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种植大豆地表土壤溅蚀效应及其空间分布特征

Splash detachment effect and its spatial distribution under soybean canopy

中文关键词:大豆 溅蚀速率 模拟降雨 穿透雨 降雨强度

Key words:Soybean Splash detachment rate Simulated rainfall Throughfall Rainfall intensity

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中文摘要:

为系统研究种植大豆条件下农地溅蚀速率变化特征并建立简单易用的模型，评价大豆种植对土壤溅蚀的影响，采用室内模拟降雨的方法，测定了不同降雨强度（40mm h^{-1}和80mm h^{-1}）、不同大豆生长阶段（始花期、盛花期、结荚期和始粒期）下的穿透雨强度和溅蚀速率，分析了大豆冠下溅蚀速率与叶面积指数和穿透雨强度的关系，探讨了冠下溅蚀速率的空间分布特征。结果表明：与裸地相比，在大豆全生育期，大豆冠下平均溅蚀速率在设计雨强40mm h^{-1}和80mm h^{-1}下，分别减少了62.85%和60.74%。冠下平均溅蚀速率随叶面积指数增加呈显著的增加趋势，且随降雨强度的增大而显著增加。冠下各点溅蚀速率受相应各点的穿透雨强度影响在80mm h^{-1}设计雨强下较为显著，随穿透雨强度的增加而增加。大豆冠下溅蚀速率的空间分布与穿透雨的分布具有一定的对应性，即冠下穿透雨较为集中的区域会在一定程度上增加溅蚀的发生，并导致冠下溅蚀速率分布不均，大豆冠下穿透雨是冠下溅蚀产生和分布的主要能量来源。该研究提出的大豆冠下溅蚀速率模型可为坡耕地土壤侵蚀防治和农田灌溉有效利用提供理论支持。

英文摘要:

In order to systematically investigate variation of splash detachment under soybean cover and to establish a simple practical model, with which to evaluate effects of soybean crop on splash detachment, rainfalls, 40mm h^{-1} and 80mm h^{-1} in intensity, were simulated indoors for measuring thoughfall intensities and splash detachment rates under soybean canopy at different growth stages, analyzing relationships of splash detachment rate and throughfall intensity with LAI, and exploring spatial distribution of splash detachment rates under soybean canopy. Results show that compared to bare soil, the field with soybean was 62.85% and 60.74% lower in average splash detachment rate of the whole growth period under rainfall, 40 mm h^{-1} and 80 mm h^{-1}, in intensity, respectively. The average splash detachment rate under soybean canopy displayed a significant trend of rising with LAI and rainfall intensity. The splash detachment rates at various monitoring points were significantly affected by the throughfall intensities at the corresponding positions, especially under the rainfall, mm h^{-1} in intensity, increasing with throughfall intensity. The spatial distribution of splash detachment rates corresponded to a certain extent with the distribution of throughfall under soybean canopy. In another word, in places where throughfall under canopy concentrated, splash detachment would increase to a certain extent, thus leading to uneven distribution of splash detachment rates under canopy. Therefore, throughfall is the major source of energy triggering splash detachment and affecting its distribution. The splash detachment model proposed in this study could provide some theoretical support for soil erosion control and effective use of irrigation water on slope lands.

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