Chair Bio-environmental Science

2.5.3 Laboratory: Forest Biochemistry

| Member: | Professor | Azuma, Jun-ichi, Dr. Agric. Sci. |
|---------|------------------|------------------------------------|
| | Senior Lecturer | Sakamoto, Masahiro, Dr. Agric. Sci |
| | Doctor's program | 2 |
| | Master's Program | 9 |
| | Undergraduate | 4 |
| | Program- | |
| | Specific | 1 |
| | Researcher | |

A. Research Activities (2010.4-2011.3)

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 diverse biomass in environmental-friendly ways 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 necessary for formation of gellous properties, 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

- Matsumoto, A., Tsubaki, S., Sakamoto, M., Azuma, J.: A novel saccharification method of starch using microwave irradiation with addition of activated carbon, Bioresour. Technol., 102 (2011) 3985-3988

- Tsuchihashi, Y., Shintaku, K., Mikano-Tanaka, S., Ito, H., Azuma, J. :Evaluation of productivity and quality of honey from some Echium plants, J. Koshien J. Coll., 29 (2011) 20-25

- Yoshida, T., Tsubaki, S., Teramoto, Y., Azuma, J.: Optimization of microwave-assisted extraction of carbohydrates from industrial waste of corn starch production using response surface methodology, Bioresour. Technol., 101 (2011) 7820-7826

- Osono, T., Hobara, S., Hishinuma, T., Azuma, J.: Selective lignin decomposition and nitrogen mineralization in forest litter colonized by Clitocybe sp., Eur. J. Soil Biol., 47 (2011) 114-121

- Itoh, E., Azuma, J., Sakamoto, M. : Cloning and analysis of GRF1 gene expressed in Moso bamboo during shoot elongation, Bamboo J., 27 (2010) 19-25

- Inoue, T., Tsubaki, S., Ogawa, K., Onishi, K., Azuma, J.: Isolation of hesperidin from peels of thinned Citrus unshiu fruits by microwave-assisted extraction, Food Chem., 123 (2010) 542-547

- Azuma, J., Tsubaki, S., Yudianti, R., Karina, M.: Characterization of cuticle layer of Ilex latifolia, Wood Res. J., 1 (2010) 56-63

- Tsubaki, S., Azuma, J.: Microwave-assisted autohydrolysis of Prunus mume stone for extraction of polysaccharides and phenolic compounds, J. Food Sci., 75 (2010) C152-C159

- R. I. Hag Ibrahim, Sakamoto, M., Azuma, J. : LA-PCR-RFLP analysis of the chloroplast DNA in some species of Salvia L. Chromosome Botany 5 (2010) 95-102

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, others

- Funds for medium-sized and small companies in Wakayama Prefecture "Project for New Innovative Manufacture" (Main, Azuma, J.)

- 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.)

- Revolutional Project for Environment-friendry Production based on Green and Water Technology in Heisei 22 by the Ministry of Agriculture, Forestry and Fisheries (Main, Azuma, J.)

Patents

- Production methods for condensed edible extract devoid of hazardous heavy metals (Patent Number 4624025) (Jun-ichi Azuma, Nobuhiro Kanayama and Hiroaki Kanayama)

b) Conference and seminar papers presented

- The 28th 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 2

Research grants

2. Other Research Grants

- Sponsered Research Funds (MAFF) by the Ministry of Education: 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) by the Ministry of Agriculture, Forestry and Fisheries : Toshiaki Umezawa (Masahiro Sakamoto): Genomics for Agricultural Innovation GMA0006

- Sponsered Research Funds (MAFF) by the Ministry of Agriculture, Forestry and Fisheries : Jun-ichi Azuma : New Type Research Funds in Wakayama (Developing of stable Shiso anthocyanins)

- Sponsered Research Funds (MAFF) the Ministry of Agriculture, Forestry and Fisheries : Jun-ichi Azuma : Utilization of not-utilized biomass produced from vine industries

A-4.International cooperations and overseas activities 1

International joint research, overseas research surveys

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

A-4.International cooperations and overseas activities 2

Visiting Research Scholars

- Cooperative reseacher 1 (Indonesia)

B.Educational Activities(2010.4-2011.3)

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: Plant Biomass (Sakamoto), 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)

C.Other Remarks

- Jun-ichi Azuma: Member of Committee of Safe Committee for Radioisotopes and Radiation, Kyoto University Radioisotopes and Radiation, Member of Consolidating Committee for Atomic Force of Kyoto University, Member of Safeguard Committee of Faculty of Agriculture for Radioisotopes and Radiation