2.5.3 Laboratory : Recycle System of Biomas

Member :	Professor	Azuma, Jun-ichi, D. Agric. Sci.
	Senior Lecturer	Sakamoto, Masahiro, Ph.D.
	Doctor's program	3
	Master's Program	7
	Undergraduate	4
	Program-Specific Researcher	1

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Development of recycling system of plant biomass

Biomass plays a key role in recycling of organic matters on earth. Therefore, reifinery of the constituents and effective utilization of the separated materials are important for maintaining environmental aspects on earth. The object of this study is to develop a versatile re-utilization system of biomass by using microwave technology of non-used bio-based materials including conversion into liquid fuels.

b) Study on molecular mechanism of flowering in bamboos

Flowering of bamboos is rare phenomenon. Recently, flowering genes are cloned and analysed from various plants. We have also cloned flowering gene, FT, from Chugokuzasa. Overexpression of FT gene from Sasa stimulated rice flowering. Gene expression and regulatory mechanism are analysed.

c) Charcterization of structure and function of constituents of biomass and their biodegradation mechanisms

Characterization of structural and functional characteristics of constituents of biomass is a key step for their innovative use. In this theme, chemical and mechanical properties of constituents of cuticlar membranes, interactions of polysaccharides in cellulosic hydrogels, importance of xylan for formation of plasticized cell-walls and maintenance of colored materials and their bio-degradation mechanisms are investigated.

d) Biosynthsis and improvement of plant biomass constituents

Characterization of biosynthetic mechanism of biomass constituents is a key step for their better use. In this theme, biochemical and molecular biological approach is carried out for

characterization of photosynthetic products and secondary metabolites in woody and monocotyledonous plants. In addition, enzymic approach is carried out to give information about biosynthesis of cell-wall polysaccharides/glycoconjugates and elongation growth of monocot. For improvement of biomass production, systems of chloroplast DNA from the very important non-woody biomass-plants such as bamboo and cotton are also investigated.

A-2.Publications and presentations

a) Publications

Books

- Tsubaki, S.; Sakamoto, M.; Azuma, J. Application of microwave heating for the utilization of agricultural biomass. In: R. M. Mohan, Research Advances in Agricultural and Food Chemistry, vol. 1 (pp. 1-12). Trivandrum, Kerala, India: Global Research Network

Original Papers

- Tsubaki, S.; Nakauchi, M.; Ozaki, Y.; Azuma, J. Microwave heating for so ubilization of polysaccharide and polyphenol from soybean residue (Okara), Food Sci. Technol. Res. 15 (2009) 307-314
- Yudianti, R., Karina, M., Sakamoto, M., and Azuma, J. : Effects of salts on rheological behavior of Salvia hydrogels. Macromol. Res. 17 (2009) 332-338
- Yudianti, R., Karina, M., Sakamoto, M., and Azuma, J. : DSC analysis on water state of Salvia hydrogels. Macromol. Res. 17 (2009) 1015-1020
- Ookuahi, Y., Sakamoto, M., and Azuma, J. : Effects of microwave irradiation on water-soluble polysaccharides of the fruiting body of Hericium erinaceum. J. Appl. Glycosci. 56 (2009) 153-157
- Lao. X., J. Azuma and M. Sakamoto : Analysis of protein expression during intermodal elongation of Moso-bamboo. Bamboo J. 26 (2009) 17-25
- Tabuchi, Y., J. Azuma and M. Sakamoto : Transition of sugar content and vacuolar invertase activity during square-stem bamboo shoot elongation. Bamboo J. 26 (2009) 26-32
- Suzuki, S., Y. Suzuki, N. Yamamoto, T. Hattori, M. Sakamoto and T. Umezawa : High-throughput determination of thioglycolic acid lignin from rice. Plant Biotechnology 26 (2009) 337-340
- Azuma, J., Yamada, A., Takeda, H., Fukasawa, T., Tsunoda, K. and Yoshimura, T. : Difference in Digestibility of Pine Wood by Two Subterranean Termites, Coptotermes formosanus Shiraki and Reticulitermes speratus Kolbe (Blattodea: Rhinotermitidae):

Proceedings of The Sixth Conference of the Pacific-Rim Termite Group, Bali, Indonesia (2009) 1-6

Reviews

- Azuma, J. : Effective utilization of agricultural, marine and forest biomass by microwave irradiation, Shikoku Island Microwave Process Institution, Vol. 6 (2009) 3-7

Reports

- Monbusho Research Grant:
Cooperative Basic Research (B) Utilization of Gellous Biomass Containing Cellulose (Main, Azuma, J., cooperative, Sakamoto, M.)
- Cooperative work on Urban Area in Nothern and Central Districts of Wakayama Prefecture（General Type）, Next Generation Type of Peeling-Off of Fruits (Report of Results obtained in Heisei 22nd Year) (Main, Azuma, J.)

Patents

- Production methods for solubilized lignin, saccharide raw material and monosaccharide raw material, and solubilized lignin (Interantional Patent: WO2009/050882 A1) (Jun-ichi Azuma, Tetsuo Sakamoto and Kiyotaka Onishi)

b) Conference and seminar papers presented

- The 27th Annual meeting of the Japanese Society of Plant Cell and Molecular Biology: 1 presentaion
- The 60th Annual Meeting of the Japan Wood Science Research Society: 5 presentaions
- Annual Meeting of the The Japan Society for Bioscience, Biotechnology, and Agrochemistry: 3 presentations
- The Third Symposium of Japan Society of Electromagnetic Energy Applications: 3 presentations
- The 27th Bioscience forum in Wakayama: 1 presentaion
- The First International Symposium of Indonesian Wood Research Society "Contribution of Scientific Profession Society on the Development of Wood Science and Technology in Indonesia": 1 presentaion
- MAPEKI XII (National Seminar of the IndonesianWood Research Society XII): 2 presentations
- International Seminar on Chemistry and Polymer 2009: 2 presentations

A-3.Off-campus activities

Membership in academic societies

- Jun-ichi Azuma : The Japan Society for Carbohydrate Research (Councilor), The Japan Society for Bioscience, Biotechnology, and Agrochemistry (Councilor of the Kansai Branch), Japan Radioisotope Association (Councilor of Life Science Division), Councilor of NPO 'Society of Maintenance of Earth Environment by Recycling'

Research grants

1. Grants-in-aid for Scientific Research(KAKENHI)

- Scientific Research (B) : Jun-ichi Azuma : Utilization of Gellous Biomass Containing Cellulose

2.Other Research Grants

- Sponsered Research Funds (MAFF)：Jun-ichi Azuma：Urban Area Cooperative Research (General type)【Nothern and Central Wakayama Areas】Developing of new peeling method of fruits
- Sponsered Research Funds (MAFF)：Toshiaki Umezawa (Collaborator; Masahiro Sakamoto)：Genomics for Agricultural Innovation GMA0006
- Sponsered Research Funds (MAFF)：Jun-ichi Azuma：New Type Research Funds in Wakayama (Developing of stable Shiso anthocyanins)
- Sponsered Research Funds (MAFF)：Jun-ichi Azuma：Functional materials in black soy-beans, konbu and others
- Sponsered Research Funds (MAFF)：Jun-ichi Azuma：Developing new hybrid materials by the frontal polymerization method

A-4.International cooperation and overseas activities

Membership in academic societies

- Jun-ichi Azuma: Open Glycocience (Editor)

International joint research, overseas research surveys

- Search and utilization of hydrogels containing cellulose, Jun-ichi Azuma, LIPI (Indonesia)

Visiting Research Scholars

- Guest Resaerch Associate 1（Indonesia）

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level: Forest Biochemistry I (Azuma, Sakamoto), Forest Biochemistry II (Sakamoto, Azuma), Forest Analytial Chemistry (Azuma), Laboratory Course in Forest and Biomaterials Science II (Sakamoro), Laboratory Course in the Basic Forest and Biomaterial Chemistry (Azuma, Sakamoto)
- Graduate level: Forest Biochemistry (Azuma), Seminar in Wood Biochemistry (Azuma, Sakamoto), Experimetary Course in Wood Biochemistry (Azuma, Sakamoto)

B-2.Off-campus teaching etc.

Part-time lecturer

- Sakamoto, M.: Doshisha Women's College of Liberal Arts (Sicence, Technology and Human)