Wellington Muchero, Ph.D
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Education:

B.Sc Crop Science, Cum Laude, California Polytechnic State University, Pomona (2000-2003)
Ph.D Plant Pathology, University of California, Riverside (2003-2007)

Professional appointments:

Joint Faculty: Oak Ridge Institute (June 2020 – Present)
Joint Faculty: Bredesen Center for Interdisciplinary Research (January 2017 - Present)
Joint Faculty: Plant Sciences Dept., University of Tennessee, Knoxville (May 2015 - Present)
Plant Molecular Biologist: Oak Ridge National Laboratory (October 2010 - Present)
Postdoctoral Scholar: University of California, Riverside (February 2008 - September 2010)

Graduate Students:

1. Cai John (Ph.D candidate), Bredesen Center, UT-Knoxville, **Current** (Supervisor)
2. Sara Love (Ph.D candidate), Depart. of Ent. and Plant Path., UT-Knoxville **Current** (Thesis committee)
3. Timothy Yates (Ph.D), Bredesen Center, UT-Knoxville, **Former** (Supervisor)
4. Jiali Yu (Ph.D), Depart. of Ent. and Plant Path., UT-Knoxville **Former** (Thesis committee)
5. Carissa Bleker (Ph.D), Bredesen Center, UT-Knoxville, **Former** (Thesis committee)
6. Piet Jones (Ph.D), Bredesen Center, UT-Knoxville, **Former** (Thesis committee)
7. Jessica Velez (Ph.D), Bredesen Center, UT-Knoxville, **Former** (Thesis committee)
8. Deborah Weighill (Ph.D), Bredesen Center, UT-Knoxville, **Former** (Thesis committee)
9. Juan RF. Coronado (MS degree), North Dakota State University, **Former** (Thesis committee)
10. Roba Bdeir (Ph.D) Michigan Technological University **Former** (Technical Adviser)

Post-Doctoral Scholars (since 2012)

Mengjun Shu	Current	Bioinformatics
Raphael Ployet	Current	Cell Wall Chemistry
Biruk Feyissa	Current	Transcriptional Regulation
Amith Devireddy	Current	Plant Stress Physiology
Debjani Pal	Current	Human Cell Immune Modulation
Kai Feng	Former	Bioinformatics/High Performance Computing
Kuntal De	Current	Plant/Human Cell Immune Modulation
Tao Yao	Current	Plant Molecular Genetics
Yali Sun	Former	Plant Microbe Interactions
Zhenzhen Qiao	Former	Plant Microbe Interactions
Anthony C. Bryan	Former	Plant Molecular Genetics
Carly M. Shanks	Former	Plant Molecular Genetics

Meng Xie	Former	Plant Molecular Genetics
Jin Zhang	Former	Bioinformatics/Plant Molecular Genetics

Active external funding:

Co-PI: DOE, 2020 – 2023 ($9.0M): SEED Biosecurity SFA.
Co-PI: DOE, 2020 – 2021 ($1.0M): Bioscales Initiative.
Co-PI: DOE, 2019 – 2022 ($2.5M): Combining genome-wide association studies and expression quantitative trait nucleotide mapping with molecular and genetic validations to identify transcriptional networks regulating drought tolerance in *Populus.*
Co-PI: DOE, **2019 - 2022 ($21.2M):** Plant Microbe Interfaces (PMI).
Co-PI: DOE/USDA Feedstocks Genomics, 2018 - 2021 ($1.2M): Towards durable resistance to *Septoria* stem canker and leaf spot: a molecular understanding of resistance.
Co-PI: DOE, 2018 - 2023 ($125M): Center for Bioenergy Innovation.
PI: DOE Early Career Award, 2017 - 2021 ($2.5M): Host genetic features mediating symbiotic Interactions in *Salix spp*.
Co-PI: NSF PGRP, 2017 - 2021 ($4.0M): Analysis of genes affecting plant regeneration and transformation in poplar.

Intellectual property:

Patents:

1. **Muchero W**, Shanks CM, Pal D, De K, inventors; UT Battelle LLC, assignee. Methods for immunoregulation by modulating plasminogen-apple-nematode (pan) domain-containing proteins. United States patent application US 17/012,139. 2021 Mar 11.

2. **Muchero W**, Chen J, Gunter LE, Jawdy S, Tuskan GA, Bryan AC, Difazio S, Guo HB, inventors. Transcription Factor Which Regulates Flavonoid, Phenylpropanoid, Tyrosine, and Tryptophan Pathways. United States patent US 20,150,353,948. 2015 Dec 10.

3. Chen J, Gunter LE, Jawdy S, **Muchero W**, Tuskan G, Guo J, Ranjan P, DiFazio SP, Bryan AC, inventors; UT-BATTELLE, LLC, assignee. KEY GENE REGULATING PLANT CELL WALL RECALCITRANCE. United States patent US 20,160,053,275. 2016 Feb 25.

4. Labbe LL, **Muchero W**, Hamilton CE, Pelletier DA, inventors; UT-Battelle LLC, assignee. Complex of mutualistic microbes designed to increase plant productivity. United States patent US 10,660,340. 2020 May 26.

5. **Muchero W**, Tuskan G, Chen JG, Gunter LE, inventors; UT-Battelle LLC, assignee. Methods for improving callus formation and regeneration in plants. United States patent application US 16/525,724. 2020 Jan 30.

6. **Muchero W**, Labbe JL, Gunter LE, Chen JG, Jawdy SS, Yang X, Tuskan GA, Wang J, Czarnecki O, Ranjan P, inventors; US Department of Energy, assignee. Methods of improving

mycorrhization in plants and genetically modifed plants with improved mycorrhization. United States patent application US 16/520,967. 2020 Jan 30.

7. **Muchero W**, Chen J, Tuskan GA, Leboldus J, inventors; Oregon State University, UT-Battelle LLC, assignee. Methods of identifying and modulating pathogen resistance in plants. United States patent application US 16/148,319. 2019 Jun 27.

8. Chen J**, Muchero W**, Tuskan GA, Bryan AC, inventors; UT-Battelle LLC, assignee. Methods of controlling vegetative growth and flowering times by modulating phosphoenolpyruvate shunt between shikimate and glycolysis pathways. United States patent application US 16/183,074. 2019 May 9.

9. Jessy LL, **Muchero W**, Tschaplinski TJ, Entler MR, Inventors, Filamentous fungi capable of producing very long chain fatty acids. US Patent App. 16/381,521, 2020.

Selected publications:

1. Pal D, De K, Shanks CM, Feng K, Yates TB, Morrell-Falvey J, Davidson RB, Parks JM, **Muchero W** (2022). Core cysteine residues in the PAN domain are critical for HGF/c-MET signaling. **Communication Biology, *in press***.

2. Badré A, Zhang L, **Muchero W**, Reynolds JC, Pan C **(2021)**. Deep neural network improves the estimation of polygenic risk scores for breast cancer. ***Journal of Human Genetics***:359-69.

3. Yates TB, Feng K, Zhang J, Singan V, Jawdy SS, Ranjan P, Abraham PE, Barry K, Lipzen A, Pan C, Schmutz J…**Muchero W (2021)**. The ancient Salicoid genome duplication event: A platform for reconstruction of de Novo gene evolution in Populus trichocarpa. ***Genome Biology and Evolution*** 13(9):evab198.

4. Qiao Z, Yates TB, Shrestha HK, Engle NL, Flanagan A, Morrell-Falvey JL, Sun Y, Tschaplinski TJ, Abraham PE, Labbé J, Wang ZY...**Muchero W***, **Chen J-G* (2021)**. Towards engineering ectomycorrhization into switchgrass bioenergy crops via a lectin receptor-like kinase. ***Plant Biotechnology Journal***. doi.org/10.1111/pbi.13671.

5. Xie M, Zhang J, Yao T, Bryan AC, Pu Y, Labbé J, Pelletier DA, Engle N, Morrell-Falvey JL, Schmutz J, Ragauskas AJ…**Muchero W***, Chen J-G* **(2020).** Arabidopsis C-terminal binding protein ANGUSTIFOLIA modulates transcriptional co-regulation of MYB46 and WRKY33. ***New Phytologist***. doi.org/10.1111/nph.16826.

6. Zhang J, Xie M, Li M, Ding J, Pu Y, Bryan AC, Rottmann W, Winkeler KA, Collins CM, Singan V, Lindquist EA…**Muchero W***, Chen J-G* **(2020)**. Overexpression of a Prefoldin β subunit gene reduces biomass recalcitrance in the bioenergy crop Populus. ***Plant Biotechnology Journal*** 18:859-71.

7. Xie M, Zhang J, Singan VR, McGranahan MJ, LaFayette PR, Jawdy SS, Engle N, Doeppke C, Tschaplinski TJ, Davis MF, Lindquist E...**Muchero W*. (2020).** Identification of functional single nucleotide polymorphism of *Populus trichocarpa* PtrEPSP-TF and determination of its transcriptional effect. ***Plant Direct*** 4:e00178.

8. Blumstein M, Richardson A, Weston D, Zhang J, **Muchero W**, Hopkins R **(2020)**. A New Perspective on Ecological Prediction Reveals Limits to Climate Adaptation in a Temperate Tree Species. ***Current Biology*** 30: 1447-1453.

9. Labbé J*, **Muchero W***, Czarnecki O, Wang J, Wang X, Bryan AC, Zheng K, Yang Y, Xie M, Zhang J, Wang D. **(2019)** Mediation of plant–mycorrhizal interaction by a lectin receptor-like kinase. ***Nature Plants*** 5:676-80.

10. Muchero W, Sondreli KL, Chen JG, Urbanowicz BR, Zhang J, Singan V, Yang Y, Brueggeman RS, Franco-Coronado J, Abraham N, Yang JY. **(2018)** Association mapping, transcriptomics, and transient expression identify candidate genes mediating plant–pathogen interactions in a tree. ***Proceedings of the National Academy of Sciences*** 115:11573-8.

11. Xie M*, **Muchero W*** (*co-1ST author and Corresponding author*), Bryan AC, Yee KL, Guo HB, Zhang J, Tschaplinski T, Singan VR, Lindquist E, Payyavula RS, Barros-Rios J et al. **(2018)**. A 5-enolpyruvylshikimate 3-phosphate synthase functions as a transcriptional repressor in *Populus*. ***The Plant Cell*** tpc-00168.

12. Zhang J, Yang Y, Zheng K, Xie M, Feng K, Jawdy SS, Gunter LE, Ranjan P, Singan VR, Engle N, Lindquist E…**Muchero W***. **(2018)** Genome-wide association studies and expression-based quantitative trait loci analyses reveal roles of HCT 2 in caffeoylquinic acid biosynthesis and its regulation by defense-responsive transcription factors in *Populus.* ***New Phytologist*** Doi.org/10.1111/nph.15297**.**

13. Bryan AC, Zhang J, Guo J, Ranjan P, Singan V, Barry K, Schmutz J, Weighill D, Jacobson D, Jawdy S, Tuskan GA…**Muchero W***. **(2018)** A variable polyglutamine repeat affects subcellular localization and regulatory activity of a Populus ANGUSTIFOLIA protein. ***G3: Genes, Genomes, Genetics*** 8:G3-200188.

14. Lang D, Ullrich KK, Murat F, Fuchs J, Jenkins J, Haas FB, Piednoel M, Gundlach H, Van Bel M, Meyberg R, Vives C…**Muchero W**…Rensing SA. **(2018)**. The *Physcomitrella patens* chromosome-scale assembly reveals moss genome structure and evolution. ***The Plant Journal*** 93: 515-33.

15. Yang X, Hu R, Yin H, Jenkins J, Shu S, Tang H, Liu D, Weighill DA, Yim WC, Ha J, Heyduk K…**Muchero W**…Tuskan GA. **(2017)**. The Kalanchoë genome provides insights into convergent evolution and building blocks of crassulacean acid metabolism. ***Nature communications*** 8: 1899.

16. Meng X, Pu Y, Yoo CG, Li M, Bali G, Park DY, Gjersing E, Davis MF, **Muchero W**, Tuskan GA, Tschaplinski TJ (**2017**) An In-Depth Understanding of Biomass Recalcitrance Using Natural Poplar Variants as the Feedstock. ***ChemSusChem*** 10: 139-50.

17. Bryan AC, Jawdy S, Gunter L, Gjersing E., Sykes R, Hinchee MA, Winkeler KA, Collins CM, Engle N, Tschaplinski .J, Yang X, Tuskan GA, **Muchero W***., Chen JG*. **(2016)**. Knockdown of a laccase in *Populus deltoides* confers altered cell wall chemistry and increased sugar release. ***Plant biotechnology Journal*** 14: 2010-2020.

18. Stevenson SR, Kamisugi Y, Trinh CH, Schmutz J, Jenkins JW, Grimwood J, **Muchero W**, Tuskan GA, Rensing SA, Lang D, Reski R. **(2016)**. Genetic analysis of *Physcomitrella patens* identifies ABSCISIC ACID NON-RESPONSIVE (ANR), a regulator of ABA responses unique to basal land plants and required for desiccation tolerance. ***The Plant Cell***, pp.tpc-00091.

19. Bhagia S, **Muchero W**, Kumar R, Tuskan GA, Wyman CE. **(2016)**. Natural genetic variability reduces recalcitrance in poplar. ***Biotechnology for biofuels*** 9: 1.

20. Yang Y, Labbé J, **Muchero W**, Yang X, Jawdy SS, Kennedy M, Johnson J, Sreedasyam A, Schmutz J, Tuskan GA, Chen JG. **(2016)**. Genome-wide analysis of lectin receptor-like kinases in *Populus*. ***BMC genomics*** 17: 699.

21. Zheng K, Wang X, Weighill DA, Guo HB, Xie M, Yang Y, Yang J, Wang S, Jacobson DA, Guo H **Muchero W**, Chen JG. **(2016)**. Characterization of DWARF14 Genes in *Populus*. ***Scientific reports*** 6: 21593.

22. Dumitrache A, Akinosho H, Rodriguez M, Meng X, Yoo CG, Natzke J, Engle NL, Sykes RW, Tschaplinski TJ, **Muchero W**, Ragauskas AJ. **(2016)**. Consolidated bioprocessing of *Populus* using *Clostridium (Ruminiclostridium) thermocellum*: a case study on the impact of lignin composition and structure. ***Biotechnology for biofuels***, 9: 1.

23. **Muchero W***, Guo J, DiFazio SP, Chen J-G, Ranjan P, Slavov GT, Gunter L, Jawdy S, Bryan AC, Sykes R, Ziebell A, Klápště J, Porth I, Skyba O, Unda F, El-Kassaby Y, Douglas CJ, Mansfield SD, Martin J, Schackwitz W, Evans LM, Czarnecki O, Tuskan GA. **(2015)** High-resolution Genetic Mapping of Allelic Variants Associated with Cell Wall Chemistry in *Populus.* ***BMC Genomics*** 16:24.

24. Evans LM, Slavov GT, Rodgers-Melnick, Martin J, Ranjan P, **Muchero W**, Schackwitz, Chen J-G, Brunner A, Tuskan GA, DiFazio SP. **(2014)**. *Populus trichocarpa* population genomics, signatures of selection and adaptive trait associations. ***Nature Genetics*** 46:1089-1096.

25. **Muchero W***, Labbé J, Ranjan P, DiFazio S, Tuskan GA **(2014)** Genome re-sequencing in *Populus*: Revealing large-scale genome variation and implications on specialized-trait genomics. T. Fenning (ed.) Challenges and Opportunities for the world's Forests in the 21st Century. Springer Academic Publishers. ***Forestry Sciences*** 81: 587-595.

26. McKown AD, Klápště J, Guy RD, Geraldes A, Porth I, Hannemann J, Friedmann M, **Muchero W**, et al. **(2014)** Genome-wide association implicates numerous genes underlying trait variation in natural populations of *Populus trichocarpa*. ***New Phytologist*** 203:535-553.

27. Czarnecki O; Yang J; Wang X; Wang S; **Muchero W,** Tuskan GA, Chen J-G **(2014)** Characterization of MORE AXILLARY GROWTH Genes in *Populus.* ***PLoS ONE*** 9: e102757.

28. Weston DJ, Timm CM, Walker AP, Gu L, **Muchero W** et al., (2014) Sphagnum physiology in the context of changing climate: Emergent influences of genomics and host-microbiome interactions to ecosystem function. ***Plant Cell & Environment*** 38:1737-1751.

29. Muchero W*, Sewell MM, Ranjan P, Gunter LE, Tschaplinski TJ, Yin T, Tuskan GA **(2013)** Genome anchored QTLs for biomass productivity in Hybrid *Populus* grown under contrasting environments. ***PLoS ONE*** 8: e54468.

30. Porth I, Klápště J, Skyba O, Hannemann J, Mckown AD, Guy RD, DiFazio SP, **Muchero W**, Ranjan P, Tuskan GA, Friedman C, Ehlting J, Cronk QCB, El-Kassaby Y, Douglas CJ, Mansfield SD **(2013)** Genome-wide association mapping for wood characteristics in *Populus* identifies an array of candidate single nucleotide polymorphisms. ***New Phytologist*****:** 200:710-726.

31. Porth I, Klápště J, Skyba O, Lai BSK, Geraldes A, **Muchero W**, Tuskan GA, Douglas CJ, El-Kassaby Y, Mansfield SD **(2013)** *Populus trichocarpa* cell wall chemistry and ultrastructure trait variation, genetic control and genetic correlations. ***New Phytologist*** 197:777-790.

32. Geraldes A, DiFazio S, Slavov GT, Priya R, **Muchero W**, Hannemann J, Gunter L, Wymore AM, Grassa CJ, Farzaneh N, Porth I, Mckown AD, Skyba O, Li E, Fujita M, Klápště J, Martin J, Schackwitz W, Pennacchio C, Rokhsar D, Friedmann MC, Wasteneys GO, Guy RD, El-Kassaby Y, Mansfield SD, Cronk QCB, Ehlting J, Douglas CJ, Tuskan GA **(2013)** A 34K SNP genotyping array for Populus trichocarpa: Design, application to the study of natural populations and transferability to other *Populus* species. ***Molecular Ecology Resources*** **13:306-323.**

33. Slavov GT, DiFazio SP, Martin J, Schackwitz SP, **Muchero W**, Rodgers-Melnick E, Lipphardt MF, Pennacchio CP, Hellsten U, Pennachio LA, Gunter LE, Ranjan P, Vining K, Pomraning KR, Wilhelm LJ, Pellegrini M, Mockler T, Freitag M, Geraldes A, El-Kassaby YA, Mansfield SD, Cronk QCB, Douglas CJ, Strauss SH, Rokhsar D, Tuskan GA **(2012)** Genome resequencing reveals multiscale geographic structure and extensive linkage disequilibrium in the forest tree *Populus trichocarpa*. ***New Phytologist*** 196:713-725.

34. Guo J, Morrell-Falvey JL, Labbé JL**, Muchero W**, Kalluri UC, Tuskan GA, Chen JG **(2012)** Highly efficient isolation of *Populus* mesophyll protoplasts and its application in transient expression assays. ***PLoS ONE*** 7(9): e44908.

35. Induri BR, Ellis DR, Slavov GT, Yin T, Zhang X, **Muchero W** et al. **(2012)** Identification of quantitative trait loci and candidate genes for cadmium tolerance in *Populus.* ***Tree Physiology*** 32: 626-638.

36. **Muchero W** et al. **(2011)** Genic SNP markers and legume synteny reveal candidate genes underlying QTL for *Macrophomina phaseolina* resistance and maturity in cowpea [*Vigna unguiculata* (L) Walp.] ***BMC Genomics*** 12:8.

37. **Muchero W** et al. **(2010)** Restriction site polymorphism-based candidate gene mapping for seedling drought tolerance in cowpea [*Vigna unguiculata* (L.) Walp.]. ***Theoretical and Applied Genetics*** 120: 509-51.

38. **Muchero W** et al. **(2010)** QTL analysis for resistance to foliar damage caused by *Thrips tabaci* and *Frankliniella schultzei* (Thysanoptera: Thripidae) feeding in cowpea (*Vigna unguiculata* L. Walp**.).** ***Molecular Breeding*** 25: 47-56.

39. **Muchero W** et al. **(2009)** A consensus genetic map of cowpea [*Vigna unguiculata* (L) Walp.] and synteny based on EST-derived SNPs. ***Proceedings of the National Academy of Sciences USA*** 106: 18159-18164.

40. **Muchero W** et al. **(2009)** Mapping QTL for drought stress-induced premature senescence and maturity in cowpea [*Vigna unguiculata* (L.) Walp.] ***Theoretical and Applied Genetics*** 118: 849-863.

Synergistic Activities:

1. Vice Chair Person: Southern Forestry Tree Improvement Committee (2021 – current)
2. Professional membership: American Phytopathological Society (2006 – Present), American Society for Plant Biologists (2010 – Present).
3. Adjunct reviewer: *Plant Cell & Environment*, *New Phytologist, PLoS ONE, BMC Genomics, BMC Plant Biology, Biotechnology for Biofuels, GCB Bioenergy, African Journal of Microbiology, Theoretical and Applied Genetics, Molecular breeding, Crop science Journal, Euphytica, African Journal of Biotechnology, The Plant Genome.*

Media coverage:

Newswise: CBI early career program develops next generation of bioenergy leaders
Within CBI, she is working with ORNL's Wellington Muchero and NREL's Yannick Bomble to identify and characterize proteins and pathways, Mar 29, 2022

ScienceDaily: New biosensors shine a light on CRISPR gene editing
Labbé, Wellington Muchero, Changtian Pan, Jin-Gui Chen, Gerald A. Tuskan, Yiping Qi, Paul E. Abraham, Xiaohan Yang. Dec 10, 2021

SciTechDaily: Bioenergy: Friendly Fungi Boost Growth for Biofuel Source: Zeng-Yu Wang, Robert L. Hettich, Gerald A. Tuskan, Wellington Muchero and Jin-Gui Chen, 17 July 2021, Plant Biotechnology Journal. Nov 28, 2021

NPR:Scientists Study Human Cancer Genes In Plants: WELLINGTON MUCHERO, Jun 30, 2019

WBIR.com: Cancer predictors, tumor formations found in tree DNA said lead geneticist Wellington Muchero, Feb 21, 2019

BioTechniques: Gene Found for Plant and Fungi Symbiotic Relationship
"We showed that we can convert a non-host into a host of this symbiont," explained Wellington Muchero (ORNL), Jul 31, 2019

ScienceDaily: Scientists make fundamental discovery to creating better crops. Jessy Labbé, Wellington Muchero, Olaf Czarnecki, Juan Wang, Xiaoping Wang, Anthony C. Bryan, Kaijie Zheng, Yongil Yang, Meng Xie, Jin Zhang, 2019

Biomass Magazine: ORNL discovery could boost biofuel yields, Jun 22, 2018

Phys.org: Genetic behavior reveals cause of death in poplars essential to ecosystems, industry
and they have been puzzled by the early death of hybridized poplars grown in many parts of the United States," said Wellington Muchero, Oct 19, 2018

Knoxblogs.com: Young stars at ORNL get early-career funding Travis Humble, Melanie Mayes, Wellington Muchero and Clayton Webster of Oak Ridge National Laboratory were among 49 young researchers, May 3, 2016