

US EPA ARCHIVE DOCUMENT

103.2.2 Other studies - Supplementary

(See review for cotton 7/10/78)
Phytotoxicity
Beneficial Insects
Aerial Drift.

104.0 Hazard Assessment

104.1 Discussion

In 1974, approximately 12.5 million acres were planted in cotton in 19 states. Approximately 2.6% (330,000 acres) of the total cotton acreage were grown in costal counties of the states of N. Carolina around through Texas.

The maximum rate for cotton is 1.0 lb/ai. acre. Cotton may be sprayed multiple times per season, but not exceed 6.0 lbs ai./Acre per season.

A theoretical residue profile for the rate range (0.25-1.0) lb ai/acre appears in table 1.

Table 1. Profenofos Residues Profile
Immediately upon initial application

Application rate (lb ai/A)	<u>Substance</u>				
	<u>6"H2O</u>	<u>Leafy Crop</u>	<u>Short range grade</u>	<u>Loney range grass</u>	<u>Forage</u>
0.25	184 ppb	31 ppb	60 ppm	27 ppm	14 ppm
1.0	734 ppb	125 ppb	240 ppm	110 ppm	58 ppm

Actual field residues were obtained during a simulated field study conducted in soybeans - the values are reported in table 2.

Table 2. Residues (ppm) of Profenofos on various vegetative substrates during multiple aerial applications at 1.0 lb ai/A.

<u>Day of Study</u>	<u>Subacute</u>				<u>Grass seed Heads</u>
	<u>Long grass</u>	<u>Soybeans</u>	<u>Soybeans top</u>	<u>Leaves Bottom</u>	
*0	6.2	18			

<u>Day of Study</u>	<u>Long grass</u>	<u>Soybeans</u>	<u>Soybeans Leaves</u>		<u>Grass seed Heads</u>
			<u>top</u>	<u>Bottom</u>	
1	(2.3)	(24)			
2		(13)			
3		(5.2)			
4		(2.9)			
*5	6.1	(0.05)	23		
*10	0.89	(3.6)	12		
*15	1.7	(4.6)	16		
*20				45	10
*25	↖ 0.67	↖ (5.1)	7.4	98	11
*30	↖ 0.4	↖ (3.5)	9.0	10 ^{a/}	11 ^{a/}
		↖ 4.9 ^{a/}			16 ^{a/}

Values in () prior to next application a /5 days after last application.

A half life of 63 hours was derived from the data on dislodgeable residues using the Imidan half life program contained in the Environmental Safety TI 51 calculator. (See file for printout).

A residue profile depicting levels over time in vegetation bordering ~~cotton~~ fields is shown on the accompanying graph. Note that short range grass was considered representative of vegetation adjacent to ~~cotton~~ fields. However rather than assuming the maximum hazard would result from 1.0 lb ai/A equalling 240 ppm it was based on 0.296 of that 240 ppm. (This 0.296 factor equals the factor derived from the dislodgeable residue study on cotton (1.0 lb ai/A = 37.5 ppm) and the nomograph value for leaves = 125 ppm. Birds and mammals will be exposed to the following average minimal residues:

1. 1.0 lb ai/A = 24 ppm for approximately 30 days, and
2. 0.5 lb ai/A = 10 ppm for approximately 60 days.

The likelihood of 10 ppb entering into the water from drift alone, not including runoff, leaching or volatilization is discussed in this next statement by R. Holst:

Aerial application of Curacron at no less than 1 gal/A would most likely result in a droplet size with a vmd of 100 to 200 u with a few droplets less than 50 to 70 u assuming "normal" nozzle and pressure in use. Assuming a release height of 10 ft. in a 5 mph cross wind with no additional turbulence, a 100 u droplet would drift 87 ft with relative humidity equal to 100% or only 60 ft before it evaporated at 50% RH while a 200 u droplet would travel only 31 ft regardless of RH.

(X) See Branch File

One and one third pint Curacron 6EC per A equals 1 lb ai/A or about 736 ppb in 6" of water if applied directly. A safe limit to non-endangered fish species is considered 10 ppb or approximately 0.7% of the total application. Allowing no more than 0.7% of the application from a single pass to reach an aquatic system, the system would have to be about 250 to 300 feet downwind. This assumes that the droplet distribution is such that 0.7% of the total droplet volume is in the less than 70 u size. (50 u droplets drift 300 ft when released at 10 ft in a 5 mph wind.)

Side by side swath application (approximately 50 ft centers) will have some affect on the total quantity that will reach the 250 to 300 ft mark but not an appreciable amount. It would most likely substantiate the need to use 300 ft rather than 250 ft buffer zone regardless of evaporation.

It must be remembered that where updrafts or turbulence occurs, the pesticide could be carried further. However, determination of the extent under even "normal" conditions can not be made at this time.

104.2

Likelihood of Adverse Effects to Non-Target organisms (including exposure and toxicity)

Aerial application of Curacron as an insecticide will result in exposure of myriad species of organisms. The major exposure will occur on field edges where residues will occur as a result of drift rather than in the cotton fields.

Based upon currently available acute and subacute data, Curacron is highly toxic to birds. (See part 103.2.1 of this review).

Curacron may adversely affect non target vertebrates by removal of insect biomass and the resultant impact upon species of insectivores that are trying to produce broods at this time. Furthermore, the repeat applications of Curacron will cause a continual removal of biomass throughout the growing season and may cause natural predator populations to be suppressed.

Although the simulated field study indicated no acute or subacute or subacute effects to birds or mammals at 1.0 lb. ai/A, residue levels on all forage (except long grass) exceeded the 1 and usually even 10 ppm (levels causing significant impairment in bobwhite quail reproduction) (see part 103.2.1 of this review). In light of these findings, the RPAR criteria 162.11 (3)ii(C)- significant reduction of nontarget organisms - has been exceeded.

Curacron is very highly toxic to fish and aquatic invertebrates such as daphnia (see part 103.2.1 of this review). As previously stated, one can expect contamination of aquatic areas adjacent to soybean fields. Unless a lay off distance in excess of 275-300 ft is adhered to, unacceptable subacute levels may be exceeded from drift alone immediately upon application in 6" of water - thereby triggering RPAR criteria 162-11 (3)i(B)(3).

There is need for such conditional aquatic studies (as: 1) acute shrimp, crab, oyster and spot or pinfish and 2) partial chronic on Brook Trout and 3) chronic on daphnia and mysid shrimp based on the following conditions:

Presently available toxicity data, use pattern conditions - approx. 330,000 acres in coastal counties and persistence data - a hypothetical minimum of 36 hrs in water, but with directions calling for 3-12 applications per season (see file for aquatic residue graph and review 7/10/78).

104.3 Endangered Species Considerations

Not discussed at this time

104.4-104.5 Status of Data

105 Classification

106 RPAR Criteria

The following two criteria have been exceeded and not rebutted (see 104.2 of this review for details).

- 1) 162.11(3)ii(C)
- 2) 162.11(3)i(B)(3)

107 Conclusions

107.1 Environmental Fate and Toxicology Acknowledgement

See as registration review on cotton 7/10/78.

107.2-.3 Not applicable at this time.

107.4 Data Adequacy Conclusions

The following data requirements for technical Profenofos have been met:

1. acute oral for waterfowl
2. subacute dietary on waterfowl
3. " " " upland gamebird
4. subacute 96-hr. LC₅₀ coldwater fish
5. subacute 96 hr. LC₅₀ warmwater fish

6. acute 48 hr. LC₅₀ aquatic invertebrate
7. waterfowl reproduction study
8. upland gamebird reproduction study

The following data requirement for Curacron 6E has been met:

- 1) simulated field study on birds and mammals at 1.0 lb ai/A in soybeans.

107.5

Data Requests

In the event that present RPAR triggers are rebutted, the following studies would still be required to support the registration on cotton.

1. 96 hr. LC₅₀ on a penaeid shrimp
2. 48 hr. oyster embryo larva or 96 hr. shell depositions
3. 96 hr. LC₅₀ on the blue crab call insects sapidus
4. 96 hr. LC₅₀ on spot Leiostomus xanthurus or pinfish Logodon rhomboides
5. partial chronic - egg to egg on brook trout Salvelinus fontinalis
6. invertebrate life cycle test - Daphnia magna.
7. invertebrate life cycle test - mypidopsis bahia.

The above studies are to be conducted using technical Profenofos. Depending upon the results of the above studies, additional studies may be required: such as a full chronic fathead minnow and a full chronic sheepshead minnow.

In order to rebutt the RPAR criteria 162.11(3)ii(C) - significant reduction of nontarget organisms, a large pen field study with mallards and bobwhite quail must be conducted with Curacron 6E.

107.7

Recommendations

Ecological Effects Branch recommends the denial of this registration on cotton, based on two avian reproduction studies demonstrating impairment at levels below residues measured in a soybean field.

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