

中国西南地区坡地钾素平衡及管理措施探讨

朱青^{1,2};王兆骞¹;陈正刚²;尹迪信³;王文华²

1.浙江大学生命科学院 浙江杭州310029; 2.贵州省土壤肥料研究所 贵州贵阳550006; 3.贵州省现代化农业发展研究所 贵阳550006

Potassium balance and management on sloping land in southwest China

ZHU Qing^{1,2};WANG Zhao-qian¹;CHEN Zheng-gang²;YIN Di-xin³;WANG Wen-hua^{2*}

1 Life Sciences College; Zhejiang Univ.; Hangzhou 310029; China; 2 Guizhou Soil and Fertilizer Inst.; Guiyang 550006; China; 3 Modernization Inst. of Guizhou Agric. Develop.; Guiyang 550006; China

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摘要 坡地钾素平衡及管理研究于2000年开始在贵州南部开展。试验分别设条带种植1、条带种植2、工程梯化、横坡种植四个水土保持农艺措施和农民习惯种植(对照)5个处理,探讨坡地钾素的平衡及其管理措施。试验结果表明,坡地的钾素平衡除了与施肥和植物吸收有关,还与降水、地表径流和土壤侵蚀有着密切的联系。在简化了的坡地钾素循环中(不包括地下渗漏的钾素部分),肥料提供给土壤的钾素达 $89.66\text{ kg/hm}^2\sim 176.83\text{ kg/hm}^2$,对土壤钾素输入总量的贡献达96%以上。而9.80%~26.26%来源于无机肥的钾素是通过作物吸收而带离土壤。地表径流和侵蚀泥砂中具有较高的有效钾含量,地表径流所含的有效钾是降水的4.28~6.67倍;侵蚀泥砂所含的有效钾是侵蚀前土壤耕层的1.51~1.92倍。它们不但带走降水中有有效钾,而且还带走土壤中的有效钾,流失量每年分别达到 $14.82\sim 23.10\text{ kg/hm}^2$ 和 $4.46\sim 9.35\text{ kg/hm}^2$ 。每年通过作物吸收而造成土壤钾素损失为 $28.46\sim 90.10\text{ kg/hm}^2$ 。坡地农业活动造成土壤缓效钾水平急剧下降,缓效钾亏缺每年达 $175.34\sim 306.04\text{ kg/hm}^2$ 。因此,在坡地钾素平衡中,应重视水土保持、秸秆还田及肥料的有效利用。条带种植措施可减少地表径流40.31%~43.77%、泥砂53.60%~65.63%、提高土壤有效钾12.62%~33.69%,使得无机肥的利用率达到26%,是坡地钾素管理的有效措施。

关键词: 钾素平衡 坡地 径流 土壤侵蚀 条带种植 钾素平衡 坡地 径流 土壤侵蚀 条带种植

Abstract: A study on potassium balance and management on sloping land was conducted in south Guizhou province of southwest China in 2000. In the trial, alley cropping, engineering terrace and contour planting combined with balanced fertilization were employed as the soil conservation measures to reduce potassium loss and keep a good K balance on sloping land, in comparison with the farmers' practice. Results showed that K balance on sloping land, beside fertilizer application and crop uptake, was related to rainfall, and runoff and soil erosion. Fertilization provided $89.66\sim 176.83\text{ kg/ha}$ total K to the soil annually making up more than 96% contribution to total K input in simplified soil K cycling. However, only 9.8%—26.26% of total K from inorganic K was removed by crop uptake. Runoff and sediment had high content of readily available K which was 4.28—6.67 times of that in rainfall and 1.51—1.92 times of that in surface soil before erosion respectively. Soil erosion not only removed the readily available K brought on by precipitation (ranged $14.82\sim 23.1\text{ kg/ha}$), but also the readily available K in the soil (ranged from $4.46\sim 9.35\text{ kg/ha}$). Crops uptook $28.46\sim 90.10\text{ kg/ha}$ total K from soil. Intensive agricultural activities on sloping arable land caused severe soil slowly available K deficiency $175.34\sim 306.04\text{ kg/(ha}\cdot\text{a)}$. Therefore, controlling water loss and soil erosion, returning crop residue to the field and using fertilizer efficiently are of great importance in maintaining potassium balance on sloping land. Alley cropping technology could significantly reduce runoff and sediment by 40.31%—43.77% and 53.6%—65.63%, respectively, compared with the local farmer's traditional practice, and enhance readily available K concentration on top soil by 12.62%—33.69% and inorganic fertilizer utilization efficiency by 26%. It is a good practice for potassium management on sloping land in southwest of China.

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