

## 长期施肥对关中土微量元素有效性的影响

李志军, 李平儒, 史银光, 张树兰

西北农林科技大学资源环境学院, 陕西杨凌 712100

## Effects of long-term fertilizer management regimes on availability of soil micronutrient elements

LI Zhi-jun, LI Ping-ru, SHI Yin-guang, ZHANG Shu-lan\*

College of Resources and Environment, Northwest A &amp; F University, Yangling, Shaanxi 712100, China

摘要

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**摘要** 以28年的长期肥料定位试验为基础,探讨了对照不施肥(CK),单施有机肥( $M_2$ ),单施氮、磷肥( $N_2P_2$ ),有机肥+氮、磷肥配合施用( $M_2N_1P_1$ 和 $M_2N_2P_2$ )5个施肥处理对关中土微量元素Fe, Mn, Zn, Cu有效性的影响。结果表明,长期施肥对耕层土壤有效Fe, Mn, Cu, Zn含量影响较大,在耕层土壤(0—20cm)中,长期不施肥土壤有效Fe, Mn, Cu, Zn含量均处于亏缺边缘;长期单施氮、磷化处理的土壤Fe, Cu, Zn也接近亏缺边缘;而长期单施有机肥、有机肥与氮、磷化肥配合处理,土壤有效Fe, Mn, Cu, Zn含量丰富。与CK相比, $M_2$ 、 $M_2N_1P_1$ 、 $M_2N_2P_2$ 均可显著增加0—10 cm土层中有效Fe、Mn、Cu和Zn含量,10 cm以下土层中,土壤有效Fe、Mn、Cu、Zn在一定程度上也有增加趋势; $N_2P_2$ 也可增加0—10 cm土层中土壤有效Fe和Mn含量(有效Mn达到显著水平),有效Cu含量降低,对有效Zn含量没有影响,而10 cm以下土层中土壤有效Fe, Mn, Cu, Zn与CK无明显差异。因此,在不施用有机肥的情况下,应施用微肥以保证作物需求;即使施用有机肥,也应当适当补充铁肥和锰肥。有机肥和氮、磷化肥配合施用的土壤微量元素养分状况较好。

**关键词:** 长期施肥 关中平原 土 微量元素 有效性

**Abstract:** The effects of fertilizer management regimes on contents of soil available iron, manganese, zinc and copper in the ploughed layer (0-20 cm) and soil profile (0-60 cm) were investigated based on the 28-year long-term experiment on Lou soil in Guanzhong Plain, Shaanxi province, China. The fertilizer management regimes included: control without applying any fertilizers (CK), application of organic manure ( $M_2$ ), application of chemical nitrogen and phosphorus fertilizers ( $N_2P_2$ ), and application of nitrogen and phosphorus chemical fertilizers plus dairy manure ( $M_2N_1P_1$  and  $M_2N_2P_2$ ). The results show that in the ploughed layer the contents of soil available Fe, Mn, Cu and Zn under the CK and the contents of available Fe, Cu and Zn under the  $N_2P_2$  are close to be deficient, while in the  $M_2$ ,  $M_2N_1P_1$  and  $M_2N_2P_2$  treatments, trace elements are in abundance. In term of the spatial variation in the soil profile, compared to the CK, the  $M_2$ ,  $M_2N_1P_1$  and  $M_2N_2P_2$  can significantly increase the contents of iron, manganese, zinc, copper in 0-10 cm layer and also have the increasing trends in soil available contents of Fe, Mn, Cu and Zn at layers below 10 cm. The  $N_2P_2$  application could increase available contents of Fe and Mn in 0-10 cm layer, and has no effects on the soil available Zn, and decrease the content of available Cu relative to the CK. However, the effects of the  $N_2P_2$  treatment on soil available Fe, Mn, Cu and Zn at deeper layers are not significant. According to the results, it is suggests that without applied any fertilizer or only applying N、P fertilizers, micro-element fertilizers should be appropriately applied to meet the need of crop growing, while only applying organic manure as this experiment, certain iron and manganese should be applied. The application of nitrogen and phosphorus chemical fertilizers plus dairy manure could meet requirement of micronutrients under winter wheat-summer maize cropping system on Lou soil.

**Keywords:** long-term fertilization Guanzhong Plain Lou soil microelement availability

Received 2010-01-28;

Fund:

“十一五”科技支撑计划(2006BAD05B07);西北农林科技大学青年骨干项目资助。

## 引用本文:

李志军, 李平儒, 史银光, 张树兰. 长期施肥对关中土微量元素有效性的影响[J] 植物营养与肥料学报, 2010, V16(6): 1456-1463

LI Zhi-Jun, LI Ping-Ru, SHI Yin-Guang, ZHANG Shu-Lan. Effects of long-term fertilizer management regimes on availability of soil micronutrient elements[J] Acta Metallurgica Sinica, 2010, V16(6): 1456-1463

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