

The influence of micro-fertilizer application on micronutrients offtake by maize

Wpływ stosowania mikronawozów na wyprowadzanie mikroelementów z plonem kukurydzy

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The aim of this study was to evaluate the effect of the new NPS fertilizer with boron, copper and zinc addition on micronutrients concentration in biomass and their offtake in maize yield. A field trial was conducted in 2015 in the Experimental Station of IUNG-PIB in Grabów (Mazowieckie). Mineral fertilizer containing micronutrients was applied to the soil simultaneously with maize seeds sowing. In the experiment, two doses of fertilizer were applied: an equivalent to 80 and 120 kg N ha⁻¹. Corresponding doses of micronutrients were equal to: B – 0.24 and 0.36; Cu – 0.60 and 0.90; Zn – 1.20 and 1.80 kg ha⁻¹. Application of micronutrients in fertilizers resulted in an increase of their concentration in the straw, and in the case of zinc also in maize grain. Boron and copper concentration in the straw increased by 16 and 11% respectively. A concentration of zinc in the straw increased by 70 and by 20% in grain. The increase of Cu and Zn concentration in biomass was influenced by a higher dose of fertilizer. Micro-nutrients application did not influence boron offtake (Tab. 2). The application of a higher dose of fertilizer resulted in increasing of copper and zinc offtake by 22 and 60% respectively.

Table 1. Micronutrients content in the straw and grain of maize (mg kg⁻¹)

Experimental factor	Straw			Grain		
	B	Cu	Zn	B	Cu	Zn
Micro-fertilizer application						
No	7.4	3.6	25.8	3.4	0.9	17.3
Yes	8.6	4.0	44.1	2.0	0.9	20.8
Micro-fertilizer rate						
Lower	8,8	3,6	25,3	3,7	0,9	18,9
Higher	7,3	4,0	44,5	1,6	0,9	19,2

Table 2. Micronutrients offtake (g ha⁻¹)

Experimental factor	Straw			Grain			Total (straw + grain)		
	B	Cu	Zn	B	Cu	Zn	B	Cu	Zn
Micro-fertilizer application									
No	44.7	21.9	160.7	18.7	5.3	98.1	63.3	27.2	258.8
Yes	51.1	23.5	263.4	9.5	4.3	99.8	60.6	27.8	363.2
Micro-fertilizer rate									
Lower	49.3	19.9	141.2	19.8	4.7	97.5	69.1	24.7	238.7
Higher	46.4	25.5	282.9	8.4	4.8	100.5	54.8	30.3	383.3

Application of micro-fertilizer resulted in increasing of boron, copper and zinc concentration in the straw of maize. In the case of maize grain, only zinc concentration was significantly modified. Boron offtake was not influenced by fertilization. Application of higher dose of fertilizer increased copper offtake by 22% and zinc offtake by 60%. The maximum micronutrient offtake in the conditions of presented experiment was equal to 69 g B, 30 g Cu and 383 g Zn per 1 ha.

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