Imidacloprid, Found in Most Homeowner Insecticides, is Translocated to Nectar and Pollen and Kills Good Bugs

Dr. Vera Krischik, Department of Entomology, University of Minnesota

Native plants used in restoration for wildlife and food plants from apples to zucchini require pollinators. Bees and other beneficial insects offer valuable ecosystem services in both natural and managed agriculture ecosystems, so it is essential to protect them. Pollinators and beneficial insects are experiencing serious decline due to insecticide use, lack of nutritionally rich native plants for pollen and nectar, and lack of habitat. Continued loss of pollinators will have an impact on the natural resources and the economy. This issue has been addressed by the Xerces Society, National Research Council Report, the Congressional Research Report, testimony by the National Academy of Sciences to the US Congress, and the media in newspapers and television programs.

Systemic neonicotinyl insecticides used on landscape plants and crops are considered as a major factor in pollinator decline. After the 1998 ban in France of the systemic seed treatment Gaucho (active ingredient, imidacloprid), French researchers found that imidacloprid is translocated from coated seeds at planting thru the growing plant to nectar and pollen in flowers. In May 2008 a large number of bees died in Germany and the government banned the use of 5 neonicotinyl insecticides, including imidacloprid and clothianidin. A similar event was document in April 2010 by bee researchers at Purdue University. However, in the US use of these 5 neonicotinyl insecticides is very common in greenhouse, landscape, and crops. Almost all of the seed and furrow insecticide applications to corn, canola, soybean, and potato use neonicotinyl insecticides. Native plants grown in greenhouses and transplanted outside may contain high levels of imidacloprid which may kill pollinators.

Research in Vera Krischik's lab in the Department of Entomology at the University of Minnesota demonstrated that nectar and pollen from greenhouse plants treated with soil applications of imidacloprid contained significantly higher amounts of imidacloprid and its metabolites, than from a Gaucho-seed treatment. The label of Gaucho states that 0.375 mg AI for corn and 0.11 mg AI of for canola of imidacloprid should be applied. The greenhouse rate used on perennial landscape plants states that 300 mg AI/ 3gallon pot with 1 plant can be used. This is an 800 times higher rate for corn and 2700 times higher rate for canola. Consequently, greenhouse and urban landscapes use higher concentrations of imidacloprid, which are often reapplied and used at peak flowering, which results in higher concentration being translocated directly to flowers. Consequently, these levels have great potential to alter behavior or kill pollinators and beneficial insects more than the seed treatment Gaucho where most of the research has been done.

Our research on greenhouse rates of imidacloprid showed that the amount of imidacloprid found in nectar of 2 flowering plants was 20 ppb to 41 ppb from a single soil application compared to 1.9 ppb imidacloprid in sunflower nectar and 0.6 to 0.8 ppb in canola nectar from a seed treatment. For buckwheat and milkweed landscape plants, a label rate of soil applied imidacloprid (Marathon 1%G) was translocated to buckwheat nectar at 16 ppb (Krischik et al. 2007) and milkweed at 41 ppb/flower (Krischik et al. 2010). These concentration of caused high mortality of beneficial insects, such as lady beetles, lacewings, and a small parasitic wasp (Smith and Krischik 1990, Rogers et al. 2007, Krischik et al. 2007, Krischik et. al 2010).

There are multiple ways that plants in urban landscapes can contain imidacloprid -contaminated nectar, since it is commonly applied in the landscape for many pests (Krischik and Davidson 2004) and many greenhouse plants are treated with prior to sale and transplanting. Imidacloprid may persist in nectar for a long time, since soil applications were effective against foliar pests for 1 to 2 years in containers (Szczepaniec and Raupp 2007, Gupta and Krischik 2007, Tenczar and Krischik 2007) and landscape trees (Cowles et al. 2006, Frank et al. 2007, Tenczar and Krischik, 2007). Injections of concentrated volumes of imidacloprid (Imicide, Pointer) applied to trees trunks and roots were effective for 12 months for ash (McCullough et al. 2003) and linden (Johnson and Williamson 2007). A soil application of imidacloprid to Eucalyptus tree resulted in 500 ppb in nectar and pollen, which will kill any insect feeding on nectar and pollen. Tree injections of imidacloprid at flowering are cause for concern, since linden flowers are a good source of nectar and pollen for bees, butterflies, and other beneficial insects.

Practice IPM and only use insecticides if you actually witness an insect and associated problem. Think kindly and widely of the need to conserve pollinators and beneficial insects. Apple, cranberrie, blueberries, almond, citrus and 45% of our food plants need pollinators.