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1. New Equipment and Facilities

- A leaf area meter (LI-3100C, LI-COR) was purchased to quantify the leaf area of experimental plants.
- A new DI water system was installed in the ASU Indoor Farming Lab for hydroponic experiments.

2. Unique Plant Responses

- Including a small portion of far-red light (700-800 nm) in sole-source lighting at the same total photon flux density (TPFD, 400-800 nm) or photosynthetic photon flux density (PPFD) had little effect on plant growth and days to flower and first fruit harvest in strawberry ‘Albion’ and ‘Monterey’ but increased the number of harvested fruits by 46-56% in strawberry ‘Monterey’.
- In the greenhouse, strawberry ‘Monterey’ grown with rockwool and peat-lite substrates showed similar plant growth and fruit production.
- When lettuce ‘Rex’ and ‘Cherokee’ seedlings were grown with organic fertilizer derived from food waste, inoculating them with *Rhizopagus intraradices* every two days increased shoot fresh weight by 77-198% compared to weekly inoculation or control.
- In a deep-water culture system, adding more air stones increased the average dissolved oxygen concentration of food waste fertilizer nutrient solution from 1.0 to 5.5 ppm and promoted shoot and root growth in lettuce ‘Rex’ and ‘Cherokee’.
- Replacing 50% of chemical fertilizer with food waste fertilizer produced lettuce ‘Nancy’ and petunia ‘Easy Wave Velour Berry’ with similar plant growth and flowering attributes.

3. Accomplishment Summaries

- **ASU Indoor Farming Certificate Program:** ASU is offering a new ASU certificate program ‘Indoor Farming Certificate’ from the 2022 Fall semester.
- **Indoor Vertical Farming Workshops in Phoenix:** Yujin Park, Zhihao Chen, and the City of Phoenix are developing 3-day workshops on indoor vertical farming, targeting a wide range of potential stakeholders in Phoenix.
- **Collaboration with the Zimin Institute for Smart and Sustainable Cities at ASU:** Yujin Park and Zhihao Chen are working together with the Zimin Institute to create a closed-loop urban food production system that uses food waste as a primary nutrient source in indoor vertical farming settings.

4. Impact Statements

- In collaboration with strategic partners, ASU Indoor Farming research and educational programs plays an important role in enhancing understanding of indoor vertical farming crop production and management and connecting stakeholders to advance the implementation of indoor vertical farming for more accessible fresh healthy food for Phoenix residents who are located in food deserts.

- While rapidly rising fertilizer prices, unstable supplies, global phosphorus shortage, and greenhouse gas emissions and high energy demands associated with chemical fertilizer production are recognized as severe threats to sustainable crop production, our research results show a great potential of using food waste fertilizer as a sustainable alternative to chemical fertilizer.
- We learned more about the plant growth, flowering, and fruit development responses of ever-bearing strawberries in response to sole-source lighting control. Our finding will contribute to improve the productivity of indoor strawberry production via precise lighting control.

5. Published Written Works

Research Abstracts

1. McClintic, N. and Y. Park. 2022. Influence of application frequency of plant growth promoting microorganisms on seedling growth of organic hydroponic lettuce transplants. ASHS 2022 Annual Conference
2. Goode, J. Chen, Z., and Y. Park. 2022. J. Amer. Soc. Hort. Sci. Evaluating the partial or full replacement of chemical fertilizer with food waste fertilizer in lettuce and petunia. ASHS 2022 Annual Conference
3. McClintic, N., Chen, Z., and Y. Park. 2022. Quantifying the effects of plant growth-promoting microorganisms and organic fertilizers on growth of indoor vegetable transplants. IHC 2022
4. Park, Y., T. Lewis, and L. Lin. 2022. Spectral effects of sole-source lighting on plant growth, flowering, and fruit development of indoor strawberries. IHC 2022