Assessment of the Fermentation Value Chain in Micro- to Small-scale Fish Processing Facilities and Its Impact on Product Quality

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Background and goal

Fisheries contribute approximately 5% to Ghana´s annual GDP, supporting over 2.6 million livelihoods. Due to the highly perishable nature of fish, various processing and preservation methods are used in Ghana such as hot smoking, drying, salting, frying and fermenting, most of which are predominately carried out by women. Fermentation is practiced because it is cost-effective, and the fermented product is a key ingredient in the local cuisine. Most processors lack adequate knowledge of standard operating procedures and guidelines, negatively impacting product quality and income. A common practice involves storing fish for 24 hours without preservation to "soften" it for fermentation, rather than using fresh fish. This can degrade the quality. The overall aim is to enhance the quality of fermented fish products in Ghana. Specifically, this study seeks to develop quality assessment guidelines and provide a better understanding of the fermentation process by evaluating key variables such as fermentation duration, salt quantity, and the freshness of raw materials.

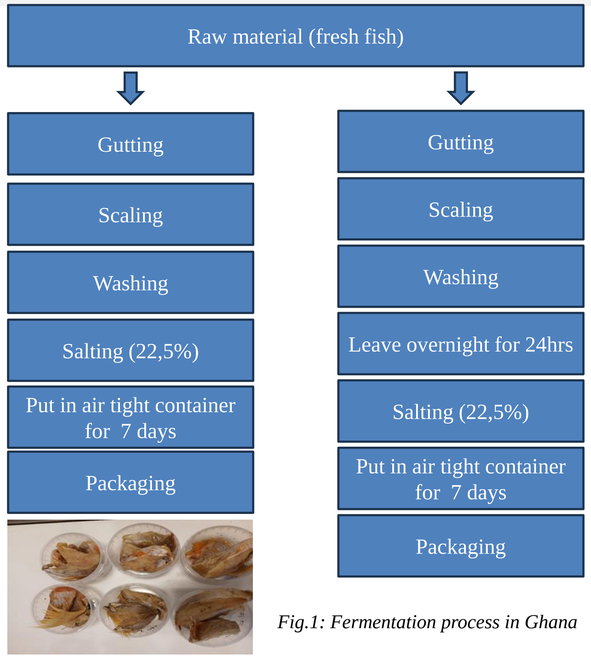


Fig.1: Fermentation process in Ghana

Methodology

Raw material (redfish, *Sebastes marinus*) was purchased from Brim, a fish processing plant, and processed (Fig. 3). Samples were placed in thick plastic bags and allowed to ferment for 3 and 7 days, respectively. Samples were analysed using sensory evaluation (specifically odour) and water activity.

Fig.2: (a) Heat oven, (b) fresh sample to be fermented

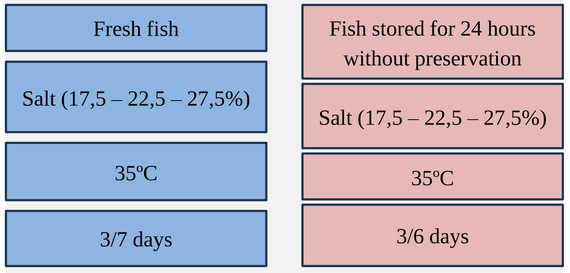
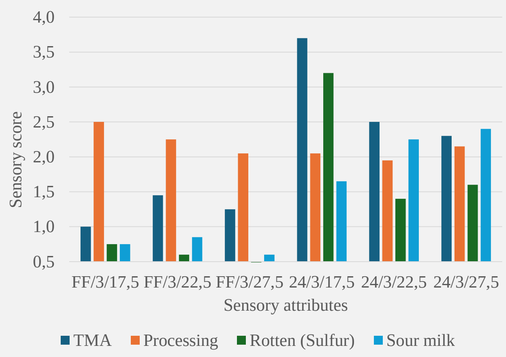


Fig.3: Experimental design

Results



Results and discussion

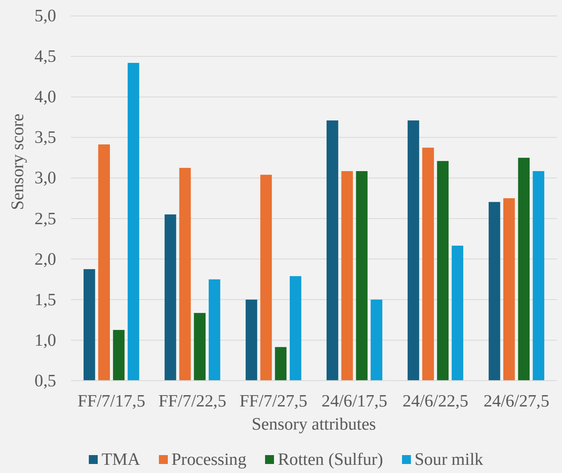


Fig.4: Average sensory score of fresh fish (FF) and fish stored for 24 hours without preservation fermented for 3, 6 and 7 days at salt ratios (17,5%, 22,5% & 27,5%).

A sensory evaluation scheme was developed based on the fermented fish samples to assess product quality. It was observed that, the positive sensory attributes (processing odour with mild TMA, and sour milk) were noted in the fresh fish fermented samples. In contrast, negative sensory attributes (high TMA, rotten sulphur odour, and sour milk) were noted for the 24-hour fish stored without preservation. Sensory attributes were influenced by variations in salt ratio, raw material and fermentation duration.

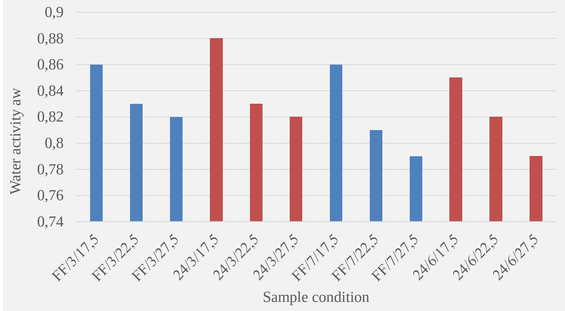


Fig. 5: Water activity vs sample condition of fresh fish (FF) and fish stored for 24 hours (24) without preservation fermented for three (3), six (6) and seven (7) days at salt ratios 17,5 %, 22,5% and 27,5%.

Water activity decreased across all sample types with increasing salt ratio. It was recorded high in samples from the fish stored for 24 hours without preservation compared to samples from fresh fish.

Conclusion

The sensory results were in line with microbial and water activity findings. The evaluation scheme developed during the trial effectively distinguished between different sample qualities. Optimal sensory results were obtained for samples using fresh fish, 22,5% salt and 7 days of fermentation, the same conditions as currently practiced in Ghana. It is anticipated that controlled handling of raw materials and standardised fermentation process will lead to a better sensory attribute (odour) and quality product. The evaluation scheme developed in this study can be used for that development.

Acknowledgements

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