Curriculum Vitae of Bruce Bugbee

Professional Preparation

B.S. University of Minnesota
M.S. University of California, Davis
Ph.D. Penn State University

Experience

Assistant Professor Plant Science Department, Utah State University
Associate Professor Plants, Soils, & Biometeorology Dept. USU
Professor Plants, Soils, & Climate Dept. USU

Awards

2020	Fellow	American Soc. Horticultural Science
2018	Fellow	American Society of Agronomy
2017	Distinguished Alumni	Penn State University
2016	D. Wynne Thorne Career Research award	Utah State University
2015	Distinguished Professor	College of Agriculture
2012	Governor's Medal for Science	State of Utah
2005	Researcher of the Year	College of Agriculture
2001	Outstanding Graduate Mentor	Utah State University
2001	Top Professor Award	Utah State University

National Committee Appointments and Positions

Elected Chairman, Biophysical sensors and measurements community, Am. Soc. Agronomy (2014-2015)

Elected chairman of the Crop Physiology division, Am. Soc. of Agronomy (2003-2004)

Invited to review of NASA Life Sciences research for the National Research Council (1996-97). This resulted in co-editing the book, "Advanced Technology for Human Life Support in Space."

Invited to serve on the American Association of Biological Sciences Advisory panel to review research proposals (3 invitations: 1992; 2001; 2008)

Nominated for NSF Presidential Young Investigator Award (1987)

Professional Service

Reviewed 42 manuscripts and 28 proposals in the past 10 years (2011-2021) for scientific journals and Federal agencies

Publications

Invited Book Chapters (journal articles start on page four)

Zhen, S., P. Kusuma, and B. Bugbee. 2021. Toward an optimal spectrum for photosynthesis and plant morphology in LED-based crop cultivation. In: *Plant factory: basics, applications and advanced research, Eds. T. Kozai, G. Niu & J. Masabni. Elsevier*

Kusuma, P., P. M. Pattison & B. Bugbee. 2021. Photon efficacy in horticulture: Turning LEDs packages into LED luminaires for indoor farming. In: *Plant factory: basics, applications and advanced research, Eds. T. Kozai, G. Niu & J. Masabni. Elsevier*

Blonquist, M. and **B. Bugbee**. 2018. Instruments and approaches for accurate measurement of air temperature. *In:* J. Hatfield (ed). *Agroclimatology*. Am. Soc. of Agronomy publication. Madison, WI.

Blonquist, M. and **B. Bugbee**. 2018. Solar, Net, and Photosynthetic radiation. *In:* J. Hatfield (ed). *Agroclimatology*. Am. Soc. of Agronomy publication. Madison, WI.

Bugbee, B. 2017. Economics of LED lighting. *In:* S.D. Gupta (ed.). Light emitting diodes for agriculture. Smart lighting. p. 81-99. Springer Verlag, Singapore. (ISBN 978-981-10-5807-3) doi.org/10.1007/978-981-10-5807-3_4

Fisher, P. Both, A. J. and **B. Bugbee**. 2017. Supplemental Lighting Technology, Costs and Efficiency. Chapter 8. *In*: P. Fisher and E. Runkle (eds). Lighting Up Profits: Understanding Greenhouse Lighting. Ball Red Book. Meister Publishing.

Bugbee, B. 2011. Effect of Environment on Ethylene Stress and Cotton. Chapter 5. *In*: Derrick M. Oosterhuis, (ed.). Stress Physiology in Cotton. The Cotton Foundation reference book series, Cordova TN.

Doucette, W., E. Dettenmaier, **B. Bugbee** and D. Mackay . 2010. Mass Transport from Soil to Plants. *In*: L. Thibodeaux and D. Mackay (eds.). Handbook of Chemical Mass Transport in the Environment. CRC Press.

Klassen, S. and **B. Bugbee.** 2005. Shortwave radiation. Chapter 3. pages 43-58 *In:* Micrometeorology in Agriculture Systems. Am. Soc. of Agronomy monograph no. 47. Madison, WI.

Bugbee, B. 2004. Nutrient Management in Recirculating Hydroponic Culture. *In:* Proceedings of the South Pacific Soilless Culture Conference. M. Nichols, (ed.). Acta Hort 648: 99-112.

Klassen, S.P., G. Ritchie, J. M. Frantz, D. Pinnock, and **B. Bugbee**. 2003. Real-time Imaging of Ground Cover: Relationships with Radiation Capture, Canopy Photosynthesis, and Daily Growth rate. Chapter 1: Pages 3 - 14. *In:* Digital Imaging and Spectral Techniques: Applications to Precision Agriculture and Crop Physiology. Am. Soc. Agronomy special publication No. 66. Madison, WI.

Doucette, W.J., **B. Bugbee**, S.C. Smith, C.J. Pajak, and J.S. Ginn. 2003. Uptake, Metabolism, and Phytovolatilization of TCE by Indigenous Vegetation. In: McCutcheon, S. and J. Schnoor. (eds). Phytoremediation: Transformation and Control of Contaminants. John Wiley and Sons, NY.

Bugbee, B. 1996. Growth Analysis and Yield Components. *In:* F.B. Salisbury (ed.). Units, Symbols, and Terminology for Plant Physiology. Oxford University Press.

Bugbee, B. 1994. Effects of Radiation Quality, Intensity, and Duration on Photosynthesis and Growth. p. 39-50. *In*: International Lighting in Controlled Environments Workshop. T. Tibbitts ed. NASA Tech Proceeding No. NASA-CP-95-3309. Kennedy Space Center, FL 32899.

Bugbee, B. and F.B. Salisbury. 1989. Controlled Environment Crop Production: Hydroponics versus Lunar Regolith. p. 107-129. *In:* D. Henninger and D. Ming (eds.) Lunar Agriculture. Am. Soc. of Agronomy.

Salisbury, F.B. and **B. Bugbee**. 1985. Wheat Farming in a Lunar Base. *In:* Michael B. Duke and Wendell W. Mendell (eds.) Lunar Bases and Space Activities of the 21st Century. Lunar and Planetary Institute, 3303 NASA Road One, Houston, Texas 77048.

Books Edited

Advances in Space Research. 1992. Life Sciences and Space Research: Natural and Artificial Ecosystems. R. MacElroy, M. Averner, T. Tibbitts, **B. Bugbee**, G. Horneck, and E. Dunlop (eds). Pergamon Press, NY.

Refereed Journals

(h-index: 51; i10-index 114)

----- 2022 -----

Zhen, S., van Iersel, M.W., and Bugbee, B. 2022. Photosynthesis in sun and shade: the surprising importance of far-red photons. New Phytologist. https://doi.org/10.1111/nph.18375

----- 2021 -----

Langenfeld, N., Payne, L., & Bugbee, B. 2021. Colorimetric determination of urea using diacetyl monoxime with strong acids. *PLoS One.* 16(11): e0259760.

Kusuma, P. M. Westmoreland, S. Zhen, and B. Bugbee. 2021. Photons from NIR LEDs can delay flowering in short-day soybean and Cannabis: Implications for phytochrome activity. *PLoS One.* https://doi.org/10.1371/journal.pone.0255232

Langenfeld, N.J. and Bugbee, B., 2021. Evaluation of Three Electrochemical Dissolved Oxygen Meters. *HortTechnology*, *1*: 1-4.

Langenfeld Noah, Paul Kusuma, Wallentine T, Criddle C S., Seefeldt L C., B. Bugbee. 2021. Optimizing Nitrogen Fixation and Recycling for Food Production in Regenerative Life Support Systems. *Frontiers in Astronomy and Space Sciences. 8: 105-115.* https://doi.org/10.3389/fspas.2021.699688

Kusuma, P. B. Fatzinger, B. Bugbee W. Soer, and R. Wheeler. 2021. LEDs for extraterrestrial agriculture: Tradeoffs between efficacy and color perception. *NASA Technical memo.* *https://ntrs.nasa.gov/citations/20210016720*

Zhen, S., van Iersel, M.W., and Bugbee, B. 2021. Why far-red photons should be included in the definition of photosynthetic photons and the measurement of horticultural fixture efficacy. *Frontiers in Plant Science 12, 693445.* doi: 10.3389/fpls.2021.693445.

Kusuma, P. and B. Bugbee. 2021. Improving the predictive value of phytochrome photoequilibrium: Consideration of spectral distortion within a leaf. *Frontiers in Plant Science*. doi: 10.3389/fpls.2021.596943

Westmoreland, F.M., P. Kusuma, B. Bugbee. 2021. Cannabis lighting: Decreasing blue photon fraction increases yield but efficacy is more important for cost effective production of cannabinoids. *PLoS One* 16(3) https://doi.org/10.1371/journal.pone.0248988

Kusuma, P. Swan, Bugbee, B. 2021. Does green really mean go? Increasing the fraction of green photons promotes growth of tomato but not lettuce and cucumber. *Plants 10* (4), 637; https://doi.org/10.3390/plants10040637

Berliner, A, …Kusuma, Zhen, Seefeldt, Bugbee, B. 2021. Towards a Biomanufactory on Mars. *Frontiers in Astronomy & Space Sci. 8:120* https://doi.org/10.3389/fspas.2021.711550

----- 2020 -----

Zhen S, Bugbee B. 2020. Steady-state stomatal responses of C_3 and C_4 species to blue light fraction: Interactions with CO_2 concentration. *Plant Cell and Environment 43(12):3020-3032. doi: 10.1111/pce.13888*

Kusuma, P. and B. Bugbee. 2020. Far-red Fraction: An Improved Metric for Characterizing Phytochrome Effects on Morphology. *Jour. Am Soc Hort Sci.* 146 (1) 3-13. https://doi.org/10.21273/JASHS05002-20

Zhen, S. and B. Bugbee. 2020. Substituting far-red for traditionally defined photosynthetic photons results in equal canopy quantum yield for CO_2 fixation and increased photon capture during long-term studies: Implications for re-defining PAR. *Frontiers in Plant Science*. https://doi.org/10.3389/fpls.2020.581156

Kusuma, P., M. Pattison, and B. Bugbee. 2020. From physics to fixtures to food: Current and potential LED efficacy. *Nature-Horticulture Research* 7: 56. https://doi.org/10.1038/s41438-020-0283-7

Zhen, S. and B. Bugbee. 2020. Far-red photons have equivalent efficiency to traditional photosynthetic photons: implications for re-defining photosynthetically active radiation. *Plant Cell and Environment. 43 (5) 1259-1272* https://doi.org/10.1111/pce.13730

Hardy JM, Kusuma P., Wheeler, R, Ewert, M, and B Bugbee 2020. Providing photons for food in regenerative life support: A comparative analysis of solar fiber optic and electric light systems. Intl Conf. Environ. Systems. ICES-2020-523 https://ttu-ir.tdl.org/handle/2346/86378

Stott, L., B. Black and B. Bugbee 2020. Quantifying Tree Hydration using Electromagnetic Sensors. *Horticulturae 6*(1) https://doi.org/10.3390/horticulturae6010002

Waldron,B, J. Sagers, M. Peel, C. Rigby, B. Bugbee. 2020. Salinity Reduces the Forage Quality of Forage Kochia: A Halophytic Chenopodiaceae Shrub. Rangeland Ecology and management. 73:384-393. https://doi.org/10.1016/j.rama.2019.12.005

----- 2019 -----

Stott, L., B. Black and B. Bugbee. 2019. Differences in Drought Tolerance among Gisela® Cherry Rootstocks Determined using Automated Weighing Lysimeters. HortScience 54(10): 1847-1852. https://doi.org/10.21273/HORTSCI14267-19

Wheeler, W., B. Black, R. Watslusky, G. Cardon, and B. Bugbee. 2019. Drought Tolerance of Navajo and Lovell Peach Trees: Precision Water Stress Using Automated Weighing Lysimeters. HortScience 54(5): 799-803. https://doi.org/10.21273/HORTSCI13806-18

Soundararajan, M., R Ledbetter, P Kusuma, S Zhen, P Ludden, B. Bugbee, S. Ensign and L Seefeldt. 2019. Phototrophic N2 and CO2 Fixation Using a Rhodopseudomonas palustris-H2 Mediated Electrochemical System with Infrared Photons. Front. Microbiol. 10:1817 https://doi.org/10.3389/fmicb.2019.01817

Monje, O. and **B. Bugbee.** 2019. Radiometric Method for Determining Canopy Stomatal Conductance. Agronomy. 9(3): 114. https://doi.org/10.3390/agronomy9030114

----- 2018 -----

Pattison, M., J. Tsao, G. Brainard & **B. Bugbee.** 2018. LEDs for photons physiology and food. **Nature** 563: 493-500. DOI:org/10.1038/s41586-018-0706-x

Tibbitts, S. and B. **Bugbee.** 2018. Effect of silicon on wheat growth and development in drought and salinity stress. M.S. thesis. Digital commons.

Adams, S., J. Lordan, G. Fazio, **B. Bugbee**, P. Francescatto, T. Robinson, B. Black. 2018. Effect of scion and graft type on transpiration, hydraulic resistance and xylem hormone profile of apples grafted on Geneva®41 and M.9-NICTM29 rootstocks. Scientia Horticulturae 227:213-222 DOI: 10.1016/j.scienta.2017.09.052

----- 2017 -----

Sagers, J., Waldron, B. E. Creech, I. Mott, and **B. Bugbee**. 2017. Salinity tolerance of three competing rangeland plant species: Studies in hydroponic culture. Ecology and Evolution. 7 (24): 10916–10929. DOI:10.1002/ece3.3607

Parry, C. and **B. Bugbee**. 2017. Reduced Root-zone Phosphorous concentration Decreases Iron Chlorosis in Maize in Soilless substrates. HortTechnology. 27(4) 490-493. Doi:10.21273/HORTTECH03735-17.

Both, AJ, **B. Bugbee**, C Kubota, RLopez, C Mitchell, E Runkle and C Wallace. 2017. Proposed Product Label for Electric Lamps Used in the Plant Sciences. HortTechnology 27: 544-549. doi: 10.21273/HORTTECH03648-16

----- 2016 -----

Snowden, C., K. Cope, and **B. Bugbee**. 2016. Sensitivity of seven diverse species to blue and green light: Interactions with photon flux. PLoS ONE. DOI: 10.1371/journal.pone.0163121

Morris, K.A., J. M. Stark, **B. Bugbee**, J. M. Norton. 2016. The invasive annual cheatgrass releases more nitrogen than crested wheatgrass through root exudation and senescence. Oecologia. DOI 10.1007/s00442-015-3544-7

Bugbee B. 2016. Toward an optimal spectral quality for plant growth and development: The importance of radiation capture. Acta Hortic. 1134, 1-12. DOI: 10.17660/ActaHortic.2016.1134.1

----- 2015 -----

Blonquist, M. and **B. Bugbee.** 2015. The challenges of measuring net radiation. Meteorological Technology International. Sept. p. 46-50.

Nelson, J. and **B. Bugbee**. 2015. Analysis of Environmental Effects on Leaf Temperature under Sunlight, High Pressure Sodium and Light Emitting Diodes. PLoSOne. DOI: 10.1371/journal.pone.0138930

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Blonquist, M. and **B. Bugbee.** 2014. Active or Passive: The challenge of accurately measuring air temperature. Meteorological Technology International. Aug. p. 62-66.

Nelson, J. and **B. Bugbee**. 2014. Economic Analysis of Greenhouse Lighting: Light Emitting Diodes vs. High Intensity Discharge Fixtures. PLoSOne. Vol 9:6 10pp. DOI:10.1371/journal.pone.0099010

Parry, C., M. Blonquist, and **B. Bugbee**. 2014. In situ measurement of leaf chlorophyll concentration: Analysis of the optical/absolute relationship. Plant Cell and Environ. 37(11): 2508–2520. *DOI: 10.1111/pce.12324*

Adams, C. and **B. Bugbee.** 2014. Nitrogen retention and partitioning at the initiation of lipid accumulation in nitrogen-deficient algae. Jour. Phycology. 50(2):356–365. *DOI: 10.1111/jpy.12167*

Black, B., **B. Bugbee**, R.S. Johnson. 2014. Infrared temperature sensors for automated monitoring of orchard tree water status. ISHS Acta Horticulturae 1177: International Symposium on Physiological Principles and Their Application to Fruit Production. 10.17660/ActaHortic.2017.1177.41

Cope, K, M. Chase Snowden, and **B. Bugbee**. 2014. Photobiological Interactions of Blue Light and Photosynthetic Photon Flux: Effects of Monochromatic and Broad-Spectrum Light Sources. Photochemistry and Photobiology 90(3)574-584. *DOI: 10.1111/php.12233*

Adams, C., Jacobson, A. Bugbee, B. 2014. Ceramic aggregate sorption and desorption chemistry: Implications for use as a component of soilless media. Journal of Plant Nutrition. 37:1345-1357. *DOI: 10.1080/01904167.2013.837921*

----- 2013 -----

Adams, C. and **B. Bugbee**. 2013. Enhancing lipid production of the marine diatom Chaetoceros5 gracilis: synergistic interactions of sodium chloride and silicon. J Appl Phycol. 26: 1351-1357. *DOI 10.1007/s10811-013-0156-7.*

Doucette, W., H. Klein, J. Chard, R. Dupont, **B. Bugbee**, W. Plaehn. 2013. Volatilization of Trichloroethylene from Trees and Soil: Measurement and Scaling Approaches. Environ. Sci. and Technology. 47(11):5813–5820. DOI 10.1021/es304115c

Cope, K, and **B. Bugbee.** 2013. Spectral Effects of Three Types of White Light-Emitting Diodes on Plant Growth and Development: Absolute versus Relative Amounts of Blue Light. HortScience. 48(4):504–509.

Romagnano, J. and **B. Bugbee**. 2013. Light level does not alter ethylene sensitivity in radish or pea. Jour. Plant Growth Regulation. 71:67-75. DOI 10.1007/s10725-013-9810-y

Adams, C., Frantz, J., **Bugbee, B**. 2013. Macro- and micronutrient-release characteristics of three polymer-coated fertilizers: Theory and Measurements. Journal of Plant Nutrition and Soil Science. 176. 76-88.

Adams, C., Godfrey, V., Wahlen , B., Seefeldt, L., **Bugbee, B**. 2013. Understanding precision nitrogen stress to optimize the growth and lipid content tradeoff in oleaginous green microalgae. Bioresource Technology. 131: 188-194.

----- 2012 -----

Wahlen, B., M. Morgan, A. McCurdy, R. Willis, M. Morgan, D. Dye, **B. Bugbee**, B. Wood, and L. Seefeldt. 2012. Biodiesel from Microalgae, Yeast, and Bacteria: Engine Performance and Exhaust Emissions. Energy & Fuels. 27: 220-228. DOI: 10.1021/ef3012382

Stoklosa A. Weiss I, and **B. Bugbee**. 2011. Composition and Functional Properties of Apogee and Perigee Wheat compared to common terrestrial wheat cultivars. International Journal of Food Properties. 14(5) 996-1006.

Slavens, M., P. Johnson, and **B. Bugbee**. 2011. Irrigation frequency differentially alters vegetative growth and seed-head development of Poa annua biotypes. Crop Sci 51:1-9.

Johnson, I., J. Thornley, J. Frantz, and **B. Bugbee**. 2010. A model of canopy photosynthesis incorporating protein distribution through the canopy and its acclimation to light, temperature and CO_2. Annals of Botany 106:735-749.

Blonquist, M., R. Allen, and **B. Bugbee**. 2010. An Evaluation of the Net Radiation Sub-model in the ASCE Standardized Reference Evapotranspiration Equation: Implications for Evapotranspiration Prediction. Ag. Water Management. 97:1026-1038.

Blonquist, M., J. Norman, and **B. Bugbee**. 2009. Automated measurement of canopy stomatal conductance based on infra-red temperature. Ag. & Forest Meteorology 149:1931-1945.

Jones, S. **B. Bugbee**, R Heinse, D. Or, and G Bingham. 2009. Porous plant growth media design considerations for lunar and Martian habitats. SAE International paper no. 2009-01-2361.

Blonquist, M., B. Tanner, and **B. Bugbee** 2009. Evaluation of measurement accuracy and

Comparison of Two New and Three Traditional Net Radiometers. Ag. and Forest Meteorology149:1709-1721.

Dettenmaier, E, W. Doucette, **B. Bugbee**. 2009. Chemical Hydrophobicity and Uptake by Plant Roots. Environmental Sci. and Technology 43:324-329.

Chen, D. M. Liang, D. DeWald, B. Weimer, M. Peel, **B. Bugbee**, J. Michaelson, E. Davis, Y. Wu. 2008. Identification of dehydration responsive genes from two non-nodulated alfalfa cultivars using *Medicago truncatula* microarrays. Acta Physiol. Plant 30:183-189.

Frantz, J., N. Cometti, M. van Iersel, and **B. Bugbee**. 2007. Rethinking Acclimation of Growth and Maintenance Respiration of Tomato in Elevated CO_2: Effects of a Sudden Change in Light at Different Temperatures. Jour. Plant Ecology 31 (4)100-110.

Henry, A., W. Doucette, J. Norton, and **B. Bugbee**. 2007. Changes in Crested Wheatgrass Root Exudation caused by Flood, Drought, and Nutrient Stress. Jour. Environmental Quality 36:904-912.

Chard, B., W. Doucette, J, Chard, and **B. Bugbee**. 2006. Trichloroethylene Uptake by Apple and Peach Trees and Transfer to Fruit. Environ. Sci. and Technology 40(15):4788-4793.

Henry, A., W. Doucette, J. Norton, S. Jones, J. Chard, and **B. Bugbee**. 2006. Design and Maintenance of an Axenic Plant Culture system to Facilitate Optimal growth in Long-term studies. Jour. Environmental Quality 35(2):590-598.

Frantz, J. and **B. Bugbee**. 2005. Acclimation of Plant Populations to Shade: Photosynthesis, Respiration, and Carbon Use Efficiency. Jour. Am. Soc. Hort. Sci. 130(6):918-927.

Doucette, W. B. Wheeler, J. Chard, **B. Bugbee**, C. Naylor, J. Carbone, and R. Sims. 2005. Uptake of Nonylphenol and Nonylphenol Ethoxylates by Crested Wheatgrass. Environ. Toxicology and Chemistry 24:2965-2972.

Klassen, S. and **B. Bugbee**. 2004. Ethylene Synthesis and Sensitivity in Crop Plants. HortScience 39:1546-1552.

Frantz, J., D. Pinnock, S. Klassen, and **B. Bugbee**. 2004. Characterizing the Environmental Response of a Gibberellic Acid Deficient Rice for Use as a Model Crop. Agronomy Jour. 96:1172-1181.

Dougher, T. and **B. Bugbee**. 2004. Long-term Blue Light Effects on the Histology of Lettuce and Soybean Leaves and Stems. Jour. Am. Soc. Hort. Sci. 129:467-472.

Frantz, J., N. Cometti, and **B. Bugbee**. 2004. Night Temperature has a Minimal Effect on Respiration and Growth in rapidly Growing Plants. Ann. Botany 94:155-166.

Frantz, J., G. Ritchie, N. Cometti, J. Robinson, and **B. Bugbee**. 2004. Exploring the Limits of Crop Productivity: Beyond the limits of tipburn in lettuce. Jour. Am. Soc. Hort. Sci. 129:331-338..

Mackowiak, C., P. Grossl, and **B. Bugbee**. 2003. Biogeochemistry of Fluoride in a Plant-solution system. Jour. of Environmental Quality 32:2230-2238.

Drysdale, A. and **B. Bugbee**. 2003. Optimizing a Plant Habitat for Space: A Novel Approach to Plant Growth on the Moon. Int. Conf. Environ. Systems 2003-01-2360.

Klassen, S. and **B. Bugbee**. 2002. Sensitivity of Wheat and Rice to Low Levels of Atmospheric Ethylene. Crop Sci. 42:746-753.

Frantz, J. and **B. Bugbee**. 2002. Anaerobic Conditions Improve Germination of a Gibberellic Acid Deficient Rice. Crop Sci. 42:651-654.

Mackowiak, C., P. Grossl, and **B. Bugbee**. 2001. Beneficial effects of humic acid on micronutrient availability to wheat. Soil Sci. Soc. Am. 65:1744-1750.

Campbell, W., F. Salisbury, **B. Bugbee**, S. Klassen, E. Nagle, D. Strickland, G. Bingham, M Levinskikh, G. Iljina, T. Veselova, V. Sytchev, I. Podolsky, W. McManus, D. Bubenheim, J. Stieber, and G. Jahns. 2001. Comparative floral development of Mir-grown and ethylene treated Earth-grown Super Dwarf wheat. Jour. Plant Physiol. 158:1051-1060.

Dougher, T. and **B. Bugbee**. 2001. Differences in the response of Wheat, Soybean, and Lettuce to reduced blue radiation. Photochemistry and Photobiology. 73:199-207.

Dougher, T. and **B. Bugbee**. 2001. Evidence for yellow light suppression of lettuce growth. Photochemistry and Photobiology. 73:208-212.

Van Iersel, M. and **B. Bugbee**. 2000. A multiple chamber, semi-continuous, crop carbon dioxide exchange system: Design, calibration, and data interpretation. Jour. Amer. Soc. Hort. Sci. 125:86-92.

Orchard, B.J., W.J. Doucette, J.K. Chard and **B. Bugbee**. 2000a. A Novel Laboratory System for Determining the Fate of Trichloroethylene in Plants. Environ. Tox. Chem. 19:888-894.

Orchard, B.J., W.J. Doucette, J.K. Chard and **B. Bugbee**. 2000b. Uptake of Trichloroethylene by Hybrid Poplar Trees Grown Hydroponically in High Rate, Flow-through Plant Growth Chambers. Environ. Tox. Chem. 19:895-903.

Cavazzoni, J., T. Volk, **B. Bugbee**, and T. Dougher. 2000. Phasic Temperature and Photoperiod Control for Soybean using a Modified Crop Grow Model. Life Supp. Biosphere Sci. 6:273-278.

Bugbee, B. 1999. Engineering Plants for Spaceflight Environments. American Soc. for Gravitational and Space Biology Bulletin. 12:67-74.

Stahl, R., P. Grossl, and **B. Bugbee**. 1999. Effect of 2(N-Morpholino)ethane Sulfonic Acid (MES) on the Growth and Tissue Composition of Cucumber. Jour. Plant Nutrition 22:315-330.

Bugbee, B., M. Droter, O. Monje, and B. Tanner. 1999. Evaluation and Modification of Commercial Infra-red Transducers for Leaf Temperature Measurement. Adv. In Space Res. 22:1425-1434.

Dougher, T. and **B. Bugbee**. 1998. Is Blue Light Good or Bad for Plants? Life Support and Biosphere Science. 5:129-136.

Bishop, D. and **B. Bugbee**. 1998. Photosynthetic Capacity and Dry Mass Partitioning in Dwarf and Semi-dwarf Wheat. Jour. Plant Physiology 153:558-565.

Smart, D., K. Ritchie, A. Bloom, and **B. Bugbee**. 1998. Nitrogen Balance for Wheat Canopies Grown under Elevated and Ambient CO_2 Concentrations. Plant Cell Environ. 21:753-763.

Dougher, T. and **B. Bugbee**. 1998. Effect of Lamp Type and Temperature on Development, Carbon Partitioning, and Yield of soybean. Adv. Space Res. 5:129-136.

Grotenhuis, T., J. Reuveni, and **B. Bugbee**. 1998. Super-optimal CO_2 Reduces Yield in Growth Chamber and Greenhouse Environments. Adv. Space Res. 20:1901-1904.

Monje, O. and **B. Bugbee**. 1998. Adaptation to High CO_2 Concentration in an Optimal Environment: Radiation Capture, Canopy Quantum Yield, and Carbon Use Efficiency. Plant Cell Environ. 21:315-324.

Jurgonski, L., D. Smart, **B. Bugbee**, and S. Nielsen. 1998. Controlled Environments Alter Nutrient Content of Soybeans. Adv. Space Res. 20:1979-1988.

Bugbee, B. and G. Koerner. 1997. Yield Comparisons and Unique Characteristics of the Dwarf Wheat Cultivar "USU-Apogee". Adv. Space Res. 20:1891-1894.

Volk, T., **B. Bugbee,** and F. Tubiello. 1997. Phasic Temperature Control Appraised with the CERES-Wheat Model. Life Support & Biosphere Sci. 4:49-54.

Smart, D., K. Ritchie, J. Stark, and **B. Bugbee.** 1997. Evidence that Elevated CO_2 Levels and Indirectly Increase Rhizosphere Denitrifier Activity. Applied & Environmental Microbiology 63:4621-4624.

Tubiello, F., T. Volk, and **B. Bugbee**. 1997. Diffuse Light and Wheat Radiation-Use Efficiency in a Controlled Environment. Life Support & Biosphere Sci. 4:77-85.

Grotenhuis, T. and **B. Bugbee**. 1997. Super-optimal CO_2 reduces Seed Yield but not Vegetative Growth in Wheat. Crop Sci. 37:1215-1222.

Reuveni, J. and **B. Bugbee.** 1997. Very High CO_2 Reduces Photosynthesis, Dark Respiration, and Yield in Wheat. Annals of Botany 80:539-546.

Ferro, A., J. Kennedy, W. Doucette, S. Nelson, G. Jauregi, B. McFarland, and **B. Bugbee**. 1997. Fate of Benzene in Soils Planted with Alfalfa: Uptake, Volatilization, and Degradation. Chapt. 16. pp 223-237. IN: Phytoremediation of Soil and Water Contaminants. E. Kruger, T. Anderson, and J. Coats (eds). Symposium Series 664. Amer. Chemical Soc. Washington, DC.

Bugbee, B., G. Koerner, R. Albrechtsen, W. Dewey, and S. Clawson. 1997. Registration of USU-Apogee Wheat. Crop Science 37:626.

van Iersel, M. and **B. Bugbee**. 1997. Increased Organic Matter in the Growing Medium Decreases Benlate DF Phytotoxicity. Plant Disease. 81:743-748.

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