

Christopher S. Brown, Ph.D.

Publications/Presentations

Papers

1. Sanwo-Lewandowski, MM, GD Goins, NC Yorio, CS Brown 2002. Carbohydrate metabolism in wheat plants grown under red and blue light. *Journal of Experimental Botany* (*submitted*).
2. Klymchuk, DO, CS Brown, DK Chapman, TV Vorobyova, and GM Martyn 2001. Cytochemical localization of calcium in soybean root cap cells in microgravity. *Adv. Space Res.* 27(5):967-972.
3. Kuznetsov, OA, CS Brown, HG Levine, WC Piastuch, MM Sanwo-Lewandowski and KH Hasenstein 2001. Composition and physical properties of starch in microgravity-grown plants. *Adv. Space Res.* 28(4):651-658
4. Nedukha, O, EL Kordyum, CS Brown, E Kordyum and DK Chapman 2001. The interaction of microgravity and ethylene on the ultrastructure of cells and Ca²⁺ localization in soybean hypocotyls. *J. Grav. Physiol.* 8(1):49-50
5. Klymchuk, DO CS Brown and DK Chapman 1999. Ultrastructural organization of cells in soybean root tips in microgravity. *J. Grav. Physiol.* 6:97-98.
6. Nedukha, O, CS Brown, E Kordyum and WC Piastuch 1999. Electron cytochemical study of Ca²⁺ in cotyledon cells of soybean grown in microgravity. *J. Grav. Physiol.* 6:123-124.
7. Tibbitts, TW, JG Croxdale, CS Brown, RM Wheeler and GD Goins 1998. Ground-based studies and space experiment with potato leaf explants. *Journal of Life Support and Biosphere Science. Journal of Life Support and Biosphere Science* 6:97-106.
8. Yorio, NC, RM Wheeler, GD Goins, MM Lewandowski, CL Mackowiak, CS Brown, JC Sager and GW Stutte 1999. Blue light requirements for crop plants used in bioregenerative life support systems. *Journal of Life Support and Biosphere Science.* 5:119-128.
9. Cook, ME, JG Croxdale, TW Tibbitts and CS Brown 1998. Development and growth of potato tubers in microgravity. *Advances in Space Research* 21(8/9):1103-1110.
10. Musgrave, ME, A Kuang, CS Brown and SW Matthews 1998. Leaf development in *Arabidopsis thaliana* during spaceflight *Annals of Botany* 81:503-512.
11. Goins, GD, NC Yorio, MM Sanwo-Lewandowski and CS Brown 1998. Life cycle experiments with *Arabidopsis* grown under red light-emitting diodes (LEDs). *Journal of Life Support and Biosphere Science* 5:143-149.
12. Yorio, NC, RM Wheeler, GD Goins, MM Lewandowski, CL Mackowiack, CS Brown, JC Sager and GW Stutte 1998. Blue light requirements for crop plants used in bioregenerative life support systems. *Journal of Life Support and Biosphere Science.* 5:119-128.
13. Brown, CS, TW Tibbitts, JG Croxdale and RM Wheeler 1997. Potato tuber formation in the spaceflight environment. *Journal of Life Support and Biosphere Science* 4(2):71-76.
14. Croxdale, J, M Cook, TW Tibbitts, CS Brown and RM Wheeler 1997. Structure of potato tubers formed during spaceflight. *Journal of Experimental Botany* 48:2037-2043.
15. Goins, GD, Yorio, NC, MM Sanwo and CS Brown 1997. Photomorphogenesis, photosynthesis, and seed yield of wheat plants grown under red light-emitting diodes (LEDs) with and without supplemental blue lighting. *Journal of Experimental Botany* 48:1407-1413.

16. Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1997. Plastid distribution in columella cells of a starchless *Arabidopsis* mutant grown in microgravity. *Plant and Cell Physiology* 38: 490-494.
17. Schuerger, AC and CS Brown 1997. Spectral quality affects disease development of three plant pathogens on hydroponically grown plants. *HortScience* 32:96-100.
18. Schuerger, AC, CS Brown and EC Stryjewski 1997. Anatomical features of pepper plants (*Capsicum annum* L.) grown under red light-emitting diodes supplemented with blue or far-red light. *Annals of Botany* 79:273-282.
19. Hilaire, EM, BV Peterson, JA Guikema and CS Brown 1996. Clinorotation affects soybean seedling morphology and ethylene production. *Plant and Cell Physiology* 37:929-934.
20. Johnson, CF, CS Brown, RM Wheeler, JC Sager, DK Chapman and GF Deitzer 1996. Infrared light-emitting diode radiation causes gravitropic and morphological effects in dark-grown oat seedlings. *Photochemistry and Photobiology* 63:238-242.
21. Johnson, CF, TW Dreschel, CS Brown and RM Wheeler 1996. Optimization of moisture content and wheat seedling germination in a cellulose acetate medium for a spaceflight experiment. *Advances in Space Research*. 18:239-242.
22. Tripathy, BC, CS Brown, HG Levine, AD Krikorian 1996. Growth and photosynthetic responses of wheat plants grown in space. *Plant Physiology* 110:801-806.
23. Gallegos, GL, EM Hilaire, BV Peterson, CS Brown and JA Guikema 1995. Effects of microgravity and clinorotation on stress ethylene production in two starchless mutants of *Arabidopsis thaliana*. *Journal of Gravitational Physiology* 2:153-154.
24. Gallegos, GL, BV Peterson, CS Brown and JA Guikema 1995. Effects of stress ethylene inhibitors on sweet clover (*Melilotus alba* L) seedling growth in microgravity. *Journal of Gravitational Physiology* 2:151-152.
25. Hilaire, E, CS Brown and JA Guikema 1995. Clinorotation affects soybean seedling morphology. *Journal of Gravitational Physiology* 2:149-150.
26. Hilaire, E, JA Guikema and CS Brown 1995. The fluid processing apparatus: From flight hardware to electron micrographs. *Journal of Gravitational Physiology* 2:165-166.
27. Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1995. Effects of clinorotation and microgravity on sweet clover columella cells treated with cytochalasin D. *Physiologia Plantarum* 95:267-273.
28. Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1995. Microgravity and clinorotation cause redistribution of free calcium in sweet clover columella cells. *Plant and Cell Physiology* 36:831-837.
29. Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1995. Cortical microtubules in sweet clover columella cells developed in microgravity. *Plant and Cell Physiology* 36:1387-1392.
30. Brown, CS, AC Schuerger and JC Sager 1995. Growth and photomorphogenesis of pepper plants under red light emitting diodes supplemented with blue or far-red illumination. *Journal of the American Society for Horticultural Science* 120:808-813.
31. Piastuch, WC and CS Brown 1995. The effects of chronic clinorotation on protein expression of *Arabidopsis thaliana*. *Journal of Plant Physiology* 146:329-332.

32. Tripathy, BC and CS Brown 1995. Root-shoot interaction in the greening of wheat seedlings grown under red light. *Plant Physiology* 107:407-411.
33. Brown, CS and WC Piastuch 1994. Starch metabolism in germinating soybean cotyledons is sensitive to clinorotation and centrifugation. *Plant, Cell and Environment* 17:341-344.
34. Brown, CS, WC Piastuch and WM Knott 1994. Soybean cotyledon starch metabolism is sensitive to altered gravity conditions. *Advances in Space Research* 14:107-110.
35. Dreschel, TW, CS Brown, WC Piastuch, CR Hinkle and WM Knott 1994. Porous tube plant nutrient delivery system development: A device for nutrient delivery in microgravity. *Advances in Space Research* 14:47-51.
36. Obenland, DM and CS Brown 1994. The influence of altered gravity on carbohydrate metabolism in excised wheat leaves. *Journal of Plant Physiology* 144:696-699.
37. Schuerger, AC and CS Brown 1994. Spectral quality may be used to alter plant disease development in a CELSS. *Advances in Space Research* 14:395-398.
38. Brown, CS, TW Dreschel, WM Cox and PV Chetirkin 1992. The vacuum operated nutrient delivery system: Hydroponics for microgravity. *HortScience* 27:1183-1185.
39. Takahashi, H, CS Brown, TW Dreschel and TK Scott 1992. Root hydrotropism in a porous tube water delivering system. *HortScience* 27:430-432.
40. McClure, BA, G Hagen, CS Brown, MA Gee and TJ Guilfoyle 1989. Transcription, organization and sequence of an auxin-regulated gene cluster in soybean. *The Plant Cell* 1:229-239.
41. Brown, CS and SC Huber 1988. Reserve mobilization and starch formation in soybean (*Glycine max*) cotyledons in relation to seedling growth. *Physiologia Plantarum* 72:518-524.
42. Brown, CS and SC Huber 1987. Photosynthesis, reserve mobilization and enzymes of sucrose metabolism in soybean (*Glycine max*) cotyledons. *Physiologia Plantarum* 70:537-543.
43. Brown, CS, E Young and DM Pharr 1985. Rootstock and scion effects on carbon partitioning in apple leaves. *Journal of the American Society for Horticultural Science* 110:701-705.
44. Brown, CS, E Young and DM Pharr 1985. Rootstock and scion effects on the seasonal distribution of dry weight and carbohydrates in young apple trees. *Journal of the American Society for Horticultural Science* 110:696-701.
45. Brown, CS, E Young and DM Pharr 1983. An enzymatic assay for sorbitol in apple organs. *HortScience* 18:469-470.

Book Chapters / Technical Memoranda

1. Brown, CS 2002. Photosynthesis and carbohydrate metabolism in space-grown plants. *Inst. Gen Ecol. Newsl* (in press).
2. Tibbitts, TW, CS Brown, JG Croxdale, and RM Wheeler 1998. Experiment IX. Astroculture: Growth and starch accumulation in potato tuber. NASA TM-1998-208697, pp. 9.221-9.228.
3. Brown, CS, TW Tibbitts, JG Croxdale and RM Wheeler 1996. Potato tuber formation and metabolism in the spaceflight environment. SAE Paper #96-1393.

4. Brown, CS, BC Tripathy and GW Stutte 1996. Photosynthesis and carbohydrate metabolism in microgravity. In: H Suge ed. *Plants in Space Biology*. Tohoku University Press. Sendai, Japan, pp 127-134.
5. Goins, GD, NC Yorio, MM Sanwo and CS Brown 1996. Seed-to-seed growth of superdwarf wheat and Arabidopsis using red light-emitting diodes (LEDs): A report conducted for NASA's proposed plant research unit (PRU). NASA TM-11678.
6. Heathcote, DG, CS Brown, GD Goins,, M Kliss, H Levine, PA Lomax, RL Porter and RM Wheeler 1996. The Plant Research Unit: Long-term plant growth support for space station. Proceedings of the Sixth European Symposium on Life Science Research in Space. ESA SP 390.
7. Brown, CS 1995. Non-gravitational factors affecting plant growth in spaceflight. Institute of Genetic Ecology Newsletter 7:9-12.
8. Dooley, HA, AE Drysdale, JC Sager and CS Brown 1995. Bioregenerative life support system design. SAE Paper #951493.
9. Piastuch, WC, TW Dreschel, JO Bledsoe and CS Brown 1995. A small, closed, computer controlled chamber for study of atmospheric and water availability effects on plant growth and metabolism. SAE Paper #957656
10. Brown, CS, TW Dreschel and WM Cox 1994. The vacuum operated nutrient delivery system (VONDS): Technology for the culture of plants in microgravity. NASA Tech Briefs 18:128. KSC-11606.
11. Brown, CS 1993. Photosynthesis and carbohydrate metabolism in higher plants in altered gravity conditions. NASA TM-4501:25-29.
12. Bushong, WE, RC Fox, CS Brown, RR Biro and TW Dreschel 1993. Clinostat delivers power to plant-growth cabinets. NASA Tech Briefs 17:92. KSC-11537.
13. Dreschel, TW and CS Brown 1993. Water-conserving plant growth system. NASA Tech Briefs 17:89-90. KSC-11536.
14. Dreschel, TW and CS Brown 1992. Porous tube nutrient delivery system for the Space Shuttle mid-deck locker Plant Growth Unit (PGU). NASA Tech Briefs 17:89-90.
15. Dreschel, TW, CS Brown, WC Piastuch, CR Hinkle, JC Sager, RM Wheeler and WM Knott 1992. A summary of porous tube plant nutrient delivery investigations from 1985-1991. NASA TM-107546.
16. Dreschel, TW, CS Brown, CR Hinkle, JC Sager and WM Knott 1990. Developing future plant experiments for spaceflight. SAE Paper # 90-4533.
17. Guilfoyle, TJ, BA McClure, G Hagen, CS Brown, MA Gee and A Franco 1990. Regulation of plant gene expression by auxins. In: JP Gustafson ed., *Gene Manipulation in Plant Improvement II*. Plenum Press, New York, pp 401-418.
18. Guilfoyle, TJ, BA McClure, G Hagen, CS Brown, R Wright and MA Gee 1990. Auxin-regulated gene expression. In: MC Elliott and I Machakova eds., *Molecular Aspects of Hormonal Regulation of Plant Development*. SPB Academic Publishing, The Hague, pp 195-201.
19. Hagen, G, B McClure, C Brown, M Gee and T Guilfoyle 1990. Auxin and gene expression. In: RP Pharis and SB Rood eds., *Growth Substances 1988*. Springer, Berlin, pp 95-99.

20. Guilfoyle, T, B McClure, G Hagen, C Brown, D Wright and M Gee 1989. Rapid activation of a gene cluster by auxin. In: R Goldberg ed., *The Molecular Basis of Plant Development*. Alan R Liss, Inc. New York, pp 203-210.
21. Brown, CS and SC Huber 1987. Characteristics of soybean cotyledon photosynthesis. In: J Biggins ed., *Progress in Photosynthesis Research Vol. 3*. Martinus Nijhoff Publishers, Boston, pp 725-728.

Published Abstracts

1. Brown, CS 2001, Programmable plants: Development of an in planta system for the remote monitoring and control of plants for life support. *Gravitational and Space Biology Bulletin* 14(1):25
2. Hasenstein, KH, OA Kuznetsov, CS Brown, HG Levine and WC Piastuch 2000. Composition and physical properties of starch in microgravity-grown plants. *Gravitational and Space Biology Bulletin* 14(1):50.
3. Brown, C.S., Sanwo-Lewandowski, M.M., Keller, M.A., Piastuch, W.C. and Guikema, J.A., 1998. The interaction of gravity and ethylene in soybean seedlings. *Gravitational and Space Biology Bulletin* 12:76
4. Brown, C.S., Sanwo-Lewandowski, M.M., Kuznetsov, O.A., Cooper, R.C. and Hasenstein, K.H. 1999. Carbohydrate metabolism and starch structure in space-grown plants. *Gravitational and Space Biology Bulletin* 13:48.
5. Peterson, B.V., Stutte, G.W., Wells, D.S., Wheeler, R.M., and Brown, C.S., 1999. Air sampling methods for plant growth experiments on ISS, International Space Station. *Gravitational and Space Biology Bulletin* 13:64.
6. Brown, CS, MM Sanwo-Lewandowski, MA Keller, WC Piastuch and JA Guikema 1998. The interaction of gravity and ethylene in soybean seedlings. *Gravitational and Space Biology Bulletin* 12:76.
7. Klymchuk, DO, CS Brown, WC Piastuch and EL Kordyum 1998. Alterations in the root tip cells of soybean seedlings grown under microgravity. *Gravitational and Space Biology Bulletin* 12:45.
8. Nedukha, O, E Kordyum, C Brown, W Piastuch and I Ovrutskaya 1998. Influence of microgravity on localization and relative content of Ca²⁺ in soybean seedlings. *Gravitational and Space Biology Bulletin* 12:76.
9. Brown, CS, MM Sanwo, GD Goins, RM Wheeler, JG Croxdale and TW Tibbitts 1997. Potato tuber growth and metabolism in space. *Gravitational and Space Biology Bulletin* 11:74.
10. Brown, CS, MM Sanwo, EC Stryjewski, BV Peterson, WC Piastuch, CF Johnson, E Hilaire, JA Guikema 1997. Carbohydrate metabolism and growth in space-grown soybean. *Plant Physiology* 114:91.
11. Johnson, KM, CS Brown and WC Piastuch 1997. Examination of the expression of genes involved in carbohydrate metabolism in soybean seedlings grown in space. *Plant Physiology* 114:253.
12. Kuang, A, CS Brown, SW Matthews and ME Musgrave 1997. Effect of spaceflight on ultrastructure, chlorophyll and carbohydrate content of *Arabidopsis* leaves. *Gravitational and Space Biology Bulletin* 11:38.
13. Kuznetsov, OA, CS Brown, MM Sanwo and KH Hasenstein 1997. Magnetogravitophoretic studies show differences in starch metabolism of space-flown soybean. *Gravitational and Space Biology Bulletin* 11:24.

14. Sanwo, MM, GD Goins, NC Yorio and CS Brown 1997. Changes in leaf carbohydrate metabolism in wheat plants grown under red and blue light. *Plant Physiology* 114:81.
15. Brown, CS, MM Sanwo, E Hilaire, JA Guikema, EC Stryjewski and WC Piastuch. 1996. Starch metabolism and ethylene production in space-grown soybean seedlings. *ASGSB Bulletin* 10:34.
16. Croxdale, JG, ME Cook, TW Tibbitts, CS Brown and RM Wheeler 1996. Structural aspects of potato tubers formed in space. *ASGSB Bulletin* 10:13.
17. Goins, GD, MM Sanwo, NC Yorio and CS Brown 1996. Photosynthesis, growth and seed yield of superdwarf wheat under red light-emitting diodes. *Plant Physiology* 111:78.
18. Goins, GD, Yorio, NC, MM Sanwo and CS Brown 1996. Photomorphogenesis, photosynthesis, and seed yield of wheat plants grown under red light-emitting diodes (LEDs) with and without supplemental blue lighting. *ASGSB Bulletin* 10:13.
19. Sanwo, MM and CS Brown 1996. Starch metabolism in space-grown soybean cotyledons. *Plant Physiology* 111:52.
20. Sanwo, MM, JT Richards, AC Schuenger and CS Brown 1996. Control of pepper growth and carbohydrate metabolism with red and blue light. *ASGSB Bulletin* 10:96.
21. Tibbitts, TW, JG Croxdale, CS Brown and RM Wheeler 1996. Growing potato tubers in space. *HortScience* 31:607.
22. Tibbitts, TW, JG Croxdale, CS Brown and RM Wheeler 1996. Potato tuber growth and starch accumulation in space. *ASGSB Bulletin* 10:28.
23. Brown CS, EM Hilaire, JA Guikema, WC Piastuch, CF Johnson, EC Stryjewski, B Peterson, and DS Vordermark 1995. Soybean seedling growth, ultrastructure, and carbohydrate metabolism in microgravity. *Plant Physiology* 108:31.
24. Brown CS, EM Hilaire, JA Guikema, WC Piastuch, CF Johnson, EC Stryjewski, B Peterson, and DS Vordermark 1995. Metabolism, ultrastructure and growth of soybean seedlings in microgravity: Results from the BRIC-01 and BRIC-03 experiments. *ASGSB Bulletin* 9:93.
25. Chapman, DK, CJ Daugherty, HG Levine, CS Brown and RM Wheeler 1995. Biocompatibility tests with plant growth facility prototype is compared to control plants in growth chambers. *ASGSB Bulletin* 9: 51.
26. Gallegos, GL, EM Hilaire, BV Peterson, CS Brown and JA Guikema 1995. Effects of microgravity and clinorotation on stress ethylene production in two starchless mutants of *Arabidopsis thaliana*. *ASGSB Bulletin* 9:16.
27. Goins, GD, NC Yorio, MM Sanwo and CS Brown 1995. Seed-to-seed growth of wheat and *Arabidopsis* using red light-emitting diodes. *ASGSB Bulletin* 9:76.
28. Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1995. Plastid Distribution in columella cells of a starchless *Arabidopsis* mutant grown in microgravity (STS-63). *ASGSB Bulletin* 9:6.
29. Johnson, CF, TW Dreschel, CW Carlson and CS Brown 1995. Analysis of water imbibition in a seed germination medium for the microgravity plant nutrient experiment on the KC-135. *ASGSB Bulletin* 9:48.

30. Sanwo, MM, GD Goins, NC Yorio and CS Brown 1995. Effect of red light emitting diodes on photosynthesis and carbohydrate metabolism in superdwarf wheat plants. ASGSB Bulletin 9:50.
31. Sanwo, MM, NC Yorio, BC Tripathy and CS Brown 1995. Photosynthesis and carbohydrate metabolism in wheat plants grown under red light-emitting diodes. Plant Physiology 108:433.
32. Sanwo, MM, NC Yorio and CS Brown 1995. Spectral quality effects on growth and carbohydrate metabolism in wheat. In: Madore, MA and WJ Lucas (eds.). *Carbon partitioning and source sink interactions in plants*. pp. 277. ASPP Press, Rockville, MD.
33. Tibbitts, TW, JG Croxdale, CS Brown, RW Wheeler and RJ Bula 1995. Potato tuber development and starch accumulation in USML-2 spaceflight. ASGSB Bulletin 9:63.
34. Yorio, NC, MM Sanwo and CS Brown 1995. Growth and carbohydrate metabolism of wheat plants grown with red light emitting diodes. HortScience 30:863
35. Brown, CS, EM Hilaire and JA Guikema 1994. Clinorotation affects soybean seedling growth and morphology. ASGSB Bulletin 8:90.
36. Dreschel, TW, CF Johnson, CW Carlson, HW Wells, EJ Wiegrefe, CS Brown, WM Knott and W Munsey 1994. The microgravity plant nutrient experiment development: Finalizing the design for a Fall 1995 flight opportunity. ASGSB Bulletin 8:77.
37. Hilaire, E, AQ Paulsen, CS Brown and JA Guikema 1994. Effects of clinorotation and microgravity (STS-60) on calcium distribution in sweet clover columella cells. ASGSB Bulletin 8:30.
38. Johnson, CF, TW Dreschel, EC Stryjewski and CS Brown 1994. Evaluation of blue light emitting diodes for use in a spaceflight plant experiment. ASGSB Bulletin 8:56.
39. Musgrave, ME, CS Brown, DM Porterfield, CJ Daugherty, DM Obenland and SW Matthews 1994. Physiological changes in *Arabidopsis thaliana* during spaceflight. Plant Physiology 105:21.
40. Piastuch, WC, TW Dreschel, JM Bledsoe and CS Brown 1994. A computer-controlled small closed chamber for study of the effects of super-elevated CO₂ on plant growth and metabolism. ASGSB Bulletin 8:24.
41. Piastuch, WC, EC Stryjewski, TW Dreschel and CS Brown 1994. Growth, morphology and metabolism of *Arabidopsis* at elevated and super-elevated CO₂ concentrations. Plant Physiology 105:50.
42. Tibbitts, TW, JG Croxdale and CS Brown 1994. Tuber formation and starch accumulation for planned experiment on USML-2. ASGSB Bulletin 8:55.
43. Tripathy, BC and CS Brown 1994. Photosynthetic adaptation of wheat plants to red light. ASGSB Bulletin 8:55.
44. Tripathy, BC and CS Brown 1994. Exposure of roots to moderately high amounts of red light during germination inhibits the greening of wheat seedlings. Plant Physiology 105:22.
45. Bennett, JH, CS Brown, NC Yorio, DM Obenland, AG Heyenga and NG Lewis 1993. Photosynthesis and biomass production by super dwarf wheat plants grown at high CO₂ concentration and low light. Plant Physiology 102:137.
46. Brown, CS, DM Obenland and MM Musgrave 1993. Spaceflight effects on growth, carbohydrate concentration and chlorophyll content in *Arabidopsis*. ASGSB Bulletin 7:83.

47. Brown, CS and AC Schuerger 1993. Growth of pepper, lettuce and cucumber under light emitting diodes. *Plant Physiology* 102:88.
48. Dreschel, TW, CF Johnson, CW Carlson, HW Wells, EJ Wiegrefe, CS Brown, WM Knott and W Munsey 1993. The microgravity plant nutrient experiment: Hardware issues and KC-135 test results. *ASGSB Bulletin* 7:88.
49. Heyenga, AG, L He, LB Davin, CS Brown and NG Lewis 1993. Plant cell wall formation, metabolism and gene expression in microgravity. *ASGSB Bulletin* 7:54.
50. Johnson, CF, TW Dreschel, CS Brown, GW Stutte, RM Wheeler and EM Hilaire 1993. Microgravity plant nutrient experiment (MPNE) development: Ground-based plant studies supporting hardware design. *ASGSB Bulletin* 7:86.
51. Johnson, CF, EC Stryjewski, RM Wheeler, CS Brown, DK Chapman, DG Heathcote and AH Brown 1993. Effects of infra-red light on *Avena sativa* cv. Seger. *ASGSB Bulletin* 7:68.
52. Levine, HG, DM Obenland, CS Brown and AD Krikorian 1993. Baseline data and design considerations in a plant tissue sharing effort. *ASGSB Bulletin* 7:38.
53. Obenland, DM and CS Brown 1993. Carbohydrate metabolism in excised wheat leaves exposed to clinorotation. *Plant Physiology* 102:88.
54. Obenland, DM and CS Brown 1993. Photosynthetic and respiratory rates of excised wheat leaves exposed to clinorotation. *ASGSB Bulletin* 7:54.
55. Piastuch, WC and CS Brown 1993. Altered gravity-induced changes in growth and starch concentration in maize seedlings. *Plant Physiology* 102:87.
56. Piastuch, WC and CS Brown 1993. Molecular analysis of maize and *Arabidopsis* grown under clinorotation. *ASGSB Bulletin* 7:92.
57. Tripathy, BC and CS Brown 1993. Photosynthetic responses of wheat (*Triticum aestivum* L. cv. Yecora rojo) grown under red light emitting diodes. *ASGSB Bulletin* 7:93.
58. Brown, CS and AC Schuerger 1992. Growth and photosynthesis of pepper plants grown under light emitting diodes. *ASGSB Bulletin* 6:52.
59. Dreschel, TW, WM Cox, CS Brown and WM Knott 1992. The vacuum-operated nutrient delivery system for hydroponics in space. *ASGSB Bulletin* 6:84.
60. Brown, CS and WC Piastuch 1991. Carbohydrate metabolism in germinating soybeans in altered gravity conditions. *Plant Physiology* 96:71.
61. Dreschel, TW, CS Brown, WC Piastuch, CR Hinkle, RM Wheeler and WM Knott 1991. Technologies for plant space biology investigations in the space shuttle mid-deck locker. *ASGSB Bulletin* 5:90.
62. Takahashi, H, CS Brown, TW Dreschel and TK Scott 1991. Root hydrotropism in a porous tube-water nutrient delivery system. *ASGSB Bulletin* 5:46.
63. Brown, CS, TW Dreschel, CJ Daugherty and B Vieux 1990. Alteration of carbon exchange rates by clinorotation. *Plant Physiology* 93:80.
64. Daugherty, CJ, CS Brown and RL Biro 1990. Report on the 1990 Space Life Sciences Training Program (SLSTP): Plant Space Biology. *ASGSB Bulletin* 4:110.

65. Dreschel, TW, CS Brown, CR Hinkle, JC Sager and WM Knott 1990. Development of a porous tube nutrient delivery system for the space shuttle mid-deck locker plant growth unit. *ASGSB Bulletin* 4:51.
66. Brown, CS and TJ Guilfoyle 1989. Promoter analysis of an auxin induced gene. *Plant Physiology* 89:64.
67. Brown, CS and SC Huber 1987. The relationship of seedling growth to cotyledon carbohydrate metabolism in soybean. *Plant Physiology* 83:36.
68. Brown, CS and SC Huber 1985. Changes in sucrose metabolizing enzymes during germination of soybean seeds. *Plant Physiology* 77:75.
69. Brown, CS, E Young and DM Pharr 1984. Carbon partitioning in apple leaves. *HortScience* 19:583.

Invited Seminars and Lectures

1. Brown, CS. Plants, Agriculture and Space. Space Life Sciences Training Program, Kennedy Space Center, FL July 2001
2. Brown, CS. Agriculture in Space. Biological and Agricultural Engineering Department, NC State University, Raleigh, NC, April 2001
3. Brown, CS. Plants in space and the NSCORT at NC State University. Space Life Sciences Training Program, Kennedy Space Center, FL, July, 2000.
4. Brown, CS. Programmable plants: Development of an *in planta* system for the remote monitoring and control of plant function for life support. NASA Institute for Advanced Concepts Annual Meeting, Goddard Spaceflight Center, Greenbelt, MD, June, 2000.
5. Brown, CS. Plants in space. KSC Senior Management Biological Science Briefing, Kennedy Space Center, FL, March, 2000
6. Brown, CS. Space biology. Howard Hughes Medical Institute lecture series, NC Central University, Durham, NC, January, 2000.
7. Brown, C.S. Carbohydrate metabolism and photosynthesis in plants in space. *Plants in Space Biology Workshop*, Tohoku University, Sendai, Japan, December , 1999.
8. Brown, C.S. Plants, gravity and space. US Air Force Academy, Ft. Collins, CO, February 8, 1999.
9. Brown, CS. Space biology. Space Day Science Symposium, NC Central University, Durham, NC, November 1998.
10. Brown, C.S, Clore, A. and Huber, J.L. Plant Space Biology and Farming in Space. *NC Science Teachers Association Meeting*, Greensboro, NC, November, 1998.
11. Brown, CS. Plant space biology. International Space University Summer Session, Cleveland State University, Cleveland, OH, July 1998.
12. Brown, CS. Plants, gravity and space. US Air Force Academy, Ft. Collins, CO, January 1998.
13. Brown, CS. Biological experimentation in space. American Association of Laboratory Animal Scientists Lecture Series, Research Triangle Park, NC, September, 1997.

14. Brown, CS. The Collaborative Ukrainian Experiment: Science Overview. NASA Headquarters, Washington DC, September 1997.
15. Brown, CS. Plants in space and the NSCORT in Gravitational Biology. SLSTP Lecture Series. Kennedy Space Center, FL, June 1997.
16. Brown, CS. The Collaborative Ukrainian Experiment: Science Overview. 12th Man In Space Symposium, Washington DC, June 1997.
17. Brown, CS Plant growth and physiology in space. Baruch College, New York, NY, March 1997.
18. Brown, CS. Plant metabolism in space. UNC-Pembroke, Pembroke, NC, March 1997.
19. Brown, CS. Soybeans, wheat and potatoes in space. SLSTP Lecture Series, Kennedy Space Center, FL, July 1996.
20. Brown CS. Plant spaceflight experimentation. University of Central Florida, Orlando FL, October 1995.
21. Brown, CS. Plant physiological responses to spaceflight. Kansas State University, Manhattan KS, April 1995.
22. Brown, CS. Technologies for growing plants in space. North Carolina State University, Raleigh, NC, March 1995.
23. Brown, CS. Plant Culture using light emitting diodes: Aspects of growth, structure and metabolism. Duke University, Durham, NC, March 1995.
24. Brown, CS. Light emitting diodes as an illumination source for space-based plant culture systems. NASA Ames Research Center, Moffett Field, CA, March 1995.
25. Brown, CS and AC Schuerger. Photosynthesis and growth of four species under light emitting diodes. World Space Congress, Hamburg, Germany, July 1994.
26. Brown, CS. Starch metabolism in space-grown soybean seedlings. STS-63 Crew Familiarization, Houston, TX, May 1994.
27. Brown, CS. Light emitting diodes as an alternative illumination source for growing plants in space. Gravitational Biology Facility Science Working Group Meeting, Fairfax, VA, December 1993.
28. Brown, CS and AC Schuerger. Enabling technologies for growing plants in space: Light emitting diodes (LEDs) as an illumination source. University of Florida, Gainesville, FL, November 1992.
29. Brown, CS and AC Schuerger. Enabling technologies for growing plants in space: Light emitting diodes (LEDs) as an illumination source. Kansas State University, Manhattan KS, November 1992.
30. Brown, CS. Growth and photosynthesis of pepper plants grown under light emitting diodes. NASA Ames Research Center, Moffett Field, CA, April 1992.
31. Brown, CS. Plant space biology research at the Kennedy Space Center. University of Central Florida, Orlando, FL, January 1992.
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