Chair Plant Production Science (Experimental Farm)

2.1.9 Laboratory : Plant Production Control

Member :	Professor	Kitajima, Akira, Dr.Agric.Sci.
	Associate Professor	Nakazaki, Tetsuya, Dr.Agric.Sci.
	Assistant Professor	Kataoka, Keiko, Dr.Agric.Sci.
	Master's Program	5
	Undergraduate	2

A. Research Activities (2010.4-2011.3)

A-1. Main Subjects

a) Transposable elements in soybean genome.

We are identifying some transposable elements in soybean genome. We try to find elements potential to transpose and reveal composition and variation among soybean varieties.

b) Screening of tanbaguro mutant

Tanbaguro is a japanese traditional soybean variety, characterized by the big black seeds. We are screening tanbaguro mutants with interesting agronomic traits from γ-ray irradiated population.

c) Studies on high productivity in rice under upland conditions.

We are collectiong the data about crop physiological traits of upland rice in order to determine the potential productivity of rice under upland condition and seek the way for further increase in rice yield under upland conditions.

d) Survey of novel flowering time genes using mutant lines

A flowering time is the most important trait that is responsible to the yield and its stability in rice. Although, resent molecular genetice analyses identified many genes involved in flowering time, the reguletory mechanism still remains unkown. Here, we identify novel flowering time genes from the investigation of flowering time mutant lines. Among them, we already have revealed some new genes and alleles.

e) Genetic analysis of agricultural trait in the population crossed between closely-related species, japonica varieties

DNA markers based on genetic polymorphism play important roles for genetic analyses and selections on breeding. Most of these markers are difficult to use when we analysize closely-related species, because the genetic background is not so different from each other. Here, we developed new DNA marker, named mPing-SCAR marker. This marker is based on the polymorphism of insertion of transposable element 'mPing'. A japonica rice variety "Gimbozu" harbors more than 1000 mPing insertion through the genome wide, whereas other japonica rice varieties harbors less than 50. When we cross Gimbozu with oher japonica varieties, the conventional DNA markers, such as RAPD, AFLP and SSR markers, is hard to use. On the other hands, over 1000 mPing SCAR markers are available. This marker can provide us a powerful method to perform genetic analyses of the agricultural traits, which are different among japonica varieties.

f) Breeding new lines of knock-out or gain-of-function using active transposable element mPing

An active transposable element mPing provides approximately 50 new insertions per plant per generation in rice varity Gimbozu. When a new insertion is appeared in a exon region of a gene, the gene will loss the function. On the other hands, when a mPing inserts in a promoter region, the gene might gain a new reguletory of the transcription, resulting gain new functions. Here, we grew ten thousand of Gimbozu, which include more than 300 thousand unique mPing insertion. Now we survey mPing insertion in our target genes.

g) Investigation the relationship between transcriptional elements (cis-elements) created by transposable element and the co-expression network

A life phenomenon is regulated by not a gene expression but genes co-expression at a time. It is considered that the cis-elemental module (the combination of cis-elements) is involved in the co-expression. A lot of cis-elements exist in transposable elements. Therefore, it is possible that co-expression network might be developed, when the same transposable element inserts in the promoter regions of the different genes.Here, we are investigating the components of cis-reguletory elements of each gene in rice, and integrate with expression data using bio-infomatical techniques.

h) Studies on seedlessness in citrus

We have been cleared that no seed development in seedless cultivar 'Mukaku Kishu' is resulted from embryo arrest at zygote or proembryo stage and the seed development is induced unede green house condition. In this year, the effects of thermal environment on embryo development in 'Mukaku Kishu' and the mechanisms of embryo development under highter temperature condition were investigated.

i) Fruit abscission mechanisms in citrus

Physiological fruit drop is one of the most important problems for stable fruit production in citrus. Fruit drop is induced by the shortage of assimilates supply from leaves to fruit and occurs on the joint tissue between fruit and receptacle. So, we investigate the mechanisms of fruit abscission process from an induction stage, shortage of carbohydrates supply to fruit, to a final stage, breakup of joint tissue between fruit and receptacle, by microarray gene expression analysis.

A-2.Publications and presentations

a) Publications

Original Papers(including book-reviews)

- Inafuku-Teramoto, S., M. Yamamoto, H. Kinjo, A. Kitajima, K. Wada and Y. Kawamitsu: Local citrus genetic resources and their polymethoxyflavones content in northern part of Okinawa Island. Hort. Res. 9; 263-271, 2010 (In Japanese with English abstract)

- Yamasaki, A., A. Kitajima and J. Kaneyoshi: Effects of high temperature period on seed and embryo development in seedless citrus. Proceedings of the International Society of Citriculture, 11th; 697-700, 2010

- Matsuda, M., T. Habu, T. Kurosawa, K. Kusumi, T. Konishi and A. Kitajima: Effect of different bearing shoot lengths on profitability of fruit production in Japanese persimmon (Diospyros kaki Thumb.) cv. Hiratanenashi. II. Bull. Exp. Farm Kyoto Univ. 19; 21-24, 2010

- Kataoka, K., K. Nishikawa,.T. Sakakibara, T. Fudano and S. Yazawa: Evaluation of newly developed parthenocarpic strains for production of winter tomatoes without heating. J. Jap. Soc. Agric. Tech. Man 17; 41-45, 2010

- Katsura, K., M. Okami, H. Mizunuma and Y. Kato: Radiation-use efficiency, N accumulation and biomass production of high-yielding rice in aerobic culture. Field Crops Res. 117; 81-89, 2010

- Kato, Y. and K. Katsura: Panicle architecture and grain number in irrigated rice grown under different water management regimes. Field Crops Res. 117; 237-244, 2010

- Saito H, Y. Okumoto, Y. Yoshitake, H. Inoue, Q. Yuan, M. Teraishi, T. Tsukiyama, H. Nishida and T. Tanisaka:
Complete loss of photoperiodic response in the rice mutant line X61 is caused by deficiency of phytochrome chromophore biosynthesis gene. Theor Appl Genet. 122; 109-118, 2011

Reviews

- Nakazaki, T.: Improvement of crops and related genes: identifying EP, the gene of high-yielding rice varieties. Bull.Exp. Farm kyoto Univ. 19; 9-13, 2010

Reports,others

- Kurosawa T., T. Habu, F. Kishida, M. Matsuda, K. Kusumi, T. Konishi and A. Kitajima: Development of high-quality fruit prodction techniques by using Tyvek® materials. Bull. Exp. Farm Kyoto Univ. 19; 35-38, 2010

- Kishida, F., T. Kurosawa, T. Konishi, K. Kusumi, M. Matsuda and T. Habu: Effect of the field environments of different weed management systems on fruit quality of grapes. Bull. Exp. Farm Kyoto Univ. 19; 29-34, 2010

b) Conference and seminar papers presented

- 11th Europian Society for Agronomy Congress "AGRO2010": 1 Presentation
- Crop Society of Japan, 230th Meeting: 2 Presentations
- 2010 Autumn Meeting of the Japanese Society for Horticultural Science : 4 presentations
- The 118th Meeting of the Japanese Society of Breeding: 1 Presentation
- ASA-CSSA-SSSA International Annual Meetings: 1 Presentation
- 3rd International Rice Congress: 2 Presentations

- The 170th Congress of the Society of Crop Science and Breeding in Kinki: 1 presentation
- 2011 General Technology Conference of Kumamoto University: 2 presentations
- 2011 Spring Meeting of the Japanese Society for Horticultural Science : 3 presentations
- The 119th Meeting of the Japanese Society of Breeding: 2 Presentations
- Crop Society of Japan, 231st Meeting: 4 Presentations

A-3.Off-campus activities 1

Membership in academic societies

- Kitajima, Akira, Dr.Agric.Sci. : The Japanese Society for Horticultural Science (Board), The Japanese Society for Horticultural Science (Editorial board), International Society of Citriculture, Japan Branch (Board)

- Nakazaki, Tetsuya, Dr.Agric.Sci. : The Society of Crop Science and Breeding in Kinki (Council member)

- Katsura, Keisuke, Dr. Agric. Sci. : Crop Society of Japan, Kinki Branch (General Secretary), The Society of Crop Science and Breeding in Kinki (General Secretary, Symposium member)

- Saito, Hiroki, Dr.Agric.Sci. : The Japanese Society of Breeding (Secretary)

A-3.Off-campus activities 2

Research grants

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

- Scientific Research (B) : A. Kitajima : Research of molecular mechanisms of fruit abscission and evaluation of parthenocarpy in citrus

- Grant-in-Aid for Young Scientists (B) : T. Habu : Searching for the parthenocarpy-related genes of grapes using the next generation sequencing

- Grant-in-Aid for Young Scientists (B) : K. Katsura : Improving the yield potential of rice by revealing the genotype by water management interactions

- Grant-in-Aid for Young Scientists (B) : H. Saito : Investigation of the reguletory system of flowering in rice using multiple mutation lines

- Scientific Research (A) : R. Tao (Collaborator; T. Habu) : Molecular basis of the S-RNase-based gametophytic self-incompatibility system in Prunus

- Scientific Research (B) (Overseas Academic Research) : T. Shiraiwa (Collaborator; K. Katsura) : Field studies on factors causing the widening gaps in soybean yield between Japan and USA

- Scientific Research (B) : Y. Okumoto (Collaborator; H. Saito) : Alteration of gene expression networks by a transporsable element mPing

2.Other Research Grants

- Sponsored Research Fund (Inter-University Research Institute Corrporation National Institutes for the Humanities) : Tetsuya, Nakazaki, D. Agric.Sci : Development of the effective display technique to contribute to education about the biological diversity

- Sponsored Research Fund (Independent Administrative Institute National Institute of Agrobiological Sciences) : Y. Okumoto (Collaborator; H. Saito) : Genetic and molecular dissection of quantitative traits in rice "Identification and functional analysis of heading time genes controlling the basic vegetative growth."

- Sponsored Research Fund (Fujikko Co. Ltd.) : Y. Okumoto (Collaborator; H. Saito) : Mutation breeding of soybean varietiy 'Tanbaguro'

A-4.International cooperation and overseas activities 1

International meetings(country,roles)

- Katsura, Keisuke :

B.Educational Activities(2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level : Plant Cultivation Technology and Farm Practice I (Kitajima, Nakazaki, Kataoka, Fudano, Habu, Katsura, Saito), Agricultural Technology and Farm Practice II (Kitajima, Nakazaki, Kataoka, Fudano, Habu, Katsura, Saito), Agronomy and Farm Practice Concerning the Dining Table (Subject of The Consortium of Universities in Kyoto, Kitajima, Nakazaki, Kataoka, Fudano, Habu, Katsura, Saito), Plant Production management Science (Kitajima), Seminar on Plant Production Control Science (Kitajima, Nakazaki, Kataoka, Fudano, Habu, Katsura, Saito), Lecture on Outline of Bioresource Science I (Kitajima), Introduction to Research (Kitajima, Nakazaki, Kataoka, Fudano, Habu, Katsura, Saito), Laboratory Course in Bioresource Science I･II (Nakazaki)
- Graduate level : Seminar on Plant Production Control Science (Kitajima), Plant Production Technique (Nakazaki), Plant Production Control Science Seminor (Kitajima, Nakazaki, Kataoka, Fudano, Habu, Katsura, Saito), Special Laboratory Work in Plant Production Control Science (Kitajima, Nakazaki, Kataoka, Fudano, Habu, Katsura, Saito)

B-2.Off-campus teaching etc.

Part-time lecturer

- Kitajima, Akira, Dr.Agric.Sci. : Kyoto University of Education

- Kitajima, Akira, Dr.Agric.Sci. : Prefectural University of Hiroshima

- Nakazaki, Tetsuya, Dr.Agric.Sci. : Faculty of Engineering, Kyoto Sangyo University (Fundamentals of Biological Experiment I, Fundamentals of Biological Experiment II)

Open lectures, etc.

- Kitajima, Akira, Dr.Agric.Sci. : The five universities relay lecture meeting in Takatsuki city, Takatsuki city, Lecturer

- Kitajima, Akira, Dr.Agric.Sci. : The university seminar in Takatsuki city, Takatsuki city, Lecturer

- Keiko, Kataoka, Dr.Agric.Sci. : 2010 Project of teaching by working people, Katsura high school, Lecturer

- Habu, Tsuyoshi, Dr.Agric.Sci: Pruning of fruit trees, Japan Flower Society, Lecturer

- Saito, Hiroki, Dr.Agric.Sci. : The 14th Open Seminar of Experimental Farm, Kyoto University, Lecturer

B-3.Overseas teaching 1

International students

- International students : Master 1 (China)

C.Other Remarks

- Kitajima, Akira, Dr.Agric.Sci. : The Public Corporation of Tree-Planting and Forest of Takatsuki-shi (Director), The Committee of local production for local consumption in Yahata City (Chairman), The Committee of local industrial vitalization of Takatsuki-Mishima-Kyoto area (Member), The Committee of Experimental Farm of Kyoto University (Board member)

- Nakazaki, Tetsuya, Dr.Agric.Sci. : The Committee of Experimental Farm of Kyoto University (Board member), The Safety Control Committee for Recombinant DNA of Resesrch Institute for Humanity and Nature (Committee)