12/1/95

Ground Water Classification by Regulation
METALAXYL

Metalaxyl is a systemic fungicide used to control air- and soil-borne diseases on a wide range of crops, as well as foliar diseases caused by the downy mildews. Foliar sprays comprised of metalaxyl and conventional protectant fungicides are recommended for the control of airborne diseases on hops, potatoes, tobacco, and vines. Metalaxyl alone is used as a soil application for the control of soil-borne pathogens causing root and lower stem rots on crops such as avocados and citrus, and is also used for primary systemic infections of downy mildew on hops and in tobacco seedbeds. Metalaxyl is used as a seed treatment for the control of systemic downy mildews and damping off of various crops such as corn, peas, sorghum, and sunflowers. Single active ingredient formulations include emulsifiable concentrate, granular, flowable, and wettable powder. Multiple active ingredient formulations include thiabendazole, captan, PCNB, and chloroneb.

Persistence

Metalaxyl was found to be moderately stable under normal environmental conditions. At 20 °C the calculated hydrolytic half-life was 200 days at pH 5 and 7, and 115 days at pH 9. Metalaxyl is photolytically stable in water when exposed to natural sunlight, with a half-life of 400 days, and less than 10% of the material photolyzed during the 28 day test period. Studies also indicated that metalaxyl was stable to photodegradation on soil, since test results indicated no difference between the irradiated sample and the control sample. The aerobic soil metabolism half-life was determined to be about 40 days.

Other laboratory studies demonstrated that less than 0.5 % of the applied metalaxyl would be lost to volatilization. Metalaxyl and its degradates readily leach (K_d = 0.43 to 1.40 in sand to sandy clay loams, respectively) in sandy soils and those low in organic matter. It is considered to be a strong leacher, since 57 and 92% of the applied was detected as parent in leachates of unaged 30 cm long soil columns of two sandy soils; while approximately 44 and 34%, and 31 and 18% of the applied was parent and the degradate CGA-62826 (N-(2,6-dimethylphenyl)-N-(methoxyacetyl)-L-alanine) in the leachates of aged soil columns of a sand and silty loam soils, respectively.

Under field conditions, the fate of metalaxyl is soil is similar to that in laboratory conditions with reported half-lives of 14 to 56 days in terrestrial field studies. In two aquatic field dissipation studies, metalaxyl dissipated from rice paddy water with half-lives of 5 and 20 days, and from soil with half-lives of 11 and 24 days. The major soil degradation product formed in the field studies was CGA-62826.

Metalaxyl, therefore, exceeds four of the persistence triggers (hydrolysis, photolysis, aerobic soil metabolism and field dissipation) for Restricted Use classification.

Mobility

Metalaxyl and its degradates readily leach (K_d = 0.43 to 1.40 in sand to sandy clay loams, respectively) in sandy soils and those low in organic matter. It is considered to be a strong leacher, since 57 and 92% of the applied was detected as parent in leachates of unaged 30 cm long soil columns of two sandy soils; while approximately 44 and 34%, and 31 and 18% of the applied was parent and the degradate CGA-62826 (N-(2,6-dimethylphenyl)-N-(methoxyacetyl)-L-alanine) in the leachates of aged soil columns of a sand and silty loam soils, respectively.

In field studies, metalaxyl and its primary degradate CGA-62826, have been shown to be capable of leaching to the 36-48 inch soil depth (which is further confirmed by groundwater and drinking water studies where metalaxyl and its degradate CGA-62826 were detected).

Detections

The 1992 "Pesticides in Ground Water Database" (Hoheisel et al., 1992) reports detections of metalaxyl typically up to 3 ppb in ground water from North Carolina and Tennessee. Additional information in EFGWB files indicates detections of metalaxyl in Maryland, Florida, and Washington as high as 236 ppb.

Environmental Fate Assessment

Based on all the data submitted, EFGWB concludes that the primary routes of dissipation of metalaxyl in surface soils appear to be aerobic soil metabolism (half-life ≈40 days), leaching (K_ds 0.4-1.4), and plant uptake (residues accumulate in plants up to 12 months after application). In aquatic systems, such as rice culture, EFGWB can only tentatively identify a route of dissipation, since the compound is stable to hydrolysis (half-life ≈200 days at pH 5 and 7 and 115 days at pH 9), photolysis on water (half-life ≈400 days) and soil (no difference between irradiated or samples incubated in the dark) and does not volatilize appreciably. However, metalaxyl degrades moderately under aerobic aquatic (half-life ≈55 days) and anaerobic aquatic (half-life ≈30 days) conditions, which are probably the main routes of dissipation in aquatic systems together with leaching, surface mobility and plant uptake. Sensitized aqueous photodegradation may also be important in dissipation of metalaxyl and residues from aquatic systems.

Terrestrial and aquatic field studies demonstrate that the compound is less stable in the field than the laboratory data indicates, and it is also mobile under normal use conditions.

REFERENCES

Hoheisel, C., J. Karrie, S. Lees, L. Davies-Hilliard, P. Hannon, R.

Bingham, E. Behl, D. Wells, E. Waldman. 1992. Pesticides in Ground Water Database - A Compilation of Monitoring Studies: 1971 - 1991. Office of Prevention, Pesticides, and Toxic Substances. EPA 734-12-92-001. September 1992.

Metalaxyl-Reregistration Eligibility Decision (RED). EPA 738-R-94-017. September 1994.

Metalaxyl. 1993. Pesticide Environmental Fate One Line Summary. Environmental Fate & Effects Division. August 9, 1993.

Physical and Chemical Characteristics of METALAXYL
Relative to EPA Restricted Use Criteria

CRITERION		CHARACTERISTIC	RESTRICTED USE CRITERIA	REPORTED VALUE
PERSISTENCE	1	Field dissipation half-life	> 3 weeks or	14-56 days
	2	Lab-derived aerobic soil metabolism half-life	> 3 weeks or	40 days
	3	Hydrolysis half-life	< 10% in 30 days or	115-200 days
	4	Photolysis half-life	< 10% in 30 days and	400 days
MOBILITY	5	Soil adsorption: K_d	≤ 5 ml/g or	0.43-1.40 ml/g
	6	Soil adsorption: K_{oc}	≤ 500 ml/g or	33-69 ml/g[1]
	7	Depth of leaching in field dissipation study	75 cm and	91-122 cm
DETECTIONS	8	Number of wells per state with detections	25 wells in 4 or more states or	17 wells in 3 states
	9	Number of counties with detections > 10% of reference point	3 counties at >10% of MCL or HAL (2 ppb)	

Shaded area indicates that parameter exceeds trigger.

Restricted Use requires [(1 or 2 or 3 or 4) and (5 or 6 or 7)] and (8 or 9)