

Shaughnessy No.: 128201

Date out of EAB: 1-5-88

To: R. Taylor
Product Manager 25
Registration Division (TS-767)

From: Emil Regelman, Supervisory Chemist
Environmental Chemistry Review Section #3
Exposure Assessment Branch/HED (TS-769C)

Thru: Paul F. Schuda, Chief
Exposure Assessment Branch/HED (TS-769C)

Attached, please find the EAB review of...

Reg./File # : 352-UUR

Chemical Name: DPX-Y6202 (Quizalofop ethyl)

Type Product : Herbicide

Product Name : ASSURE

Company Name : E.I. duPont de Nemours and Co.

Purpose : Review of a Photodegradation on Soil study and a
Terrestrial Field Dissipation study.

Action Code: 111

EAB # (s): 70983

Date Received: 9/24/87

Total Reviewing Time: 8 days

Date Completed: 1/4/88

Monitoring Study Requested: _____

Monitoring Study Volunteered: _____

Deferrals to: _____ Ecological Effects Branch

_____ Residue Chemistry Branch

X Toxicology Branch

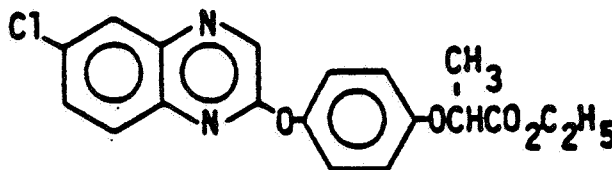
1. CHEMICAL:

chemical name: Ethyl 2-[4-(6-chloroquinoxalin-2-yloxy) phenoxy] propanoate

common name: Quizalofop Ethyl, DPX- Y6202

trade name: ASSURE

structure:



physical/chemical properties:

molecular formula: $C_{19}H_{17}ClN_2O_4$

molecular weight: 372.5

physical state: white, crystalline solid

melting point: $91.7 - 92.1^{\circ}C$

vapor pressure: 3×10^{-7} mm Hg at $20^{\circ}C$

2. TEST MATERIAL:

- A. [Phenyl(U)- ^{14}C] DPX-Y6202 with a specific activity of 21.8 uCi/mg and radiochemical purity of >99%; and [Quinoxaline(U)- ^{14}C] DPX-Y6202 with a specific activity of 19.3 uCi/mg and radiochemical purity of >99%.
- B. DPX-Y6202-23 was the test material. The formulation was a 0.8 lb ai/gal emulsifiable concentrate.

3. STUDY/ACTION TYPE:

- A. Review of a Photodegradation on Soil study submitted in support of registration.

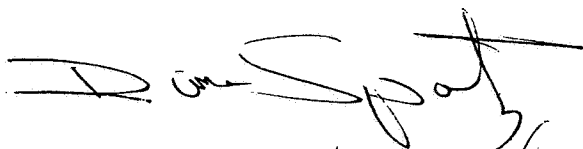
- B. Review of a Terrestrial Field Dissipation study submitted in support of registration.

4. STUDY IDENTIFICATION:

- A. Ryan, D.L. and Atkins, B. "Photodegradation of [phenyl(U)-¹⁴C] DPX-Y6202 and [quinoxaline(U)-¹⁴C] DPX-Y6202 on Soil." E.I. du Pont de Nemours and Company, Wilmington, Delaware. Study completed on July 3, 1986 and submitted to EPA on September 10, 1987. Accession number: 403360-02.
- B. Ryan, Keith. "Field Dissipation of DPX-Y6202 (ASSURE). Performing laboratory: Biospherics Inc., Rockville, MD. Submitted by: E.I. du Pont de Nemours and Co. Received by EPA on 9-10-87. Accession number: 403360-01.

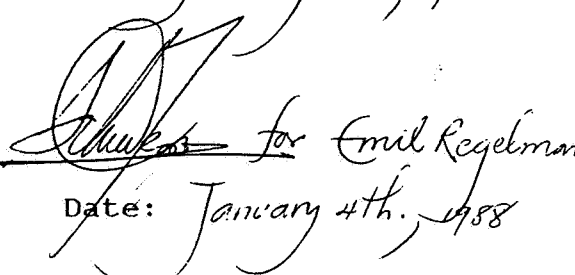
5. REVIEWED BY:

Dana Spatz
Chemist, Review Section 3
EAB/HED/OPP


Date: January 4th, 1988

6. APPROVED BY:

Emil Regelman
Supervisory Chemist, Review Section 3
EAB/HED/OPP


Date: January 4th, 1988

7. CONCLUSIONS:

- A. The photodegradation on soil study requirement is satisfied by this submission. The half-life for phenyl-labeled DPX-Y6202 was reported to be 42.8 days. For quinoxaline-labeled DPX-Y6202 the half-life was 38.5 days. The major degradate was ¹⁴CO₂, comprising 22.3% and 13.4% of applied [phenyl ¹⁴C] DPX-Y6202 and [quinoxaline ¹⁴C] DPX-Y6202, respectively. The only major soil-extracted degradate was DPX-Y6202 acid; 5.4% and 5.2% of the applied radioactivity.
- B. The results of this study indicate that the half-life of DPX-Y6202/DPX-Y6202 acid in an actual field use setting is approximately 140 days. The pesticide was moderately mobile in silty clay loam from Illinois and in silt loam from Mississippi and was immobilized in the top 4 inches of loam from California.

A major metabolite of DPX-Y6202, Phenol 4, (2-[(4-hydroxyphenyl) oxy]propanoic acid), was not included in the study as a degradate that should have been identified and quantitated by soil analyses.

The Aerobic Soil Metabolism of [Phenyl- ^{14}C (U)]DPX-Y6202 study (Cadvan and McFetridge, 1985), indicated that in Flanagan silt loam soil treated at 0.1 ppm, Phenol 4 levels were 26% of applied ^{14}C by week 2, and that in soil treated at 1 ppm, Phenol 4 levels were 30% by week 5. This information establishes the prevalence of Phenol 4 and, as such, suggests that this degradate be included in the list of degradates being analyzed for in the dissipation/mobility studies.

However, if this degradate is found to be of no toxicological concern to the Toxicology Branch of HED, then this field dissipation study may satisfy EPA requirements for registering pesticides. If found to be of toxicological concern, then depending upon storage stability data and the availability of the soil samples, either the soil samples can be re-analyzed for Phenol 4 or a new field dissipation study be submitted.

8. RECOMMENDATIONS:

- A. This study fully satisfies the photodegradation on soil requirement.
- B. The Toxicology Branch should be consulted on their concern, if any, over the degradate 2-[(4-hydroxyphenyl)oxyl]propanoic acid, (Phenol 4). The registrant should then be notified as to whether or not more data are necessary to fulfill the Terrestrial Field Dissipation study requirement.

9. BACKGROUND:

The registrant has submitted a Photodegradation on Soil study and a Terrestrial Field Dissipation study for the purpose of obtaining registration for DPX-Y6202.

DPX-Y6202 is a herbicide to be used for the postemergent control of annual and perennial grass weeds in soybeans. The 9.5% EC (Assure, 0.8 lb ai/gal) is to be applied at 0.075 - 0.250 lb ai/acre depending on regional rainfall (proposed label dated August, 1985). In arid regions, a second application applied 2-3 weeks following the initial application is recommended; however, the total amount applied should equal the recommended rate.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

I.A. Study Identification

Ryan, D.L. and Atkins, B. "Photodegradation of [phenyl(U)- ^{14}C] DPX-Y6202 and [quinoxaline(U)- ^{14}C] DPX-Y6202 on Soil." E.I.

du Pont de Nemours and Company, Wilmington, Delaware. Study completed on July 3, 1986 and submitted to EPA on September 10, 1987. Accession number: 403360-02.

I.B. Materials and Methods

The test material was either [phenyl(U)-¹⁴C] DPX-Y6202 or [quinoxaline(U)-¹⁴C] DPX-Y6202.

All organic solvents used were analytical grade and water was purified by a Milli-Q water purification system.

The test soil was a Woodstown sandy loam:

% sand:	67.0	% O.M.:	1.4
% silt:	25.0	pH:	4.5
% clay:	8.0	CEC:	4.0 meq/100 g

A viscous soil slurry was prepared by mixing soil with water in an approximate ratio of 2:1 (g:ml). A TLC spreader was used to spread this soil slurry over 1" x 3" precleaned microscope slides taped to a 20 cm x 20 cm glass plate. The slides were air-dried for several days at room temperature, resulting in a soil layer approximately 1 mm thick, with 2.5 in.² of soil area on each slide.

0.150 ml of [phenyl(U)-¹⁴C] DPX-Y6202 treatment solution or [quinoxaline(U)-¹⁴C] DPX-Y6202 treatment solution was added to each slide, resulting in a DPX-Y6202 application rate equivalent to 8 oz a.i./acre.

Each group of sample soil plates was placed on individual 5 in. x 5 in. stainless steel heat exchangers, each of which was contained inside a 7 in. x 7 in. x 2 in. water-tight Lucite box. The plates were thermostatted by water pumped through the system. The tops of the Lucite boxes were fitted with a 6" x 6" x 0.25" quartz window. For non-irradiated soil samples, the boxes were covered with aluminum foil to exclude light.

All boxes were placed on the roof of the building in Delaware from May 8 to June 9, 1986. The soil temperature was maintained between 24-28°C. The soil photolysis boxes were equipped with vents which allowed a 10 ml/min. stream of air to be drawn through each box and then passed through a gas washing bottle containing 100 ml of 1 N sodium hydroxide solution to trap evolved ¹⁴C carbon dioxide.

Tables 1 and 2 contain the climatological conditions for 39°40"N latitude for the months of May and June 1986. Table 3 shows the data obtained from the pyranometer for each day of the study.

The soil from each slide removed for analysis was scraped into a centrifuge tube and extracted four times with 5 ml portions of acetonitrile/water/85% phosphoric acid (90:10:1 v/v/v). All acetonitrile extracts were combined and 10 ml of scintillation cocktail was added for LSC.

Further extraction of the acetonitrile extracts involved partitioning against ethyl acetate. The combined ethyl acetate extracts were counted by LSC as was the aqueous phase.

The ethyl acetate extracts were concentrated and analyzed by thin layer chromatography. Soil residue remaining after extraction was air-dried, weighed and combusted, trapping ^{14}C - CO_2 for analysis by LSC.

TLC plates were developed in a mobile phase of toluene:ethyl ether:methanol:acetic acid (60:40:10:2.5, v/v/v/v) against standards which were located by ultraviolet quenching. Rf values of standards are shown in Table 4. A TLC linear analyzer was used to detect and quantitate areas of radioactivity.

Some extracts were also analyzed qualitatively by TLC in a solvent system of toluene:acetone:methanol:acetic acid (150:60:12:1, v/v/v/v) against standards.

The sodium hydroxide trap solutions were analyzed by LSC. To demonstrate that the ^{14}C detected was present as ^{14}C -carbon dioxide, 1 ml of NaOH was combined with 2 ml of saturated barium chloride solution and 1.0 ml of 2 M potassium carbonate. The resulting precipitate was separated from the solution by centrifugation. Aliquots of the clear supernatant were combined with scintillation cocktail and unprecipitated ^{14}C -radioactivity was determined by LSC. This procedure showed that >95% of the radioactivity was precipitated as ^{14}C -carbon dioxide.

I. C. Reported Results

The recovery and distribution of radioactivity for the soil slides treated with [phenyl(U)- ^{14}C] DPX-Y6202 and [quinoxaline(U)- ^{14}C] DPX-Y6292 are summarized in Tables 5 and 6. In the phenyl-Y6202 study, ^{14}C -carbon dioxide accounted for 22% of the applied radioactivity by the end of the study, (32 days).

In the quinoxaline-Y6202 study, ^{14}C -carbon dioxide formation was 13% of the applied by the end of the study.

In the control soil studies which were shielded from light, ^{14}C -carbon dioxide formation was insignificant.

The results of chromatographic analysis of the extracts of the soil samples treated with [phenyl(U)- ^{14}C] DPX-Y6202 and [quinoxaline(U)- ^{14}C] DPX-Y6202 are shown in Tables 7 and 8.

After 32 days of exposure to sunlight, [phenyl(U)- ^{14}C]DPX-Y6202 accounted for 60.7% of applied radioactivity as opposed to 95.4% for the dark control. After 29 days of exposure to sunlight, [quinoxaline(U)- ^{14}C]DPX-Y6202 accounted for 60.1% of applied radioactivity as opposed to 93.3% for the dark control.

The only other major radiolabeled material was DPX-Y6202 acid. Minor amounts of Phenol 2, hydroxylated Phenol 2 and other unidentified decomposition products were also detected, but individually did not accumulate to greater than 5%.

The disappearance of DPX-Y6202 from the solar irradiated and non-irradiated soil samples is shown in Figures 1 and 2. The rate of decline of the parent compound was similar for both labels.

Using the equations described in Table 9, the half-life of the sunlight-irradiated [phenyl(U)- ^{14}C] DPX-Y6202 was 42 days and sunlight-irradiated [quinoxaline(U)- ^{14}C] DPX-Y6202 was 39 days.

I. D. Study Author's Conclusions

The calculated half-life was approximately 40 days under sunlight vs >200 days in the dark.

The major photodecomposition product was ^{14}C - carbon dioxide, indicating complete breakdown of the phenyl and quinoxaline rings. The only other significant radiolabeled decomposition product was DPX-Y6202 acid which was present in both the irradiated and non-irradiated samples after 32 days at levels of approximately 5% of applied radioactivity.

I. E. Reviewer's Discussion and Interpretation of Study Results

Carbon dioxide is the only major photoproduct attributable to the breakdown of sunlight-irradiated DPX-Y6202, since approximately the same amount of DPX-Y6202 acid was present in both the irradiated and non-irradiated samples at the end of the study. There were, in addition, other minor photoproducts which were unidentified because of the very low concentrations of each one.

Because TLC is not a sensitive analytical technique, EAB feels that it alone cannot be used for positive identification. As clearly shown in Figure 4 as well as in Table 4, TLC was unable to separate DPX-Y6202 acid from Phenol 2. Other more highly sensitive instrumental techniques should have been employed to positively identify and quantitate these degradates.

The application rate was twice the maximum label rate and the soil used was the same as in the aerobic soil metabolism study. The material balances (100.4% - 104.3%) were acceptable and sample calculations were provided.

Assure exposure assessment review

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6.4 oz ai/A is 60% higher than the proposed maximum label rate of 4 oz ai/A. The 8 oz ai/A is double the proposed maximum rate. The control plots received no treatment.

Crops:

IL- Fallow throughout study.

CA- Cotton planted 115 days prior to application. Hand-harvested 56 days after application. A second cotton crop was planted by tractor 257 days after application.

NC- Soybeans planted 24 days prior to application.

MS- Soybeans planted 14 days prior to application.

Sampling Techniques:

IL and CA- 78 or 72 twelve inch cores were selected randomly at a given sampling. The cores were then subdivided into 4 inch segments, composited and mixed.

NC- One 8 inch core taken per subplot (20 subplots). Cores were subdivided into 0-4 inch and 4-8 inch segments and composited by depth.

MS- 20 cores were selected randomly per sampling. 6 inch cores through day 28 sampling, 12 inch cores beginning day 58. Cores were subdivided into 0-3 inch, 3-6 inch, and 6-12 inch segments and composited.

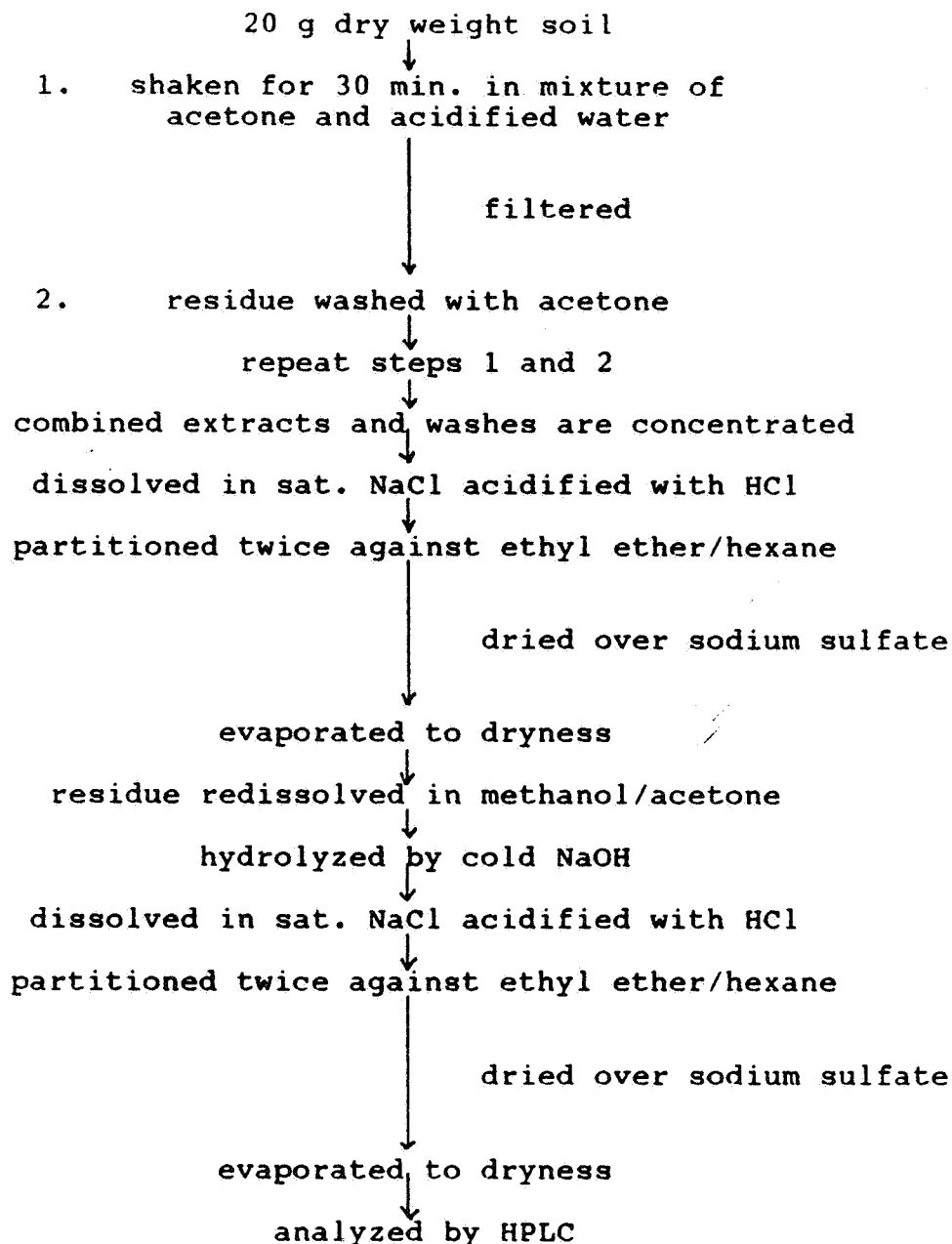
All samples were frozen as soon as possible after compositing and mixing, and were kept frozen until analysis.

Analytical methods:

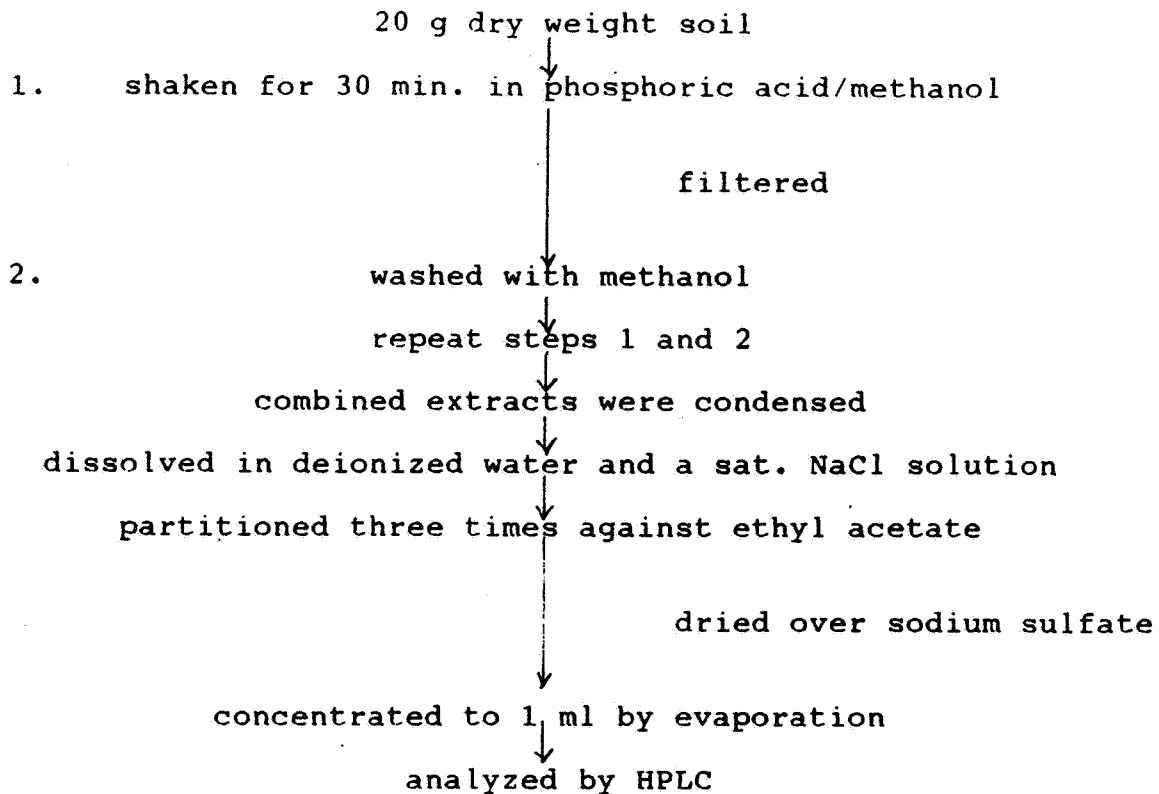
With each set of samples analyzed, 1-3 samples from untreated soils were fortified to monitor residue recoveries.

Isolation and Purification- Total Quizalofop

Total Quizalofop= sum of residues of parent DPX-Y6202 and the acid metabolite of DPX-Y6202.



Isolation and Purification- 3-OH-phenol 2



II.C. Reported Results

Because hydrolysis of DPX-Y6202 at the ethyl ester linkage has been shown to occur relatively rapidly, dissipation of the pesticide was assessed in terms of its primary metabolite, DPX-Y6202 acid. The analytical method employed measures total residues of both species; "Total Quizalofop".

The results are tabulated in tables 1, 2, 3, and 4 and graphed in figures 1, 2, 3, and 4.

Calculated Half-Lives

	<u>half-life</u>	<u>correlation coefficient</u>
IL	145 days	.89
* CA	364 days	.50
** NC	4.9 days	.90
MS	139 days	.42

* If the California data are considered without the 0.03 ppm value reported for the 4-8 inch layer at day 184, the half-life changes to 138 days and the correlation coefficient increases to .89. The sample may have been unrepresentative as a result of contamination during sampling, or the point may represent analytical error.

** The author feels that the NC results are unreliable because there were only three data points and 0.8 inches of rain fell on the day of application.

The data for IL indicates moderate mobility of DPX-Y6202 in silty clay loam. There was no evidence of leaching in the loam soil from CA except for the day 184 value at 4-8 inches. No residues were found in the 4-8 inch layer of the NC sandy loam at any interval. The results from the MS site loam were comparable to that of IL.

No residues of 3-OH-Phenol 2 were found in any of the samples from IL, CA, or NC. 0.07 ppm and 0.08 ppm were found in MS 0-3 inch soil samples for days 7 and 185, respectively.

II.D. Study Author's Conclusions

DPX-Y6202 is moderately mobile in silty clay loam from Illinois

and in silt loam from Mississippi, and has half-lives of about 145 days and 139 days, respectively in these soils. The substance seems to be immobilized in the top four inches of loam from California. The half-life in this soil is probably substantially below the calculated 364 days. Data for mobility and dissipation in North Carolina sandy loam were inconclusive.

In view of the higher rates of application used in this study (1.6-2x maximum label rate), it seems unlikely, from the data, that use of DPX-Y6202 at recommended rates will produce any measurable residues of 6-chloro-2,3-dihydroxyquinoxaline, the major metabolite succeeding DPX-Y6202 acid.

II.E. Reviewer's Discussion and Interpretation of Study Results

The results indicate that DPX-Y6202 and its acid metabolite are immobile to moderately mobile. The greatest leaching potential was found in the Illinois silty clay loam, which was also fallow. The low potential for leaching is supported by a previous leaching study which found DPX-Y6202 to be immobile (class 1) in four soils, (2 sandy loam soils and two silt loam soils, T. Priester, 1985, acc. # 073548).

As explained in the conclusion section of this review, the metabolite, 2-[(4-hydroxyphenyl)oxyl]propanoic acid, should have been analyzed for since it was found, in previous studies, to be a major metabolite.

The post application soil analyses confirm the stated application rates, which were higher than the proposed maximum rates.

Recoveries for total quizalofop averaged 82.6% (see table 5). Recoveries for 3-OH-phenol 2 averaged 82% (see table 6).

11. COMPLETION OF ONE-LINER:

Not completed at this time.

12. CBI APPENDIX:

Not applicable.

Assure exposure assessment review

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