Effect of soil components on adsorption of *Pepper Mild Mottle Virus* by Japanese soils

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The *Pepper Mild Mottle Virus* (PMMoV) is a soil-borne virus that causes the mosaic disease to *Capsicum* ssp. This virus disease had been controlled by soil fumigation using methyl bromide, but the method was banned in 2005. Therefore, a new management and control technology that replaces methyl bromide is required. In the present study, the adsorption of PMMoV by soils that is considered to be one of the most important factors of the virus inactivation was examined.

Five Andosols (three soils with a high humus content and two soils with a low humus content), a gray low land soil, a yellow soil, and an allophanic mineral sample were used. Two hundred milligrams of soil and mineral samples were mixed with 2 mL of phosphate buffer containing 100μg of PMMoV. The suspensions were shaken for 2 h then they were stored overnight at 4˚C, and were centrifuged at 20,000×g for 20 min at 4˚C. The concentration of PMMoV in the supernatant was determined by double antibody sandwich enzyme linked immuno solvent assay (DAS-ELISA) method and calculated adsorption rate. To evaluate the charge characteristics of the soil and clay samples on the adsorption of PMMoV, the adsorption experiments were also performed at pHs 4 and 5.

Large amounts of PMMoV particles were adsorbed by the soil samples with a low humus content at the low pH. This was attributed to the increase in the positive charges of the soil samples. On the other hand, low virus adsorptions were observed at any pH levels in the soils with a high organic matter content. There were close negative correlations ($P < 0.05$) between the PMMoV adsorption by the soils and the humus content of the soil samples. There was no significant relationship between the rate and Si_o or Fe_d contents. The present study suggests that the inhibitory effect of humus against the PMMoV adsorption by soils is rather important in Japan because the country is extensively covered by soils with a high organic matter content.

Isolation of plant growth-inhibiting compounds from acidulocompost; a garbage compost processed under thermoacidophilic conditions

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The use of garbage composts for agricultural production is essential for a sustainable society in the viewpoint of environmental conservation and resources protection. We have tested the agricultural use of acidulocompost (AC); a unique garbage compost processed under thermoacidophilic conditions (Nishino et al., 2003). We clarified that the garbage AC was more effective for potato production than cattle manure compost and showed a function of weed growth suppression (Tatenai et al., 2006).

In order to identify a plant growth-inhibiting compounds derived from garbage AC, we examined the followings; 1) the extracting method to effectively recover the active compounds from AC, 2) the effects on plant growth of the law material (cedar-wood saw material with a starter microorganism) used for acidulocomposting process, and 3) isolation of the active compounds from AC. The plant growth inhibiting activity was evaluated from the germination and the hypocotyl and radicle elongations of lettuce (*Lactuca sativa* L.) after 48 hours' in-

cubation at 25˚C.

Most of the plant growth-inhibiting compounds in garbage AC were collected with three extractions using a mixture of methanol: chloroform: water = 2:1:0.8. The hypocotyl and radicle elongations of lettuce were severely inhibited with the extracted materials from AC, but the extracts from the law material had no activity on plant growth inhibition. This result suggests that the inhibition activity of AC is attributed to the compounds produced or modified during the composting process. The extracts were subjected to reverse-phase column chromatography on C18-coated silica gel and the major activity was fractionated into the Hexane-EtOAc (6:4) eluted fraction. The active fraction was then subjected to preparative HPLC and active compound was isolated at 2.4 min in retention time. We are currently promoting the identification of the inhibitory compound.

References

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Effect of chemical treatment on mineralization of C and N in Andosols rich in Al-humus complexes

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Andosols accumulate soil organic matter (SOM) in large amounts mainly due to stabilization of SOC by formation of Al-humus complexes, low soil pH and high Al toxicity. In this study, we changed these factors by chemical treatments and investigated their effects on mineralization of C and N.

We used three soil samples: Mukaiyama A1, Mukaiyama 3A3 (Miyagi Prefecture), and Utsunomiya (Tochigi Prefecture). Soils were treated with chemical reagents such as $CaCO_3$ (increasing soil pH and decreasing soluble Al), KH_2PO_4 (decreasing soluble Al with minimum change of soil pH), and H_2SO_4 (decreasing soil pH and increasing soluble Al). For measurement of soil respiration, we put fresh soils (30 g dry soil equivalent) into conical flasks (500 mL) and incubated the soil samples under lighting condition (25˚C) and dark condition (16˚C). Then we flew fresh air to flasks and sealed them for 1 h. The concentration of CO_2 in the flasks was measured by IR spectroscopy. For inorganic N measurement, we put fresh soils (150 g dry soil equivalent) into plastic pot (500 mL) and incubated them under dark condition (30˚C). Inorganic N (ammonium N plus nitrate N) was periodically measured. We extracted soil DNA from soil samples and investigated microbial community by PCR-denaturing gradient gel electrophoresis with specific 16S rDNA.

The $CaCO_3$ treatment increased soil respiration in all the soil samples. This was considered to be due to the increase in soil pH and the decrease in soluble Al. The apparent soil respiration may include CO_2 derived from $CaCO_3$. The $CaCO_3$ treatment did not increase amounts of inorganic N as compared to control. In Mukaiyama A1 soil, the treatment even decreased mineralization of N, suggesting the intense immobilization of N. The KH_2PO_4 treatment largely increased soil respiration and N mineralization in all the soils. This may be due to solubilization of soil organic matter in addition to the decrease of Al toxicity. While the H_2SO_4 treatment decreased the amounts of soil respiration and N mineralization in Mukaiyama A1 soil, this treatment did not affect in other soils. In comparison among the three soil samples, the amounts of soil respiration and N mineralization of Mukaiyama