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Foliar nutrients enhance physiological responses and yield of maize (*Zea mays* L.) under drought at tassel initiation

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Abstract

Drought stress at the reproductive stage significantly reduces the yield and quality of maize. Thus, this study aimed to evaluate the physiological responses and yield of maize following foliar applications of K, Ca, and Zn under drought stress conditions, prior to the critical tassel initiation stage. The experiment was arranged in a Randomised Complete Block Design (RCBD) with four replications. The eight treatments were as follows: T1: Well-watered control; T2: Drought stress at tassel initiation; T3–T4: Foliar K^+ at 2 % and 4 %; T5–T6: Foliar Ca^{2+} at 0.1 % and 0.2%; and T7–T8: Foliar Zn^{2+} at 0.3 % and 0.6 % at the critical tassel initiation stage under drought conditions. Physiological responses, including net photosynthetic rate (Pn), transpiration rate (E), and stomatal conductance (g_s) were maintained under drought stress conditions through foliar applications of T3 and T4 treatments. Furthermore, T3 and T4 treatments significantly increased the total soluble sugar content in the silks, while decreasing proline content in the silks under drought stress conditions. Moreover, compared to the well-watered control (T1), yield under drought stress was effectively maintained in the T3, T4, T7, and T8 treatments. Correlation analysis revealed that yield was significantly and negatively correlated with proline content in the silks. Specifically, an increase in yield, g_s, and E was associated with a decrease in silk proline content. In conclusion, T3 and T4 treatments effectively induced physiological responses in maize under drought conditions, thereby maintaining yield. These treatments reduced the proline content in the silks. Furthermore, they maintained g_s and E under stress.

Keywords: Drought stress, foliar nutrient application, maize, physiological responses, yield

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