New External Standard For Polyphosphates Determination In Meat Samples By 31p Nmr

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The phosphates are essential components of meat products due to their properties such as: pH control, reduction of the cook losses, improvement of the textural properties and colour development. Therefore data about the daily intake of this element from fresh meat and meat products is important from the dietary and human health point of view. Because the protein-rich food, such as meat, contains natural phosphorus compounds (nucleotides, phospholipids, etc.) along with naturally occurring orthophosphates, hence the direct determination of polyphosphates in meat products is difficult. Therefore different analytical techniques such as: ion chromatography (IC), capillary electrophoresis (CE), spectrophotometry (UV-VIS), combination of enzymatic and colorimetric were used for mono-, di-, and polyphosphates determination in solution. Unfortunately, methods of polyphosphates determination in food sample were not explained clearly and most of these techniques were too complex to apply in a standard laboratory conditions. Therefore it would be beneficial for quality control laboratories to elaborate simple and accurate technique to determine the amount of the added phosphates.

The usefulness of $^{31}$P NMR technique using Methylene phosphonic Acid (MDPA) as external standard was examined for analysis of selected polyphosphates in meat and meat products.

Raw pork meat was purchased from local slaughterhouse and meat products from local market. Prior to the analysis, pork meat was spiked with the known amount of one of the examined four phosphates. The samples were minced, homogenized and extracted with redistilled water using an orbital shaker for 60 min. The extracts were separated using centrifuge at 9000 rpm for 30 min, followed by filtration. $^{31}$P NMR spectra were recorded at 80.96 MHz on a Varian Gemini - spectrometer in 5 mm diameter tube and on a (300 MHz Bruker Avance: pulse 24.3 degree, acquisition time 1 sec, 196 repetitions) against MDPA.

Calibration curves were constructed using six standard solutions for each the phosphate salt ($\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$, $\text{K}_4\text{P}_2\text{O}_7$, $\text{Na}_5\text{P}_3\text{O}_{10}$, $\text{Na}_3\text{P}_3\text{O}_{9}$ and $\text{KH}_2\text{PO}_4$) in six repetitions. Calibration points were established by measuring the NMR peaks area (PA) using procedure available in program MestReC versus standard concentration.

The obtained results were compared with $^{31}$P NMR method using $\text{H}_3\text{PO}_4$ as internal standard and official spectrophotometric method of phosphorus determination (PN-ISO 13730, 1999).

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