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

APR 23 1991

OFFICE OF
PESTICIDES AND TOXIC
SUBSTANCES

MEMORANDUM:

SUBJECT: 91-WA-11. Proposed Section 18 exemption for the use of the soil fungicide, Pentachloronitrobenzene (Terraclor® EC, EPA Reg No. 400-400; and, Terraclor® 10G, EPA No. 400-402) on potatoes. [DEB No.: 7818; MRID: n/a] DP Barcode D1622967.

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Toxicology Branch
Hazard Evaluation Division (TS-769)

The Washington State Department of Agriculture is requesting a Section 18 emergency exemption for the use of pentachloronitrobenzene (PCNB) to control Rhizoctonia in or on potatoes. A maximum of 4,300 acres of potatoes is to be treated in Skagit, Whatcom, Lewis, and Snohomish counties in Washington State.

Tolerances are established (40 CFR 180.291) for negligible residues of pentachloronitrobenzene in or on cottonseed at 0.1 ppm. Tolerances with regional registration are established at 0.2 ppm for the combined residues of pentachloronitrobenzene (PCNB), and its metabolites pentachloroaniline (PCA), and methyl pentachlorophenyl sulfide (MPCPS) in or on collards, kale, and mustard greens.



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No tolerances for meat, milk, poultry and eggs exist.

Temporary tolerance petitions are pending on several other RACs, peanuts at 1 ppm (PP#1F1083); and banana, beans, broccoli, brussels sprouts, cabbage, cauliflower, garlic, peppers, potatoes, and tomatoes at 0.1 ppm (PP#1F1083). A tolerance of 0.1 ppm (not more than 0.02 ppm of which is HCB) has been proposed for residues of PCNB, its metabolites PCA and MPCPS, and its impurities PCB and HCB in or on potatoes.

Pentachlorobenzene (PCB) and Hexachlorobenzene (HCB) are contaminants in technical PCNB. During the RPAR (Special Review) for PCNB it was concluded that the most likely cause of any adverse effect(s) of PCNB was due to the presence of HCB as an impurity. The RPAR (Special Review) was concluded with an agreement by the producers to reduce the amount of HCB in the technical grade of PCNB to 0.5% by April, 1983, and to 0.1% by April, 1988 (47 FR 18177). Technical grade PCNB previously contained 1.5% - 3.0% HCB (See Susan V. Hummel, Memorandum, 8/8/86).

On April 19, 1990, Uniroyal Chemical Co. voluntarily issued a temporary withdrawal of Terraclor for use on potatoes. This action was taken because residue data generated by Uniroyal indicated that potato samples contained residues exceeding the temporary tolerance (0.1 ppm). Additionally, there were measurable quantities of HCB present.

A Reg. Standard Residue Chemistry Chapter has been prepared for PCNB, it is dated 6/90.

Proposed Use

The soil fungicide is to be ground applied only.

Apply as a preplant treatment only. Apply Terraclor EC at a rate of 9.0 to 12.5 gallons (18.0 to 25.0 lbs. a.i.) per acre. Apply Terraclor 10G at a rate of 180 to 250 gallons (18.0 to 25.0 lbs. a.i.) per acre.

Livestock are not to be grazed on treated fields. Do not feed cull potatoes to livestock.

The use period will be restricted to between April 5 and July 1, 1991.

Subdivision O of the Pesticide Assessment Guidelines (PAG) does not list cull potatoes as under grower control. CBRS considers this restriction desirable, however, it is both impractical and unenforceable. CBRS will therefore evaluate the residues likely

to result in meat and milk as a result of the proposed use as if there were no feeding restriction imposed.

Nature of the Residue

Plants

The metabolism of PCNB in or on plants is not adequately understood according to a preliminary review of metabolism data submitted in connection with Reregistration.

Uniformly ring labeled ^{14}C -PCNB was mixed with a nonradioactive EC formulation of PCNB. The mixture was incorporated into the soil at a treatment rate of 18.9 lbs. a.i./Acre (0.75X). Potato seed pieces were then planted into the treated plots. Potato tubers were harvested at early maturity, 11 weeks after planting (77 day PHI). Samples were stored frozen until extraction. The extraction process involved blending with 80% methanol. The methanol was evaporated, the extracts were adjusted to a pH of 5.5 and then partitioned with chloroform. The aqueous phase was adjusted to a pH of 2.0 and partitioned with ether.

Bound radioactivity in the peel was released by heating in anhydrous methanolic HCl at 60°C for up to two hours (an unpublished PD 2/3 document reported that most of the residue can be found within 2-3 mm of the surface). The peel hydrolyzates were dried by rotary evaporation at 30°C. The extract was reconstituted in water, and partially "cleaned up" using a SEP PAK (i.e., a C-18 solid phase extraction tube). The eluates were analyzed using HPLC.

The extracts from the three different fractions, aqueous, chloroform, and the ether fraction were further "cleaned up" by TLC and HPLC. The aqueous samples were also "cleaned up" on a XAD2 column. The samples were then analyzed by Mass Spectrometry (MS). Various MS techniques were utilized to analyze the samples, including positive and negative chemical ionization (CI), direct injection MS, and thermospray MS.

Analysis of the metabolites, although incomplete, indicate that the metabolism of PCNB in potato, cabbage, and peanut occurs by three mechanisms:

- 1) Reduction of the nitro group to form N-hydroxy-pentachloroaniline (NOHPCA), and pentachloroaniline (PCA).
- 2) Displacement of the nitro group by the sulfhydryl group of reduced glutathione to give a glutathione adduct

which is metabolised further, or to a lesser extent, by a hydroxyl group to give a chlorinated phenol.

- 3) Dechlorination by reduction, i.e., chlorine replaced by hydrogen; or oxidation, i.e., chlorine replaced by a OH group.

For the purposes of this Section 18 request only, the residue of concern in plants is the parent compound Pentachloronitrobenzene, its metabolites pentachloroaniline (PCA), and methyl pentachlorophenyl sulfide (MPCPS), and the impurities pentachlorobenzene (PCB), and hexachlorobenzene (HCB).

Animals

The nature of the metabolism in animals is not adequately understood. In response to data requirements Uniroyal Chemical Co. has submitted additional information concerning the metabolism in ruminants and poultry. That information has received a preliminary contractor review but it has not yet been secondary reviewed by CBRS.

Uniroyal Chemical Corp. submitted data pertaining to the metabolism of PCNB in goats. Two lactating goats were orally dosed for 5 consecutive days with uniformly ring-labeled ¹⁴C-PCNB. One of the goats was dosed at 770 ppm of PCNB and the second at 1400 ppm of PCNB. A third goat served as a Control. The extent of PCB and HCB impurities were not specified.

Milk, urine, and feces samples were collected daily and stored frozen until analysis. The goats were sacrificed within 24 hours after the last administered dose and tissue samples were collected.

Tissue samples and feces were combusted and analyzed for TRR by LSC; samples of milk, urine, and pan rinses were analyzed directly by LSC. Approximately 60% of the TRR was recovered in the goats.

Most of the PCNB was excreted in the urine (33% for 770 ppm feeding level) and feces (26% for 770 ppm feeding level). The tissue samples were extracted as described in the PCNB Registration Standard Update (6/9/90). The details will not be repeated here. The results of the extraction, however, will be summarized.

Only 42% of the TRR in liver was solvent extractable. The remainder (58%) of the liver was solubilized by protease treatment. 78% of the residue in kidney was extractable, the remainder was bound. Protease treatment of the kidney released

an additional 20% of the TRR in the kidney tissue. In omental fat, 82% of the TRR was extractable. In renal fat, 100% of the TRR was apparently extractable. In milk, 92% of the TRR was reported to be extractable. Extract samples were analyzed by HPLC and many were verified by MS.

For the purposes of this Section 18 request only, CBRS will assume that the residue of concern in meat and milk and poultry is the parent compound Pentachloronitrobenzene, its metabolites pentachloroaniline (PCA), and methyl pentachlorophenyl sulfide (MPCPS), and the impurities pentachlorobenzene (PCB), and hexachlorobenzene (HCB).

Analytical Methodology

Data were collected using a GLC/ECD method (Uniroyal Method No. CAM-24-73 modified 10/28/87 and 3/15/88). In brief the method involves a hexane/isopropyl alcohol extraction followed by analysis by a GC equipped with an electron capture detector. The limit of detection is reported to be 0.002 ppm for PCNB, PCA, MPCPS, PCB, and HCB. Recoveries were reported to be: 72-112% for PCNB, 68-110% for PCA, 80-116% for MPCPS, 70-125% for PCB, and 68-121% for HCB.

CBRS concludes that suitable analytical methods are available for enforcement purposes (PAM Vol I).

Magnitude of the Residue

No residue data were submitted with this Section 18 request. However data for PCNB use on potatoes was submitted in connection with reregistration of PCNB.

Uniroyal Chemical Co. submitted data from 12 residue trials conducted in ten states including WA. The data reflect residues resulting from application of the 2 lb/gal EC formulation (containing 0.5% HCB) at 25 lbs. a.i./Acre (1X). Residue data for PCNB, its metabolites, and impurities are presented in Table 1.

No. of Samples	PCNB (ppm)	PCA (ppm)	MPCPS (ppm)	PCNB + PCA + MPCPS (ppm)	PCB (ppm)	HCB (ppm)	PCB + HCB (ppm)
25	<0.00	<0.00	<0.00	0.53	<0.00	<0.00	0.14
	2- 0.160	2- 0.204	2- 0.161		2- 0.112	2- 0.024	

Table 1. Residue trial data for PCNB, its metabolites, and impurities.

Based on the available residue data, CBRS concludes that the combined residue of PCNB and its metabolites PCA, MPCPS are not likely to exceed 1 ppm as a result of the proposed use. CBRS also estimates that the combined residues of PCB and HCB are not likely to exceed 0.3 ppm.

Processing Studies

Processing studies submitted by Uniroyal Chemical Corp. have received a preliminary contractor review. The contractor's review of the submitted data indicates the following:

- 1) Residues may concentrate up to 6X in the wet peel and up to 13X in the dry peel.
- 2) Residue of HCB were 0.002-0.009 ppm in the wet peel and 0.002-0.003 in the dry peel.

No data are available on potato granules, chips and french fries.

Meat, Milk, Poultry and Eggs

Ruminants.

Cull potatoes are a major feed item for cattle, they may constitute up to 50% of cattle (swine) diet. Feeding data discussed in the Residue Chemistry chapter of the PCNB Registration Standard were very sketchy.

However, a cattle feeding study in which animals were fed 10, 1, 0.1 ppm PCNB containing 1.4% HCB (corresponding to 0.14 ppm, 0.014 ppm and 0.0014 ppm HCB feeding levels) as a contaminant was discussed in 9F0754 (E. Gunderson, 2/18/70) and in 1F1083 (D. Reed, 2/23/72). Level of PCB in the PCNB was not presented. Data indicate that only finite HCB and PCA residues were consistently found in tissues.

At the 1 ppm feeding level, residues of PCNB, PCA, MPCPS, and PCB were not detected (<0.005 ppm for each component) in the liver, kidney, or muscle; HCB level was not discussed and PCA was detected in fat only (0.005-0.06 ppm).

At the 10 ppm PCNB feeding level, HCB was present at 0.015 ppm in milk and 0.8 ppm in fat, and PCA was present at 0.22-0.5 ppm (other tissue residue levels were not presented).

No HCB data are available for kidney, liver and muscle at the 1 ppm or 10 ppm feeding level, but HCB levels were reported at <0.001 ppm in all tissues except 0.01-0.013 ppm in fat at the 0.1 ppm feeding level.

The ruminant dietary burden based on a 1.0 ppm (PCNB + PCA + MPCPS) and 0.30 ppm HCB + PCB residue levels in treated potatoes would be 0.5 ppm PCNB and its metabolites residues contaminated with 0.15 ppm HCB. Therefore, based on PCNB feeding studies results, the combined residues of PCNB, PCA, and MPCPS will not exceed 0.005 ppm in meat, milk, fat and meat by-products. For HCB and PCB, CBRS estimates a combined level of 0.015 ppm in milk and 0.8 ppm in fat of ruminants.

Poultry.

Cull potatoes may be fed up to 20% in the poultry diet, which corresponds to a dietary burden of 0.2 ppm PCNB and its metabolites and 0.06 ppm HCB + PCB residues assuming PCNB-treated potatoes would bear 1.0 ppm PCNB + PCA + MPCPS residues and 0.30 ppm of HCB and PCB residues.

According to the Residue Chemistry chapter, chickens were fed various levels of PCNB contaminated with 1.5% HCB (level on PCB was not addressed). Only combined levels of PCNB residues were reported (except in one case).

At the 0.05 ppm feeding level, maximum combined PCNB residues (in ppm) were 0.157 in fat, 0.017 in liver, 0.005 in muscle, 0.014 in egg yolk and no data on egg white and kidney at this feeding level. The fat sample was further analyzed to show 0.018 ppm parent (11%), 0.073 ppm PCA (47%), and 0.066 ppm HCB (42%).

At the 1 ppm feeding level, maximum combined residues in ppm were 0.176 in fat, 0.033 in liver, 0.005 in muscle and 0.006 in egg white; data were not available for egg yolk and kidney.

CBRS therefore estimates for the purposes of this Section 18 request only, that combined residues of PCNB in poultry are not likely to exceed 0.05 ppm in muscle and liver, 0.1 ppm in eggs, and 0.6 ppm in fat. HCB levels in fat and eggs are not likely to exceed 0.30 ppm.

Conclusions

1. For the purposes of this Section 18 request only, the residue of concern in plants is the parent compound Pentachloronitrobenzene, its metabolites pentachloroaniline (PCA), and methyl pentachlorophenyl sulfide (MPCPS), and the impurities pentachlorobenzene (PCB), and hexachlorobenzene (HCB).
2. CBRS estimates that the maximum combined residue of pentachloronitrobenzene (PCNB), pentachloroaniline (PCA), methyl pentachlorophenyl sulfide (MPCPS) is not likely to

exceed 1.0 ppm in or on potatoes, granules, chips, and french fries as a result of this proposed Section 18 request. The combined residues of pentachlorobenzene (PCB) and hexachlorobenzene (HCB) are not likely to exceed 0.3 ppm in or on potatoes, granules, chips, and french fries as a result of this proposed Section 18 request.

3. For the purposes of this Section 18 request only, the residue of concern in animals is the parent compound Pentachloronitrobenzene, its metabolites pentachloroaniline (PCA), and methyl pentachlorophenyl sulfide (MPCPS), and the impurities pentachlorobenzene (PCB), and hexachlorobenzene (HCB).
4. CBRS estimates the combined residues of PCNB, PCA, and MPCPS are not likely to exceed 0.05 ppm in meat, milk, fat and meat by-products. For combined levels of HCB and PCB, CBRS estimates 0.015 ppm in milk and 0.8 ppm in fat of ruminants as a result of the proposed Section 18 use.
5. CBRS estimates that the combined residues of PCNB in poultry are not likely to exceed 0.05 ppm in muscle and liver, 0.1 ppm in eggs, and 0.6 ppm in fat. Combined levels of HCB and PCB in fat and eggs are not likely to exceed 0.30 ppm.
6. CBRS concludes for the purposes of this Section 18 request only, that adequate methods are available for enforcement purposes.
7. Analytical Reference Standards for PCNB, its metabolites and impurities (HCB) are available from the Pesticides and Industrial Chemicals Repository, RTP, NC.
8. Residue data used to estimate residues for this use were not produced by Craven Laboratories.

Recommendations

TOX considerations permitting, CBRS has no objection to the proposed Section 18 request. An agreement should be made with the FDA regarding the legal status of the treated commodities in commerce.

SACB

CC: D. McNeilly; ^S(Saito); Section 18; SF; PMSD/PIB (C. Furlow);
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