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Hazards of Insecticides to the Bumble Bees *Bombus impatiens* (Hymenoptera: Apidae) Foraging on Flowering White Clover in Turf

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Abstract

Insecticides used on turf are sometimes applied to areas with flowering weeds that attract honey bees and native pollinators. We tested residual effects of such treatments on colony vitality and behavior of the bumble bees *Bombus impatiens* Cresson foraging on turf containing white clover, *Trifolium repens* L. Imidacloprid, a systemic chloronicotinyl used for preventive control of root-feeding grubs, was applied as granules, followed by irrigation, or sprayed as a wettable powder, with or without irrigation. Hives were confined on the plots in large field cages after residues had dried and colony vitality (i.e., numbers of brood, workers, and honey pots, and weights of queens, workers, and whole colonies with hives) was evaluated after 28–30 d. Workers' foraging activity and defensive response to an aggressive stimulus also were evaluated. In

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plots after residues had dried, with effects on colony vitality evaluated after 14 d. Finally, foraging activity of wild bumble bees was monitored on open plots to determine if insecticide-treated areas were avoided. Imidacloprid granules, and imidacloprid sprays applied with posttreatment irrigation, had no effect on colony vitality or workers' behavior, suggesting that such treatments pose little systemic or residual hazard to bumble bees. In contrast, exposure to dry nonirrigated residues of all of the aforementioned insecticides had severe impact on colony vitality. Foraging workers did not avoid insecticide-treated areas. Means by which turf managers can reduce hazards of insecticide applications to pollinators are discussed.

Keywords: *Bombus impatiens*, bumble bee, turfgrass, ecotoxicology, imidacloprid, cyfluthrin

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