Discussions on the mechanizm of soil-aggregate formation and stabilization

*Seiko Yoshikawa[1], Yasufumi Kuroda[2], Hideto Ueno[3], Noriharu Ae[4]

1. Institute for Agro-environmental Sciences, National Agriculture and Food Research Organization, 2. Tokushima Agriculture, Forestry and Fisheries Technology Support Center, 3. Department of Agriculture, Ehime University, 4. Rakuno Gakuen University

To examine the effects of natural constituents on the stability of soil aggregates, phenolic acids or/and carbohydrates were mixed into several different types of soils. After a one-month incubation, the plot with applied phenolic acids showed the greatest mean weight diameter (MWD) of all the plots. For the treated soils before incubation, saturated water permeability was intermittently measured during continuous water percolation. The decline in water permeability was mitigated in the phenolic acids plot compared to the other plots for each soil. In order to determine the mechanism of aggregate stabilization by phenolic acids, they were added to synthetic soil aggregates using two methods (mixing and brushing), and the aggregates were then incubated for 153 days. The aggregate stability was greatest in the phenolic acid surface plots for the Andisol and the gray lowland soil and was most stable in the phenolics mix plot for the yellow soil. Aggregate stabilities in the carbohydrates plots and control plots were at lower levels. Phenolic acids were also found to have an effect on soil aggregate stability in sandy soil. The microbial activity alone could not explain the change in aggregate stability though it seemed more related to fungal number than bacterial number. In another similar experiment using the gray lowland soil, the liquid extracted from soil aggregates, to which p-coumaric acid had been added, was monitored using size exclusion chromatography. The p-coumaric acid-corresponding peak gradually disappeared, and larger substance-corresponding peaks had increased slightly by days 14 and 28, which was likely accompanied by an increase in aggregate stability.

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