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centro tecnolóxico da **carne**
Centro Tecnológico de la Carne
de Galicia,

Aging of different horse muscles: a proteomic approach

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From the 20th Century-Fox
CinemaScope Production

EPA-4006
45 E.P.



LOVE
ME
TENDER
**ELVIS
PRESLEY**

Music from the
original sound track
recording



- Accepted by consumers as a natural and safe process

- Effective in increasing tenderness in meat from other species

- Easy to apply in groceries and butcheries

AGING

- Increases production costs and, so, final price

- Specific rules are lacking at European and national level



....taking the first steps...

Rossier, E., & Berger, C. (1988). La viande de cheval: des qualités indiscutables et pourtant méconnues. Cahiers de nutrition et de diététique, 23(1), 35-40. 4-5 days

• 4-5 days

Roth, D. M., Brewer, M. S., Bechtel, P. J., Kline, K. H., & McKeith, F. K. (1995). Sensory, color, and composition characteristics of young and mature chevaline. Journal of Muscle Foods, 6(1), 83-89.

• 30 hours

Dufey, P. A. (1996). Sensory and physicochemical properties of meat from horses of different age groups. In Proceedings of the 42nd International Congress of Meat Science and Technology', Lillehammer, Norway (pp. 1-6).

• 6-14 days

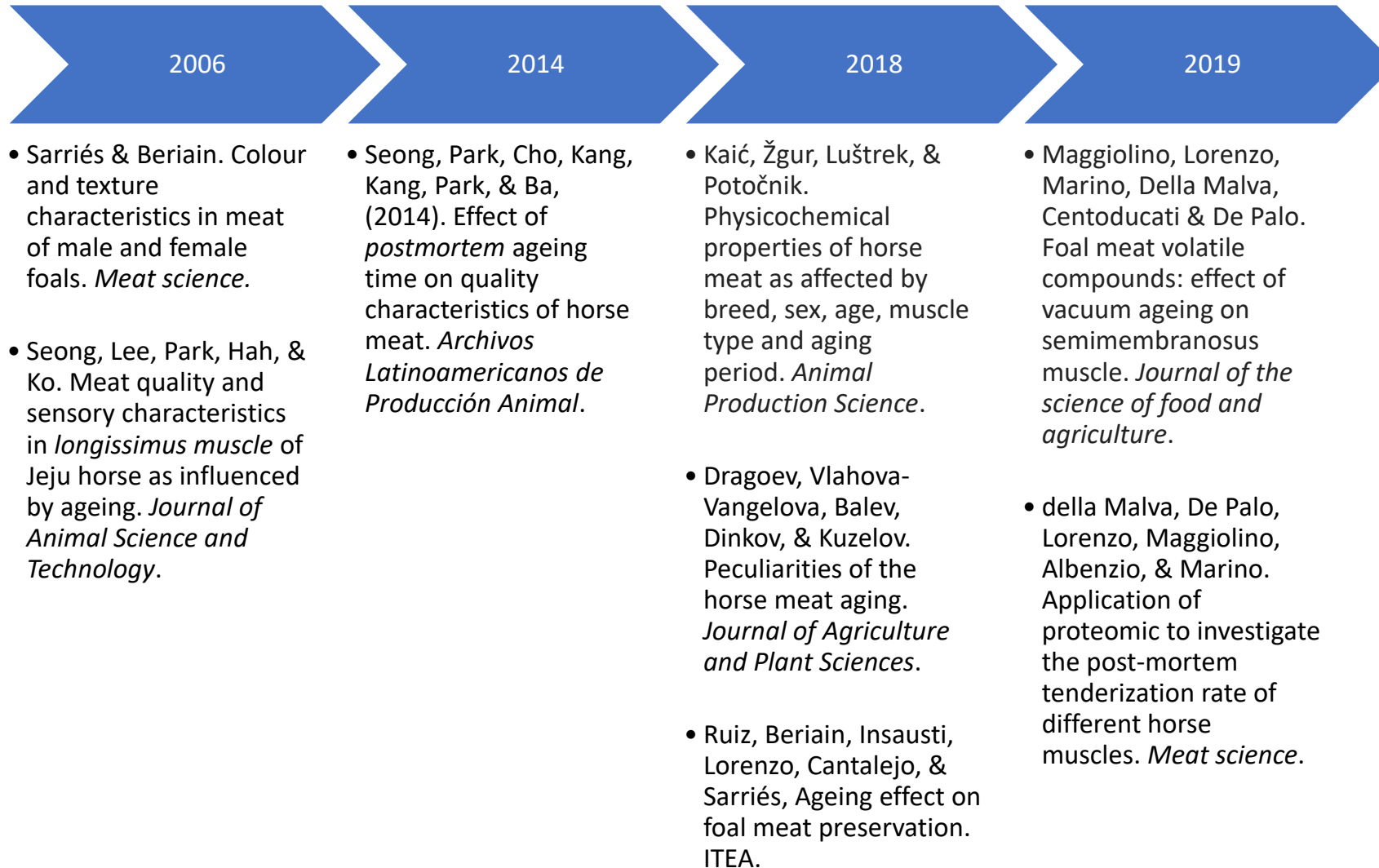
Segato, S., Cozzi, G., & Andrighetto, I. (1999). Effect of animal morphotype-sex and age on quality of horse meat imported from Poland. In Proceeding of the ASPA Congress-Recent Progress in Animal Production Science (Italy).

• 6-14 days

Sarriés, M. V., & Beriain, M. J. (2006). Colour and texture characteristics in meat of male and female foals. Meat science, 74(4), 738-745.

• 4 days

....a hot topic...





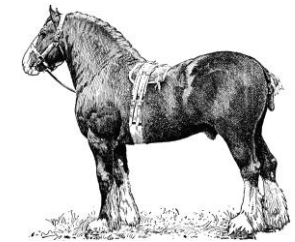
How fibrillar proteolytic patterns change during aging in horse meat?

How proteolysis affects meat tenderness in horse meat?

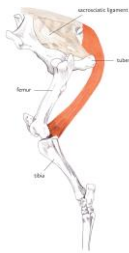


Is there any difference between muscle in proteolysis dynamics in horse carcass?

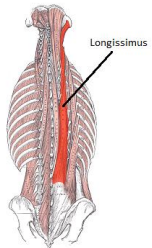
Materials and Method



ST



SM



LL



T1



T6



T14

Lab Analysis

WBSF on grilled sample

SDS – PAGE *Marino et al., 2013*

Hydroxyproline and total collagen *Hutson et al., 2003*

Tn-T Western blot *Marino et al., 2015*

Myofibrillar fragmentation index (MFI) *Culler et al., 1978*

2 Dimensions Gel Electrophoresis *Marino et al., 2015*

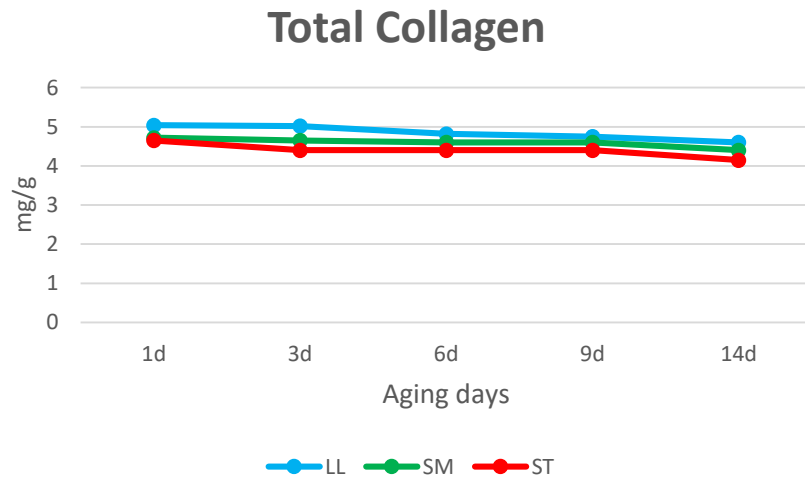
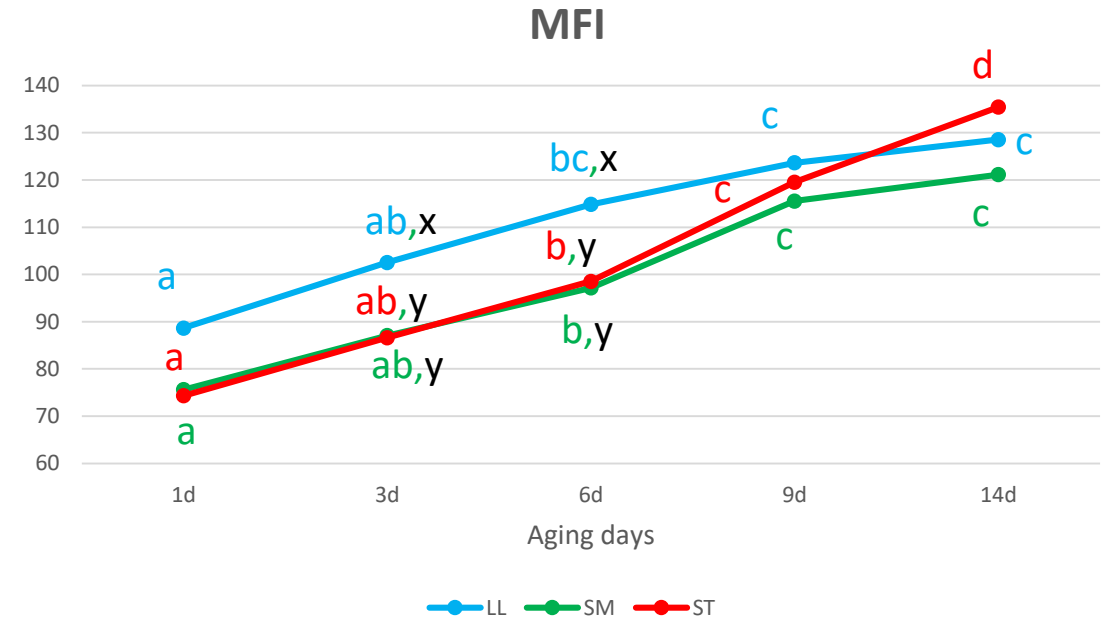
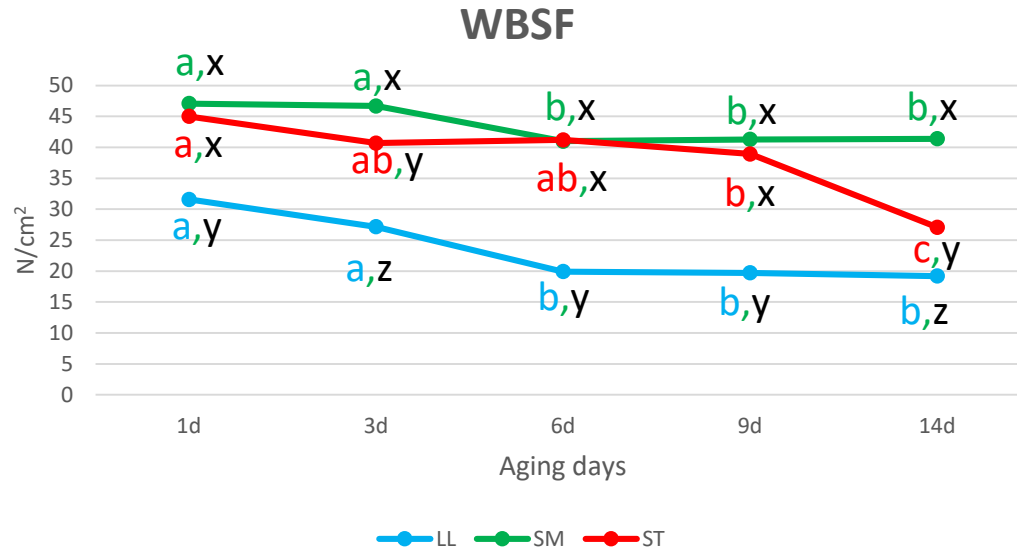


© Can Stock Photo - csp6969679

Proc GLM *SAS, 2013* : Aging time, muscle, aging time x muscle and RRE as fixed effects

Fisher's LSD test *SAS, 2013* : *post hoc* analysis

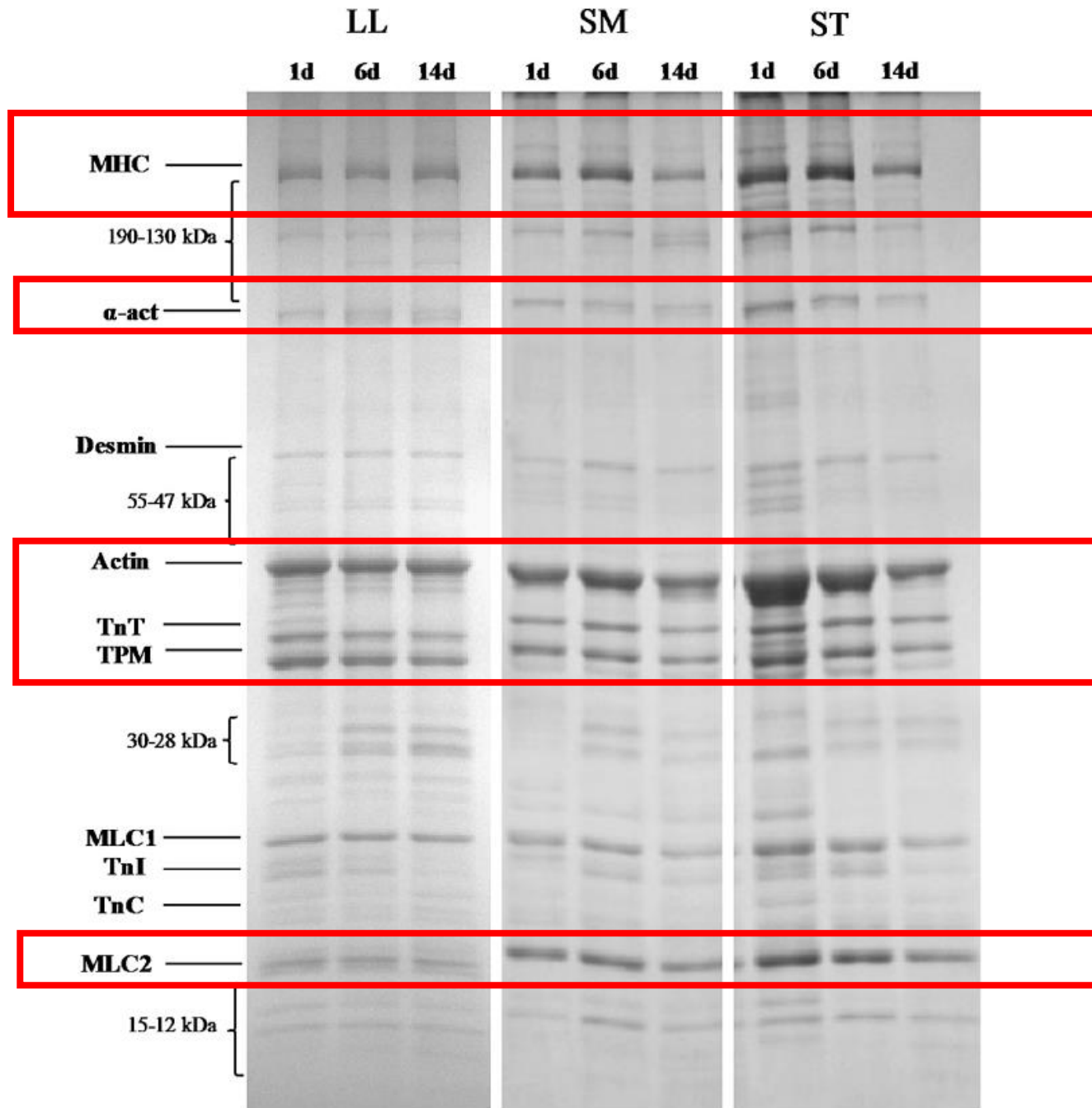
Results



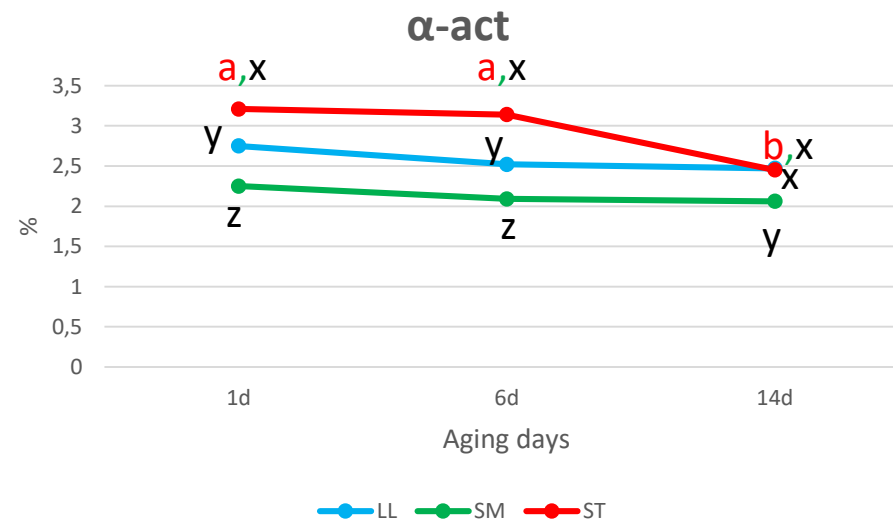
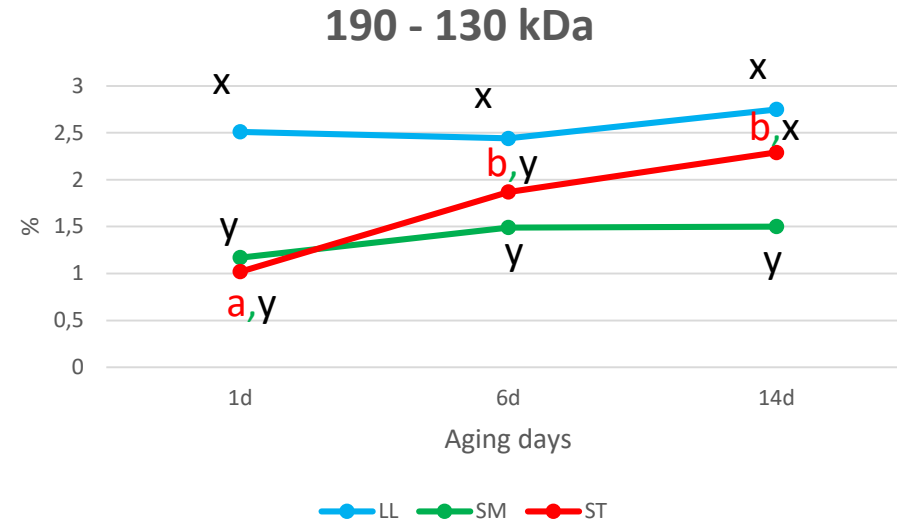
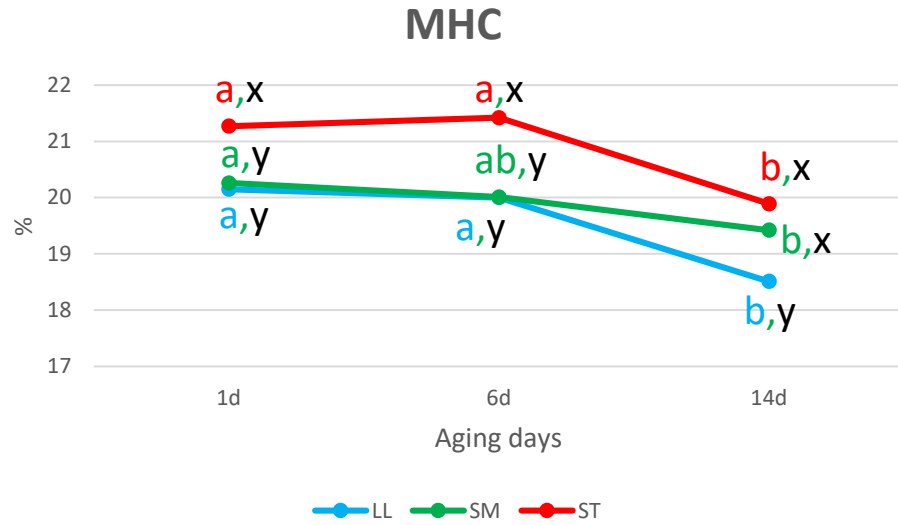
a, b, c, d = $P < 0.05$ in the row (aging effect)
 x, y, z = $P < 0.05$ in the column (muscle effect).



Results

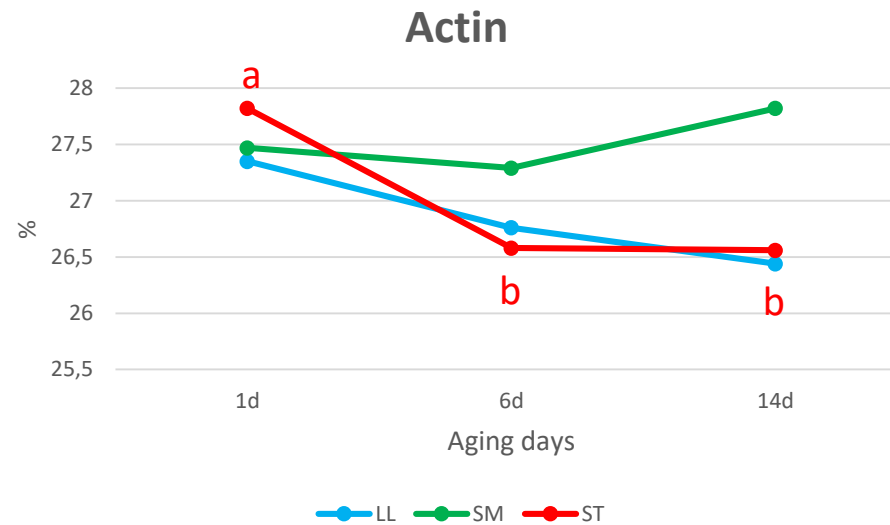
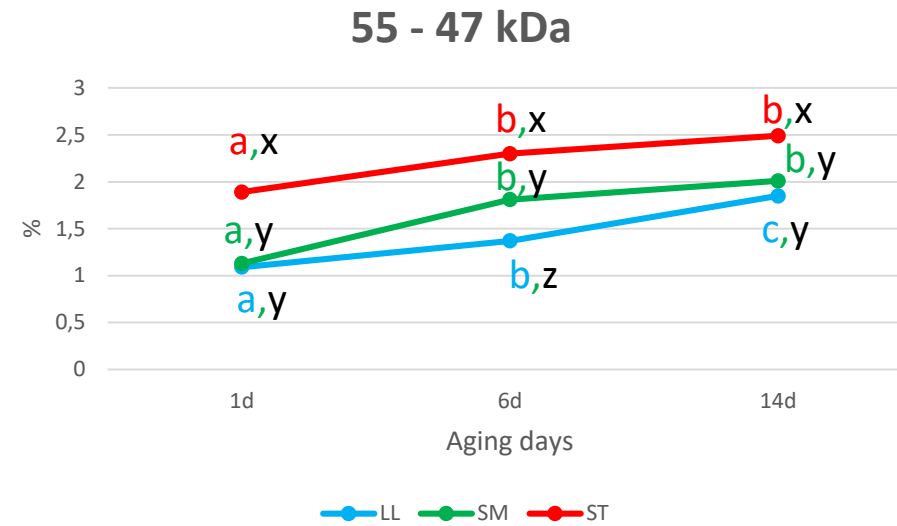
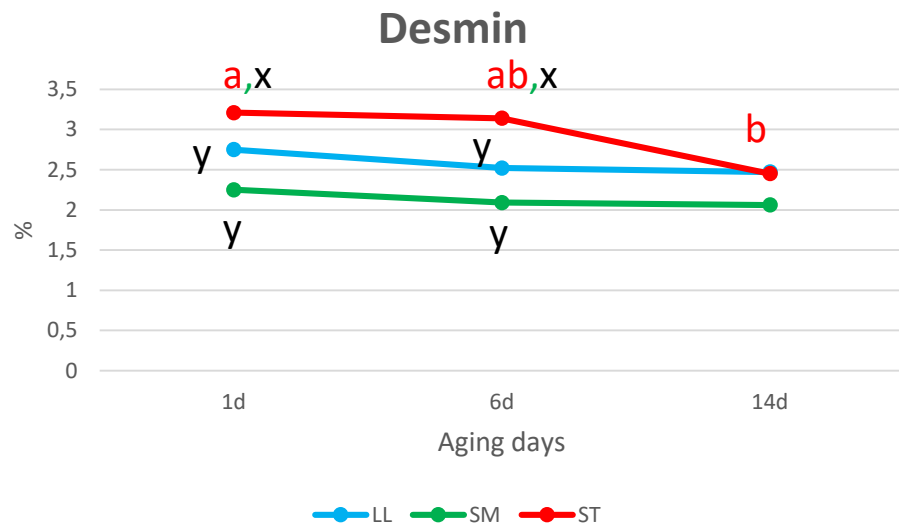


Results



a, b = $P < 0.05$ in the row (aging effect)
 x, y, z = $P < 0.05$ in the column (muscle effect).

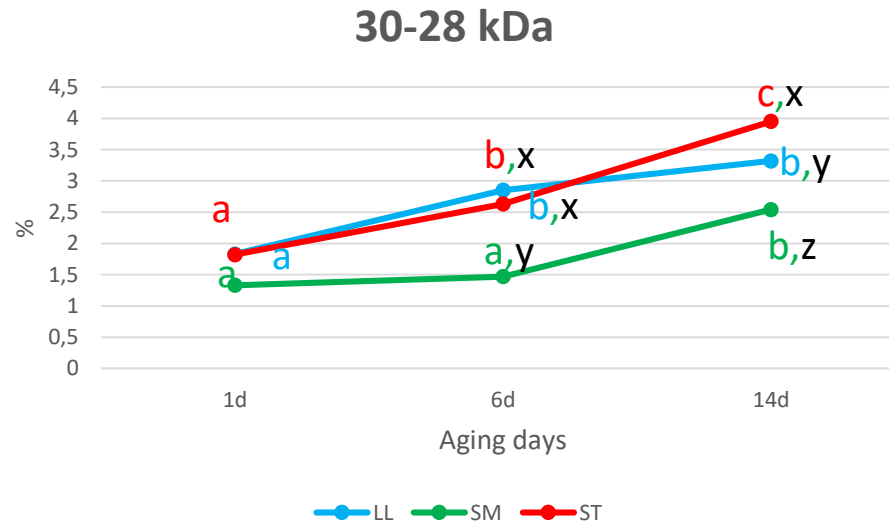
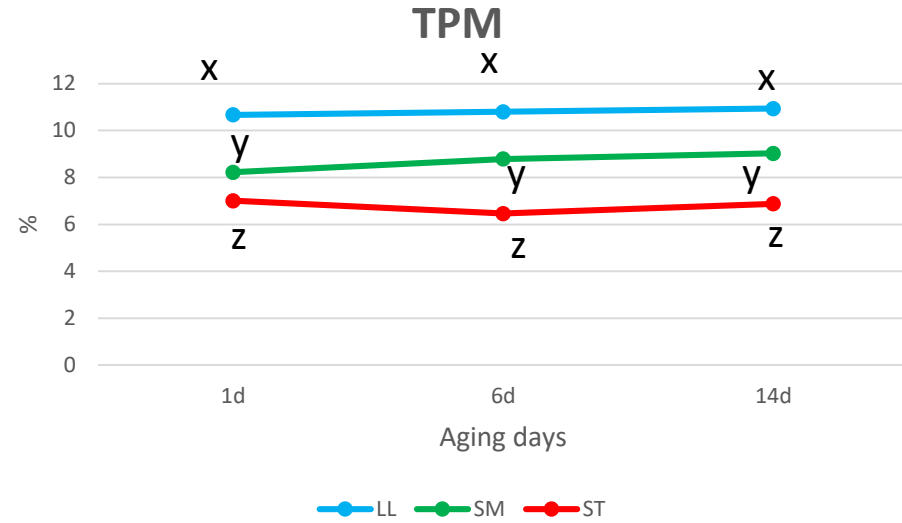
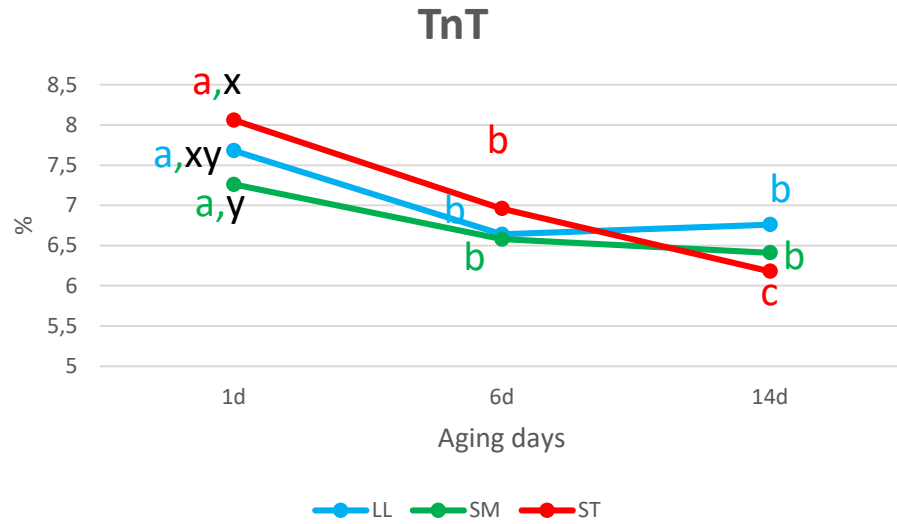
Results



a, b = $P < 0.05$ in the row (aging effect)
 x, y, z = $P < 0.05$ in the column (muscle effect).



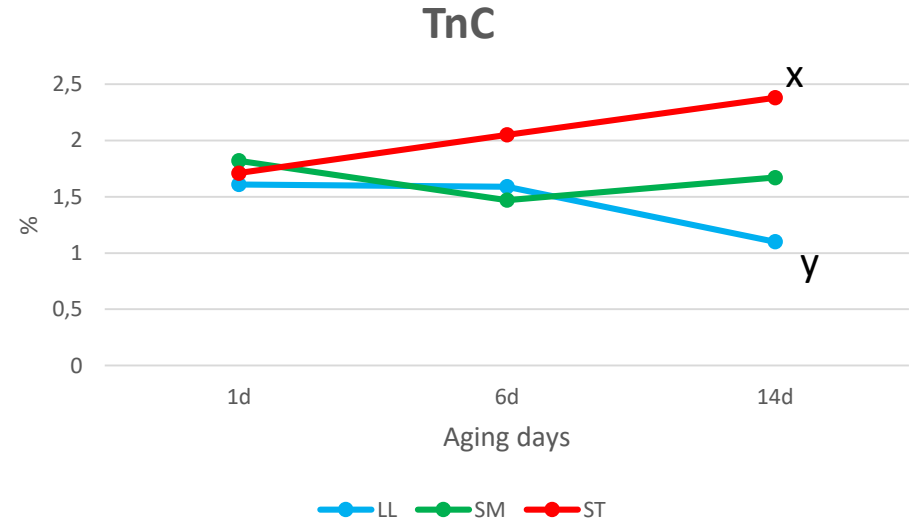
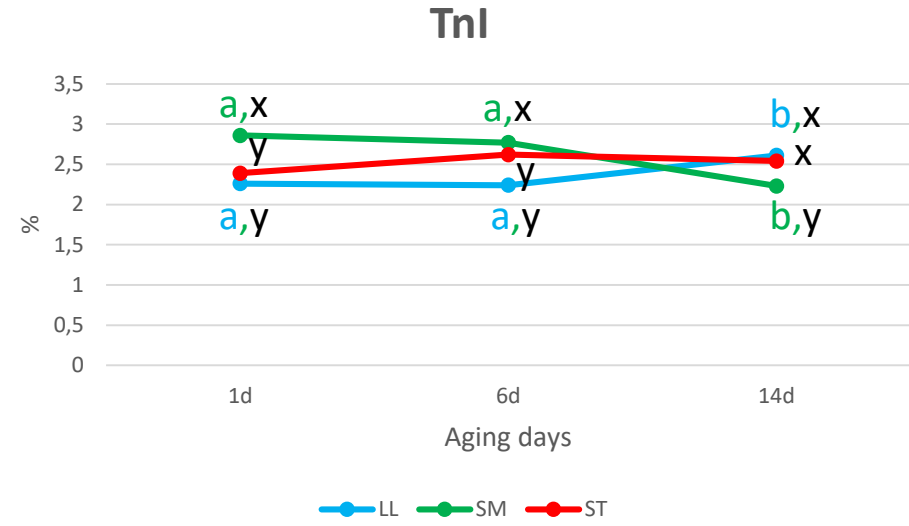
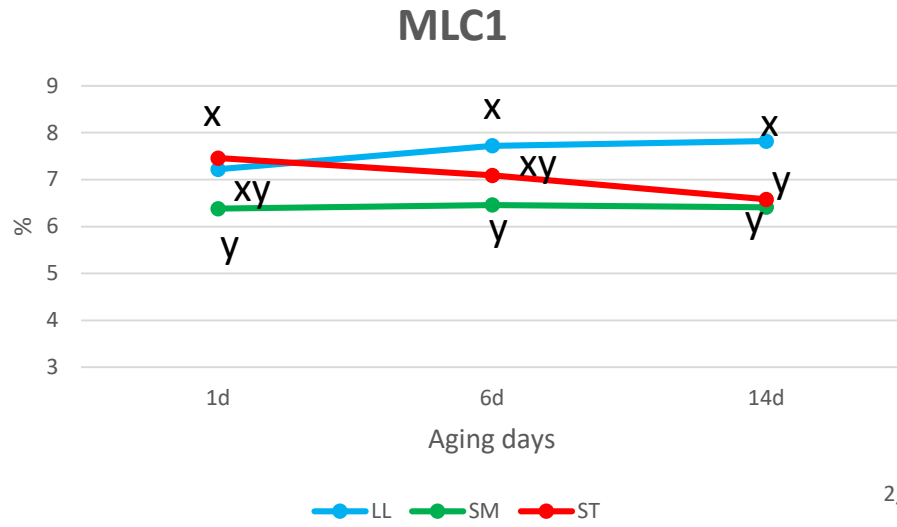
Results



a, b, c = $P < 0.05$ in the row (aging effect)
 x, y, z = $P < 0.05$ in the column (muscle effect).



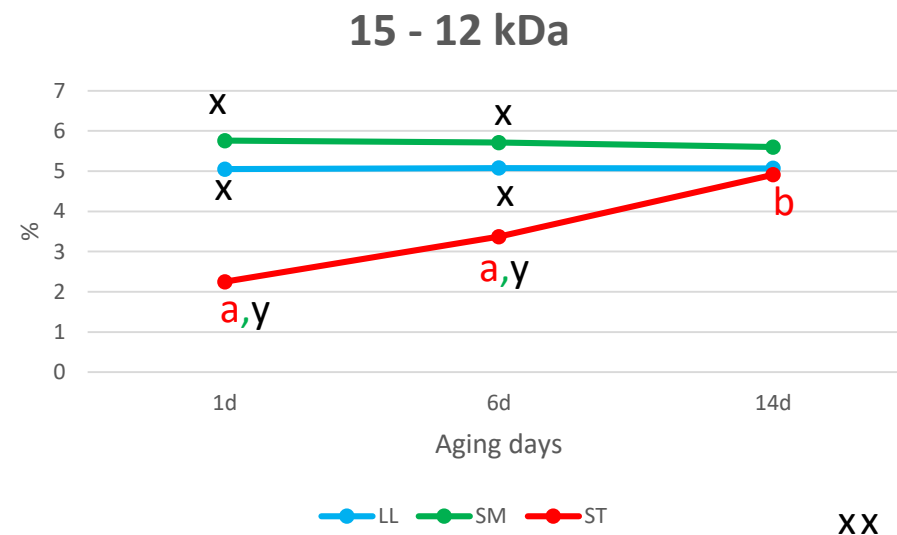
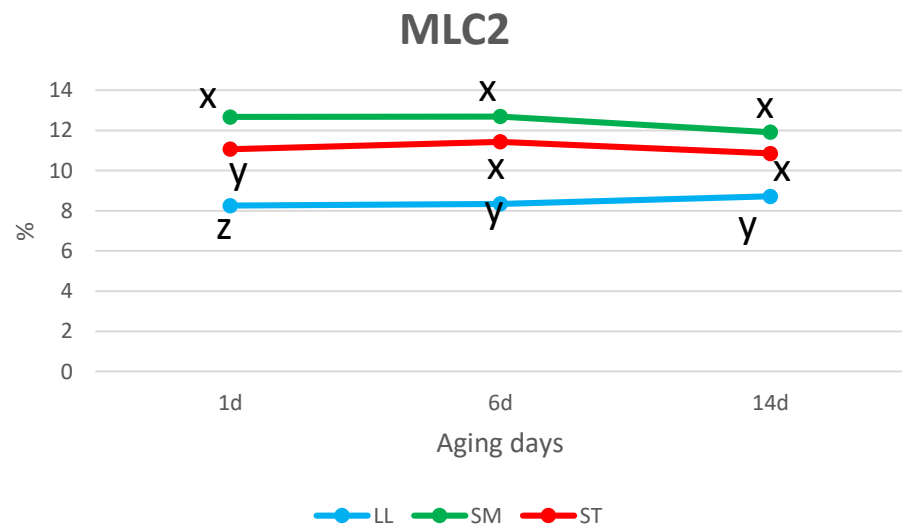
Results



a, b = $P < 0.05$ in the row (aging effect)
 x, y = $P < 0.05$ in the column (muscle effect).

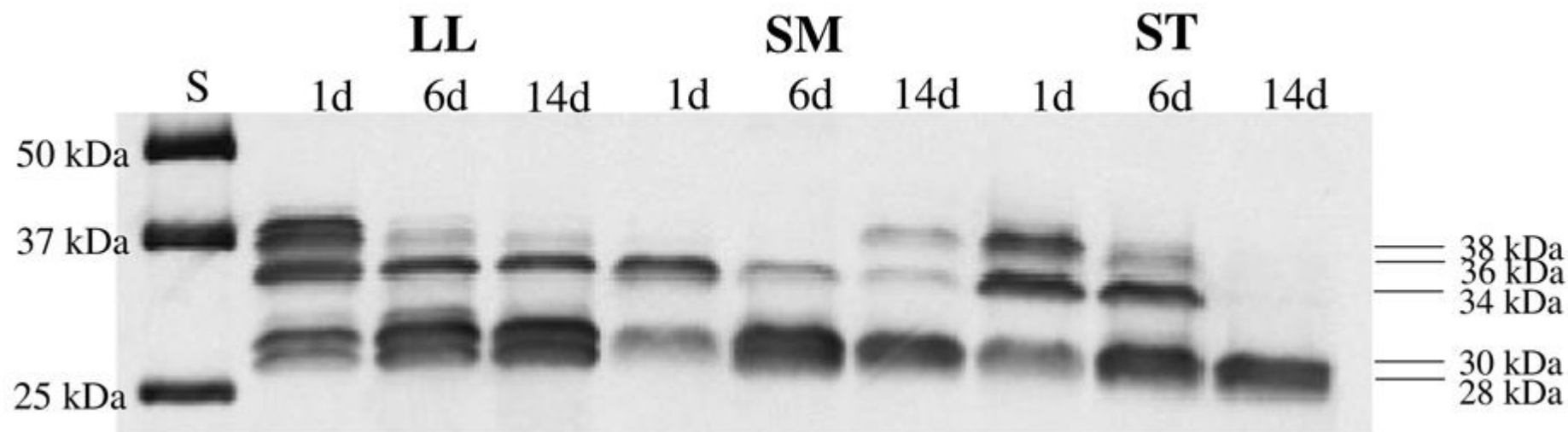


Results



a, b = $P < 0.05$ in the row (aging effect)
 x, y = $P < 0.05$ in the column (muscle effect).

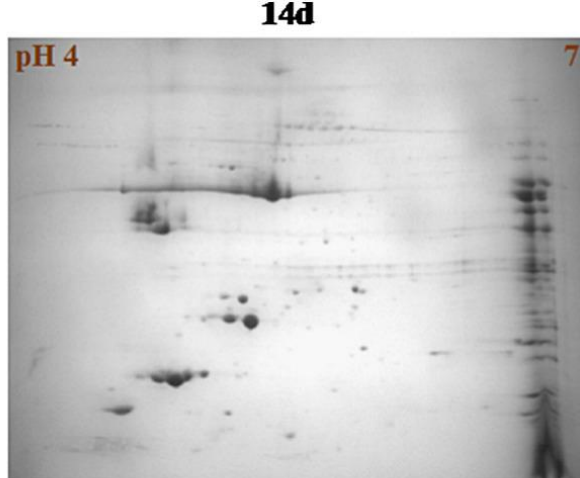
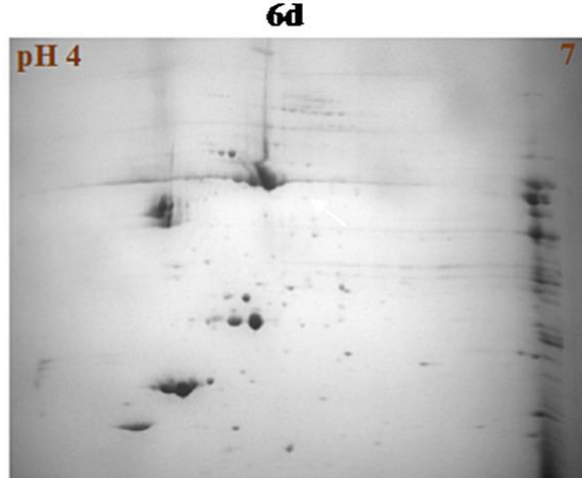
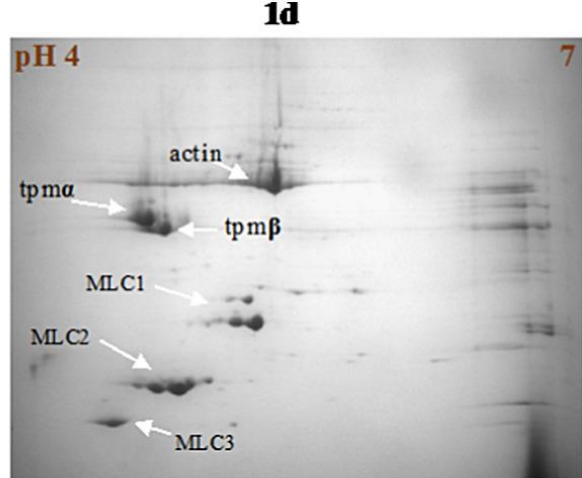




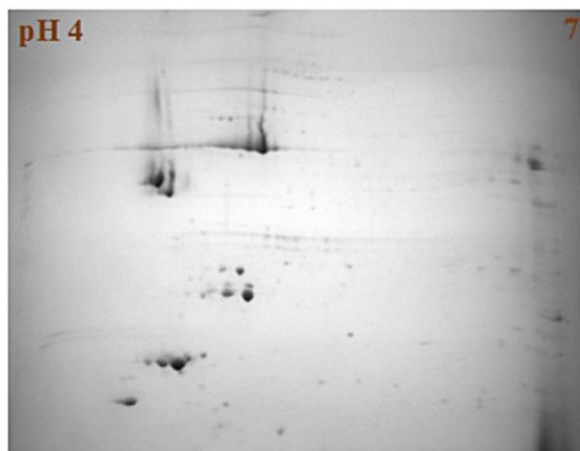
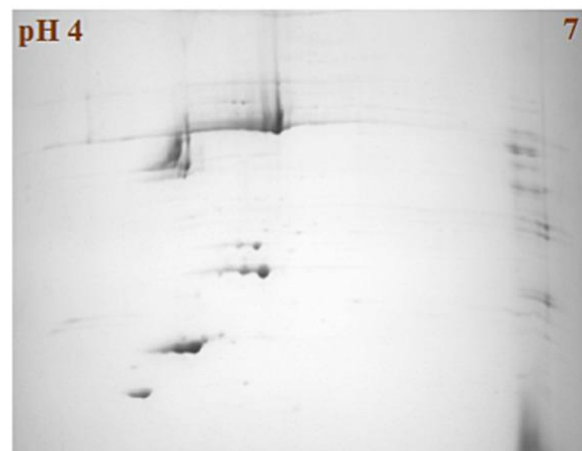
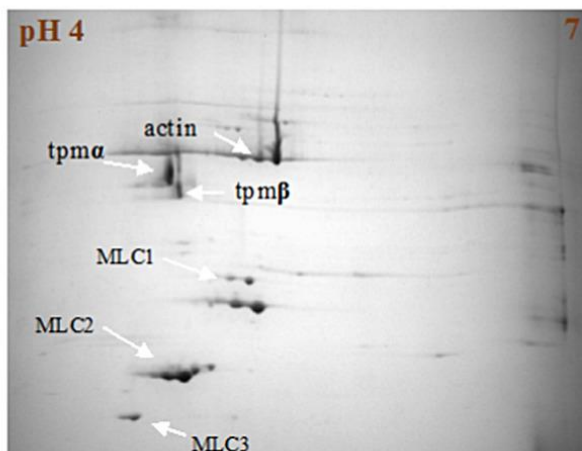
| | LL | | | SM | | | ST | | | SEM | Effects. P | |
|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|---------|------|------------|-------|
| | 1d | 6d | 14d | 1d | 6d | 14d | 1d | 6d | 14d | | Muscle | Aging |
| Intact forms | | | | | | | | | | | | |
| 38 kDa | 21.4 a | 5.6 b | 2.4 c | ND | ND | 10.7 | 36.1 a | 10.8 b | ND | 0.97 | ** | *** |
| 36 kDa | 22.1 | ND | ND | 58.0 a | 11.0 b | 5.0 c | 38.7 a | 31.3 b | ND | 0.61 | *** | ** |
| 34 kDa | 25.8 a | 23.3 b | 21.2 c | ND | ND | ND | ND | ND | ND | 0.52 | *** | * |
| Degraded forms | | | | | | | | | | | | |
| 30 kDa | 22.7 b | 51.7 a | 46.7 a | 42.0 b | 89.0 a | 84.4 a | 25.2 c | 57.9 b | 100.0 a | 1.83 | ** | ** |
| 28 kDa | 8.0 c | 19.4 b | 29.6 a | ND | ND | ND | ND | ND | ND | 0.72 | *** | ** |

ND= not detected; *= P<0.05; **=P<0.01; ***=P<0.001. a. b. c= P<0.05 in the row (aging effect).

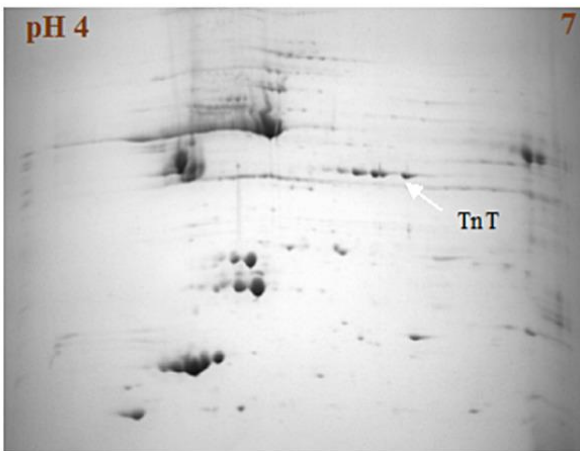
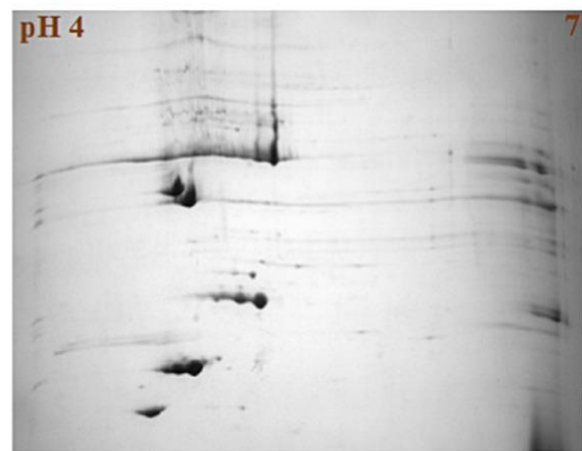
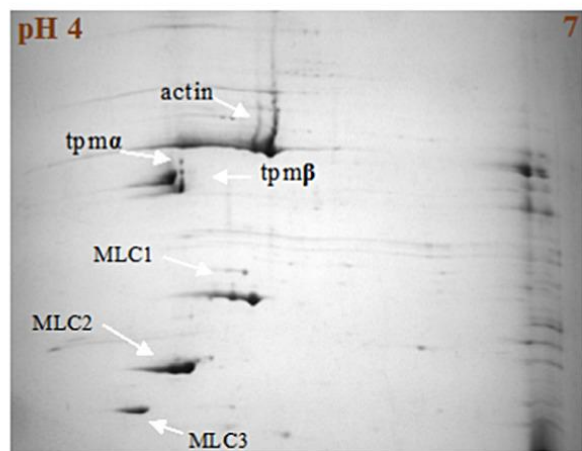
LL



SM



ST



Main outcomes....

Differences in WBSF between muscles and during aging time are not due to collagen content, but to myofibril degradation

Between muscles there is variability in isoforms, concentration, degradation rate

As in beef, interesting proteomic markers of tenderness could be Tn-T and MHC

Muscles, independently from the collagen content, tend to increase tenderness during aging, in relation to proteolysis

Thank you

