SERVATION OF MEAT SAMPLES FOR PHYSICAL ANALYSIS

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mary

rial was carried out on 12 Friesian young bulls slaughtered at about 570 kg. From right side stored into idge cell for 7 days at 2°C were dissected 3 muscles (Longissimus dorsi, Semitendinosus e Gluteobiceps); om each muscle were taken six slices for physical determinations of: pH and colour (L*, a*, b*, illuminant C ng MACBETH 1400) on raw meat, water holding capacity and tenderness (Warner Bratzler Shear with Instron 01) on raw and cooked meat. One slice was analized immediately after dissection (control), while the others re stored in plastic film (2, into fridge at 4°C) or in vacuum package (3, into freezer at -25°C); and at fined distance from dissection: a) at 4 and 10 days those fresh; b) at 1, 3 and 6 months those frozen were alyzed. We report only data on Longissimus dorsi muscle. Essentially the conservation affects, only on raw at for frozen samples, the water holding capacity (1,29% vs 2,73%) and colour, in particular the hue (94,5 33,2) and the chroma (25,8 vs 22,4).

troduction

ere are several studies made on freezing methods to evaluate physical, chemical and structural changes in eat due to times and temperatures of freezing and storage. These aspects of freezing are very important cause they are bound to some organoleptics properties of product as consistance, flavour, colour, water loss c. (MONZINI and CRIVELLI, 1972; MOORE 1990a and b).

NZINI and CRIVELLI (1972) have shown that with a temperature of -18°C, meat can be stored for 1 year without nificant changes of quality. This time can be extended up to 2 years if the temperature is -22°C.

e colour stability of pork meat stored at -17.8°C is greater than that stored at -7.8°C.

is often impraticable to analyze immediately meat samples from carcass dissection for two main problems: e fast transport of samples and the need to analyze togheter a lot of samples for difficulty of apparatus ndardization. Nevertheless we can storage samples only if there aren't significant differences in mean lues of collected parameters during conservation. After defining temperature of storage (-25°C to frozen at and 4°C to fresh meat) an according to National regulations, the aim of this work is to estimate the anges in main physical characteristics due to conservation time of fresh and frozen meat.

terials and Methods

m the right side of 12 Friesian young bulls, slaughtered at about 570 kg, stored in fridge cell for 7 days 2°C, were taken 3 muscles (Longissimus dorsi, Semitendinosus and Gluteobiceps).

m the central part of these muscles were cut off 5 samples, each consisting of 2 slices each 2.5 cm thick; e fibers were disposed perpendicularly to cut's surface.

e of the 6 samples, was analyzed immediately after dissection (control), two were stored in fridge at 4°C on ay and protected by plastic film and three were vacuum-packed and stored at -25°C; the conserved samples re analysed at fixed distances from dissection: a) at 4 and 10 days, for those at 4°C; b) at 1, 3 and 6 nths for those at -25°C.

all samples were taken some qualitative parameters: 1) pH taken twice, at 48 h of distance; 2) colour on w meat; 3) hardness and 4) water loss on raw and cooked meat.

e colour parameters taken with spectrofotometer MACBETH 1400 were: lightness (L*), red (a*) and yellow (b*) ues with 3 different illuminants, "A" (light from electric bulb 2.854°K); "C" (cloudy weather day light of

3.770°K) and "F" (light from fluorescence lamp). From index a* and b* were calculated, in order to make more evident and intelligible colour's characteristics, the parameters: chroma or saturation ($C = \sqrt{a^{*2}+b^{*2}}$) which shows the percentage of pure colour (for C=0 we have grey) and hue (H=arctg b*/a*) which shows colour's tonality (for H=0 we have purple red).

By using a steel cylinder were taken perpendicularly to cut's surface, from raw and cooked meat four cores with 2.5 cm of lenght and 2.5 cm of diameter. On these cores was measured, using INSTRON 1011 with dispositive for Warner Bratzler Shear (WBS) test, meat's hardness (kg/cm^2).

For water loss determination the slice of meat, previously weighted, and contained in a polyethylene small bag to avoid evaporation, was put on a hurdle located in a container to prevent, as more as possible, direct contact between meat and support surface; everything was conserved for 48 h at 4°C, then the sample was weighted again; water loss on raw meat was calculated by difference of weights. The same slice, ever in polyethylene small bag, was cooked in bain marie at 75°C for 50'; then was cooled under running water for 45' and after drying was weighed again and was calculated the water loss on cooked meat.

Here we expose data referred to Longissimus dorsi (LD) muscle: pH, colour (L*, C, H) taken only with illuminant C, water loss and hardness.

Results and Discussion

From table 1 where have been reported pH value of LD muscle in different times of conservation it is possible to show that the conservation of fresh meat until 10 days did not alter pH value at 0 and 48 h. Only after 3 months of frozen storage, in agreement with MOLEERATANOND (1981) there was a significant change in pH (5.75 vs 5.61) at 0 h while there was tendency only at 48 h (5.75 vs 5.65).

Nevertheless those pH values collected on fresh and frozen meat remain within the usual range for post-rigor meat (5.5 - 6.8, PEARY, 1977).

About colour parameters (tab. 1) lightness for fresh meat is constant (41.2); with freezing, only at 1 month there was a significant difference with control (36.7 vs 40.6), while increasing time of conservation L* values were similar to those of control. It seems possible to use fresh or frozen meat (only after 3 months of conservation) to estimate L*.

Time of conservation didn't influence chroma on fresh and frozen meat; while freezing caused a significant decrease of saturation index (22.4 vs 25.8).

On fresh meat it is possible to determine the value of hue only within 4 days without significant changes, while the use of frozen meat causes a significant increase of hue (33.2° vs 34.6°). The trend of this last parameter determined on frozen meat is similar to that found by MOLEERATANOND et al. (1981) while there is not agreement for the others.

For loss of storage (table 2) obviously there was significant difference between fresh and frozen meat means (3.76% vs 8.57%). Moreover we may point out that time of frozen storage didn't determine any difference on thaw exudate, in general agreement with MILLER et al., (1980).

The water holding capacity (WHC) of fresh meat didn't depend on time of conservation while this factor influenced the meat frozen for a longer time (3.40% vs 2.14%). This effect has been found by MILLER et al. (1980) on beef and pork meats, too. CARROLL et al. (1981) attributed at some slight compaction into meat's structure occurred with longer times of storage the major value of drip loss.

Total drip loss was a function of previous parameter. Therefore rispect to "control" (1.29%), there was a significant greater drip loss on fresh meat (4.75%) and some more on frozen meat (11.12%) with a significant different mean value at 0 months of storage (12.21%) respect to 1 and 4 months.

These results mean that is possible to store fresh meat a lot of days before WHC test without problems (1.29%

95%). While the frozen meat values aren't comparable (1.29% vs 2.78%)and also within frozen storage this possible because there was significant difference due to times of conservation; between 1 and 6 months difference was significant (2.14% vs 3.40%).

The drip loss on cooked meat only at 6 months there was a tendency to lose more liquid respect to 1 month "control" (23.49% vs 25.85% and 25.81%, rispectively). Therefore until 3 months of storage can be possible test the samples without differences on results.

Hardness on cooked meat shows no differences (mean 1.42 kg/cm^2) while on raw meat the significant lowest ue is at 4 days (2.25 kg/cm^2). There are no significant differences between 0 and 10 days, 1, 3 and 6 is mean values, so we can conclude that storing fresh or frozen meat at different times doesn't affect ness on cooked meat and on raw meat except for meat stored for 4 days at 4°C, whose hardness on raw meat s to differ significantly from "control", in agreement with CARROL et al., (1981) that didn't find ificant changes in the shear measurement due to the lenght of frozen storage on Semitendinosus muscle.

lusions

lts from this study indicate that is possible to store up fresh meat samples until 10 days without ificant differences on majority of physical characteristics. The conservation's effects are much more ous on raw meat for frozen samples. In fact, the water holding capacity decreases with a more long time of ervation and the meat shows a minor saturation index and shifts away from red colour, so we can't use en meat to determinate colour's parameters. The cooking reduces the conservation's effects, in particular ardness, in agreement with GIGLI et al., (1992).

study point out that on frozen meat the results of any parameters aren't always comparable; the comparison e possible only in same conditions of storage.

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Table 1.- Colour(*) and pH of LD muscle

Time	pH		Lightness	Chroma	Hue
	0 h	48 h	L*	C	H
0 days	5,61 b	5,65 a	40,6 ab	26,8 a	34,6 c
4 days	5,62 b	5,67 a	41,1 ab	25,1 a	36,3 bc
10 days	5,65 ab	5,74 a	41,9 a	25,2 a	37,1 b
1 month	5,74 ab	5,66 a	36,7 c	22,9 b	37,3 ab
3 months	5,66 ab	5,69 a	39,5 ab	21,7 b	39,2 a
6 months	5,75 a	5,75 a	39,0 bc	22,6 b	38,1 ab
Mean	5,67	5,69	39,8	24,1	37,1
Residual variance	0,013	0,014	11,13	5,51	6,51

Note: different letters mean significant differences ($P < 0.05$)

(*): Illuminant C (6770°K) = Cloudy weather day light.

Table 2 - Drip and cooking losses and Hardness of LD muscle

Time	Loss %				Hardness kg/cm2	
	Drip			Cooked	Raw	Cooked
	Storage (1)	48 h (2)	Total (3)			
0 days	---	1,29 c	1,29 d	25,81 a	2,65 ab	1,37 a
4 days	3,45 b	1,20 c	4,60 c	24,74 a	2,26 b	1,44 a
10 days	4,05 b	0,89 c	4,90 c	24,64 a	2,58 ab	1,49 a
1 month	8,43 a	2,14 b	10,39 b	25,85 a	2,93 a	1,45 a
3 months	8,19 a	2,80 ab	10,77 b	25,01 a	2,57 ab	1,36 a
6 months	9,10 a	3,40 a	12,21 a	23,49 a	2,62 ab	1,39 a
Mean	6,64	2,08	7,45	24,99	2,60	1,42
Residual Variance	3,587	0,752	2,404	7,528	0,220	0,033

See note table 1.

(1) (Weight to dissection - weight after storage)/ Weight to dissection * 100

(2) (Weight after storage - weight at 48 h from end of storage)/ Weight after storage * 100

(3) (Weight to dissection - weight at 48 h from end of storage)/ weight to dissection * 100