

## ZINC DEFICIENCY RESPONSE OF SORGHUM, WHEAT, AND CORN

B.G. Hopkins\*, V.D. Jolley\*\*, D.A. Whitney\*\*\*. and R.L. Lamond\*\*\*  
U. Idaho\*, Brigham Young U.\*\*, and Kansas State U.\*\*\*  
[bhopkins@uidaho.edu](mailto:bhopkins@uidaho.edu)

### Abstract

Zinc (Zn) deficiency in corn (*Zea mays* L.) is more common than in sorghum (*Sorghum bicolor* (L.) Moench) or wheat (*Triticum* sp.). The ability of wheat to withstand low soil Zn conditions is related to increased release of phytosiderophore, a natural chelate, from its roots. The reasons for sorghum's ability to utilize low levels of soil Zn have not been adequately explored. The objective of this research was to: 1) ascertain if Zn deficiency can be induced with sorghum, wheat, and corn grown in a chelator-buffered nutrient solution, 2) determine if sorghum, wheat, and/or corn increase root exudation of phytosiderophores under Zn deficiency conditions, and 3) compare sorghum with corn and wheat with respect to Zn deficiency and phytosiderophore release. Sorghum, wheat, and corn were grown hydroponically in the greenhouse with a chelator-buffered nutrient solution designed to induce Zn deficiency while supplying adequate amounts of other nutrients. Root exudates were collected to measure phytosiderophore release from the roots of these crop species. Shoot Zn concentration and shoot and root dry matter yields were determined. The results of this study show that the chelator-buffered nutrient solution technique is effective for inducing Zn deficiency in sorghum, wheat, and corn. All three species showed Zn deficiency as evidenced by: 1) reduced shoot and root dry matter yield, 2) shortened internodes, 3) reduced shoot Zn concentration, and 4) plant Zn concentrations below the suggested critical values for these species. Sorghum and wheat plants increased the release of phytosiderophore in response to Zn deficiency, but corn did not. The total amount of phytosiderophore released by the roots decreased in the order wheat > sorghum >> corn. The absence of a "phytsiderophore" response to Zn deficiency of corn, coupled with the evidence that this species requires, or at least accumulates, more Zn than wheat or sorghum, provides an explanation as to why Zn deficiencies are more prevalent for corn than wheat or sorghum. These findings are supported with field studies showing that wheat and sorghum can withstand much lower levels of "bioavailable" zinc determined by the DTPA soil test as compared to corn.

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Program Chair:

**Larry Bundy**  
**University of Wisconsin**  
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