GLYPHOSATE RESISTANT WATERHEMP IN IOWA. Micheal D. K. Owen, Professor, Agronomy Department, Iowa State University, Ames, IA 50011.

Research conducted at Iowa State University demonstrated that individual common waterhemp plants within populations are resistant to glyphosate. Furthermore, all common waterhemp populations investigated, including a pristine (never under agricultural production) population from Ohio demonstrated variable response to glyphosate. Interestingly, the agricultural populations demonstrated less variable response than the non-agricultural population. Divergent recurrent selections resulted in a 3.5 fold increase in resistance. However, after 2 selections, while the frequency of the resistance increased within the population, there was limited segregation within the material and no stable homozygous resistant line was identified. This suggests that while the trait for glyphosate resistance is heritable, it is likely a polygenic characteristic. As common waterhemp is dioecious, and the genes controlling the glyphosate resistance have yet to be identified, it is impossible to provide growers with an accurate prediction as to how quickly populations will shift from sensitive to resistant. Furthermore, the specific mechanism(s) by which common waterhemp is resistant to glyphosate must be identified.

Regardless, sufficient information has been generated by weed scientists to suggest that common waterhemp populations can evolve resistance to glyphosate. Thus, growers need to consider how crop management practices impact the evolution of glyphosate resistance. It is obvious that the use of glyphosate-resistant soybean has contributed to the common waterhemp problem. Given the widespread adoption of glyphosate-resistant soybean and the multiple in-crop applications of glyphosate, considerable selection pressure for glyphosate resistance in weed populations has been imparted upon weed communities. Furthermore, the anticipated adoption of glyphosate-resistant corn hybrids will increase the selection pressure for glyphosate resistance. Should growers thus change management systems in order to delay the evolution of glyphosate resistance?

The use of glyphosate and GM crops has provided growers with a reportedly inexpensive and reasonably consistent weed management program. While the risk of glyphosate resistant common waterhemp biotypes is implicit in the system, other risks exist for a glyphosate-based crop production system. These risks include glyphosate drift from the multiple applications, concern for the marketability of the GM crops, lack of clear economic return on investment, yield differences compared to non-GM crops, pollen drift from GM maize, and other socio-economic concerns. Nevertheless, growers appear to be convinced that glyphosate-based crop production systems are in their best economic interest. The author suggests that this attitude is primarily the result of the presumed simplicity and consistency of the glyphosate-based systems.

Alternative weed management strategies exist that will delay the evolution of glyphosate-resistant common waterhemp. The inclusion of other herbicides and the use of mechanical tactics have considerable value in managing the evolution of glyphosate resistance. However, despite the risks that glyphosate-based crop production systems have, growers apparently not deemed these risks significant and continue to use glyphosate and glyphosate-resistant crops. It is difficult for extension weed scientists to make recommendations that growers use other herbicides and crop production strategies when that recommendation is based solely on the anticipated evolution of glyphosate-resistant common waterhemp populations, particularly when the speed of the population shift cannot be predicted and the alternative strategies result in the grower accepting more risk.

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