（学位第３号様式）

学 位 論 文 要 旨

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題　目	The Studies on Recycling and Circulation Resource for Protecting the Life Sustaining of the Quality of Groundwater on Miyako Island, Okinawa （沖縄県宮古島の地下水保全に関する資源循環型総合研究）

All of the drinking water on Miyako Island is dependent upon the groundwater. Thus, preserving the ground water is very important. This can be accomplished through the establishment of low-input fertilization techniques by circulating the organic resources being procured on the island. This technique can also be used in conjunction with the application of chemical fertilizers to crops. On the other hand, rich dark red soil containing Ca is distributed over most of Miyako Island. This soil is difficult to use in crops as it forms a hardly soluble inorganic phosphoric acid, accounting for 90% or more relative to the total phosphate.

Therefore, bagasse charcoal was examined in this study as a carrier of phosphorous dissolving bacteria that solubilize inorganic phosphoric acid. Next, to identify phosphorus dissolving bacteria that was previously unidentified until now, the form of bagasse charcoal that was used as a carrier of the bacteria was closely examined. In addition, we have also explored the effect of solubility of poorly soluble inorganic phosphate through the application of bagasse vinegar and its effect on the growth of sugar cane.

1. Identification of phosphorus dissolving bacterium Strain-22

The nucleotide sequence results of *16S rDNA* area, the Strain 22 was identified as *Bacillus thuringiensis*. The Strain 22 was a result of a mycological properties test and had a cell within the crystal with protein forming ability.

2. Morphology of bagasse charcoal and physical tests

The bagasse charcoal, honeycomb voids were regularly arranged in diameters 10 ~ 20 μm and observed. The results of the pF-moisture curve, indicated that bagasse charcoal was shown to retain large amounts of water in the air gap as compared with regular charcoal and thus had large water retention properties. Strain 22 enables life supported by bagasse charcoal, suggesting the possibility of adapting to survive in the soil environment, amongst competition from other microorganisms.

3. Effect of solubilization of phosphorus accumulated in the soil of bagasse charcoal by phosphorus dissolving bacterium as a carrier on the growth and nutrient uptake of sugarcane in ratooning cultivation

The result of the study implies that phosphorus dissolving bacterium such as the Strain-22 can facilitate solubilizing of accumulated phosphorus in the soil when it is used in conjunction with organic carbon sources such as bagasse and molasses. Consequently this resulted in an increase in absorption of phosphorus on the growth and nutrient uptake of sugarcane in ratooning cultivation.

4. Effect of bagasse vinegar on the dissolution of tricalcium phosphate ($Ca_3(PO_4)_2$).

The bagasse vinegar was applied to the tricalcium phosphate, solubility of phosphoric acid and was detected at higher values as compared with water.

5. Effect of Absorption of Phosphorus by Bagasse Vinegar on the Growth and Nutrient Uptake in Sugarcane

The present results, suggest that the bagasse vinegar treatment at the soil surface to the ripening stage of sugarcane improves the cane quality through the utilization of phosphoric acid in the soil.

From the present study, solubilization of phosphorus accumulated in the soil by microbial function advantage and bagasse vinegar as well as chemical solubility such as phosphorus dissolving bacteria, to increase the utilization of phosphorus in sugarcane, has contributed to overall growth and quality improvement.