[EJ] Evening Poster | H (Human Geosciences) | H-CG Complex & General

[H-CG26]What scientists should do for reconstruction after Fukushima Daiichi Nuclear Power Plant Accident

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Seven years have passed since the Fukushima Dai-ichi Nuclear Power Plant accident on March 2011. Some local villagers have started returning their own home. Most of suspension on shipment of agricultural products from Fukushima has been released. Scientists temporarily concentrated on Fukushima-related issues are returning to their own research topics although we still need to solve various problems from application levels to pure scientific topics. For example, it is critical for farmers in Fukushima how to recover productivity of decontaminated agricultural lands. Radiocesium (Cs)-bearing microparticles having relatively high specific radioactivity (Bq/kg) had recently been discovered; however, the fate of the Cs-bearing microparticles, e.g., inert or not, is not well understood to date. It is about time for rural planning scientists to propose their own opinions rather than reporting case studies. We had preliminary discussion at ASA, CSSA and SSSA International Annual Meeting in Tampa, USA 2013 by driving a session of "Battles of Soil Scientists in Fukushima, Japan". In addition, we had "Battles of soil scientists for recapturing Fukushima land from Nuclear Power Plant accident. What can we do then?" last year. In this session, we are looking forward to presentations from soil and water sciences to social and agronomic sciences related to interaction of human and nature under the condition of post-nuclear power plant accident.

[HCG26-P01]Effects of addition of clay minerals on the existing state of radiocesium in soil

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The accident at the Fukushima Daiichi nuclear power plant occurred in 2011, resulting in contamination of agricultural fields by radioactive substances such as ^{137}Cs (RCs). Potassium (K) fertilization is typically considered as an effective countermeasure for reducing RCs uptake by plants. However, in case of pasture, K fertilizer application results in increase of K concentration in the grass, causing a metabolic disease for cattle known as grass tetany. Therefore, alternative countermeasures for reducing RCs uptake are required in the pasture polluted by RCs. In this study, we investigated the effect of clay minerals on the RCs behavior in grassland soil.

Soil samples were taken from a grassland polluted by RCs at the surface layer (from 0 to 5cm) in Fukushima prefecture. Zeolite and weathered biotite were selected as clay minerals. Incubation was conducted in a constant temperature (25℃) room. The clay minerals were added at 1, 5 and 10% per 50 g dried soil. Incubation duration was 7, 28 and 258 days. Soil moisture was adjusted to 86% and 120% mass water content. Effect of drying-wetting cycles was also examined.

For drying-wetting cycle, the soil was repeatedly incubated under room temperature (25℃) and 50℃ for

48 hours at each temperature condition. After drying, the samples were rewetted to be mass water content of 120%.

After the incubation, 1M ammonium acetate was added to be dry soil: solution ratio of 1:4, and shook for 6 hours. Suspension was filtered by 0.45µm membrane filter. Cs concentration (denoted as exchangeable Cs, Ex-Cs) in the filtrates were measured by a Ge semiconductor detector.

To confirm adsorption of RCs on weathered biotite, after the incubation, soil sample was washed, sieved and collected weathered biotite larger than 5 mm. Obtained weathered biotite was fixed on the paper and placed in contact with an imaging plates (IP) for 7days. The IP image was scanned to detect radioactive substances.

With increasing in amount of clay minerals added to the RCs polluted soil samples, the concentration of Ex-Cs decreased where more decrease in Ex-Cs was observed for the sample at higher water content. Incubation period had no effect under the constant mass water content condition.

After the incubation under drying-wetting cycles for 28 days (7 cycles), the sample applied weathered biotite showed more reduction in the concentration of Ex-Cs as compared to that of the zeolite. Number of drying-wetting cycles, and thus incubation period, had an effect on RCs behavior.

IP image suggested radioactive substances could have transferred from the soil to weathered biotite.
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