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石灰岩質土壌にエタノール廃液を施用した場合の溶存有機物と化学成分の溶脱
Leaching of dissolved organic matter and chemical components with vinasse application to a calcareous soil

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Bio-ethanol is at present demonstratively produced from biomass material (Sugarcane molasses, wheat straw, rice straw, etc.) all over Japan. Up to 20 litters of stillage may be generated for each litter of ethanol produced, and disposal and utilization of the stillage have been important problems for sustainable bio-ethanol production. In southeast region of Japan, demonstration studies have been conducted to produce bio-ethanol from sugarcane-molasses generated at sugar factories, where stillage (called ”Vinasse”) is generated during distillation process. Because the vinasse contains fertilizer ingredients, application to agricultural land as the fertilizer water is a hopeful utilization method. However, vinasse contains very large amounts (60,000 mg/L) of dissolved organic carbon (DOC), and its application to agricultural land raises concerns about ground water pollution. In addition, DOC can influence mobility of heavy metals in soils because heavy metals form complexes with DOC. Furthermore, vinasse contains a lot of Fe (44. 5 mg/L), Mn (9.58 mg/L) and Zn (4.80 mg/L). Thus, leaching of dissolved organic carbon and chemical components, including heavy metals, with application of sugarcane-molasses ethanol vinasse to a calcareous soil was evaluated by the soil column studies.

After vinasse of 100 m^3/ha was added to soil surface in calcareous soil columns (7 cm internal diameter; 15 cm height), deionized water was supplied to the soil surface by a peristaltic pump at fast (7.0 cm/d) and slow (1.7 cm/d) infiltration rates. The column effluent was collected by a fraction collector. At a cumulative water discharge of 20 cm, DOC cumulative discharges were 636 mg and 315 mg at the fast infiltration rate and the slow infiltration rate, respectively; DOC cumulative discharge for slow infiltration rate was clearly less than for the fast infiltration rate. The results suggested that residence time in the soil column would influence DOC leaching. Retention and transport properties of chemical components, including heavy metals, in the soil column are currently under investigation.