## 2.5.7 Laboratory : Ecological Information

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| Member : | Professor | Amano, Hiroshi, Ph. D. |
| | Associate Professor | Osakabe, Masahiro, Dr. Agric. Sci. |
| | Assistant Professor | Yano, Shuichi, Dr. Agric. Sci. |
| | Doctor's program | 1 |
| | Master's Program | 4 |
| | Undergraduate | 1 |
| | Other | 2 |
| | Post-Doctoral fellow | 1 |
| | Program-Specific Researcher | 1 |
| | Researcher | 1 |

**A. Research Activities (2009.4-2010.3)**

**A-1. Main Subjects**

a) outline

The major research topic in this laboratory is the ecological, molecular and biochemical analysis of the interactions among plants, herbivors and predators, along with basic ecological and genetical studies of individual components comprising of these systems.

b) Inter- and intra-specific variations in the ecological performance of spider mites

Phytophagous mites of the family Tetranychidae occur in a variety of environments, while their adaptive traits such as diapause, dispersal and host plant range vary within species and between them. We have studied experimentally and theoretically, the genetic basis of this variation, and the ecological factors responsible for and the significance of the variation.

c) Management of spider mite population in orchards

We have compared the abundance of spider mite populations in pear and persimmon orchards that have different cultural and control programs, and determined the artificial factors responsible for outbreaks of the mites. Based on this survey, we proposed strategies for controlling the mite population, including the use of natural enemies, such as phytoseiid mites, and the development of new cultural management techniques.

d) Ethological interactive studies of spider mites and their predators

In general, herbivors and their predators are involved in complex food webs. Moreover, members within a trophic level also interact through inter-specific competition and/or intra-guild predation. We have investigated direct and indirect impacts of these interactions on the population dynamics of herbivors.

e) Evolutionary ecology of plant-herbivore interactions

Diverse interactions between plants and herbivors are maintained by the balance between defense of plants against herbivores and counter adaptation of herbivors. From this viewpoint, we have examined the reason why host ranges of phytophagous insects and mites are generally restricted to a small range of plant fauna available to them. We also investigated proximate factors responsible for the interactions such as secondary metabolites of host plants.

f) Meta-population structure and maintenance of genetic variation in spider mites

Neutral mutations are frequently lost or fixed by genetic drift within a finite population. Nevertheless, genetic variations in pesticide susceptibilities are maintained in a selection-free, wild population of spider mites. Such variations may be maintained by the meta-population structure of spider mites. We have analyzed the structure using molecular markers such as DNA polymorphism, and discussed the maintenance mechanism of the genetic variations.

**A-2.Publications and presentations**

a) Publications

Books

- Amano, H. In:Colored Guide to the plant mites of Japan. Phytoseiidae (pp.88-102), Stigamaeidae (pp.113-114), Insect natural enemy (pp. 189-191), Biology and Identification of insect natural enemy (pp.286-289), and Preparation of specimens and rearing mrthod of plant mites (pp.301-311), Zenkoku Noson Kyoiku Kyokai, Tokyo, 2009 (In Japanese)

Original Papers

- Nguyen, T. T. P. and H. Amano: Temperature at immature and adult stages differentially affects mating duration and egg production of Neoseiulus californicus females mated once (Acari: Phytoseiidae). J. Asia-Pacific Entomol.13: 65-68, 2010.
- Ohtsuka, K. and Mh. Osakabe: Deleterious effects of UV-B radiation on herbivorous spider mites: They can avoid it by remaining on lower leaf surfaces. Environ. Entomol. 38: 920-929, 2009.

- Hinomoto, N., T. Higaki, Mh. Osakabe and A. Takafuji: Development and evaluation of microsatellite markers in Tetranychus truncatus Ehara (Acari: Tetranychidae). J. Acarol. Soc. Jpn. 18: 91-98, 2009.

- Yano, S. and Mh. Osakabe: Do spider mite-infested plants and spider mite trails attract predatory mites? Ecol. Res. 24: 1173-1178, 2009.

- Uesugi, R., T. Sasawaki and Mh. Osakabe: Evidence of a high level of gene flow among apple trees in Tetranychus urticae. Exp. Appl. Acarol. 49: 281-290, 2009.

- Nguyen, T. T. P. and H. Amano: Mating duration and egg production of the predaceous mite Neoseiulus californicus (Acari: Phytoseiidae) vary with temperature. J. Asia-Pacific Entomol. 12: 297-299, 2009.

- Shimoda, T., H. Kishimoto, J. Takabayashi, H. Amano and M. Dicke: Comparison of thread-cutting behavior in three specialist predatory mites to cope with complex webs of Tetranychus spider mites. Exp. Appl. Acarol. 47: 111-120, 2009.

- Kunimoto, Y., T. Nakama, H. Amano and A. Takafuji: Species composition of spider mites in persimmon orchards in Nara Prefecture with reference to the effect of weed management. J. Acarol. Soc. Jpn. 18: 7-16, 2009.

- Ohashi, K., S. Ehara, Y. Kunimoto, H. Amano and A. Takafuji: The occurrence of Schizotetranychus baltazari Rimando (Acari:Tetranychidae) in Japan. J. Acarol. Soc. Jpn. 18: 29-31, 2009.

Reviews

- Osakabe, Mh., R. Uesugi and K. Goka: Evolutionary aspects of acaricide-resistance development in spider mites. Psyche 2009 (doi:10.1155/2009/94739), 2009.

- Osakabe, Mh. and R. Uesugi: Acaricide resistance in spider mites. J. Pestic. Sci. 34: 207-214, 2009.

- Osakabe, Mh. and K. Ohtsuka: Spider mites and UV radiation: Why does the two-spotted spider mite, Tetranychus urticae remain on the lower leaf surfaces of their host plants? Plant Protection 63: 583-586, 2009.

- Yano, S., M. Ozawa, Mh. Osakabe and T. Kawasaki: Ecological backgrounds for retaining predatory mites on plants. Plant Protection 63: 635-640, 2009.

b) Conference and seminar papers presented

- 54th Annual Meeting of Japanese Society of Applied Entomology and Zoology: 10 papers

- 16th Annual Meeting of the Acarological Society of Japan: 5 papers

- 69the Annual Meeting of the Entomological Society of japan: 1 paper (invited)
- International Symposium of the Strategy against the Climate Change (Jeju, Korea ): 1 paper (invited)

**A-3.Off-campus activities**

Membership in academic societies

- Amano, Hiroshi, Ph. D. : Japanese Society of Applied Entomology and Zoology (Editorial Board), The Entomological Society of Japan, The Society of Population Ecology, The Acarological Society of Japan (President)
- Osakabe, Masahiro, Dr. Agric. Sci. : Japanese Society of Applied Entomology and Zoology (Councilor, Editor), The Genetics Society of Japan, Pesticide Science Society of Japan, The Society of Population Ecology, The Acarological Society of Japan (Councilor)
- Yano, Shuichi, Dr. Agric. Sci. : Japanese Society of Applied Entomology and Zoology (Editorial Board), The Society of Population Ecology, The Acarological Society of Japan, The Ecological Society of Japan

Research grants

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

- Scientific Research (C) : Yano, Shuichi : Effect of ants on predator-prey interactions among mites in agroecosystems
- Scientific Research (C) : Amano, Hiroshi : Establishment of pest managemant system with self-propagation system of natural enemies by farmers

**A-4.International cooperation and overseas activities**

Membership in academic societies

- Osakabe, Masahiro, Dr. Agric. Sci.: The Entomological Society of America, European Association of Acarologists

Visiting Research Scholars

- JSPS Post doctoral Fellow　1（Great Britain）

**B.Educational Activities(2009.4-2010.3)**

**B-1.On-campus teaching**

a) Courses given

- Undergraduate level: Ecological Management (Osakabe), Seminar in Ecological Management (Amano, Osakabe), Outline of Bioresourse Science IV (Osakabe), Fundamentals of the Experiments of Bioresource Science (Yano), Laboratory Course in Bioresource Science I･II (Yano)
- Graduate level: Ecological Information (Amano), Seminar in Ecological Information and Management (Amano, Osakabe), Research in Ecological Information and Management (Amano, Osakabe and Yano)

**B-2.Off-campus teaching etc.**

Part-time lecturer

- Amano, Horoshi: Chiba University, Faculty of Horticulture (Applied Zoology), The Open University of Japan (Looking into the world of insects)
- Osakabe, Masahiro: Ishikawa Prefectural University (Applied Entomology), Kyoto Prefectural University, Graduate School if Life and Enviromental Science (Sustainable Human life and Enviroment)

**C.Other Remarks**

- Amano, Hiroshi: Working of Organizational Change of Graduate School of Science and Technology, Nagasaki University (External advisor)