2.1.3 Laboratory: Vegetable and Ornamental Horticulture

Member:	Professor	Doi, Motoaki, Dr. Agric.Sci.
	Associate Professor	Hosokawa, Munetaka, Dr. Agric.Sci.
	Assistant Professor	Mizuta, Youichi, Dr. Agric.Sci.
	Doctor's program	2
	Master's Program	8
	Undergraduate	3

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Formation of novel capsaicinoid-like substances (CLSs) in chilli fruit Some chilli cultivars including 'CH-19 Sweet' contains CLSs such as capsinoids and capsiconinoids. These fruits have no pungency but similar physiological functions to capsaicinoids for human health. We have conducted experiments on the formation of CLSs in the fruits and the related genes.

b) Flower scent formation and its control

Considering the flower sent as an important quality element of ornamental plants, we are studying the formation of flower scents and how we could change it. Using perennial gypsophila inflorescences, which have unpleasant odor attributed to isovaleric acid, we developed a method to suppress the odor and to add pleasant smell.

c) Hypersensitive physiological disorders induced by photooxydative stress
Plants which become hypersensitive state by an infection of pathogens or mechanical wounding respond severly to temperature and potooxydative stress often resulting in occurrence of physiological disorders. Using canna leaves we are studing the mechanisms of signal transduction of harvesting and subsequent potooxydative physiological disorders.
d) Various applications of leaf primordial free shoot apical meristem culture in horticulture Leaf primordia-free shoot apical meristem culture which is originally developed by this laboratory is an effective method for viroid free plant production. In addition to this

application, we are developing methods for the disease resistant plant screening in in vitro and for generating transgenic plants.

e) Unknown environmental factors for horticultural crops

Phosphorus deficiency in fertilizer or nutrient solution causes the decrease of anthocyanin biosynthesis and consequently makes red petals turn white in some petunia cultivars. We are trying to clarify the mechanism how phosphorus regulates the anthocyanin biosynthesis in petunia. And in dahlia, there are cultivars with unstable anthocyanin expression in their petals responding to high temperature. And we research about the capsicum plants which has an inflection temperature about 25°C. We are exploring unknown genetic resources in the constant temperature area in the world. At last, for determining the mutagen in in vitro culture, we would like to develop a new in vitro culture method without mutation. These four interesting environmental factors, which will concern in the genetic or epigenetic gene expressions, have not been reported.

f) Development of new plant production system

We developed new tissue culture method of the plant without using the sterility equipment by adding chlorine to the medium with sterile containers. And the enlargement method and the liquid culture method are being developed now. (2) We developed sucrose supplying technique to plant by microbe-static conditions established by phosphate elimination using aluminum hydroxide and root split. By the results obtained by this technique and the simplified tissue culture system, the method of supplying the vegetable with sugar in the open vessels was under development. (3) We facilitated the transplant and the control of the rhizosphere by making rhizosphere plane. (4) We are developing the system that consistently does the tissue culture, the raising seedling, and the harvest by combining these three methods.

A-2.Publications and presentations

a) Publications

Original Papers

- Doi, M., N. Shimomura, K. Inamoto and H. Imanishi. 2009. Contribution of individual bent shoot layers to cut flower productivity in shoot-bending 'Asami Red' roses. J. Japan. Soc. Hort. Sci. 78: 478-484.

- In, B. C., K. Inamoto and M. Doi. 2009. A neural network technique to develop a vase life prediction model of cut roses. Postharvest Biol. Technol. 52: 273–278.

- Doi, M. and M. Tsuruga. 2009. Hydration of cut chrysanthemum shoots in relation to the physical propaties of vase water. Hort. Res.(Japan) 8: 235-241. (in Japanese with English summary)

- Omori, H, M. Hosokawa, N. Shitsukawa, K. Murai, S. Yazawa. 2009. Screening of chrysanthemum plants with strong resistance to Chrysanthemum Stunt Viroid. J. Japan. Soc. Hort. Sci. 78. 350-355.

- Zhang, Y, T. Hayashi, M. Hosokawa, S. Yazawa, Y. Li. 2009. Metallic luster and the optical mechanism generated from the leaf surface of Begonia rex. Sci. Hort.121. 213-217.

- Kitamura, Y, M. Hosokawa, T. Uemachi, S. Yazawa. 2009. Selection of ABC genes for candidate genes of morphological changes in hydrangea floral organs induced by phytoplasma infection. Sci. Hort. 122. 603-609.

- Kesumawati, E, M. Hosokawa, T. Uemachi, T. Kimata, S. Yazawa. 2009. Flower greening in phytoplasma-infected Hydrangea macrophylla grown under different shading conditions. Sci. Hort. 121. 199-205.

- Suzue, H, M. Hosokawa, S. Yazawa. 2009. A convenient method for exposing shoot apical meristems using compressed air. HortScience 44. 1401-1503.

- Tanaka, Y, M. Hosokawa, K. Otsu, T. Watanabe, S. Yazawa. 2009. Assessment of capsiconinoid composition, nonpungent capsaicinoid analogues, in capsicum cultivars. J. Agr. Food Chem.57. 5407-5412.

- Kitamura, Y, M. Hosokawa, T. Uemachi, S. Yazawa. 2009. Increase in the number of decorative florets in the inflorescence of Hydrangea through phytoplasma infection. Sci. Hort. 124. 134-138.

- Wakita, M, Y. Tanaka, S. Yazawa. 2009. Evaluation of low temperature tolerance in newly developed tolerant cultivar (Capsicum baccatum var. pendulum) and other cultivars. Bulletin Exp. Farm, Kyoto University 18. 11-17.

- Koeda, S, M. Hosokawa, B-C. Kang, S. Yazawa. 2009. Dramatic changes in leaf development of the native Capsicum chinense from the Seychelles at temperatures below 24°C . J. Plant Res. 122.623-631.

b) Conference and seminar papers presented

- 2009 Autumn Meeting of the Japanese Society for Horticultural Science (6 presentations)

- 2010 Spring Meeting of the Japanese Society for Horticultural Science (4 presentations)

- 2009 Meeting of the Japanese Society for Horticultural Science, Kinki Region(1 presentation)

A-3.Off-campus activities

Membership in academic societies

- Doi Motoaki : The Japanese Society for Horticultural Science, The American Society for Horticultural Science, The Japaneses Society of Agricultural, Biological and Environmental Engineers and Scientists, Hydroponic Society of Japan

- Hosokawa Munetaka : The Japanese Society for Horticultural Science

- Mizuta Youichi : The Japanese Society for Horticultural Science

Research grants

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

- Scientific Research (C) : M.Doi : Development of new cut flower crops through regulating the signal transduction and mechanisms of hypersensitive physiological disorders after harvest

- Scientific Research (B) : M.Hosokawa : Screening of functional sequences in viroid

- Challenging Exploratory Research : M.Hosokawa : Screening of antimutagen suppressing the somatic mutation occurence

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level:	Ornamental Horticulture (Doi and Hosokawa), Vegetable Science
	(Doi), Seminar in Horticultural Science (Doi), Laboratory in
	Bioresource Science I, II (Hosokawa and Mizuta)
- Graduate level:	Vegetable and Ornamental Horticulture (Advanced course) (Doi),
	Vegetable and Ornamental Horticulture-Seminar (Doi), Special
	Laboratory Work in Vegetable and Ornamental Horticulture (Doi,
	Hosokawa and Mizuta)

C.Other Remarks

- Doi Motoaki : A Member of the Selection Committee of Kounosuke Matsushita Foundation of EXPO '90 Awards, A Trustee of Japan Flower Promotion Center.