
AINONG SHI

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<https://horticulture.uark.edu/people/faculty/uid/ashi/name/Ainong+Shi/>

EDUCATION

- **Ph.D.** in Plant Pathology and Crop Sciences, North Carolina State University, Raleigh, NC. 1997
 - **M.S.** in Computer Systems, City University, Seattle, WA. 2000
 - **M.S.** in Plant Genetics and Breeding, Chinese Academy of Agricultural Sciences, Beijing, China. 1986
 - **B.S.** in Plant Pathology and Entomology, Zhejiang University, Hangzhou, China. 1983
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RESEARCH EXPERIENCE

Full Professor (July 2025–Present); **Associate Professor** (July 2019 – June 2025); **Assistant Professor** (2014 – June 2019), Department of Horticulture, University of Arkansas, Fayetteville, AR, USA

- Lead classical and molecular breeding programs in vegetable crops such as arugula, spinach, and cowpea for germplasm development and cultivar release.
- Conduct genetic and association mapping, SNP discovery and genotyping, and next-generation sequencing (WGS, WGRS, ddRADseq, GBS, WGBS, RNAseq, IsoSeq).
- Apply proteomics, marker-assisted selection (MAS), and genomic selection (GS) in arugula, beans (cowpea, common bean, soybean), *Plantago*, spinach, and tomato.
- Developed pangenome resources for *Eruca* and *Plantago* species.

Scientist / Soybean Genetics Project Lead – Syngenta Seeds, Slater, IA, USA (Oct 2009 – May 2013)

- Implemented more than 10,000 F2/F3 populations and developed a Visual Basic (VB) tool for marker-based trait selection in soybean breeding.
- Designed and validated SNP markers for aphid resistance (*Rag1*, *Rag2*, *rag1*, *rag3*, *rag4*), enabling selection of stacked resistance lines.
- Led the development of 11 SNP markers for *Phytophthora* root rot resistance (*Rps1a*, *Rps1c*, *Rps1k*, *rps1*).
- Contributed to association analysis for sudden death syndrome (SDS) resistance, validating nine QTLs in Syngenta soybean lines.
- Conducted QTL analyses for iron deficiency chlorosis (IDC) and soybean cyst nematode (SCN) resistance (*rhg1*, *Rhg4*, *Rhg5*, SCN-qtl regions).
- Analyzed 50+ biparental populations for genetic studies and high-yield line development.

Plant Geneticist – Indiana Crop Improvement Association and Purdue University, IN, USA (Jul 2008 – Sep 2009)

- Conducted molecular marker identification, genetic mapping, SNP discovery, and association studies in corn, soybean, and tomato.

Postdoctoral Research Associate – Institute of Genomic Diversity, Cornell University, Ithaca, NY, USA (Dec 2007 – Jul 2008)

- Conducted association analysis in switchgrass and participated in nested association mapping of maize.

Postdoctoral Research Associate – Department of Crop, University of Arkansas, Fayetteville, AR, USA (Oct 2005 – Nov 2007)

- Identified markers associated with seed quality and disease resistance; conducted genetic diversity, QTL mapping, and association studies.
- Contributed to soybean breeding efforts.

Postdoctoral Research Associate – Nursery Station, Tennessee State University, TN, USA (Apr 2003 – Oct 2005)

- Identified markers linked to disease resistance, analyzed dogwood genetic diversity, and detected nursery crop pathogens.

Postdoctoral Research Associate – Department of Crop, Washington State University, WA, USA (Oct 1997 – Sep 1998)

- Evaluated and identified wheat disease resistance and contributed to germplasm and cultivar release.

Research Assistant – Plant Pathology & Crop Science Departments, North Carolina State University, Raleigh, NC, USA (Sep 1993 – Sep 1997)

- Evaluated and mapped disease resistance genes in wheat and assisted in wheat breeding programs.

Researcher – Institute of Crop Breeding and Cultivar, Chinese Academy of Agricultural Sciences (CAAS), Beijing, China (Aug 1986 – Aug 1993)

- Conducted germplasm identification, genetic analysis of disease resistance in rice and wheat, and led rice breeding for cultivar release.

OTHER EXPERIENCE

Software Test Engineer – Volt (Microsoft), Redmond, WA, USA (Sep 2001 – Mar 2003)

Computer Lab Assistant – City University, Renton, WA, USA (Nov 1998 – Aug 2001)

PROFESSIONAL MEMBERSHIPS

- American Phytopathological Society (APS), since 1995.
- American Society for Horticultural Science (ASHS), since 2013. Promotion to **ASHS Fellow** in 2026.
- Crop Science Society of America (CSSA), since 2005
- International Spinach Association, since 2014
- Gamma Sigma Delta

EDITORIAL SERVICE

- *Agronomy* – Editorial Board
- *BMC Plant Biology* – Guest Editor
- *Crop Breeding, Genetics and Genomics (CBGG)* – Editorial Board
- *Crop Science* – Associate Editor
- *Euphytica* – Editorial Board
- *Frontiers in Plant Science* – Associate Editor (Plant Breeding) & Review Editor (Plant Bioinformatics)
- *Seeds* – Editorial Board
- *Vegetable Research* – Associate Editor
- *Horticultural Plant Journal* - Editorial Board

JOURNAL REVIEWER (48 Journals)

Reviewed manuscripts for journals including: *Agronomy*, *Crop Science*, *Euphytica*, *Frontiers in Plant Science*, *Horticulture Research*, *HortScience*, *Plant Disease*, *Plant Breeding*, *Plants*, *PLoS ONE*, *Scientific Reports*, *Theoretical and Applied Genetics*, and *The Plant Genome*, among others.

TEACHING

- HORT 6033: Molecular Plant Breeding – Graduate course, taught to 60+ students over four semesters. 2026 Fall Course website at <http://www.spinachdb.com/MB/index.html>.
- CEMB 590V: Special Topics in Cell and Molecular Biology – Graduate course.

GRANTS AWARDED (Total: \$10,764,303, Shi's share: \$3,974,502)

Type of	As Principal Investigator (PI)			As Co-PI		
Project	Amount (\$)	My Share (\$)	# Projects	Amount (\$)	My Share (\$)	# Projects
Federal	8,571,193	3,279,794	23	1,519,000	309,000	2
Non-federal	384,936	325,708	10	289,174	60,000	1
Total	8,956,129	3,605,502	32	1,808,174	369,000	3

A. Federal Grants

1. **Shi, A.**, Y. Qu, and P. Rosas-Anderson. 2026. *Developing and implementing integrated management strategies for Phythium root rot in controlled environment spinach production*. CPPM-ARDP 2026-08729. 9/15/2026-9/14/2029. Total: \$299,821. Principal Investigator.
2. **Shi, A.**, J. Correll, R. Dickson, and N. Kalengamaliro. *Development of Genomic Resources for Pythium Tolerance in Spinach*. NIFA AFRI #2024-12908. 2026–2029. 04/01/2026-03/31/2029. **Total:** \$615,000. Principal Investigator. <https://portal.nifa.usda.gov/enterprise-search/projects/1034419>.
3. **Shi, A.**, and K. Ling. 2025. *Developing Novel Solutions to Manage Tomato Brown Rugose Fruit Virus in Tomato*. USDA-ARS NACA Agreement #58-6080-3-01258-6080-5-029. 09/01/2025–08/31/2027. **Total:** \$99,884. Principal Investigator.
4. **Shi, A.**, J. Correll, C. Avila, B. Mou, L. du Toit, L. Stein, J. Enciso, S. Zapata, B. Poudel-Ward, S. Scheufele, and G. Bhattarai. 2023. *Development of Germplasm Resources and Molecular Breeding Tools to Combat Endemic and Emerging Diseases in U.S. Spinach Production*. NIFA SCRI #2023-05687. 09/15/2023–09/14/2027. **Total:** \$3,578,418. Principal Investigator. <http://www.spinachdb.com/>
5. **Shi, A.**, and K. Ling. 2023. *Managing Emerging Tomato Brown Rugose Fruit Virus in Greenhouse Tomatoes Using Alternative Rootstock and Disinfection*. NIFA CPPM Award #2023-70006-40603. 09/01/2023–08/31/2026. **Total:** \$323,001. Principal Investigator.
6. **Shi, A.**, and B. Mou. 2023. *Enhancement of Spinach and Leafy Vegetables for Disease Resistance and Nutritional Components Using GWAS and Genomic Prediction*. USDA-ARS NACA. 07/01/2023–06/30/2026. **Shi's share:** \$40,157. Principal Investigator.
7. **Joshi, V., A. Shi**, M. Colley, and A. Formiga. 2022. *Streamlining Systems Approaches to Maximize Organic Spinach Productivity*. USDA OREI #2022-51300-37886. 09/01/2022–08/31/2026. **Total:** \$1,500,000. **Shi's share:** \$299,561. Collaborating Investigator.
8. **Ling, K.**, and **A. Shi**. 2022. *Evaluation and GWAS for Tomato Brown Rugose Fruit Virus Resistance in USDA Tomato Germplasm*. USDA Germplasm Evaluation, Agreement #58-6080-3-012. 09/01/2022–08/30/2023. **Total:** \$30,000. Collaborating Investigator.
9. **Shi, A.** 2022. *Developing Nutritious Spinach and Arugula for Hydroponics and Indoor Farming with Disease and Pest Tolerance*. Arkansas Specialty Crop Block Grant Program. 10/01/2022–12/31/2025. **Total:** \$79,658. Principal Investigator.
10. **Shi, A., D.M. Viteri**, and D.A. Linares. 2022. *Evaluation and GWAS for Ashy Stem Blight Resistance in USDA Common Bean Germplasm*. USDA Germplasm Evaluation, Agreement #58-2090-2-025. 09/01/2022–08/30/2024. **Total:** \$19,000. Principal Investigator.
11. **Shi, A.**, B. Bluhm, G. Bhattarai, and H. Xiong. 2021. *Evaluation, GWAS, and Genomic Prediction for Bacterial Wilt and Abiotic Stress Tolerance in Tomato*. USDA Germplasm Evaluation, Agreement #58-8060-1-008. 08/01/2021–07/30/2023. **Total:** \$22,761. Principal Investigator.
12. **Shi, A.**, J. Correll, and G. Bhattarai. 2020. *Evaluation and Association Analysis of Pythium Resistance in USDA Spinach Germplasm*. USDA Germplasm Evaluation, Agreement #58-5030-0-047. 08/01/2020–08/31/2022. **Total:** \$24,500. Principal Investigator.
13. **Shi, A.**, and Y. Pan. 2021. *Genetic Analysis and Trait-Specific Molecular Marker Development in Sugarcane*. USDA-ARS NACA Agreement #58-6052-1-002. 06/01/2021–05/31/2024. **Total:** \$52,000. Principal Investigator.

14. **Shi, A.**, and W. Ravelombola. 2020. *Evaluation, GWAS, and Genomic Selection of Salt Tolerance in USDA Cowpea Germplasm*. USDA Germplasm Evaluation, Agreement #58-6046-9-004. 09/01/2020–08/31/2022. **Total:** \$23,256. Principal Investigator.
15. **Shi, A.**, and J. Correll. 2019. *Evaluation and Association Analysis of Leaf Spot Resistance in USDA Spinach Germplasm*. USDA Germplasm Evaluation, Agreement #58-5030-9-051. 07/01/2019–06/30/2021. **Total:** \$19,380. Principal Investigator.
16. **Shi, A.**, J. Qin, and W. Ravelombola. 2019. *Evaluation and Association Analysis of Drought Tolerance in USDA Cowpea Germplasm*. USDA Germplasm Evaluation, Agreement #58-6046-9-004. 07/01/2019–06/30/2020. **Total:** \$19,380. Principal Investigator.
17. **Shi, A.**, J. Qin, and S. Chen. 2018. *Evaluation and Association Analysis of Soybean Cyst Nematode Resistance in USDA Common Bean Germplasm*. USDA Germplasm Evaluation, Agreement #58-2090-8-053. 07/01/2018–06/30/2020. **Total:** \$21,318. Principal Investigator.
18. **Shi, A.**, J. Correll, B. Mou, C. Avila, L. du Toit, C. Feng, L. Stein, and R. Hogan. 2017. *Developing Genetic and Molecular Resources to Improve Spinach Production and Management*. USDA SCRI #2017-51181-26830. 09/01/2017–06/30/2022. **Total:** \$2,447,430. Principal Investigator.
19. **Shi, A.**, and J. Correll. 2017. *Evaluation and Association Analysis of White Rust Resistance in USDA Spinach Germplasm (Second Award)*. USDA Germplasm Evaluation, Agreement #58-5030-6-076. 07/01/2017–06/30/2019. **Total:** \$29,868. Principal Investigator.
20. **Shi, A.**, J. Correll, and B. Mou. 2016. *Classical and Molecular Breeding for Downy Mildew Resistance in Spinach*. USDA-AMS SCMP #16SCCMAR0001. 10/01/2016–04/30/2021. **Total:** \$755,784. Principal Investigator.
21. **Shi, A.** 2016. *Evaluation and Association Analysis of Seed Protein Content in USDA Cowpea Germplasm*. USDA Germplasm Evaluation, Agreement #58-6046-6-004. 2016–2017. **Total:** \$11,650. **Principal Investigator.**
22. **Shi, A.**, and J. Correll. 2016. *Evaluation and Association Analysis of White Rust Resistance in USDA Spinach Germplasm*. USDA Germplasm Evaluation, Agreement #58-5030-6-076. 07/01/2016–06/30/2019. **Total:** \$12,621. Principal Investigator.
23. **Shi, A.** 2014. *Association Analysis of Bacterial Blight Resistance in USDA Cowpea Germplasm Core Collection*. USDA Germplasm Evaluation, Agreement #6607-21000-011-00D. 2014–2015. **Total:** \$12,686. Principal Investigator.
- B. Non-Federal Grants (State, Industry, University, and Private)**
24. **Shi, A.** 2023. *Developing Molecular Breeding Resources for Plantago Breeding and Genetics*. 80 Acres Urban Agriculture, Inc. 10/01/2023–09/30/2025. **Total:** \$120,545. Principal Investigator.
25. **Shi, A.** 2022. *Evaluation and Development of Spinach and Arugula Germplasm and Breeding Lines*. Bowery Farming. 05/2022–05/2023. **Total:** \$55,982. Principal Investigator.
26. **Shi, A.** 2020. *Arugula Breeding and Genetics*. Bowery Farming. 04/2020–04/2021. **Total:** \$51,762. Principal Investigator.
27. **Shi, A.**, B. Bluhm, H. Xiong, and G. Bhattarai. 2020. *GWAS and Genomic Prediction for Bacterial Wilt Resistance in Tomato*. University of Arkansas Provost's Collaborative Research Grant. 10/01/2020–12/31/2021. **Total:** \$4,900. Principal Investigator.
28. **Shi, A.** 2017. *Evaluation and Association Analysis of Seed Protein Content in Cowpea*. University of Arkansas Provost Grant. 01/01/2017–12/31/2017. **Total:** \$2,000. Principal Investigator.
29. **Shi, A.**, and J. Correll. 2016. *Development of SNP Markers for White Rust Resistance and Genetic Diversity in Spinach*. Industry collaboration (Pop Vriend, Rijk Zwaan, Sakata). 07/01/2016–06/30/2018. **Total:** \$118,827. Principal Investigator.
30. **Shi, A.**, and J. Correll. 2016. *Molecular Research and Breeding through DNA Sequencing and SNP Development in Spinach*. Industry collaboration (Pop Vriend Seeds). 2016–2018. **Total:** \$9,500. Principal Investigator.
31. **Shi, A.** 2016. *QTL and Association Analysis for White Rust Resistance in Spinach*. Texas Spinach Producers Board. 2016–2017. **Total:** \$3,420. Principal Investigator.

32. **Shi, A.** 2015. *QTL and Association Analysis for White Rust Resistance in Spinach*. Texas Spinach Producers Board. 2015–2016. **Total:** \$5,000. Principal Investigator.
33. **Shi, A.** 2014. *Enhancing Spinach Improvement for White Rust Resistance and Heat Tolerance with Reduced Bolting*. Texas Spinach Producers Board. 2014–2015. **Total:** \$5,000. Principal Investigator.
34. **Shi, A.** 2013. *Research in Teaching Grant*. University of Arkansas Global Campus. 2013–2014. **Total:** \$3,500. Principal Investigator.
35. **Chen, S., T. Michaels, and A. Shi.** 2017. *Identification and Characterization of Soybean Cyst Nematode Resistance in Dry Bean*. AGRI Minnesota Crop Research Program #2090-21000-032-11S. 01/01/2017–12/31/2020. **Total:** \$289,174. Collaborator.
36. **Shi, S.** 2013-2014. Sakata, Spinach Improvement. \$10,000. Principal Investigator.

PUBLICATION AND PRESENTATION

Type of Publication/Meeting	#Published/Presentation
Peer-reviewed journal articles (# corresponding; first author)	208 (88; 32)
Abstracts published	185
Talks/poster	216

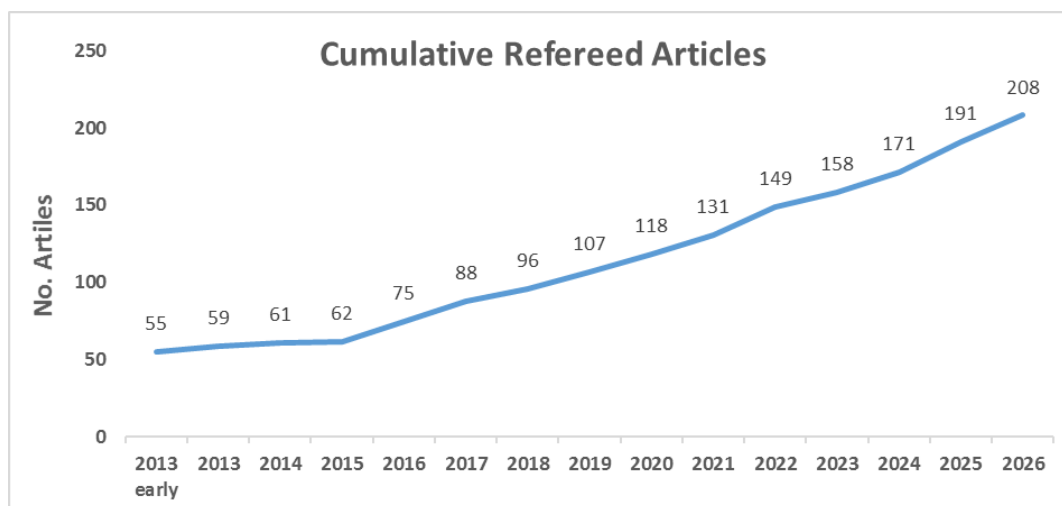
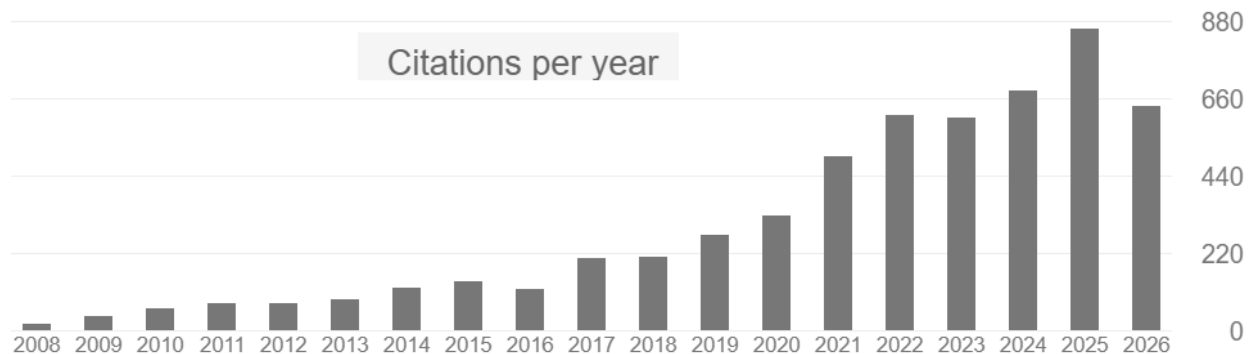
PUBLICATION (refereed: 208; abstract:185; presentation:216; patent:13)

Google Scholar Metrics:

(Publication list: 405, Citations: 5859, h-index: 44, and i10-index: 130;

since 2021, Citations: 3912, h-index: 36; and i10-index: 107;

<https://scholar.google.com/citations?user=o4rwUWEAAAAJ&hl=en>, accessed on 10/05/2026)



Refereed (ordered by year and then by last name) (*represents corresponding author)

2026 (16 published, 11 submitted)

1. Alkabkabi, H., I. Alatawi, H. Xiong, K. Chiwina, Q. Luo, Y. Qu, R. Du, R. Khanal, M.M. Ullah, P. Rosas-Anderson, B. Mou, K. Ling, and **A. Shi***. 2026. Evaluation of seedling-stage salt tolerance in USDA spinach (*Spinacia oleracea* L.) accessions. HortScience.
2. Alkabkabi, H., K. Chiwina, Y. Qu, R. Du, R. Khanal, Q. Luo, M. Ullah, H. Xiong, P. Rosas-Anderson, B. Mou*, and **A. Shi***. 2026. Genome-wide association study and genomic prediction of bolting trait in spinach (*Spinacia oleracea* L.). *Frontiers in Plant Sciences* 19 April 2026 Sec. Functional and Applied Plant Genomics 17 – 2026. <https://doi.org/10.3389/fpls.2026.1795277>
3. Das, M.K.*, N.D. Adhikari, I. Simko, **A. Shi**, and B. Mou. 2026. Membrane lipid remodeling under salt stress associated with salt tolerance in lettuce, BMC Plant Biology. Published: 20 June 2026. <https://doi.org/10.1186/s12870-026-09169-3>
4. Ghanbari, M.A., O.J. Olorunwa, M. Verma, S.C. Popescu, **A. Shi**, T.C. Barickman*, and G. V. Popescu*. 2026. Systems-level developmental reprogramming under waterlogging stress in cowpea revealed by integrated phenotypic, physiological, and transcriptomic analysis. *Plant, Cell & Environment* 1–26 <https://doi.org/10.1111/pce.70692>
5. Jailani, A.K., A. Gilliard, **A. Shi**, and K. Ling*. 2026. One-step exo RT-RPA for rapid field-based detection of the emerging seed-borne tomato brown rugose fruit virus. *Phytopathology* (Accepted)
6. Khuimphukhieo, I.*, J.C. Chavez, C. Avila, **A. Shi**, W. Ojeda, and J. Enciso. 2026. Use of unmanned aerial system (UAS)-based high-throughput phenotyping for yield prediction and growth analysis of spinach. *International Journal of Agronomy* 2026:1411368. <https://doi.org/10.1155/iao/1411368>.
7. Li, Y., X. Wu, Q. Chen, Z. Liu, X. Shi, Z. Meng, **A. Shi***, N. Li*, X. Chen*, and L. Yan*. 2026. Genome-wide Association Analysis of Soluble Sugar Content in Soybean Sprouts. *Journal of Plant Genetic Resources* 27 (8):1559-1570. <https://doi.org/10.13430/j.cnki.jpgr.20260311001>
8. Li, Y., X. Wu, Q. Yang, Z. Liu, X. Shi, Q. Chen, F. Wang, S. Lamlo, S. Zhao, Z. Gao, H. Ren, **A. Shi**, X. Chen*, and L. Yan*. 2026. Phenotypic characterization and germplasm screening for sprout agronomic performance in Huang-Huai soybean accessions. *Industrial Crops & Products*. Date: September 2026; Article: 124089, Volume: 251, <https://doi.org/10.1016/j.indcrop.2026.124089>
9. Park, S.*, S. Oh, E. Ahn, **A. Shi**, and B. Mou. 2026. Major Quantitative Trait Loci Control Low-Temperature Germination in Lettuce. *Life* 2026, 16(3), 411; <https://doi.org/10.3390/life16030411>
10. Qian W, Shi A and Liu L (2026) Editorial: Growth and development in horticultural crops: mechanisms, regulation, and innovation. *Front. Plant Sci.* 17:1947377. <https://doi.org/10.3389/fpls.2026.1947377>
11. Qu, Y., R. Du, K. Chiwina, R. Khanal, M.M. Ullah, H. Alkabkabi, Q. Luo, P. Rosas-Anderson, H. Xiong, C. Avila*, B. Mou*, and **A. Shi***. 2026. Genome-wide association study and genomic prediction of fruit weight trait in spinach. *Scientific Reports* (2026). <https://doi.org/10.1038/s41598-026-46903-1>
12. Riaz, A.*, A. Kumar, Y. Dwiningsih, A. Silva, **A. Shi**, and J. Thomas*. 2026. Integrative genomic analyses to unravel genomic regions and candidate genes associated with flag leaf photosynthesis in rice. *Frontiers in Plant Science* 22 April 2026, Sec. Photosynthesis and Photobiology, Volume 17 - 2026 | <https://doi.org/10.3389/fpls.2026.1752716>
13. Srungarapu, R.S., **A. Shi***, and C.A. Avila*. 2026. Genome-wide association mapping and genomic prediction of anthracnose resistance in spinach. *Plant Genome* 21 May 2026 <https://doi.org/10.1002/tpg2.70254>
14. Wang, M., X. Liu, S. La, Y. Zhang, **A. Shi**, J. Guo*, and L. Dong*. 2026. Effects of regulated deficit irrigation on tomato quality and key aroma compounds. *HortScience* 61(3), 475–482. <https://doi.org/10.21273/HORTSCI18820-25>
15. Wang, S., C. Wang, X. Wei, L. Qie, **A. Shi***, and Q. Yin*. 2026. Identification of candidate genes for malic acid content in tomato fruits and development of associated SNP markers. *Front. Plant Sci.*, 23 March 2026, Sec. Plant Genetics, Epigenetics and Chromosome Biology, Volume 17 - 2026 | <https://doi.org/10.3389/fpls.2026.1791734>

16. Zhang, J., Y. Li, C. Wang, F. Miao, L. Qie, C. Li, M. Zhou, **A. Shi**, Q. Yin*, and S. Wang*. 2026. Multi-trait evaluation of adult-stage salt tolerance identifies elite tomato germplasm under natural saline field conditions, *Horticulturae* 12(9), 1112; <https://doi.org/10.3390/horticulturae12091112>; <https://www.mdpi.com/2311-7524/12/9/1112>.

Submission

- Chen, Q., X. Shi, Q. Meng, L. Liu, B. Liu, Q. Yang, Z. Liu, C. Yang*, **A. Shi***, and L. Yan*. 2026. Genome-wide association study and genomic prediction of brown stem rot resistance in soybean.
- Corpuz, B.L., A.K. Jailani, A. Halpin-McCormick, A.R. Adhikari, S. Wages, M.B. Kantar, A. Shi, K. Ling, and J. Y. Suzuki. 2026. Application of Recombinase Polymerase Amplification (RPA) probes for rapid real-time detection of major sweet potato viruses in sweetpotato germplasm in Hawaii (Submitted to *PhytoFrontiers*, PHYTOFR-09-26-0105-SC).
- Das, M.K.*, **A. Shi**, S. Park, and B. Mou. 2026. Genomic prediction for salt tolerance at the seed germination stage in lettuce: an insight into across-population prediction (submitted to *Scientific Reports*).
- Gyawali, S., **A. Shi**, J.C. Correll, and L. J. du Toit*. 2026. Genome wide association study and genomic prediction of Fusarium wilt resistance in USDA spinach germplasm (Submitted to *Plant Pathology*)
- Jailani, A.K., A. Gilliard, C. Almeyda-Becerra, P. Wadl, M.L. Wang, **A. Shi**, and K. Ling*. 2026. A simple and rapid Exo RT-RPA field-based detection of five major DNA and RNA viruses infecting sweetpotato (Submitted to)
- Jailani, A.K., A. Gilliard, C.V. Almeyda, P.A. Wadl, M. Wang, J.Y. Suzuki, **A. Shi**, and K. Ling*. 2026. A real-time recombinase polymerase amplification platform for rapid and field-deployable detection of major sweetpotato viruses (Submitted to *Journal of Agricultural and Food Chemistry* Manuscript ID: jf-2026-144095)
- Joshi, V.*, M. Colley, **A. Shi**, and A. Formiga. 2026. Genomic dissection of seed productivity trait in spinach reveals major loci associated with flowering time, yield, and gender distribution balance (Submitted to *Scientific Reports*).
- Ling, K, A.K. Jailani, S. Qiong, A. Gilliard, and **A. Shi**. 2026. Improving bioassay on tomato brown rugose fruit virus seed health testing with biological relevance using image analysis (Submitted to *Phytofrontiers*)
- Olaoye, D., G. Bhattarai, J. Correll*, and **A. Shi***. 2026. Identification of novel genomic regions for downy mildew resistance and validation of predictive breeding in spinach (*Spinaciae oleracea*) (Submitted to *BMC Plant Biology*)
- Olaoye, D., L. Rasaki, O. Adesina, B. Kareem, S. Kandel, W. Ravelombola, Y. Yang, and **A. Shi***. 2026. RNA-seq meta-analysis and machine learning identify stress-responsive genes and improve genomic prediction in common bean (*Phaseolus vulgaris* L.) with cross-species application in cowpea (*Vigna unguiculata* L.); <https://doi.org/10.64898/2026.08.08.743654> ; <https://www.biorxiv.org/content/10.64898/2026.08.08.743654v1#follow-form>
- Tallury, S., T. Close, W. Ravelombola*, M. Mobley, **A. Shi**, E. Rios, and E. von Wettberg. 2026. The USDA *Vigna* germplasm collection: Status, prospects, challenges, and genetic vulnerability. *J. Plant Regist.* (Submitted).

Book Chapter

17. Kik, C., B. Mou, G. Bhattarai, **A. Shi**, J. C. Correll, and L. J. du Toit. 2026. F1 Hybrid Breeding and the Genetics of Disease and Pest Resistance, In *Compendium of Spinach Diseases, Pests, and Disorders*. APS PRESS Online Books. <https://doi.org/10.1094/9780890547106.01.03.1>

2025 (20)

18. Alatawi, I., H. Xiong, H. Alkabkabi, K. Chiwina, B. Mou*, Y. Qu, R. Du, Q. Luo, D.J. Harrison, and **A. Shi***. 2025. Genome-wide association study and genome prediction of tallness trait in spinach. *Front. Plant Sci.* 16:1654904. <https://doi.org/10.3389/fpls.2025.1654904>

19. Alatawi, I., H. Xiong*, K. Chiwina, H. Alkabkabi, Q. Luo, N.K. Joshi, X. Sun, X. Zhuang, K. Ling*, and **A. Shi***. 2025. Evaluation of salt tolerance in USDA tomato germplasm at seedling stage. *HortScience* 60:56–65. <https://doi.org/10.21273/HORTSCI18149-24>
20. Alatawi, I., H. Xiong*, H. Alkabkabi, K. Chiwina, Q. Luo, K. Ling, Y. Qu, R. Du, and **A. Shi***. 2025. Genetic diversity and population structure of tomato (*Solanum lycopersicum*). *Agronomy* 15:22. <https://doi.org/10.3390/agronomy15010022>
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Non-refereed Publications / Conference Proceedings

1. Ling, K.-S., J. Zhou, N. Jaiswal, B. Zia, B. Chanda, A. Gilliard, J. McGuire, A. Shi, J. Tung, S.P. Dinesh-Kumar, S.A. Whitham, and B. Baker. 2024. Managing tomato brown rugose fruit virus in tomato by incorporating short-term disinfection and long-term disease resistance. VII International Symposium on Tomato Diseases, Brasília, DF (Brazil), October 1–4 (accepted).
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ABSTRACTS PUBLISHED:

2026

1. Renjie Du; Yuejun Qu; Hanan Alkabkabi; Kenani Chiwina; Renuka Khanal; Qun Luo; Muhammad Muneeb Ullah; Erik Wijnker Wijnker; Lynn Vorstenbosch; Robbert Treuren; Chris Kik; Lindsey J. du Toit; Jim Correll; Beiquan Mou; **Ainong Shi**. “Genome-Wide Association Study of Resistance to Multiple Races of the Spinach Downy Mildew Pathogen (*Peronospora effusa*).” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S19**.
VGBR #1, 11:00 AM.
2. Raja Sekhar Srungarapu; **Ainong Shi**; Carlos A. Avila. “Integrating Genome-Wide Association and Genomic Prediction to Enhance Anthracnose Resistance (*Colletotrichum dematium*) in Spinach (*Spinacia oleracea* L.).” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S20**.
VGBR #1, 11:15 AM.
3. Muhammad Muneeb Ullah; Gehendra Bhattarai; Maryam Fallahi; Awais Riaz; Hannan Alkabkabi; Kenani Chiwina; Renuka Khanal; Yuejun Qu; Renjie Du; Pablo Rosas-Anderson; Beiquan Mou; James Correll; **Ainong Shi**. “Temporal Transcriptomic Profiling Reveals Early Defense Mechanisms in Spinach against Downy Mildew (*Peronospora effusa*).” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S21**.
VGBR #1, 11:30 AM.
4. **Ainong Shi**. “Development of Germplasm Resources and Molecular Breeding Tools to Combat Endemic and Emerging Diseases in Spinach Production.” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S89**.
Symposium presentation/item 8.
5. **Ainong Shi**; Jim Correll; Gehendra Bhattarai; Bo Liu; Heizheng Xiong; Dotun Olaoye; Yuejun Qu; Muhammad Muneeb Ullah; Renjie Du; Kenani Chiwina; Hanan Alkabkabi; Renuka Khanal; Lindsey du Toit; Sanjaya Gyawali; Sintayehu Daba; Carlos Avila; Jana Jeevan Rameneni; Raja Sekhar Srungarapu; Juan Enciso; Samuel Zapata; Larry Stein; Vijay Joshi; Benedict Analin; Beiquan Mou; Bindu Poudel-Ward; Chris Detranaltes; Susan Scheufele. “Development of Germplasm Resources and Molecular Breeding Tools to Combat Endemic and Emerging Diseases in U.S. Spinach Production.” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S160**.
GG #1, 10:15 AM.
6. Benedict Analin Arokia Samy; Dalton Thompson; **Ainong Shi**; Vijay Joshi. “Genetic and Physiological Markers of Heat Resilience in Spinach Cultivated under Organic Field Conditions.”

HortScience 61(8) Supplement, 2026 ASHS Annual Conference, **S208**.
Organic Horticulture poster 103.

7. Hanan Alkabkabi; Ibtisam Alatawi; Haizheng Xiong; Kenani Chiwina; Yuejun Qu; Renjie Du; Renuka Khanal; Muhammad Muneeb Ullah; BeiQuan Mou; **Ainong Shi**. “Genome-Wide Study of Salt Tolerance in USDA Spinach Germplasm at Seedling Stage.” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S251**.
VGBR #2, 4:45 PM.
8. Modan Das; Ivan Simko; **Ainong Shi**; BeiQuan Mou. “Genome-Wide Association Study of Salt Tolerance at the Seedling Stage in Lettuce.” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S310**.
GG #2, 9:30 AM.
9. Kenani Chiwina; Yuejun Qu; Hanan Alkabkabi; Muhammad Ullah; Renuka Khanal; BeiQuan Mou; Renjie Du; Qun Luo; **Ainong Shi**. “Genome-wide Association Study and Genomic Prediction of Monoecy in Spinach.” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S319**.
VGBR #3, 11:00 AM.
10. Renuka Khanal; Hanan Alkabkabi; Kenani Chiwina; Yuejun Qu; Renjie Du; Muhammad Muneeb Ullah; Michael Grusak; BeiQuan Mou; **Ainong Shi**. “Genome-Wide Association Study and Candidate Gene Identification for Mineral Accumulation in USDA Spinach Germplasm.” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S321**.
VGBR #3, 11:45 AM.
11. Yuejun Qu; Renjie Du; Kenani Chiwina; Hanan Alkabkabi; Muhammad Muneeb Ullah; Renuka Khanal; Qun Luo; Pablo Pablo Rosas-Anderson; Haizheng Xiong; Carlos A. Avila; BeiQuan Mou; **Ainong Shi**. “Genome-Wide Association Study and Candidate Gene Identification of Fruit Weight in USDA Spinach Germplasm.” *HortScience* 61(8) Supplement, 2026 ASHS Annual Conference, **S321**.
VGBR #3, 12:00 PM.

2025

12. Alatawi, I., H. Xiong, B. Mou, and A. Shi. 2025. Genome-Wide Association Study and Genomic Prediction of Leafminer Tolerance in Spinach. *PAG 32*, January 10–15, 2025, San Diego, USA. <https://pag.confex.com/pag/32/meetingapp.cgi/Paper/59122>
13. **Shi, A.**, H. Xiong, J. Vijay, B. Analin, C.A. Avila, and B. Mou. 2025. Genome-Wide Analysis for Nutritional Components in Spinach. *PAG 32*, January 10–15, 2025, San Diego, USA. <https://pag.confex.com/pag/32/meetingapp.cgi/Paper/56498>
14. Joshi, V., B. Analin, M. Colley, A. Shi, and A. Formiga. 2025, May. Genetic Studies on the Productivity Traits of Organic Spinach. In: *Scientific Conference on Breeding to Meet Environmental and Societal Challenges*, p. 152. https://orgprints.org/id/eprint/55838/1/EUCARPIA%202025_Abstracts_e-Book_Final_LS.pdf
15. **Shi, Ainong***; Kenani Chiwina; Hanan Alkabkabi; Qun Luo; Haizheng Xiong; Ibtisam Alatawi; Kai-Shu Ling. “Genome-wide Study of Salt Tolerance in USDA Tomato Germplasm at Seedling Stage.” *HortScience* 60(7) Supplement, 2025 ASHS Annual Conference, **S2**.
Session: Genetics and Germplasm 1, 9:00 AM.
16. Benedict Analin*; **Ainong Shi**; Vijay Joshi; Dalton Thompson. “Natural Variation and Genome-Wide Association Mapping of Photosynthetic Traits in USDA Spinach Germplasm Under Organic Production.” *HortScience* 60(7) Supplement, 2025 ASHS Annual Conference, **S44**.
Session: Organic Horticulture 1.
17. Kenani Chiwina*; Yuejun Qu; Renjie Du; Hanan Alkabkabi; Muhammad Ullah; Ibtisam Alatawi; Qun Luo; Derrick Harrison; BeiQuan Mou; **Ainong Shi**; Awais Riaz; Haizheng Xiong. “Evaluation of Drought Tolerance in USDA Tomato USDA Germplasm Using Morphological and Physiological Approaches.” *HortScience* 60(7) Supplement, 2025 ASHS Annual Conference, **S266**.
Session: Vegetable Breeding 2, 9:30 AM.

18. **Shi, Ainong***; Yuejun Qu; Renjie Du; Kenani Chiwina; Hanan Alkabkabi; Muhammad Ullah; Ibtisam Alatawi; Haizheng Xiong; Qun Luo; Derrick Harrison; Beiquan Mou. “Genome-Wide Association Study of Seed Spine in Spinach.” *HortScience* 60(7) Supplement, 2025 ASHS Annual Conference, **S491**.
Session: Vegetable Breeding 3, 1:45 PM.
19. Jana Jeevan Ramenen*; A. S. M. Faridul Islam; **Ainong Shi**; Carlos Avila. “GWAS-derived Markers Improves Genomic Prediction of Vitamin C Content in Spinach.” *HortScience* 60(7) Supplement, 2025 ASHS Annual Conference, **S491–S492**.
Session: Vegetable Breeding 3, 2:00 PM.
20. Kenani Chiwina*; Yuejun Qu; Hanan Alkabkabi; **Ainong Shi**; Muhammad Ullah; Awais Riaz; Renjie Du; Beiquan Mou. “Genome-wide Association Study Reveals Genetic Loci Associated with Leaf Base Color Variation in Spinach (*Spinacia oleracea* L.).” *HortScience* 60(7) Supplement, 2025 ASHS Annual Conference, **S492**.
Session: Vegetable Breeding 3, 2:15 PM.
21. Kenani Chiwina*; Yuejun Qu; Renjie Du; Hanan Alkabkabi; Muhammad Ullah; Ibtisam Alatawi; Haizheng Xiong; Qun Luo; Derrick Harrison; Beiquan Mou; **Ainong Shi**. “Genome-Wide Association Study and Genomic Prediction of Leaf Texture in USDA GRIN Spinach Germplasm.” *HortScience* 60(7) Supplement, 2025 ASHS Annual Conference, **S492–S493**.
Session: Vegetable Breeding 3, 2:30 PM.
22. Kenani Chiwina*; Yuejun Qu; Hanan Alkabkabi; Muhammad Ullah; Ibtisam Alatawi; Qun Luo; Derrick Harrison; **Ainong Shi**; Renjie Du; Haizheng Xiong. “Evaluation of Salt Tolerance in USDA Spinach (*Spinacia oleracea* L.) Germplasm at the Seedling Stage.” *HortScience* 60(7) Supplement, 2025 ASHS Annual Conference, **S493**.
Session: Vegetable Breeding 3, 2:45 PM.

2024

23. Alatawi, I., H. Xiong, B. Mou, A. Shi, G. Bhattarai, K. Chiwina, and H. Alkabkabi. 2024. Genome-Wide Association Study and Genome Prediction of Tallness Trait in Spinach. *HortScience* 59(9), S417. <https://doi.org/10.21273/HORTSCI.59.9S.S1>
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25. Bhattarai, G., A. Shi, S. Gyawali, C. Kik, R. van Treuren, and L. du Toit. 2024. Insights into the Genetic Diversity and Population Structure of Wild and Cultivated Spinach. *HortScience* 59(9), S35. <https://doi.org/10.21273/HORTSCI.59.9S.S1>
26. Bhattarai, G., A. Shi, B. Mou, and J.C. Correll. 2024. Progress and Insights Into Downy Mildew Resistance Mapping Efforts in Spinach. *HortScience* 59(9), S111. <https://doi.org/10.21273/HORTSCI.59.9S.S1>
27. Chiwina, K., H. Xiong, B. Mou, and A. Shi. 2024. Genome-Wide Association Study and Genome Prediction of Verticillium Wilt Resistance in Spinach. *HortScience* 59(9), S110. <https://doi.org/10.21273/HORTSCI.59.9S.S1>
28. Vijay Joshi, V., A. Shi, B. Analin, M. Colley, and A. Formiga. 2024. Phenotypic Landscape of the Photosynthetic Performance and Seed Productivity of Spinach Germplasm under Organic Conditions. *HortScience* 59(9), S261, S246. <https://doi.org/10.21273/HORTSCI.59.9S.S1>
29. Xiong, H., A. Shi, K. Chiwina, I. Alatawi, and H. Alkabkabi. 2024. Genome-Wide Association Study Identifies Key SNPs Associated with Mineral Element Accumulation in Spinach. *HortScience* 59(9), S546. <https://doi.org/10.21273/HORTSCI.59.9S.S1>

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30. Alatawi, I., H. Xiong, G. Bhattarai, B. Mou, and A. Shi. 2023. Genome-Wide Association Study and Genomic Prediction of Leafminer Tolerance in Spinach. [Abstract]. ASA, CSSA, SSSA International Annual Meeting, St. Louis, MO. <https://scisoc.confex.com/scisoc/2023am/meetingapp.cgi/Paper/151456>

31. Bhattarai, G., B. Liu, H. Xiong, J.C. Correll, and A. Shi. 2023. Evaluation and Development of Genomic Tools for Breeding Pythium-Resistant Spinach Cultivars in Both Conventional and Controlled Environment Production. [Abstract]. ASHS Annual Conference, Orlando, FL. <https://ashs.confex.com/ashs/2023/meetingapp.cgi/Paper/39722>
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112. Bhattarai, G., J. Qin, Y. Weng, L. John, B. Morris, W. Ravelombola, W. Yang, and A. Shi. Association Analysis of Cowpea Mosaic Virus Resistance in the USDA Cowpea Germplasm Collection. *NAPB 2017 Annual Meeting*, Aug. 7–10, University of California, Davis, CA, USA. TU07. [Link](#)
113. Kumar, A., J. Thomas, S. Basu, R. Venkategowda, A. Shi, S. Yingling, and A. Pereira. P0779: Genome Mapping, Tagging & Characterization: Rice Genome-Wide Association Study of Water Use Efficiency and Drought Resistance Traits in Rice. *Plant & Animal Genomics XXV*, 2017. [Link](#)
114. Qin, J., A. Shi, S. Chen, T.E. Michaels, and Y. Weng. Whole Genome Sequencing and Resequencing for Genome-Wide Study in Common Bean. *ASA-CSSA-SSSA 2017 Annual Meeting*. [Link](#)
115. Qin, J., Q. Song, A. Shi, S. Li, M. Zhang, and B. Zhang. Genome-Wide Association Study of Resistance to Five Races of *Phytophthora sojae* in Soybean. *ASA-CSSA-SSSA 2017 Annual Meeting*. [Link](#)
116. Qin, J., A. Shi, B. Mou, M.A. Grusak, J. Correll, Y. Weng, D. Motes, L. Dong, W. Yang, G. Bhattarai, W. Ravelombola, H. Xiong, and J. Ma. Genetic Diversity and Association Analysis of Mineral Components in Spinach. *ASHS 2017 Annual Meeting*, Sept. 19–22, Waikoloa, Hawaii, USA. [Link](#)
117. Qin, J., and A. Shi. Association Analysis of Seed Antioxidant Content and Aphid Tolerance in Cowpea. *Plant & Animal Genomics XXV*, Jan. 14–18, 2017, San Diego, CA, USA. [Link](#)
118. Ravelombola, W., A. Shi, Y. Weng, B. Mou, D. Motes, J.R. Clark, P. Chen, V. Srivastava, J. Qin, L. Dong, W. Yang, G. Bhattarai, and Y. Sugihara. Evaluation of Association Analysis of Salt Tolerance in Cowpea. *ASHS 2017 Annual Meeting*, Sept. 19–22, Waikoloa, Hawaii, USA. [Link](#)

119. **Shi, A.**, J. Qin, B. Mou, J. Correll, Y. Weng, C. Feng, D. Motes, W. Yang, G. Bhattarai, W. Ravelombola, L. Dong, and Y. Sugihara. Genome-Wide Association Study Using Next-Generation Sequencing in Spinach. *ASHS 2017 Annual Meeting*, Sept. 19–22, Waikoloa, Hawaii, USA. [Link](#)
120. **Shi, A.**, J. Qin, Y. Weng, W. Ravelombola, D. Motes, H. Xiong, L. Dong, W. Yang, G. Bhattarai, and B. Mou. Whole Genome Sequencing and Resequencing for Genome-Wide Study in Cowpea. *ASHS 2017 Annual Meeting*, Sept. 19–22, Waikoloa, Hawaii, USA. [Link](#)
121. **Shi, A.**, J. Qin, Y. Weng, B. Mou, S. Chen, W. Ravelombola, D. Motes, H. Xiong, L. Dong, W. Yang, and G. Bhattarai. Genome-Wide Association Study (GWAS) in Cowpea. *ASA-CSSA-SSSA 2017 Annual Meeting*, Oct. 22–25, Tampa, FL. [Link](#)
122. **Shi, A.**, B. Mou, J. Ma, J. Correll, J. Qin, Y. Weng, D. Motes, and W. Yang. Genetic Diversity and Association Analysis in Spinach. *Plant & Animal Genomics XXV*, Jan. 14–18, 2017, San Diego, CA, USA. [Link](#)
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126. Ravelombola, W., Y. Weng, D. Motes, and A. Shi. Evaluation of Salt Tolerance at Germination Stage in USDA Cowpea Germplasm. *ASHS 2016 Annual Meeting*. [Link](#)
127. Ravelombola, W., Y. Weng, D. Motes, C. Wingfield, and A. Shi. Evaluation of Total Seed Protein Content in Eleven Arkansas Cowpea Genotypes. *ASHS 2016 Annual Meeting*. [Link](#)
128. **Shi, A.**, B. Mou, J. Correll, D. Motes, Y. Weng, J. Qin, and Y. Wei. Association Analysis of Resistance to Verticillium Wilt in Spinach. *ASHS 2016 Annual Meeting*. [Link](#)
129. **Shi, A.**, B. Mou, J. Correll, S. Koike, L. du Toit, D. Motes, J. Qin, Y. Weng, and W. Yang. Association Analysis of Stemphylium Leaf Spot Resistance in Spinach. *ASHS 2016 Annual Meeting*. [Link](#)
130. Weng, Y., D. Moseley, W. Yang, W. Ravelombola, J. Qin, D. Motes, P. Chen, and A. Shi. Evaluation of Two Methods for Measuring Cowpea Seed Protein Content. *ASHS 2016 Annual Meeting*. [Link](#)
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132. Yang, W., A. Shi, J. Ma, J. Correll, M. Evans, D. Motes, H. Xiong, Y. Weng, and J. Qin. Identification of the Pathogen of Powdery Mildew Disease on Dandelions. *ASHS 2016 Annual Meeting*. [Link](#)

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133. **Shi, A.**, B. Mou, J. Ma, J. Correll, and D. Motes. SNP Discovery, Genetic Diversity and Association Analysis in Spinach. *2015 International Spinach Conference*, February 24–25, 2015, Yuma, AZ. [Link](#)
134. Chitwood, J., A. Shi, M. Evans, J.R. Clark, D. Motes, P. Chen, D. Hensley, C. Rom. The Use of Seed Germination Rate as an Indicator of Heat Tolerance in Spinach (*Spinacia oleracea* L.). *HortScience* 50(9) Supplement—2015 ASHS Annual Conference, S120.
135. Chitwood, J., A. Shi, B. Mou, J.R. Clark, D. Motes. Genetic Diversity and Association Analysis for Bolting, Tallness, and Erectness in Spinach. *HortScience* 50(9) Supplement—2015 ASHS Annual Conference, S391.
136. **Shi, A.**, B. Buckley, J. Clark, D. Motes, B. Mou, D. Hensley, H. Xiong, J. Ma, J. Chitwood, and N. Barkley. Molecular Breeding in Cowpea. *HortScience* 49(9) Supplement, S244.
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138. **Shi, A.**, B. Buckley, B. Mou, H. Xiong, W. Lu, J. Ma, D. Motes, D. Hensley, and J. Chitwood. Association Analysis in Cowpea. [Link](#)

139. **Shi, A.,** B. Mou, J. Ma, Z. Fei, J. Correll, D. Motes, C. Feng, J. Chitwood, W. Lu, and H. Xiong. SNP Discovery and Genetic Diversity in Spinach. [Link](#)
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142. Xiong, H., J. Clark, B. Mou, D. Motes, D. Hensley, J. Ma, J. Chitwood, and A. Shi. Development of SSR and SNP Markers and Association Mapping of Morphological Traits in Cowpea. *HortScience* 49(9) Supplement, S248.
143. Chitwood, J., M. Evans, C. Rom, B. Mou, D. Motes, J. Ma, H. Xiong, and A. Shi. Temperature Effect on Seed Germination in Spinach. *HortScience* 49(9) Supplement, S294.
144. Ma, J., A. Shi, B. Mou, M. Evans, J. Clark, D. Motes, H. Xiong, J. Chitwood, and J. Campbell. Association Mapping of Leaf Traits of Spinach. *HortScience* 49(9) Supplement, S249.
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146. Ma, J., A. Shi, M.R. Evans, B. Mou, D. Motes, H. Xiong, W. Lu, and J. Chitwood. SNP Discovery and Genetic Diversity in Dandelion. [Link](#)
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150. **Shi, A.,** P. Chen, B. Zhang, and A. Hou. Genetic Diversity and Association Analysis of Protein and Oil Contents in Food-type Soybean. *ASA-CSSA-SSSA 2008 International Annual Meetings*, October 25-29, 2008, Houston, TX.
151. Sharma, M., S.K. Kantartzi, A. Shi, and J.M. Stewart. Chloroplast Microsatellite Primers for Distinguishing Tetraploid Cotton Species. *ASA-CSSA-SSSA 2008 International Annual Meetings*, Houston, TX.
152. Hou, A., J. Alloatti, L. Mozzoni, B. Zhang, A. Shi, and P. Chen. Genetic Variability of Seed Sugar Content in Worldwide Soybean Collections. *ASA-CSSA-SSSA 2008 Meetings*, Houston, TX.
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154. Zhang, B., P. Cheng, L. Florez-Palacios, A. Hou, and A. Shi. Genetic Association Analysis for the Discovery of Calcium Content in Soybean Seeds. *ASA-CSSA-SSSA 2008 International Annual Meetings*, Houston, TX.
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162. Hou, A., P. Chen, T. Ishibashi, L. Mozzoni, B. Cornelius, A. Shi, B. Zhang, and C. Gray. 2007. Yield potential and agronomic performance of historical soybean cultivars under modern cultivation conditions. *ASA-CSSA-SSSA 2007 International Annual Meetings*, November 4–8, 2007, New Orleans, LA.
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164. **Shi, A.**, P. Chen, and A. Hou. 2007. Phenotypic interaction of two soybean mosaic virus strains. *Phytopathology* 97(7): S107.
165. Miranda, L.M., J.H. Lyerly, G. Srnic, L. Perugini, J.J. Maxwell, A. Shi, D. Marshall, C. Cowger, S. Leath, G. Brown-Guedira, J. Kolmer, R.A. Navarro, and J.P. Murphy. 2007. Genetic and mapping of powdery mildew resistance in North Carolina wheat germplasm. *2007 Eastern Wheat Workers / Southern Small Grain Workers Conference*.
166. **Shi, A.**, P. Chen, C. Zheng, A. Hou, and S. Zhu. 2006. Gene pyramiding for soybean mosaic virus resistance using microsatellite markers. *ASA-CSSA-SSSA 2006 International Annual Meetings*, November 12–16, 2006, Indianapolis, IN.
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168. Zheng, C., P. Chen, and A. Shi. 2006. Identification of new genes for resistance to soybean mosaic virus in soybean. *ASA-CSSA-SSSA 2006 International Annual Meetings*, November 12–16, 2006, Indianapolis, IN.
169. Chen, P., B. Cornelious, C. Feng, A. Hou, L. Mozzoni, A. Shi, and B. Zhang. 2006. Genetic divergence and relatedness of historical soybean cultivars assessed by AFLP markers. *ASA-CSSA-SSSA 2006 International Meetings*, November 12–16, 2006, Indianapolis, IN.
170. Zhu, S., X. Fu, F. Yuan, R. Luo, A. Shi, A. Hou, B. Li, D. Zhu, and P. Chen. 2006. Development and evaluation of a RIL population for seed quality improvement in vegetable soybean. *ASA-CSSA-SSSA 2006 International Annual Meetings*, November 12–16, 2006, Indianapolis, IN.
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175. **Shi, A.**, M. Mmbaga, S. Reed, and J. Bai. 2005. Identification of NBS-LRR type disease resistance gene analogs in dogwood (*Cornus florida*). *Phytopathology* 95: S95.

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181. Shi, A., S. Leath, and J.P. Murphy. 1997. Identification of RAPD markers linked to two major genes for powdery mildew resistance in Pm12 wheat line. *Phytopathology* 87: S89.
182. Shi, A., S. Leath, X. Chen, and J.P. Murphy. 1997. Identification of wheat powdery mildew resistance genes in twenty-two wheat lines. *Phytopathology* 87: S89.
183. Shi, A., S. Leath, X. Chen, and J.P. Murphy. 1996. Transfer of resistance to wheat powdery mildew from *Dasyphyrum villosum* to *Triticum aestivum*. *Phytopathology* 86: S47.
184. Shi, A., S. Leath, and J.P. Murphy. 1996. Transfer of a major gene for wheat powdery mildew resistance from einkorn wheat to common wheat. *Phytopathology* 86: S56.
185. Shi, A., S. Leath, and J.P. Murphy. 1995. Identification of RAPD markers linked to major genes for resistance to powdery mildew in wheat. *Phytopathology* 85: 1023: 712.

Conferences and Presentations

In addition to 166 abstracts that were presented at conference meetings, 64 presentations as a co-author.

1. Alkabkabi, H., I. Alatawi, H. Xiong, K. Chiwina, Y. Qu, R. Du, R. Khanal, M.M. Ullah, B. Mou, and A. Shi. 2026. Genome-wide study of salt tolerance in USDA spinach germplasm at the seedling stage. ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
2. Amirudeen, A.K.J., A. Gilliard, A. Shi, and K.-S. Ling. 2026. Rapid, field-based detection of tomato brown rugose fruit virus in plant and seed tissues using a one-step Exo RT-RPA assay. Plant Health 2026, Providence, Rhode Island, USA, August 1–4, 2026.
3. Amirudeen, A.K.J., A. Gilliard, C.V. Almeyda, M.L. Wang, P.A. Wadl, A. Shi, and K.-S. Ling. 2026. P-517. Fast, on-site, and simultaneous detection of two strains of sweet potato chlorotic stunt virus using a simple duplex Exo RT-RPA assay. Plant Health 2026, Providence, Rhode Island, USA, August 1–4, 2026.
4. Chiwina, K., Y. Qu, H. Alkabkabi, M.M. Ullah, R. Khanal, B. Mou, R. Du, Q. Luo, and A. Shi. 2026. Genome-wide association study and genomic prediction of monoecy in spinach. ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
5. Daba, S.D., M. Gordon, S. Gyawali, A. Shi, and L.J. du Toit. 2026. P-119. Putative candidate genes in *Spinacia oleracea* for resistance to races 1 and 2 of *Fusarium oxysporum* f. sp. *spinaciae*. Plant Health 2026, Providence, Rhode Island, USA, August 1–4, 2026.
6. Das, M., I. Simko, A. Shi, and B. Mou. 2026. Genome-wide association study of salt tolerance at the seedling stage in lettuce. ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
7. Du, R., Y. Qu, H. Alkabkabi, K. Chiwina, R. Khanal, Q. Luo, M.M. Ullah, E. Wijnker, L. Vorstenbosch, R. van Treuren, C. Kik, L.J. du Toit, J. Correll, B. Mou, and A. Shi. 2026. Genome-wide association study of resistance to multiple races of the spinach downy mildew pathogen (*Peronospora effusa*). ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
8. Khanal, R., H. Alkabkabi, K. Chiwina, Y. Qu, R. Du, M.M. Ullah, M. Grusak, B. Mou, and A. Shi. 2026. Genome-wide association study and candidate gene identification for mineral accumulation in USDA spinach germplasm. ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.

9. Ling, K.-S., A.K.J. Amirudeen, A. Gilliard, and A. Shi. 2026. P-520. Developing a rapid and sensitive bioassay to determine tomato brown rugose fruit virus infection on treated tomato seeds. Plant Health 2026, Providence, Rhode Island, USA, August 1–4, 2026.
10. Qu, Y., R. Du, K. Chiwina, H. Alkabkabi, M.M. Ullah, R. Khanal, Q. Luo, P. Rosas-Anderson, H. Xiong, C.A. Avila, B. Mou, and A. Shi. 2026. Genome-wide association study and candidate gene identification for fruit weight in USDA spinach germplasm. ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
11. Samy, B.A.A., D. Thompson, A. Shi, and V. Joshi. 2026. Genetic and physiological markers of heat resilience in spinach cultivated under organic field conditions. ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
12. Shi, A., J. Correll, G. Bhattarai, B. Liu, H. Xiong, D. Olaoye, Y. Qu, M.M. Ullah, R. Du, K. Chiwina, H. Alkabkabi, R. Khanal, L.J. du Toit, S. Gyawali, S. Daba, C. Avila, J.J. Rameneni, R.S. Srungarapu, J. Enciso, S. Zapata, L. Stein, V. Joshi, B. Analin, B. Mou, B. Poudel-Ward, C. Detranaltes, and S. Scheufele. 2026. Development of germplasm resources and molecular breeding tools to combat endemic and emerging diseases in U.S. spinach production. ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
13. Srungarapu, R.S., A. Shi, and C.A. Avila. 2026. Integrating genome-wide association and genomic prediction to enhance anthracnose resistance (*Colletotrichum dematium*) in spinach (*Spinacia oleracea* L.). ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
14. Ullah, M.M., G. Bhattarai, M. Fallahi, A. Riaz, H. Alkabkabi, K. Chiwina, R. Khanal, Y. Qu, R. Du, P. Rosas-Anderson, B. Mou, J. Correll, and A. Shi. 2026. Temporal transcriptomic profiling reveals early defense mechanisms in spinach against downy mildew (*Peronospora effusa*). ASHS 2026 Annual Conference, Dallas, Texas, USA, August 3–7, 2026.
15. Scheufele, S.B., G. Higgins, and A. Shi. 2025. Winter spinach production in New England. International Spinach Conference, Monterey, California, USA, October 21-22, 2025.
16. Correll, J.C., C. Feng, M. Fallahi, M.I. Villarreal-Zaballos, B. Dhillon, A. Shi, H.V., Zima, K. Clark, S.J. Klosterman, B. Irish. 2025. A 35-year perspective on downy mildew of spinach caused by *Peronospora effusa*. International Spinach Conference, Monterey, California, USA, October 21-22, 2025.
17. Fallahi, M., M.I. Villarreal-Zaballos, H.V., Zima, S.J. Klosterman, A. Shi, and J.C. Correll. 2025. Race Diversity in the spinach downy mildew pathogen *Peronospora effusa*. International Spinach Conference, Monterey, California, USA, October 21-22, 2025.
18. Mou, B., and A. Shi. 2025. Leafminer resistance in spinach. International Spinach Conference, Monterey, California, USA, October 21-22, 2025.
19. Shi, A., J. Correll, G. Bhattarai, B. Liu, H. Xiong, Y. Qu, and D. Olaoye, L.J. du Toit, S. Gyawali, S.D. Daba, C.A. Avila, J. J. Rameneni, R.S. Srungarapu, L. Stein, V. Joshi, B. Analin, and B. Mou. 2025. Genome-wide Analysis for Disease Resistance, Nutrients, and Health-Promoting Compounds in Spinach. International Spinach Conference, Monterey, California, USA, October 21-22, 2025.
20. Daba, S.D., M.I. Gordon, S. Gyawali, A. Shi, and L.J. du Toit. 2025. Genpme-wide association study of spinach accessions for resistance to two races of *Fusarium oxysporum* f.sp. *spinaciae*. International Spinach Conference, Monterey, California, USA, October 21-22, 2025.
21. Avila, C.A., R.S. Srungarapu, and A. Shi. 2025. Genome-wide association mapping and genomic prediction of anthracnose (*Colletotrichum dematium*) resistance in spinach (*Spinacia oleracea* L.). International Spinach Conference, Monterey, California, USA, October 21-22, 2025.
22. Alatawi, I., H. Xiong, K. Chiwina, H. Alkabkabi, Q. Luo, K.-S. Ling, and A. Shi. 2025. *Genome-wide study of salt tolerance in USDA tomato germplasm at the seedling stage*. ASHS 2025 Annual Conference, July 28 – August 1, New Orleans, USA.
23. Avila, C.A., J.J. Rameneni, A.S.M.F. Islam, and A. Shi. 2025. *Genomic prediction of vitamin C in spinach*. Annual Meeting of the Society for Experimental Biology, July 8–11, Antwerp, Belgium.
24. Chiwina, K., A. Riaz, H. Xiong, I. Alatawi, H. Alkabkabi, B. Mou, Y. Qu, R. Du, Q. Luo, M.M. Ullah, D.J. Harrison, and A. Shi. 2025. *Evaluation of drought tolerance in USDA tomato germplasm using*

- morphological and physiological approaches*. ASHS 2025 Annual Conference, July 28 – August 1, New Orleans, USA.
25. Du, R., Y. Qu, K. Chiwina, H. Alkabkabi, M.M. Ullah, I. Alatawi, H. Xiong, Q. Luo, D.J. Harrison, B. Mou, and A. Shi. 2025. *Genome-wide association study and genomic prediction of leaf texture in USDA GRIN spinach germplasm*. ASHS 2025 Annual Conference, July 28 – August 1, New Orleans, USA.
 26. Enciso, J., C.A. Avila, J.C. Chavez, I. Khuimphukhieo, A. Shi, and W. Ojeda. 2025. *Unmanned aerial system (UAS)-based phenotyping for selection of spinach varieties*. Annual Meeting of the Society for Experimental Biology, July 8–11, Antwerp, Belgium.
 27. Qu, Y., R. Du, K. Chiwina, H. Alkabkabi, M.M. Ullah, I. Alatawi, Q. Luo, D.J. Harrison, B. Mou, and A. Shi. 2025. *Genome-wide association study of seed spine in spinach*. ASHS 2025 Annual Conference, July 28 – August 1, New Orleans, USA.
 28. Rameneni, J.J., A.S.M.F. Islam, A. Shi, and C.A. Avila. 2025. *GWAS-derived markers improve genomic prediction of vitamin C content in spinach*. ASHS 2025 Annual Conference, July 28 – August 1, New Orleans, USA.
 29. Ullah, M.M., A. Riaz, H. Alkabkabi, K. Chiwina, Y. Qu, R. Du, B. Mou, and A. Shi. 2025. *Genome-wide association study reveals genetic loci associated with leaf base color variation in spinach (*Spinacia oleracea* L.)*. ASHS 2025 Annual Conference, July 28 – August 1, New Orleans, USA.
 30. Correll, J.C., B. Dhillon, A. Shi, K.H. Lamour, P. Tandy, B. Bluhm, S. Klosterman, K. Clark, H.V. Zima, and M. Villarroel-Zeballos. 2023. *Spinach downy mildew: mitigating a conundrum*. 10th Eucarpia Leafy Vegetables Conference, August 28–31, Utrecht, The Netherlands.
 31. **Shi, A.** 2019. *Cowpea breeding program at the University of Arkansas*. Legume Workshop, March 4–5, The Samuel Roberts Noble Foundation, Ardmore, OK.
 32. **Shi, A.**, J. Qin, S. Chen, and T. Michaels. 2019. *Genetic diversity and association study of SCN resistance in common bean*. Bean Improvement Cooperative (BIC) and North American Pulse Improvement Association (NAPIA) Joint Meeting, November 3–8, Fargo, ND.
 33. Correll, J., C. Feng, and A. Shi. 2018. *White rust: beyond borders*. The 2018 International Spinach Conference, February 14–15, Murcia, Spain.
 34. Dhillon, B., C. Feng, A. Shi, Q. Pan, and J. Correll. 2018. *Spinach genome sequence overview including NIL1 and candidate resistance genes*. The 2018 International Spinach Conference, February 14–15, Murcia, Spain.
 35. Feng, C., B. Liu, B. Dhillon, M. Villarroel-Zeballos, B. Bluhm, A. Shi, and J. Correll. 2018. *Molecular markers for spinach sex determination*. The 2018 International Spinach Conference, February 14–15, Murcia, Spain.
 36. Ravelombola, W., J. Qin, A. Shi, Y. Weng, G. Bhattarai, L. Dong, and J.B. Morris. 2018. *A SNP-based association analysis for plant growth habit in worldwide cowpea germplasm*. Southern Region ASHS Conference, February 2–4, Jacksonville, FL.
 37. Ravelombola, W., J. Qin, Y. Weng, G. Bhattarai, and A. Shi. 2018. *Evaluation of drought tolerance in cowpea*. Southern Region ASHS Conference, February 2–4, Jacksonville, FL.
 38. Ravelombola, W., Y. Weng, J. Qin, and A. Shi. 2018. *Phenomics of cowpea at the seedling stage under salt stress*. Southern Region ASHS Conference, February 2–4, Jacksonville, FL.
 39. Ravelombola, W., Y. Weng, J. Qin, and A. Shi. 2018. *A rapid approach for salt tolerance evaluation in cowpea at the seedling stage*. Southern Region ASHS Conference, February 2–4, Jacksonville, FL.
 40. Ravelombola, W., J. Qin, A. Shi, J.C. Miller Jr., D. Scheuring, Y. Weng, G. Bhattarai, L. Dong, and W. Yang. 2018. *Association analysis for iron deficiency chlorosis tolerance in cowpea*. Southern Region ASHS Conference, February 2–4, Jacksonville, FL.
 41. **Shi, A.** 2018. *Genome-wide association study and genomic selection in spinach*. Guest talk, February 23, Arkansas Biosciences Institute, Arkansas State University, Jonesboro, AR.
 42. **Shi, A.**, J. Qin, Y. Weng, J. Correll, C. Feng, G. Bhattarai, W. Ravelombola, B. Zia, W. Zhou, and B. Mou. 2018. *Genetic diversity, genome-wide association study, and genomic selection in spinach*. The 2018 International Spinach Conference, February 14–15, Murcia, Spain.

43. **Shi, A.**, J. Qin, Y. Weng, G. Bhattarai, W. Ravelombola, B. Zia, W. Zhou, J. Correll, and B. Mou. 2018. *Genetic diversity and genome-wide association study in spinach*. Southern Region ASHS Conference, February 2–4, Jacksonville, FL.
44. **Shi, A.**, J. Qin, B. Mou, Y. Weng, W. Ravelombola, H. Xiong, and G. Bhattarai. 2018. *Genetic diversity, population structure, and genome-wide association study in cowpea*. Southern Region ASHS Conference, February 2–4, Jacksonville, FL.
45. Weng, Y., J. Qin, G. Bhattarai, W. Ravelombola, B. Zia, W. Zhou, and A. Shi. 2018. *Study on photoperiodism in spinach (Spinacia oleracea L.)*. Southern Region ASHS Conference, February 2–4, Jacksonville, FL.
46. Bhattarai, G., J. Qin, Y. Weng, L.J.B. Morris, W. Ravelombola, W. Yang, and A. Shi. 2017. *Association analysis of cowpea mosaic virus resistance in the USDA cowpea germplasm collection*. National Association of Plant Breeders (NAPB) Annual Meeting, August 7–10, University of California, Davis, CA.
47. **Shi, A.** 2017. *Cowpea breeding and genetic research*. Horticulture Department Seminar, September 27, University of Arkansas, Fayetteville, AR.
48. **Shi, A.** 2017. *Whole genome sequencing and genotyping-by-sequencing for crop improvement*. Cell and Molecular Biology (CEMB) Program Seminar, April 7, University of Arkansas, Fayetteville, AR.
49. **Shi, A.**, and J. Correll. 2017. *Spinach molecular breeding*. International Working Group on *Peronospora farinosa* (IWGP) Conference, February 1, The Netherlands.
50. Correll, J.C., C. Feng, A. Shi, and K.H. Lamour. 2016. *Race diversity of the spinach downy mildew pathogen*. The 2016 International Spinach Conference, November 30 – December 1, San Antonio, TX.
51. Ravelombola, W., Y. Weng, D. Motes, C. Wingfield, and A. Shi. 2016. *Evaluation of cowpea salt tolerance*. Biology Department Seminar, September 7, University of Arkansas, Fayetteville, AR.
52. Ravelombola, W., Y. Weng, D. Motes, C. Wingfield, and A. Shi. 2016. *Variability of protein content in cowpea*. Global Food Security Workshop, August 5–18, Purdue University, West Lafayette, IN.
53. **Shi, A.** 2016. *Spinach molecular breeding*. Guest talk, September 15, Arkansas Biosciences Institute, Arkansas State University, Jonesboro, AR.
54. **Shi, A.**, and J. Correll. 2016. *Molecular plant breeding in the University of Arkansas spinach breeding program*. International Working Group on *Peronospora farinosa* (IWGP) Conference, February 1, The Netherlands.
55. **Shi, A.** 2015. *Molecular plant breeding in the University of Arkansas spinach breeding program*. Horticulture Department Seminar, October 14, University of Arkansas, Fayetteville, AR.
56. **Shi, A.** 2015. *Research progress of association analysis and SNP marker identification for white rust resistance in spinach*. Teleconference, August 27, with Del Monte, Enza Zaden, Pop Vriend Seeds, Rijk Zwaan, Sakata, Texas A&M AgriLife, and University of Arkansas.
57. **Shi, A.**, B. Mou, J. Ma, J. Correll, and D. Motes. 2015. *SNP discovery, genetic diversity, and association analysis in spinach*. The 2015 International Spinach Conference, February 24–25, Yuma, AZ.
58. **Shi, A.**, and D. Motes. 2015. *Cowpea breeding and genetics program at the University of Arkansas*. 2015 Southern Pea Field Day, August 12, Alma, AR.
59. **Shi, A.** 2014. *Molecular breeding in vegetable crops*. Plant Pathology Department Seminar, September 9, University of Arkansas, Fayetteville, AR.
60. **Shi, A.**, B. Mou, Z. Fei, J. Correll, D. Motes, J. Ma, and C. Feng. 2013. *Genome-wide SNP discovery, genetic map construction, linkage mapping, and genome-wide association in spinach using genotyping-by-sequencing*. 2013 International Spinach Conference, December 10–12, Guangzhou, China.
61. Correll, J.C., C. Feng, A. Shi, K.E. Kammeijer, S. Koike, L. DuToit, K.H. Lamour, and D.N. McRoberts. 2013. *Downy mildew of spinach: are we making progress?* 2013 International Spinach Conference, December 10–12, Guangzhou, China.

62. **Shi, A.**, R. Vierling, and R. Grazzini. 2009. *Development of a 13-SNP multiplex assay for I-2, Mi, SW-5, Tm-2, and Ve1 disease resistance genes in tomato*. 42nd Tomato Breeder Roundtable Conference, July 28 – August 2, Sacramento, CA.
63. **Shi, A.**, P. Chen, B. Zhang, and A. Hou. 2008. *Genetic diversity and association analysis of protein and oil contents in food-type soybean*. Global Plant Breeding Conference, June 16–18, Des Moines, IA.
64. Costich, D., A. Shi, J. Cherney, M. Casler, and E. Buckler. 2008. *An assessment of ploidy variation in switchgrass and its impact on association mapping*. Pan-American Congress on Plants and BioEnergy, June 22–25, Mérida, Mexico.

PATENTS

Justia Patent Lists: <https://patents.justia.com/inventor/ainong-shi>; | <https://idiyas.com/inventor/ainong-shi> | <https://patents.google.com/?inventor=ainong+shi&oq=ainong+shi>

1. Nematode Resistance Alleles in Soybean

- Patent Numbers: 20220033886; 11180795
- Abstract: Methods for conveying soybean cyst nematode (SCN) resistance into non-resistant soybean germplasm, including marker-assisted breeding using nucleic acid markers linked to SCN resistance. SNPs associated with SCN resistance and soybean plants/seeds produced by these methods are provided.
- Type: Grant
- Filed: Oct 19, 2021; Jun 2, 2016
- Date of Patent: Nov 23, 2021; Feb 3, 2022
- Assignee: Syngenta Participations AG
- Inventors: **Ainong Shi**, Becky Welsh Breitingner, Ju-Kyung Yu, Azhaguvel Perumal
- [Patent Link 1](#) | [Patent Link 2](#)

2. Molecular Markers Linked to Disease Resistance in Soybean

- Patent Numbers: 11716943; US11716943B2; US-2020-0291418-A1; 10655142
- Abstract: Methods for identifying, selecting, and/or producing soybean plants or germplasm carrying the Rps1 resistance allele against *Phytophthora sojae*. Plants, parts, and germplasm identified or produced by these methods are included.
- Type: Grant
- Filed: Jan 19, 2016; Apr 24, 2020
- Date of Patent: May 19, 2020; Aug 8, 2023
- Assignee: Syngenta Participations AG
- Inventors: **Ainong Shi**, Harish T. Gandhi, Becky Welsh Breitingner, Zhanyou Xu, Roger L. McBroom, Harikrishnan Ramasubramaniam
- [Patent Link 1](#) | [Patent Link 2](#)

3. Molecular Markers Associated with Soy Iron Deficiency Chlorosis

- Patent Numbers: 11236400; 10648041; 9879326
- Abstract: Methods for identifying, selecting, and/or producing soybean plants or germplasm tolerant to iron deficiency chlorosis, including progeny and seeds derived from these plants.
- Type: Grant
- Filed: Dec 3, 2015; Dec 15, 2017; Apr 2, 2020
- Date of Patent: Jan 30, 2018; May 12, 2020; Feb 1, 2022
- Assignee: Syngenta Participations AG
- Inventors: Mark Charles Hamilton, Craig Lynn Davis, Jean Robert Gelin, Elhan Sultan Ersoz, Ju-Kyung Yu, Thomas Joseph Curley, Baohong Guo, **Ainong Shi**
- [Patent Link 1](#) | [Patent Link 2](#)

4. Resistance Alleles in Soybean

- Patent Numbers: 9458504; 9708674; 10544470

- Abstract: Methods for identifying, selecting, and/or producing soybean plants or germplasm with iron deficiency chlorosis tolerance.
 - Type: Grant
 - Filed: Apr 30, 2012; Sep 1, 2016; Jun 13, 2017
 - Date of Patent: Oct 4, 2016; Jul 18, 2017; Jan 28, 2020
 - Assignee: Syngenta Participations AG
 - Inventors: Mark Charles Hamilton, Harish Gandhi, **Ainong Shi**, Craig Lynn Davis, Thomas Joseph Curley Jr., Baohong Guo
 - [Patent Link 1](#) | [Patent Link 2](#) | [Patent Link 3](#)
 - 5. **Soy Gene Cluster Regions and Methods of Use**
 - Patent Numbers: 20220312708; 11382290; 9307707; 10045494
 - Abstract: Methods for conveying pathogen resistance into non-resistant soybean germplasm using nucleic acid markers, including SNPs, and producing soybean plants, seeds, tissue cultures, and compositions including amplification primers.
 - Type: Grant
 - Filed: Nov 28, 2012; Dec 14, 2015
 - Date of Patent: Apr 12, 2016; Aug 14, 2018
 - Assignee: Syngenta Participations AG
 - Inventors: Ju-Kyung Yu, Becky Welsh Breitingner, David Plunkett, **Ainong Shi**, Daniel Dyer
 - [Patent Link](#)
 - 6. **Triticum aestivum Accessions (Plant Inventory)**
 - Reference: Murphy P., Leath S., Navarro R.A., **Shi A.**, Huynh D. (1998). PI 597348, PI 597349, PI 597350, PI 599034, PI 599035, PI 599036. Plant Inventory No. 206, Part I. USDA-ARS.
 - [Link \(https://www.ars-grin.gov/npgs/pi_books/scans/pi206pt1.pdf\)](https://www.ars-grin.gov/npgs/pi_books/scans/pi206pt1.pdf)
 - 7. **Provisional Patent Application – SCN Resistance in Soybean**
 - Reference: Chen S.* and **Shi A.*** (2020). Identification of a major QTL for resistance to soybean cyst nematode (Heterodera glycines) and methods of use. Provisional Patent Application No. 63/011,633, filed Apr 17, 2020 (Atty. File No. 920171.00331).
- USPTO Granted Patents Listed (<https://idiyas.com/inventor/ainong-shi>)
1. [11716943 - Molecular markers linked to disease resistance in soybean \(2023-08-08\)](#),
 2. [11382290 - Soy gene cluster regions and methods of use \(2022-07-12\)](#),
 3. [11236400 - Molecular markers associated with soy iron deficiency chlorosis \(2022-02-01\)](#),
 4. [11180795 - Nematode resistance alleles in soybean \(2021-11-23\)](#),
 5. [10716271 - Soy gene cluster regions and methods of use \(2020-07-21\)](#),
 6. [10655142 - Molecular markers linked to disease resistance in soybean \(2020-05-19\)](#),
 7. [10648041 - Molecular markers associated with soy iron deficiency chlorosis \(2020-05-12\)](#),
 8. [10544470 - Resistance alleles in soybean \(2020-01-28\)](#),
 9. [10045494 - Soy gene cluster regions and methods of use \(2018-08-14\)](#),
 10. [9879326 - Molecular markers associated with soy iron deficiency chlorosis \(2018-01-30\)](#),
 11. [9708674 - Resistance alleles in soybean \(2017-07-18\)](#),
 12. [9458504 - Resistance alleles in soybean \(2016-10-04\)](#),
 13. [9307707 - Soy gene cluster regions and methods of use \(2016-04-12\)](#),

INTELLECTUAL PROPERTY

- Cowpea Varieties: ‘AR 10-ES01’, ‘AR07-303’, ‘AR09-393’, and ‘AR09-692’
- Arkansas Cowpea Cultivars/Breeding Lines:
 - High Drought Tolerance: AR Blackeye#1, AR17-40, AR17-61, AR17-81, AR17-86, AR17-131, Early Scarlet, Empire
 - Salt Tolerance: AR09-671, AR09-529, AR09-470
 - High Seed Protein Content: Early Scarlet, AR09-204, AR01-1781
 - High Seed Sugar Content: Empire, AR09-655

SPINACH RESEARCH AND NEWS

1. USDA NIFA Spinach Pythium grant 2026

[UofA News](#) | [UADA News](#) | [Hortidaily](#) | [Indoor Ag-Con - LinkedIn](#) | [UADA – LinkedIn](#)

2. USDA SCRI Spinach Grant, 2023 – Lead \$3.57M national effort to improve disease resistance in spinach, University of Arkansas

[UofA News](#) | [AAES News](#) | [EurekAlert](#) | [Seed World](#)

3. USDA SCRI Spinach Grant, 2017 – Developing genetic and molecular resources to improve spinach production

[NIFA Project Page](#)

4. Texas A&M AgriLife Research Grant – \$1.5M from NIFA to improve organic spinach production

[AgriLife Today](#)

5. USDA SCMP Grant – Spinach Downy Mildew

[Delta Farm Press](#)

6. Spinach Research Progress Social Media

○ [LinkedIn](#)

7. Bowery Farming Collaboration – Spinach development project with University of Arkansas scientists

○ [Vegetable Growers News](#)

SKILLS AND KNOWLEDGE

Plant Breeding and Genetics:

- Extensive experience in field, greenhouse, and laboratory experiments, including experimental design and statistical analysis using JMP and SAS.
- Project management skills: organizing, supervising, proposal writing, and execution.

Molecular Biology and Genomics:

- Wet-lab skills: DNA/RNA extraction, Southern blot, electrophoresis, PCR, cloning, sequencing, primer design.
- Molecular marker analysis: AFLP, PCR, RAPD, SNP, SSR, RFLP.
- Next-generation sequencing: RNAseq, IsoSeq, GBS, ddRADseq, whole-genome sequencing, resequencing.

Quantitative Genetics and Bioinformatics:

- QTL mapping, genetic diversity analysis, GWAS, genomic prediction (GP).
- Software/tools: Arlequin, BLINK, FarmCPU, GAPIT, GenSel, Paup, NTSys, Phylip, Structure, MEGA, Tassel, Haploview, JoinMap, MSTmap, Qgene, PowerMarker, rrBLUP/gBLUP/cBLUP/Bayers, WinQTLCartographer, QTLNetwork, MapChart.
- Bioinformatics: Assay Design, BLAST, BioEdit, ClustalW/X, MEGA, Primer3, SSRLocator, TreeView, ExPASy; databases: FASTA, GenBank, PDB, PubMed, Soybase.

Computing and Programming:

- Proficient in Word, Excel, Access, PowerPoint, Outlook, MS FrontPage.
- Programming: R, VB/VBA, C/C++, HTML, Java, Perl, SQL.
- Database management: MySQL, MS SQL Server.
- Certifications: MCP, MCSE, MCDBA (Microsoft, 2000); Java 2 Programming (University of Washington & Sun Microsystems, 2000); C, C++, HTML, Java 2, JavaScript.