COLOR STABILITY OF REFRIGERATED PORK LOIN STORED UNDER DIFFERENT MODIFIED ATMOSPHERES

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Background

Retail pork shelf-life is limited by color changes and microbial spoilage which begins with its exposure to oxygen. The need to extend meat market share and shelf-life have induced research aiming the microbial and sensory quality maintenance, specially through the use of modified atmospheres (LAMBERT et al., 1991; SØRHEIM et al., 1999; 2001). In this respect, among the employed gases, carbon monoxide have been tested for use in meat and meat products due to, even in low concentrations, its capacity to generate a stable cherish-colored pigment similar to that of fresh meats (CLARK et al., 1976; LUNÕ et al., 1998; 2000; SØRHEIM et al., 1999; 2001; PEREIRA, 2000; JAYASINGH et al., 2001).

Objectives

Measure the influence of different modified atmospheres on the color of pork loins stored under refrigeration.

Methods

Pork loin (*Longissimus dorsi*) cuts were packaged in multilayer poliolefin film under different atmospheres: vacuum; 100% CO_2; 99%CO_2+1% CO; 100% O_2 and exposure to 100% CO for one hour, followed by vacuum. After package sealing the loin cuts were stored at 5 ± 0,5°C. Samples of each treatment were taken, in duplicate, after 0, 4, 8, 16, 20 e 25 days for sensory and objective color analysis. Objective color was evaluated by reading CIELab reflectance. Chroma (c*) and hue angle (h*) were calculated (SØRHEIM et al., 1999; PEREIRA, 2000). Color data were descriptively analised. Subjective color was evaluated after 1 and 20 days of storage for its acceptability by 100 untrained consumer panel using a 9 points hedonic scale (HELGESEN & NAES., 1997; CARNEIRO, 2001). Sensorial data were analised by the SAS 8.0 program for Principal Component Analysis.

Results and discussion

Though pork lightness (L*), as also observed by SØRHEIM et al. (1997), has increased after the first days of storage, specially those of the treatment with 99% CO_2 and 1% CO, it steadily decreased after the fifth storage day and the samples turned darker. This treatment, however, showed to be effective in maintaining objective color values close to that of the fresh loin throughout storage (Figure 1). In special, redness (a* value) remained essentially unchanged in this treatment while decreasing (vacuum, 100% O_2 and 100% CO_2) or increasing (100% CO followed by vacuum) overtime in the remaining treatments. Samples of the 100% O_2 treatment maintained a* values near that of the fresh loin only through the first five days of storage. Redness (a* value) improvement or maintenance in CO-based treatments is explained by the generation of the stable cherish-red MbCO pigment. Redness (a* value) behavior strongly influenced chroma (c*) and hue angle (h*) which, throughout the storage period, showed values most representative of redish-colored loins in those treatments employing CO. CLARK et al. (1976) reported that modified atmospheres containing as low as 0,5% CO lead to the stabilization of beef color for over 30 days of storage. SØRHEIM et al. (1999) also reported a cherish-red color and high stable a* values during 21 days of beef and pork storage (4°C) in an atmosphere containing approximately 0,4% CO + 60% CO_2 and 40% N_2. SØRHEIM et al. (1999) also noted that meat samples packaged in 70% O_2 + 30% CO_2 atmosphere kept their redness only until the third storage day. Decrease in a* value during a 22 day of pork storage (1°C) was also observed by SØRHEIM et al. (1996) in samples packaged in an atmosphere of 100% CO_2. Results from Principal Component Analysis evidenced the difference between the various atmospheres in the visual acceptance of the pork samples indicating that after 1 day of storage pork loins packaged under 99% CO_2 + 1% CO was preferred by a greater number of consumers. After 20 days, in accordance with the objective color data, the most accepted samples were those stored under this atmosphere as well as those that have been previously treated with 100% CO and then vacuum packaged.

Conclusions

CO based treatments were the most effective ones in keeping the desired red color of pork loin resulting in a color resembling that of fresh loins up to 20 days. The use of 99% CO_2 + 1% CO is suggested for pork packaging and storage as it maintained color values closer to those of the fresh pork throughout the storage time granting consumer acceptance using lower CO level. The other CO-based treatment should also be considered as it has the advantage of long term color stability and acceptance while having the advantage of producing packages allowing lower package volume and better transport capacities.

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Data

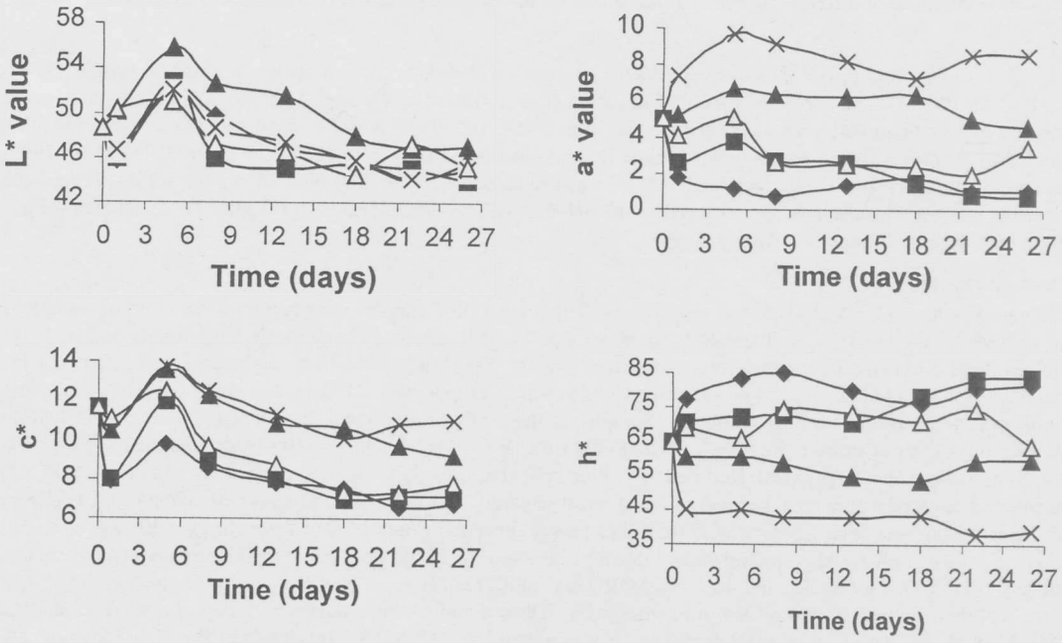

Figure 1 – Evolution of L*, a*, c* and h* values of pork loin packaged in different modified atmospheres and stored at 5 ± 0,5°C. (♦) vacuum; (■) 100% CO_2; (▲) 99% CO_2 + 1% CO; (×) 100% CO + vacuum; (△) 100% O_2.

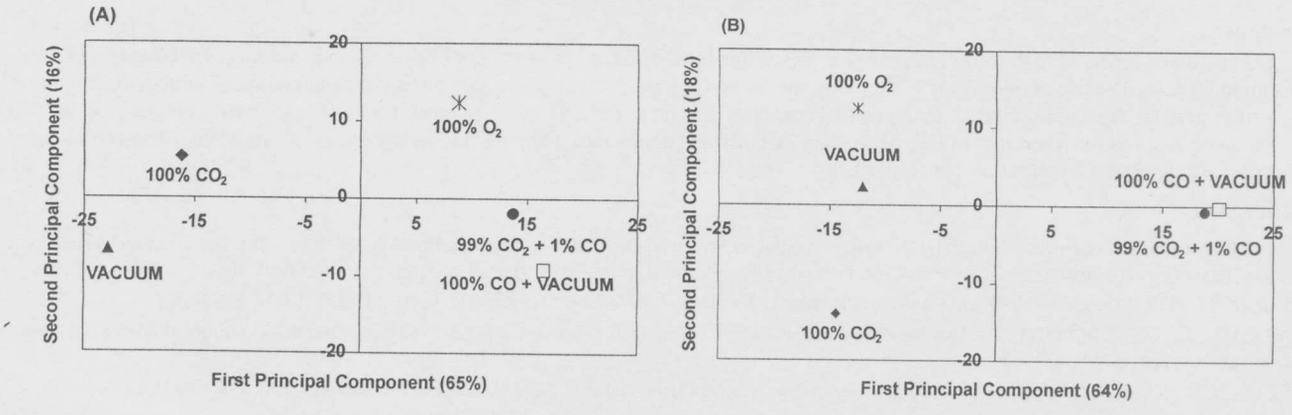

Figure 2 – Dispersion of pork loin samples relative to visual consumer acceptance after 1 (A) and 20 (B) days of storage. (♦) vacuum; (■) 100% CO_2; (▲) 99% CO_2+1% CO; (×) 100% CO + vacuum; (△) 100% O_2.