

2.4.1 Laboratory : Plant Genetocs

Member:	Professor	Endo, Takashi, D. Agric.Sci
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	Assistant Professor	Nasuda, Shuhei, Ph.D.
	Doctor's program	3
	Master's Program	5
	Undergraduate	1
	Program-Specific Resea	1
	Researcher	1

A. Research Activities (2010.4-2011.3)

A-1. Main Subjects

a) Cytogenetic analysis of 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. In 2010 we have finished the production of dissection lines of common wheat for alien chromosomes, rye chromosome 1R and barley chromosome 4H, and using these lines, we constructed physical chromosome maps of 1R and 4H. We published these achievements as two papers.

b) Molecular cytogenetic analyses of chromosome and genome structures in wheat and relatives

Overall objective of our studies is to understand the structure and function of the chromosomes of wheat, barley and related species. By molecular cytogenetic analyses, (1) we developed a set of SSR markers that is suitable for detection of molecular markers linked to important genes in wheat breeding. We will search for tightly linked markers of the target genes so that those markers can be used in marker-assisted breeding. (2) Gametocidal (Gc) genes are exploited in induction of chromosome mutants in our laboratory. Norin 26 wheat has an inhibitor gene *Igc1* against a type of the Gc gene. We successfully mapped *Igc1* gene in the pericentromeric region of chromosome. (3) We analyzed chromosome behavior in interspecific hybrid of *Hordeum* species (barley and its relatives). We could demonstrate that uni-parental chromosome elimination in the hybrids is associated with loss of CENH3 in the centromeres of eliminating chromosomes.

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

To establish 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 resistance 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(including book-reviews)

- Sakata M, Nasuda S, Endo TR:

Dissection of barley chromosome 4H in common wheat by the gametocidal system and cytological mapping of chromosome 4H with EST markers. *Genes Genet Syst* 85: 19-29, 2010 査読有

- Kotseruba V, Pistrick K, Blattner FR, Kumke K, Weiss O, Rutten T, Fuchs J, Endo T, Nasuda S, Ghukasyan A, Houben A:

The evolution of the hexaploid grass *Zingieria kochii* (Mez) Tzvel. ($2n = 12$) was accompanied by complex hybridization and uniparental loss of ribosomal DNA. *Mol Phylogenet Evol* 56:146–155, 2010 査読有

- Gyawali YP, Nasuda S, Endo TR:

A Cytological Map of the Short Arm of Rye Chromosome 1R Constructed with 1R Dissection Stocks of Common Wheat and PCR-based Markers. *Cytogenet Genome Res* 129:224-33, 2010 査読有

- Yamano S, Nitta M, Tsujimoto H, Ishikawa G, Nakamura T, Endo TR, Nasuda S:

Molecular mapping of the suppressor gene *Igc1* to the gametocidal gene *Gc3-C1* in common wheat. *Genes Genet Syst* 85: 43-53, 2010 査読有

Reviews

- Kazuhiro Sato, Takashi R. Endo and Nori Kurata:

Cereal Resources in National BioResource Project of Japan. *Interdisciplinary Bio Central* 2:1-8, 2010

Reports,others

- Masaya Sakata, Shuhei Nasuda and Takashi R. Endo:

Is barley chromosome 4H dicentric?: A cytological evidence with common wheat lines carrying deleted 4H chromosomes. *eWIS No.110*:1-3, 2010

- Soichi Yamano, Hisashi Tsujimoto, Takashi R. Endo, and Shuhei Nasuda:
Radiation mutants for mapping genes and markers in pericentromeric region of chromosome 3B of
Norin 26 wheat. eWIS No.109:11-13, 2010

- Takashi R. Endo:
National BioResource Project Wheat : Overview 2009. eWIS No.110:41, 2010

- Taihachi Kawahara, Takashi R. Endo, Tomohiro Ban and Masahiro Kishii
The report of National Bioresource Project-Wheat II. Seed resources, 2009. eWIS No.110:43, 2010

- Miyuki Nitta and Shuhei Nasuda
Annual report (fiscal year 2009) of the project "Polymorphism survey among hexaploid wheat and
its relatives by DNA markers". eWIS No. 110:47-48, 2010

b) Conference and seminar papers presented

- The 82 Annual Meeting of the Genetic Society of Japan: 2 Presentations
- The 117th Meeting of the Japanese Society of Breeding (3 presentations)
- The 118th Meeting of the Japanese Society of Breeding (3 presentations)
- The 20th Annual meeting of the Japan Society of Tropical Ecology; 1 Presentation
- 10th Gatersleben Research Conference (GRCX) 2010 (1 presentation)
- The 3rd GEN Network International Seminar Sustainable Bio-Resources for Global Welfare : 1
Presentation

A-3.Off-campus activities 1

Membership in academic societies

- Endo, Takashi : The Genetics Society of Japan (Editor-in-Chief of Genes & Genetic Systems),
Japanese Society of Breeding (member)

- Naohiko Miyashita : The Genetics Society of Japan (member)

- Shuhei Nasuda : The Genetics Society of Japan (member), Japanese Society of Breeding (Council
member), The Society of Crop Science and Breeding in Kinki (Council member)

A-3.Off-campus activities 2

Research grants

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

- Scientific Research (B) : Endo, Takashi : Production of barley chromosomal dissection lines and
development of their PCR screening

2.Other Research Grants

- Sponsored Research Funds(MEXT): Endo, Takashi, D. Agric.Sci: National Biorespirce Project
- Sponsored Research Funds (MAFF): Shuhei Nasuda: Basic stdies for development of molecular markers to be used in marker-associated breeding of wheat

B.Educational Activities(2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level: Basic Bioresource Science 1(Endo), Outline of Bio-production Science 1(Endo), Genetics 1(Endo), Genetics 2(Miyashita), laboratory of Bioresource Science1,2 (Endo, Miyashita, Nasuda), Seminar in Plant Resource Science(Endo, Miyashita, Nasuda)
- Graduate level: Genetics(Advanced Cource)1 (Endo), Genetics(Advanced Cource)2 (Miyashita), Seminar in Plant Genetics(Endo, Miyashita, Nasuda), Research in Plant Genetics(Endo, Miyashita, Nasuda)

B-2.Off-campus teaching etc.

Part-time lecturer

- Nasuda, S.: Doshisha Women's U College of Liberal Arts (Life Sciences)

B-3.Overseas teaching 1

International students

- International students : Doctral 3 (China 1, Nepal 2)

C.Other Remarks

- Endo, Takashi : Genetic Resources Committee and Resource Center, National Institute of Genetics (Member), Advisory Board of National Institute of Agrobiological Science (member)