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POTASSIUM REPLACEMENT BY SODIUM IN DIFFERENT SUGAR BEET FERTILIZING SYSTEMS

Remplacement du potassium par le sodium dans différents systèmes de fertilisation de betteraves sucrières / Ersatz von Kalium durch Natrium in verschiedenen Zuckerrüben-Düngesystemen

ABSTRACT

Sodium is an unique element required only by a few crops, including sugar beets. Its physiological functions are weakly recognized, but it is supposed that sodium can replace, to some extent, potassium. The formulated hypothesis assumes a lack of differences in yield, and its quality between K fertilized plants and those with an increasing contribution of Na. Field experiments were conducted in 2010, 2011, 2012 in four locations, differing in soil fertility level. The experimental concept relied on applying cations in the total rate of 3205 moles per ha, differing in share structure. The five treatments were as follows: i) NP, ii) NPK (as muriate of potash, 100% K), iii) K as Korn-Kali (K_2O: MgO: Na as 13.3: 2: 1), iii) NPK, K as Kainite (0.56: 0.25: 1), v) NPK, K as a mixture of Korn-Kali and Kainite (1.94: 0.44: 1). All fertilizers were applied in the preceding autumn. Soil K fertility level, as measured by its available content in spring was high. Content of attainable sodium was variable, and the highest was noted for the Kainite plot. The nutritional status of beets, determined at full rosette stage, did not show a high response to tested treatments, except Kainite. In this treatment, a sodium/potassium antagonism was observed. Yields of storage roots were high, but year and site specific. The assumed hypothesis was fully validated for the mixture of Korn-Kali and Kainite. Plants fertilized with more sodium than potassium showed the highest year-to-year variability both in yield of storage roots and white sugar. The main reason of lower yield of sugar was both a slightly reduced yield of beet and an increased concentration of melassogenic substances, mainly sodium but also α-ammino nitrogen. It can be concluded that in sugar beet growing areas with frequently occurred drought it was rational to replace potassium, to some extent, by sodium.