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Editorial

Green Plant Protection Innovation: Challenges and Perspectives

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This issue of *Engineering* was compiled from papers presented at the First International Conference on Green Plant Protection Innovation (1st ICGPPI), held in Haikou in May 2018, and the Second International Conference on Green Plant Protection Innovation (2nd ICGPPI), held in Guiyang in October 2019. The conferences were sponsored by the Chinese Academy of Engineering, and the Academic Committee of the Forum of the ICGPPI, chaired by Professor Baoan Song, organized the conference. The 1st ICGPPI was attended by more than 800 people from seven countries, while the 2nd ICGPPI had more than 200 attendees from nine countries. The wide range of topics related to more environmentally sound crop protection was of great interest to all, and the meetings provided an opportunity for scientists from many disciplines of crop protection to exchange and share ideas and advances.

Many opportunities await us in green plant protection. Healthy plants and a healthy environment are important safeguards against pests and diseases of our food crops, ensuring a sustainable food supply.

Green plant protection is an underlying principle of sustainable agriculture, with less dependence on synthetic chemical pesticides and fertilizers, and more use of the innate ability of crop plants to resist pests, harsh climates, and high salinity. A healthy soil-water-plant ecology will improve both productivity and the harmony between agriculture and the increasing world population. Just as a healthy microbiome promotes human health, a healthy ecosystem will deliver abundant and healthy food now and into the future.

Conferences such as the ICGPPI are essential to promote understanding and cooperation in developing the tools needed for a sustainable and safe food supply. International cooperation has been vital to progress in related areas such as biotechnology and food safety. Such cooperation between nations and their scientific talent can improve pest management and agricultural productivity.

Pest-control chemistry, in particular, is ripe for improvement. Here, we get our clues from natural systems. Natural pesticides can be effective when pests evolve resistance to older, conven-

tional pesticides. For example, resistance to glyphosate, the most used herbicide globally, is evolving at a rapid pace, creating a great need for new herbicides with new modes of action. Natural phyto-toxins are pointing the way to the discovery and development of badly needed new herbicides.

The 13 papers in this special issue demonstrate the broad scope of greener pest management research. The use of precision agriculture and remote sensing to more efficiently use pest management tools, including chemical pesticides, is discussed. Improvements in this area have the potential to greatly reduce the volume of chemical pesticides used. Related to this topic is a paper on monitoring forest resources with advanced methods.

Greener materials for pest management are the topic of several papers. Maeinisch et al. review the use of RNA-based pest management. New data on the mode of action of natural monoterpenes as insecticides is provided by Chen et al. New pesticides based upon aromatic amides containing sulfide and sulfones are discussed. Li et al. provide new information on rhamnolipids induced by glycerol-enhanced dibenzothiophene biodegradation. The synthesis and fungicidal activity of new thiolactomycin derivatives are provided by Hua et al. New strategies for the discovery of badly needed herbicides with novel molecular target sites are summarized by Dayan and Duke.

A more in-depth understanding of the biology of pests and their hosts is needed to develop greener management strategies and products. For example, Wang and Jing cover how plant pathogens utilize effectors to hijack the host endoplasmic reticulum during infection. Understanding this process is necessary in order to discover methods of disrupting the process. Clark and Symington provide a paper on an improved method of studying pyrethroid interaction with ion channels. This approach could lead to the design of more effective, more selective, and safer pyrethroid insecticides. A paper by Kang et al. on more effective resistance assays is also included in this issue.

Producing disease-resistant crops is a green method of pest management. Fincher discusses a unique approach to engineering crops to counter the fungal infection process. Similarly, Wang et al. provide new information on the polypeptide-associated complex involved in the development and pathogenesis of a fungal disease on wheat.

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E-mail address: basong@gzu.edu.cn (B. Song).<https://doi.org/10.1016/j.eng.2020.04.001>2095-8099/© 2020 THE AUTHORS. Published by Elsevier LTD on behalf of Chinese Academy of Engineering and Higher Education Press Limited Company. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).Please cite this article as: B Song, JNSeiber, S. O. Duke et al., Green Plant Protection Innovation: Challenges and Perspectives, Eng, <https://doi.org/10.1016/j.eng.2020.04.001>

We hope that these papers communicate new information of great value to those involved in the discovery and development of greener crop protection strategies, methods, and products. The concepts and discoveries in these contributions will play a part in conquering hunger and poor nutrition by fostering improved crop production and crop protection methods.

Welcome Address from James N. Seiber to the ICGPPI

My welcome to the International Conference on Green Plant Protection Innovation (ICGPPI).

Thanks to the chairman of the Academic Committee of the Forum of the ICGPPI, the Chinese Academy of Engineering, Academician Professor Baoan Song. And thanks to the members of the Academic Committee of the Forum. Special thanks to Professor Qing X. Li, University of Hawaii, Associate Editor of the *Journal of Agricultural and Food Chemistry* and my former graduate student, and to Dr. Lu Yu and other consultants for the excellent arrangements. I also bring greetings from the American Chemical Society (ACS) Agrochemicals Division (AGRO)! AGRO will celebrate its 50th anniversary with a major program during the ACS meeting in San Francisco on August 16–20, 2020. I hope you can attend and bring copies of the special issue for participants. Qing X. Li or I will highlight the special issue during the celebration.

We now have better tools for communication via the Internet to accompany scientific advances in molecular biology, analytical chemistry, and pest-control chemistry and biology. Communication is the key—hence the value of this conference and the resulting special issue of the journal *Engineering*. We can help to conquer hunger, poor nutrition, and epidemics such as the current one involving the novel coronavirus-19 by cooperating to educate the next generation of students in better crop production and crop protection methods, including sanitation during quarantine and shipments of foods to global markets.

My congratulations to all on the successful completion of the special issue on green plant protection innovation.

The special issue has received helpful guidance and constructive suggestions from the following academicians of the Chinese Acad-

emy of Engineering: Professors Xu Liu, Zhonghui Xiang, Tingzhao Rong, Jiulin Sun, Yu Li, Zhibiao Nan, Wenfu Chen, Le Kang, Xiwen Luo, Youyong Zhu, Kongming Wu, Jianping Chen, Xuhong Qian, Tianlai Li, Jianzhong Shen, and Zhensheng Kang. We have also received help and guidance from Professor Stephen Powles, the academician of the Australian National Academy of Sciences and the National Academy of Engineering; Professor Kong Luen Heong, the academician of the World Academy of Sciences (formerly known as the Third World Academy of Sciences) and of the Malaysian Academy of Sciences; Professor Heinz Mehlhorn, the academician of the German Academy of Sciences; Professor Jong-Yil Chai, the academician of the Korean Academy of Medical Sciences; Professor Stephen O. Duke, the Editor-in-Chief of the *Pest Management Science*; Professor John Clark, the Editor-in-Chief of the *Journal of Pesticide Biochemistry and Physiology*; Professor Qing X. Li, the associate editor of the *Journal of Agricultural and Food Chemistry*; Professor Pugu Zhou, the director of the Institute for the Control of Agrochemicals, Ministry of Agriculture; Professor Zhonghua Li, the executive associate president of the China Crop Protection Industry Association; Professor Wanquan Chen, the president of the China Society of Plant Protection; Professor Peter Maiefisch from Syngenta Crop Protection AG; Professor Herbst Andreas from the German Federal Crop Research Center, Plant Protection and Application Technology Institute; Professor Christian Nansen from the University of California, Davis; Professor Xueping Zhou from the Institute of Plant Protection, Chinese Academy of Agricultural Sciences; Professor Xuexin Chen from Zhejiang University; Professors Liusheng Duan and Xiongui He from China Agricultural University; Professor Yuanchao Wang from Nanjing Agricultural University; Professor Zhong Li from East China University of Science and Technology; Professor Song Yang from Guizhou University; and Professor Yonggui Robin Chi from Guizhou University.

I especially note and appreciate the efforts of Professor Qing X. Li, who stepped in to help when most needed, and of Dr. Xiangyang Li, who kept us organized and focused throughout.

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