Effect of Surface Cover Materials and Soil Amendments on Sediment Discharge from Upland Fields

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BACKGROUND & OBJECTIVES
Soil erosion is one of the major reasons for non-point source (NPS) pollution in alpine agricultural fields in Korea. Soil erosion and runoff control are important not only for soil and water conservation but also for the reduction of sediment discharge in runoff.

Key factors of soil erosion
- Rainfall intensity
- Vegetation cover
- Soil characteristics (texture, structure, etc.)
- Slope

Control methods of soil erosion
- Contour cultivation
- Terracing
- Crop residues
- Straw mats
- Gypsum

RESULTS & DISCUSSION
Effect of the Straw Mat
- The runoff coefficient from the mat-covered plots decreased significantly compared to the control plots, regardless of rainfall intensity and slope.
- Under 30 mm/h simulation, sediment discharge decreased by 87.4%, and 61.1% for 10% and 20% plots, respectively.
- Based on the experiment, it was thought that the rice straw mat cover might be an effective best management practice for the control of sediment from sloping highland fields.

Effect of Straw Mat, PAM and Gypsum
- Under 30 mm/h simulation, the runoff coefficient with straw mat covers was 32.0% and 45.6% for 10% and 20% plots, respectively. But when PAM and gypsum were added one by one, the coefficient reduced to 6.2%, 14.3%, and then 0.0% and 0.2%, respectively. Under 60 mm/h simulation, the similar reduction pattern of the coefficient was also observed.

Effect of rice straw mats with PAM/gypsum on sediment discharge (Unit: g)
- The runoff coefficient from the mat-covered plots decreased significantly compared to the control plots.
- Even if the raindrop intensity was reduced in one simulation, sediment discharge decreased 61.1% and 58.7% for 10% and 20% plots, respectively.

CONCLUSION
- The runoff coefficient from the mat-covered plots decreased significantly compared to control plots regardless of rainfall intensity and slope.
- The effect of the mat cover on the reduction of sediment discharge was greater than runoff. Under 60 mm/h simulation and 20% slope, which was the worst case, the covered plots with the mat and soil amendments could reduce 98% of sediment.
- It was concluded that the function of the mats was significantly improved by adding PAM and gypsum.
- The combined use of the mats, PAM, and gypsum could be an effective best management practice to reduce runoff and sediment discharge from highland sloping agricultural fields. However, a series of field experiments was recommended to verify the effect of combined use of the mats, PAM and gypsum on runoff and sediment reduction.

Rainfall simulation
- The rainfall simulator was used to investigate the effect of surface cover materials and soil amendments on surface runoff and sediment discharge in laboratory scale experiments using an indoor rainfall simulator.

Rainfall simulator

Rice straw mat ($) Rice straw mat+PAM (SP)
- The rainfall simulator was used to investigate the effect of surface cover materials and soil amendments on surface runoff and sediment discharge in laboratory scale experiments using an indoor rainfall simulator.

Rice straw mat+PAM (SPG)
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