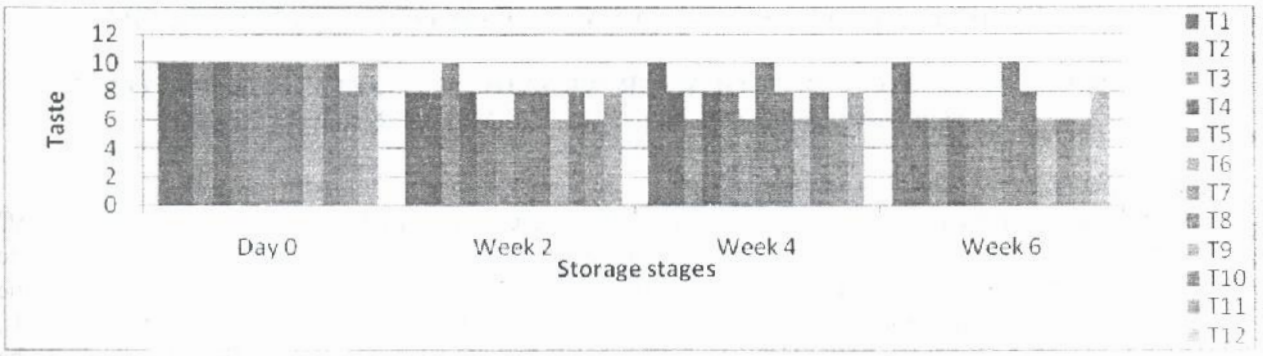

Figure 8: change in taste of smoked catfish during storage as affected by preservative treatments

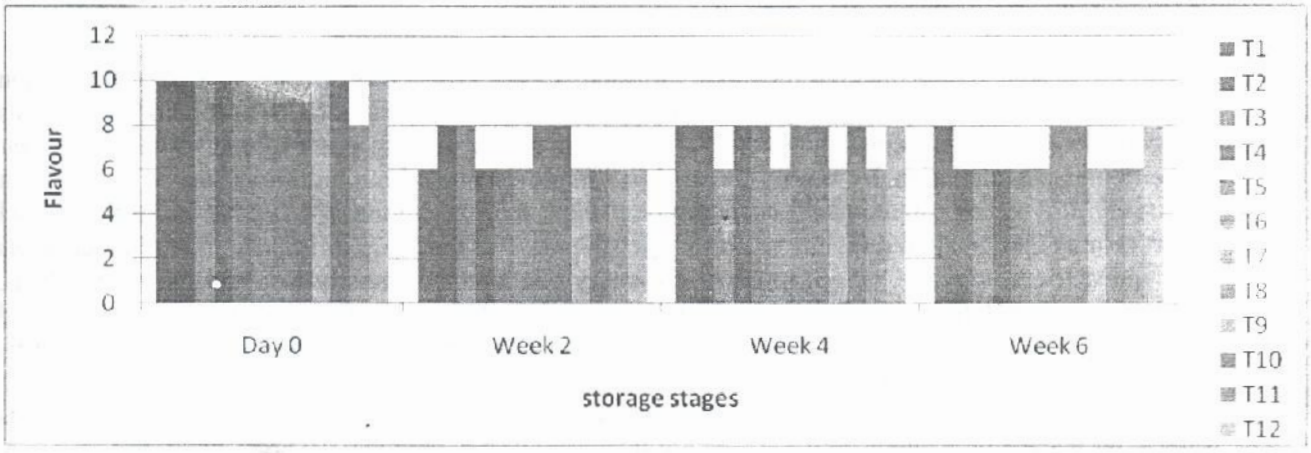

Figure 9: Change in flavour of smoked catfish during storage as affected by preservative treatments

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