

My View

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Biological systems or populations can readily adapt to new environments because of their diversity. There always seems to be a variant in successful biological systems that can exploit new environments. The likelihood of having a variant that will be able to exploit a new environment increases with the number of variants in the population, i.e., the diversity of the population.

Humans are usually more apt to reduce than to increase diversity. Simple interventions in complex natural systems may lead to undesirable outcomes. We have been conditioned to extol the virtues of fields where it is difficult to find weeds; however, this kind of “hygiene” may not be the most desirable outcome. Beneficial arthropods, soil microbes, and other organisms requiring weed shoot and root resources are likely to be limited in fields with few weeds. Will the organisms important for avian food supply, insect pest and weed seed predation, and nutrient cycling continue to thrive where weeds are scarce?

Herbicides are remarkable weed management tools. Their use has led to marvelous gain. Their overuse has led us to neglect other strategies until necessity (environmental awareness, herbicide resistance, pesticide reduction goals, etc.) dictated that we broaden our thinking and consider other tools more carefully. It is human nature to want to repeat a successful practice; in many cases it is also simple common sense. Repeating a successful practice is not a problem in the world of assembly lines and machines, where all “genotypes” are defined. But living systems with inherently high levels of variation and diversity rapidly adapt to repeated practices. Adaptation is more difficult when practices are diverse.

In some ways our collective weed science group functions in a manner that discourages diversity. Whether we over-emphasize herbicides until weed resistance forces us to do otherwise or whether we essentially ignore everything but weed biology and ecology, we focus so tightly on the merits of a single technology or subject that technologies or subjects that may be crucial to future success may be ignored. Focusing on very specific goals can be good as long as those goals help us to resolve a broad range of possible future challenges. However, given that our knowledge of the future is, at best, only conjecture, there is a need to diversify our thinking to accommodate many possibilities. Bandwagons have been difficult to avoid or ignore. Unfortunately, those who step off the bandwagon, or even ride on a more seasoned wagon, are sometimes criticized rather than praised.

My view of successful weed science evolution is that we would strive for diversity: weed management diversity, agribusiness diversity, expertise diversity, research partnership diversity, and general diversity of thought. If weed ecology

and integrated weed management studies had not been neglected in the 1950s through the 1980s, we would probably have much less weed resistance and a more well-rounded approach to current research. Perhaps a lack of diversity in our previous studies and areas of emphasis has encouraged us to overcompensate and neglect research, which had been considered previously with greater respect (diversity over time helps, but having diversity in space is a superior goal). Smaller “pendulum shifts” would enable us to retain some disciplines, practices, and expertise that would surely be valuable in the future.

Research on ecological approaches to weed management is crucial and must continue. However, the pendulum may have swung too far. For example, there seems to be a dearth of research involving herbicide application technology. Improved application technology can lead to dramatic improvements in herbicide efficiency and reduced environmental impact. But application technology research generally lacks popularity, funding, and ideological support (particularly in public institutions).

Some sneer at any form of research involving herbicides. Is research involving herbicides really inferior and “tainted”? Is “organic” agriculture really more sustainable than conventional agriculture? Is food produced without pesticides really more healthy? Perception may be reality for politicians, but scientists regard hard data over media hype and, often hysterical, public opinion. Nevertheless, most of us find funding opportunities difficult to ignore, even when the principles underlying the proposed projects have foundations speckled with hype and hysteria.

Will transgenic crop research and applications be severely restricted in the future? Public institutions, managers, and multinationals that continue to abdicate advocacy responsibilities because they are not willing to “step into the fray” will ensure such restrictions. Despite the genetically modified organism controversy, diverse transgenic crop research avenues and ventures will help to ensure flexibility and adaptability in an unknown future.

If the weed science group is to thrive or even survive, it can only do so if it does not restrict its diversity. Weed ecology and biology research is good. Research on herbicide efficacy and adjuvant technology is good. Alternative weed management strategy research is good. Research with herbicide-resistant crops is good. Application technology research is good. Research on biological weed control is good. Transgenic crop research is good. Herbicide mode of action research is good. Research on the environmental fate of herbicides is good. Weed research that determines “how” as well as “why” is good. Extension and outreach activities in all the above areas are good.

If we mimic the diversity found in natural systems and let variation flourish in our current weed science group, then perhaps we will flourish as a group in the future. We cannot afford to neglect or throw away many of our tools, technologies, or research areas. Amid all our priority activities, there is a need to ensure that we do not rapidly abandon activities we perceive to be less critical. Perceptions change much more rapidly than research personnel and programs can be reestablished. Aldo Leopold said: “the first rule of

intelligent tinkering is to save all the cogs and wheels.” Perhaps we should even consider leaving a few more weeds in the field (Dosdall et al. 2003).

Literature Cited

Dosdall, L. M., G. W. Clayton, K. N. Harker, J. T. O'Donovan, and F. C. Stevenson. 2003. Weed control and root maggots: making canola pest management strategies compatible. *Weed Sci.* 51:576–585.