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BRAIN CHOLINESTERASE DEPRESSION AND MORTALITY OF BOBWHITE CHICKS EXPOSED TO GRANULAR CHLORPYRIFOS OR FONOFOS APPLIED TO PEANUT VINES

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ABSTRACT

Granular-formulated insecticides are applied on over 60% of the peanut acreage in North Carolina, each year, to control southern corn rootworm. This application is applied as a 0.45m band overtop peanut vines between June and August. Lorsban® 15G (chlorpyrifos) and Dyfonate® 15G (fonofos) are used 90% of the time by peanut growers. Quail chicks foraging within or on the edge of peanut fields may consume granules as grit material as the insecticide granules are not soil-incorporated. Therefore, we examined the hazard posed by these insecticides to bobwhite chicks foraging in peanut fields. Two identical experiments were conducted in which 4, 15×150m plots, were treated with Lorsban 15G or Dyfonate 15G and 2 plots were untreated. Human-imprinted bobwhite chicks ($N = 7-9$ chicks per plot) from two age groups, 4-7 or 11-12 days, were allowed to forage for one hour in treated and control plots. Brain cholinesterase (ChE) activity and ChE depression, relative to control ChE values, were determined for each chick. Differences in ChE activity between treatments were tested for using a two-way ANOVA with "broods" serving as the experimental unit. Relationships of age to ChE depression, within treatments, were analyzed separately using linear regression. Chicks foraging in peanut fields were observed ingesting granules directly and indirectly via granules adhered to arthropods. Chick brain ChE depression averaged 22% (SE = 3.6) and 8% (SE = 3.2) for chicks exposed to Dyfonate and Lorsban, respectively. Brain ChE was significantly lower than control values for chicks exposed to Dyfonate ($P = 0.014$). While ChE depression was not correlated to chick age ($P > 0.15$), two 4-day-old quail chicks exposed to Dyfonate died and one 7-day-old chick was unable to walk. Chicks exposed to Dyfonate were lethargic and brooded whereas chicks exposed to Lorsban and control chicks showed no overt behavioral changes. Our results indicate that this application of Lorsban 15G presents a relatively low hazard to quail chicks foraging in recently treated peanut fields. In a follow-up experiment, chicks foraging in Dyfonate-treated peanut fields, 1 day post-application, exhibited less ChE depression ($\bar{x} = 12\%$, $SD = 10.2$) than chicks exposed immediately following the application, suggesting the hazard from Dyfonate may be temporary.

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