

RESISTANCE IN PERSPECTIVE: HOW MUCH OVERLAP IS THERE BETWEEN THE PERCEPTION AND THE REALITY OF RESISTANCE?

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Resistance to insecticides is one of the foremost concerns to the sustainability of modern agriculture. The proliferation of arthropod species resistant to one or more insecticides and the perceived failure of earlier generations of active ingredients have led to concerns that newer chemical and toxin-based controls will inevitably succumb to the same fate as their predecessors. While such concerns serve as precautionary devices and possibly help curtail excessive pesticide use, they also potentially have profound impact on pesticide use policy. The proper balance must be struck between unconstrained pesticide use that leads down the road to resistance, and over-constrained pesticide use that inhibits optimal pest control. It is therefore imperative that our perspective on resistance be clear and distortion-free so that policy decisions are made to best meet the needs of agriculture.

One of the problems, however, is that resistance is too often viewed simplistically as an all or none phenomenon when it is more realistically a multifaceted occurrence expressed an infinite number of ways. A researcher has only to discover one of these ways, or at least measure its expression in a pest population, for that population and indeed that species to be classified “resistant”. Another species is then added to the pesticide-resistant list, another pesticide relegated to the spent-and-useless list, and another crisis in agriculture is played out over what steps should be taken to prevent further resistance occurrences. While this sort of hand-wringing can have a positive impact by increasing awareness of the dangers of resistance and of the steps that can be taken to avoid additional cases, it also can distort the significance of any one resistance event. In most instances, resistance is insufficiently characterized to know what impact it will have on pest management.

Resistance expression is both qualitative and quantitative in form so that the level of resistance manifested in a natural population may be unimportant in terms of field control. The presumption tends to be that resistance is progressive, and that even if it is present at low frequencies and low levels of expression, its frequency and intensity will increase. Although the law of natural selection supports the concept of increasing frequencies under sustained pressure, it does not necessarily support the idea that resistance intensity will increase. Thus, a resistance mechanism that is expressed at a modest level of resistance in the homozygous state, but still vulnerable to field rates of insecticides, probably will not constitute a threat to field management even if it increases to saturation in the population. This is but one hypothetical example of how resistance can be present in a population, even at saturation, yet without curtailing crop yields. Other real examples will be drawn upon to make the case that resistance, although never a desirable outcome, is not always the destructive phenomenon as it is often too casually presented.

