2.4.1 Laboratory : Plant Genetics

Member:	Professor	Endo, Takashi, D. Agric. Sci.
	Associate Professor	Miyashita, Naohiko, Ph. D.
	Assistant Professor	Nasuda, Shuhei, Ph. D.
	Doctor's program	2
	Master's Program	4
	Undergraduate	5
	Program-Specific Researcher	2

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Cytoagenetic analysis of a genetic genome rearrangement system in wheat

Chromosomal structural changes frequently occur in specific lines of common wheat carrying certain alien chromosomes from wild species related to wheat. These chromosomal aberrations can be identified by the chromosome banding and in situ hybridization techniques. Using this genome rearrangement system, we have established deletion and translocation lines of wheat and are conducting studies on chromosome mapping and the introduction of useful genes from alien species, such as barley and rye, into bread wheat. Also, we have initiated a basic study aimed at clonig the gene responsible for the unique genome rearrangement system.

b) Molecular cytogenetic analysis of wheat and its relative species

We are aiming at elucidating the molecular structure of the chromosomes of wheat, barley and rye by the analyses of molecular genetics and cytogenetics. Major interests are (1) chromosome mapping of DNA markers by using aneuploid ines, (2) functional and structural analysis of the centromere of chromosomes, and (3) molecular analysis of the chromosome hebavior during the gametogenesis of systimetic triploid wheat.

c) Molecular population genetics study on DNA variation in the genera Arabidopsis and Arabis, and Oryza

To eatablish a model system for plant population genetics, we have chosen two genera Agrabidopsis and Arabis. So far, several genic regions have been analyzed to quantify DNA variation at a specific genic region. In addition, microsatellite and AFLP analyses were conducted to investigate the pattern of DNA polymorphism over the entire genome. Currently, we are analyzing genes involved in herbicide resistancee in A. thaliana. To examine a more general picture of molecular variation in plant species, we are planning to compare these two genera and Oryza species, which are monocots. We have already analyzed DNA variation in two Adh locus regions in Oryza species, and are analyzing Blast-related and flowering genes.

d) Metagenomics analysis on soil microorganisms in tropical forests in the South East Asia In order to establish assessment methods of tropical forest ecosystem, we are conducting metagenomics analysis on soil microorganisms. We extracted microbial DNA from soil sampled in natural and degraded forests in Sarawak, Malaysia. Nucleotide sequences of microbes were determined by next-generation sequencers. By applying bioinformatics methods, we will clarify microbe composition and metabolic characteristics. We are also planning to conduct similar analyses in Indonesia and other areas in the South East Asia.

A-2.Publications and presentations

a) Publications

Original Papers

- Endo, T. R. : Cytological dissection of barley genome by the gametocidal system. Breed. Sci. 59; 481-486, 2009

- Gyawli, Y. P., S. Nasuda and T. R. Endo: Cytological dissection and molecular characterization of chromosome 1R derived from 'Burgas 2' common wheat. Genes Genet. Syst. 84; 407-416, 2009

- Sakai, K., S. Nasuda, K. Sato and T. R. Endo: Dissection of barley chromosome 3H in common wheat and a comparison of 3H physical and genetic maps. Genes Genet. Syst. 84; 25-35, 2009

 Yoshida, K. and N. T. Miyashita: DNA polymorphism in the blast disease resestance gene Pita of the wild rice Oryza rufipogon and its related species. Genes Genet. Syst. 84; 121-136, 2009

- Ishikawa, G., T. Nakamura, T. Ashida, M. Saito, S. Nasuda, T. R. Endo, J. Wu and T. Matsumoto: Localization of anchor loci representing five hundred annotated rice genes to wheat chromosomes using PLUG markers. Theor. Appl. Genet. 118; 499-514, 2009 <u>Reports</u>

- Endo, T. R.: National Bioresource Project Wheat: Overview. Wheat Information Service (eWIS), 2009

- Kawahara, T., T. R. Endo, T. Ban, M. Kishii and T. Sasanuma: The report of National Bioresource Project-Wheat II. Seed resources, 2008. Wheat Information Seivice (eWIS), 2009

- Nitta, M. and S. Nasuda: Annual report of the project "Polymorphism survey among hexaploid wheat and its relatives by DNA markers". Wheat Information Service (eWIS), 2009

b) Conference and seminar papers presented

- 116th Annual Meeting of the Japanese Society of Breedng: 3 presentations
- 117th Annual Meeting of the Japanese Society of Breeding: 3 presentations
- 4th Mugirui-kenkyukai: 3 presentations
- 32th Annual Meeting of the Molecular Biology Society of Japan: 1 presentation
- 6th International Triticeae Symposium: 1 presentation

A-3.Off-campus activities

Membership in academic societies

- Endo, Takashi, D.Agric.Sci : Genetic Society of Japan (Editor-in-Chief), Japanese Society of Breeding (Member)

- Miyashita, Naohiko, Ph. D. : The Society for the Study of Species Biology (Editorial Board), Genetic Society of Japan (Member)

- Nasuda, Shuhei, Ph. D. : Genetic Society of Japan (Member) , Japanese Society of Breeding (Member)

Research grants

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

- Scientific Research (B) : Endo, Takashi : Production of barley chromosome dissection lines and the development of their PCR-based selection

2.Other Research Grants

- Surveys and research on science promotion policies (Research Center for Science Systems, JSPS) : Endo, Takashi : Surveys and research on agronomical sciences

- Conservation program of bioresources, MEXT : Endo, Takashi : Conservation program of wheat aneuploid lines

- National BioResource Project -Wheat : Endo, Takashi (PI), Nasuda, Shuhei (Co-operater) : Preservation, collection, and distribution of wheat seed strains and DNA resources for gene isolation

National BioResource Project -Genome Information Upgrading Program : Ogihara,
Yasunari (PI, Yokohama City University), Nasuda, Shuhei (Co-operater) : Full-length cDNA resources of common wheat

- Environment Research and Technology Development Fund from Ministry of the Environment Government : Harada, Ko (PI, Ehime University), Miyashita, Naohiko (Co-operater) : Establishment of methods for assessing forest degration caused by deforestation and maintenance of biodiversity

A-4.International cooperation and overseas activities

Visiting Research Scholars

- Guest Scholar 1 (Germany)

- Research Fellow 1 (China)

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level :	Basic Bioresource Science I (Endo), Outline of Bio-productin
	Science I (Endo), Genetics I (Endo), Genetics II (Miyashita),
	Laboratory of Bioresource Scinece I, II (Endo and Miyashita),
	Seminar in Plant Resource Science (Endo and Miyashita)
- Graduate level :	Genetics (Advance Course) I (Endo), Genetics (Advance Course) II
	(Miyashita), Seminar in Plant Genetics (Endo and Miyashita),
	Research in Plant Genetics (Endo and Miyashita)

B-2.Off-campus teaching etc.

Part-time lecturer

- Miyasita, Naohiko: Faculty of Agriculture, Kobe University, (Population Genetics)

- Nasuda, Shuhei: Faculty of Education, Kyoto University of Education (Genetics), Doshisya Woman's College of Liberal Arts (Life Sciences)

B-3.Overseas teaching

International students

- International students : Doctral 2 (Nepal)

C.Other Remarks

- Endo, Takashi : Genetic Resources Committee and Resource Center, National Institute of Genetics (Member), Advisory committee of National Institute of Agribiological Sciences (Member)