

Guo Shirong



Areas of Research

Physiology and ecology of protected crops, soilless culture.

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Research Interests

Physiology and ecology of protected crops, soilless culture

The Guo lab integrates to analyze the action mechanism of polyamines in abiotic stress of protected vegetables, and develop the soilless culture substrate.

Physiology and ecology of protected crops

China has become the largest country in the area of protected horticulture. However, due to the simplicity of horticultural infrastructure and the poorly ability to withstand natural disasters, the vegetables often encounter environmental stresses, such as extreme temperature and salt stress, which seriously restrict the yield and quality of vegetables in our country. Our aims are to understand the mechanism of plants response to these abiotic stresses, especially in hypoxia, salt and heat stress. In the past two decades, we systematically analyzed the mechanism of polyamines in protected vegetables from photosynthesis, reactive oxygen species metabolism, carbon and nitrogen cycle and other pathways.

Soilless culture

Soilless cultivation replaces soil environment with artificial below-ground environment, where water, air and nutrient supply could be effectively manage compared with the traditional soil cultivation. Soilless cultivation promotes crop growth and yield by providing the most suitable environment for root growth and development. Soilless culture system in China mainly includes two categories: substrate culture and nutrient solution culture, in which substrate culture area accounts for more than 95%. With the

rapid development of protected horticulture in China, a large amount of organic substrate is required for soilless cultivation of crops. We use the industrial and agricultural organic waste, such as vinegar residue, cassava residue, and mushroom residue, to develop the seedlings and cultivation substrates. We have screened out special fermentation inoculants for vinegar residue, cassava residue, and mushroom residue and established a fermentation system to produce corresponding seedling and cultivation substrates. Furthermore, we also explore high-efficiency production technology of protected vegetables from aspects of environmental regulation and nutrient solution management.

Education Background

Bachelor: Shanxi Agricultural University

Master: Shanxi Agricultural University

Doctor: Mie University

Work experience

Lecturer, College of Horticulture, Shanxi Agricultural University, 12/1986-10/1992

Associate Professor, College of Horticulture, Shanxi Agricultural University, 11/1992-4/1998

Professor, College of Horticulture, Shanxi Agricultural University, 5/1998-8/1998

Post doctor, Nanjing Agricultural University, 9/1998-7/2000

Professor, College of Horticulture, Nanjing Agricultural University, 8/2000-

Honors and Awards

Second Prize of National Science and Technology Progress Award, 2009

First Prize of Jiangsu Agricultural Technology Extension Award, 2015

First Prize of Jiangsu Agricultural Technology Extension Award, 2018

Post Scientist of National Bulk Vegetable Industry Technology System

Director of the Chinese Society of Agricultural Engineering and Deputy Director of the Protected Horticulture Professional Committee

Executive Director of the Facility Horticulture Branch of the Chinese Horticultural Society

Director of Seedling Branch of China Vegetable Association

Director of Protected Agriculture Branch of China Agricultural Mechanization Association

Selected Publication

1. Mohammad Shah Jahan, Shirong Guo*, Abdul Raziq Baloch, Jin Sun, Sheng Shu, Yu Wang, Golam Jalal Ahammed, Khairul Kabir, Rana RoyJahan. Melatonin alleviates nickel phytotoxicity by improving photosynthesis, secondary metabolism and oxidative stress tolerance in tomato seedlings. *Ecotoxicology and Environmental Safety*, 2020,197: 110593.

2. Mohanmad Shah Jahan, Sheng Shu, Yu Wang, Zheng Chen, Mingming He, Meiqi Tao, Jin Sun, Shirong Guo*. Melatonin alleviates heat-induced damage of tomato seedlings by balancing redox homeostasis and modulating polyamine and nitric oxide biosynthesis. *BMC Plant Biology*, 2019,19: 414.
3. Meiwen He, Yu Wang, Jianqiang Wu, Sheng Shu, Jin Sun, Shirong Guo*. Isolation and characterization of S-Adenosylmethionine synthase gene from cucumber and responsive to abiotic stress. *Plant Physiology Biochemistry*, 2019, 141:431-445.
4. Mohammad Shah Jahan, Yu Wang, Sheng Shu, Min Zhong, Zheng Chen, Jianqiang Wu, Jin Sun, Shirong Guo*. Exogenous salicylic acid increases the heat tolerance in Tomato (*Solanum lycopersicum* L) by enhancing photosynthesis efficiency and improving antioxidant defense system through scavenging of reactive oxygen species. *Scientia Horticulture*, 2019, 247:421-429.
5. Sheng Shu, Ruonan Yuan, Jianlan Shen, Jie Chen, Liangjie Wang, Jianqiang Wu, Jin Sun, Yu Wang, Shirong Guo*. The positive regulation of putrescine on light-harvesting complex ii and excitation energy dissipation in salt-stressed cucumber seedlings. *Environmental and Experimental Botany*, 2019,162: 283-294.
6. Ying Wei, Yu Wang, Xinyi Wu, Sheng Shu, Jin Sun, Shirong Guo*. Redox and thylakoid membrane proteomic analysis reveals the *Momordica (momordica charantia* L.) rootstock-induced photoprotection of cucumber leaves under short-term heat stress. *Plant Physiology and Biochemistry*,2019, 136:98-108.
7. Min Zhong, Yu Wang, Yuemei Zhang, Sheng Shu, Jin Sun, Shirong Guo*. Overexpression of transglutaminase from cucumber in tobacco increases salt tolerance through regulation of photosynthesis. *International Journal of Molecular Sciences*,2019, 20(4): 894.
8. Min Zhong, Yu Wang, Kun Hou, Sheng Shu, Jin Sun, Shirong Guo*. TGase positively regulates photosynthesis via activation of Calvin cycle enzymes in tomato. *Horticulture Research*, 2019, 6: 92.
9. Yinghui Yuan, Min Zhong, Nanshan Du, Sheng Shu, Jin Sun, Shirong Guo*. Putrescine enhances salt tolerance of cucumber seedlings by regulating ion homeostasis. *Environmental and Experimental Botany*, 2019, 165: 70-82.
10. Xinyi Wu, Sheng Shu, Yu Wang, Ruonan Yuan, Shirong Guo*. Exogenous putrescine alleviates photoinhibition caused by salt stress through cooperation with cyclic electron flow in cucumber. *Photosynthesis Research*, 2019,141(3): 303-314.
11. Jianlan Shen, Yu Wang, Sheng Shu, Mohammad Shah Jahan, Min Zhong, Jianqiang Wu, Jin Sun, Shirong Guo*. Exogenous putrescine regulates leaf starch overaccumulation in cucumber under salt stress. *Scientia Horticulture*, 2019, 253: 99-110.
12. Ye Xu, Yinghui Yuan, Nanshan Du, Yu Wang, Sheng Shu, Jin Sun, Shirong Guo*. Proteomic analysis of heat stress resistance of cucumber leaves when grafted onto *Momordica* rootstock. *Horticulture Research*, 2018, 5: 53.
13. Lizhong He, Li Yu, Bin Li, Nanshan Du, Shirong Guo*. The effect of exogenous calcium on cucumber fruit quality, photosynthesis, chlorophyll fluorescence, and fast chlorophyll fluorescence during the fruiting period under hypoxic stress. *BMC Plant Biology*, 2018,18: 180.

14. Jianqiang Wu, Sheng Shu, Chengcheng Li, Jin Sun, Shirong Guo*. Spermidine-mediated hydrogen peroxide signaling enhances the antioxidant capacity of salt-stressed cucumber roots. *Plant Physiology and Biochemistry*, 2018,128: 152-162.
 15. Yuanyuan Tang, Yinghui Yuan, Sheng Shu, Shirong Guo*. Regulatory mechanism of NaCl stress on photosynthesis and antioxidant capacity mediated by transglutaminase in cucumber (*Cucumis sativus* L.) seedlings. *Scientia Horticulturae*, 2018, 235: 294-306.
 16. Jing Du, Shirong Guo*, Jin Sun, Sheng Shu. Proteomic and physiological analyses reveal the role of exogenous spermidine on cucumber roots in response to $\text{Ca}(\text{NO}_3)_2$ stress. *Plant Molecular Biology*, 2018, 97: 1-21.
 17. Ruonan Yuan, Sheng Shu, Shirong Guo*, Jin Sun, Jianqiang Wu. The positive roles of exogenous putrescine on chlorophyll metabolism and xanthophyll cycle in salt-stressed cucumber seedlings. *Photosynthetica*, 2018, 56 (2): 557-566.
 18. Yahong An, Heng Zhou, Yinghui Yuan, Lin Li, Jin Sun, Sheng Shu, Shirong Guo*. 24-Epibrassinolide-induced alterations in the root cell walls of *Cucumis sativus* L. under $\text{Ca}(\text{NO}_3)_2$ stress. *Protoplasma*, 2018, 255(3): 841-850.
 19. Nanshan Du, Lu Shi, Yinghui Yuan, Jin Sun, Sheng Shu, Shirong Guo*. Isolation of a potential biocontrol agent *Paenibacillus polymyxa* NSY50 from vinegar waste compost and its induction of host defense responses against Fusarium wilt of cucumber. *Microbiological Research*, 2017, 202:1-10.
 20. Jing Du, Sheng Shu, Yahong An, Heng Zhou, Shirong Guo*, Jin Sun. Influence of exogenous spermidine on carbon–nitrogen metabolism under $\text{Ca}(\text{NO}_3)_2$ stress in cucumber root. *Plant Growth Regulation*, 2017,81:103-115.
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