Summary

(In accordance with 40 CFR Part 152, this summary is available for public release after registration)

Study Title

LORSBAN* INSECTICIDE: A PILOT YEAR EVALUATION OF ITS EFFECTS UPON AVIAN AND MAMMALIAN SPECIES ON AND AROUND CITRUS GROVES IN CALIFORNIA

Data Requirement

EPA Pesticide Assessment Guidelines
FIFRA Subdivision E, Section 71-5
Hazard Evaluation: Wildlife and Aquatic Organisms (EPA 1982)

Author(s)

S. P. Gallagher
D. A. Palmer
H. O. Krueger

Study Completion Date

July 20, 1994

Sponsor

The Environmental Toxicology & Chemistry Research Laboratory
Health and Environmental Sciences
The Dow Chemical Company
Midland, Michigan 48674

Performing Laboratory

Wildlife International Ltd.
8598 Commerce Drive
Easton, Maryland 21601

Contract Lab Project No: 103-365
Dow ID No: ES-2525

*Trademark of DowElanco

SUMMARY

Effects of chlorpyrifos formulated as LORSBAN*4E Insecticide on wildlife were evaluated in central California to determine the relative hazard of two different spray regimes. Vertebrate wildlife associated with citrus groves were monitored to determine which species were most at risk. The study also was designed to examine and refine several wildlife monitoring methods to determine their possible utility in evaluating hazard under the conditions of this study. The field portion of the study was conducted in the spring and summer of 1992 using 12 replicates, eight of which received applications of LORSBAN 4E during the season, and the remaining four left untreated for use as reference replicates. The eight treated replicates were divided into two groups with different application rates and timing. Regime A had nominal application rates of three (post bloom) and 12 pints/acre (post petal fall), while Regime B had nominal application rates of seven (post bloom) and eight pints/acre (post petal fall). The sites selected for study were chosen in an attempt to bias the test conditions toward worst case exposure of non-target vertebrate wildlife to chlorpyrifos, particularly birds.

Hazard was evaluated by searching for casualties and monitoring environmental concentrations of chlorpyrifos. Effects of LORSBAN applications on wildlife were assessed by examining circumstances under which casualties were found and by measuring chlorpyrifos residue levels in carcasses. Two hundred twenty casualties were found during the field work phase of the study. This does not include trapping mortalities, radiotelemetry casualties, nest box casualties and those believed to have occurred prior to the study. A summary of casualties collected is listed below:

		Application Period		
	Pre	(April - May) Post Bloom	(May - June) Post Petal Fall	Post Total
Regime A	7	40	31	71
Regime B	10	30	15	45
Reference	11	49	27	76
TOTAL	28	119	73	192

*Trademark of DowElanco

There was no clear differences between the number of casualties found between either LORSBAN treatment group and the reference group or between the two LORSBAN treatment groups. Overall, during the post application period, more casualties were found on reference replicates than on either group of LORSBAN treatment replicates. However, the numbers cannot be directly compared because personnel spent more time on reference replicates conducting additional study activities, therefore, more time was available to find casualties.

On Regime A replicates, three casualties found during the post application period may have been treatment related based on external chlorpyrifos residues (one bird, two mammals) and one casualty was considered likely treatment related due to internal and external residues (western rattlesnake). On Regime B replicates, two casualties found during the post application period may have been treatment related based on whole body residues (one bird, one mammal).

None of the 87 casualties found on the reference replicates were considered treatment related. The high number of casualties found on reference replicates provides evidence that there is a high likelihood of finding casualties that are not a result of insecticide applications. This is probably a result of a combination of grove management practices, as well as the large numbers of wildlife using the citrus groves in an otherwise arid environment.

Residues of chlorpyrifos were measured in selected samples of soil, citrus foliage, adjacent vegetation, invertebrates and water collected from all treated groves.

A summary of mean chlorpyrifos residues (ppm) from all replicates within treatment groups on selected days is presented below:

[redacted]

Matrix and Day	Application Period and Approximate Application Rates: Post-Bloom, Regime A, 3 pts/acre, 1.5 lbs a.i./acre	Post-Bloom, Regime B, 7 pts/acre, 3.5 lbs a.i.	Post-Petal Fall, Regime A, 12 pts/acre, 6 lbs a.i.	Post-Petal Fall, Regime B, 8 pts/acre, 4 lbs a.i.
Crop Foliage				
A+0	29.9	110	166	117
A+7	4.26	9.77	27.2	19.6
A+14	1.91	5.26	12.1	7.69
Soil				
A+0	2.28	7.63	6.65	7.81
A+7	0.426	1.86	1.22	3.37
A+14	0.427	0.442	0.338	1.30
Non-Crop Foliage				
A+0	6.13	21.9	36.4	80.6
A+7	1.20	2.03	3.79	6.38
A+14	0.647	1.99	1.40	2.44
Crop Invertebrates				
A+0	5.49	4.21	14.2	5.15
A+7	1.08	1.29	2.62	5.88[a]
A+14	0.500[b]	0.500	1.28	0.500
Water (ppb) (when available)				
A+0	0.500	0.500	244	0.500
A+7	0.500	0.500	0.500	0.500
A+14	0.500	0.500	0.500	0.500

[a]Value is for a single composited sample.

[b]Values below the limit of quantitation (1.0 ppm for invertebrates and 1.0 ppb for water) were given a value of half the limit of quantitation.

Avian species composition, relative abundance and crop use of wildlife in the study area were assessed by conducting avian censuses and by making general wildlife observations. Results indicated that the study area contained a diverse and abundant wildlife population during the field work phase of the study. Wildlife species noted during other study activities also were assessed to determine species most likely at risk. One hundred and seven species of birds, 27 mammalian species, nine reptilian species and four amphibian species were observed in the study area. Of these, 73 avian, 15 mammalian, four reptilian and one amphibian species were observed using the crop.

Several techniques were evaluated to determine their possible utility in determining hazard to wildlife. Radiotelemetry, colormarking (mark-recapture/resighting) and both nest box and natural nest monitoring were evaluated for birds. Trapping (mark-recapture and catch-per-unit-effort) was also evaluated for monitoring small mammal populations. The above techniques were conducted only on non-treated reference replicates to permit an objective evaluation in the absence of possible treatment effects.

Seventy-six birds were marked with transmitters on the four reference replicates. Birds were marked during seven, generally three-day capture sessions conducted throughout the field portion of the study. Results indicated that telemetry may not be a useful technique to evaluate hazard to passerines due to limited retention times of transmitters (<8 days). Mean retention time of transmitters on California quail (29.2 days) may make telemetry a useful techniques for this species. Quail could be marked and followed during an approximately 51 day period around post petal fall applications. This time period would have to include all trapping, a period of adjustment for radiomarked birds, test compound application and post application monitoring. To statistically evaluate potential hazard of LORSBAN to California quail using telemetry, it would be necessary to radiomark a minimum of 21 quail on each of eight pairs of sites.

One hundred-ninety birds were color marked during the same avian capture sessions that were used for radiomarking. Attempts to resight marked birds were made during searches conducted throughout the field portion of the study and to recapture them during subsequent trapping sessions. Results indicated that a mark/recapture study would not be a useful technique to evaluate hazard. Recapture/resighting rates for all species and during all application periods were too low for estimates of survival to be calculated.

Thirty-one active nests were monitored in the 200 nest boxes placed on reference replicates. Two avian species nested in the boxes. Neither European starling nor ash-throated flycatchers used nest boxes in numbers high enough to indicate that nest box monitoring would be a useful technique to evaluate hazard in other studies. Overall nest box occupancy was approximately 15% with only 17 birds of either species fledging from all reference replicates combined. Thirty-two natural nests of 10 avian species were located on reference replicates. Scrub jays, mourning doves and brown towhee were the only species with more than two nests located, but numbers of fledglings were insufficient to make natural nest searches a useful technique.

Small mammal trapping was evaluated using two different techniques. A mark-recapture study was conducted on two of the reference replicates using traps placed in a grid layout in the grove interior. Traps used on the other two reference replicates were placed along transects located in both the grove interior and in habitat adjacent to the citrus grove. Capture data for the transects and grids was used to determine catch-per-unit-effort as an index to small mammal abundance. Capture rates and numbers of individuals captured generally increased throughout the field portion of the study, with slight fluctuations on individual replicates. Highest capture rates and largest sample sizes occurred just prior to or following the post petal fall application. It was determined that small mammal grid or transect trapping to estimate small mammal populations can be conducted during all application periods.

This document is coded (B) May be requested under the Freedom of Information Act (http://www.epa.gov/pesticides/foia/), but access is restricted to entities not engaged in the production, sale, or distribution of pesticides outside the United States.