Effect of Zinc Source and Application Time on Zinc Uptake and Grain Yield of Flood-Irrigated Rice

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Received for publication May 1, 2004. Zinc is the most common micronutrient fertilizer applied to rice (Oryza sativa L.) in the USA. Preventing yield limitations from Zn deficiency requires knowledge of the proper application rates and times of commercial Zn fertilizers. The objective of this research was to evaluate the Zn nutrition and grain yield response of rice as affected by Zn-fertilizer source and application time. Four field trials were conducted to evaluate several Zn sources applied preplant incorporated (PPI), delayed preemergence (DPRE), and postemergence (POST) before flooding at the four-leaf stage. Zinc treatments included Zn solutions sprayed at 1.1 to 2.2 kg Zn ha⁻¹ and dry-granular Zn fertilizers broadcast at 11.2 kg Zn ha⁻¹. Zinc-fertilizer source, averaged across application times, significantly affected grain yield at all sites with Zn fertilization increasing yields by 12 to 180% compared with the unfertilized control. Zinc-application time, averaged across Zn sources, significantly affected grain yield at only one site, which had severe Zn deficiency. Zinc applied PPI (6915 kg grain ha⁻¹) and DPRE (7456 kg grain ha⁻¹) produced similar yields that were greater than Zn applied POST (5526 kg grain ha⁻¹). Zinc solutions sprayed at 1.1 to 2.2 kg Zn ha⁻¹ generally produced yields that were comparable with yields from granular fertilizers applied at 11.2 kg Zn ha⁻¹. Fertilization recommendations should reflect the advantages of Zn fertilization performed before crop emergence. Growers can confidently apply Zn fertilizer solutions or granules to the soil surface without incorporation before emergence, with recommended rates (11 kg Zn ha⁻¹) of granular Zn preferred for alkaline, Zn-deficient soils.

Abbreviations: DPRE, delayed preemergence • LIN, Lincoln County • LIN00, Lincoln County in 2000 • POST, postemergence • PPI, preplant incorporated • PTBS, Pine Tree Branch Station • PTBS00, Pine Tree Branch Station in 2000 • RREC, Rice Research Extension Center • RREC01, Rice Research Extension Center in 2001 • RREC02, Rice Research Extension Center in 2002 • ZnEDTA, zinc ethylenediaminetetraacetic acid • ZnOxS, zinc oxysulfate • ZnSO, zinc sulfate

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