

## 土施和喷施锌肥对冬小麦子粒锌含量及生物有效性的影响

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## Effects of soil and foliar applications of Zn on winter wheat grain Zn concentration and bioavailability

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**摘要** 为揭示潜在性缺锌土壤上不同施锌方式对小麦子粒锌含量及其生物有效性的影响,选用5个冬小麦品种进行了土施和喷施锌肥的田间裂区试验。结果表明,供试土壤条件下,不同施锌方式对小麦产量均无明显影响,但是在一定施锌方式下小麦子粒锌含量大幅度提高。与对照相比,土施、喷施及土施+喷施锌肥提高小麦子粒锌含量幅度分别为-6.1%、64%和83%,提高小麦子粒锌携出量幅度分别为-3.6%、69%和83%。3个施锌处理降低子粒中植酸含量的幅度分别为-2.4%、7.2%和1.5%,降低植酸与锌摩尔比的幅度分别为-25%、41%和44%,且不同品种之间也存在一定差异;虽然植酸与锌的摩尔比有所下降,但仍高于20。此外,单独土施锌肥虽可大幅度提高耕层土壤有效锌含量,但对子粒锌含量及生物有效性的影响很小。总之,在小麦生长后期喷施锌肥是提高潜在性缺锌土壤上小麦子粒锌含量和生物有效性较为经济的方式,对改善小麦锌营养品质有较好作用。

**关键词:** 锌肥 土施 喷施 锌含量 生物有效性 植酸

**Abstract:** A field experiment with a split plot design was conducted to investigate the effects of different Zn application methods (soil application or foliar spray) on grain Zn concentration and Zn bioavailability of 5 winter wheat cultivars in potentially zinc (Zn)-deficient calcareous soil. The results show that there are little effects of applying Zn fertilizer on grain yield of wheat, while the grain Zn concentration is significantly increased under certain methods of Zn application. Compared with the control treatment (no Zn application), the grain Zn concentrations are increased by -6.1%, 63.9% and 82.6% under the methods of soil application, foliar spray and soil+foliar application of Zn fertilizers, and the grain Zn uptakes are increased by -3.6%, 69% and 83%, respectively. The phytic acid concentrations are decreased by -2.4%, 7.2% and 1.5% and the phytic acids to Zn molar ratios are decreased by -25%, 41% and 44% of the three treatments, respectively, and there are differences of the phytic acid concentration and the ratio among wheat cultivars. Although the molar ratios of phytic acid to Zn are decreased by the Zn applications, the ratios are still higher than 20. The soil application of Zn can increase the content of soil DTPA-Zn significantly, while the effects of the soil application of Zn on grain Zn concentration and bioavailability are not significant. In conclusion, comparing with the 3 Zn application methods, the foliar application of Zn fertilizer to wheat at the late growth stage (for example, the milk and dough stage) is an economical and effective method to attain high Zn concentration and bioavailability, and to improve the Zn quality of wheat grain in potentially Zn-deficiency calcareous soil.

**Keywords:** zinc soil application foliar application Zn concentration Zn bioavailability phytic acid

Received 2010-01-11;

Fund:

教育部新世纪优秀人才支持计划(NCET-06-0866);国家自然科学基金项目(40971179)资助。

**引用本文:**

曹玉贤, 田霄鸿, 杨习文, 陆欣春, 陈辉林, 南雄雄, 李秀丽. 土施和喷施锌肥对冬小麦子粒锌含量及生物有效性的影响[J] 植物营养与肥料学报, 2010, V16(6): 1394-1401

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