

# Importance of Zinc in the Brazilian Agribusiness

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## INTRODUCTION

The essentiality of Zn for plants was established by Chandler et al. (1931) about 70 years ago. Zinc deficiency was identified in some places of the world 30 years ago. Brazil depends exclusively on imports of minerals and Zn concentrates, the former especially from Peru, to attend its needs, including the supply of the fertilizer industry.

## METHODS

In Brazil, the areas of “cerrado”, the last agricultural frontier (2.04 million km<sup>2</sup>), are deficient in Zn and in other elements. This fact limits productivity and quality of the seeds resulting in negative effects on human and animal nutrition.

## RESULTS AND DISCUSSION

### Zinc in Plants

Zinc deficiency lowers the levels of indole acetic acid (IAA), protein, charger membrane and protein stability, reduces the dissipation of superoxide radicals, thereby causing damage to protein and cell membranes. Photosynthesis and food quality are reduced. Death may occur when the deficiency is acute.

### Zinc in Soil

Zinc available to the crop is in soil solution (intensity factor), that is directly dependent on the amount of Zn in the solid phase (quantity factor) and the soil capacity to transfer Zn from the solid phase into solution in a given period of time. It is known that 60% of the contact takes place by diffusion. For this reason, Zn has to be placed near the seed or the plant.

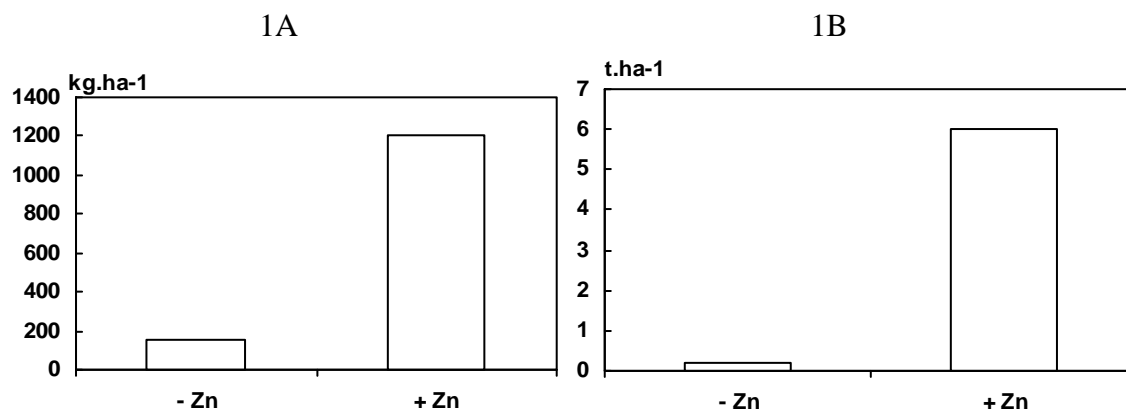
The main factors are associated with deficient soils derived from poor parent materials, including those found in the “cerrado” (Haplodox, Ultisols, Entisols), where Galvão (1986) obtained spectacular responses in rice and corn (Figures 1a and 1b) on soils with neutral or higher pH; either naturally or induced by liming, on flooded soils with lower layers brought up to the surface and no till planting with excess phosphate fertilizer.

### Zinc Sources

Zinc sources used in Brazil are mainly sulfate, oxide oxisulfate and chelates. There are several application ways for planting furrows of annual crops. These are foliar sprays, seed and stool treatments, irrigation water, and broadcasting and turning Zn in. Zinc can be added to superphosphate and then mixed with other fertilizers. Incorporation into granules or coating are also used. Rates vary according to plant needs, soil levels, and the sources and methods of application. When broadcasted, in the lasting corrective fertilization, 2 and 4 kg of the element are used in sand and heavy soils, respectively. In planting furrows, the doses are lower. Zinc sulfate and Zn chelate are used in perennial crops, especially the former. To increase uptake, 0.25% KCl is usually added to the ZnSO<sub>4</sub> solution. In the case of seed treatments and of sugarcane stools, doses are much lower.

## Recommendation

The main criteria for Zn recommendations are visual, leaf, and soil analysis and a “good sense”, especially for responses with corrective management and established no-till planting. In Brazil, the critical soil level of Zn is 1,2 (DTPA extraction) and 1,6 (Melich-1 extraction)  $\text{mg dm}^{-3}$ .



**Fig. 1. Response of rice (1A) and corn (1B) to Zn application in “cerrado” soil of Brazil.**

## Balance of Fertilization with Zinc

In Brazil, the estimated export of Zn by the main 16 crops is 14,761 t Zn. The need of Zn for fertilization is 59,046 t of Zn (considering an efficiency of 25% in the application year). The consumption in 2005 was 21,600 t. Therefore, there is a negative balance of 37,446 t of Zn.

## ACKNOWLEDGEMENTS

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