METHODOLOGICAL ASPECTS IN THE HEME IRON DETERMINATION IN RED MEATS

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Background

Most of the literature data regarding the iron content in meats and meat-based foods are generally referred to their total iron content, few data on their heme and non-heme iron composition are available (Carpenter & Clark, 1995). The reliability of the estimation of heme iron content in meat is an important task for monitoring its content in both raw and cooked meats and allows to evaluate the storage stability of meats and meat-based foods, being non-heme iron one of the major catalyst of lipid oxidation (Love & Pearson,1974).

Objectives

The aim of this study was to determine the best conditions for heme iron extraction and determination in raw and cooked red meat (beef loin), when the most often method referenced (Hornsey, 1956) is used.

Methods

Both raw and cooked beef loin samples were frozen, freeze-dried and grinded in a food processor to ensure a homogeneous and representative sample for chemical analysis.

Total iron: Analyses were performed by Atomic Absorption Spectrometer (Varian SpectrAA 40) on a graphite tube atomizer (GTA 96) under standard conditions and following liquid ashing of the samples (4ml HNO_3+1ml H_2O_2) in a microwave digestion system.

Heme iron: Analyses were carried out using the method described by Hornsey (1956), but critical factor such as HCl in extracting solution, sample weight, stirring initial time, developing color time in the dark, manual stirring time and centrifugation time were optimized as described in experimental design. For the heme pigments extraction and determination procedure a Box-Hunter design was followed and RSM used to find a relationship between factors and response.

Results and discussion

On the basis of the application of the RSM, which integrate the responses of the different variables considered in this study, %HCl (X1) and sample weight (X2) were the main critical factors influencing the effectiveness of heme pigments extraction from both raw and cooked meats. Our findings indicated that for these two main variables the maximum of heme pigment extracting ability was obtained for raw meat when X1 was 3.15% and X2 was 1.54g. Otherwise for cooked meat the best results were obtained when X1 was 2.54% and X2 was 1.14g. In conclusion the contemporary use of the Box-Hunter design and of RSM allowed to identify the best analytical conditions to be used in order to maximize heme pigments extraction for a quantitative determination of total heme pigments in red meats when the method of Hornsey (1954) is used.

Pertinent literature

Carpenter, C.E. & Clark, E. (1995) *J. Agric. Food Chem.* 43:1824-27.
Hornsey, H.c. (1956) *J. Sci. Food Agric.* 7:534-40.
Love, J.D. & Pearson, A.M. (1974) *J. Agric. Food Chem.* 22:1032-34.

Figure 1.- Computer-generated contour plot of the estimed HFe surface, locating the stationary point for raw (A) and cooked (B) meats.