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湘南红壤丘陵区不同生态种植模式下土壤磷素流失特征*

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摘 要 以湖南省祁阳县红壤坡地大型标准径流场为例,研究了湘南红壤丘陵区 8 种不同生态种植模式下土壤磷素的地表流失特征. 结果表明: 总磷流失量以撂荒处理(T_1)最严重,顺坡种植模式处理(T_2、T_3)其次,5 种梯田模式处理(T_4 ~ T_8)均能有效减少土壤磷的流失,磷流失量分别是 T_1 处理的 9.9%、37%、0.7%、2.3% 和 1.9%. 生态种植模式直接影响红壤坡地土壤磷素的地表流失形态,研究区流失的磷素以颗粒磷为主. 暴雨(日降雨量 > 50 mm)情况下,降雨量对不同生态种植模式下磷流失量影响差异不大,但磷流失量随降雨强度增大而增加. 红壤坡地土壤磷素地表流失主要集中在 6—9 月,降雨量和降雨强度是影响湘南红壤丘陵区土壤磷素地表流失时间分布的直接因素.

关键词 红壤丘陵区 生态种植模式 地表径流 磷素流失
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Characteristics of soil phosphorous loss under different ecological planting patterns in hilly red soil regions of southern Hunan Province, China.

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Abstract: Taking a large standard runoff plot on a red soil slope in Qiyang County, southern Hunan Province as a case, this paper studied the surface soil phosphorus loss characteristics in the hilly red soil regions of southern Hunan under eight ecological planting patterns. The phosphorus loss from wasteland (T_1) was most serious, followed by that from natural sloped cropping patterns (T_2 and T_3), while the phosphorus loss amount from terrace cropping patterns ($T_4 - T_8$) was the least, only occupying 9.9%, 37%, 0.7%, 2.3%, and 1.9% of T_1, respectively. The ecological planting patterns directly affected the forms of surface-lost soil phosphorus, with the particulate phosphorus (PP) as the main lost form. Under the condition of rainstorm (daily rainfall > 50 mm), rainfall had lesser effects on the phosphorus loss among different planting patterns. However, the phosphorus loss increased with increasing rain intensity. The surface soil phosphorus loss mainly occurred from June to September. Both the rainfall and the rain intensity were the factors directly affected the time distribution of surface soil phosphorus loss in hilly red soil regions of southern Hunan.

Key words: hilly red soil region; ecological planting pattern; surface runoff; phosphorus loss.

水土流失导致严重的土壤养分流失,并引起人们广泛重视. 坡地养分的迁移造成肥料投入的增加和湖泊的严重污染[1],导致水体质量恶化[2-3]. 湘南红壤丘陵区土壤肥力衰减的原因除了只用不养或用多养少等生产活动外,水土流失引起的土壤养分流失也是重要因素[4].

磷是作物生长必需的大量营养元素之一,也是土壤养分重要的组成部分. 湘南红壤丘陵区土壤普遍缺磷,已成为本地区作物高产的限制因素. 施用化学磷肥是补充土壤磷素的重要手段,但由于过量和不合理的施用以及水土流失的影响,磷的流失问题

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