

EEE BRANCH REVIEW

DATE: IN 9/21/78 OUT 1/21/80 IN _____ OUT _____ IN _____ OUT _____

FISH & WILDLIFE

ENVIRONMENTAL CHEMISTRY

EFFICACY

FILE OR REG. NO. 100-ANN

PETITION OR EXP. PERMIT NO. _____

DATE DIV. RECEIVED _____

DATE OF SUBMISSION _____

DATE SUBMISSION ACCEPTED _____

TYPE PRODUCT(S): I, D, H, (F), N, R, S, FungicideDATE ACCESSION NO(S). (234439 - Vol. 13 of 13)PRODUCT MGR. NO(S). 21 - JacobyPRODUCT NAME(S) Subdue®COMPANY NAME CIBA-GEIGYSUBMISSION PURPOSE Full registration of new chemical for certaindiseases of ornamentals, turf and non-bearing citrus.CHEMICAL & FORMULATION Metalaxyl (CGA-48988):N-(2,6-Dimethylphenyl)-N-(methoxyacetyl) alanine methyl ester.....5%Inerts 95%100%

Subdue®

100 Pesticide Label Information

100.1 Pesticide Use

Fungicide for control of certain diseases on non-bearing citrus (Florida only), ornamentals and turf.

100.2 Formulation Information

Subdue®	5%
Inerts	95%
	<u>100%</u>

100.3 Application Methods, Directions, Rates, Target Organisms

In citrus and ornamentals, use at time of seeding and transplanting. Within the rate range given for a specific group of ornamentals, use the lower rate for the shortest interval listed and the higher rate for the longest interval. Under severe disease conditions, use the highest rate and the shortest interval specified.

Use either as a soil drench or soil mix on ornamentals (or foliar spray on azaleas).

Ornamentals

Use on container, bench or bedgrown ornamentals in greenhouse or outdoor nurseries. Controls damping off, root and stem rot diseases of ornamentals caused by Pythium and Phytophthora.

Precaution: Do not apply to Euonymus as injury may occur.

<u>Foliage Plants</u>	<p><u>SOIL DRENCH:</u> Mix 2-6 ozs. with 100 gal. of water and apply to 400-800 sq. ft. (1 to 2 pts./sq. ft.) of bed or bench area. Repeat applications at two to three month intervals if necessary.</p> <p>*On Philodendron, use 2-10 ozs./100 gals.</p> <hr/> <p><u>Precaution:</u> To minimize the potential for injury to Pothos, do not use more than 4 ozs./100 gals. and do not apply more frequently than once every 3 months.</p> <hr/> <p><u>SOIL MIX:</u> Thoroughly mix 0.5-2 ozs. with each cu. yd. of soil mixture.</p>
Aglanema Aphelandra Dieffenbachia Peperomia Philodendron* Pothos Schefflera	
<u>Bedding Plants</u>	<p><u>SOIL DRENCH At Seeding</u> (Soil 2-3 inches deep): Mix 1.25 to 2.5 ozs. with 100 gals. of water and apply to 800 sq. ft. (1 pt./sq. ft.) of bed area.</p> <hr/> <p><u>At Transplanting</u> (Soil 2-3 inches deep): Mix 2.5-10 ozs. with 100 gals. of water and apply to 800 sq. ft. of bed area. Repeat applications at one to two month intervals if necessary. Do not apply rates of 8-10 ozs./100 gals. more often than once every six weeks.</p> <hr/> <p><u>SOIL MIX At Seeding and At Transplanting:</u> Thoroughly mix 0.5-1 oz. with each cu. yd. of soil mixture.</p>
Ageratum Aster Begonia Carnation Chrysanthemum Coleus Geranium Impatiens Marigold Pansy Salvia Snapdragon Verbena Vinca Zinnia	

<u>Flowers</u>	<u>SOIL DRENCH:</u> Mix 2.5-10 ozs. with 100 gals. of water and apply to 400-800 sq. ft. (1 to 2 pts./sq. ft.). Repeat application at one to two month intervals if necessary. Do not apply rates of 8-10 ozs./100 gals. more often than once every six weeks.
African violet	
Carnation	
Chrysanthemum	
Geranium	
Poinsettia	
<u>Azalea</u>	<u>SOIL DRENCH:</u> Phytophthora root and crown rot - Mix 5-12 ozs. with 100 gals. of water and apply to 400-800 sq. ft. of bed area. Repeat applications at two to four month intervals if necessary.
	<u>FOLIAR SPRAY:</u> Phytophthora shoot blight - mix at 6-12 ozs. with 100 gal. Spray to runoff. Repeat at two to three month intervals if necessary.
	<u>Precaution:</u> To minimize the potential for injury to azaleas, do not apply repeat applications of 9-12 ozs./100 gals. closer than every 3 months, and do not exceed a total of 20 ozs. in 6 months.
<u>Woody Ornamentals Other Than Azalea</u>	<u>SOIL DRENCH:</u> Mix 5-20 ozs. with 100 gals. of water and apply to 400-800 sq. ft. (1 to 2 pts./sq. ft.). Repeat applications at two to three month intervals if necessary. Do not apply rates of 16-20 ozs./100 gal. more often than once every ten weeks.
Acuba japonica	
-Andromeda	
Arborvitae	
Ceanothus	
Ilex	
Pinus	
thumbergii	
Savin juniper	
Tam juniper	
Shore juniper	
Pittosporum	
Rhododendron	

For use on ornamentals in less than 4 inches of soil, apply 100 gals. soil drench to 800 sq. ft. of surface area (1 pt./sq. ft.). For more than 4 inches of soil depth apply 100 gals. soil drench to 400-600 sq. ft. of surface area (1 1/2-2 pts./sq. ft.). Do not exceed recommended rates or apply more frequently than directed, as plant injury may result.

Citrus

Controls Phytophthora root and crown rot of non-bearing citrus (Florida).

Non-Bearing
Citrus in Citrus
Nurseries *
(Florida Only)

SOIL DRENCH: Mix 20 to 30 ozs. with 100 gals. of water and apply as a soil directed drench in a 2 ft. band over the row. Apply 100 to 250 gals./1,000 ft. of row. When using the minimum 100 gals./1,000 ft. of row rate, follow with 1/2 inch of irrigation water. Repeat application at three to five month intervals, if necessary.

*Non-bearing citrus seedlings or trees in nurseries that will not bear fruit within 12 months after application.

Turf

Controls Pythium blight and Pythium damping-off in turf. Use it on established turf to control Pythium blight, or use it at time of seeding to control damping-off, caused by Pythium. Subdue® is compatible with Tersan 1991® (benomyl), Daconil 2787® (chlorothalonil), Tersan LSR® (maneb), Fore® (mancozeb), Dyrene® (anilazine) and Acti-dione TGF® (cycloheximide).

Established Turf: Pythium Blight - Apply as a preventive treatment at 5-10 ozs. in 3-5 gals. of water per 1,000 sq. ft. Retreat at 10-21 day intervals during periods favorable for disease.

Newly Seeded Areas: Pythium Damping-Off and Pythium Blight- Apply Subdue at 5-10 ozs. in 5-10 gals. of water per 1,000 sq. ft. immediately after seeding. Irrigate with 1/4-1/2 inch water to improve soil penetration of the fungicide and to initiate seed germination. Retreat at 7-14 day intervals, if conditions remain favorable for disease.

100.5 Precautionary Labeling

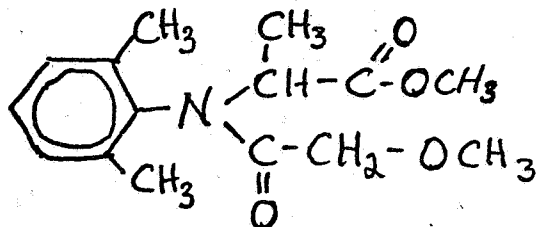
Keep out of lakes, streams, or ponds. Apply only as specified on this label. Do not apply when weather conditions favor drift from treated areas. Do not contaminate water by cleaning of equipment or disposal of wastes.

101 Physical and Chemical Properties

101.1 Chemical Name

N-(2,6-Dimethylphenyl)-N-(methoxyacetyl) alanine methyl ester.

101.2 Structural Formula



101.3 Common Name

Metalaxyl

101.4 Trade Name

Subdue® (Ridomil®, CGA-48988)

101.5 Molecular Weight

279.34

101.6 Physical State

Odorless tan powder or brown solid material

101.7 Solubility

Technical material - no data available

Formulation - Ridomil 2E (25%):

Water	0.7%
Methanol	65%
Benzene	55%
Hexane	0.9%
Isopropanol	27%
Methylene Chloride	75%

Behavior in the Environment

(From review by S.M. Creeger, 10/24/79, of Environmental Fate Branch)

"Under conditions likely to be found in the environment, Ridomil will be stable to hydrolysis and soil surface photolysis. However it will photodegrade in water with a half-life of 1 week forming CGA-62826 in small (5%) amounts plus 4 unidentified polar compounds (totaling 17%) and production of some (12%) volatile compounds. Aqueous photolysis in the presence of photosensitizers greatly accelerates degradation of Ridomil to a half-life of 1 hour.

"In soil, under aerobic conditions, Ridomil can be expected to degrade with a half-life of about 7 weeks, with CGA-62826 being the principle product. The CGA-62826 then breaks down to non-extractable material and CO₂. Under anaerobic soil conditions, Ridomil degrades with a half-life of about 9 weeks with CGA-62826 being the major product but persisting longer than under aerobic conditions. Ridomil is stable in sterile soil, indicating soil microbes contribute to its breakdown under non-sterile conditions.

"At use rates, Ridomil will not affect soil microbe growth, metabolism of cellulose, protein or starch or nitrification.

"Ridomil and its aged soil residues are highly mobile via leaching in sandy soils low in organic matter but loss of Ridomil due to volatilization is not expected. Also, soil adsorption of Ridomil is minor, as supported by its high leachability.

"Under field conditions, the fate of Ridomil in soil is similar to that under aerobic and anaerobic lab conditions, as described above, except for the shorter half-life of 2 weeks under field conditions.

"Exposure of fish to the parent compound or soil aged residues will not result in accumulation values above 10X in the whole fish. Also, during 14 days of depuration, 80% and more of the accumulated residues will be discharged."

102.1

Soil

(Taken from review by S. M. Creeger, 2/26/79, of Environmental Fate Branch)

Soil Surface Photolysis - None

Soil Degradation - Aerobic half-life of ca. 40 days with CGA-62826 the major metabolite peaking at 53.6% at 66 days

- Anaerobic half-life of ca. 66 days with CGA-62826 again the major metabolite peaking at 52.4% at 89 days
- Sterile (autoclaved) - no degradation

Soil Volatilization - Less than 0.5% loss

Soil Adsorption - Minor

Field Degradation - Half-life of ca. 2 weeks with CGA-62826 as major metabolite peaking at 20% at 30 days,

- Half-life of ca. 6-8 weeks in soil sprayed 3 times at 1.1 lb. AI/acre 28 days apart

(S. M. Creeger, 10/24/79)

Leaching

"Ridomil and its soil aged residues leach very strongly in loamy and silty soils low in organic matter and especially strongly in sandy soils posing possible groundwater contamination. Hydrolysis in groundwater would have little effect on the degradation of Ridomil but microbes would degrade it. In soil, under the influence of soil microbes, parent material will decline steadily while amounts of product CGA-62826 and non-extractable material will increase.

<u>Time</u>	<u>%parent(Ridomil)</u>	<u>%CGA-62826</u>	<u>%non-extractable</u>
1 mo.	60	30	6
3 mo.	19	48	20
6 mo.	5	33	37
12 mo.	<2	23	38

"Therefore, several factors, such as how fast leaching occurs, rainfall, soil microbes present and the depth of the water table will determine the relative amounts of Ridomil and its degradation reaching groundwater.

"However, residue amounts that would be present for human consumption via drinking and whether residues would be taken up by crops irrigated with contaminated groundwater is not known."

102.2 Water

(S.M. Creeger, 2/26/79)

Hydrolysis - None (or very little) at pH 5, 7 and 9, and at 20-30°C.

(S.M. Creeger, 10/24/79)

Photolysis - Half-life of 6 1/2 days at pH 8.3 and 25°C.
- Half-life of 57 minutes in 1% acetone (as a photosensitizer) at pH 8.3 and 25°C.

102.3 Plants

(From review by G.P. Makhijani, 3/29/79, Residue Chemistry Branch)

Potatoes - Absorbed into potato leaves and stems with little translocation into tubers and extensively metabolized principally to CGA-62826.

(S.M. Creeger, 2/26/79)

Tobacco - Extensively metabolized to ca. 25 different metabolites with CGA-62826 never more than 1.5%.

102.4 Animal

(G.P. Makhijani, 3/29/79)

Rat - Almost all was excreted in urine and feces within 6 days; no parent compound was found.

- Within 48-hr, 62.1% of activity in urine (which was 63.5% of total) was in form of glucuronic acid conjugates.

- Metabolism proceeds by 1) methyl ester hydrolysis, 2) N-dealkylation, 3) methyl ether cleavage, 4) 2,6-methyl oxidation and 5) subsequent conjugation with glucuronic acid.

102.5 Microorganisms

(S.M. Creeger, 10/24/79)

Cultures - No effect on cultures of 1) actinomycetes, 2) cellulose decomposing, nitrogen fixating and esterase producing bacteria, 3) algae and 4) decomposing, esterase and antibiotic producing and arsenic metabolizing fungi.

Nutrient Metabolism - No effect at normal use rates on cellulose, protein or starch metabolism.

Activated Sludge - Continuous treatment of activated sludge inhibits breakdown of carbon and allows parent compounds to be discharged in effluent.

102.6 Bioaccumulation

(S.M. Creeger, 10/24/79)

Bluegill - Bluegills (5.6 ± 2.5 gm, 7.3 ± 0.9 cm.) were continuously exposed to ^{14}C -phenyl-labeled parent at 1 ppm for 29 days at 17.0°C , pH 7.0-7.2 and 60% saturation of DO. Remaining fish were placed in clean water for 14 days. Results are tabulated below:

¹⁴C - Residues in Water and Fish

Day		Water	Edible		Non-Edible		Whole Fish	
		<u>ppm</u>	<u>ppm</u>	<u>BF</u>	<u>ppm</u>	<u>BF</u>	<u>ppm</u>	<u>BF</u>
exposure	0	0.99						
	1	0.96	0.94	.98	5.04	3.25	2.64	2.75
	3	1.14	0.72	.63	9.01	7.90	3.99	3.50
	7	0.90	0.79	.88	8.02	8.91	3.78	4.20
	10	0.96	0.58	.60	6.65	6.93	3.02	3.16
	14	0.94	0.66	.70	13.77	14.65	5.83	6.20
	21	0.94	0.62	.66	7.99	8.50	3.64	3.87
	29	0.95	0.66	.69	4.62	4.86	2.23	2.35
depuration	1	<0.01	0.45		5.13		2.30	
	3	<0.01	0.24		1.38		0.70	
	7	<0.01	<0.25		0.43		<0.32	
	9	<0.01	0.23		0.31		0.26	
	14	<0.01	0.25		0.70		0.43	

(based on radiometric analysis of individual tissue portions)

Identification or characterization of residues in fish was not done due to low levels.

Catfish - Catfish (5.1 + 1.4 gm, 82.1 + 7.8 mm) were placed in well water (18°C, pH 7.1, 78-87% DO saturation) for 28 days which 3 days before had been flooded onto previously 30-day aged soil containing 3.3 ppm ¹⁴C-phenyl-labeled parent. Remaining fish were placed in clean water for 14 days. Results are tabulated below:

Distribution of ¹⁴C During Catfish Residue Uptake Study

	Day	Soil <u>ppm</u>	Water <u>ppm</u>	Edible <u>ppm</u>	Non-Edible <u>ppm</u>	Whole Fish <u>ppm</u>
Aging	0	2.27				
	7	2.03				
	14	2.27				
	21	1.80				
	30*	2.47				
	33	—	0.016			
Exposure	0		0.020			
	1	1.43	0.049	0.052	0.009	0.025
	3	0.77	0.068	0.011	0.019	0.016
	8	0.54	0.100	0.016	0.029	0.024
	10	0.66	0.095	0.019	0.023	0.021
	15	0.93	0.110	0.019	0.030	0.026
	21	0.62	0.117	0.018	0.029	0.025
	28	0.67	0.137	0.018	0.029	0.025
Depuration	1	—	ND**	0.002	0.007	0.005
	3	—	ND	0.004	0.007	0.006
	7	—	ND	0.002	0.004	0.003
	10	—	ND	<0.005	0.005	<0.005
	14	—	ND	<0.003	0.003	<0.003

* soil flooded - begin 3 day equilibration period

** ND = ¹⁴C level below detectable limits

Again, residue levels were too low to allow identification. Both tests indicate little if any potential for bioaccumulation.

102.7 Summary
(S.M. Creeger, 10/24/79)

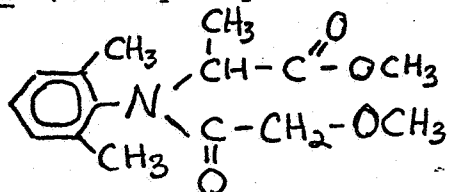
"Ridomil is stable to hydrolysis and soil surface photolysis but does photodegrade in water with a half-life of 1 week. Photosensitizers accelerate degradation. Aerobic and anaerobic soil half-lives are 7 and 9 weeks, respectively, with CGA-62826 forming which in turn breaks down. Soil microbes metabolize Ridomil but soil microbe functions are not affected at use rates. Ridomil and its soil residues leach strongly in soil and especially strongly in sandy soils low in organic matters. Groundwater contamination is a strong possibility considering the proposed citrus use. Ridomil dissipates under field conditions with a half-life of 2 weeks and accumulation in whole fish is not expected to exceed 10X.

"The fate of CGA-48988 (Ridomil) in the environment has been satisfactorily described and has been found to have the potential to leach into groundwater supply. Attention is drawn to the proposed citrus use - an agricultural area incorporating sandy soil - and the high leachability of Ridomil and its soil aged residues. Use of Ridomil as proposed may result in residues reaching groundwater. This will also apply to all uses in areas of sandy soil such as turf, etc."

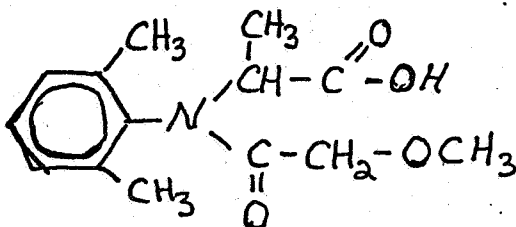
102.7

Comparative Structural Formulas

Metalaxyl (parent CGA-48988): N-(2,6-Dimethylphenyl)-N-(methoxyacetyl)alanine methyl ester



CGA-62826: N-(2,6-Dimethylphenyl)-N-(methoxyacetyl)alanine



103

Toxicological Properties

103.1 , References from Toxicology Branch

(From reviews by K. K. Locke, 10/31/79 and by S.-L. Chan, Toxicology Branch 3/21/79, based in part on previous reviews by W. Woodrow 11/8 & 11/27/78)

Technical (90% A.I.)

Rats - Acute Oral LD₅₀ = 669 mg/kg

Rabbits - Acute Dermal LD₅₀ > 6 gm/kg

Rabbits - Skin Irritation Index = 0.1/8 = mild irritant

Rabbits - Eye Irritation Index = 9.5/110

Guinea pig - Skin Sensitization - Negative

Rats - 90-day Feeding NOEL = 250 ppm (body and organ wts.,
feed intake, blood, urine,
histopathology)

Dogs (Beagles) - 90-day Feeding NOEL = 250 ppm (same above)

Rats - Teratology Study - Not Teratogenic at 120 mg/kg.

Salmonella - Mutagenicity - Negative in TA 1535
TA 1537, TA 98 and
TA 100, with and without
microsomal activation

Mouse - Dominant Lethal - Negative Mutagenic Potential

Formulation - CGA-48988 5W

Rats - Acute Oral LD₅₀ >5000 mg/kg; tremors & convulsions

Rabbits - Acute Dermal LD₅₀ >10,000 mg/kg; depression &
loss of appetite

Rabbits - Eye Irritation - Unwashed: recovery by day 10
Washed: no irritation

Rabbits - Skin Irritation - None

Rats - Acute Inhalation LC₅₀ >2.97 mg/l

Formulation - Ridomil-2E (27.8% AI; contains ethylene
dichloride)

Rats - Acute Oral LD₅₀ = 1889.48 mg/kg

Rabbits - Acute Dermal LD₅₀ = 3571.5 mg/kg

Rabbits - Eye Irritation - Corneal opacity

Rabbits - Skin Irritation - Very slight irritant

Formulation - Ridomil-2EG (27.9% AI; does not contain ethylene
dichloride)

Rats - Intraperitoneal LD₅₀ = 312 mg/kg

Rats - Acute Inhalation LC₅₀ - (not determined)

103.2

Minimum Requirements

(Following table is modified from J. Tice 3/28/79)
Studies Validated in a 9/1/78 Review by J. Tice for Riddimil 2E.

Organism	Test	Results (95% CI)	Active	Validation Category
<u>Bird</u>				
mallard duck	acute oral LD50	1,466(1128-1906)mg/kg	Tech.	Core
Japanese quail	"	923(798-1069)mg/kg	"	Invalid
Bobwhite quail	8-day dietary LC50	>>10,000 ppm	"	Core
Japanese quail	"	"	"	Supp
mallard duck	"	"	"	Core
<u>Fish</u>				
Rainbow trout	96-hr LC50	>100 ppm	Tech.	Supp
Bluegill	"	>100 ppm	"	Supp
Catfish	"	>100 ppm	"	Supp
Carp	"	>100 ppm	"	Supp
Guppy	"	>100 ppm	"	Supp
Rainbow trout	"	130 ppm (100-160)	"	Core*
Bluegill	"	150 ppm (130-170)	"	Core*
<u>Invertebrates</u>				
Daphnia magna	48-hr. LC50	29.3(21.6-38.9)ppm	Tech.	Supp
"	"	28(21-37) mg/l.	"	Core*

* Studies Core for the technical material only.

103.2.3 Fish Acute LC₅₀'s

(Note: The following is not a validation)

U.S. EPA. 1979. Report on the toxicity of Ridomil 2EG to bluegill, Daphnia magna and rainbow trout. (U.S. EPA, Chemical and Biological Investigations Branch, Beltsville, MD.; Static Jar Test Nos. 2411, 2416, 2417, 7/20 & 24/79 unpublished report). IN:EEB Metalaxyl Registration Review file.

<u>Species</u>	<u>Reported LC₅₀</u>	<u>LC₅₀ in AI (27.9%)</u>
Bluegill	96-hr. = 27 ppm	7.53 ppm
<u>Daphnia magna</u>	48-hr. = 12.5 ppm	3.49 ppm
Rainbow trout	96-hr. = 18.4	5.13 ppm

Reported results are similar enough to results recalculated with Stephan's computer program and will be used in this review.

Note that the 2EG (27.9%) formulation is considerably more toxic on an active ingredient basis (and even on a total volume basis) than the technical material.

104 Hazard Assessment

104.1 Discussion

Ecological Effects Branch has proposed that an interim policy be formulated to deal with pesticides that can contaminate groundwater. This interim policy would use criteria in the following general categories to select pesticides for regulatory action: use patterns, volume of use (or potential volume), environmental chemistry and toxicity. If a pesticide triggers a number of these criteria, appropriate action is recommended at the earliest opportunity, in this case with the initial registration. The following Hazard Assessment reflects the proposed interim policy outlined above.

Likelihood of Adverse Effects

Metalaxyl is being reviewed for registration on non-bearing citrus seedlings (Florida only), ornamentals and turf with repeat applications under the brand name Subdue® as a 5% WP. (It also has had several EUP's on potatoes and tobacco as a 25% EC under the brand name Ridomil® by which it is more well known.) Of particular concern are the uses on citrus seedlings in sandy soils and on turf (including homes, golf courses, parks and turf farms); the turf use especially can be close to home and municipal ground water (and other drinking water) supplies. As a new chemical its current use volume is minimal. However, use could be widespread and volume quite large shortly judging by future registration considerations. There is a Conditional Registration proposed as a 25% EC on tobacco at the other end of the registration review pipeline with numerous Sect. 18's anticipated if it is not registered, and a previous EUP tested for efficacy on potato late blight. Metalaxyl is also considered very promising against two types of soil-borne fungal diseases, Pythium and Phytophthora, which attack a wide spectrum of crops. Thus, metalaxyl is of at least initial concern from both its type of use and its potential volume and diversity of use.

Environmental chemistry information is restricted mainly to technical metalaxyl. (Product chemistry data is restricted to the 25% EC which is soluble in water to 700 ppm.) Several laboratory and field tests using the technical and simulating agricultural application indicate extensive leaching, particularly in sandy soils, although this has not yet been completely quantified.

Nonetheless, potential contamination of groundwater has all but been admitted by the registrant. Although no information is available on the potential for run-off, this route of contamination of surface-drinking water supplies could be possible through sheet run-off. Metalaxyl is also considered stable to hydrolysis and photolysis in water and on soil for one to several weeks. Photolysis in 1% acetone (as a photosensitizer), on the other hand, is quite rapid. Little soil degradation of metalaxyl occurs as well. In all cases the major degradate or metabolite is the parent compound minus its methyl ester. Tests done on activated sludge systems show that metalaxyl will pass through untouched and will inhibit other carbon breakdown as well. Little if any bioaccumulation occurs in fish uptake studies. Thus, metalaxyl is persistent and mobile enough to warrant concern.

Acute toxicity information from tests on laboratory mammals and aquatic organisms show that metalaxyl is only moderately toxic with a Daphnia 48-hr LC_{50} of 3.49 ppm AI. (Avian tests also indicate little acute toxicity.) There is currently not enough laboratory mammal information from chronic tests to characterize

its potential for long-term effects. On the basis of its persistence, mobility and repeated applications, an aquatic invertebrate life-cycle study will be required by EEB prior to any registration.

Aquatic bioassays indicate differential toxicity of different formulations of metalaxyl. The technical material has a 48-hr LC₅₀ to Daphnia of 28 ppm and does not stay in solution at higher concentrations. The 25% EC, having no difficulty staying in solution, has the 48-hr LC₅₀ of 3.4 ppm AI. Therefore, prior to any registration EEB will require aquatic bioassays be conducted on the formulation up for review.

Since future registration proposals for these different formulations are anticipated, it is important that the fate of metalaxyl (when applied as these formulations) be more completely quantified in the field. The 25% EC formulated to be miscible with water, is anticipated to leach at least as much as the technical material. Quantification of environmental fate of all formulations are needed before risks can be adequately assessed.

104.3 Endangered Species Considerations

Although little acute hazard to non-target organisms is anticipated, possible chronic effects are presently unknown. Until there is more information about what levels will cause chronic effects, EEB defers comment on possible hazards of metalaxyl to Threatened and Endangered Species.

104.4 Adequacy of Toxicity Data

As noted in the previous review by J. Tice (3/28/79), all minimum tests that require use of the technical material have been fulfilled. However, because aquatic tests conducted with the technical had problems and had unique test conditions, these tests are not adequate to support registration of formulated products.

104.5 Additional Data Required

As noted in Sects. 104.4 and 104.2, metalaxyl's technical and formulated products have different acute toxicities, the parent is persistent and mobile, and the fate of its formulated products is unquantified in the field. For these reasons the following tests will be required prior to registration: 1) acute aquatic tests on the formulated product, 2) an aquatic invertebrate life-cycle test on the technical and 3) more completely quantified fate of the formulated product through field monitoring studies.

107 Conclusions

107.4 Data Adequacy Conclusions

As stated in the previous review by J. Tice (3/28/79), although all of the minimum tests that require use of the technical material have been fulfilled, "aquatic tests of the formulated products will be necessary for the products registration."

107.5 Data Requests

As noted previously by J. Tice (3/28/79) and due to the much greater toxicity of Ridomil 2EG (27.9%) (Sect. 103.23), the following tests on the formulated product, Subdue 5WP, are required prior to consideration of registration:

1. A fish 96-hr LC₅₀ on a warmwater species (preferably bluegill) and a coldwater species (preferably rainbow trout); and
2. An aquatic invertebrate acute LC₅₀ either for 48-hr on first instar daphnids or for 96-hr on early instar amphipods, stoneflies or mayflies.

Due to metalaxyl's proposed use pattern and potential volume of use and also its persistence and mobility, the following test on the technical is also required prior to consideration of registration:

An aquatic invertebrate life-cycle test (preferably Daphnia magna).

Although it is known that metalaxyl will contaminate groundwater, to what extent has not yet been completely quantified. More information on the quantified fate of the formulated products would be helpful in assessing the chronic hazards of metalaxyl to aquatic organisms.

107.6 Special Notes

Hazard Evaluation is formulating an interim policy*to deal with pesticides that can contaminate groundwater. Ecological Effects Branch has proposed that this interim policy use criteria in the following general categories to select pesticides for regulatory action: use patterns, volume of use (or potential volume) environmental chemistry and toxicity. Following the proposed policy metalaxyl is of concern because of its: 1) proposed registration on citrus seedlings (Florida only) in sandy soils and on turf (especially close to home and municipal groundwater supplies) 2) efficacy on two fungal diseases that attack a wide spectrum of crops, 3) ability to persist and leach down to

groundwater supplies, and 4) incomplete laboratory mammal chronic test requirements and differential toxicity of its different formulations.

107.7 Recommendations

Ecological Effects Branch objects to any registration (other than EUP's for environmental fate) of metalaxyl until the Data Requests have been fulfilled.

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