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ISOTHERMAL KINETICS OF MALONDIALDEHYDE CONTENT CHANGES IN CHICKEN MEATS

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Lipid oxidation is a classic parameter of meat quality evaluation, mostly when the composition of the meat is modified, even by modifying the animal's diet or by adding food supplements during post-slaughter meat processing. Malondialdehyde (MDA) is commonly accepted as the major lipid oxidation product in meat and considered as a terminal accumulating compound. It is generally measured together with the other coloured aldehydes resulting from lipid oxidation, with a global methodology called TBARS (thiobarbituric acid reactive substances) index. This index is expressed as equivalent MDA, considering MDA as the preponderant compound by way of a calibration using 1,1,3,3-tetramethoxypropane (TMP) or 1,1,3,3-tetraethoxypropane (TEP). For more precision, MDA is sometimes directly quantified by high performance liquid chromatography (HPLC). The TBARS index or MDA content are mostly measured on fresh meat, but several studies have focused on their changes during meat processing (storage, cooking or other processes). This study set out to characterize changes in MDA content during meat cooking. For this purpose, small samples (1.5 g) of ground chicken thighs were conditioned in plastic bags to form thin films of less than 0.5 mm. The plastic bags were then immersed in a water bath at different temperatures (50, 70 and 100°C) for different immersion times (from 0 to 30 min). Due to the very thin layer of meat, the temperature was considered as constant from the immersion time to the cooling time in an ice bath. MDA content was measured by HPLC. Different meat samples enriched with omega 3 poly-unsaturated fatty acids (transferred in the meat from a dietary flax seeds supplementation) were used to determine the differences in MDA content depending on the vitamin E and xanthophylls' contents in the diets administered to the chickens. The results showed that the appearance kinetics of MDA depended on the heating temperature. At 70°C, three phases were observed in MDA content change: first an increasing phase, then a plateau phase and finally a decreasing phase. At 100°C, the three phases also appeared but the results were more dispersed, probably because of contradictory MDA appearance and disappearance reactions at the same time. Finally, at 50°C, no modification on the MDA content was observed. So, the best temperature for studying MDA content changes during meat cooking was 70°C. It was selected to study differences between the meat sources. The diet composition had no effect on the kinetics of MDA content changes but it greatly affected the MDA contents. The highest MDA contents were determined in meats from chickens reared without a vitamin E dietary supplement.

Keywords: Oxidation, omega 3, chicken meat, malondialdehyde, kinetics

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