

Utilization of Unused Biomass for Promotion of Plant Growth and Soil Improvement

Sirilak Sanpa

Because of increasing environmental concerns, the studies on utilization of biomass such as the developments of new energy and useful materials from biomass are carrying out based on the national policy in Japan (Biomass Nippon). This study aimed to develop new usages of unused biomass resources with the viewpoint of materials circulation.

Concern about circulation of nitrogenous resources, protein biomass resources were tried to use as the plant growth-stimulating materials instead of chemical fertilizer in agriculture. Bluegill, which is foreign fish in Japan, increases and destroys the fresh water ecosystem in Lake biwa and other lakes and marshes, thus the large number of bluegill is disposed of. Bluegill, unused protein biomass, was tried to utilize in this study. Strain BGM1 was isolated as bluegill-degrading bacteria and identified as *Brevibacillus* sp. The fresh weight of *Brassica rapa* which grown with degraded bluegill products (DGP) by strain BGM1 was increased higher than that with chemical fertilizer. The mechanism of DGP on the growth of *B. rapa* was analyzed, and peptide(s) included in DGP led to promote the root hair number and adventitious root formation. The results suggest that the effect of the peptide(s) is one mechanism for promotion of plant growth. The root hair-promoting activity was obtained only from the degraded products of order *Perciformes*, suggesting that bluegill contains specific amino acid sequence(s) for promotion of root hair. Therefore, the peptide(s) from unused biomass, bluegill, have the possibility for plant growth in stead of chemical fertilizer, and the utilization of unused biomass can contribute for improvement of the environmental circulation.

Mineralization is one of the most important processes for the circulation of resources in environment. Since soil microorganisms play an important role for mineralization. This study aimed to enhance the soil microorganisms by using charcoal. Especially, we focused on the charcoal from woody waste, which is unused biomass, for enhancement of soil microorganisms. When the charcoal (5-20%) was added in the soil, the soil bacterial biomass was increased about 2 times higher than that without the charcoal, and the increase of soil bacterial biomass was stably maintained in the long-term experiment. The immobilized bacteria were detected within the mini-pore of the charcoal. Addition of the charcoal in the planting soil led to promote the plant growth, indicating that enhancement of the mineralization with bacteria, the aeration, and water-holding capacity by adding the charcoal might lead to contribute for plant growth.

This study indicates that application of unused biomass resources has a possibility to improve the environmental circulation such as decrease of chemical fertilizer in agriculture or activating the mineralization in soil.