

# Mineral fertilization and trace element content in the milk thistle achenes (*Silybum marianum* (L.) Gaertner)

Nawożenie mineralne a zawartość pierwiastków śladowych w niełupkach  
ostroprestu plamistego (*Silybum marianum* (L.))

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The aim of the research was to estimate an influence of mineral fertilization on the content of trace elements in milk thistle achenes. The research with domestic population of this plant was carried out in years 2009–2011. The research was based on a field experiment set up in a completely randomized design with three repetitions. The experiment was run at the Experimental Station in Tomaszkowo, which belongs to the University of Warmia and Mazury in Olsztyn. Milk thistle were grown on arable land of higher medium quality (R IVa), on dystrophic brown soil (dystric Cambisol) developed from loamy sand.

The soil had the following characteristics: pH 5.32-5.70 in 1 mol KCl dm<sup>-3</sup> extract and levels of available minerals P – 69–72; K – 82–90; Mg – 38–48 mg kg<sup>-1</sup>. The content of available forms of trace elements, was as follows: 0,33–0,42 mg B kg<sup>-1</sup> (hot water soluble) and Cu – 0.90–1.05; Zn – 4.50–5.59; Mn – 110–139 mg kg<sup>-1</sup> in 1 mol HCl dm<sup>-3</sup> extract. With the background of constant fertilization with phosphate (40 kg P kg ha<sup>-1</sup> as triple superphosphate) and potassium (117 kg K ha<sup>-1</sup> as 60% potassium chloride), we analysed the effect of fertilization with nitrogen (0; 40; 80 and 120 kg N ha<sup>-1</sup> as ammonium sulphate) and magnesium (20 kg Mg ha<sup>-1</sup> as kieserite) and boron (150 g B ha<sup>-1</sup> as Bormax).

During the harvest, the yield of milk thistle achenes was determined, and samples were taken for the purpose of chemical analysis. Dried and ground plant material was subject to wet mineralization in a mixture of nitric(V) and chloric(VII) acid (at a ratio of 4:1), with an addition of hydrochloric acid. The content of Cu, Zn, Mn, Cr, Cd and Ni was determined using the atomic absorption spectrophotometric method using an AA-6800 Shimadzu instrument. In order to determine the content of boron, the plant material was subject to dry mineralization (550°C) in the presence of calcium oxide, and the ash was dissolved in a 0.5 mol HCl dm<sup>-3</sup>. The boron content was determined colorimetrically using azomethine-H.

The average content of microelements and trace elements was as follows: Cu – 7.26; Zn – 61.53; Mn – 34.32; B – 26.30; Ni – 5.27; Cr – 8.85 and Cd – 0.115 mg kg<sup>-1</sup> d.m. The divergent weather conditions in each year of research were the most important factor influencing differentiation of the concentration of the elements. Increase of nitrogen dose resulted in decreasing content of copper and cadmium but did not have unambiguous influence on concentration of boron and manganese. The amount of zinc, nickel, and chromium in the milk thistle fruits was independent on nitrogen dose. The fertilization with magnesium only in a slight degree influenced on an increase in content of manganese as well as chromium and cadmium, and at the same time lowered the amount of boron. Due to the fertilization with boron, the content of this element in milk thistle achenes increased and at the same time the concentration of cadmium and manganese decreased.