Comparative studies of selected minerals in the skeletal muscles of fallow deer (Dama dama) and red deer (Cervus elaphus) from the ecological rearing system

Janusz Kilar[1], Anna Kasprzyk[2]

[1] Institute of Agricultural and Forest Economy, Jan Grodek State University in Sanok 21 Mickiewicza St., 38-500 Sanok, Poland
[2] Institute of Animal Breeding and Biodiversity Conservation, University of Life Sciences in Lublin 13 Akademicka St., 20-950 Lublin, Poland

Introduction: The close relationship between the nutrition and human health confirmed by scientific research prompts consumers to eat organic food. The aim of the research was to identify and evaluate the determinants of the Ca, Mg, Zn, Fe, Cd and Pb content in longissimus lumborum (LL) and semimembranosus (SM) muscles of fallow deer and red deer from the ecological breeding system.

Materials and methods: The research material consisted of 12 samples of longissimus lumborum and semimembranosus muscles incised from the right half-carcasses of fallow deer and red deer. Both groups of animals comprised 6 ♀ and 6 ♂. The fallow deer were ca. 18 and 30 months old, and the deer were ca. 32 and 44 months old. The farms had an appropriate certificate of organic farming. The pastures for the fallow deer were covered by 191 plant species, whereas 108 species were identified in the fallow deer feeding ground. The concentration of basic minerals (Ca, Mg, Zn, Fe,) was determined by means of atomic absorption spectrometry (AAS) (Varian SpectrAA 280 FS spectrometer). The samples of organs for determining minerals were subjected to wet mineralization in accordance with AOAC(2000) 986.15. To determine the concentration of Cd and Pb the solutions were analysed on an inductively coupled plasma mass spectrometer (ICP Mass Spectrometer Varian MS-820). Results were expressed as mg/kg of base wet weight. One-way and three-way analysis of variance, cluster analysis with the Ward agglomeration method, Fischer-Snedecor F test, NIR test were used to analyze the statistical results. Differences were considered significant at $p \leq 0.05$. The calculations were made in the STATISTICA 13.1 program.

Results: In the fallow deer, the mean Ca content was 154.75 mg/kg in LL and 95.27 mg/kg in SM (p=0.000). In the red deer, LL and SM contained 96.46 mg/kg and 129.69 mg/kg of Ca, respectively (p=0.000). The Zn content was significantly higher in LL of both species (fallow deer: 45.83 mg/kg; red deer: 49.92 mg/kg). The contents of Mg and Fe were not correlated significantly with the type of muscle. However, the levels of Mg and Fe in the fallow deer were higher in MS by 14.50 mg/kg and 2.08 mg/kg, respectively. In the red deer, the content of Mg was by 7.00 mg/kg higher in SM, while the amount of Fe was by 5.00 mg/kg higher in LL. The analyzed variability factors (muscle, sex, age) exerted the strongest effect on the Mg content. The cluster analysis identified four segments of the fallow deer meat and five segments of the red deer meat that differed significantly in the Ca, Mg, Zn, and Fe profiles. Cd was detected in only two samples of the fallow deer meat and in one sample of the red deer meat, but its content did not exceed 0.007 mg/kg. In turn, Pb was present in only three samples of the fallow deer meat and in two samples of the red deer meat, and its concentration did not exceed 0.026 mg/kg.

Conclusions: The content of Ca, Mg, and Fe was higher in the organic fallow deer meat, whereas the organic red deer meat was characterized by higher Zn levels. A particularly valuable Ca, Mg, and Fe profile was determined in the SM of fallow deer females.

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