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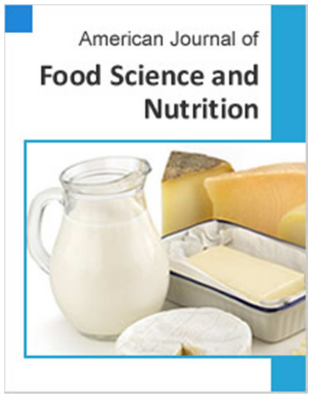

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Assessment of Different Brine Concentrations on Quality and Freshness of Bagrus Bayad and Lates Niloticus Using QIM

Sani A. A.[1], Haruna M. A.[2], Obaroh I. O.[3]

[1]Department of Forestry, Fisheries and Wildlife, Kano University of Science and Technology, Wudil, Nigeria
[2]Department of Fisheries and Aquaculture, Federal University Dutse, Jigawa State, Nigeria
[3]Department of Biological Sciences, Kebbi State University of Science and Technology, Aliero, Nigeria

Email address
aminasaniaminu@ymail.com (Sani A. A.), auwal3@yahoo.com (Haruna M. A.), obarohio@gmail.com (Obaroh I. O.)

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Abstract
The study was conducted to determine the effect of different brine concentrations on the quality and freshness of *Bagrus bayad* and *Lates niloticus* with a view to ascertaining best quality performance. A total of thirty samples (30) fifteen each for both species were used for the experiment. Five treatments A, B, C, D and E with concentrations of 0%, 2.5%, 5.0%, 7.5% and 10% assigned to five different periods of 2, 4, 6, 8 and 10 hrs respectively were replicated twice. The lowest mean QIM value of 4 for *Bagrus bayad* were obtained at 2 hours period for treatments C, D and E respectively. Similar low mean QIM values were also recorded for treatments C, D and E at 2 hours for *Lates niloticus*. Therefore, it can be concluded that both species recorded low QIM values at 2 hours period for treatments C, D and E respectively, this signifies that, highest quality performance could be achieved at higher concentration of brine at a low period of time.

1. Introduction

Fish is among food items that are extremely perishable [1], soon after death, fish begins to spoil. In the healthy live fish, all the complex biochemical reactions are balanced and the fish flesh is sterile. After death however, irreversible change that results in fish spoilage begins to occur and the resultant effect is the decomposition of the fish [2].

Fish is highly susceptible to deterioration without any preservation or processing measures and immediately fish dies, a number of physiological and microbial deterioration sets in and thereby degrades the fish [3, 4, & 5]. Consumers demand for high quality, safe, and healthy foods is increasing on a global basis [6], however Consumer studies appear to indicate that, quality is still the very buying cue for fish purchases [7]. Besides, in order to secure the food safety, it is important to keep the quality of fishes at a high level in each link of the whole complex chain from catch to consumer [8].

Enzyme and bacteria spoilage of fish can be temporarily halted by various techniques. The tradition and popular methods employed include; temperature reduction by the use

of ice (freezing or ice blasting), drying to reduce or completely reduce water, salting to reduce water and to halt enzymatic decomposition and application of heat e.g. canning and smoking to destroy the enzymes and bacteria.

Alternative scaling methods such as the Quality Index Methods (QIM) have been suggested, where the descriptions of the individual grades are precise, objective, independent and primary rather than a cluster of terms. The QIM is based on the significant sensory parameters of raw fish. The scores for all the characteristics are added to give an overall sensory score, the so-called quality index, which can also be used to predict storage life. Based on the structural scaling method, the QIM is suggested as a practical and objective tool for evaluating the fresh fish in production management [9].

QIM was developed initially for whole fish storage in ice but currently it is also been applied to other products including; frozen fishes and fillets [10]. In actual fact QIMs are available for a large range of fish and crustacean species both wild and farmed [11]. This method has been expected to become the leading reference method for the assessment of fresh fish [12]. However, it was suggested that, more studies are needed to evaluate the applicability of QIM for the handling, storage and processing of the fishes under different conditions. The quality index method (QIM) is based on a structural scaling for quality measurements and provides accurate and precise information concerning the freshness and a prediction of the remaining shelf-life for specie-specific fishes.

Therefore, the main objective of this research was to assess the freshness of *Bagrus bayad* and *Lates niloticus* treated with different brine concentrations using the quality index method (QIM).

2. Materials and Methods

2.1. Study Site

The study was conducted at the fisheries and animal science laboratory of Kano University of Science and Technology Wudil, Nigeria, located on geographical coordinates of 11°49' North, 8°51' East.

2.2. Experimental Fish

Fifteen samples each of *Bagrus bayad* (average body weight 168g and average body length of 28.6cm) and *Lates niloticus* (average body weight 143g and average body length of 29.4cm) were obtained from Thomas dam, in Dambatta local government area, Kano State, Nigeria.

2.3. Experimental Design and Brine Preparation

Five treatments A, B, C, D and E with concentrations of 0%, 2.5%, 5.0%, 7.5% and 10% respectively were replicated twice and assigned to five different periods (2, 4, 6, 8 and 10 hours).

The brine was prepared by dissolving 25, 50, 75 and 100g of salt as treatments 2, 3, 4, and 5 respectively in 1 liter of water and placed in a different bowl with treatment 1(without brine) as the control. The experimental fish's weight and length were measured in grammes using digital scale and a measuring board calibrated in centimeters. Each of the measured fish was then immersed completely into the solution (brine) at different times (2, 4, 6, 8 and 10 hrs respectively). The fishes were stirred occasionally to enhance the uptake of salt [5]. The fishes were removed from the brine and kept in a safe place for further observation.

The treated fishes were observed using sensory method under quality index scheme of demerit score as developed by Tasmanian Food Research Unit (Table 1).

Table 1. *Typical evolution of sensory scores for the quality as determined by a QI scheme.*

SN	Score	Quality Evolution
1	Zero to 5	High quality
2	6 to 9	Moderatequality
3	10 to 14	Low quality
4	Over 14	Rejected

Source: Tasmanian Food Research Unit.

2.4. Statistical Analyses

Data collected was subjected to analysis of variance (ANOVA) to test the effect of different brine concentrations on the quality and freshness of the fishes. Duncan's Multiple Range Test (DMRT) was used to separate the means where significant difference existed.

3. Results

Table 2 presents sensory score of *Bagrus bayad* treated with various concentrations of brine. All treatments were not significantly different ($p > 0.05$) at 2hrs. All the treatments recorded high quality values for 2 hours, while treatments D and E had moderate values for 2, 4, 6 and 8 hours. Low quality was however, observed at 10 hours for treatments B, C, D and E while treatment A had a rejected value only at 10 hours.

Table 2. *Sensory score of Bagrus bayad treated with varying concentrations of brine.*

Trts	Con%	2hrs	4hrs	6hrs	8hrs	10hrs
A	0	5^{a}	8^{a}	8^{a}	11^{a}	18^{a}
B	2.5	5^{a}	7^{ab}	7^{ab}	10^{a}	13^{b}
C	5.0	4^{a}	6^{b}	7^{ab}	10^{a}	12^{bc}
D	7.5	4^{a}	6^{b}	6^{b}	8^{b}	11^{bc}
E	10.0	4^{a}	6^{b}	6^{b}	8^{b}	10^{c}

Mean within the same column with different letter are significantly different ($p<0.05$).

Table 3 shows sensory score of *Lates niloticus* treated with different concentrations of brine. Treatment C, D and E

recorded high quality values for 2 hours whereas treatments D and E indicated moderate values for 4 and 6 hours. All the treatments showed rejected values for 10 hours period while treatment A had rejected values for 6, 8 and 10 hours. Treatments C, D and E were statistically similar for 2, 4, 8 and 10hrs and indicated significant difference ($P<0.05$) for 6hrs only.

Table 3. *Sensory score of Lates niloticus treated with varying concentrations of brine.*

Trt	Con%	2hrs	4hrs	6hrs	8hrs	10hrs
A	0	7.00^{a}	12.00^{a}	15.00^{a}	17.00^{a}	19.00^{a}
B	2.5	6.00^{ab}	11.00^{a}	12.00^{b}	15.00^{a}	18.00^{a}
C	5.0	5.00^{b}	7.67^{b}	9.00^{c}	12.33^{b}	14.67^{b}
D	7.5	4.33^{b}	7.33^{b}	9.00^{c}	12.33^{b}	14.67^{b}
E	10.0	4.00^{b}	7.00^{b}	9.00^{c}	11.33^{b}	14.67^{b}

Means within the same column with different letters are significantly different ($p<0.05$).

4. Discussion

The result of this experiment which shows low values (high quality) at 2 hours in all treatments for *Bagrus bayad* and for treatments C, D and E for *Lates niloticus* is in conformity with the work of [14], who indicated that fish is in a fresh state within 1-3 hours of being caught and can be characterized by brilliantly colored gills, firm flesh with abdominal wall intact, bulging eyes with black brilliant pupils, iridescent lustrous skin, transparent mucous and no odor.

The moderate values recorded for *Bagrus bayad* at treatments D and E for 2, 4, 6 and 8 hours and for 4 and 6 hours for *Lates niloticus* agrees with the findings of [3, 14 & 15] who showed that, fish treated with 10% brine concentration had a better quality when compared with fish treated with 2.5% brine concentration.

5. Conclusion

From the findings of this study, it was observed that, *Bagrus bayad* promote better quality in all the treatments with a single rejected value for treatment A at 10 hours' period. *Bagrus bayad* however, presented more rejected values at the 10 hours' period for all treatments. In conclusion, this study infers that, brine enhanced better quality of *Bagrus bayad* when compared with *Bagrus bayad,* and brine is more effective at higher concentration. Therefore, it can be concluded that both species recorded lowest QIM values at 2 hours period for treatments C, D and E respectively, this signifies that, highest quality performance could be achieved at higher concentration of brine at a lower period of time.

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