Effect of different mineral fertilization rates on zinc management in maize

Wpływ różnych dawek nawożenia mineralnego na gospodarkę cynku w kukurydzy

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Evaluation of zinc and other micronutrient nutritional status in maize at the critical growth stages is an important diagnostic and prognostic factor that plays a substantial role in shaping its final yield. A hypothesis was verified that the application of different phosphorus and potassium fertilization rates affected zinc nutritional status in maize at the critical growth stages: leaf development (BBCH 17) and flowering (BBCH 65), as well as zinc accumulation at the stage of ripening (BBCH 89, fully ripe). A single factor field study was conducted during 5 subsequent vegetation seasons (2007–2011). The obtained results showed that mineral fertilization significantly increased zinc concentration in maize leaves at BBCH 17 and BBCH 65 growth stages. Regardless of experimental factor effects, Zn leaf content in maize at both critical growth stages was much below the normative value. Even though zinc concentration observed at the stage of leaf development was low, no significant relationship was found between zinc nutritional status in maize at that time and the obtained grain yield. Stronger relationships between maize zinc nutritional status and grain yield were observed at maize flowering stage. The total accumulation of zinc in maize was significantly differentiated by the experimental factor. The chemical form of phosphorus applied had no significant effect on Zn contents in maize at the critical growth stages as well as on the accumulation of this nutrient in fully ripe plants. ZnHI value obtained in the control treatment was 51.7%, whereas the values obtained in fertilizer treatments were higher and ranged from 52.9% (W100 PAPR – with partially acidulated phosphate rock) to 57.3% (W25–25% of K and P recommended rate). Correlation analysis on maize yield and zinc accumulation showed that yield quantities were determined the most by zinc accumulation in maize vegetative organs (especially husk leaves).