2.1.4 Laboratory : Pomology

Member :	Professor	Yonemori, Keizo, D. Agric. Sci.
	Associate Professor	Tao, Ryutaro, D. Agric. Sci.
	Assistant Professor	Yamane, Hisayo, D. Agric. Sci.
	Doctor's program	4
	Master's Program	9
	Undergraduate	3
	Post-Doctoral fellow	1
	Program-Specific Researcher	1

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Molecular markers for selecting pollination-constant and non-astringent (PCNA) type persimmon in breeding populations

Bud dormancy in deciduous fruit tree species is a complex process necessary for plant survival in the unfavorable environment. Once formed in summer, buds enter a endodormant state and require a certain amount of cold temperatures to resume growth in a favorable environment. Recent global warming potentially causes serious problem such as irregular or loss of flowering. Recently, we have found a MADS-box transcription factor that is putatively related to endodormancy induction and endodormancy release. We are now conducting functional study to characterize the MADS-box transcription factor toward the ultimate goal to understand the internal genetic factors controlling endodormancy of deciduous fruit tree species.

b) Molecular basis of gametophytic self-incompatibility in Prunus

Many fruit tree species in Prunus exhibit the monofactorial gametophytic self-incompatibility. As they are unable to bear fruits parthenocarpically, fertilization is a very important factor in fruit production in self-incompatible fruit species in Prunus. We attempt to elucidate the physiological and molecular mechanisms of gametophytic self-incompatibility of four fruit tree species of Prunus: almond, Japanese apricot, Japanese plum, and sweet cherry. We have identified both the pistil determinant (S-RNase gene) and the pollen determinant (S haplotype-specific F-box protein gene) of the self-incompatibility reaction. We are now on the

way to elucidate the molecular basis of the self and nonself recoginition system in Prunus.

c) Dormancy in temperate fruit tree

Bud dormancy in deciduous fruit tree species is a complex process necessary for plant survival in the unfavorable environment. Once formed in summer, buds enter a endodormant state and require a certain amount of cold temperatures to resume growth in a favorable environment. Recent global warming potentially causes serious problem such as irregular or loss of flowering. Recently, we have found a MADS-box transcription factor that is putatively related to endodormancy induction and endodormancy release. We are now conducting functional study to characterize the MADS-box transcription factor toward the ultimate goal to understand the internal genetic factors controlling endodormancy of deciduous fruit tree species.

A-2.Publications and presentations

a) Publications

Original Papers

- Akagi, T., A. Ikegami, Y. Suzuki, J. Yoshida, M. Yamada, A. Sato, and K. Yonemori (2009) Expression balances of structural genes in shikimate and flovonoid biosynthesis cause a difference in proanthocyanidin accumulation in persimmon (Diospyros kaki Thunb.) fruit. Planta 230：899-915

- Akagi, T., A. Ikegami, T. Tsujimoto, S. Kobayashi, A. Sato, A. Sato, and K. Yonemori (2009) DkMyb4 is a myb transcription factor involved in proanthocyanidin biosynthesis in persimmon fruit. Plant Physiol. 151: 2028-2045

- Akagi, T., S. Kanzaki, M. Gao, R. Tao, D. E. Parfitt, and K. Yonemori (2009) Quantitative real-time PCR to determine allele number for the astringency locus by analysis of a linked marker in Diospyros kaki Thunb. Tree Genetics & Genomes 5: 483-492

- Esumi, T., C. Hagihara, Y. Kitamura, H. Yamane, and R. Tao (2009) Identification of an FT ortholog in Japanese apricot (Prunus mume Sieb et Zucc.). J. Hortic. Sci. & Biotech. 84: 149-154

- Fernandez i Marti, A., T. Hanada, J.M. Alonso, H. Yamane, R. Tao, and R. Scoias i Company (2009) A modifire locus affecting the expression of the S-RNase gene could be the cause of breakdown of self-incompatibility in almond. Sex. Plant Reprod. 22:179-186

- Hanada, T., K. Fukuta, H. Yamane, T. Esumi, and R. Tao (2009) Cloning and characterization of a self-compatible Sf haplotype in almond [Prunus dulcis (Mill.) D.A. Webb. syn. P. amygdalus Batsch to resolve previous confusion in its Sf-RNase sequence. HortScience 44: 609-613
- Hanada, T., K. Fukuta, H. Yamane, R. Tao, J. M. Alonso, and R. Socias i Company (2009) Cloning of self-compatible Sf locus in almond. Acta Hort. 814: 623-627
- Ikegami, A., T. Akagi, D. Potter, K. Yonemori, M. Yamada, A. Sato, A. Kitajima, and K. Inoue (2009) Molecular identification of 1-Cys peroxiredoxin and anthocyanidin/flavonol 3-O-galactosyltransferase from proanthocyanidin-rich young fruits of persimmon (Diospyros kaki Thunb.). Planta 230: 841-855
- Ikegami, A., T. Akagi, K. Yonemori, M. Yamada, and A. Kitajima (2009) Analysis of differentially expressed genes in astringent fruit using suppression subtractive hybridization. Acta Hort. 833: 151-156
- Kanzaki, S., Yamada M, Sato A, Mitani N, Utsunomiya N, Yonemori K (2009) Conversion of RFLP markers for the selection of pollination-constant and non-astringent type persimmons (Diospyros kaki Thunb.) into PCR-based markers. J Jpn Soc Hort Sci 78:68–73
- Tao, R., M. Gao, T. Esumi, Y. Kitamura, and A. Yamada (2009) High frequency ploidy variation observed in seedlings of a hexaploid persimmon cultivar 'Fujiwaragosho'. Acta Hort. 833: 131-133
- Tao, R., T. Habu, K. Fukuta, D. Matsumoto, and H. Yamane (2009) Self-(in)compatibility in Japanse apricot (Prunus mume). Acta Hort.814: 375-380
- Yamane, H., K. Fukuta, D. Matsumoto, T. Hanada, G. Mei, T. Habu, Y. Fuyuhiro, S. Ogawa, H. Yaegaki, M. Yamaguchi, and R. Tao (2009) Characterization of a novel self-compatible S3'haplotype leads to the development of a universal PCR marker for two distinctly originated self-compatible S haplotypes in Japanese apricot (Prunus mume sieb. et Zucc.). J. Japan. Soc. Hort. Sci. 78: 40-48
- Yamane, H., Ichiki, M., and R. Tao (2009) Growth characteristics of the samall-fruit mutant in Japanese persimmon (Diospyrs kaki Thunb.). Acta Hort. 814: 343-347
- Yamane, H., M. Ichiki, R. Tao, and K. Yonemori (2009) Fruit growth and development of small-fruit dwarf mutant in Japanese persimmon (Diospyros kaki Thunb.). Acta Hort. 833: 125-130
- Yonemori, K., and Y. Suzuki (2009) Differences in three-dimensional distribution of tannin cells in flesh tissue between astringent and non-astringent type persimmon. Acta Hort.

Reviews

- Yamane, H. and R. Tao (2009) Molecular basis of self-(in)compatibility and current status of S-genotyping in rosaceous fruit trees. J.Japan. Soc. Hort. Sci. 78: 137-157

b) Conference and seminar papers presented

- The 51st Annual meeting of the Japanese Society of Plant Physiologists: 1 Presentation
- Spring meeting of the Japanese Society for Horticultural Science: 6 Presentations
- Autumn meeting of the Japanese Society for Horticultural Science: 7 Presentation
- Plant and Animal Genome Conference: 2 Presentation
- Plant Dormancy Symposium: 1 Presentation

A-3.Off-campus activities

Membership in academic societies

- Yonemori, Keizo : Japanese Society for Horticultural Science (President)
- Tao, Ryutaro : Japanese Society for Horticultural Science (Vice Secretary General)

Research grants

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

- Scientific Research (B) : Yonemori, Keizo : Exploring the genes linked to tannin accumulation in persimmon and its utilization for analysis of genome composition and breeding
- Scientific Research (B) : Yonemori, Keizo : Exploration of the original wild species of the cultivated Diospyros kaki
- Scientific Research (A) : Tao, Ryutaro : Molecular Basis of the S-RNase-based Gametophytic Self-incompatibility in Prunus

2.Other Research Grants

- Sponspred Research Funds: Promotion of Basic Research Activities for Innovative Biosciences (BRAIN) : Yamane, Hisayo : Molecular basis of bud dormancy in temperate fruits
- Asahi Glass Foundation Research Grant Program : Yamane, Hisayo : Molecular basis of the adaptation to seasonal temperature changes in higher plants

A-4.International cooperation and overseas activities

Membership in academic societies

- Yonemori, Keizo: International Society for Horticultural Science (Council member)

- Tao, Ryutaro: International Society for Horticultural Science (Council member)

International meetings(country,roles)

- Yonemori, Keizo : The 80th Anniversary Meeting of Chinese Society for Horticultural Society (China, invited speaker)

International joint research, overseas research surveys

- Reproductive biology in tropical fruit trees,Yonemori, K (Thailand)
- Studies on the mechanism of tannin accumulation in persimmon, Yonemori, K (USA, Italy)
- Studies on a PCNA cultivar of Chinese origin,Yoenmori, K. (China)
- Survey on mango germplasm in Australia for mango breeding, Yonemori, K. (Australia)
- Transformation of fruit tree species, Tao, Ryutaro (USA)
- Self-incompatibility in Prunus, Tao, Ryutaro (Spain, Thailand, USA)
- Survey of low-chill deciduous fruit tree species adapted to subtropical regions, Yamane, Hisayo (Thailand)

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level : Pomology I (Yonemori), Pomology II (Yonemori, Tao), Cell Biology (III), Introduction to Foeign Literature in Bioresource Science (Tao), Seminar in Horticultural Science (Yonemori, Tao, Yamane), Laboratory Course in Bioresource Science I, II (Tao, Yamane), Fundamentals for the Laboratory Cource in Bioresource Science (Tao, Yamane)
- Graduate level : Advanced Course of Pomology (Yonemori), Pomology Seminar (Yonemori, Tao, Yamane), Special Laboratory Work in Pomology (Yonemori, Tao, Yamane)

B-2.Off-campus teaching etc.

Part-time lecturer

- Yonemori, Keizo: Fukui Prefectural University, Faculty of Biotechnology, Department of Bioscience (Pomology)