NEONICOTINOID INSECTICIDES AND IPM IN PROCESSING VEGETABLES

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Abstract

Production and processing of specialty crops in Wisconsin are very important to both state and national agricultural industries. And key among these processing crops in Wisconsin include sweet corn, succulent snap beans, field peas and potatoes. In addition, the vast majority of these commercial, contract acres receive an at-plant in-furrow, or seed treatment of a Group 4A insecticide (neonicotinoid). Increasingly, producers rely heavily on this single class of insecticides for control of early season pests including Colorado potato beetle, seed maggots, potato leafhopper, and bean leaf beetles (NASS 2006). Reported at-plant applications of these neonicotinoid seed treatments have occurred on nearly 90% of all acres reported and reflect statewide use rates in many other grain crops. In the 2014 and 2015 growing season, the in-plant concentrations of thiamethoxam (Cruiser® 5FS) were monitored using an ultra-performance liquid chromatographic mass spectrometry procedure in both leaf and floral tissues at varying stages after emergence from the soil. Beginning in 2008, the Wisconsin Department of Agriculture, Trade, and Consumer Protection began testing for neonicotinoids in groundwater test wells in the state, finding one or more compounds in dozens of test wells, with most detections occurring in the Central Sands and Lower Wisconsin River Valley agroecosystems. In 2011, our laboratory began similar testing and detection levels were confirmed in a portion of high-capacity, overhead, center- pivot irrigation systems applying this contaminated groundwater to flowering irrigated crops (cucumber, snap beans, alfalfa) throughout the cropping season Since our testing began, we have confirmed a total of 298 samples from 92 unique high-capacity irrigation wells which have tested positive for the presence of thiamethoxam (the most water-soluble and widely used neonicotinoid in the area). Furthermore, an analysis of the spatial structure of these well detects suggests that the level of contamination is extremely variable from the landscape scale down to the individual field scale, and that the amount of contamination at a particular well can shift by one or two orders of magnitude from year to year and even within a growing season. The high degree of observed spatial and temporal variability in thiamethoxam detections underscores the need to investigate the relationship between individual well detections and together with both land and insecticide usage patterns in the vicinity of each well.

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