Product Performance Study Review
Kevin Sweeney, Entomologist, IB
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Kevin J Sweeney 4/10/01

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Registrant: BASF Corporation

Reviewer: Ann Sibold

Product Manager: Ann Sibold, Acting PM 10

Submission: S591278

DP# D272077

OPPTS Guideline: 810.36.

Product Name: Chlorfenapyr Termiticide-Insecticide

Active Ingredient: chlorfenapyr 21.44%. Request approval of application rates from 0.125% to 2.00% for control of subterranean termites, including Formosan termites, and claims to provide residual protection from termites (for five years post-treatment).

The registrant, BASF, submitted a non-GLP product performance study entitled, AC 303630 Treatments to Soil for Control of Subterranean Termites by Ted Roland, USDA-FS and Susan Burkhart, BASF Corporation, MRID 453006-01. This submission is divided into four parts: 1) the Fourth Progress Report of chlorfenapyr at USDA-FS field sites (year 2000 data); 2) a summary of the four years of Forest Service Testing; 3) Soil Residue Data for Years 1-3, USDA-FS Trials; and 4) a summary of representative sites from the EUP.

Product performance results for chlorfenapyr termiticide-insecticide (PHANTOM) at the USDA-FS field sites have been inconsistent. For four years in Arizona and South Carolina (1997 through 2000), this formulation has been100% effective in the concrete slab test at rates of 0.125% to 2.00% and in the ground board test at application rates ranging from 0.25% to 2.00%. Untreated (control) replicates in Arizona (10%-40%) and South Carolina (70%-100%) were penetrated by termites resulting in extensive wood board damage. On the other hand, termite damage to boards in untreated replicates of the concrete slab and ground board tests was nearly 100% for all four years of testing in the Florida and Mississippi test plots.

Termites penetrated the chlorfenapyr barrier and damaged wood in a total of seven replicates in the Florida and Mississippi concrete slab test plots (see attached table). In Florida,

termite penetrations occurred in the second (1998) and fourth years (2000) in the concrete slab test and in the first (1997) and the second years (1998) in the ground board test. Mississippi test plots had barrier penetrations in the second (1998) and third years (1999) in the concrete slab test and in the third year (1999) in the ground board test. Ninety percent (36/40) of the 0.125% label rate replicates have been protected for four years in the concrete slab test (no ground board data were collected at this rate). The results for the trials with the 0.25% concentration indicate success in 97.5% (39/40) of the replicates in the concrete slab test and 87.5% (35/40) in the ground board test. At the 0.5% concentration, 100% (40/40) of the replicates were protected in the concrete slab test and 97.5% (39/40) in the ground board test.

The higher rates of chlorfenapyr were expected to be more efficacious than the lower rates ($\leq$ 5 %) discussed above if effectiveness were related to the amount of chlorfenapyr applied per unit area. However, this may not be the case based on the results to date. At the 0.75% rate, only 95% (38/40) of the replicates were protected in the concrete slab test while100% were protected in the more rigorous ground board test. The 1.00% rate was 100% successful (40/40) in the ground board and concrete slab trials. At the highest rate tested, 2.00% there was one penetration in Mississippi in 1998 in the concrete slab test resulting in 97.5 % (39/40) protection of the replicates while being 100% effective in the ground board test (40/40) during the same time period.

Four out of six - or 67% of the penetrations in the concrete slab test occurred at the 0.125% rate. The three remaining barrier penetrations in the concrete slab test were at the higher application rates of 0.25%, 0.75% , and 2.00%. In all cases damaged wood boards were replaced with new ones.

In the more rigorous ground board test, termites penetrated the chlorfenapyr barrier four times. The 0.25% rate was penetrated three times and the 0.5% rate once (The 0.125% rate was not tested). Three penetrations occurred in Florida: one in 1997 at 0.25%; two in 1998 at 0.25% and 0.5%; and one in Mississippi in 1999 at the 0.25% rate. Damaged boards were replaced with new ones in every case.

In the attached table, 90% control translates into termite penetration of a chlorfenapyr barrier in 1 of 10 replicates at an tested application rate while 80% control means that 2 of 10 replicates were penetrated by termites. In every case there was termite feeding on the protected block of wood. Feeding damage varied and did not occur in twice at any of the replicates to date. However, the reason that termites have not feed at a replicate for more than once is unclear. **Three explanations are possible: 1)the termites may have been killed by the slow acting chlorfenapyr residues after repeated dermal (cuticle)contact and possible ingestion; or 2) the USDA-FS practice of replacing damaged boards at a penetrated replicate may have disturbed the foraging termites, causing them to leave the replicate permanently. Termite behavior is not well understood but it is known that an environmental disturbance may cause termite species from the genus *Reticulitermes* to alter their foraging behavior and abandon a feeding site. ; or 3) there is insufficient chlorfenapyr available to kill foraging**

termites.

BASF contends that due to the non-repellent nature and slow acting mode of action of chlorfenapyr (interrupting oxidative phosphorylation by altering the permeability of the mitochondrial membrane to hydrogen ions) termites are able to cross the chlorfenapyr barrier and feed on wood. BASF believes that the termite feeding stops because repeated crossings by worker termites through the chlorfenapyr barrier results in absorption/ingestion of a lethal dose that results in death. This contention is feasible but remains unproven. The data collected to date do not support or refute this hypothesis since the experiments were not designed to test its validity.

HOW EPA should apply the ASTM rating data for the penetrated replicates to the evaluation of this termiticide is unclear since the reason that termites discontinue their feeding on the wood board is not completely understood.

As expected, the submitted residue data through three years indicate that chlorfenapyr residues decline over time. At three years post-treatment, the lowest rate, 0.125%, had less than 20 ppm remaining in the soil. Since 10 ppm has been determined to be the LC_{90} value from USDA/BASF laboratory assays (LC_{100} value not indicated), the amount of chlorfenapyr remaining in soil appears to be barely enough to kill 90% of the foraging termites and may not be enough (depending on the LC_{100} value) to kill them 100% of time. Unlike the USDA field sites, soil samples from EUP trials show that as % chlorfenapyr in the solution applied to the soil increases, the amount of chlorfenapyr soil residue increases in linear fashion (when plotted on a non-log scale). Reading and interpreting the residue data was difficult because the graphs have different scales on the y-axis. The four year data are outstanding but are necessary for a regulatory decision.

Some of the EUP results to date were submitted to show that at 24 months post-treatment, control of termites from the genera *Coptotermes* and *Reticulitermes* in previously infested structures have been successful. Application rates range from 0.063% to 0.25% chlorfenapyr. Data/testimony were included for crawl space, post and beam, monolithic slab, brick veneer, and slab on grade with stucco over frame construction. Some of the treatments appeared to be complete treatments while others were spot treatments. Elimination of termite infestations appeared to be rapid - a month of less following treatment.

Interim Conclusions:

1. Termite penetration has occurred on multiple occasions in Florida and Mississippi at the 0.125% rate but none of these replicates have been penetrated more than once. The reason for this result is unclear but could be due to any one or combination of the following: 1) the termites may have been killed by the slow acting chlorfenapyr residues after repeated dermal (cuticle) contact and possible ingestion; or 2) the USDA-FS practice of replacing damaged boards at a penetrated replicate may have disturbed the foraging termites, causing them to leave the replicate

permanently, resulting in a false negative replicate the following years. Termite behavior is not well understood but it is known that an environmental disturbance may cause termite species from the genus *Reticulitermes* to alter their foraging behavior by abandoning a feeding site.; or 3) there is insufficient chlorfenapyr available to kill foraging termites.

2. When submitted, EUP data should be categorized by structure, geographic location, and treatment type (complete or spot/partial). Any soil residue testing at EUP structures should be reported and correlated with termite control results at structures where collected.

4. BASF should discuss their results with chlorfenapyr termiticide in light of the Kd values for this chemical.

5. BASF should explain the reason for termite penetrations at the USDA-FS plots. EPA and BASF have discussed possible explanations for these results but the registrant has not submitted a written explanation explaining the results in terms of chlorfenapyr's chemical properties and mode of action.

6. A regulatory decision on chlorfenapyr should not be made until all EUP, USDA-FS and residue data have been submitted and reviewed. The data submitted to date do not support registration of chlorfenapyr as a soil applied termiticide.

7. BASF should submit the USDA-FS itemized results for all untreated (control) and treated replicates. This should include a description of damage done to wood, termite activity at time of inspection, and ASTM rating for each replicate.

8. Based on the ground board data, chlorfenapyr should be applied at rates of 0.75% a.i. and above to protect wood in soil such as fence posts and deck supports.

9. The registrant should submit the LC_{100} values from the laboratory bioassays with chlorfenapyr.