EXTENSION OF MEAT CUTS SHELF LIFE BY ACID SPRAYING OF CARCASSES

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BACKGROUND

Spraying of carcasses aiming to reduce its microbial contamination is not new. BARULA & CHELEF (1980) used a solution of glucose to supress *Pseudomonas* growth in meats. PRASAS et al (1991) reduced above 90% total counts of bovine carcass surface by using a lactic acid spray (1%) at 55° C. SIRAGUSA & DICKSON (1993) significantly reduced the population of pathogenic microrganisms in meats treating them with lactic and acetic acid solutions. CUTTER & SIRAGUSA extended this work to measure the effects of different solutions of lactic e acetic and in eliminating *Escherichia coli e Pseudomonas* adhered to the meat surface. Good results were reported by OSTHOLD et al (1984) which by using a solution containing a mixture of organic acids reduced in 3,5 log UFC/cm^2 the total count of aerobic bacteria e em 4,0 log UFC/cm^2 the *Enterobacteriacea* in bovine carcasses. It was not found studies relating de contamination of carcasses with the shelf life of cuts removed from them.

The purpose of this study was to determine the shelf-life of refrigerated meat cuts removed from carcasses sprayed with a mixture of organic acids and cold stored up to fifteen days.

METHODS

Treatment

Three Nelore 30 months old were slaughtered at the Meat Technology Centre. Hot half carcasses of the same animal were either sprayed with 500ml of a solution containing 2% acetic, 1% lactic, 0,25% citric and 0,10% ascorbic acid (pH 2,21; 22°C) or water (control)according to OSTHOLD et al (1984). These half carcasses were stored at 7± 2°C and sampled after 05, 08 and 15 days of storage. At these times control and treated carcasses were deboned and two cuts from the fore quarter and three cuts from the hindquarter were further stored at the same temperature to have its shelf-life determined.

Microbiological examination

Sampling for microbiological determinations were carried out by the non destructive method recommended by LEE & FUNG (1986) on the surface of the half carcasses at five points. Each point was sampled by using a cotton swab and a metallic mold of 10cm^2. The five cotton swabs were placed in a tube with 25 ml of peptoned water and represented the sample from a half carcass. Each ml from this solution represents the microbial load of 2,0 cm^2 (DELAZARI et al, 1980). For the meat cuts 25 cm^2 were sampled over each piece and analysis conducted in duplicates. For the determination of *Psychotrophic* bacteria plates containing Plater Count Agar, were incubated at 20° C for 72h according to CLIVEIRA & PARMELEE (1976). For *molds & yeasts* plates containing Potato Dextrose Agar were incubated at 25° C for 24h according to the FDA(1984).

pH

pH was determined by use of a flat sensor on twelve points of the half carcasses chosen randomly, using a potentiometer.

RESULTS AND DISCUSSION

The pH drop at the carcarss surface immediately after acid spraying was significant the pH lowered from 6,94, as observed for the control, to 5,21. Twenty-four hours later the treated carcasses had a significanly lower average pH 0f 5,40 against 6,29 for the control. At 05, 08 and 11 days of cold storage at 7± 2°C the surface of the treated and control carcasses had similar pH values in the range of 5,50 5,60. After 15 days of storage the control carcass presented a signicantly higher pH of 5,94 against 5,69 for the treated carcass.

In *Table 1.* is shown that the initial total psychrotrophic bacteria counts on the carcasses surfaces were not significantly different between treated and control carcasses. From the 5th day of storage the acid treated carcasses had significantly lower pH ($p < 0,05$) than the control ones. The differences were always higher than 1 log cycle indicating that acid spraying causes a 90% reduction in the total psychrotrophic bacteria load at the carcass external surface. According to FUNG et al (1980) at the end of the storage, the treated carcasses presented intermediate contamination, below the 4,0 log UFC/cm^2 that would indicate high bacterial contamination. Yeast & Molds counts were low initially but increased to over 4,0 Log UFC/cm^2 at the end of storage.

The initial total counts psychrotrophic and yeasts and molds of meat cuts removed from the cold stored carcasses at 5 days of storage (TABLE 2) were much higher than those measured on the carcasses. Except for the 8th day os storage, there were no significant difference between counts on cuts from treated and control carcasses. These high initial counts in the meat cuts are probaly due to contamination during the deboning oprations. Yeast & Molds counts were high for cuts from both control and treated carcasses. Considering the value of 6,0 log UFC/cm^2 suggested by FUNG et al (1980) as a limit for human consumption all cuts would be at the limit of edibility at 11 days os storage.

In *Table 3* are shown the total counsts of *psichrotrophic* bacteria and *yeasts and molds* in cuts stored at 7± 2°C up to 11 days after removal of carcasses. After 8 days os storage cuts from control carcass had counts above the 6,0 Log UFC/cm^2 limit while those from the treated carcass did not reach this value even after 11 days of storage. Differences are even more striking during storage of cuts removed from the carcasses kept for 15 days storage at 7± 2°C. Cuts from the control carcass are already above 6,0 Log UFC/cm^2 immediately after removal from the carcass, while those from treated carcasses are near this value only after 5 days os storage. Yeast and molds counts were high on cuts from both treated and untreated carcasses. These results indicate that the acid mixture spraying is effective in maintaining low counts of psychrotrophs on carcasses surfaces and might extend the shelf life of the cuts removed from them.

LITERATURE

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TABLE 1. PSYCHROTROPHIC BACTERIA AND YEAST & MOLDS ON THE EXTERNAL CARCASS SURFACE DURING STORAGE AT 7± 2ºC

TIME (DAYS)	PSYCHROTROPHIC (LOG UFC/cm^2)		YEASTS & MOLD5 (LOG UFC/cm^2)	
	CONTROL	TREATED	CONTROL	TREATED
0	1.83^a	1.26^a	< 1	< 1
5	2.68^b	1,24^a	1.43	< 1
8	3.52^b	2.21^a	2,24	< 1
11	3.61^b	2.57^a	3.20	2.19
15	5.35^b	3,54^a	4,81	4.54

Different letters in the same line indicate significant difference ($p < 0,05$)betwen averages

TABLE 2. PSYCHROTROPHIC BACTERIA AND YEAST & MOLDS COUNTS DURING STORAGE OF MEAT CUTS REMOVED FROM THE HALF CARCASSES STORED FOR FIVE DAYS AT 7± 2ºC

TIME (DAYS)	PSYCHROTROPHIC BACTERIA		YEASTS & MOLDS	
	CONTROL	TREATED	CONTROL	TREATED
0	4.87^a	3.87^a	3.76^a	4.04^a
3	4.21^a	4.47^a	3.71^a	4.77^a
8	5.76^b	3.75^a	5.52^b	3.68^a
11	5.55^a	5.67^a	5.51^a	4.97^a

Different letters on the same line indicate significant differences ($p < 0,05$)betwen averages values

TABLE 3. PSYCHROTROPHIC BACTERIA AND YEAST & MOLDS COUNTS DURING STORAGE OF MEAT CUTS REMOVED FROM THE HALF CARCASSES STORED AFTE EIGHT AND FIFTEEN DAYS OF STORAGE AT 7± 2ºC

TIME DAYS	8				15			
	PSYCHROTROPHIC		YEAST & MOLDS		PSYCHROTROPHIC		YEAST & MOLDS	
	C	T	C	T	C	T	C	T
0	3.92^a	5.67^a	2.51^a	4.89^b	6.60^b	5.43^a	6.21^a	6.03^a
5	4.91^a	3.63^a	3.89^a	3.57^a	6.86^a	5.56^a	5.56^a	4.82^a
8	6.37^b	5,69^a	5.10^a	6.17^a	6.50^a	5.93^a	5.50^a	5.78^a
11	6.25^a	5.67^a	5.39^a	5.15^a	8.98^b	7.32^a	7.44^a	7.21^a

Different letters on the same line of carcass storage and for the same microrganism indicate significant differences ($p < 0,05$)betwen the average values