

RESUME  
Derrick M. Oosterhuis  
*Distinguished Professor of Crop Physiology*

**Research Area**

My main objective is to help solve crop production problems using both basic and applied approaches. This entails field studies, growth room work, and laboratory analyses. I specialize in stress physiology. The main projects in progress at the moment are:

- (1) **Physiological basis for potassium deficiency and improved sampling techniques.** These studies focus on understanding plant K requirements and K deficiency. Studies include the effect of potassium deficiency and water deficit on K uptake and distribution, on foliar fertilization, on drought tolerance, and on the leaf cuticle and K absorption.
- (2) **Evaluating available plant growth regulators (PGRs) and their physiological mechanisms.** The aim is to evaluate available PGRs and make the results available to producers as a data base on which to base their decisions about using PGRs. The focus will be on the mode of action of *Bacillus cereus* in PGR-IV and Pix Plus, the use of PGRs to ameliorate growth under stress, and enhancement of protein levels, endotoxins and insect mortality with NP321.
- (3) **Physiological background to the COTMAN cotton monitoring program.** I will continue to provide research to support the COTMAN program and to improve its use. This will include: (i) the use of an upper threshold temperature for heat unit calculation, (ii) effects of environmental stress on the target development curve, and (iii) the physiological reasoning for the 350 heat unit insecticide termination rule, including boll wall anatomy. In addition I am leading the effort to update and rewrite the COTMAN manual.
- (4) **The nature and role of the leaf cuticle in foliar agrochemical absorption.** Anatomical, Physiological, and biochemical changes in the cuticle with stress, reaction to temperature, drought, humidity, and pH.
- (5) **Yield variability in cotton/Temperature and boll growth.** Cotton originates from hot climates, but does not necessarily grow best at excessively hot temperatures. I have found a strong negative correlation between yield and high temperatures during the boll development period in Arkansas. These studies focus on the effects of elevated night temperature on boll growth and the effects of water stress on boll development and partitioning. There is a component with researchers in Greece for modeling and testing in a contrasting (similar day temperatures, cool night) environment. The object is to explain the effect of extreme temperatures on yearly yield variability in Arkansas.
- (6) **Physiological and molecular characterization of drought tolerance in cotton.** A collaborative project with Dr. Stewart to assess cotton germplasm for physiological and molecular traits, namely osmotic adjustment, for identification of associated genes.
- (7) **Growth Enhancing Properties of TRIMAX insecticide:** Physiological and biochemical evaluation of the apparent growth effects of the insecticide Trimax.

I also give talks at extension meetings and answer inquiries over the telephone from producers, extension personnel and consultants from Arkansas and other cotton producing states about production problems. In addition, I periodically write popular articles on crop production physiology for the Extension Service, and various production magazines such as *Cotton Grower* and *Cotton Farming*.

## Publications

Senior or co-author of over 700 published articles:

- ▶ 110 refereed journal (*a selection of ten is shown below*)
- ▶ 370 non-refereed articles
- ▶ 20 book chapters
- ▶ 202 published abstracts
- ▶ 242 annual reports and industry reports
- ▶ editor of 20 proceedings
- ▶ 2 books (two more in review). Currently co-editing a book *Handbook of Cotton Physiology* (to be completed in 2004), writing a *Cotton Glossary* with over 700 definitions (to be completed in 2005), updating the *Cotton Root Disorders Manual* that we published in 2000, and acting as senior editor for the update of the *COTMAN Crop Monitoring Manual*.

### Select Publications:

1. Oosterhuis, D.M. and Wulschleger, S.D. 1987. Osmotic adjustment in cotton leaves and roots in response to water stress. *Plant Physiol.* 84:1154-1157.
2. Oosterhuis, D.M. and Wulschleger, S. 1987. Water flow through cotton roots in relation to xylem anatomy. *J. Exp. Bot.* 38:1866-1874.
3. Oosterhuis, D.M. and Wulschleger, S.D. 1988. Psychrometric water potential analysis in leaf discs. pp. 113-133. In: H.F. Linskens and J.F. Jackson (Eds.) *Modern Methods of Plant Analysis*. New Series, Vol. 9. Springer-Verlag.
4. Wulschleger\*, S.D. and Oosterhuis, D.M. 1991. Evidence for light-dependent recycling of respired carbon dioxide by the cotton fruit. *Plant Physiol.* 97:574-579.
5. Brown, R.W. and Oosterhuis, D.M. 1992. Measuring plant and soil water potentials with thermocouple psychrometers: some concerns. *Agron. J.* 84:78-86.
6. Bondada\*, B.R., Oosterhuis, D.M. and Norman, R.J. 1997. Cotton leaf age, epicuticular wax, and nitrogen-15 absorption. *Crop Sci.* 37:807-811.
7. Oosterhuis, D.M. and Bednarz, C.W. 1997. Physiological changes during the development of potassium deficiency in cotton. pp 347-351. In, T. Ando et. Al. (Eds). *Plant Nutrition for Sustainable Food Production and Environment*. Kluwer Academic Publishers, Japan
8. Gerik, T.J., Oosterhuis D.M. and Torbert, H.A. 1998. Managing cotton nitrogen supply. *Advances in Agronomy.* 64:116-149.
9. Oosterhuis, D.M. and Jemstedt, J. 1999. Anatomy and morphology of cotton. In, W. Smith and J.S. Cothren (eds). *Cotton Monograph*. Wiley and Sons, New York
10. Nepomuceno\*, A., Oosterhuis, D.M., Stewart, J.M., Turley, R., Neumaier, N. and Farais, R.B. 2002. Expression of heat shock protein and trehalose-6-phosphate synthase homologues induced during water deficit stress. *Brazilian Plant Physiology* 14:11-20.
11. Zhao\*, D. and Oosterhuis, D.M. 2002. Cotton carbon exchange, nonstructural carbohydrates, and boron distribution in tissues during development of boron deficiency: *Field Crop Research* 78:75-87.
12. Oosterhuis, D.M. And Stewart, J.M. 2003. Physiological basis of yield and environmental adaptation. In: H.T. Nguyen and A. Blum (eds.) *Physiology and Biotechnology Integration for Plant Breeding*. Marcel Dekker Inc., New York. (In press)

\*Dr. Oosterhuis's graduate student.

### Research Grant Proposals Funded:

- ▶ over \$2,000,000 as principal or co-investigator.

## Teaching

I have lectured or worked in 15 countries including: USA, United Kingdom, Australia, Switzerland, South Africa, Israel, Turkey Argentina, Greece, Zimbabwe, Zambia, Brazil, Bolivia and Egypt. Courses taught at the University of Arkansas:

Undergraduate:

- ▶ Cotton Production CSES 3312
- ▶ Advanced Crop Science CSES 4013 (to be taught in Spring 2004)

Other undergraduate courses taught at other universities include: Thermocouple Psychrometry BOTY 4000, Fiber and Oil Seeds AGRN 3123, Agricultural Botany ABOT 212, and Plant Production Science AGR 250

Graduate courses:

- ▶ Crop Physiology CSES 5013
- ▶ Research Techniques in Agronomy (physiology measurements) CSES 5314
- ▶ Crop Monitoring AGRN 504V
- ▶ Special topics (root physiology) AGRN504V

Major professor:

- ▶ Major Professor to 7 M.S. students
- ▶ Major Professor to 13 Ph.D. students
- ▶ Served on 40 graduate student advisory committees
- ▶ My students have received 77 awards
- ▶ Supervised 7 visiting scholars
- ▶ Supervised 5 postdocs

**Other Offices Held and Activities:**

Membership Professional Societies and Offices Held:

- ▶ Member of two UN/FAO committees on cotton plant nutrition and plant growth regulators 1994-2003
- ▶ American Society of Agronomy, Editor ASA/CSSA/SSSA publication *Nitrogen Nutrition of Cotton: Practical Issues* 1990, Nominations committee A101 for ASA President Elect 1998.
- ▶ Crop Science Society of America: Associate Editor Crop Science Journal 1989-92, Board of Directors CSSA 1996-97, Chairman C-2 Physiology and Metabolism CSSA 1997, Fellows committee CSSA 2001-02, Nominations committee C101 for CSSA President Elect 1998, Nominations committee C111.02 for Division C-2 1997/8.
- ▶ National Cotton Council Beltwide Physiology Conf. Steering Com. 1992-94, 1999-2001 Chair 1989, 2001
- ▶ Member American Society of Plant Biology, Arkansas Academy of Sciences, Society of Experimental Botany, S.A. Society of Crop Production, International Plant Nutrition Society.

Academic Honors and Recognition:

- ▶ Fellow in the American Society of Agronomy, 2002
- ▶ Outstanding (National) Cotton Physiologist Award 2000
- ▶ Promoted to Distinguished Professor, 1999
- ▶ Fellow in the Crop Science Society of America 1999
- ▶ Arkansas Alumni Distinguished Faculty Award for Teaching & Research 1999
- ▶ Arkansas Cotton Achievement Award
- ▶ John White Team Award 1999 (with 3 other researchers)
- ▶ John White Outstanding Researcher Award, 1995
- ▶ Gamma Sigma Delta Outstanding Researcher Award 1991
- ▶ Chairman C-2, Crop Science Soc. America 1997
- ▶ Chairman, Arkansas Cotton Research Group 1992-2003
- ▶ Program Chairman, Physiology Conference 1989 Beltwide Cotton Meetings
- ▶ Steering Committee Physiology Conference National Cotton Council 1990-94, 1999-02

- ▶ Board of Directors, International Plant Nutrition Society 199-2003
- ▶ Board of Editorial Advisors of the Food Products Press, New York 1999
- ▶ ARCPACS certified 1981
- ▶ Member of Gamma Sigma Delta, Phi Kappa Phi, and Phi Beta Delta
- ▶ Rhodesian Ministry of Agriculture 4-year scholarship 1965
- ▶ M.S. degree from Reading University awarded with "distinction" 1973
- ▶ D.F. Retief award for best scientific paper, Crop Science Society of SA 1981
- ▶ Listed in American Men and Women of Science 1991-99
- ▶ Listed in Who's Who in Science & Engineering, 1992-6.
- ▶ Keynote or plenary (invited) papers at 1994, 1998 and 2003 World Cotton Conferences.