

EVALUATION OF SOME PROCESSING METHODS ON MOISTURE CONTENT OF *Clarias gariepinus* (BURCHELL, 1822)

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ABSTRACT

The gap between the demand and supply of fish is widening due to increase population, poor post-harvest handling, inadequate processing and storage facilities. However, good post-harvest handling of fish such as smoking and brining could enhance better preservation of fish. Therefore, this study was carried out to evaluate the effect of some processing methods on moisture content of *C. gariepinus*. The fish were washed aseptically and divided into four treatment groups; Smoked Whole Fish (SWF), Brine Smoked Whole Fish (BSWF), Smoked Guttled Fish (SGF) and Brine Smoked Guttled Fish (BSGF) with 15 *C. gariepinus* per treatment and replicated twice. The fish was smoked using smoking kiln at 100°C for 2, 4, 6, 8 and 10 hours and moisture contents of 3 body parts such as the head, middle and tail were determined. The results revealed that moisture loss was between 40 and 50% when fish was smoked for 2 hours in all the treatment groups and increased gradually from 50 to 75% between 4 to 10 hours due to increasing drying durations. Guttled fish loss more water than whole fish, this could be that gut helps to speed up the rate of water loss when compared to the whole smoked fish. There was significant difference ($p < 0.05$) in the moisture content of the treated groups at 2, 4, 8 and 10 hours while no significant difference ($p > 0.05$) was observed at 6 hours among the treatments. Conclusively, this mean that, at higher temperature brining is more effective in removing water than at lower temperature.

Keyword: Quality; Acceptability; Fish processing; Water loss; Drying

INTRODUCTION

Nigerians consume fish as a major source of animal protein. Fish is cheap and highly acceptable, with little or no religious bias, which gives it an advantage over pork or beef. It can be eaten fresh, preserved or processed. However, the gap between the demand and supply of fish is widening due to increase in population, poor post-harvest handling, inadequate of processing and storage facilities (Ayuba and Omeji, 2006).

Poor post-harvest technology such as handling, preservation and processing have the ability to cause massive spoilage. Proper processing and preservation of fresh fish could prevent economic losses to farmers. Traditional fish processing, such as brining, drying and smoking, allow better fish preservation and storage (Egbal *et al.*, 2010).

METHODOLOGY

Sample collection, Processing, determination of dry matter and storage

Clarias gariepinus (60) with initial mean weight of 245.30 ± 3.75 g was purchased from OAUSTECH fish farm. Fish were washed aseptically and divided into four treatment groups; Smoked Whole Fish (SWF), Brine Smoked Whole Fish (BSWF), Smoked Guttled Fish (SGF) and Brine Smoked Guttled Fish (BSGF) with 15 *C. gariepinus* per treatment and replicated twice. Sodium chloride (30%) was used as recommended by FAO (1988) on proper use of salt. Brining was done for 30 minutes. Smoking kiln was used by first loading charcoal into the heat chamber, preheating it for 1 hour to allow heat radiation in the Kiln. The treated fish samples were smoked at 100°C for 2, 4, 6, 8 and 10 hours. The moisture content of each of the fish sample were determined using oven dry method at three body portion such as head, middle and tail.

Statistical analysis

Data were presented in mean and standard deviation. One-way analysis of variance (ANOVA) was used and mean of the treatments were separated using Duncan's Multiple Range. $P < 0.05$ was considered significant. All analysis was done using Statistical Analysis for Science (SAS) version 9.0

RESULTS AND DISCUSSION

Moisture loss was between 40 and 50% when fish was smoked for 2 hours in all the treatment groups and increased gradually from 50 to 75% after 4 to 10 hours due to increasing drying durations (Figure 1). At 10 hours, SGF losses more water than SWF (Table 1) and this could be that the gut helps to speed up the rate of water loss when compared to the whole smoked fish. The results revealed a significant difference ($p < 0.05$) was observed in moisture content of the head, middle and tail of all the treated groups. Also, it was observed as the duration of processing increases the moisture content decreased (Table 2). Brine Smoked Guttred Fish had the lowest moisture content of 4.06 ± 0.10 and 2.10 ± 0.05 for head and tail at 10 hours respectively while Brine Smoked Whole Fish recorded the lowest moisture content of 2.04 ± 0.72 for middle at 10 hours.

Fish smoked for 2 hours (soft smoking) should be consumed in less than 24 hours so as to avoid rancidity. Fish smoked at 8 and 10 hours during this study could be stored because the moisture contents were within the values (6 to 8%) recommended by Olayemi *et al.* (2011) for a dried catfish.

Table 1: Percentage moisture loss of different fish treatments smoked at different durations

Durations	Treatments			
	BSWF	SWF	BSGF	SGF
2	43.97 ± 0.96^b	35.77 ± 0.45^c	47.57 ± 0.82^a	44.43 ± 1.4^b
4	47.00 ± 0.00^{bc}	46.10 ± 0.74^c	54.40 ± 0.80^a	52.77 ± 1.9^{ab}
6	58.20 ± 0.44^a	57.23 ± 1.02^a	61.43 ± 1.55^a	58.50 ± 3.76^a
8	66.50 ± 0.57^a	62.77 ± 1.54^b	68.59 ± 0.98^a	68.47 ± 0.43^a
10	73.80 ± 4.23^a	62.70 ± 1.74^b	79.00 ± 2.90^{ab}	76.50 ± 1.35^a

*Means in the same row with different superscripts are significantly different ($P \leq 0.05$)

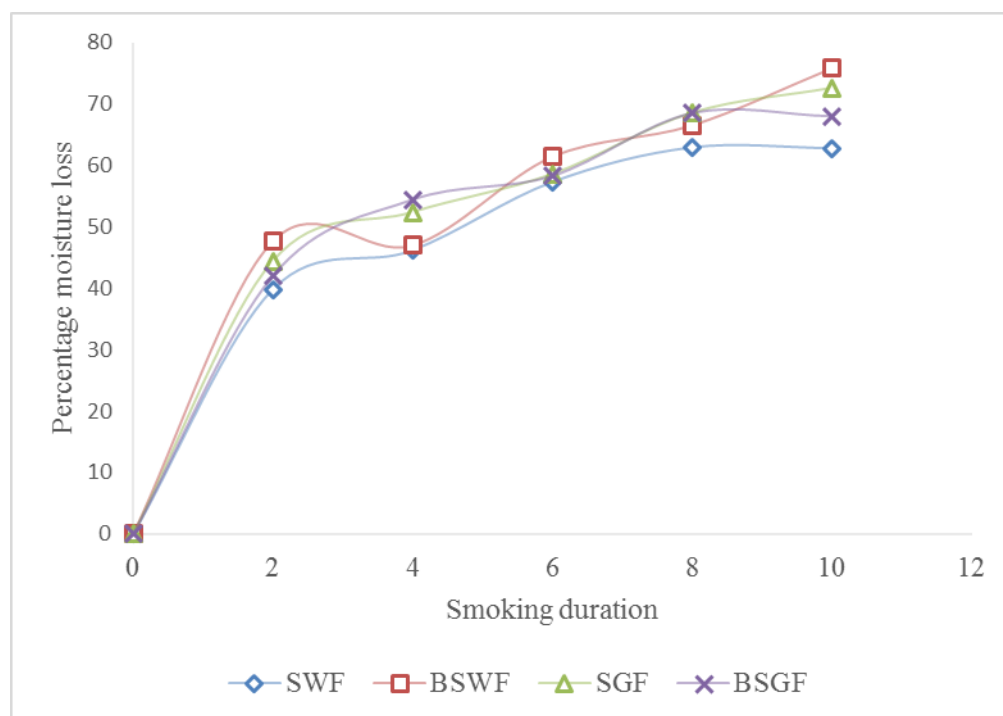


Figure 1: Percentage moisture loss of SWF, BSWF, SGF and BSGF

Table 2: Percentage moisture content of fish portions at different drying durations

Fish portions	Treat -ments	Drying durations				
		2hours	4hours	6hours	8hours	10hours
Head (%)	SGF	16.79 ± 0.60^b	14.40 ± 0.04^b	8.80 ± 0.80^c	6.00 ± 0.00^c	4.90 ± 0.00^b

	BSGF	15.00±0.00 ^c	10.36±0.04 ^c	8.41±0.40 ^c	4.25±0.50 ^d	4.06±0.10 ^c
	SWF	17.20 ±0.05 ^a	15.07±0.03 ^a	13.86±0.80 ^a	6.92±0.92 ^a	6.98±0.83 ^a
	BSWF	16.88 ±0.41 ^a	14.88±0.10 ^a	10.00±0.00 ^b	6.01±0.11 ^b	5.04±0.01 ^b
Middle (%)	SGF	15.12 ±0.14 ^b	13.06±0.37 ^b	9.77±0.75 ^b	4.06±0.05 ^c	2.09±0.07 ^b
	BSGF	13.20 ±0.22 ^c	9.32±0.34 ^c	7.84±0.64 ^c	3.16±0.22 ^d	2.23±0.07 ^b
	SWF	17.04 ±0.73 ^a	15.16±0.86 ^a	11.29±0.28 ^a	6.31±0.39 ^a	3.86±0.2 ^a
	BSWF	16.78 ±0.70 ^a	14.88±0.03 ^a	8.10±0.10 ^c	5.84±0.70 ^b	2.04±0.72 ^b
Tail (%)	SGF	19.46±0.47 ^a	15.62±0.60 ^a	11.31±0.03 ^a	5.03±0.21 ^b	2.14±0.01 ^c
	BSGF	16.00±0.00 ^c	13.05±0.59 ^c	7.93±0.69 ^b	4.07±0.06 ^c	2.10±0.05 ^c
	SWF	16.07±0.12 ^b	14.10±0.42 ^b	8.06±0.02 ^b	6.65±0.63 ^a	4.12±0.09 ^a
	BSWF	15.94 ±0.34 ^b	13.84±0.01 ^b	10.82±0.02 ^a	4.31±0.79 ^c	3.05±0.18 ^b

*Mean with the same superscript along the columns are not significantly different at p>0.05

CONCLUSION AND RECOMMENDATION

The results show that moisture content could be an indicator to fish spoilage. From this study, it is advisable for fish farmer to smoke their fish at 8 and 10 hours for better flesh quality. Brining of fish show a better performance and it is therefore recommended that fish farmers should brine their fish for better quality and acceptability.

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