STUDY OF ACID FISH SILAGE PRODUCTION PARAMETERS

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Background

Fish industries generate a large amount of residues, of which, most are used in the production of low quality fish meal. Acid fish silage is simple and low cost employ option of this residues; it consists of a liquefied product preserved by acidification and obtained by the action of proteolitic enzymes naturally found in fish. In despite of been simple, silage production operation need to be especified in a most exact way concernig to the assignement of variables like temperature, raw material and acidifying agent.

Objectives

This works aimed to study the influence of temperature, raw material and acidifying agent in fish silage production in order to provide a better utilization of fish industrie waste , in terms of hygiene and environmental pollution.

Methods

Mullet(Mugil brasiliensis), castanha(Umbrina canosai) and weakfish(Macrodon ancyladon) wastes (including guts) were ground one at each time and distributed in 1 kg batches, where acetic acid P.A. 15% w/v was added and homogeneized. Mullet and Castanha silages were kept in two distinct temperature conditions: environmental (25 ± 3ºC) and in a climatized chamber (30 ± 3ºC). Silage with vineger was prepared by mixing 0,5 Kg o weakfish waste and 0,5 L of commercial alcohol vineger. After homogenization, the silage was kept at 25 ± 3ºC by the firsts days, and then at 30 ± 3ºC until the end of process; pH and temperature determinations were realised during the process. Proximal composition of the wastes and of the silage solid fraction was determined through A.O.A.C. [2] officials methods. By day 32, it was observed a natural separation of the liquid fraction of mullet silage kept at 30ºC and vineger silage; in the other silages, by the 81th process day, the liquid fraction was separeted and removed by centrifugation at 4000 r.p.m. for 20 minutes. Proteic hyrolisis was measured by the nitrogen soluble content determined using Kjedhal method (Nx 6,25), after protein preciptation with acid trichloroacetic (TCA) 10%. Total viable count was determined In silage and wastes acording to ABNT [1].

Results and discussions

Table 1 shows proximal composition of wastes and of the silages. The proximal composition of the silages is similar to that of the waste from which they were obtained; small variations can be atributed to heterogeneity, as assigned by WINDSOR & BARLOW [3]. By the other side, silages prepared with waste of different fish species showed distinct proximal composition. No difference in proximal composition was observed in relation to temperature used in silage obtention, neither by the use of vineger, which only effect was an rise in moisture content due to the need of a higher volume of vineger than of acetic acid variable to maitain a pH value below 4,0. Temperature was maintened above 20ºC during all process, even for silages kept at environmental. Acetic acid was able in maintening ph below 4,0, while vineger showed to be unable in periods longer than 32 days, presenting a gradual rise during latter days, reaching a pH of 5,62 by day 57 (figure1), reducing product microbiology stability, which was confirmed by the microbiological count presented in table 2.

Table 1. Proximal Composition of raw materials and of the silages obtained from distinct fish species at different temperature conditions.

Sample	% Protein		% Fat		% Minerals		% Moisture	
	Raw Mat.	Silage	Raw Mat.	Silage	Raw Mat.	Silage	Raw Mat.	Silage
Weakfish AA	16,8±0,49	18,9± 0,37	9,3 ± 0,55	5,8 ± 0,20	6,4 ± 1,77	8,8 ± 0,46	70,6 ± 1,98	65,5±0,42
Weakfish V	16,8±0,49	16,4±1,58	9,3 ± 0,55	3,9±0,35	6,4 ± 1,77	3,12 ± 0,34	70,6 ± 1,98	86,9±0,31
Mullet A	14,2±0,004	19,8± 2,27	0,8 ± 0,10	1,0 ± 0,12	9,4 ± 1,02	12,8 ± 1,28	76,0 ± 0,87	65,1 ± 0,04
Mullet C	14,2±0,004	12,7± 0,98	0,8 ± 0,10	0,98±0,01	9,4 ± 1,02	8,4 ± 0,08	76,0 ± 0,87	74,4 ± 2,99
Castanha C	16,1 ± 0,32	17,8± 0,73	11,7±1,07	5,8 ± 0,23	9,0 ± 1,03	7,3 ± 1,83	64,8 ± 2,41	68,9 ± 0,82

Weakfish AA: weakfish waste silage with acetic acid; Weakfish V: weakfish waste silage with commercial vineger; Mullet A: mullet waste silage at environmental temperature; Mullet C: mullet waste silage kept in climatized chamber; Castanha C: castanha waste silage kept in climatized chamber.

Table 2. Total viable count (CFU/g) of Weakfish raw waste acidified with acetic acid and with vineger.

	Total viable count (CFU/g)				
Sample	Waste	6 days of silage	32 days of silage	59 days of silage	81 days of silage
Weakfish V	$5,3X10^4$	$8X10^3$	$2,5X10^1$ est	$3,5X10^7$	-
Weakfish AA	$5,3X10^4$				$5,9X10^3$

AA: Acetic Acid P.A.; V: vineger

Silage kept in climatized chamber, as well, that kept at environmental temperature showed a fast increase in soluble nitrogen content until the 12th process day, when proteic hydrolysis achieved a slower rate until the end of the process, as it can be visualized at figure 2. By this time, mullet silage at environmental temperature showed a lower protein solubilisation, 41% soluble nitrogen, than mullet and castanha silages kept in climatized chamber, whose nitrogen contents reached 50 and 48% respectively; showing the ocurrence of a higher hydrolisi rate at

higher temperatures. It was observed, a light variation at the hydrolysis degree reached by mullet and castanha silages kept at environmental temperature, remarking the influence of raw material used in the protein solubilization degree.

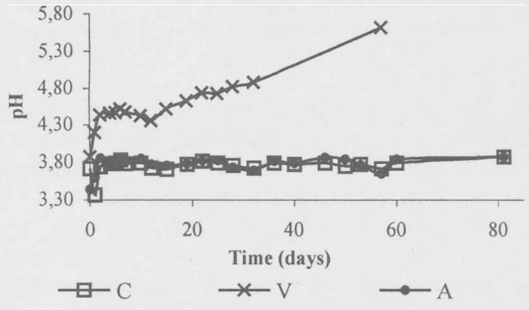

Figure 1. Silages pH evolution: C: middle curve in climatized chamber, A: at environmental temperature; V: silage using vineger.

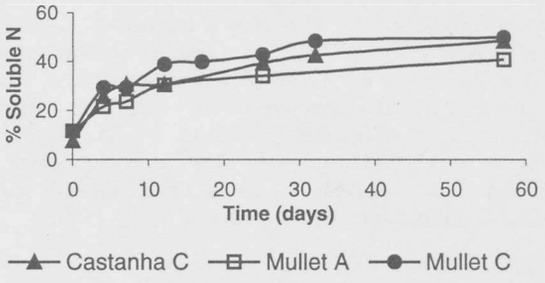

Figure 2. Soluble nitrogen curve of silages at environmental temperature (A), and of silages in climatized chamber (C).

Conclusions

Fish species showed influence in process hydrolysis rate, as well as in proximal composition. Temperature had now effect in proxinmal composition, but influenciated greatly hydrolysis rate and liquefaction, promoting an acceleration of the process by at 30 °C, and drecreasing the process velocity at 20°C. Commercial vineger can be used as acidifying agent in acid fish silage process, when the product is used within 32 days.

References

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