



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

19 SEP 1988

10152-96  
OFFICE OF  
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: PP321 (Karate) - Hazard Assessment for  
Honey Bees

FROM: Allen W. Vaughan, Entomologist 9.13.88  
Ecological Effects Branch  
Environmental Fate and Effects Division (TS-769)

THRU: Norman J. Cook, Supervisory Biologist 9.14.88  
Ecological Effects Branch  
Environmental Fate and Effects Division (TS-769)

THRU: James W. Akerman, Chief 9/16/88  
Ecological Effects Branch  
Environmental Fate and Effects Division (TS-769)

TO: Adam Heyward, PMT-15  
Insecticide/Rodenticide Branch  
Registration Division (TS-769)

PP321 (Karate)

Hazard to Honey Bees - Summary

EEB has reviewed the additional bee data submitted in support of registration of Karate. From all bee data submitted to date, the following are EEB's conclusions:

- 1) Karate is highly toxic to honey bees, when bees are exposed to direct application at normal use rates.
- 2) Karate is highly toxic to honey bees as a foliar residue, when bees are caged on treated foliage.
- 3) Karate is moderately repellent to honey bees in the field, thus significantly reducing residual toxicity hazard.

On the basis of the studies reviewed, EEB believes that the bee precaution statement on the Karate product label should be as follows:

This product is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds while bees are actively visiting the treatment area.

This statement reflects the fact that there is a significant bee hazard from direct application, but that residual toxicity is not a concern.

Attached material includes the DER's for three studies received under Record No. 212924.

Finally, please note that no additional testing is required on Karate and honey bees.

Attachments

DATA EVALUATION RECORD

1. Chemical: PP321 (Karate)
2. Test Material: 1.0 E, 1 lb ai per gal.
3. Study Type: Honey bee field repellency and toxicity

Species Tested: Apis mellifera

4. Study ID: Hearn, L.C. 1985. KARATE 1E and AMBUSH 25WP: Honey bee field repellency and toxicity study (California). Study performed by E.L. Atkins, Univ. of California, Riverside. Submitted by ICI Americas Inc., Wilmington, DE. Reg. No. 10182-OA.

5. Reviewed By:

Allen W. Vaughan  
Entomologist  
EEB/HED

Signature: Allen W. Vaughan  
Date: 9-13-88

6. Approved By:

Norman J. Cook  
Supervisory Biologist  
EEB/HED

Signature: Norman J. Cook  
Date: 9-13-88

7. Conclusions:

When PP321 was applied to seed alfalfa at 0.0075 and 0.015 lb ai/A, overall hazard to honeybees was determined to be nil. High mortality resulted only when bees were exposed to direct application. Also, PP321 was rated moderate with regard to bee repellency.

This study is scientifically sound, but does not address any guideline requirement.

8. Recommendations: N/A
9. Background: This study was submitted by ICI Americas in support of registration.
10. Discussion of Individual Tests: N/A

11. Materials and Methods

Karate 1E was applied by fixed-wing aircraft to determine the toxic and repellent effects on honey bees in seed alfalfa. Application was made at 0.0075 and 0.015 lb ai per acre in 10 gal water. Effects were determined by a variety of methods, including: foliar residue bioassay; monitoring bee mortality at colonies and in field cages; assessing colony strength and behavior; monitoring blossom visitation.

12. Reported Results:

When bees were exposed to aerial application, significant mortality resulted (89.52% mortality at 0.015 lb ai/A, ~~50.47%~~ mortality at 0.0075 lb ai/A). Otherwise, no significant hazard was indicated, as PP321 suppressed bee visitation 41 to 54% for 2 days. Overall honey bee hazard was determined to be nil.

13. Study Author's Conclusions/Q.A. Measures:

Reported results are listed above. The data obtained indicate that PP321 is highly hazardous to bees when bees are exposed to direct application, and that residues of PP321 may be repellent to honey bees under certain conditions.

Quality Assurance measures were not reported.

14. Reviewer's Discussion and Interpretation of the Study

A. Test Procedures:

Procedures were scientifically sound. However, protocol does not correspond to any test type in the guidelines, and test does not address any specific data requirement.

B. Statistical Analysis:

No analyses were reported.

C. Discussion/Results:

Residues of PP321 may remain repellent to honey bees for as long as 2 days posttreatment. Also, although hazard to bee exposed to direct application is high, there is little or no bee hazard from dried residues on foliage.

D. Adequacy of Study:

1. Classification: Supplemental
2. Rationale: Does not address any data requirement.
3. Reparability: N/A

15. Completion of One-Liner: N/A

16. CBI Appendix: N/A

DATA EVALUATION RECORD

1. Chemical: PP321 (Karate)
2. Test Material: Not reported
3. Study Type: Honey bee: Foraging study with simulated honeydew

Species Tested: Apis mellifera

4. Study ID: Gough, H.J., I.G. Collins, and W. Wilkinson. 1986. PP321: Effects on honey bees (Apis mellifera) foraging on simulated honeydew on winter wheat, 1985. Submitted by ICI Americas Inc., Wilmington, DE. Reg. No. 10182-OA.

5. Reviewed By:

Allen W. Vaughan  
Entomologist  
EEB/HED

Signature: Allen W. Vaughan

Date: 9-13-88

6. Approved By:

Norman J. Cook  
Supervisory Biologist  
EEB/HED

Signature: Norman J. Cook

Date: 9.13.88

7. Conclusions:

Under the conditions of this test (using treated "honeydew"), PP321 caused no significant increase in mortality whereas dimethoate killed thousands of bees. Inhibition of foraging by PP321 was detectable for up to 3 days, but was strongly marked in the first 24 hours. PP321 at 7.5 or 15 gm ai per ha on cereals where there is honeydew should present no appreciable hazard to honey bees.

This study does not address any guideline requirement.

8. Recommendations: N/A

9. Background: This study was submitted by ICI Americas in support of registration.

10. Discussion of Individual Tests: N/A

## 11. Materials and Methods

In 3 consecutive trials plots of winter wheat, enclosed in tunnel greenhouse frames, were sprayed with sucrose solution to simulate aphid honeydew. Each tunnel had a colony of honey bees which were confined by plastic mesh covering the tunnel frame. The bees foraged on the sucrose deposits and the daily mortality and foraging activity were monitored for several days before and after applying insecticide treatments. Behavior of bees near the hive was also observed, mainly on treatment days.

Treatments were applied at 300 liters per ha when several hundred bees were foraging on the crop. The first two trials each used 4 tunnels, one for each treatment: 7.5 gm ai per ha or 15 gm ai per ha PP321; 500 gm ai per ha dimethoate; and water control. The insecticides were applied to only half the crop in the tunnel, the other half receiving water, giving the bees a choice but avoiding differential wetting as a factor influencing the choice. The third trial used a single tunnel in which PP321 was applied at 15 gm ai per ha to the entire area of the enclosed crop.

Mortality was measured by counting dead bees at the hive entrances daily. Foraging activity was monitored by counts of foraging bees on 1 m wide strips of crop. In the two trials using 4 treatments foraging was assessed 4 times daily, 7 or 8 times on treatment days.

12. Reported Results: Reported results are listed above under #7, "Conclusions."

## 13. Study Author's Conclusions/Q.A. Measures:

Reported results are listed above. The data obtained indicate that residues of PP321 may be repellent to honey bees under the conditions of these tests.

Protocol and final report audits were conducted by ICI's Quality Assurance Unit.

## 14. Reviewer's Discussion and Interpretation of the Study

### A. Test Procedures:

Procedures were scientifically sound. However, protocol does not correspond to any test type in the guidelines, and test does not address any specific data requirement.

### B. Statistical Analysis:

EEB did not attempt to validate the results of the analyses.

C. Discussion/Results:

Residues of PP321 may remain repellent to honey bees for as long as 3 days posttreatment.

D. Adequacy of Study:

1. Classification: Supplemental

2. Rationale: Does not address any data requirement.

3. Reparability: N/A

15. Completion of One-Liner: N/A

16. CBI Appendix: N/A

DATA EVALUATION RECORD

1. Chemical: PP321 (Karate)
2. Test Material: 1 lb EC formulation
3. Study Type: Honey bee: Toxicity of residues on foliage

Species Tested: Apis mellifera

4. Study ID: Gough, H.J., and R.A. Brown. 1987. PP321: Toxicity of residues on foliage to honey bees (Apis mellifera). Submitted by ICI Americas Inc., Wilmington, DE. Reg. No. 10182-OA.

5. Reviewed By:

Allen W. Vaughan  
Entomologist  
EEB/HED

Signature: Allen W. Vaughan

Date: 9.13.88

6. Approved By:

Norman J. Cook  
Supervisory Biologist  
EEB/HED

Signature: Norman J. Cook

Date: 9.13.88

7. Conclusions:

The toxicity of PP321 residues to bees caged onto treated alfalfa foliage for 24 hours decreased with time after application. The LT50 (age of residue lethal to 50% of the bees) of the 0.013 lb ai/acre rate was between 4 and 12 hours, and about 23 hours at 0.031 lb ai/acre. The "NOEL" (time to no-effect) was 24-48 hours for the lower rate and in excess of 96 hours for the higher.

On the basis of these figures, PP321 is considered highly toxic to honey bees as a foliar residue. This study fulfills the guideline requirement for a foliar residue toxicity test on honey bees.

8. Recommendations: N/A

9. Background: This study was submitted by ICI Americas in support of registration.
10. Discussion of Individual Tests: N/A
11. Materials and Methods
- A. Test Animals were worker bees obtained from research colonies.
- B. Test System:
- General: Bees were collected by sweeping them from the combs into a plastic bucket. Bees were anesthetized by feeding carbon dioxide gas into the bucket. They were then placed in cages and allowed to recover. During the test period, bees were kept in a controlled temperature room at 25-26.5°C and 70%  $\pm$  5% R.H.
- A field crop of alfalfa was sprayed with an EC formulation of PP321 at rates of 15 and 35 gm ai per ha. Foliage samples were collected after 3, 8, 24, 48, and 96 hours, cut into 50 mm lengths, and placed over a supply of sucrose syrup in exposure cages. On each occasion 50 worker bees were then added to each cage and held for 24 hours before the effects on them were assessed. The study comprised two consecutive tests with differing meteorological conditions during each test.
- C. Dose: Exposure to treated foliage.
- D. Design: 150 bees per dose level and control, divided into 3 reps.; replicated two times over time. Two dose levels (application rates): 15 and 35 gm ai per ha.
- E. Statistics: Estimates of the age of residue lethal to 50% of the bees were obtained by fitting a probit model to the toxicity data.
12. Reported Results: Reported values are listed above under #7, "Conclusions."
13. Study Author's Conclusions/Q.A. Measures:
- Reported values are listed above. The values obtained indicate that residues of PP321 may be highly toxic to honey bees, under the conditions of these tests, for as long 96 hours.

Protocol and final report audits were conducted by ICI's Quality Assurance Unit.

14. Reviewer's Discussion and Interpretation of the Study

A. Test Procedures:

Procedures were in accordance with protocols recommended in the guidelines. There were no problems in this regard.

B. Statistical Analysis:

EEB did not attempt to validate the results of the analyses.

C. Discussion/Results:

Residues of PP321 may remain toxic to honey bees for as long as 4 days posttreatment.

D. Adequacy of Study:

1. Classification: Core

2. Rationale: Guidelines protocol

3. Reparability: N/A

15. Completion of One-Liner: N/A

16. CBI Appendix: N/A