

ALLAN BRUCE DOWNIE**EDUCATION**

1994	Ph.D.	Botany	University of Guelph, Botany, Guelph, Ontario, Canada
1989	M.Sc.	Silviculture	Swedish University of Ag. Sci., Umeå, Sweden
1986	B.Sc. (Hon.)	Biology	Acadia University, Wolfville, Nova Scotia, Canada

APPOINTMENTS

Professor of Horticulture, University of Kentucky, Lexington	July 2020 - present
Associate Professor of Horticulture, University of Kentucky, Lexington	July 2005 - June 2020
Assistant Professor of Horticulture, University of Kentucky, Lexington	Aug. 1998 - June 2005
Post-Doctoral Research Associate, University of California, Davis, CA	Jan. 1995 - Aug. 1998
Ph.D. studies at the University of Guelph, Guelph, Ontario, Canada	1991 - 1994
Forestry Canada Tree Seed Center, Chalk River, Ontario, Canada	1989 - 1991
Swedish University of Agricultural Science & Swedish Cellulose Co.	1987 - 1989

RESEARCH PUBLICATIONS

- 67) Han Q, Chen K, Yan D, Hao G, Qi J, Wang C, Dirk LMA, **Downie AB**, Gong J, Jianhua W, Zhao T. 2020. *ZmDREB2A* regulates *ZmGH3.2* and *ZmRAFS*, shifting metabolism towards seed aging tolerance over seedling growth. *The Plant Journal*. Accepted. doi:10.1111/tpj.14922
- 66) Tian R, Wang F, Zheng Q, Niza VMAGE, **Downie AB**, Perry SE. 2020. Direct and indirect targets of the arabidopsis seed transcription factor ABSCISIC ACID INSENSITIVE3. *The Plant Journal*. Accepted. doi:10.1111/tpj.14854
- 65) Dirk LMA, Abdel CG, Ahmad I, Costa Silva Neta I, Carvalho Pereira C, Carlos Bezerra Pereira FE, Unêda-Trevisoli SH, Guariz Pinheiro DI, **Downie AB**. 2020. LATE EMBRYOGENESIS ABUNDANT PROTEIN-CLIENT PROTEIN interactions. *Plants*. 9(7):814. doi:10.3390/plants9070814
- 64) Li T, Zhang Y, Li Y, Li X, Hao G, Han Q, Dirk LMA, **Downie AB**, Ruan Y-L, Wang J, Wang G, Zhao T. 2020. Raffinose synthase enhances drought tolerance through raffinose synthesis or galactinol hydrolysis in maize and *Arabidopsis* plants. *Journal of Biological Chemistry*. 295(23):8064-8077. doi:10.1074/jbc.RA120.013948
- 63) AL-Amery M, **Downie B**, DeBolt S, Crocker M, Urschel K, Goff B, Teets N, Gollihue J, Hildebrand D. 2019. Proximate composition of enhanced DGAT high oil, high protein soybeans. *Biocatalysis and Agricultural Biotechnology*. 21:101303. doi: 10.1016/j.bcab.2019.101303
- 62) Han Q, Qi J, Hao G, Zhang C, Wang C, Dirk LMA, **Downie AB**, Zhao T. 2019. *ZmDREB1A* regulates *RAFFINOSE SYNTHASE* controlling raffinose accumulation and vegetative chilling stress tolerance in maize. *Plant and Cell Physiology*. 61(2):331-341. doi:10.1093/pcp/pcz200
- 61) Gu L, Jiang T, Zhang C, Li X, Wang C, Zhang Y, Li T, Dirk L, **Downie B**, Zhao T. 2019. Maize HSFA2 and HSBP2 antagonistically modulate raffinose biosynthesis and heat tolerance in *Arabidopsis*. *The Plant Journal*. 100(1):128-142. doi: 10.1111/tpj.14434
- 60) Zhang Y, Sun Q, Zhang C, Hao G, Wang C, Dirk LMA, **Downie AB**, Zhao TY. 2019. Maize VIVIPAROUS1 interacts with ABA INSENSITIVE5 to regulate *GALACTINOL SYNTHASE2* expression controlling seed raffinose accumulation. *Journal of Agricultural and Food Chemistry*. 67(15):4214-4223. doi: 10.1021/acs.jafc.9b00322
- 59) Dirk LMA, **Downie AB**. 2018. An examination of Job's rule: Protection and repair of the proteins of the translational apparatus in seeds. *Seed Science Research*. 28(Special Issue 3: Seeds as Systems):168–181. doi: 10.1017/S0960258518000284

- 58) Dirk LMA, Majee M, Kumar S, **Downie AB**. 2018. PHYTOCHROME INTERACTING FACTOR1 interactions leading to the completion or prolongation of seed germination. *Plant Signaling and Behavior*. 13(10):e1525999 doi: 10.1080/15592324.2018.1525999
- 57) Majee M, Kumar S, Kathare PK, Wu S, Gingerich D, Nayak NR, Salaita L, Dinkins R, Martin K, Goodin M, Dirk LMA, Lloyd TD, Zhu L, Chappell J, Hunt AG, Vierstra R, Huq E, **Downie AB**. 2018. KELCH F-BOX protein positively influences seed germination by targeting PHYTOCHROME-INTERACTING FACTOR1. *Proceedings of the National Academy of Science, USA*. 115(17):E4120-E4129. doi: 10.1073/pnas.1711919115
- 56) Li T, Zhang Y, Wang D, Liu Y, Dirk LMA, Goodman J, **Downie AB**, Wang J, Wang G, Zhao TY. 2017. Regulation of seed vigor by manipulation of raffinose family oligosaccharides (RFOs) in maize and Arabidopsis. *Molecular Plant*. 10(12):1540-1555. doi: 10.1016/j.molp.2017.10.014
- 55) Majee M, Wu S, Salaita L, Gingerich D, Dirk LMA, Chappell J, Hunt AG, Vierstra R, **Downie AB**. 2017. A misannotated locus positively influencing Arabidopsis seed germination is deconvoluted using multiple methods, including surrogate splicing. *Plant Gene*. 10:74-85. doi: 10.1016/j.plgene.2017.05.012
- 54) Santos JF, Dirk LMA, **Downie AB**, Sanches MFG, Vieira RD. 2017. Reciprocal effect of parental lines on the physiological potential and seed composition of corn hybrid seeds. *Seed Science Research*. 27(3):206-216. doi: 10.1017/S0960258517000095
Science – Seed Science; Findings from São Paulo State University Broaden Understanding of Seed Science (Soluble sugars, storage proteins and reciprocal effect of parental lines of corn hybrid seeds.). *Agriculture Week*, Sep 21, 2017, p.106
- 53) Gu L, Zhang YM, Zhang MS, Li T, Dirk LMA, **Downie B**, Zhao TY. 2016. *ZmGOLS2*, a target of transcription factor *ZmDREB2A*, offers similar protection against abiotic stress as *ZmDREB2A*. *Plant Molecular Biology*. 90(1-2):157–170. doi: 10.1007/s11103-015-0403-1
- 52) Han QH, Li T, Zhang LF, Yan J, Dirk LMA, **Downie B**, Zhao TY. 2015. Functional analysis of the 5' regulatory region of the maize *ALKALINE ALPHA-GALACTOSIDASE1* gene. *Plant Molecular Biology Reporter*. 33:1361-1370. doi: 10.1007/s11105-014-0840-z
- 51) Barrero JM*, **Downie AB***, Xu Q, Gubler F. 2014. A role for barley CRYPTOCHROME1 in light regulation of grain dormancy and germination. *The Plant Cell*. 26(3):1094-1104. doi: 10.1105/tpc.113.121830. *Co-first authors. In this issue: Cryptochromes and seed dormancy: The molecular mechanism of blue light inhibition of grain germination. Nancy Hofmann. *The Plant Cell*. 2014. 26(3):846. doi: 10.1105/tpc.114.124727.
- 50) Kushwaha R, Schäfermeyer KR, **Downie AB**. 2014. A Protocol for phage display and affinity selection using recombinant protein baits. *Journal of Visualized Experiments*. 84:e50685. doi: 10.3791/50685
- 49) Petti C, Harman-Ware AE, Tateno M, Kushwaha R, Shearer A, **Downie AB**, Crocker M, DeBolt S. 2013. Sorghum mutant *RG* displays antithetic leaf shoot lignin accumulation resulting in improved stem saccharification properties. *Biotechnology for Biofuels*. 6(1):146. doi: 10.1186/1754-6834-6-146
- 48) Gu Lei, Han Z, Zhang L, **Downie B**, Zhao TY. 2013. Functional analysis of the 5' regulatory region of the maize *GALACTINOL SYNTHASE2* gene. *Plant Science*. 213:38–45. doi: 10.1016/j.plantsci.2013.09.002
- 47) Nayak NR, Putnam AA, Addepalli B, Lowenson JD, Chen T, Jankowsky E, Perry SE, Dinkins RD, Limbach PA, Clarke SG, **Downie AB**. 2013. An ATP dependent DEAD-box RNA-helicase loses activity upon isoAsp formation but is restored by PROTEIN ISOASPARTYL

- METHYLTRANSFERASE. *The Plant Cell*. 25(7):2573-2586. doi: 10.1105/tpc.113.113456
- 46) Kushwaha R, **Downie B**, Payne CM. 2013. Uses of phage display in Agriculture: Sequence analysis and comparative modeling of Late Embryogenesis Abundant client proteins suggests protein-nucleic acid binding functionality. *Computational and Mathematical Methods in Medicine*. (Special Issue on Phage Display Informatics). 2013:470390 doi: 10.1155/2013/470390
- 45) Kushwaha R, Payne CM, **Downie B**. 2013. Uses of phage display in Agriculture: A review of food-related protein-protein interactions discovered by biopanning over diverse baits. *Computational and Mathematical Methods in Medicine*. (Special Issue on Phage Display Informatics) 2013:653759 doi: 10.1155/2013/653759
- 44) Kushwaha R, Lloyd TD, Schäfermeyer KR, Kumar S, **Downie AB**. 2012. Identification of Late Embryogenesis Abundant (LEA) protein interactors using phage display. *International Journal of Molecular Sciences*. 13(6):6582-6603. doi: 10.3390/ijms13066582
- 43) Nosarzewski M, **Downie AB**, Wu B, Archbold DD. 2012. The role of SORBITOL DEHYDROGENASE in *Arabidopsis thaliana*. *Functional Plant Biology*. 39(6):462-470. doi: 10.1071/FP12008
- 42) Mendu V, Griffiths JS, Persson S, Stork J, **Downie AB**, Voiniciuc C, Haughn GW, DeBolt S. 2011. Subfunctionalization of cellulose synthases in seed coat epidermal cells mediates secondary radial wall synthesis and mucilage attachment. *Plant Physiology*. 157(1):441-453. doi: 10.1104/pp.111.179069
- 41) Wu X, Liu M, **Downie B**, Liang C, Ji G, Li QQ, Hunt AG. 2011. Genome-wide landscape of polyadenylation in *Arabidopsis* provides evidence for extensive alternative polyadenylation. *Proceedings of the National Academy of Science, USA*. 108(30):12533-12538. doi: 10.1073/pnas.1019732108
- 40) Chen T, Nayak N, Majee SM, Lowenson J, Schäfermeyer KR, Eliopoulos AC, Lloyd TD, Dinkins R, Perry SE, Forsthoefel NR, Clarke SG, Vernon DM, Zhou ZS, Rejtar T, **Downie AB**. 2010. Substrates of the *Arabidopsis thaliana* PROTEIN ISOASPARTYL METHYLTRANSFERASE 1 identified using phage display and biopanning. *Journal of Biological Chemistry*. 285(48):37281-37292. doi: 10.1074/jbc.M110.157008
- 39) Chanda B, Venugopal SC, Kulshrestha S, Navarre DA, **Downie B**, Vaillancourt L, Kachroo A, Kachroo P. 2008. Glycerol-3-phosphate levels are associated with basal resistance to the hemibiotrophic fungus *Colletotrichum higginsianum* in *Arabidopsis*. *Plant Physiology*. 147(4):2017-2029. doi: 10.1104/pp.108.121335
- 38) Shen H, Zhu L, Castillon A, Majee M, **Downie B**, Huq E. 2008. Light-induced phosphorylation and degradation of the negative regulator PIF1 depends upon its direct physical interactions with photoactivated phytochromes. *The Plant Cell*. 20(6):1586-1602. doi: 10.1105/tpc.108.060020
- 37) Dinkins RD, Majee SM, Nayak NR, Martin D, Xu Q, Belcastro MP, Houtz RL, Beach CM, **Downie AB**. 2008. Changing transcriptional initiation sites and alternative 5'- and 3'-splice site selection of the first intron deploys *Arabidopsis* PROTEIN ISOASPARTYL METHYLTRANSFERASE2 variants to different subcellular compartments. *The Plant Journal*. 55(1):1-13. doi: 10.1111/j.1365-313X.2008.03471.x
- 36) Villa ST, Xu Q, **Downie AB**, Clarke SG. 2006. *Arabidopsis* protein repair L-isoaspartyl methyltransferases: Predominant activities at lethal temperatures. *Physiologia Plantarum*. 128(4):581-592. doi: 10.1111/j.1399-3054.2006.00772.x
- 35) Zhao TY, Corum III JW, Meeley RB, Mullen JT, Helentjaris T, Martin D, **Downie B**. 2006. An *ALKALINE α -GALACTOSIDASE* transcript is present in maize seeds and cultured embryo cells,

- and accumulates during stress. *Seed Science Research*. 16(2):107-121. doi: 10.1079/SSR2006243
- 34) Salaita L, Kar RK, Majee M, **Downie AB**. 2005. Identification and characterization of mutants capable of rapid seed germination at 10°C from activation-tagged lines of *Arabidopsis thaliana*. *Journal of Experimental Botany*. 56(418):2059-2069. doi: 10.1093/jxb/eri204
- 33) Xu Q, Zhang D, **Downie B**. 2005. Rapid and efficient subcloning of DNA without dephosphorylation or gel electrophoresis. *Molecular Biotechnology*. 29(2):111-118. doi: 10.1385/MB:29:2:111
- 32) Xu Q, Belcastro MP, Dolan (nee Villa) ST, Dinkins RD, Clarke SG, **Downie AB**. 2004. A second protein L-isoaspartyl methyltransferase gene in *Arabidopsis* produces two transcripts whose products are sequestered in the nucleus. *Plant Physiology*. 136(1):2652-2664. doi: 10.1104/pp.104.046094
- 31) Zhao TY, Martin D, Meeley RB, **Downie B**. 2004. Expression of the maize *GALACTINOL SYNTHASE* gene family: II) Kernel abscission, environmental stress and *myo*-inositol influences transcript accumulation in developing seeds and callus cells. *Physiologia Plantarum*. 121(4):647-655. doi: 10.1111/j.1399-3054.2004.00368.x
- 30) Zhao TY, Thacker RR, Corum III JW, Snyder JC, Meeley RB, Obendorf RL, **Downie B**. 2004. Expression of the maize *GALACTINOL SYNTHASE* gene family: I) Expression of two different genes during seed development and germination. *Physiologia Plantarum*. 121(4):634-646. doi: 10.1111/j.1399-3054.2004.00367.x
- 29) Nosarszewski M, Clements AM, **Downie AB**, Archbold DD. 2004. Sorbitol dehydrogenase expression and activity during apple fruit set and early development. *Physiologia Plantarum*. 121(3):391-398. doi: 10.1111/j.1399-3054.2004.00344.x
- 28) Wang H, Caruso LV, **Downie AB**, Perry SE. 2004. The embryo MADS-domain protein AGL15 directly regulates expression of a gene encoding an enzyme involved in gibberellin metabolism. *The Plant Cell*. 16(5):1206-1219. doi: 10.1105/tpc.021261
- 27) **Downie AB**, Dirk LMA, Xu Q, Drake J, Zhang D, Dutt M, Levy A, Butterfield DA, Geneve RL, Corum III JW, Lindstrom KG, Snyder JC. 2004. A physical, enzymatic, and genetic characterization of perturbations in the *brownseed* mutants of tomato. *Journal of Experimental Botany*. 55(399):961-973. doi: 10.1093/jxb/erh112
- 26) Siriwitayawan G, Geneve RL, **Downie AB**. 2003. Seed germination of ethylene perception mutants of tomato and *Arabidopsis*. *Seed Science Research*. 13(4):303-314. doi: 10.1079/SSR2003147
- 25) **Downie B**, Zhang D, Dirk LMA, Thacker RR, Pfeiffer J, Drake J, Levy A, Butterfield DA, Buxton JW, Snyder JC. 2003. Communication between the maternal testa and the embryo and/or endosperm affect testa attributes in tomato. *Plant Physiology*. 133(1):145-160. doi: 10.1104/pp.103.022632
- 24) Bradford KJ, **Downie AB**, Gee OH, Alvarado VY, Yang H, Dahal P. 2003. Abscisic acid and gibberellin differentially regulate expression of genes of the *SNF1-related Kinase (SnRK1)* complex in tomato seeds. *Plant Physiology*. 132(3):1560-1576. doi: 10.1104/pp.102.019141
- 23) Zhao TY, Meeley RB, **Downie B**. 2003. Aberrant processing of a Maize *GALACTINOL SYNTHASE* transcript is caused by heat stress. *Plant Science*. 165(1):245-256. doi: 10.1016/S0168-9452(03)00168-7
- 22) **Downie B**, Gurusinge S, Dahal P, Thacker RR, Snyder JC, Nonogaki H, Yim K, Fukanaga K, Alvarado V, Bradford KJ. 2003. Expression of a *GALACTINOL SYNTHASE* gene in tomato seeds is upregulated prior to maturation desiccation and again following imbibition whenever

radicle protrusion is prevented. *Plant Physiology* 131(3):1347-1359. doi: 10.1104/pp.016386
21) Siriwitayawan G, **Downie AB**, Geneve RL. 2003. Ethylene evolution is positively correlated with seed vigor in sweet corn and tomato seed lots with differing vigor levels but similar germination capacity. *Journal of the American Society for Horticultural Science*. 128(4):608-614. doi: 10.21273/JASHS.128.4.0608

WEBSITES

http://www.uky.edu/hort/LEAPin_overview and <http://www.seedsleuths.com/>

TEACHING

PLS 622, Plant Physiology: (Development and Anatomy). Fall semester (1999 to present). I am responsible for 1/4 of the course.

PLS 657, Seed Biology. Spring semester (every odd year; 2001) (2003; 2017; 2019 cancelled). Team taught; I am the course coordinator and responsible for teaching 1/3 of the course.

ABT 301, Writing & Presentations for the Life Sciences. Spring semester (2015 to 2017); Fall semester (2018 to present).