Determination of protoporphyrins in ham samples using UHPLC

Claudia Giménez Campillo[1], Natalia Campillo[1], Marta Pastor-Belda[1], Natalia Arroyo-Manzanares[1], Juan de Dios Hernández[2], Isidro Guillén[2], Pascuali Vizcaíno[2], Ignacio López-García[1] and Pilar Viñas[1]

[1] Department of Analytical Chemistry, Faculty of Chemistry, Regional Campus of International Excellence "Campus Mare-Nostrum", University of Murcia, Murcia, Spain

[2] Productos del Sur S.A. (Prosur), Av. Francisco Salzillo, P/27-2, 30169 San Ginés, Murcia, Spain

Nitrites and nitrates are added to meat products to develop colour, stop the growth of harmful bacteria and improve flavour. However, these additives have some toxicity and could give rise to potentially carcinogenic compounds, such as N-nitrosamines [1]. Traditionally, it was believed that the only responsible for the attractive red colour of meat was myoglobin formed from the addition of nitrite, but new recent trends have shown that the responsible for the red colour of Parma ham is zinc(II) protoporphyrin IX (Zn(II)PPIX). Protoporphyrins are organic compounds consisting of four pyrrole rings linked by methane bridges. The formation of Zn(II)PPIX in ham is unknown and it appears together with other protoporphins biochemically interrelated to it, such as hemin and protoporphyrin XI (PPIX) [1].

The objective of this work is the development of an analytical method for the determination of four protoporphyrins (hemin, heme, PPIX and Zn(II)PPIX) in different type of meat products. The proposed method is carried out by weighing 2 g of ground sample and 1.5 mL of ethyl acetate:acetic acid (3:1) as extractant solvent. The mixture is centrifuged and the extract is filtered and injected (20 µL) in an UHPLC-Q-TOF-MS using electrospray ionization in positive mode. Other detectors such as diode-array and fluorescence were also used. The method was validated by obtaining parameters of linearity, limits of detection and quantification, selectivity, precision and accuracy, and different type of meat products were analysed. Zn(II)PPIX was detected in higher concentration in the meat samples processed in the absence of nitrites, thus demonstrating the inhibition of the formation of this protoporphyrin in the presence of these compounds.

References

1. Wakamatsu, J. I., Kawazoe, H., Ohya, M., Hayakawa, T., & Kumura, H. (2020). Improving the color of meat products without adding nitrite/nitrate using high zinc protoporphyrin IX-forming microorganisms. Meat science, 161, 107989.

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