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Education

Ph.D. 2003. Floriculture & Ornamental Horticulture/ Plant Molecular Biology/Plant Breeding. Cornell University, Ithaca, NY
M.S. 1989. Ornamental Botany. Huazhong Agricultural University, China
B.S. 1986. Forest Science. Huazhong Agricultural University, China

Research Interest

- Synthetic biology or Biology by Design
- Genomics and proteomics of CAM (Crassulacean Acid Metabolism) plants
- Discovery of small signaling and secretory proteins
- Comparative and evolutionary genomics
- Genome-wide prediction of protein-protein interactions
- ncRNAs in plants

Professional Experiences

2014 - present	Joint faculty, Graduate School of Genome Science and Technology (GST), University of Tennessee, Knoxville
2012 - present	Joint faculty, Department of Biochemistry & Cellular and Molecular Biology, University of Tennessee, Knoxville
8/2008 - present	Staff Scientist, Biosciences Division, Oak Ridge National Laboratory.
8/2006 - 8/2008	Postdoctoral Research Scientist, Oak Ridge National Laboratory.
3/2006 - 8/2006	Research Associate II, Department of Plant Sciences, University of Tennessee.
5/2005 - 3/2006	Postdoctoral Research Associate, Department of Plant Sciences, University of Tennessee.
11/2002 - 5/2005	Postdoctoral Fellow, Department of Horticulture, Cornell University.
8/1997 - 8/2002	Graduate Research Assistant, Department of Horticulture, Cornell University.
6/1989 - 7/1997	Research Assistant and Assistant Research Scientist, Department of Ornamental Horticulture, Institute of Vegetables and Flowers, Chinese Academy of Agricultural Sciences, Beijing, China.

Honors and Awards

2008 Distinguished Achievement Award for Post-Graduate Research in Environmental Science (In recognition of outstanding early career productivity, ability to collaborate effectively in a team setting, and ability to integrate bioinformatics and molecular biology to gain novel insights into evolutionary genomics).

2000 Liu Memorial Award in recognition of his excellent progress and high potential for a successful academic career.

1995 Israeli Foreign Ministry Fellowship for training at the Volcani Center.

Other Professional Activities

US National Science Foundation (NSF) review panel. Reviewer for USDA National Research Initiative Competitive Grants Program.

Reviewer for BMC Bioinformatics, BMC Biotechnology, Critical Reviews in Plant Sciences, Environmental Management, International Journal of Plant Genomics, Journal of Experimental Botany, Journal of Plant Biotechnology, Journal of Proteomic Research, New Phytologist, Phyiologia Plantarum, Planta, Plant Methods, Plos Computational Biology.

Organizer of the 34th New Phytologist Symposium: Systems biology and ecology of CAM plants. Tahoe City, CA, USA, 15–18 July 2014. (http://www.newphytologist.org/symposiums/view/5)

Leader of the ORNL CAM Biodesign Program, a key component of the $14.3 million multi-institutional DOE project to engineer crassulacean acid metabolism (CAM) into C_3 plants to enhance water-use efficiency for sustainable biofuels production on marginal land.

Teaching experience

Yang, X. Phylogenetics: Concepts and Applications, guest lectures for Advanced Experimental Techniques I (BCMB515), Dept. of Biochemistry & Cellular & Molecular Biology, University of Tennessee.

Yang, X. Homolog identification in *Populus*; phylogenetics, ortholog and primer design. BESC *Populus* workshop. Hosted by Gunter, L., Yang, X., Kalluri, U.C., and Tuskan, G.A., Feb 20, 2008. Townsend, TN.

Cheng, Z.-M. and Yang, X. Advanced Plant Genomics, Dept. of Plant Sciences, University of Tennessee. 2006 Spring semester.

Invention Disclosure

Nine Invention Disclosures for genes impacting cell wall biosynthesis and biomass recalcitrance in *Populus* (ORNL Invention Disclosure #: 201102698, 201102699, 20110270, 20110271, 20110272, 20110273, 20110275, 20110276, 2011027).

TNT Digestion-Ligation Buffer Formulation (ORNL Invention Disclosure 201403356, DOE S-124,977).

TNT-cloning System (ORNL Invention Disclosure 201403357, DOE S-124,978).

Publications (*Corresponding author)

Myburg AA *et al*. 2014. The genome of *Eucalyptus grandis*. Nature 509: 356-362.

Kalluri U, Yin H, Yang X, Davison B. 2014. Systems and synthetic biology approaches to alter plant cell walls and reduce biomass recalcitrance. *Plant Biotechnology Journal* (In press).

Yin HF, Chen CJ, Yang J, Weston DJ, Chen JG, Muchero W, Ye N, Tschaplinski TJ, Wullschleger SD, Cheng ZM, Tuskan GA, Yang X*. 2014. Functional genomics of drought tolerance in bioenergy crops. Critical Reviews in Plant Sciences 33: 205-224.

DePaoli HC, Borland AM, Tuskan GA, Cushman JC, Yang X*. 2014. Synthetic biology as it relates to CAM photosynthesis: challenges and opportunities. Journal of Experimental Botany 65(13): 3381-3393.

Borland AM, Hartwell J, Weston DJ, Schlauch KA, Tschaplinski TJ, Tuskan GA, Yang X, Cushman JC. 2014. Engineering crassulacean acid metabolism to improve water-use efficiency. Trends Plant Sci 19: 327-338.

Szoevenyi P, Devos N, Weston DJ, Yang X, Hock Z, Shaw JA, Shimizu KK, McDaniel SF, Wagner A. 2014. Efficient purging of deleterious mutations in plants with haploid selfing. Genome Biology and Evolution 6(5): 1238-1252.

Borland AM, Wullschleger SD, Hartwell J, Tuskan GA, Yang X, Cushman JC. 2014. Engineering of Crassulacean acid metabolism into trees for climate-resilient agroforestry. Plant Cell and Environment (Provisionally accepted with minor revision)

Borland AM, Yang X. 2013. Informing the improvement and biodesign of crassulacean acid metabolism via system dynamics modelling. New Phytologist 200(4): 946-949.

Ye C-Y, Li T, Yin H, Weston DJ, Tuskan GA, Tschaplinski TJ, Yang X*. 2013. Evolutionary analyses of non-family genes in plants. Plant Journal 73: 788-97.

Ye C-Y, Yang X, Xia X, Yin W 2013 Comparative analysis of cation/proton antiporter superfamily in plants. Gene 521:245–251.

Chen S, Huang X, Yan X, Liang Y, Wang Y, Li X, Peng X, Ma X, Zhang L, Cai Y, Ma T, Cheng L, Qi D, Zheng H, Yang X, Liu G. 2013. Transcriptome analysis in sheepgrass (*Leymus chinensis*): A dominant perennial grass of the Eurasian Steppe. PLoS One 8(7): e67974

Karve AA, Jawdy SS, Gunter LE, Allen SM, Yang X, Tuskan GA, Wullschleger SD, Weston DJ. 2012. Initial characterization of shade avoidance response suggests functional diversity between Populus phytochrome B genes. *New Phytol* 196(3): 726-737.

Bennetzen JL, Schmutz J, Wang H, Percifield R, Hawkins J, Pontaroli AC, Estep M, Feng L, Vaughn JN, Grimwood J, Jenkins J, Barry K, Lindquist E, Hellsten U, Deshpande S, Wang X, Wu X, Mitros T, Triplett J, Yang X, Ye CY, Mauro-Herrera M, Wang L, Li P, Sharma M, Sharma R, Ronald PC, Panaud O, Kellogg EA, Brutnell TP, Doust AN, Tuskan GA, Rokhsar D, Devos KM. 2012. Reference genome sequence of the model plant *Setaria*. Nat Biotechnol 30(6): 555-561.

Yang X*, Tschaplinski TJ, Hurst GB, Jawdy S, Abraham PE, Lankford PK, Adams RM, Shah MB, Hettich RL, Lindquist E, Kalluri UC, Gunter LE, Pennacchio C, Tuskan GA. 2011. Discovery and annotation of small proteins using genomics, proteomics, and computational approaches. *Genome Research* 21(4): 634-641.

Yang X*, Ye C-Y, Bisaria A, Tuskan GA, Kalluri UC. 2011. Identification of candidate genes in *Populus* cell wall biosynthesis using text-mining, co-expression network and comparative genomics. *Plant Science* 181: 675– 687.

Yang X*, Ye C-Y, Cheng Z-M, Tschaplinski TJ, Wullschleger SD, Yin W, Xia X, Tuskan GA. 2011. Genomic aspects of research involving polyploid plants. *Plant Cell, Tissue and Organ Culture* 104: 387–397.

Ye C-Y, Li T, Tuskan GA, Tschaplinski TJ, Yang X*. 2011. Comparative analysis of GT14/GT14-like gene family in *Arabidopsis*, *Oryza*, *Populus*, *Sorghum* and *Vitis*. *Plant Science* 181: 688– 695.

Weston DJ, Karve AA, Gunter LE, Jawdy SS, Yang X, Allen SM, Wullschleger SD. 2011. Comparative physiology and transcriptional networks underlying the heat shock response in Populus trichocarpa, Arabidopsis thaliana and Glycine max. *Plant Cell Environ* 34(9): 1488-1506.

Cai B, Yang X, Tuskan GA, Cheng ZM. 2011. MicroSyn: a user friendly tool for detection of microsynteny in a gene family. *BMC Bioinformatics* 12: 79.

Guo J, Yang X, Weston DJ, Chen JG. 2011. Abscisic Acid receptors: past, present and future. *J Integr Plant Biol* 53(6): 469-479.

Guo J, Jin Z, Yang X, Li JF, Chen JG. 2011. Eukaryotic initiation factor 6, an evolutionarily conserved regulator of ribosome biogenesis and protein translation. Plant Signal Behav 6(5): 766-771.

Yang X*, Li T, Weston D, Karve A, Labbe JL, Gunter LE, Sukumar P, Borland A, Chen J-G, Wullschleger SD, Tschaplinski TJ, Tuskan GA. 2011. Innovative biological solutions to challenges in sustainable biofuels production. In Biofuel Production-Recent Developments and Prospects, (ed. MADS Bernardes), pp. 375-414. Intech, Rijeka.

DiFazio SP, Yang X, Tuskan GA. 2011. The *Populus* Genome Sequence. In *Genetics, Genomics and Breeding of Poplar*, (ed. CP Joshi, SP DiFazio, C Kole). Science Publishers, Enfield, New Hampshire.

Tyler L, Bragg JN, Wu J, Yang X, Tuskan GA, Vogel JP. 2010. Annotation and comparative analysis of the glycoside hydrolase genes in *Brachypodium distachyon*. *BMC Genomics* 11: 600.

Vogel JP, Garvin DF, Mockler TC, Schmutz J, Rokhsar D, Bevan MW, Barry K, Lucas S, Harmon-Smith M, Lail K, …, Yang X, Kalluri UC, Tuskan GA et al. 2010. Genome sequencing and analysis of the model grass *Brachypodium distachyon*. *Nature* 463(7282): 763-768.

Ranjan P, Yin T, Zhang X, Kalluri U, Yang X, Jawdy S, Tuskan G. 2009. Bioinformatics-based identification of candidate genes from QTLs associated with cell wall traits in *Populus*. *BioEnergy Research* DOI 10.1007/s12155-009-9060-z: 1-11.

Xu Z, Zhang D, Hu J, Zhou X, Ye X, Reichel KL, Stewart NR, Syrenne RD, Yang X, Gao P, Shi W, Doeppke C, Sykes RW, Burris JN, Bozell JJ, Cheng MZ, Hayes DG, Labbe N, Davis M, Stewart CN, Jr., Yuan JS. 2009. Comparative genome analysis of lignin biosynthesis gene families across the plant kingdom. *BMC Bioinformatics* 10 Suppl 11: S3.

Yang X*, Kalluri UC, DiFazio SP, Wullschleger SD, Tschaplinski TJ, Cheng ZM, Tuskan GA. 2009. Poplar genomics: State of the science. *Crit Rev Plant Sci* 28(5): 285-308.

Yang X, Jawdy S, Tschaplinski TJ, Tuskan GA. 2009. Genome-wide identification of lineage-specific genes in *Arabidopsis*, *Oryza* and *Populus*. *Genomics* 93(5): 473-480.

Osburn LD, Yang X, Li Y, Cheng ZM. 2009. Micropropagation of Japanese honeysuckle (*Lonicera japonica*) and Amur honeysuckle (*L. maackii*) by shoot tip culture. J Environ Hort 27(4): 195-199.

Yang X, Kalluri UC, Jawdy S, Gunter LE, Yin TM, Tschaplinski TJ, Weston DJ, Ranjan P, Tuskan GA. 2008. The F-box gene family is expanded in herbaceous annual plants relative to woody perennial plants. *Plant Physiology* 148(3): 1189-1200.

Yuan, J.S., Yang, X., Lai, J., Lin, H., Cheng, Z.-M., Nonogaki, H., and Chen, F. (2007). The endo-beta-mannanase gene families in Arabidopsis, rice, and poplar. Funct Integr Genomics 7: 1-16.

Yang, X., Tuskan, G.A., and Cheng, Z.-M. (2006). Divergence of the Dof gene families in poplar, Arabidopsis, and rice suggests multiple modes of gene evolution after duplication. Plant Physiol 142: 820-830.

Yang, X., Scheffler, B.E., and Weston, L.A. (2006). Recent developments in primer design for DNA polymorphism and mRNA profiling in higher plants. Plant Methods 2: 4.

Yang, X., Scheffler, B.E., and Weston, L.A. (2004). *SOR1*, a gene associated with bioherbicide production in sorghum root hairs. J Exp Bot 55: 2251-2259.

Yang, X., Owens, T.G., Scheffler, B.E., and Weston, L.A. (2004). Manipulation of root hair development and sorgoleone production in sorghum seedlings. J Chem Ecol 30: 199-213.

Bertin, C., Yang, X., and Weston, L.A. (2003). The role of root exudates and allelochemicals in the rhizosphere. Plant and Soil 256: 67-83.

Hagiladi, A., Umiel, N., and Yang, X. (1997) *Curcuma alismatifolia*. II. Effects of temperature and daylength on the development of flowers and propagules. Acta Horticulturae 430: 755-761

Hagiladi, A., Umiel, N., Yang, X., and Gilad, Z. (1997) *Curcuma alismatifolia*. I. Plant morphology and the effect of tuberous root number on flowering date and yield of inflorescences. Acta Horticulturae 430: 747-753

Jin, B., Dong, H., and Yang, X. (1995) Shortening hybridization breeding cycle of rose - a study on mechanisms controlling achene dormancy. Acta Horticulturae 404: 40-47

Jin, B., Dong, H., Mu, D., Yang, X., Wang, Y., and Xu, X. (1992) Studies on the mechanism of action of B9 in reducing stem elongation of chrysanthemum. Acta Horticulturae Sinica 19: 171-174

Jin, B., Dong, H., and Yang, X. (1993) Influence of gaseous environment and light on growth of tissue-cultured carnation plants. Acta Horticulturae Sinica 20: 389-393

Mu, D., Jin, B., and Yang, X. (1992) Studies on the effect of IBA and nutrient- mist on the rooting of chrysanthemum cuttings. Acta Horticulturae Sinica 19: 89-90

Mu, D., Yang, X., and Zhang, Y. (1997) The proportional fertilization in pot *Cordyline fruticosa* and *Rosa chinensis*. Acta Horticulturae Sinica 24: 71-74

Yang, X., Jin, B., Zhang, Y., Mu, D., and Tang, X. (1995) Enhancement of direct shoot regeneration from internode segments of chrysanthemum by silver nitrate. Acta Horticulturae 404: 68-73

Yang, X., and Hu, W. (1990) Studies on the removal of seed dormancy in *Magnolia denudata* Desr. Journal of Chinese Landscape Architecture 6: 49-51

Yang, X., Hu, W., and Sun, X. (1991) Changes in biomacromolecules in *Magnolia denudata* seed during dormancy breaking. Acta Horticulturae Sinica 18: 75-80

Yang, X., and Jin, B. (1994) The Camellias. China Agricultural Scientech Press, Beijing