

## Grzegorz Witek

### PhD thesis title: **Analysis of the effectiveness of innovative foliar fertilization technologies in sugar beet production**

#### **Summary:**

The study presents the results of a three-year, controlled micropot experiment on foliar fertilization of sugar beets. The experiment was conducted from 2015 to 2017 in two locations: Buszkowice in the Podkarpackie Voivodeship (Location 1 - L1) and Brożec in the Opolskie Voivodeship (Location 2 - L2). The experiment included seven levels of foliar fertilization with four replications. The experimental factor was foliar fertilization using selected fertilizer formulations. The following fertilization levels were tested:

P1: Control – no foliar fertilization

P2: 1,000 g B·ha<sup>-1</sup> (fertilizer product 1)

P3: 2,000 g B·ha<sup>-1</sup> (fertilizer product 1)

P4: 60 g B·ha<sup>-1</sup>, 4 g Cu·ha<sup>-1</sup>, 120 g Fe·ha<sup>-1</sup>, 80 g Mn·ha<sup>-1</sup>, 1g Mo·ha<sup>-1</sup>, 40 g Zn·ha<sup>-1</sup>, 60 g Na·ha<sup>-1</sup> (fertilizer product 2)

P5: 120 g B·ha<sup>-1</sup>, 8 g Cu·ha<sup>-1</sup>, 240 g Fe·ha<sup>-1</sup>, 160 g Mn·ha<sup>-1</sup>, 2 g Mo·ha<sup>-1</sup>, 80 g Zn·ha<sup>-1</sup>, 120 g Na·ha<sup>-1</sup> (fertilizer product 2)

P6: 180 g Ca·ha<sup>-1</sup> (fertilizer product 3)

P7: 360 g Ca·ha<sup>-1</sup> (fertilizer product 3)

The doses of individual fertilizer components were provided in terms of pure substance. The analysis of the obtained results revealed that foliar fertilization had an impact on the yield of sugar beet roots. The highest yields were obtained in the experimental variant P5 at location L1, where a comprehensive fertilizer was applied. The sucrose content in the pulp of sugar beet roots was closely related to the applied dose of multicomponent fertilizer. The highest sucrose content was recorded in the case of sugar beet plants fertilized with a dose of 4 kg·ha<sup>-1</sup> (variant P5). The use of foliar fertilization with a multicomponent product resulted in the highest biological and technological sugar yields. The application of 4 kg·ha<sup>-1</sup> (variant P5) of fertilizer containing 120 g B·ha<sup>-1</sup>, 8 g Cu·ha<sup>-1</sup>, 240 g Fe·ha<sup>-1</sup>, 160 g Mn·ha<sup>-1</sup>, 2 g Mo·ha<sup>-1</sup>, 80 g Zn·ha<sup>-1</sup>, 120 g Na·ha<sup>-1</sup> led to an 11.5% increase in the average biological sugar yield and an 11.1% increase in the technological sugar yield compared to the yields obtained for the control variant.

An analysis of the profitability of sugar beet production using multicomponent foliar fertilizer at a dose of  $4 \text{ kg}\cdot\text{ha}^{-1}$  (fertilizer variant P5) demonstrated the highest economic production effect. The analysis did not include a bonus for the sale of sugar beet roots due to a higher sucrose content than the declared level of 16%.