

姚淑霞,赵传成,张铜会.科尔沁不同沙地土壤饱和导水率比较研究[J].土壤学报,2013,50(3):469-477.Yao Shuxia,Zhao Chuancheng and Zhang Tonghui.A comparison of soil saturated hydraulic conductivity (Kfs) in different Horqin Sand Land[J].Acta Pedologica Sinica,2013,50(3):469-477



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科尔沁不同沙地土壤饱和导水率比较研究

A comparison of soil saturated hydraulic conductivity (Kfs) in different Horqin Sand Land

投稿时间: 2012-05-28 最后修改时间: 2013-01-31

DOI: 10.11766/trxb201205280206

中文关键词: [饱和导水率](#) [沙漠化](#) [科尔沁沙地](#)

Key Words: [Saturated hydraulic conductivity](#) [Desertification](#) [Horqin Sand Land](#)

基金项目:国家重点基础研究发展规划项目(973计划)(2009CB421303)、科技支撑计划项目(2011BAC07B02)资助

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中文摘要:

用Guelph入渗仪对科尔沁沙地不同沙漠化阶段土壤不同层次的土壤饱和导水率(Kfs)进行测定,分析研究了 Kfs 与沙地类型、土层厚度、沙丘坡位及土壤理化性质的关系。结果表明:(1)草地(潜在沙漠化)、固定沙丘(轻度沙漠化)和流动沙丘(严重沙漠化)的 Kfs 依次增大,平均值分别为2.15、4.79和5.89 $mm\ min^{-1}$,呈现出土壤入渗能力随沙漠化程度的增强而增强的趋势;三种沙地间 Kfs 差异显著,沙丘不同坡位 Kfs 也有较大差异,表明科尔沁沙地 Kfs 具有较高的空间异质性;(2)三种沙地 Kfs 随深度的变化规律差异较大,草地 Kfs 随深度呈抛物线状变化,而固定沙丘 Kfs 随深度呈指数函数变化;(3)通过逐步回归分析发现对 Kfs 影响较大的土壤理化性质是土壤有机质含量、土壤细砂含量、黏粉粒含量和粗砂粒含量,并且 Kfs 与前三个因素呈显著的负相关关系,与最后一个因素呈显著的正相关关系。

Abstract:

In situ measurements with a Guelph Permeator were performed to investigate the saturated hydraulic conductivity of soils (Kfs) at various desertified sand lands, such as grassland, fixed sand dune and mobile sand dune of Horqin Sand Land. Based on analyzing the relationships of Kfs with the sand land types, soil depths, slope position of sand dunes and soil physical and chemical properties, the results indicated that: (1) The average Kfs increased in the order: grassland (potential desertification), fixed sand dune (light desertification) and mobile sand dune (serve desertification), and the value was 2.15, 4.79 and 5.89 $mm\ min^{-1}$, respectively. That was, the more serious desertified, the higher infiltration capacity. A statistically significant differences ($p < 0.05$) in Kfs were found among the three sites and between the slope positions of the two dunes. So, the Kfs at Horqin Sand Land has showed a higher heterogeneity; (2) The changes of Kfs was considerably with the increase of soil profile depths. The changes of Kfs with soil depths at grassland could be fitted with parabola models, and for fixed sand dune by exponential models; (3) The stepwise regression revealed that the soil organic matter content, the fine sand fraction (0.1–0.05 mm) and the clay and silt content (<0.05 mm) were some key factors affecting Kfs with a significantly negative relationship, but there was a significantly positive correlation with the coarse sand fraction (2–0.1 mm).

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