

# Development of Management System for Bioremediation of Contaminated Soil with Agricultural Chemicals by Basidiomycetes

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# 2000 Fiscal Year Final Research Report Summary

## Development of Management System for Bioremediation of Contaminated Soil with Agricultural Chemicals by Basidiomycetes

Research Project

### Project/Area Number

11480148

### Research Category

Grant-in-Aid for Scientific Research (B).

### Allocation Type

Single-year Grants

### Section

一般

### Research Field

環境保全

### Research Institution

Kanazawa University

### Principal Investigator

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### Project Period (FY)

1999 – 2000

### Keywords

contaminated soil with agricultural chemicals / white-rot fungus / lignin-degrading Enzyme / immobilized cell culture / polyurethane foam

### Research Abstract

In recent years, environmental pollution by agricultural chemicals used on farmlands, golf courses, and other areas has been a serious social problem in Japan. Since farmlands and golf courses connect closely with water systems, i.e. rivers and lakes, the agricultural chemicals cause water pollution and provide a bad influence on the natural water ecosystem. In order to prevent water pollution by agricultural chemicals, the direct treatment of soil containing agricultural chemicals using microorganisms

seems to be one of the most effective methods. In this research, the incubation condition for efficient production of lignin-degrading enzymes by immobilized cell culture using a white-rot fungus, *Pleurotus ostreatus*, and the treatment of agricultural chemicals, 2, 4-D and 2, 4, 5-T, by the lignin-degrading enzymes were examined. Production of lignin-degrading enzymes, i.e. manganese peroxidase (MnP) and laccase (Lac), by white-rot fungus *Pleurotus ostreatus* was studied using polyurethane foam (PUF) as a carrier of immobilized cells. The maximum activity of the two enzymes was 500 and 80 U/ml, respectively, under incubation conditions such as 40 PUF numbers, pH 4.5, 30°C, and 20 g/l of glucose concentration. Agricultural chemicals, 2, 4-D and 2, 4, 5-T, were decreased by the enzyme solution from *P.ostreatus* to the extent of about 50% at an incubation time of 50 h and decreased by the mixed enzyme solution from *P.ostreatus*, *B.adusta*, and *P.chrysosporium* to the extent of about 70% at an incubation time of 30 h.

## Research Products (12 results)

All Other

All Publications

[Publications] Nakamura, Y., Sungusia, M.G., Sawada, T., Kuwahara, M.: "Lignin-Degrading Enzyme Production by *Bjerkandera adusta* Immobilized on Polyurethane Foam" *Journal of Bioscience and Bioengineering*. 88. 35-41 (1999) ▼

[Publications] Nakamura, Y., Sawada, T., Yamaguchi, K.: "Breeding and Cultivation of Glucoamylase-Producing Yeast with Inactivation of MAT locus" *Journal of Chemical Engineering of Japan*. 32. 424-430 (1999) ▼

[Publications] 中村嘉利, 沢田達郎, 小森正樹: "固定化菌による重金属イオン存在下のフェノールの微生物分解" *環境化学*. 9. 581-587 (1999) ▼

[Publications] Nakamura, Y., Sawada, T.: "Biodegradation of Phenol in the Presence of Heavy Metals" *Journal of Chemical and Technology and Biotechnology*. 75. 137-142 (2000) ▼

[Publications] 中村嘉利, 小林史尚, 沢田達郎, 山口和男: "グルコアミラーゼの効率的生産のための大量発現系遺伝子組換え大腸菌の育種と培養" *化学工学論文集*. 26. 687-692 (2000) ▼

[Publications] 中村嘉利, 沢田達郎, 井上英一: "汚染物のゼロエミッションの実現できる工業技術の提案を目指したユーカリから分離した各成分の有用資源化" *環境科学会誌*. 13. 562-568 (2000) ▼

[Publications] Nakamura, Y., Sungusia, M.G., Sawada, T., Kuwahara, M.: "Lignin-Degrading Enzyme Production by *Bjerkandera adusta* Immobilized on Polyurethane Foam" *Journal of Bioscience and Bioengineering*. 88-1. 35-41 (1999) ▼

[Publications] Nakamura, Y., Sawada, T., Yamaguchi, K.: "Breeding and Cultivation of Glucoamylase-Producing Yeast with Inactivation of MAT locus" *Journal of Chemical Engineering of Japan*. 32-4. 424-430 (1999) ▼

[Publications] Nakamura, Y., Sawada, T., Komori, M.: "Microbial Degradation of Phenol in the Presence of Heavy Metal Ion by Immobilized Bacterial Cells" *Journal of Environmental Chemistry*. 9-3. 581-587 (1999) ▼

[Publications] Nakamura, Y., Sawada, T.: "Biodegradation of Phenol in the Presence of Heavy Metals" *Journal of Chemical and Technology and Biotechnology*. 75-2. 137-142 (2000) ▼

[Publications] Nakamura, Y., Kobayashi, F., Sawada, T., Yamaguchi, K.: "Breeding and Incubation of Recombinant *Escherichia coli* having Overexpression System of Cloned Gene for Effective Production of Glucoamylase" *Kagaku Kogaku Ronbunshu*. 26-5. 687-692 (2000) ▼

[Publications] Nakamura, Y., Sawada, T., Inoue, E.: "Conversion of Each Component Separated from *Eucalyptus* into Useful Resource with Aim of Presenting of Industrial Technique Capable of Zero Emission" *Kankyo Kagaku Kaishi*. 13-5. 562-569 (2000) ▼

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