

# CURRICULUM VITAE

Personal Information			
Name	Jian Zhao	Gender	Male
Position Title	Professor of Plant Biology		
Working Department	College of Plant Science & Technology National Key Lab of Crop Genetics Improvement		
Email	jianzhao@mail.hzau.edu.cn		
Address	1 Shizishan Str. Hongshan District, Wuhan, Hubei, 430070 China		
Tel	+86-27-87386719; 87385199	Fax	
Research Interest			
<p>My lab's research focuses on primary and secondary metabolism in leguminous crops such as soybean and alfalfa for nutritional quality improvement. The biosynthesis of flavonoids, saponins, vitamins, lipids, and phytosterols in legume plants and their intra- or inter-cellular transport and transcriptional regulation are major research targets of my lab in HZAU. We use metabolite profiling, transcriptomic analysis, combined with genetic phenotyping, molecular characterization and biochemistry property studies to reveal fundamental principles of plant primary and secondary metabolism associated with plant physiology and genetics contexts. Eventually, our studies are to benefit human beings with enhanced plant food nutrition on either nutritional diversity or fortification of certain desirable nutritional values.</p>			
Member of American Society of Plant Biologist			
Professional Memberships			
Member of American Society for Pharmacognosy Member of American Society of Plant Biologist Member of Society of Experimental Biology Member of Phytochemistry Society for North American			
Other Roles			
<p><b>Editorial board member for Recent Patents on Biotechnology;</b>            As manuscript reviewer for <i>The Plant Journal</i>, <i>Plant Physiology</i>, <i>Plant Cell &amp; Environment</i>, <i>JEX</i>, <i>Planta</i>, <i>Annals of Botany</i>, <i>New Phytologist</i>, <i>Biotechnology and Bioengineering</i>, <i>Molecules</i>, <i>Applied Microbiology and Biotechnology</i>, <i>Plant Cell Reports</i>; <i>Biotechnology Progress</i>; <i>Phytochemistry Reviews</i>; <i>Process Biochemistry</i>; <i>Biotechnology and Applied Biochemistry</i>. ...            As reviewer for National Science Foundation grant application (USA, Switzerland, ...)</p>			
Education & Working Experience			
<u>Education:</u>			
<b>Ph.D. Pharmacognosy, 1999, Chinese Academy of Medical Sciences &amp; Peking Union Medical College, Institute of Materia Medica, Beijing, China</b>			
<b>M.S. Plant Science. 1995, Northeast Normal University, Changchun, Jilin, China</b>			
<b>B.S. Biology 1992, Inner Mongolia Normal University, Huhhot, Inner Mongolia, China</b>			



## Work experiences:

2012.6- present Professor, College of Plant Science & Technology, National Key Lab of Crop Genetics Improvement.

2008.4–2012.5: Postdoct Fellow, Plant Biology Division, The Samuel Roberts Noble Foundation, OK,

2004.7-2008.4: Research Associate, USDA/Children's Nutrition Research Center, Baylor College of Medicine, USA

2002.5-2004.7: Research Associate, Department of Biochemistry, Kansas State University, USA

2000.1-2002.4: JSPS Foreign Researcher (Japan Society for Promotion of Science). Biochemistry, Faculty of Agriculture, Kyushu University, Japan.

## Publications

### Peer-Reviewed Journal Publications

1. Li P\*, Chen B\*, Zhang G\*, Chen L, Dong Q, Wen J, Mysore KS. **Zhao, J.** 2016 Regulation of anthocyanin and proanthocyanidin biosynthesis by *Medicago truncatula* bHLH transcription factor MtTT8. *New Phytologist* In press. \* **equal contribution to this work.**
2. Li P, Dong, Q, Ge S, He X, Verdier J, Li D, **Zhao J.** 2016. Metabolic engineering of proanthocyanidin production by repressing the isoflavone pathways and redirecting anthocyanidin precursor flux in legume. *Plant Biotechnology Journal* in press.
3. Luo P, Ning G, Wang Z, Shen Y, Jin H, Li P, Huang S, **Zhao J**, Bao M. 2016. Disequilibrium of flavonol synthase and dihydroflavonol-4-reductase expression associated tightly to white vs. red color flower formation in plants. *Frontier in Plant Science* 6:1257.
4. Luo P, Shen Y, Jin S, Huang S, Cheng X, Wang Z, Li P, **Zhao J**, Bao M, Ning G. 2016. Overexpression of *Rosa rugosa* anthocyanidin reductase enhances tobacco tolerance to abiotic stress through increased ROS scavenging and modulation of ABA signaling. *Plant Science* 245: 35–49 doi:10.1016/j.plantsci.2016.01.007
5. Hong Y\*†, **Zhao J**\*†, Guo L, Kim SC, Deng X, Wang G, Zhang G, Li M, Wang X†. 2016. Plant phospholipases D and C and their diverse functions in stress responses. *Progress in Lipid Research* 62:55–74 \* **equal contribution to this work.**;
6. Li P\*, Zhang G\*, Gonzales N, Guo Y, Hu H, Park S, **Zhao J.** 2016. Ca<sup>2+</sup>-and diurnal rhythm-regulated Na<sup>+</sup>/Ca<sup>2+</sup> exchanger AtNCL affects flowering time and auxin signaling in Arabidopsis. *Plant Cell & Environment* 39: 377–392. doi:10.1111/pce.12620 \***equal contribution to this work.**
7. **Zhao J**, Li P, Motes CM, Park S, Hirschi KD. 2015. CHX14 is a plasma membrane K-efflux

transporter that regulates K<sup>+</sup> redistribution in *Arabidopsis thaliana*. ***Plant Cell & Environment*** 38: 2223-2238. doi: 10.1111/pce.12524.

8. **Zhao J.** 2015. Phospholipase D and phosphatidic acid in plant defence response: from protein-protein and lipid-protein interactions to hormone signalling. ***Journal of Experimental Botany*** 66:1721-36
9. **Zhao J.** 2015. Flavonoid transport mechanisms: how to go, and with whom. ***Trends in Plant Science*** 20:576-585
10. **Zhao J\***, Wang X. (2013) Biochemical analysis of the interaction between phospholipase Dα1 and GTP-binding protein α-subunit from *Arabidopsis thaliana*. ***Methods in Molecular Biology*** 1043:21-35.
11. **Zhao J\***, Devaiah SP, Wang C, Welti R, Wang X\*. (2013) *Arabidopsis* phospholipase Dβ1 modulates defense responses to bacterial and fungal pathogens. ***New Phytologist*** 199:228-240
12. Verdier J\*, **Zhao J\***, Torres-Jerez I, Ge S, He XZ, Mysore KS, Dixon RA, Udvardi MK (2012) The MtPAR MYB transcription factor acts as an on-switch for proanthocyanidin biosynthesis in *Medicago truncatula*. ***Proc Natl Acad Sci USA*** 109 (5) 1766-1771 \* equal contribution to this work.
13. **Zhao J**, Wang C, Bedair M, Welti R, Sumner LW, Ivan Baxter I, Wang X. (2011) Suppression of phospholipase D<sub>ys</sub> confers an increased aluminum resistance in *Arabidopsis thaliana*. ***PLoS One*** 6(12): e28086
14. **Zhao J**, Huhman D, Shadle G, He XZ, Sumner LW, Tang Y, Dixon RA.(2011) MATE2 mediates vacuolar sequestration of glycosylated and malonylated flavonoids in *Medicago truncatula*. ***Plant Cell***. 23: 1536-1555.
15. **Zhao J**, Dixon RA (2010) The “ins” and “outs” of flavonoid transport. ***Trends in Plant Science***. 15:72-80.
16. **Zhao J**, Pang YZ, Dixon RA (2010) The mysteries of proanthocyanidin transport and polymerization. ***Plant Physiology*** 153: 437-443
17. **Zhao J**, Connorton JM, Guo YQ, Li X, Shigaki T, Hirschi KD, Pittman JK. (2009) Functional studies of split *Arabidopsis* Ca<sup>2+</sup>/H<sup>+</sup> exchangers. ***Journal of Biological Chemistry***. 284:34075-34083.
18. **Zhao J**, Dixon, RA. (2009) MATE transporters facilitate vacuolar uptake of epicatechin 3'-O-glucoside for proanthocyanidin biosynthesis in *Medicago truncatula* and *Arabidopsis*. ***Plant Cell*** 21: 2323-2340.

19. Mei H, Cheng NH, **Zhao J**, Park S, Escareno RA, Pittman JK, Hirschi KD. (2009) Root development under metal stress in *Arabidopsis thaliana* requires the H<sup>+</sup>/cation antiporter CAX4. ***New Phytologist*** 183:95-105.
20. **Zhao J**, Shigaki T, Mei H, Guo YQ, Cheng NH, Hirschi KD. (2009) Interaction between *Arabidopsis* Ca<sup>2+</sup>/H<sup>+</sup> exchangers CAX1 and CAX3. ***Journal of Biological Chemistry*** 284: 4605-4615.
21. **Zhao J**, Cheng NH, Motes CM, Blancaflor EB, Moore M, Gonzales N, Padmanaban S, Sze H, Ward JM, Hirschi KD. (2008) AtCHX13 is a plasma membrane K<sup>+</sup> transporter. ***Plant Physiology*** 148:796-807.
22. **Zhao J**, Barkla BJ, Marshall J, Pittman JK, Hirschi KD. (2008) The *Arabidopsis cax3* mutants display altered salt tolerance, pH sensitivity and reduced plasma membrane H<sup>+</sup>-ATPase activity. ***Planta*** 227:659-669.
23. Mei H, **Zhao J**, Pittman JK, Lachmansingh J, Park S, Hirschi KD. (2007) In planta regulation of the *Arabidopsis* Ca<sup>2+</sup>/H<sup>+</sup> antiporter CAX1. ***Journal of Experimental Botany*** 58:3419-3427.
24. **Zhao J**. (2007) Interplay among nitric oxide and reactive oxygen species: A complex network determining cell survival or death. ***Plant Signaling & Behavior*** 2:544-547.
25. Zhao J, Fujita K, Sakai K. (2007) Reactive oxygen species, nitric oxide, and their interactions play different roles in *Cupressus lusitanica* cell death and phytoalexin production. ***New Phytologist*** 175: 215-229.
26. **Zhao J**. (2007) Nutraceutical, nutritional therapy, phytonutrients, and phytotherapy for improvement of human health: A perspective on plant biotechnology application. ***Recent Patents on Biotechnology*** 1:75-97.
27. **Zhao J** (2007) Plant terpenoids: Chemistry, biological activity, and biosynthesis. ***Current Medicinal Chemistry*** 14(24):2597-2621.
28. **Zhao J**, Verpoorte R. (2007) Manipulating indole alkaloid production in *Catharanthus roseus* cell cultures in bioreactors: from biochemical processing to metabolic engineering. ***Phytochemistry Reviews*** 6:435-457
29. Buseman CM, Tamura P, Sparks AA, Baughman E, Maatta S, **Zhao J**, Roth MR, Esch SW, Shah J, Williams TD, Welti R. (2006) Wounding stimulates the accumulation of glycerolipids containing oxophytodienoic acid and dinor-oxophytodienoic acid in *Arabidopsis* leaves. ***Plant Physiology*** 142:28-39.
30. Mishra G, Zhang W, Deng F, **Zhao J**, Wang X (2006) A bifurcating pathway directs abscisic acid effects on stomatal closure and opening in *Arabidopsis*. ***Science*** 312:264-266.

31. Zhao J, Matsimaga Y, Fujita K, Sakai K. (2006) Metabolic flux and signal analysis of  $\beta$ -thujaplicin and monoterpene biosynthesis in elicited *C. lusitanica* cell culture by elicitor and methyl jasmonate. ***Metabolic Engineering*** 8:14-29
32. Buseman CM, Tamura P, Sparks AA, Baughman E, Maatta S, Zhao J, Roth MR, Esch SW, Shah J, Williams TD, Welti R. (2006) Wounding stimulates the accumulation of glycerolipids containing oxophytodienoic acid and dinor-oxophytodienoic acid in Arabidopsis leaves. ***Plant Physiology*** 142:28-39.
33. Shigaki T, Barkala B, Miranda-Vergara MC, Zhao J, Pantoja O, Hirschi K (2005). Identification of a critical histidine involved in metal transport activity in Arabidopsis cation/H exchanger CAX1. ***Journal of Biological Chemistry*** 280: 30136 – 30142
34. Shigaki T, Barkala B, Miranda-Vergara MC, Zhao J, Pantoja O, Hirschi K(2005). Identification of a critical histidine involved in metal transport activity in Arabidopsis cation/H exchanger CAX1. ***Journal of Biological Chemistry*** 280: 30136 - 30142
35. Zhao J, Fujita K, Sakai K. (2005) Oxidative burst in plant cell culture process: a role in production of  $\beta$ -thujaplicin by *Cupressus lusitanica* suspension culture. ***Biotechnology and Bioengineering*** 90: 621-631.
36. Zhao J, Davis LC, Verpoorte R (2005) Elicitor signal transduction leading to production of plant secondary metabolites. ***Biotechnology Advances*** 23:283-333.
37. Zhang W, Qin C, Zhao J, Wang X. (2004) Phospholipase D $\alpha$ 1-derived phosphatidic acid interacts with ABI1 phosphatase 2C and regulates abscisic acid signaling, ***Proc Natl Acad Sci USA*** 101:9508-9513.
38. Zhao J, Zheng SH, Fujita K, Sakai K. (2004) Jasmonate and ethylene signaling pathways and their interaction are integral parts of the elicitor signal transduction leading to phytoalexin biosynthesis in *Cupressus lusitanica* cell cultures. ***Journal of Experimental Botany*** 55:1003-1012.
39. Zhao J, Guo Y, Kosaihira A, Sakai K. (2004) Rapid metabolism of phosphoinositides and its possible roles in phytoalexin biosynthesis in elicitor-treated *Cupressus lusitanica* cell cultures. ***Planta*** 219:121-131.
40. Zhao J, Guo Y, Fujita K, Sakai K. (2004) Involvement of cAMP signaling in elicitor-induced phytoalexin accumulation in *Cupressus lusitanica* cell cultures. ***New Phytologist*** 161:723-733.
41. Zhao J, Wang X. (2004). The common plant phospholipase D, PLD $\alpha$ 1, interacts with Arabidopsis heterotrimeric G-protein  $\alpha$ -subunit through a motif analogous to the DRY motif in G-protein-coupled receptors. ***Journal of Biological Chemistry*** 279: 1794-1800.
42. Zhao J, Sakai K. (2003) Multiple signaling pathways mediate fungal elicitor-induced

$\beta$ -thujaplicin accumulation in *Cupressus lusitanica* cell cultures. **Journal of Experimental Botany** 54:647-656.

43. Zhao J, Sakai K. (2003) Peroxidases are involved in biosynthesis and metabolism of  $\beta$ -thujaplicin in fungal elicitor-treated *Cupressus lusitanica* suspension cultures. **New Phytologist** 159:719-731.
44. Zhao J, Fujita K, Yamada J, Sakai K. (2001) Improved  $\beta$ -thujaplicin production in *Cupressus lusitanica* suspension cultures by fungal elicitor and methyl jasmonate. **Applied Microbiology and Biotechnology** 55: 301-305.
45. Zhao J, Hu Q, Guo YQ, Zhu WH. (2001) Effects of stress factors, bioregulators and precursors on indole alkaloid production in the compact callus clusters culture of *Catharanthus roseus*. **Applied Microbiology and Biotechnology** 55: 693-698.
46. Zhao J, Hu Q, Guo YQ, Zhu WH. (2001) Elicitor-induced indole alkaloid biosynthesis in *Catharanthus roseus* cell cultures is related to  $Ca^{2+}$ -influx and the oxidative burst. **Plant Science** 161:423-431.
47. Zhao J, Hu Q, Zhu WH. (2001) Enhanced catharanthine production in *Catharanthus roseus* cell cultures by combined elicitor treatment in shake flasks and bioreactors. **Enzyme and Microbial Technology** 28:673-681.
48. Zhao J, Zhu WH, Hu Q (2001) Selection of fungal elicitors to increase indole alkaloid accumulation in *Catharanthus roseus* suspension cell culture. **Enzyme and Microbial Technology** 28:666-672.
49. Zhao J, Zhu WH, Hu Q, He XW (2001) Enhanced indole alkaloid production in suspension compact callus clusters of *Catharanthus roseus*: impacts of plant growth regulators and sucrose. **Plant Growth Regulation** 33: 33-41
50. Zhao J, Wei-Hua Zhu, WH, Hu Q (2001) Effects of light and plant growth regulators on the biosynthesis of vindoline and other indole alkaloids in *Catharanthus roseus* callus cultures. **Plant Growth Regulation** 33: 43-49
51. Zhao J, Fujita K, Sakai K(2001) Production of  $\beta$ -thujaplicin in *Cupressus lusitanica* suspension cultures fed with organic acids and monoterpenes. **Bioscience Biotechnology Biochemistry** 65:1027-1032
52. Zhao J, Zhu WH, Hu Q, Guo YQ (2001) Compact callus cluster suspension cultures of *Catharanthus roseus* with enhanced indole alkaloid biosynthesis. **In Vitro Cell Dev Biol Plant** 37:68-72
53. Zhao J, Zhu WH, Hu Q. (2000) Enhanced ajmalicine production in *Catharanthus roseus* cell cultures by combined elicitor treatment: from shake-flask to 20-l airlift bioreactor. **Biotechnology Letters** 22: 509-514.

54. **Zhao J**, Zhu W-H, Hu Q (2000) Promotion of indole alkaloid production in *Catharanthus roseus* cell cultures by rare earth elements. ***Biotechnology Letters* 22**: 825–828.
55. **Zhao J**, Zhu W-H, Hu Q, He X-W (2000) Improved alkaloid production in *Catharanthus roseus* suspension cell cultures by various chemicals. ***Biotechnology Letters* 22**: 1221–1226
56. **Zhao J**, Zhu W-H, Hu Q, He X-W (2000) Improvement of indole alkaloid production in *Catharanthus roseus* cell cultures by osmotic shock. ***Biotechnology Letters* 22**: 1227–1231

#### **Book Chapters:**

57. **Zhao J**, Sakai K. (2001) Involvement of peroxidases and hydrogen peroxide in the metabolism of  $\beta$ -thujaplicin in fungal elicitor-treated *Cupressus lusitanica* suspension cultures. In: Morohoshi N, Komamine A, (eds), Molecular Breeding of Woody Plants: Proceedings of the International Wood Biotechnology Symposium. ***Progress in Biotechnology***, Vol 18, Elsevier: Tokyo, p263-272.
58. **Zhao J**. (2006) Elicitor signal transduction leading to biosynthesis of plant defensive secondary metabolites. In: Teixeira da Silva J (eds), ***Floriculture, Ornamental and Plant Biotechnology***. Vol 3. Global Science Books Ltd: Tokyo, London. p344-357.
59. **Zhao J**. (2011) Phytonutrient and phytotherapy for improving health. In: Peter Prendergast and Melvin A. Shiffman (eds), ***Aesthetic Medicine: Art and Techniques***. Springer-Verlag : Heidelberg, Germany, Part 2, p47-58.
60. **Zhao J**. (2012) Nutraceuticals/functional foods for improving health and preventing disease. In: Oliver Kayser and Heribert Warzecha (eds), ***Pharmaceutical Biotechnology –Drug Discovery and Clinical Applications (2<sup>nd</sup> Edition)***. Wiley-VCH Verlag: Weinheim, Germany. p599-628.

#### **Additional Information**

##### **Patent:**

Verdier J, **Zhao J**, Udvardi M, Dixon RA. Methods and Compositions for Regulating Production of Proanthocyanidins. US 9121031