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

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OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

**MEMORANDUM** PC 109301 PC 109303

SUBJECT: Fenvalerate/Esfenvalerate - Submission of a Skin Sensory Stimulation Study on Several End Use Products (EPA Registration No. 352-502)

Tox Chem. Nos: 77A/268J/2AA
Project No: 9-1646
Record No: 246788

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Conclusions

The study is Core-Supplementary. The information provided indicates that varying the formulation components of Asana 0.66 EC can influence the skin stimulation properties of Asana 0.66 EC.

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**DATA EVALUATION REPORT**

STUDY TYPE: Skin Sensory Stimulation

TOX CHEM Nos.: 77A
268J
2AA

MRID No.: 411164-01

Test Materials:
1. Pydrin 2.4 EC
2. Payoff 2.5 EC
3. Asana 1.9 EC - formulation 1
   - formulation 2
   - formulation 3
4. Asana 0.66 EC - formulation 1
   - formulation 2
   - formulation 3
5. Asana 1.28 EC

Synonyms: See Attachment # 1 for a description of each test substance (includes purity, color, CAS No.). See Table 1 for a description of each formulation tested.

Sponsor: Du Pont

Testing Facility: Du Pont
Haskell Laboratory for Toxicology and Industrial Medicine
Newark, DE 19714

Title of Report: Skin Sensory Stimulation Elicited by Various Pyrethroid Formulations in Guinea Pigs

Author: L. A. Malley

Study No: Medical Research No. 4581-536, -522, -553
Haskell Laboratory Report No. 308-88

Report Issued: May 5, 1989

Classification: Supplementary

Conclusions: Varying the formulation components of Asana 0.66 EC can influence the skin stimulation properties of Asana 0.66 EC.

Materials and Methods:

Young adult male Duncan Hartley albino guinea pigs were obtained from Charles River Breeding Laboratories, Stone Ridge, NY and were allowed to acclimate to laboratory conditions for approximately 1 week. The animals were individually housed in suspended, stainless steel, wire-mesh cages in rooms with a temperature of 23 $\pm$ 2° C, relative humidity of 50 $\pm$ 10% and a 12-hour on/ 12-hour off light cycle. Purina Certified Guinea Pig Chow # 5026 and water were available ad libitum except for the 4-5 hour observation period on the day of the test. Approximately 24-72 hours prior to study initiation, the hair on the back and trunk of each quinea pig was clipped. A depilatory lotion was then used for approximately 10-15 minutes. The test areas were washed with water and then dried with a paper towel. On the day of treatment, 0.1 ml of the test material was placed on the flank (a 5 X 5 $cm^2$ area) on the quinea pig. Approximately, 0.1 ml of a second test material was placed on the opposite flank. The guinea pigs were then observed for scratching, licking or biting of the test sites for 5 minute intervals after 10, 25, 40, 55, 115, 175 and 235 minutes. The scratching, licking, biting behavior was quantitated by counting the number of times the animal licked, bit or scratched the test site. The responses from each interval were added to obtain a cumulative response score for each animal. When 2 test substances were simultaneously applied, both a cumulative score and a percentage were calculated for each test substance. The percentage was calculated by dividing the cumulative score for each test substance applied by the sum of the scores for both test substances and multiplying by 100. Cumulative scores for each pair of pyrethroids applied were analyzed using a student's t-test. Significance was determined at the alpha = 0.05 level. A number of comparisons were tested with various formulations. In addition, comparisons were made testing formulations at various concentrations. The comparison tests are indicated in the table below. Each group consisted of 4 male guinea pigs.

| Test No. | Test Substance | Formulation Concentration (%) | Active Ingredient (%) | Active Isomer (%) |
|---|---|---|---|---|
| 1 | Pydrin 2.4 EC | 2.1 | 0.69 | 0.15 |
| | Payoff 2.5 EC | 0.8 | 0.27 | 0.07 |
| 2 | Pydrin 2.4 EC | 0.52 | 0.17 | 0.004 |
| | Payoff 2.5 EC | 0.2 | 0.07 | 0.002 |
| 3 | Pydrin 2.4 EC | 0.52 | | |
| | Asana 1.9 EC | 0.2 | 0.06 | 0.05 |
| 4 | Pydrin 2.4 EC | 0.52 | 0.17 | 0.004 |
| | Asana 1.9 EC* | 0.2 | 0.06 | 0.05 |

* - "Different solvent system"

| | | | | |
|---|---|---|---|---|
| 5 | Pydrin 2.4 EC | 0.52 | 0.17 | 0.04 |
| | Asana 1.9 EC | 0.16 | 0.05 | 0.04 |
| 6 | Pydrin 2.4 EC | 0.053 | 0.017 | 0.004 |
| | Asana 0.66 EC | 0.058 | 0.006 | 0.005 |
| 7 | Pydrin 2.4 EC | 0.52 | 0.17 | 0.04 |
| | Asana 0.66 EC | 0.58 | 0.06 | 0.05 |
| 8 | Pydrin 2.4 EC | 1.05 | 0.35 | 0.08 |

| | | | | |
|---|---|---|---|---|
| | Asana 0.66 EC | 1.15 | 0.12 | 0.10 |
| 9 | Pydrin 2.4 EC | 0.52 | 0.17 | 0.04 |
| | Asana 0.66 EC ** | 0.58 | 0.06 | 0.05 |
| 10 | Pydrin 2.4 EC | 0.52 | 0.17 | 0.04 |
| | Asana 1.28 EC | 0.30 | 0.06 | 0.05 |
| 11 | Asana 1.9 EC | 0.02 | 0.006 | 0.005 |
| | Asana 0.66 EC | 0.058 | 0.006 | 0.005 |

**-Different formulation lacks the C-65 methyl ester

| | | | | |
|---|---|---|---|---|
| 12 | Asana 1.9 EC | 0.2 | 0.06 | 0.05 |
| | Asana 0.66 EC (Trial #1) | 0.58 | 0.06 | 0.05 |
| 13 | Asana 1.9 EC | 0.2 | 0.06 | 0.05 |
| | Asana 0.66 EC (Trial #2) | 0.58 | 0.06 | 0.05 |
| 14 | Asana 0.66 EC | 0.06 | | |
| | Asana 0.66 EC*** | 0.06 | | |
| 15 | Asana 0.66 EC | 0.58 | 0.06 | 0.05 |
| | Asana 0.66 EC*** | 0.58 | 0.06 | 0.05 |

| | | | | |
|---|---|---|---|---|
| 16 | Asana 1.9 EC | 0.02 | 0.006 | 0.005 |
| | Payoff 2.5 EC | 0.02 | 0.007 | 0.0002 |
| 17 | Asana 1.9 EC | 0.2 | 0.06 | 0.05 |
| | Payoff 2.0 EC | 0.2 | 0.07 | 0.0002 |

***-Solvent only formulation

Results

Summaries of the results of the tests can be found in Tables 4-10 (attached).

Comparison of Pydrin 2.4 EC to Payoff 2.5 EC

At field-use dilutions of 2.1% Pydrin and 0.8% Payoff, no differences in skin sensory stimulation were discerned. However, at 1/4 of field-use dilutions (0.52% Pydrin, 0.2% Payoff), Payoff produced the greatest stimulation (see Table 4).

Comparison of Pydrin 2.4 EC to Two Formulations of Asana 1.9 EC

When Pydrin and Asana were tested at 1/4 field-use dilutions of 0.52% and 0.2%, respectively, Asana produced the greatest simulation. When Pydrin and Asana were tested at concentrations at which they both contained equivalent amount of the active isomer (0.52% and 0.16%, respectively), Asana produced the greatest stimulation. A second Asana formulation was tested that contained 10% cottonseed oil. At a concentration of 0.2% the second Asana formulation produced more stimulation than the Pydrin formulation at a concentration of 0.52%. It was concluded that the difference in the degree of stimulation between Pydrin and Asana could not be related to the active isomer concentration or to a change in the solvent system (not described) that contained 10% cottonseed oil (see Table 5).

Comparison of Pydrin 2.4 EC to Two Formulations of Asana 0.66 EC

Asana 0.66 EC, at concentrations of 0.058% and 0.58% (1/4 field-use dilution), and Pydrin at concentrations of 0.053% and 0.52% were tested. The skin sensory stimulation were comparable among the 4 test groups. However, Asana at a concentration of

1.15% caused greater stimulation than Pydrin at a concentration of 1.05%. A second formulation of Asana that did not contain the C-65 methyl ester was tested at 0.58% and compared to Pydrin at a concentration of 0.53%. The second Asana formulation produced greater stimulation. It was concluded that at concentrations greater than 1/4 field-use dilution, Asana produced greater stimulation than Pydrin (see Table 6).

Comparison of Pydrin 2.4 EC to Asana 1.28 EC

The field-use dilution of Pydrin (0.52% and 1/4 field-use dilution of Asana (0.30%) were tested and found to be comparable (see Table 7).

Comparison of Asana 1.9 to Asana 0.66 EC

Asana 1.9 EC at concentrations of 0.02 or 0.2% and Asana 0.66 EC at concentrations of 0.058 and 0.58% were tested. Asana 1.9 EC at a concentration of 0.02% caused greater skin sensory stimulation than Asana 0.66 EC at a concentration of 0.058%. However, at higher concentrations of 0.58% and 0.2%, respectively, Asana 0.66 EC produced more skin sensory stimulation than Asana 1.9 EC (see Table 8).

Comparison of Two Asana 0.66 EC formulations

Concentrations of 0.06% and 0.58% of Asana 0.66 EC and concentrations of 0.067% and 0.58% Asana 0.66 EC (solvent only) were tested. The solvent only formulation was somewhat (64%) less stimulating than Asana 0.66 EC at a concentration of 0.58% and 42% less stimulating at a concentration of 0.06% (see Table 9).

Comparison of Asana 1.9 EC to Payoff 2.5 EC

Asana 1.9 EC and Payoff 2.5 EC were both tested at concentrations of 0.02% or 0.2%. At both concentrations, the skin sensory stimulation evoked by Payoff 2.5 EC was quite similar to Asana 1.9 EC (see Table 10).

Summary

The Various pyrethroid formulations tested varied with respect to the concentration of technical Asana, percentage of cottonseed oil, percentage of C-65 methyl ester, percentage and type of emulsifier and type of solvent. Payoff 2.5 EC, two formulations of Asana 1.9 EC and Asana 1.28 EC elicited more skin sensory stimulation than Pydrin 2.4 EC. Concentrations of 0.58% or less of Asana 0.66 EC and Pydrin 2.4 EC caused equivalent stimulation. However, at higher concentrations Asana 0.66 EC produced more stimulation than Pydrin 2.4 EC. Similarly, at concentrations of 0.058% Asana 0.66 was less stimulating than

Asana 1.9 EC; but, was more stimulating at higher concentrations. The degree of skin sensory stimulation was similar for Payoff 2.5 EC and Asana 0.66 EC. [The data indicate that altering formulation components can influence the skin sensory effects of Asana 0.66 EC.]

Itachment #1



## REPORT AND COMPOUND INFORMATION

### Test Material

| | |
|---|---|
| Material Tested: | Benzeneacetic acid, 4-chloro-alpha-(1-methylethyl)-, cyano(3-phenoxyphenyl)methyl ester |
| Medical Research No.: | 4581-536 |
| Haskell No.: | 16,827 |
| Physical Form: | Clear yellow liquid |
| Purity: | 32.97% active ingredient |
| Composition: | 32.97% Active ingredient: fenvalerate<br>67.03% Inert ingredients |
| Synonyms: | For the mixture:<br>• Pydrin® 2.4EC<br><br>For the active ingredient:<br>• Fenvalerate<br>• (RS)-alpha-Cyano-3-phenoxybenzyl (RS)-2-(4-chlorophenyl)-3-methylbutyrate |
| Other Code: | IN Y4306-35 |
| Submitter's Notebook No.: | E-48171-58 |
| CAS Registry No.: | For the active ingredient: 51630-58-1<br>For mixture: None |

Attachment #1



REPORT AND COMPOUND INFORMATION (Continued)

| | |
|---|---|
| Material Tested: | Tenneco 500-100, mixt. with Toximul PY |
| Medical Research No.: | 4581-536 |
| Haskell No.: | 16,834 |
| Physical Form: | Clear yellow liquid |
| Composition: | 89.56% Tenneco 500-100<br>10.44% Toximul PY (Stephan Co.) |
| Synonyms: | IN Y4306-35 Formulation Blank |
| Submitter's Notebook No.: | E-48171-58-9 |

REPORT AND COMPOUND INFORMATION (Continued)

| | |
|---|---|
| Material Tested: | Benzeneacetic acid, 4-(difluoromethoxy)-alpha-(1-methylethyl)-, cyano(3-phenoxyphenyl)methyl ester |
| Medical Research No.: | 4581-536 |
| Haskell No.: | 16,828 |
| Physical Form: | Dark amber liquid |
| Purity: | 34.3% active ingredient |
| Composition: | 34.3% Active ingredient: flucythrinate<br>65.7% Inert ingredients |
| Synonyms: | For mixture:<br>• Pay-Off® 2.5EC<br><br>For active ingredient:<br>• Flucythrinate<br>• (RS)-Cyano(3-phenoxyphenyl)methyl (S)-4-(difluoromethoxy)-alpha-(1-methylethyl)benzeneacetate |
| Other Code: | IN Y4835-2 |
| Submitter's Notebook Nos.: | • E-48171-58<br>• 47971-49 |
| CAS Registry No.: | For active ingredient: 70124-77-5<br>For mixture: None |

Attachment #1



REPORT AND COMPOUND INFORMATION (Continued)

| | |
|---|---|
| Material Tested: | Benzeneacetic acid, 4-chloro-alpha-(1-methylethyl)-, cyano(3-phenoxyphenyl)-methyl ester, [S-(R*,R*)]- |
| Medical Research No.: | 4581-536 |
| Haskell No.: | 16,823 |
| Physical Form: | Straw to amber liquid |
| Purity: | 29.04% active ingredient |
| Composition: | 29.04% Active ingredient: esfenvalerate<br>70.96% Inert ingredients |
| Synonyms: | For the mixture:<br>• Asana® Insecticide<br>• 1.9EC Asana® Formulation<br><br>For the active ingredient:<br>• Esfenvalerate |
| Other Code: | IN YB656-20 |
| Submitter's Notebook No.: | E-48171-58 |
| CAS Registry No.: | For the mixture: None<br>For the active ingredient: 66230-04-4 |

REPORT AND COMPOUND INFORMATION (Continued)

| | |
|---|---|
| Material Tested: | Benzeneacetic acid, 4-chloro-alpha-(1-methylethyl)-, cyano(3-phenoxyphenyl)-methyl ester, [S-(R*,R*)]- |
| Medical Research No.: | 4581-536 |
| Haskell No.: | 16,846 |
| Physical Form: | Straw to amber liquid |
| Purity: | 28.85% active ingredient |
| Composition: | 28.85% Active ingredient: esfenvalerate<br>71.15% Inert ingredients |
| Synonyms: | For the mixture:<br>• Asana® Insecticide<br>• 1.9EC Asana® Formulation<br>For the active ingredient:<br>• Esfenvalerate |
| Other Codes: | • IN YB656-24<br>• DPX-YB656-24 |
| Submitter's Notebook No.: | E-48171-86-1 |
| CAS Registry No.: | None for the mixture<br>For the active ingredient: 66230-04-4 |

Attachment #1



REPORT AND COMPOUND INFORMATION (Continued)

| | |
|---|---|
| Material Tested: | Benzeneacetic acid, 4-chloro-alpha-(1-methylethyl)-, cyano(3-phenoxyphenyl)-methyl ester, [S-(R*,R*)]- |
| Medical Research No.: | 4581-536 |
| Haskell No.: | 16,825 |
| Physical Form: | Straw to amber liquid |
| Purity: | 10.15% active ingredient |
| Composition: | 10.15% Active ingredient: esfenvalerate<br>89.85% Inert ingredients |
| Synonyms: | For the mixture:<br>• Asana® Insecticide<br>• 0.66EC Asana® Formulation<br><br>For the active ingredient:<br>• Esfenvalerate |
| Other Code: | IN YB656-22 |
| Submitter's Notebook No.: | E-48171-58 |
| CAS Registry No.: | For the mixture: None<br>For the active ingredient: 66230-04-4 |

REPORT AND COMPOUND INFORMATION (Continued)

| | |
|---|---|
| Material Tested: | Benzeneacetic acid, 4-chloro-alpha-(1-methylethyl)-, cyano(3-phenoxyphenyl)-methyl ester, [S-(R*,R*)]- |
| Medical Research No.: | 4581-536 |
| Haskell No.: | 16,826 |
| Physical Form: | Straw to amber liquid |
| Purity: | 10.03% active ingredient |
| Composition: | 10.03% Active ingredient: esfenvalerate<br>89.97% Inert ingredients |
| Synonyms: | For the mixture:<br>• Asana® Insecticide<br>• 0.66EC Asana® Formulation<br><br>For the active ingredient:<br>• Esfenvalerate |
| Other Code: | IN YB656-23 |
| Submitter's Notebook No.: | E-48171-58 |
| CAS Registry No.: | For the mixture: None<br>For the active ingredient: 66230-04-4 |

Attachment #1



REPORT AND COMPOUND INFORMATION (Continued)

| | |
|---|---|
| Material Tested: | Benzeneacetic acid, 4-chloro-alpha-(1-methylethyl)-, cyano(3-phenoxyphenyl)-methyl ester, [S-(R*,R*)]- |
| Medical Research No.: | 4581-552 |
| Haskell No.: | 16,924 |
| Physical Form: | Straw to amber liquid |
| Purity: | 19.80% active ingredient |
| Composition: | 19.80% Active ingredient<br>80.20% Inert ingredients |
| Synonyms: | For the mixture:<br>• Asana® 1.28EC Insecticide<br><br>For the active ingredient:<br>• Esfenvalerate |
| Other Codes: | • IN YB656-26<br>• DPX-YB656-26 |
| Submitter's Notebook No.: | E-48171-93 |
| CAS Registry No.: | For the mixture: None<br>For the active ingredient: 66230-04-4 |

REPORT AND COMPOUND INFORMATION (Continued)

| | |
|---|---|
| Material Tested: | Benzeneacetic acid, 4-chloro-alpha-(1-methylethyl)-, cyano(3-phenoxyphenyl)-methyl ester, [S-(R*,R*)]- |
| Medical Research No.: | 4581-553 |
| Haskell No.: | 16,922 |
| Physical Form: | Straw to amber liquid |
| Purity: | 10.59% active ingredient |
| Composition: | 10.59% Active ingredient<br>89.41% Inert ingredients |
| Synonyms: | For the mixture:<br>• Asana® 0.66EC Insecticide<br><br>For the active ingredient:<br>• Esfenvalerate |
| Other Codes: | • IN YB656-27<br>• DPX-YB656-27 |
| Submitter's Notebook No.: | E-48171-95 |
| CAS Registry No.: | For the mixture: None<br>For the active ingredient: 66230-04-4 |

Table 1

Compound Name, Identification and Formulation of Material Tested for Skin Sensory Stimulation

| Compound Name | Code | Formulation Components | | |
|---|---|---|---|---|
| | | Active Ingredient (%) | Solvent (%) | Oil[a] (%) |
| Asana® 1.9EC | IN YB656-20 | 29.04 | 65.96[b] | |
| Asana® 1.9EC | IN YB656-24 | 28.85 | 56.15[c] | 10.0 |
| Asana® 0.66EC[d] | IN YB656-22 | 10.15 | 12.0 | 47.49 |
| Asana® 0.66EC[e] | IN YB656-23 | 10.03 | 12.0 | 67.97 |
| Asana® 0.66EC[e] | IN YB656-27 | 10.59 | 84.41 | |
| Asana® 1.28EC | IN YB656-26 | 19.80 | 55.20 | 20.0 |
| Payoff® 2.5EC | IN Y4835-2 | 34.30 | N.A.[f] | |
| Pydrin® 2.4EC | IN Y4306-35 | 32.97 | 60.03 | |

a Cottonseed oil.

b Proprietary solvent A.

c Proprietary solvent B.

d Formulation contains a C-65 methyl ester.

e Formulation does not contain C-65 methyl ester.

f The exact composition of Payoff® 2.5EC is not available.

Table 2

Comparison of Active Isomer Concentrations in Dilutions of Pydrin 2.4EC, Asana® 1.9EC, Asana® 0.66EC, Asana® 1.28EC, and Payoff® 2.5EC

Formulations

| Code | Compound | Dilution Concentration(%) | % Active Ingredient[a] | %Active Isomer[b] |
|---|---|---|---|---|
| IN Y4306-35 | Pydrin® 2.4EC | 0.053 | 0.017 | 0.004 |
| | | 0.52[d] | 0.17 | 0.04 |
| | | 1.05 | 0.35 | 0.08 |
| | | 2.1[c] | 0.69 | 0.15 |
| IN Y4835-2 | Payoff® 2.5EC | 0.02 | 0.007 | 0.0002 |
| | | 0.2[d] | 0.07 | 0.002 |
| | | 0.8[c] | 0.27 | 0.07 |
| IN YB656-20, -24 | Asana® 1.9EC | 0.02 | 0.006 | 0.005 |
| | | 0.16[d] | 0.05 | 0.04 |
| | | 0.2 | 0.06 | 0.05 |
| IN YB656-22, -23, -27 | Asana® 0.66EC | 0.058 | 0.006 | 0.005 |
| | | 0.58[d] | 0.06 | 0.05 |
| | | 1.15 | 0.12 | 0.10 |
| IN YB656-26 | Asana® 1.28EC | 0.30[d] | 0.06 | 0.05 |

a The active ingredient concentration is calculated from the dilution factor and percentage of active ingredient.

b The active isomer concentration is calculated from the isomeric ratio and percentage of active ingredient.

c Field use concentration.

d One-fourth field use concentration.

Table 3

Cumulative Mean Response[a] Following Topical Application of Pydrin® 2.4EC or Blank to Guinea Pigs

| | | Trial[b] | | |
|---|---|---|---|---|
| GROUP 1 | | 1 | 2 | 3 |
| | Pydrin® 2.4EC | 27.2 (15.6)[c] | 14.5 (9.9) | 33.2 (25.9) |
| | Blank | 0.2 (0.5) | 1.0 (0.8) | 2.5 (1.3) |
| GROUP 2 | | | | |
| | Pydrin® 2.4EC | 38.8 (14.1) | 15.8 (10.6) | 35.8 (8.4) |
| | Blank | 2.2 (2.2) | 1.2 (2.5) | 1.0 (1.4) |

a See Materials and Methods Section D for calculation of cumulative mean response.

b Three applications were administered to the same animals over a 14-day time period.

c Standard deviation of the mean. Data were not subjected to comparison by Student's T-test.

Table 4

Cumulative Mean Response[a] and Mean Percent Response Following Topical Application of Pydrin® 2.4EC and Payoff® 2.5EC to Guinea Pigs

| Compound | Concentration(%) | Mean Cumulative Response | Mean Percent Response(%) |
|---|---|---|---|
| Pydrin® 2.4EC | 2.1 | 26.2 (6.8)[b] | 53 (19) |
| Payoff® 2.5EC | 0.8 | 24.8 (12.0) | 47 (19) |
| Pydrin® 2.4EC | 0.52 | 3.2 (5.2) | 14 (17) |
| Payoff® 2.5EC | 0.2 | 12.5* (9.9) | 86 (17) |

a See Materials and Methods Section D for evaluation of cumulative mean response and mean percent response.

b Standard deviation of the mean.

* Payoff® 2.5EC (0.2%) caused a significantly greater response than Pydrin® 2.4EC (0.53%) at $p < 0.05$.

Table 5

Cumulative Mean Response[a] and Mean Percent Response Following Topical Application of Pydrin® 2.4EC and Two Formulations of Asana® 1.9EC to Guinea Pigs

| Compound | Concentration(%) | Mean Cumulative Response | Mean Percent Response(%) |
|---|---|---|---|
| Pydrin® 2.4EC | 0.52 | 6.2 (2.9)[b] | 22 (5) |
| Asana® 1.9EC | 0.2 | 21.5* (7.3) | 78 (5) |
| Pydrin® 2.4EC | 0.52 | 19.8 (6.2) | 28 (2) |
| Asana® 1.9EC (different solvent system) | 0.2 | 51.5# (12.4) | 72 (2) |
| Pydrin® 2.4EC | 0.52 | 5.2 (2.9) | 29 (6) |
| Asana® 1.9EC | 0.16 | 12.5+ (5.1) | 71 (6) |

a See Materials and Methods Section D for calculation of cumulative mean response and mean percent response.

b Standard deviation of the mean.

* Asana® 1.9EC (0.2%) caused a significantly greater response than Pydrin® 2.4EC (0.53%) at $p < 0.05$.

\# Asana® 1.9EC (0.2%) containing a different solvent system caused a significantly greater response than Pydrin® 2.4EC (0.53%) at $p < 0.05$.

\+ Asana® 1.9EC (0.16%) caused a significantly greater response than Pydrin® 2.4EC (0.53%) at $p < 0.05$.

Table 6

Cumulative Mean Response[a] and Mean Percent Response Following Topical Application of Pydrin® 2.4EC and Two Formulations of Asana® 0.66EC to Guinea Pigs

| Compound | Concentration(%) | Mean Cumulative Response | Mean Percent Response(%) |
|---|---|---|---|
| Pydrin® 2.4EC | 0.053 | 6.5 (7.2)[b] | 64 (34) |
| Asana® 0.66EC | 0.058 | 3.8 (3.5) | 36 (34) |
| Pydrin® 2.4EC | 0.52 | 12 (6.9) | 60 (18) |
| Asana® 0.66EC | 0.58 | 9.5 (7.2) | 40 (18) |
| Pydrin® 2.4EC | 1.05 | 13.8 (11.5) | 28 (20) |
| Asana® 0.66EC | 1.15 | 26.0 (14.0) | 72 (20) |
| Pydrin® 2.4EC | 0.53 | 7.5 (5.4) | 37 (14) |
| Asana® 0.66EC[c] (different formulation) | 0.58 | 13.0 (7.4) | 63 (14) |

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a See Materials and Methods Section D for calculation of cumulative mean response and mean percent response.

b Standard deviation of the mean.

c Formulation lacks the C-65 methyl ester component.

Table 7

Cumulative Mean Response[a] and Mean Percent Response Following Topical Application of Pydrin® 2.4EC and Asana® 1.28EC to Guinea Pigs

| Compound | Concentration(%) | Mean Cumulative Response | Mean Percent Response(%) |
|---|---|---|---|
| Pydrin® 2.4EC | 0.52 | 12.2 (6.9)[b] | 54 (34) |
| Asana® 1.28EC | 0.30 | 19.0 (15.6) | 46 (34) |

a See Materials and Methods Section D for calculation of cumulative mean response and mean percent response.

b Standard deviation of the mean.

Table 8

Cumulative Mean Response[a] and Mean Percent Response Following Topical Application of Asana® 1.9EC and Asana® 0.66EC to Guinea Pigs

| Compound | Concentration(%) | Mean Cumulative Response | Mean Percent Response(%) |
|---|---|---|---|
| Asana® 1.9EC[b] | 0.02 | 13.8 (11.7)[c] | 89 (13) |
| Asana® 0.66EC | 0.058 | 3.2 (4.7) | 11 (13) |
| Asana® 1.9EC[b] (Trial 1) | 0.2 | 24.5 (17.1) | 43 (13) |
| Asana® 0.66EC (Trial 1) | 0.58 | 31.8 (18.2) | 57 (13) |
| Asana® 1.9EC[b] (Trial 2) | 0.2 | 13.2 (4.8) | 33 (12) |
| Asana® 0.66EC (Trial 2) | 0.58 | 30.5 (15.9) | 67 (12) |

a See Materials and Methods Section D for calculation of cumulative mean response and mean percent response.

b Asana® 1.9EC formulation containing proprietary solvent A (see Table 1).

c Standard deviation of the mean.

Table 9

Cumulative Mean Response[a] and Mean Percent Response Following Topical Application of Two Asana® 0.66EC Formulations to Guinea Pigs

| Compound | Concentration(%) | Mean Cumulative Response | Mean Percent Response(%) |
|---|---|---|---|
| Asana® 0.66EC | 0.06 | 6.0 (3.5)[b] | 64 (11) |
| Asana® 0.66EC (solvent only formulation) | 0.06 | 3.5 (1.9) | 36 (11) |
| Asana® 0.66EC | 0.58 | 27.5 (13.9) | 73 (13) |
| Asana® 0.66EC (solvent only formulation) | 0.58 | 9.8 (5.1) | 27 (13) |

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a See Materials and Methods Section D for calculation of cumulative mean response and mean percent response.

b Standard deviation of the mean.

Table 10

Cumulative Mean Response[a] and Mean Percent Response Following Topical Application of Asana® 1.9EC and Payoff® 2.5EC to Guinea Pigs

| Compound | Concentration(%) | Mean Cumulative Response | Mean Percent Response(%) |
|---|---|---|---|
| Asana® 1.9EC | 0.02 | 0 (0)[b] | 0 (0) |
| Payoff® 2.5EC | 0.02 | 1.8 (2.9) | 50 (57.7) |
| Asana® 1.9EC | 0.2 | 7.5 (8.7) | 50.5 (33) |
| Payoff® 2.5EC | 0.2 | 5.2 (3.9) | 49.5 (33) |

[a] See Materials and Methods Section D for calculation of cumulative mean response and mean percent response.

[b] Standard deviation of the mean.