



Kądziołka-Gaweł, M. and Wojtyniak, M. (2026)
'Identification of iron in foods: Mössbauer spectroscopy study',
Journal of Elementology, 31(1), ,
available: <https://doi.org/10.5601/jelem.2025.30.4.3674>



RECEIVED: 7 October 2025

ACCEPTED: 11 December 2025

ORIGINAL PAPER

Identification of iron in foods: Mössbauer spectroscopy study

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Abstract

Iron is a multifunctional trace element that plays a key role in the growth and development of the human body at all stages of its life. This element is a nutrient that the human body cannot synthesize and must be obtained through food. Iron deficiency develops when the amount of iron in the diet is insufficient, leading to anemia and other pathological changes in the body. Iron is an essential ingredient in many food products, and with a measure of willingness, it is possible to ensure an adequate intake of this element. Limited research has examined the mineral content of plant or animal-based foods, especially iron. For this reason, this paper used Mössbauer spectroscopy and X-ray fluorescence methods to examine the concentration and properties of iron in foods. The results of studies using Mössbauer spectroscopy present the chemical states of iron naturally occurring in food products. Such studies have not been conducted before. The content of other essential micro- and macronutrients for our body, such as zinc, potassium, magnesium, and calcium, was also determined. Such knowledge is particularly relevant in the current environment, with an increasing number of people adopting a plant-based diet. Our research is based on products readily available in supermarkets or butcher shops. Among others, we used products such as black olives, soybeans, pumpkin seeds, beef, pork, and poultry liver. The research shows that just 100 grams of animal products provide an adequate daily dose of iron. The iron in these products is primarily heme iron, with only beef spleen, pork spleen, and pork liver containing nonheme iron. The plant-based products studied should not be considered a sufficient source of this element in the daily diet. However, these products contain significantly more magnesium and calcium than animal products.

Keywords: dietary iron, iron content, heme and nonheme iron, animal products, plant products, Mössbauer spectroscopy