

Title The foliar uptake of micronutrients
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Abstract

In leafy vegetables the content of minerals assists the nutritional state of the consumers and by it the health status of body and mind. Foliar fertilization of micronutrients was thought to increase the mineral content of vegetables. The application of additional potassium should promote the uptake due to its part in stomatal regulation. Eichert and Burkhardt (2001) showed that stomatal uptake of solutes increased with humidity, stomatal aperture and stomatal density. We measured the foliar uptake and effect of a single application of K^+ (2500 g ha^{-1}) and two blends (m1, m2) of Boron, Manganese and Zinc (g ha^{-1} , m1: 150/250/210; m2: 300/500/420) on nutritional status and stomatal conductance of *Spinacia oleracea* in a field experiment. Leaf fertilization is often combined with the compelling application of an insecticide, therefore two plots were additionally treated with the insecticide Decis (7.5 g ha^{-1}). Like most of the insecticides (and fungicides), Decis lowered the stomatal conductance by 32 to 42% on the 5th day after application. Measurements of stomatal conductance following the application K^+ +m1 showed no influence of potassium on stomatal conductance and did not enhance the mineral content of leaves. After the application of m2 the content of B (+50%) and Mn (+33%) were significantly enhanced but the Zn content was not altered. Anatomical studies showed that guard cells on adaxial surface of spinach leaves are in a raised position surrounded by grooves, where epidermis cell walls are rich in ectodesmata. Supposing stomata are open, the liquid film with minerals might be concentrated in these grooves. Even considering this our data strongly support the conclusion that the uptake of minerals from the leaf surface occurs predominantly via channels in the cuticle, depending on the concentration of minerals in the aqueous blend