EFFECTS OF DIFFERENT SLIME CLEANING MATERIALS ON THE NUTRITIVE VALUE OF CATFISH

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ABSTRACT
Using the best method for de-sliming fish makes it more nutritious, appealing, and tasty. A total of 60 mature Clarias gariepinus with an average weight of 298.0 ±0.01g were divided into four treatments de-slimed each for five minutes using cold water, warm water, alum and salt. The treated samples were further processed by smoking and the smoked samples were analyzed for their proximate composition. Sensory analysis was undertaken by twenty trained panelists to score the smoked products on a 10-point hedonic scale. The result of the proximate composition for the four treatments significantly differs ($p<0.05$) from each other for each nutrient analyzed. The alum treated group has the highest crude protein content (29.20±5.11%), followed by the warm water group (23.20±8.10%), while the lowest recorded in percentage protein is the cold-water group (control) with a value of 18.13±3.17%. Parameters tested for sensory evaluation are not significantly different ($p<0.05$). The results of this study suggest that de-sliming materials do not have any deleterious effect on the nutrients of fish in contrary to some erroneous belief that alum usage may disrupt the nutritional profile of fish and may be damaging to health.
Keywords: De-sliming, Catfish Processing, Nutritious, appetizing

INTRODUCTION

Slime coat of fish is often removed with basic or acidic chemicals (cleaning material) during processing, prior to consumption. All fish must have their protective slime coating removed. Bacteria are abundant in this covering, and if not entirely eliminated, they will cause stink and attract bugs (Dan Rinehart, 2021). Cleaning materials like alum, lime, table salt and vinegar are mostly used as desired by the consumers during processing to remove the slime. Lime has a lot of citric acid, with salt containing sodium chloride (NaCl) while alum is a form of double salt ($KAL_2(SO_4)_2.12H_2O$). Consumers are unaware of the potential consequences that these cleaning materials can have when in touch with nutrients, which is why these chemicals (cleaning materials) are used as intended. Sarwar (2005) reported that anti-nutritional factors may result from food processing. Acid treatment can result in the deamination of amide nitrogen, leading to the hydrolysis of peptide bonds, thereby increasing protein solubility, which may likely affect digestibility (Micheal *et al*., 2000).

Processing methods determine the availability of major nutrients to the body. There is an urgent surge for protein-rich foods in developing countries [www.foodqual.sat, 2018] as most countries in Africa are distinctly affected by malnutrition, especially under nutrition. The manner food products are processed is very crucial for the preservation of their nutritional contents, because ignoring the ideal processing techniques can lead to the full destruction of the nutritional components (Djikeng *et al.,* 2022). It is well acknowledged that one of the main factors contributing to malnutrition is ignorance (Womeni, 2012; Uboh *et al*., 2014).

Clarias gariepinus is consumed by most West Africans. These consumers utilize it as a source of protein. These catfish species have a lot of mucus on their flesh, which can be cleaned properly to make the flesh look and taste better. Information about the impacts of these cleaning materials on *Clarias gariepinus* meat is not currently available as well as the bio availability of nutrients when treated with the cleaning materials. This brings about the novelty of this work. This study is therefore designed to evaluate the effects of using some common de-sliming materials when processing catfish flesh on its nutritional and sensory parameters after processing.

MATERIALS AND METHODS

Collection, Preparation and Processing of Fish Samples

This research work was carried out at the Teaching and Research farm of The Federal Polytechnic Ilaro. 60 mature *Clarias gariepinus* with an average weight of 298.0±0.01g were divided into 4 bowls, each containing 15 catfish per bowl. These were weighed, slaughtered and gutted before treatment with the required de-sliming material. The four de-sliming agents used in cleaning the fish serve as the treatments. The materials and treatments include cold water (serving as the control), warm water (45^{0}C), alum and common salt. The fish in each bowl was later sub-divided into 3, representing three replicates with five fish per replicate. When thoroughly cleansed for 5minutes, each fish was cut into two to have 10 samples per replicate. The fish was smoked at a temperature of 35^{0}C for the first two hours and then at 100^{0}C for another four hours, totaling 6 hours of processing. Charcoal was used to generate heat and smoke. After smoking, fish fillet samples were collected and put in labeled cellophane bag, before being taken to the laboratory for analysis.

Laboratory Analysis

The cold water, warm water, alum-treated and salt-treated fish were separately analyzed for their proximate composition following the methods of AOAC (2005). Sensory analysis was undertaken using twenty taste panelists already familiar with scoring smoked fish product. The products were scored on a 10 point hedonic scale of 10- like definitely (excellent), 8- like moderately (good), 6- Neither like nor dislike (fair), 4- Dislike moderately (poor) and 2-Dislike definitely (bad).

Statistical Analysis

Data collected was subjected to statistical analysis using one-way Analysis of variance (ANOVA) and Duncan Multiple Range Test to separate significance among means at $p<0.05$.

RESULTS AND DISCUSSION

The proximate composition of the four treatments (cold water, warm water, alum and salt) is presented in table 1.

Table 1: Proximate composition of *C. gariepinus* de-slimed with different cleaning materials

SAMPLES	MOISTURE	CRUDE FAT	CRUDE ASH	PROTEIN	CHO
Cold water	33.13 ± 10.47^c	12.44 ± 3.53^a	0.48 ± 0.16^a	18.13 ± 3.17^a	35.81 ± 4.13^b
Warm water	21.32 ± 11.68^{ab}	17.21 ± 6.97^a	0.65 ± 0.27^{ab}	23.20 ± 8.10^{ab}	37.62 ± 3.69^b
Alum	15.13 ± 7.99^a	23.09 ± 4.43^b	0.83 ± 0.20^b	29.20 ± 5.11^b	31.72 ± 1.87^a
Salt	28.27 ± 4.24^{bc}	13.67 ± 3.04^a	0.50 ± 0.16^a	18.49 ± 4.02^a	39.09 ± 3.03^b

Means in each column with distinct superscripts indicate a significant difference ($p<0.05$)

In this research work, it was discovered that fish de-slimed with alum prior to smoking had the highest crude protein content (29.20±5.11), followed by those de-slimed by warm water (23.20±8.10), leaving a far margin behind when compared with those treated with salt and cold-water having values of 18.49±4.02% and 18.13±3.17 respectively. Alum is an inorganic chemical compound composed primarily of water molecules, aluminium or other metals and sulphates. The high protein content recorded for alum-treated sample can be ascribed to the works of Olatidoye and Sobowale, 2016 who reported that there was no difference in the protein content of snails de-slimed using alum and lime. Alums are said to be used as acidulating agents in cooking. Agbor *et al*., 2021 demonstrated that the treatment of protein sources with acids increase solubility, and coupled with the addition of heat after cleaning, this may further enhance the digestibility of protein making it more available. This is also demonstrated in warm water treated samples coming next after alum treated samples. The significant increase in protein content observed with these pre-heated samples, samples de-slimed with warm water for 5minutes, compared to the control and salt treated group can be made explicit by the fact that heat and processing time freed some proteins that were bound to other molecules, breaking the low energy bond and making them more available (Alipour, 2010).

The alum treated group also has the highest crude ash content (0.83±0.20%) followed by the Warm water treated group with a value of 0.65±0.27%, with means significantly different from the last two groups (salt and cold water treated), which have different values but are not statistically different. The ash content followed a trend which was believed to be normal because alum is a double salt and is rich in K and S. Alum is a mineral that exists in nature in both pure and impure forms. It is a mineral salt and can occur as alunite and leucite. This may account for the high value recorded for alum treated group. There is no significant difference among means for crude fat except the alum treated grouped whose mean significantly differs from others at $p<0.05$. There is close similarity in the sequence followed by the treatments for crude protein, ash and crude fat content.

This relationship appears in the inverse direction among the treatments when it comes to the moisture content of the smoked samples. The inverse relationship observed in the moisture content of the treatments in comparison with crude protein can best be sorted by the explanation of Fennema, 1996 who reported that denatured proteins tend to have a larger water binding capacity than native proteins. The increase in moisture content seen in some samples compared to others could be ascribed to protein denaturation, which leads to increased moisture retention. Also, alums are reported to be used as drying agents and this property could be attributed to the low moisture content value recorded for this group and this positive feature may make it a potential preservative in food processing industry.

The result of the analysis of variance (ANOVA) conducted on the sensory evaluation of the taste panelists scorings during this research work showed that there is no significant difference ($p\leq0.05$) in the parameters analyzed for the four treatments (cold water, warm water, alum and salt treated). This can be seen in table 2 below

Table 2: Sensory evaluation result of smoked samples of *C. gariepinus* de-slimed with different cleaning materials

Sample	Appearance	Colour	Taste	Texture	Aroma	Overall acceptability
Cold water	8.10±1.65	7.90±1.89	8.50±1.57	8.10±1.89	7.90±2.10	8.60±1.31
Warm water	8.70±1.75	8.40±1.54	8.60±1.60	7.80±2.33	7.90±1.89	8.50±1.57
Alum	8.25±1.83	8.25±1.45	8.10±1.77	7.50±1.70	7.40±2.60	8.10±1.51
Salt	8.55±1.43	8.40±1.23	8.40±1.90	7.90±1.77	8.20±1.44	8.30±1.49

The sensory evaluation of the fish samples does not follow a defined path. The cold-water treatment is rated least for its colour and appearance and this accounts for the statement that using the right method in de-sliming catfish makes the product more appealing and appetizing. It is however astonishing that the same cold-water treatment had the highest overall acceptance and texture. This explains the reason why some consumers still prefer the locally processed fish to the modernized kiln processed one due to the belief that the former has a distinct taste not found in the latter. The distinct taste is likely brought about by the remnant slime on the fish not totally cleansed. The locally smoked fish are not healthy to consumers due to the presence of hydrocarbons in wood products used for smoking.

All sensory parameters tested for are rated good as there is no significant difference among treatments ($p<0.05$). This therefore implies that any of the de-sliming method can be used based on consumers' preference.

CONCLUSION

From the results of this research work, it was discovered that alum and warm water group are highly recommended for removal of slime. Both do not have any deleterious effect on the nutrients of fish in contrary to some erroneous belief that alum usage may disrupt the nutritional profile of fish and may be damaging to health. The easiest and fastest means of removing slime from catfish, however is through the use of Alum and salt.

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