SMARTER STORAGE: HOW TO SAFELY INCREASE THE SHELF-LIFE OF FRESH FISH IN AFRICA

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1. INTRODUCTION:

In Sub-Saharan Africa, up to one-third of total fish production is lost post-harvest, translating into USD 2-5 billion in annual financial losses. Spoilage driven by microbial growth, enzymatic activity, and lipid oxidation rapidly undermines quality, safety, and market value. These losses occur throughout the value chain—from production to consumption (Figure 1), amplified by inadequate handling, storage, and infrastructure. As bacterial load rises beyond 10^7 CFU/g, fish is deemed spoiled due to off-odours and texture degradation.

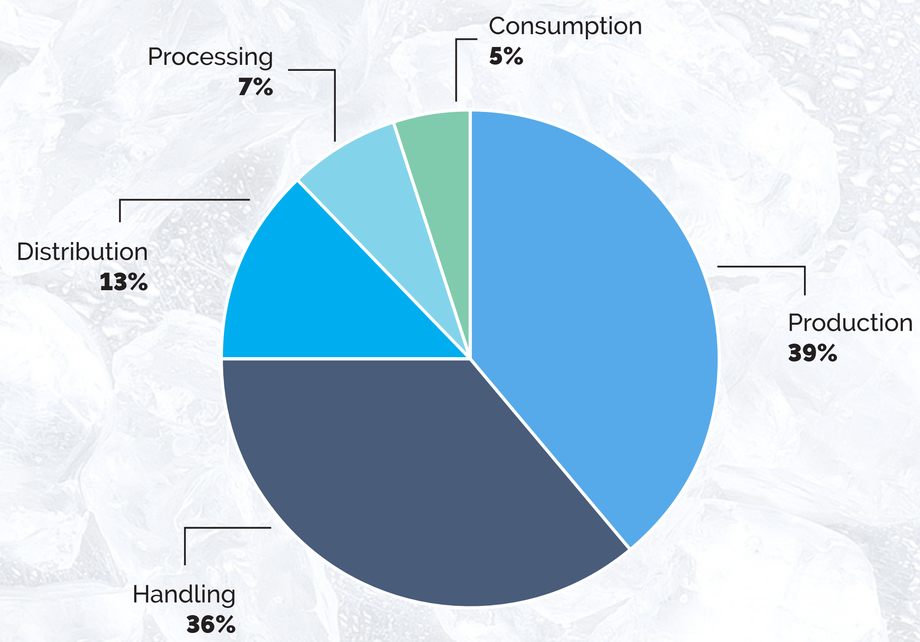

Figure 1: Post-harvest fish losses by value chain stage in Sub-Saharan Africa. Losses are highest during production and handling.

2. OBJECTIVE:

To assess the effectiveness of Savour Solutions™ interventions - formulated with lactic acids, inorganic salts and, optionally, Ethyl Lauroyl Arginate (E 243) - in extending the shelf-life of fresh Nile Tilapia *(Oreochromis niloticus)*.

3. MATERIALS AND METHODS:

Fresh tilapia (100 – 250 g) were humanely euthanised, scaled, eviscerated, and divided into three groups: Control, Treated 1, and Treated 2. Fish were dipped in their respective treatment solutions pre- and post-filleting, then packed and sealed.

Figure 2: Preparation of tilapia samples for treatment and grouping prior to shelf-life trial.

Samples were stored at 4 ± 2 ˚C for 14 days. Every second day, sealed fillets from each group were tested for Total Viable Aerobic Bacterial Count (TVC). For each test, 25 g of sample was homogenised in 225 ml diluent, serially diluted, plated on Plate Count Agar (PCA) and incubated for 48 hours at 36 ± 2 ˚C. Thereafter, the colonies on the plates were counted and recorded.

The results of this study will determine the effectiveness of the Savour Solutions™ interventions in prolonging the freshness and safety of fresh fish, thereby offering extended shelf-life to fresh fish, that will result in a reduction in post-harvest losses in fish production.

6. ACKNOWLEDGEMENTS:

- Savour Solutions for sponsoring the products
- OmniQu Laboratories for the microbial analysis
- Aquaculture unit on Welgevallen Experimental Farm for sponsoring the Nile Tilapia

4. RESULTS AND DISCUSSION:

Total Viable Counts (TVCs) increased over time in all groups, with clear differences in microbial growth rates (Figure 3).

The **Control group** (green) exceeded the 10^7 CFU/g spoilage threshold by day 7, indicating clear microbial spoilage and loss of sensory quality—consistent with off-odours and unmarketable fish.

Treated 1 (purple) showed delayed growth, only approaching 10^7 CFU/g by day 9, suggesting a modest shelf-life extension.

Treated 2 (blue) maintained microbial levels well below 10^7 CFU/g throughout the 14-day period, indicating prolonged freshness and potential marketability.

According to sensory quality references (e.g., Codex CXC 52-2003), TVC values below 10^5 CFU/g are associated with very fresh fish. Treated 2 remained near or below this threshold for most of the storage period, demonstrating the superior effectiveness of this intervention.

These findings suggest that Savour Solutions™ treatments, particularly Treated 2, can effectively slow microbial spoilage, extending shelf-life and reducing post-harvest losses.

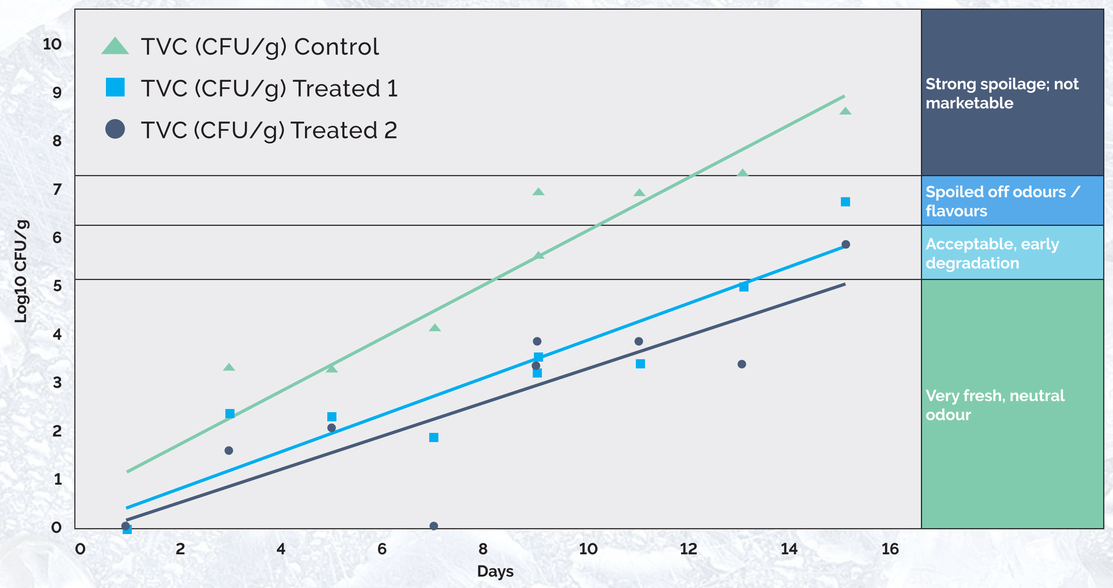

Figure 3: TVC (CFU/g) growth over 10 days in Control, Treated 1, and Treated 2 tilapia fillet groups stored at 4 ± 2 ˚C. Shaded bands represent microbial quality thresholds for fresh fish, from “very fresh” to “strong spoilage” (adapted from Codex and ICMSF guidelines).

Figure 4 highlights changes in colour, brightness, and overall appearance of tilapia during this trial. On Day 1, all fillets appeared similar in colour and freshness, with no visible differences between treatments. By Day 10, the Treated 1 and Treated 2 samples retained a brighter colour and fresher appearance, while the Control showed clear signs of discolouration and quality decline.

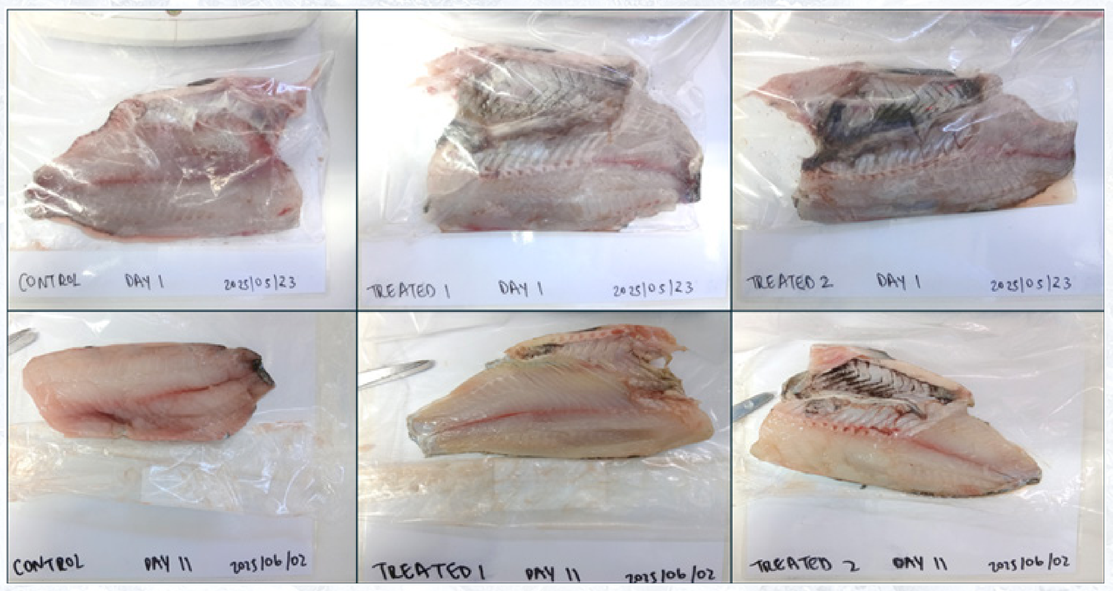

Figure 4: Visual comparison of tilapia fillets over time across treatment groups.

5. CONCLUSION AND RECOMMENDATIONS:

Savour Solutions™ treatments demonstrated clear potential in extending the shelf-life of fresh tilapia by slowing microbial spoilage compared to untreated controls. Both interventions delayed the onset of spoilage, with Treated 2 maintaining microbial counts below the 10^7 CFU/g threshold throughout the 14-day trial. The Control group exceeded the acceptable microbial threshold for freshness (10^5 CFU/g) after 5 days while Treated 1 and Treated 2 remained within the “fresh” classification until Day 11 and Day 12, respectively. These findings are especially promising in the context of Sub-Saharan Africa’s post-harvest fish losses, where spoilage leads to significant food waste and economic hardship.

Encouraged by these results, the next step will be a larger-scale trial with a statistically significant sample size (n = 5) to validate repeatability. Further investigation will also explore the optimal point of application during processing and include organoleptic assessments to compare sensory attributes—such as colour, odour, and taste—between treated and untreated fish.

This work lays the foundation for a practical, scalable solution to reduce losses and increase value across the fresh fish supply chain.