



**LABORATORY OF ENVIRONMENTAL CONTROL ENGINEERING
DEPARTMENT OF BIOPRODUCTION SCIENCE
CHIBA UNIVERSITY**

**MATSUDO, CHIBA 271, JAPAN
PHONE: 81-47-308-8841, 8842, 8843**

**STATION REPORT FOR NCR-101 MEETING, MARCH 11-14, 2000.
Chieri Kubota and Changhoo Chun (ckubota@midori.h.chiba-u.ac.jp and
changhoo@midori.h.chiba-u.ac.jp)**

General overview

The Laboratory of Environmental Control Engineering is one of 19 laboratories in the Department of Bioproduction Science, Chiba University. The faculty members of the laboratory are Professor Toyoki Kozai, Dr. Chieri Kubota, and Dr. Changhoo Chun. Currently we have 4 visiting scholars, 10 graduate students and 8 undergraduate students. The research in our lab aims for the development of new concepts and methodology for plant production under controlled environment.

New facilities

A test plant of "closed-type transplant production system" was constructed on the Matsudo campus. The construction started in April, 1999 and finished in February, 2000. The plant was designed to conduct researches on sweetpotato plug transplant production in a closed system using artificial lighting. Analysis of energy balance in the system and development of new technologies to produce transplants with minimum input of energy and resources will soon be under way.

On-going research projects:

- Sweetpotato transplant production under artificial lighting in a closed system (Kozai, Kubota, Chun, Ohyama)
- Value-added transplant production under artificial lighting in a closed system (Chun, Kozai)
- Analysis of energy and mass balance in a closed system for transplant production. (Ohyama, Kozai)
- Development of scaled-up photoautotrophic micropropagation system (Zobayed, Kubota, Kozai)
- Fundamental study on periodic changes of environmental variables for plant growth (Ohmura, Chun, Kozai)
- Establishment of photoautotrophic growth of somatic embryos. (Zobayed, Kubota, Kozai)
- Modeling and simulation for vegetative propagation (Kubota, Kozai)
- Controlling air current speed in transplant production system under artificial lighting (Chintakovid, Chun, Kozai)

Workshops/colloquia/symposia

An international symposium on transplant production in closed systems was held at Chiba University from February 28 to March 2, 2000. The symposium was organized by members of our laboratory and was very successful, with nearly 150 participants from 13 countries. Fifty two oral and poster presentations were presented for researches on both the biological and engineering aspects of transplant production and micropropagation. These were followed by an excursion to our new facility for transplant production at the Matsudo campus.

Recent publication

- Adelberg, J., K. Fujiwara, C. Kirdmanee, and T. Kozai. (1999) Photoautotrophic shoot and root development for triploid melon. *Plant Cell Tissue and Organ Culture*. 57:95-104.
- Afreen-Zobayed, F., Zobayed S.M.A., C. Kubota, and T. Kozai. (1999) Supporting material affects the growth and development of sweet potato plantlets in vitro. *In Vitro Cellular and Development Biol. Plant*. 35:470-474.
- Chun, C., A. Watanabe, H.-H. Kim, T. Kozai, and J. Fuse. (2000) Bolting and growth of spinach (*Spinacia oleracea* L.) can be altered by using artificial lighting to modify the photoperiod during transplant production. *HortScience*. 35:xxx-xxx (in press)
- Chun, C., T. Kozai, C. Kubota, and K. Okabe. (2000) Manipulation of bolting and flowering in spinach (*Spinacia oleracea* L.) transplant production system using artificial light. *Acta Horticulture* (in press).
- Kim, H.-H., C. Chun, T. Kozai, and J. Fuse. (2000). The potential use of photoperiod during transplant production under artificial lighting conditions on floral development and bolting, using *Spinacia oleracea* L. as a model. *HortScience* (35):xxx-xxx.
- Kozai, T. C. Kubota, S. Zobayed, Q.T. Nguyen, F. Afreen-Zobayed, J. Heo. (1999) Developing a mass-propagation system of woody plants. In: K. Watanabe and A. Komamine (eds.) *Challenge of Plant and Agricultural Sciences to the Crisis of Biosphere on the Earth in the 21st Century*, Proc. of the 12th Toyota Conference, Landes BioScience, Austin, TX, 293-307.
- Kozai, T. and S. Zobayed. (2000) Acclimatization, In: R.E. Spier et al. (eds.) *The Encyclopedia of Cell Technology*, John Wiley & Sons Inc., New York (in press).
- Kozai, T., K. Ohyama, F. Afreen, S. Zobayed, C. Kubota, T. Hoshi and C. Chun. (1999) Transplant production in closed systems with artificial lighting for solving global issues on environmental conservation, food, resources and energy. Proc. of ACESYS III Conference, Rutgers University, CCEA, 31-45.
- Kubota, C. and T. Kozai. (2000) Development of a mathematical model for vegetative propagation: Simulated sweetpotato cutting production as affected by propagation methods and environmental conditions. *Acta Horticulture* (in press).
- Kubota, C. and T. Kozai. Use of transition matrix models for transplant production under controlled environments. Paper No. 995061. ASAE, 2950 Niles Rd., St. Joseph, MI 49085-9659.
- Nguyen, Q.T., T. Kozai, G. Niu, and U.V. Nguyen. (1999) Photosynthetic characteristics of coffee (*Coffea arabusta*) plantlets in vitro in response to different CO₂ concentrations and light intensities. *Plant Cell Tissue and Organ Culture*. 55:133-139.
- Nguyen, Q.T., T. Kozai, and Nguyen, U.V. (2000) Effects of sucrose concentration, supporting material and number of air exchanges of the vessel on the growth of in vitro coffee (*Coffea arabusta*) plantlets, *Plant Cell, Tissue and Organ Culture*. (in press).
- Zobayed, S.M.A., F. Afreen-Zobayed, C. Kubota, and T. Kozai. (1999) Stomatal characteristics and leaf anatomy of potato plantlets cultured in vitro under photoautotrophic and photomixotrophic conditions. *In Vitro Cellular and Developmental Biol. Plant*. 35:183-188.
- Zobayed, S.M.A., F. Afreen-Zobayed, C. Kubota, and T. Kozai. (2000) Large-scale quality transplant production of *Eucalyptus* through photoautotrophic micropropagation, *Plant Science*. 150: xxx-xxx (in press)
- Zobayed, S.M.A., F. Afreen-Zobayed, C. Kubota, and T. Kozai. (2000) Mass propagation of *Eucalyptus camaldulensis* in a scale-up vessel under in vitro photoautotrophic condition. *Annals of Botany*. 85: xxx-xxx (in press)