Published February 1, 2019

2017 Reciprocal Meat Conference – Meat and Poultry Quality

Meat and Muscle Biology™

Effect of Freezing (Time and Temperature) and Methods of Thawing in the Physicochemical Quality of Beef

T. J. Sillva[1], C. L. Gomes[2], G. B. Silva[1], H. M. Bolini[2], and S. B. Pflanzer[1]*

[1]Department of Food Technology, University of Campinas, Campinas, Brazil;
[2]Food and Nutrition Department, University of Campinas, Campinas, Brazil

Keywords: color, freezing time, lipid oxidation, meat quality, microwave cooking
Meat and Muscle Biology 1(3):69 **doi:10.221751/rmc2017.063**

Objectives

The aim of this study was to evaluate the effects of freezing temperature and storage time (–10°C or –20°C either by 1 or 3 mo) and thawing methods (microwave, 20°C and 4°C) on the physicochemical characteristics of beef

Materials and Methods

A total of 6 pieces of striploin (3 for each time of storage) were collected directly from the slaughterhouse and sent to the meat lab (48 h after slaughter). Each piece was cut in 7 steaks of 2.5cm and 7 steaks of 1cm tick. One steak of each thickness was destined for 1 of 7 treatments: without freezing, plus treatments formed by the combination of 2 freezing temperatures and 3 thawing methods. Before freezing samples were weighed, vacuum packed and aged 14 d. Samples were frozen until reaching a desired temperature (–10°C or –20°C). The thawing was performed, after 1 or 3 mo of storage, in microwave (800W), ambient temperature (20°C) or in refrigerator (4°C), until the samples reached 4°C. After thawing, the samples (2.5cm thick) were analyzed for thawing loss (TL), instrumental color (L*, a*, b*), cooking loss (CL) and shear force (WBSF). The 1.0cm steaks were destined to lipid oxidation (TBAR), moisture and fat contents. Statistical analyses were performed by GLM, with a completely randomized design, to determine if there were significant interactions between treatments. The means (± SEM) were tested by Duncan test at 5% significance

Results

There were no interactions ($P > 0.05$) between sources of variation for any of the traits. The TL (~3.26 ± 0.38%) and lightness (L*; ~37.02 ± 0.70) were not affected neither by the time nor freezing temperature ($P > 0.05$). However, microwave (4.90 ± 0.46%) had greater TL than other thawing methods (~2.44 ± 0.22%), and fresh steaks had higher L* (41.15 ± 1.11) than steaks that received some of the freezing/thawing treatments (~37.02 ± 0.86; $P < 0.05$). Freezing, independent of the temperature and method of thawing, decreased the a*values (18.66 ± 0.55) when compared to fresh meat (23.01 ± 0.55), and lower values were observed for samples stored by 3 mo (17.67 ± 0.59) in relation of those stored by 1 mo (19.48 ± 0.34). In the same hand, higher time of storage decrease de b* values (19.48 ± 0.34 and 17.35 ± 0.42 for 1 and 3 mo, respectively). The moisture content was not affected by freezing time or temperature ($P > 0.05$), but the samples thawed in microwave (72.63 ± 0.38%) presented lower values than other methods (~73.71 ± 0.29, $P < 0.05$). TBAR content of fresh meat (0.06 ± 0.01mgMDA/g) was lower when compared to samples that were frozen/thawed (0.26 ± 0.02mgMDA/g). It was verified that the longer storage time increased the values of TBAR (0.19 ± 0.01 and 0.32 ± 0.01 mgMDA/g, for 1 and 3 mo, respectively). CL was not affected neither by time nor temperature of freezing ($P > 0.05$). However, CL was higher in samples thawed at 20°C (22.32 ± 0.34%) and lower in samples thawed in microwave (20.52 ± 0.40%). The fat content (2.65 ± 0.40%) and shear force (3.50 ± 0.14kg) showed no difference between the storage time, freezing temperature and thawing methods. However, fresh meat was tougher (4.33 ± 0.29kg, $P < 0.05$) than all others frozen/thawed samples

Conclusion

The procedure of freezing/thawing, in general, improved meat tenderness, however, it negatively affected color, and increased the levels of lipid oxidation with longer storage periods. Microwave would not be recommended for thawing due to higher values of exudation

