2.2.10 Laboratory : Tree Cell Biology

Member :	Associate Professor	Takabe, Keiji, Dr. Agric. Sci.
	Assistant Professor	Yoshinaga, Arata, Dr. Agric. Sci.
	Assistant Professor	Awano, Tatsuya, Dr. Agric. Sci.
	Doctor's program	2
	Master's Program	6
	Undergraduate	5

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Formation process of plant cell walls

Many subjects on the formation and ultrastructure of wood cell walls were investigated as the basic studies on plant materials. Formation processes of cellulose microfibrils, hemicelluloses, and lignin were investigated using various microscopic techniques including light microscopy, confocal laser scanning microscopy, UV microscopy, FT-IR and Raman microscopy, and immunoelectron microscopy. Distribution and deposition process of hemicelluloses in softwood and hardwood species was examined by immunoelectron microscopy with monoclonal antibodies. For lignification, transportation mechanism was investigated using microsomal fraction from differentiating xylem and monoclonal antibodies against lignin substructures were raised and their specificity was examined.

b) Structural studies on the formation, physiology and functions of the cells in vascular bundles in plants.

Structures and behaviors of cell organelles, stored substances and walls in xylem and phloem cells are investigated in trees, bamboos and grass, lianas in relation to their development, physiological events and functions. Distribution of living wood fibers in some tree species, difference in anatomy and hemicellulose distribution between liana and trees, seasonal change in starch distribution in bamboo and their change during air drying were investigated.

c) Change in cell wall ultrastructure and cell wall components in enzyme saccharification of woody biomass.

Changes in cell wall ultrastructure and distribution of cell wall component (cellulose, hemicellulose, and lignin) were examined as fundamental studies on enzyme saccharification

of woody biomass. Effect of alkali pre-treatment was investigated on bamboo. Other pre-treatments, which were effective for enzyme saccharification of bark in softwood, were also investigated.

A-2.Publications and presentations

a) Publications

Original Papers

- Ido, K., Ifuku, K., Yamamoto, Y., Ishihara, S., Murakami, A., Takabe, K., Miyake, C., Sato, F.: Knockdown of the PsbP protein does not prevent assembly of the dimeric PSII core complex but impairs accumulation of photosystem II supercomplexes in tobacco. Biochimica et Biophysica Acta, Bioenergetics 1787, 873-881, 2009
- Morikawa, Y., Yoshinaga, A., Kamitakahara, H., Wada, M., Takabe, K.: Cellular distribution of coniferin in differentiating xylem of Chamaecyparis obtusa as revealed by Raman microscopy. Holzforschung 64, 61-67, 2010
- Osawa, N., Yoshinaga, A.: The presence of micropyles in the shells of developing and undeveloped eggs of the ladybird beetle Harmonia axyridis (Coleoptera: Coccinellidae). Eur. J. Entomol. 106, 607-610, 2009
- Baba, K., Park, Y.W., Kaku, T., Kaida, R., Takeuchi, M., Yoshida, M., Hosoo, Y., Ojio, Y., Okuyama, T., Taniguchi, T., Ohmiya, Y., Kondo, T., Shani, Z., Shoseyov, O., Awano, T., Serada, S., Norioka, N., Norioka, S., Hayashi, T.: Xyloglucan for generating tensile stress to bend tree stem. Molecular Plant 2, 893-903, 2009

b) Conference and seminar papers presented

- The 60th Annual Meeting of the Japan Wood Research Society: 9 papers
- The 7th Paciffic Regional Wood Anatomy Conference 9 papers

A-3.Off-campus activities

Membership in academic societies

- Takabe, Keiji : International Academy of Wood Science (Fellow), The Japan Wood Research Society (Councilor)
- Yoshinaga, Arata : The Japan Wood Research Society (Editorial board member of the journal)

Research grants

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

- Fundamental Research (B) : Takabe, Keiji : Proteins relating to transportation and polymerization of monolignols
- Fundamental Research (C): : Kamitakahara, Hiroshi : Fine synthesis of cellulosic block co-polymers and their functionalization based on supermolecular structures

2.Other Research Grants

- NEDO, Accelerated Technology Development for Biofuel：Sugiyama, Junji (Study Group of Material Structure)：Basic R&D on Enzymatic Saccharification of Cellulosic Biomass and Biofuel Production.

A-4.International cooperation and overseas activities

International joint research, overseas research surveys

- Characterization of lignin in transgenic trees that are grown in field for more than 10 years with altered lignin metabolisms, Yoshinaga, Arata (INRA, France),

Visiting Research Scholars

- Researcher 1（France）

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level： Basic Forest and Biomaterials Science I (Takabe), Structural and Physiological Biology of Woody Plant Cells (Takabe), Formation of Plant Cell Walls (Takabe), Mushroom Science (Awano), Information Technology in Forest and Biomaterials Science (Awano), Reading of Foreign Literature II (Yoshinaga, Awano), Laboratory Course in Forest and Biomaterials Science I (Takabe, Yoshinaga, Awano), Laboratory Course in Forest and Biomaterials Biology (Takabe, Yoshinaga, Awano), Laboratory Course in Ultrastructural Observation of Wood (Takabe, Yoshinaga, Awano), Practice in University Forests I (Yoshinaga), Seminar in Forest and Biomaterials Science (Takabe)
- Graduate level： Seminor on Tree Cell Biology (Takabe), Laboratory Course in Tree Cell Biology (Takabe)

B-2.Off-campus teaching etc.

Open lectures, etc.

- Takabe, Keiji: Open Seminar in Forest Science, "Earth and me", Research Institute for Sustainable Humanoshere and Division of Forest and Biomaterials Science, Kyoto University, Lecturer
- Awano, Tatsuya: Open Seminar in Forest Science, "Earth and me", Research Institute for Sustainable Humanoshere and Division of Forest and Biomaterials Science, Kyoto University, Lecturer

B-3.Overseas teaching

International students

- International students : Doctral 1 (South Korea)