

【抄録】

題名: Application of GeoWEPP to a cabbage monocropping region: developing agricultural strategies to mitigate water erosion under short-duration intense rainfall

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要旨

The increasing frequency of short-duration, high-intensity rainfall events has heightened the importance of soil and water conservation (SWC) measures in agricultural watersheds. Evaluating watershed erosion and the effectiveness of SWC practices at a daily rather than an annual temporal scale is increasingly required. However, scenario studies involving the application of models and the quantitative assessment of SWC measures at a daily time step, considering a continuous crop system, remain limited. This study applied the Geo-spatial interface for the Water Erosion Prediction Project (GeoWEPP) to a small mountainous watershed characterized by monoculture cabbage farming to evaluate sediment yield under intense rainfall and examine effective SWC strategies. River discharge and sediment yield were monitored for about three years to investigate runoff characteristics. Based on the monitoring results, GeoWEPP was calibrated on a daily scale. Using the calibrated model, we simulated the impact of SWC measures—such as cover crop introduction and cropping schedule changes—on sediment yield. The results revealed that a few significant runoff events accounted for 60-72% of the annual sediment yield. A significant positive correlation was found between sediment yield and the product of peak flow and daily runoff. The calibrated model demonstrated high prediction accuracy. Simulations of cover crop effects showed substantial reductions in sediment yield, which were attributed not only to surface coverage but also to improved soil permeability that led to reduced surface runoff. Uncertainties mainly arose from uncalibrated peak flow estimation and sediment concentration extrapolation using the LQ equation during extreme events. Also, modeling limitations included the assumption of homogeneous soil conditions across the watershed and default crop growth parameters without local calibration. Despite uncertainties to be addressed, this study demonstrates that GeoWEPP can be an effective and practical predictive tool for evaluating soil conservation measures in agricultural watersheds facing increasingly frequent short-duration intense rainfall events.

題名: Risk Evaluation of Verticillium Wilt on Cabbage Grown in Soil Reused from Sediment Basins

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要旨

There is a growing demand for the reuse of sediment basin soil in cabbage fields; however, reusing soil poses a potential challenge of spreading Verticillium wilt to the fields via pathogen-infested sediments. We evaluated the density of the Verticillium wilt pathogen in sediment basin soil using a quantitative nested real-time polymerase chain reaction assay and its incidence using pot cultivation tests. We detected low pathogenic DNA levels in the sediment, coupled with a low Verticillium wilt incidence and severity in the pot experiment, indicating a low risk of spreading Verticillium wilt with the reuse of sediment basin soil.