

KRISHNA NEMALI, Ph.D.

EDUCATION

- B.S. Agriculture Science (1992). Andhra Pradesh Agricultural University, India
- M.S. Horticulture Physiology (2002). University of Georgia, Athens, GA, USA.
- Ph.D. Horticulture Physiology (2005). University of Georgia, Athens, GA, USA.

RESEARCH EXPERIENCE

M.S. and Ph. D in Horticulture Physiology: (University of Georgia, Athens; 2001-2005)

- ***Identifying optimal light requirements by measuring whole-plant photosynthesis:*** Wax begonias grow slow in greenhouses and occupy space for considerable time. This research aimed at understanding the optimal light requirements of wax begonia (sun/shade loving plant) using whole-plant gas exchange with a view to increase its growth rate and production efficiency.
- ***Re-circulating sub-irrigation systems:*** This research studied the effect of changes in water-use efficiency on optimal fertilizer solution concentration for petunias and wax begonias under sub-irrigation. We hypothesized that plants with high water-use efficiency should be supplied with high fertilizer concentration in the solution used for subirrigation as these plants will lose small volume of water in producing a gram of dry mass.
- ***Water requirements of ornamental crops:*** This research identified substrate moisture level that would not result in drought stress but at the same time reduces wastage of irrigation water and minimizes leaching and run off from containers. This research was conducted on bedding plants, Hydrangeas, Elms, and Maples. I measured leaf and whole-plant gas exchange coupled with chlorophyll fluorescence and leaf water status measurements to identify moisture levels resulting in normal growth.
- ***Novel irrigation controller for greenhouses:*** An automated irrigation controller was developed using a CR10X datalogger, ECH₂O moisture sensors, and solenoid valves. This system automatically monitors moisture status in the substrate at frequent intervals and maintains target water content in the substrate. This system can be programmed to automatically irrigate plants based on plant water requirement and has great application in drought research as it can automatically maintain distinct moisture levels in containers.
- ***Moisture retention in greenhouse substrates:*** Soil moisture retention curves and pore-size distribution in two different commercial soilless mixes were estimated with a view to develop comprehensive information on plant water availability, water release patterns, and irrigation requirements in these substrates.
- ***Soil moisture sensors for scheduling irrigation in greenhouses:*** I have calibrated and tested the efficacy of several volumetric water content sensors like ECH₂O probes, Theta probes, and heat dissipation probes. I studied the effect of temperature and alkalinity of the substrate on probe measurements.
- ***Drought stress for height control of marigolds:*** This research looked at growth responses of container plants to controlled drought stress.
- ***Physiological responses to different drought regimes in tomatoes:*** This research looked at both whole-plant and leaf physiological responses in tomato to gradual, chronic and rapid drought regimes with a purpose to understand acclimation responses to drought.

Post-Doctoral Fellowship: Screening Arabidopsis Ecotypes for Improved Water-use Efficiency (University of California, Davis; Jan 2006- Jul 2007)

- Phenotyping *Arabidopsis* ecotypes to understand physiological basis for drought tolerance and water-use efficiency

- Design and construction of a semi-continuous automatic whole plant gas exchange system for measuring carbon and water balance in plants
- Can higher nighttime transpiration increase calcium uptake in tomatoes?

Controlled Environment Physiologist, Monsanto Biotechnology/Regulatory (Oct. 2007-May 2016)

- High throughput greenhouse screening for improved water use efficiency, drought tolerance and nitrogen stress using visual, hyper-spectral and thermal imaging in the Monsanto Automated Greenhouse at Research Triangle Park, NC
- Modeling greenhouse data to predict field performance of transgenic plants
- Design and construction of whole-plant gas exchange system for continuous photosynthesis / transpiration measurements
- Physiological mechanism of action in the biotechnology derived Monsanto drought tolerant maize
- Lead the trait characterization work required for regulatory approvals in the greenhouse under GLP-like environment
- Knowledge of USDA and EPA compliance requirements
- Experience with regulatory requirements and technical dossiers for regulatory submissions

Publications

15. K.S. Nemali, C. Bonin, F.G. Dohleman, M. Stephens, W.R. Reeves, D.E. Nelson, P. Castiglioni, J. E. Whitsel, B. Sammons, R.A. Silady, D. Anstrom, R. E. Sharp, O. R. Patharkar, D. Clay, M. Coffin, M. A. Nemeth, M. E. Leibman, M. Luethy & M. Lawson. 2015. Physiological Responses Related to Increased Grain Yield under Drought in the First Biotechnology-Derived Drought Tolerant Maize. *Plant Cell & Environment* 38 (9): 1866-80.
14. K.S. Nemali and M. Stephens. 2014. Plant Abiotic Stress: Water. *Encyclopedia of Agriculture and Food Systems*, Elsevier Publishing Company 4: 335-43.
13. H.M. Easlson, K.S. Nemali, J.H. Richards et al. 2013. The physiological basis for genetic variation in water-use efficiency and carbon isotope composition in *Arabidopsis thaliana*. *Photosynthesis Research* 119 (1-2):119-29.
12. J.K. McKay, J.H. Richards, K.S. Nemali, S. Sen, T. Mitchell-olds, S. Boles, E.A. Stahl, T. Wayene, T.E. Juenger. 2008. Genetics of drought adaptation in *Arabidopsis thaliana* II: QTL analysis of new mapping population, Kas-1 x Tsu-1. *Evolution* 62 (12): 3014-3026.
11. K.S. Nemali and M.W. van Iersel. 2008. Physiological responses to different substrate water contents: screening for high water-use efficiency in bedding plants. *J. Amer. Soc. Hort. Sci.* 133: 1-8.
10. K.S. Nemali and M.W. van Iersel. 2007. A new controller for irrigation and simulating drought stress in potted plants. *Scientia Horticulturae* 110: 292-297.
9. K.S. Nemali, F. Montesano, S.K. Dove, and M.W. van Iersel. 2007. Calibration and Performance of moisture sensors in soilless substrates: ECH₂O and Theta probes. *Scientia Horticulturae*. 112: 227-234.
8. Nemali, K. and M.van Iersel.2004. Acclimation and growth of photosynthesis of wax begonias grown at different light levels. In: E. Runkle and P. Fischer (eds.) *Lighting up profits. Understanding greenhouse lighting*. p. 22-23. Meister publishing, Willoughby, Ohio. (ISBN 1-892829-10-X)
7. van Iersel, M.W. and K.S. Nemali. 2004. Drought stress can produce small but not compact marigolds. *HortScience* 39: 1298-1301.
6. Kang, J-G., M.W. van Iersel, and K.S. Nemali. 2004. Fertilizer concentration and irrigation method affect growth and fruiting of ornamental pepper. *J. Plant Nutr.* 27: 867-884.
5. Nemali, K.S. and M.W. van Iersel. 2004. Acclimation of wax begonia to light intensity: changes in photosynthesis, respiration, and chlorophyll concentration. *J. Amer. Soc. Hort. Sci.* 129: 745-751.
4. Nemali, K.S. and M.W. van Iersel. 2004. Light effects on wax begonia: photosynthesis, growth respiration, maintenance respiration, and carbon use efficiency. *J. Amer. Soc. Hort. Sci.* 129: 416-424.

3. Nemali, K.S. and M.W. van Iersel. 2004. Light Intensity and fertilizer concentration: II. Optimal fertilizer solution concentration for species differing in light requirement and growth rate. *HortScience* 39:1293-1297.
2. Nemali, K.S. and M.W. van Iersel. 2004. Light Intensity and fertilizer concentration: I. estimating optimal fertilizer concentration from water-use efficiency of wax begonia. *HortScience* 39:1287-1292.
1. Nemali K.S. (Sainath-Krishna, M.N) and M.W. van Iersel. 2003. Light effects on wax begonia: photosynthesis, growth respiration, and maintenance respiration. *Acta Hort.* 624:541-547.

Awards & Grants

1. **Monsanto:** Technology award (2015) for DroughtGard maize publication, Above and Beyond award (2014) for DroughtGard Research, Technology award (2014) for High Yield Corn regulatory submissions, Recognition for developing greenhouse assay on DroughtGard stacks (2015), Regulatory Leadership Team award (2014) for DroughtGard publication, Excellence award for identification of area of improvement in employee safety (2010), Yield and Traits program awards (2008, 2009 and 2011).
2. **American Society for Horticultural Science:** Student poster competition, 1st place (2005) and 3rd place (2004)
3. **Southern Nursery Association:** Bryson L. James student research competition, 3rd place in PhD division (2005) and 2nd place in PhD division (2004)
4. **John Carew memorial scholarship:** (received 2nd highest scholarship amount \$5500), Floriculture Industry Research and Scholarship Trust, 2001.
5. **Fred Gloeckner Foundation:** Research grant (\$5000). Growing more with less water. PI: Marc van Iersel.
6. **Travel Grants:** from Postdoctoral Scholars Union, UC Davis (2006), Graduate School, University of Georgia during (2005 and 2004), and American Society for Horticultural Science (2002).
7. **Biology of Transpiration:** meeting, Snowbird, Utah: Poster award (2006).

Conference Proceedings

1. Sainath Krishna, M.N. and M.W. van Iersel. 2002. Starter fertilizer and plant water use can modify fertilizer requirements. Proceedings of the SNA research conference. Forty-seventh annual report. p. 44-47
2. Nemali, K.S. and M.W. van Iersel. 2003. Photosynthesis-light response of whole plants of wax begonia grown under different light intensities. Proceedings of the SNA research conference. Forty-eighth annual report. p. 559-563
3. Nemali, K.S. and M.W. van Iersel. 2004. Moisture stress for growth control: Physiological responses of salvia (*Salvia splendens*) and vinca (*Catharanthus roseus*). Proceedings of the SNA research conference. Forty-ninth annual report. p. 618-623
4. Nemali. K.S. and M.W. van Iersel. 2004. Photosynthesis, Respiration, and Water Relations of Vinca and Salvia Subjected to Moisture Stress. *HortScience* 39: 896
5. Nemali. K.S. and M.W. van Iersel. 2004. Two New Moisture Sensors for Soilless Growing Media. *HortScience* 39: 763
6. Nemali. K.S. and M.W. van Iersel. 2005. Water Requirements and Drought Tolerance of Potted Bedding Plants. Abstract submitted to the annual conference of the American Society for Horticultural Science, Las Vegas, NV, *HortScience* 40: 1115
7. Nemali. K.S. and M.W. van Iersel. 2005. A novel automated system for irrigation and simulating drought stress in potted plants. *HortScience* 40: 1017

8. Nemali. K.S. and M.W. van Iersel. 2005. A novel automated irrigation system for potted plants. Proceedings of the SNA research conference. 50th annual report.
9. Krishna S. Nemali, James H. Richards, John K. McKay, Eli A. Stahl, Thomas E. Juenger, Lisa A. Donovan. Does nighttime transpiration affect water use efficiency of plants? Biology of transpiration: from guard cells to globe.

TEACHING EXPERIENCE

Teaching assistantship: Graduate Teaching Assistant, Horticulture Department, University of Georgia (2002 to 2005). The following were the different courses for which I was a teaching assistant:

- HORT 2000. Introduction to Horticulture (2002, Fall)
- HORT 4210/6210. Postharvest Physiology of Horticultural and Agronomic crops (2003 spring, 2004 spring)
- HORT 4440/6440. Environmental Physiology in Horticulture (2005, fall)

General responsibilities include helping students in lab projects, preparing exam questions, evaluating exams, and lecturing specific topics of interest in classes.

Voluntary teaching in classes: I sought faculty members in Horticulture and other departments to provide opportunities in lecturing in their classes. These lectures were given in both graduate and undergraduate courses.

- Cell wall elasticity and drought stress. In: Graduate course in Growth and Development of Horticultural plants
- Photosynthesis and growth under drought stress. In: Graduate course in Ecophysiology
- Plant aquaporins. In: Graduate seminar course
- Sun and shade adaptations of plants. In: Undergraduate course in Environmental physiology
- Water requirements of bedding plants. In: Departmental seminar
- Chlorophyll fluorescence: basics, theory, and applications. In: Graduate course in photosynthesis
- Suppression subtractive hybridization: a technique to isolate genes for drought tolerance in plants. In: Graduate/undergraduate course in Gene technology
- Light effects on subirrigated begonia: optimal fertilizer concentration and whole-plant CO₂ exchange rate. In: Departmental seminar
- Nitrate uptake kinetics of *Helianthus* sp. Adapted to low and high nitrate available habitats. In: Graduate course in Ecophysiology
- Desiccation tolerance in wheat embryos. In: Graduate course in Carbohydrate metabolism
- Nutrient requirements of greenhouse crops.

Horticulture Instructor, online: ACCEPtS Program (Oklahoma State University, University of Arkansas, Louisiana State University, Mississippi State University): HORT 4543 Sustainable Nursery Production. Spring 2016.

EXTENSION EXPERIENCE

Training programs:

- I have conducted trainings to greenhouse growers at southeastern greenhouse conference and trade show, Greenville, SC.
 1. Plant work shop: Monitoring nutrition and basic plant growth regulation. Invited speaker. (Southeast Greenhouse Conference. Greenville, SC, 2005). I trained growers with techniques of monitoring substrate EC and pH during production.

- I communicated my applied research findings at conferences that were mainly attended by growers and representatives from the industry. Some examples include:
 1. Starter fertilizer and plant water-use can modify fertilizer requirements (Southern Nursery Association, Atlanta, GA, 2002).
 2. Using moisture stress as alternate for plant growth regulators (Southern Nursery Association, Atlanta, GA, 2004).
 3. Water requirements of bedding plants (American Society for Horticultural Science, Las Vegas, NV, 2005).
 4. A novel automated irrigation system for potted plants (Southern Nursery Association, Atlanta, GA, 2005).

Monsanto:

- I contributed to developing research based outreach information on Monsanto DroughtGard corn.
- I conducted research on Monsanto DroughtGard commercial hybrids intended to be used as ‘on-farm display’ for farmers.

Rural Agricultural Work Experience Program, India:

- This is an internship program designed for a period of one semester in a village during my undergraduate program in Agriculture Sciences (B.S. Ag, 1988-92).
- This program is designed to provide extension experience to students. The student, in the role of an extension agent, is responsible to bridge the gap between researchers and farmers.
- Participation in day-to-day activities of some select farms, extension outreach programs like exhibitions, group discussions, visiting research farms along with farmers are some of the activities.