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Herbicide banning: an international forum

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Symposium

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The Weed Science Society of America (WSSA) and the International Weed Science Society (IWSS) sponsored a symposium on the banning of herbicides at the 2019 WSSA meeting held in New Orleans, Louisiana. The goal of the symposium was to provide a forum to summarize and understand the body of knowledge around globally important herbicides that have been banned or are under consideration for being banned. The ecological, sociological, and economic risks of banning or continuing to use certain herbicides are not well understood, and the symposium offered an opportunity to explore these risks. If a herbicide is banned, generally it is to protect human health or the environment and is due to its unfavorable toxicology or environmental fate. However, misinformation from, and political agendas of, certain groups or individuals can lead to demands for a product to be removed from the market without good cause.

Weeds are usually the most difficult-to-manage pests in crop production and the major cause of yield losses. Management of weedy and invasive species also is required in non-crop areas such as pastures, forests, aquatic situations, transportation systems, parks and recreation areas, and urban sites, including residential sites. Presently, herbicides are the most used weed management tool in crop and non-crop areas. However, there are opposing views, some of which are on the extreme ends of the spectrum, about the utility of herbicides.

Many people, who either oppose or support different views about pesticides, know little about the issue or are sourcing information from nonscientific media. This problem is exacerbated by the fact that scientific parlance is often circuitous and difficult to understand. Scientific information often is not accessible to the public or is difficult to find, and the public does not always have the capability to filter sources of information. Exaggerations, misunderstandings, and misguided decisions are rampant on social media.

This symposium covered in detail glyphosate, paraquat, and other herbicides of great importance to certain regions. The discussions centered on what is happening at the global level. The objective of the symposium was not to defend herbicide use, but to try to bring a greater understanding of how different countries are addressing the issue and which herbicides are under consideration to be banned or to have their use be more restricted. Further, the goal was to raise awareness among weed scientists about the issue and to discuss how to facilitate better access to factual, understandable educational materials.

The series of papers presented in this symposium was anchored by two key presentations: (1) "The Toxicology of Glyphosate" by Keith Solomon of the Center for Toxicology, University of Guelph, Ontario, Canada; and (2) "The Environmental Fate and Ecological Impact of Glyphosate" by Stephen Duke of the USDA-ARS, Oxford, Mississippi, USA. The glyphosate toxicology paper is being published elsewhere, while the environmental fate paper is included in this symposium's proceedings. Some key points from Keith Solomon's presentation are mentioned here. There is no strong association between glyphosate use and cancer, neurological disorders, or reproductive aberrations. A strong disagreement across various sectors of society about these claims has played out on the global scene. One sword being wielded is the IARC (International Agency for Research on Cancer) report stating that there is limited evidence for carcinogenicity of glyphosate in humans, there is positive association of long-term glyphosate use and non-Hodgkin lymphoma, and there is sufficient evidence for carcinogenicity of glyphosate in experimental animals. With these summations, the IARC concluded that glyphosate is probably a Group 2A carcinogen for humans. A panel of experts disagreed; their analysis was published in Williams et al. (2016). The U.S. EPA has not changed the registration status of glyphosate. The ban on glyphosate has been withdrawn in many countries. How can two groups of scientists arrive at opposing conclusions about a herbicide that has been at center stage of global agriculture for decades? One has to take into account the whole body of evidence, but even then, experts may still arrive at different conclusions. As for this presentation, the presenter concluded that decisions to ban or restrict glyphosate are not supported by evidence.

Although time constraints precluded including examples of all herbicides under consideration for bans from every country, speakers were able to provide a global perspective. Speakers from Asia, Europe, and Central, North, and South America addressed the issue. Recently at the global level, two herbicides in particular, glyphosate and paraquat, have been under increased scrutiny for consideration to be banned or for their use to be greatly restricted. Speakers discussed these two herbicides as well as others that are important in different cropping systems.

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Regulations vary among countries on herbicide registration and use. Another presentation that is not among this series of symposium papers is from Israel. One important lesson from that presentation that needs to be considered is the influence that markets have on herbicide use. Following the ban of triazines in Europe, a large market for Israeli agricultural products, Israel banned terbutryn and prometryn in 2012, simazine in 2013, restricted the use of atrazine to corn (*Zea mays* L.) since 2013, and banned trifluralin in 2015. The body of evidence does not support these bans or restrictions in Israel. As a result, the burden of weed control shifted to foliar herbicides (i.e., glyphosate, ACCase inhibitors, ALS inhibitors), which history tells us are more compromised by weed resistance than residual herbicides. Thus, we see that indiscriminate bans can result in other problems.

There was a discussion of how to develop accurate and understandable educational materials for consumption by the general public, especially those who rely mostly on social media for information. There was a general sense that there is a need to convey the importance of herbicides in agriculture and educate society about the risks and benefits of herbicides. It is also critical to educate herbicide users about personal, public, and environmental safety pertaining to herbicide use.

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