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特大暴雨下油松林根系对土壤元素迁移的影响

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Effectiveness of pine roots on elements transport of loess soil during the heavy rainstorm on the Chinese Loess Plateau

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摘要 | 参考文献 | 相关文章

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摘要 根际是元素由土壤进入植物体的主要界面,降水对根际土壤元素的迁移有显著影响。本文用原状土柱淋滤实验装置及大型挖掘剖面壁法,定量分析了特大暴雨下不同深度土层油松林根系影响土壤元素的稳定输出通量的剖面特征,旨在探索黄土区林木根系对土壤养分生物有效性的提高途径。研究结果表明,特大降雨条件下,油松林地的元素随土层深度增加呈明显的递减规律,在农地土壤剖面中变异不明显。油松林地元素稳定输出通量的平均值显著大于无根系土壤。油松林0—30.cm土壤剖面中的元素输出通量占总剖面元素输出通量的96.32%;油松林根系对常量元素K、Na、Mg、Ca、有益元素Si、微量营养元素Mn有明显稳定强化作用的土层深度范围为0—30cm,对有益元素Al和微量元素Cu、Fe有明显稳定强化作用的土层深度范围为0—45.cm。

关键词: 根系 特大暴雨 元素迁移通量 有效性模式 黄土高原 根系 特大暴雨 元素迁移通量 有效性模式 黄土高原

Abstract: Plant roots are the main interface for plants to uptake nutrients from soil and may have potential impacts to intensify elements transport in the loess soil.Climate,especially rainfall is the main factor for soil formation and soil environment.To assess the effectiveness of plant roots on elements transport of loess soil during the heavy rainstorm,a field study was carried out on nutrients transport in the forest(*Pinus tabulaeformis*) soil as affected by pine roots and farmland soil with no roots as the control on the hilly and gully areas of the Loess Plateau.With the method of a large-size profile for measuring root density and root weight and an equipment of undisturbed monolith soil for measuring elements transport of loess soil,we investigated transport flux of 9 elements in the loess soil during the rainfall of 200 mm and rain intensity of 2.0 mm/min.The objective was to establish the effective model of plant root for intensifying elements transport flux in the loess soil,in order to provide a scientific foundation for improving the nutrients uptake of plant roots and establishing the fine artificial ecological systems of soil and water conservation.The results indicated that differences among elements transport flux in the loess soil during the heavy rainstorm were not only depended on the amount of elements in soil but mainly on the distribution of plant roots less than 1 mm in diameters.Impacts of plant roots on intensifying elements transport in the different depth of the loess soil decreased as the soil depth increased.As for the pine-land during the heavy rainstorm,elements output flux in the soil layer of 0—60 cm decreased significantly with the increase of the soil depth;as for the farmland,there are no significant differences for the whole soil profile.The impacts on the transport flux of K,Na,Mg,Ca,Si,Mn tended sharply to lighter in the soil layer of 0—30 cm,but its impacts on the transport flux of Al,Cu,Fe approached sharply to smaller in the soil layer of 0—45 cm in the pine-land during the heavy rainstorm as the increase of soil depth.The effective root parameters had significant positive relationship with the impacts of plant roots to intensify elements transport in soil profiles on the Loess Plateau with the R~2 between 0.95 and 0.99.

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