NCERA-101 Station Report 2019 – The Ohio State University

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1. New Facilities and Equipment (including sensors, instruments, and control systems purchased/installed)

- New growth chambers (two walk-in rooms each with 90 ft^2) were installed in the basement of Howlett Hall Greenhouse Complex, Department of Horticulture and Crop Science. Inside each growth chamber, there will be four independent units of movable growing systems with three tiers with selected lighting system. This facility will provide ample space to examine different experiments studying light qualities, intensities, CO_2 as well as relative humidity.
- A mini VF unit 'Veggie Box' was installed in the head house of Howlett Hall Greenhouse Complex. This is a modular, all-in-one, commercial unit originally imported from Japan (Sankyo Frontier, Japan). This 60 ft^2 footprint, highly insulated and contained structure is equipped with a four-tiered re-circulating hydroponic production system (total production area 50 ft2), LED lighting (300 or 600 $\mu mol\ m^{-2}\ s^{-1}$), nutrient pH and EC controller, CO_2 controller, as well as A/C condensation water recovery system.
- A new greenhouse research complex (Controlled Environment Food Production Research Complex) has been planned to be built in Columbus campus.
- A new leaf gas exchange measurement system (CIRAS3, PP System) was acquired.

2. Unique Plant Responses

- Species specific responses (growth and nutrient uptake) to pH lower than conventional range were investigated. Basil plants can be grown without showing growth reduction or nutrient disorder up to pH 4.0. (Gillespie and Kubota, unpublished)

3. Accomplishment Summaries

- The 2019 Greenhouse Management Workshop was organized by Peter Ling and Chieri Kubota with 48 participants (including 19 online). This year's focus was 'Root-zone optimization in hydroponics and substrate-based culture systems' covering both ornamental and vegetable crops.

- A new workshop series "Basics of the Greenhouse Environment for K-12 Educators" was first offered in 2018. The workshop was organized by Uttara Samarakoon, Kimberly Sayers, and Peter Ling with 24 participants.

- 5 one-day private workshops were offered to 7 parties to learn basics of physiology and technologies of soilless strawberry and tomato production.

4. Impact Statements

- In August 2018, we launched an online monthly forum 'Indoor Ag Science Café' to serve as a non-competitive communications platform for indoor farmers and relevant stakeholders. The Café has been communicated by various media and blogs, in some cases reaching more than 1,600 readers. During each Café forum, we provide a short presentation (recorded and shared in YouTube) and then discuss production and business obstacles (but these portions are not recorded). We have received tremendous encouragement from participants, and the Café stakeholder membership has quickly increased (from 47 to over 200 members presently), serving as a very effective engagement method with industry stakeholders.

5. Published Written Works

Books/Book Chapters

Kubota, C., M. Chao, S. Masoud, Y.J. Son, R. Tronstad. 2019. Advanced technologies for large-scale plant factories – integration of industrial and systems engineering approach in controlled environment crop production.P.353-362. In: (M. Anpo, H. Fukuda, and T. Wada, eds.) Plant factory using artificial light. Elsevier, Amsterdam, The Netherlands.

Kubota, C., A. de Gelder, and M. Peet. 2018. Greenhouse tomato production. P.276-313. In: (E. Heuvelink, ed.) Tomatoes, 2nd Edition. CAB International, Boston, USA.

Refereed Journal Articles

Masoud, S., Y.J. Son, **C. Kubota**, and R. Tronstad. 2018. Evaluation of simulation based optimization in grafting labor allocation. Applied Engineering in Agriculture. 34(3): 479-489.

Samtani, J.B., C.R. Rom, H. Friedrich, S.A. Fennimore, C.E. Finn, A. Petran, R.W. Wallace, M.P. Pritts, G. Fernandez, C.A. Chase, **C. Kubota**, and B. Bergefurd. 2019. The status and future of the strawberry industry in the United States. HortTechnology https://doi.org/10.21273/HORTTECH04135-18

Refereed Conference Proceedings Articles

N/A

Other Creative Works

Kroggel, M. and **C. Kubota**. 2018. Hydroponic nutrient solution for optimized greenhouse tomato production. (factsheet). Ohio State University Extension <https://ohioline.osu.edu/factsheet/hyg-1437>

Kubota, C., C. Miles and X. Zhao. (eds.) 2018. Grafting Manual: How to Produce Grafted Vegetable Plants. (http://www.vegetablegrafting.org/resources/grafting-manual/)

Kubota, C. 2018. History of Grafting. In: C. Kubota, C. Miles, and X. Zhao (eds.) Grafting Manual: How to Produce Grafted Vegetable Plants. www.vegetablegrafting.org/resources/grafting-manual

Zhao, X., C. Miles and **C. Kubota**. 2018. Why Graft? In: C. Kubota, C. Miles, and X. Zhao (eds.) Grafting Manual: How to Produce Grafted Vegetable Plants. www.vegetablegrafting.org/resources/grafting-manual

Kubota, C. and C. Miles. 2018. Healing and Acclimatization Methods and Design Principles. In: C. Kubota, C. Miles, and X. Zhao (eds.) Grafting Manual: How to Produce Grafted Vegetable Plants. www.vegetablegrafting.org/resources/grafting-manual

Kubota, C. 2018. Automation in Vegetable Grafting Nurseries. In: C. Kubota, C. Miles, and X. Zhao (eds.) Grafting Manual: How to Produce Grafted Vegetable Plants. www.vegetablegrafting.org/resources/grafting-manual

Kubota, C. 2018. Designing Logistics/Workflow of Grafting Nurseries. In: C. Kubota, C. Miles, and X. Zhao (eds.) Grafting Manual: How to Produce Grafted Vegetable Plants. www.vegetablegrafting.org/resources/grafting-manual

Website and social media

Indoor Ag Science Café YouTube Channel: https://www.youtube.com/playlist?list=PLjwIeYlKrzH_uppaf2SwMIg4JyGb7LRXC

Kubota Lab (Controlled Environment Plant Physiology and Technology): http://u.osu.edu/cepptlab

Facebook for Controlled Environment Plant Physiology and Technology Lab: https://www.facebook.com/CEPPTLAB/