BAMST Symposium
Kortrijk, December 10th, 2013

Influence of two breeds (Belgian Blue and Limousin) and previous storage time on pigment and lipid stability of high-oxygen atmosphere packaged beef

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INTRODUCTION

The shelf life of fresh meat is mainly limited by the development of pathogenic or spoilage microorganisms, and/or the oxidation of some of its constituents. In order to limit these phenomena, the European legislation allows chilling or freezing, eventually combined with vacuum or modified atmosphere packaging.

The oxidation of myoglobin turns this pigment to metmyoglobine, which gives a brown color to meat. Lipid oxidation results in formation of aldehydes, some of them being often associated with the development of off-flavors even at low concentrations. Myoglobin and lipid oxidation often appear to be linked.

The Belgian meat sector often complains of a sensitivity of Belgian Blue (BB) beef to oxidation processes, in particular in high-oxygen modified atmosphere packaged (MAP) meat previously aged in vacuum conditions.

OBJECTIVE

To evaluate the effect of two breeds (Belgian Blue *vs*. Limousin) and previous storage time and temperature on color and lipid stability of meat packaged in high-oxygen atmosphere.

MATERIALS AND METHODS

Samples

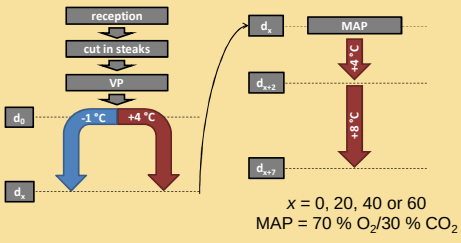
Vacuum-packaged (VP) striploins from cows supplied 2 days after slaughter

Breed	Age (yr)	Quantity
Belgian Blue	7.0 ± 2.4	4
Limousin	6.0 ± 1.0	4

Performed analysis

- Color measurement (C.I.E. L*a*b*)
- Metmyoglobin % [1]
- TBARS [2]
- Fat content [3]

Experimental design



x = 0, 20, 40 or 60
MAP = 70 % O_2/30 % CO_2

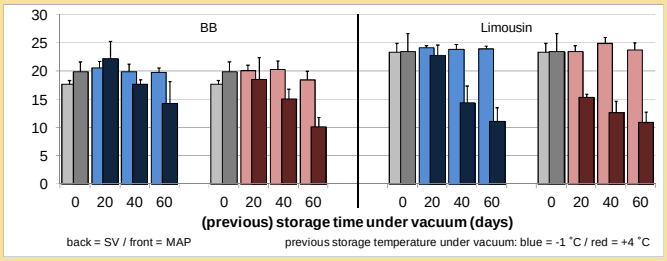
Analysis started at day 0(+7) and were repeated each 20 d

BB MAP sample

Limousin MAP sample

RESULTS AND DISCUSSION

C.I.E. a*

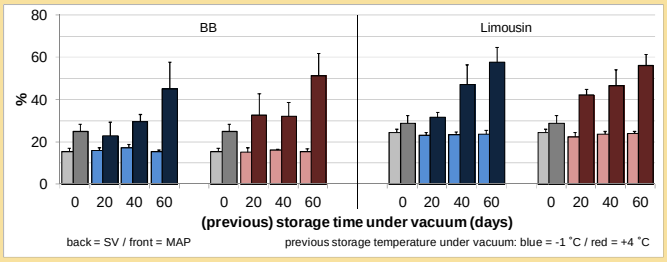


No spectacular change of color observed in VP samples, but decrease of the chromaticity a* after repackaging under modified atmosphere.

Limousin samples presented grater initial chromaticity a* values, but values of a* from MAP Belgian Blue samples tended to stay longer stable.

RESULTS AND DISCUSSION

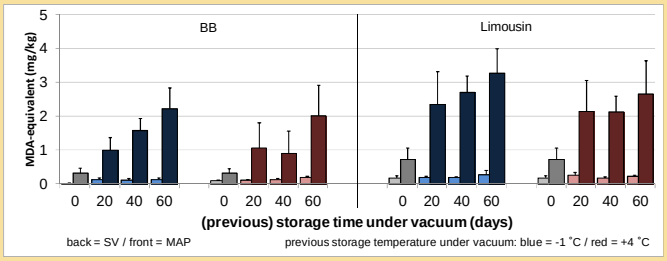
Metmyoglobin %



No significant change in metmyoglobin % was observed during vacuum storage.

Belgian Blue samples under modified atmosphere tended to present a higher myoglobin stability until 40 days of previous storage under vacuum.

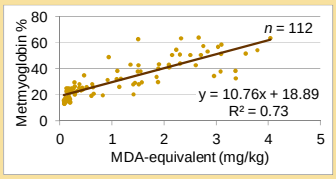
TBARS



VP storage at −1 °C provided the best conditions for lipid stability.

Repackaging under modified atmosphere brought out and effect of previous storage time under vacuum.

Metmyoglobin % x TBARS



Positive correlation established between metmyoglobin % and TBARS suggesting an eventual link between myoglobin oxidation and lipid oxidation.

Fat content

The higher amount of fat in meat from Limousin (4.6 ± 0.8 % *vs*. 1.4 ± 0.7 % in meat from Belgian Blue) could partially explain its sensitivity to oxidation.

CONCLUSIONS

The Limousin meat samples of this study presented a higher sensitivity to myoglobin and lipid oxidation, possibly due to its higher fat content. The duration and temperature of VP storage seemed to influence the sensitivity of samples to pigment and lipid oxidation during subsequent MAP storage.

Lipid and myoglobin oxidation appear to be linked. An understanding of the oxidative processes and their interaction would provide basis for explaining quality deterioration in meat and also for developing strategies (e.g. antioxidant supplementation) to maintain sensory quality.

ACKNOWLEDGEMENTS

This study was funded by the General Operational Direction of Agriculture, Natural Resources and Environment (DGARNE) of the Walloon Region (Belgium) Project D31-1275 (CONSBBB)

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