APPLICATION OF HURDLE TECHNOLOGY TO PROCESS SPENT LEGHORN HEN MEAT. RANCIDITY

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Background

Egg producers worldwide dispose of 2.6 billions spent hens annually after finishing their laying cycle [1]. In the United States disposing of spent hens is a big problem, as producers may pay from US $ 0.15 to 0.18/bird to dispose spent hens [2]. In Brazil, there are over 60 millions laying hens and app. 45 millions are removed after their productive period of appr. 75 wk and one hen is sold alive for appr. US$ 0.10-0.15/ bird. To offer an alternative for spent table egg layers, a hurdle technology described by Leistner [3] has been introduced to process spent hen breast and thigh meat. This study describes the use of simple techniques to preserve the rancidity during processing and storage of the product at room temperature.

Objectives

The aim of this work was to introduce simple technique of salting and drying to preserve spent hen meat including controlling of rancidity.

Methods

Eighty wk old White Leghorn spent hens (n=82) were obtained from Londrina State University School Farm. Birds were killed and breast and leg samples were removed. A mixture of BHA and BHT and $NaNO_2$ was added according to Garcia et al. (4). Fluxogram of processing is shown in Fig. 1 and all analysis including chemical composition, rancidity and fatty acids profile were carried out according to Garcia et al (4).

Results and discussions

Basic chemical composition: The basic chemical composition of hen breast and thigh meat and Aw values before and after processing are shown in Table 1. Moisture dropped approximately 32.0% from fresh to salted breast meat and 37.0% for thigh meat. The protein fraction increased proportionally from approximately 20.0 to 31.0% and 22.0 to 33.0%, for breast and thigh meat, respectively. Lipid content also increased from 1.39 to 2.11% for breast and 3.67 to 4.49% for thigh meat. The incorporation of salt was from 1.0 to 17.6% for breast meat and from 0.82 to 17.4% for thigh meat resulting in a final Aw value of 0.75 for both samples. All these results are typical for intermediate moisture meat product as observed previously for beef charqui meat (5,6).

Rancidity measurement: TBARS level increased significantly throughout processing and storage irrespective of samples. It can be observed in Fig.2, a relative increase in rancidity up to 20-30d and decreasing afterwards. This condition was not observed in samples containing antioxidant mixture, which inhibited rancidity to a level of <1.0 mg of TBARS/kg of sample up to 20d of storage for salted thigh muscle and up to 60d for salted breast muscle.

Fatty acids profile: Table 1 shows fatty acid profile. There was an app. 30% decrease in the ratio of PUFA/SFA in salted breast meat during 60d storage period compared to fresh breast meat. A similar reduction of app. 25% was observed for thigh meat.

Conclusions

Salted and dried spent hen meat provided a high protein product with a low rancidity.

References

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TABLE 1. Proximate chemical composition of spent hen fresh and salted breast and thigh meat

	Fresh meat (Mean±SD)		Salted meat (Mean±SD)	
	Breast	Thigh	Breast	Thigh
Moisture %	71.50±1.14	72.09±1.58	48.68±0.58	44.76±0.63
Protein %	26.00±0.91	22.39±0.74	31.24±0.44	33.08±0.95
Fat %	1.39±0.19	3.67±0.22	2.11±0.13	4.49±0.18
Ash %	1.00±0.02	0.82±0.02	17.63±0.21	17.43±0.23
Aw	0.99±0.01	0.99±0.01	0.75±0.01	0.75±0.01

±Standard deviation; Aw = water activity

TABLE 2 – Changes in the fatty acid profile in salted breast and thigh meat from 80 wk old hens prepared with rock salt and rock salt with a mixture of BHA/BHT and $NaNO_2$ during 60d of storage (%).

FATTY ACIDS	TREATMENTS (Mean±SD)									
	Breast					Thigh				
	Fresh meat	Before storage		Storaged 60d		Fresh meat	Before storage		Storaged 60d	
		Rock salt	Rock salt +$NaNO_2$ + BHA/ BHT	Rock salt	Rock salt +$NaNO_2$ + BHA/ BHT		Rock salt	Rock salt +$NaNO_2$ + BHA/ BHT	Rock salt	Rock salt +$NaNO_2$ + BHA/ BHT
PUFA	27.15^{AB} ±0.21	26.20^{AB} ±0.46	27.70^{A} ±1.36	21.65^{B} ±0.37	26.76^{AB} ±2.07	27.84^{AB} ±0.28	27.14^{AB} ±0.24	28.34^{A} ±1.02	23.50^{AB} ±0.73	26.92^{AB} ±1.15
MUFA	41.33^{ABC} ±1.43	40.26^{BC} ±1.20	39.10^{C} ±2.05	4.66^{AB} ±0.94	41.36^{ABC} ±1.65	43.7^{AB} ±0.47	42.91^{ABC} ±2.19	42.33^{ABC} ±1.72	44.60^{A} ±1.18	43.74^{AB} ±0.52
SFA	29.27^{A} ±0.82	31.46^{A} ±1.06	30.21^{A} ±1.47	33.36^{A} ±0.78	31.07^{A} ±0.30	27.28^{A} ±0.72	28.95^{A} ±1.72	28.27^{A} ±0.62	31.29^{A} ±1.74	30.31^{A} ±0.96
PUFA/ SFS ratio	0.93^{AB} ±0.02	0.83^{BC} ±0.01	0.92^{AB} ±0.14	0.65^{D} ±0.03	0.86^{BC} ±0.07	1.02^{A} ±0.03	0.94^{AB} ±0.05	1.00^{A} ±0.01	0.75^{DC} ±0.07	0.89^{AB} ±0.07

[a-d] means within a line followed by different letters are statistically significant ($P < 0.05$). ±Standard deviation. BHA = Butylated Hydroxianisole; BHT = Butylated Hydroxytoluene; PUFA = Polyunsaturated Fatty Acids; MUFA = Monosaturated Fatty Acids; SFA = Saturated Fatty Acids

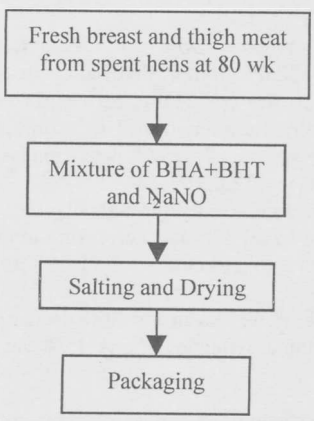

Figure 1- Fluxogram of hurdle technology for preserving breast and thigh meat from spent hens.

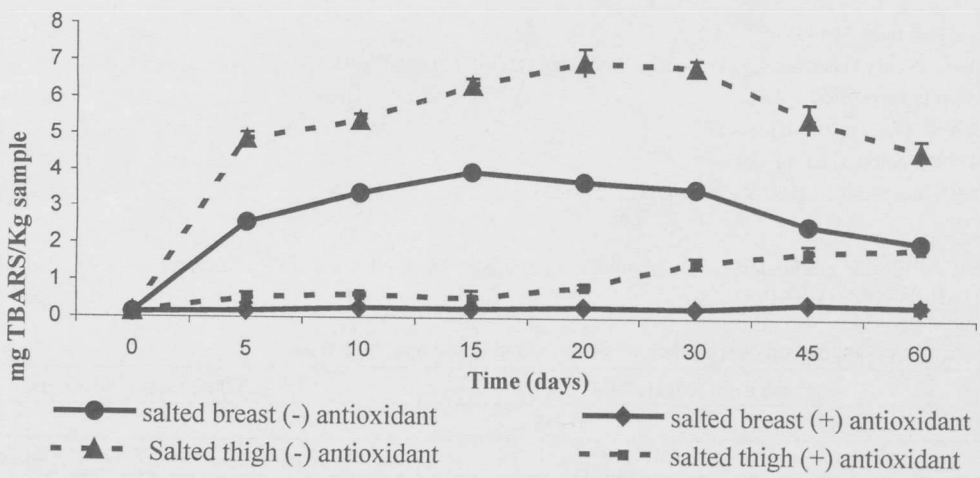

Figure 2- Changes in rancidity (mg TBARS/kg of sample) of spent hen salted breast and thigh meat during processing and storage at 25°C for 60d. Standard deviation bars are indicated (N= 24 per treatment group).