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Comparative Study of Sun Drying and Solar Tent Drying of *Hyperopisus bebe occidentalis*

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Abstract: An experiment was conducted to investigate the effect of two drying processing methods on the nutritional qualities of *Hyperopisus bebe*. The two methods used were solar tent dryer and traditional sun drying methods. The experimental fish were dried for 120 h (5 days). The results of proximate analysis showed significant difference ($p<0.05$) between the two techniques. Organoleptic evaluation showed no physical damage, no discolouration in the treatments and both had firm texture though fishes under traditional sun drying were infected by insects.

Key words: Traditional sun drying, solar tent, *Hyperopisus bebe*

INTRODUCTION

Fish is a highly nutritious food and it is particularly valued for providing protein of high quality better than those of meat and egg. However, it is one of the most perishable of all the foods because it is a suitable medium for growth of micro-organisms after death. Igene (1983) found that in the tropics at ambient temperature, spoilage is rapid; fish will spoil within 12-20 h depending on species, method of capture. As soon as fish is caught and dried, certain irreversible spoilage begin to take place, leading to spoilage and deterioration (Conne, 1995) and most subsequent processing or preservation operation are intended to prevent these causes or usually reduce the rate at which they proceed (Eyo, 1986).

Sun drying is one of the traditional methods employed to preserve fish. It has been observed as the most convenient and cheapest form of preservation in Nigeria (Eyo, 1986). The need to use solar radiation/energy for fish drying has become even more than necessary at the present time because of the huge competitive demand for fuel wood for fish smoking. Solar drying is an improved method of sun drying. It minimizes or stop some of the limitations of open sun drying. It differs from open sun drying in that a structure, often very simple in construction is used to enhance the effect of the insulation due to the fact that solar tent dryer is an enclose structure that traps heat inside the tent and make effective use of the heat which is stored inside the tent both in the day and night by the help of some rocky stones which are painted black to absorb heat.

Hyperopisus bebe occidentalis is the sole specie of genus Hyperopisus. It has a small rayed fin situated well to the rear of the body. This specie inhabits in both rivers and swamps and is one of the most common momyrids the commercial catches.

This study assessed and compared the organoleptic and proximate composition of solar tent dried fish and open sun dried fish.

MATERIALS AND METHODS

The design of the solar tent dryer is based on horticultural green house. It consists of a plastic polythene sheet stretched over a wooden frame work (3 feet wide by 4 feet long by 4 feet high) with side and top vent (1 by 1 feet) and the fish rack (1.5 feet by 1.5 feet) were placed with wire mesh under and underneath were painted rocks which was used as a heat collector and transmitter area.

Sun drying rack was constructed by placing sack on a concrete floor and a wooden frame work was constructed from chicken wire mesh which was used to cover the sack that is placed directly under the sun for maximum utilization of the sun.

The experimental fish (*Hyperopisus bebe)* used for the experiment were purchased and transported to the laboratory for further analysis. They were washed and manually operated by descaling and gutting was carried out. The gutted fish were arranged on the tray within the solar tent dryer (treatment B) and open sun drying (treatment A).

Proximate analysis was carried out on the fresh fish before the experiment and on the experimented fish every 24 h for 5 days. The analysis was done using the method of AOAC, 1980. The parameters measured were crude protein, ash, crude fibre, moisture content, lipids. Organoleptic assessment was also carried out using a

Table 1: Fresh proximate composition of *Hyperopisus bebe occidentalis*

Protein (%)	Moisture (%)	Lipid (%)	Ash (%)	Crude fibre (%)
29.96	74	29.6	1.57	0.2

Table 2: The daily proximate composition of crude protein, lipid, ash and crude fibre

	Moisture		Protein		Lipid		Ash		Crude Fibre	
Day	A	B	A	B	A	B	A	B	A	B
Day 1 (24 h)	3.36± 0.01[a]	3.39± 0.01[b]	3.70± 0.10[a]	3.94± 0.01[b]	0.34± 0.01[a]	0.41± 0.01[a]	1.19± 0.01[a]	1.24± 0.01[b]	0.02± 0.01[a]	0.01± 0.01[a]
Day 2 (24h)	3.15± 0.01[a]	2.88± 0.01[b]	3.99± 0.01[a]	3.68± 0.28[a]	0.20± 0.01[a]	0.44± 0.01[b]	2.58± 0.01[a]	2.22± 0.01[b]	0.03± 0.01[a]	0.02± 0.01[a]
Day 3 (24 h)	2.02± 0.01[a]	1.74± 0.01[b]	6.68± 0.1[a]	6.12± 0.01[b]	0.08± 0.01[a]	0.53± 0.01[b]	1.59± 0.01[a]	1.29± 0.01[b]	0.04± 0.01[a]	0.06± 0.01[a]
Day 4 (24 h)	0.28± 0.01[a]	0.29± 0.01[a]	8.36± 0.01[a]	9.46± 0.01[b]	2.18± 0.01[a]	2.11± 0.01[b]	1.13± 0.01[a]	0.99± 0.01[b]	0.05± 0.01[a]	0.07± 0.01[a]
Day 5 (24 h)	0.12± 0.01[a]	0.23± 0.01[b]	6.26± 0.01[a]	7.20± 0.01[b]	3.47± 0.01[a]	2.89± 0.01[b]	1.04± 0.01[a]	0.96± 0.01[b]	0.00± 0.01[a]	0.04± 0.01[b]

Hedonic scale grading base on method of Doe and Olley (1990). Analysis of variance was used to statistically test the results.

RESULTS

The proximate analysis of the fresh *Hyperopisus bebe* were 74% moisture, 29.96% crude protein, 1.57% ash and 0.2% crude fibre (Table 1)

The daily proximate composition of crude protein, lipid, ash and crude fibre analyzed were increasing in the two treatments (A and B) from the first day to the last day of the drying process i.e. fifth day (Table 2). The highest protein was recorded treatment B which is the solar tent dryer with a value of 62.5% on the fifth day while treatment A which is traditional sun drying was 59.8% in the fifth day. There was no significant difference ($p>0.05$) among the days of the experiment but significant difference ($p<0.05$) was observed between the treatments.

The moisture content range of the treatment B was 65% in the first day to 10% in the fifth day while treatment A was 69-11.5% in the last day (Table 2). Significant difference ($p<0.05$) was observed between the treatments.

Table 2 also shows the lipid composition of the two treatments. The lipid concentration of traditional sun dried fish ranged between 30.2% in the first day to 28.30% In the fifth day while solar tent dried fish ranged was 29.4% In the first day and 26.50% in the last day of the experiment. Significant difference was also observed ($p<0.05$).

The ash content of the experimented fish is also presented in Table 2 which ranged between 2.50-11.1% in the fifth day I treatment A and 0.5-1.94% in treatment B and significant difference ($p<0.05$) was observed.

The crude fibre of the two treatments increased from the first day to the last day (Table 2). Traditional sun dried ranged from 0.5-1.94% in the fifth day while solar tent dried (treatment B) ranged from 0.3% in the first day to 2.4% in the fifth day. Significant difference ($p<0.05$) was also observed between the treatments (Table 2).

The organoleptic evaluation showed that the appearance of the two treatments were in good condition throughout the experiment. Also, no discolouration was observed in the treatments. The texture of the two treatments was also observed to be in good condition throughout the experiment.

Bacteria infestation was observed in treatment B which was the traditional sun drying method during the first and second day of the experiment.

DISCUSSION

The moisture content of both treatment A and B reduced from 74-11.5% and 10% respectively which agreed with Clucas (1982). Clucas (1982) reported that a fish well dried or moisture content reduced to 25% will not be affected and if further dried to a moisture content of 15%, the growth of mould will cease and increase the shelf life.

The protein content of the experimented fish was 23.33% which increased to 59.8% and 62% in treatment A and B respectively. This agrees with Cowey and Sargent (1972) who reported that as moisture content of fish reduces, the protein content increases. They further observed that the crude protein in fish is between 50% and 70% which agrees with this finding.

The lipid content of this fresh fish was 29.96% which agrees with the findings of Conne (1995) who reported that lipid content of fish varies from lean fish to fatty fish. The reported that fatty fish is between 21-30% and could be above and *Hyperopisus bebe* is a fatty fish. The lipid content reduced to 28.50 and 26.50% in treatment A and B respectively.

The ash content of the fresh Hyperopisus bebe was 1.57% which increase to 11.1% in treatment A and 9.40% in treatment B. This finding agrees with Tunison *et al.* (1990) who observed ash content to be between 2.50 and 4.60%.

Conclusion: From this study, the solar tent dryer has proven to be more efficient and reliable form of fish preservation and processing using the ambient solar energy. The products were of good quality compare to sun drying in terms of nutritional value and hygienic condition.

It was also discovered that an average fisher man/fish farmer can own a solar tent dryer in his/her farm with just about #3,000.00.

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