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Evaluation of the process of determining sediment yield in forested slopes with different forest floor cover percentage

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Recently, forest management, especially thinning, has not been conducted fitly in Japanese forest area. In unmanaged Japanese cypress plantations, where the weak penetration of sunlight into forest plantations results in poor growth of understory vegetation, soil erosion has been a serious problem. Many studies have reported the protective effects of forest floor cover on soil erosion. However, mechanism of preventing soil erosion by floor cover is not fully understood. To evaluate the effects of forest floor cover on the process of determining sediment yield in forested slopes, we measured rainfall, surface runoff, soil splash detachment and sediment yield which are considered to closely link with sediment yield in two kinds of forest stands consisting of Japanese cypress (CY:Chamaecyparis obtusa) with poor floor cover and Konara oak (KO:Quercus serrata Thunb.) with dense floor cover, which is located in Gunma Prefecture, Japan. The intensive observation was conducted from June 2010 to August 2011. The forest floor cover percentage (FCP) in CY were between 73 and 87%, on the contrary, that in KO was were about 100% during observation periods. Soil splash detachment was by about six times higher in CY than in KO, although the kinetic energy of raindrops measured below the canopies was almost equal in both sites. This indicates that the higher FCP in KO caused reducing raindrops impact to soil surface and contributed to preventing of soil splash detachment. Sediment yield was by about one order higher in CY than KO, and positively correlated with soil splash detachment in both sites. Maximum intensity of surface runoff was higher in CY than KO, and positively correlated with sediment yield in CY. These results suggest that higher sediment yield in CY was responsive for higher intensity of surface runoff, which contributes to transporting of soil detached by raindrop impact, as well as for higher splash detachment in CY.

Keywords: Soil erosion, Forest floor cover, Surface runoff, Cypress plantation, Soil splash detachment, Sediment yield