DYNAMAC
CORPORATION

DIALLATE

Task 2: Environmental Fate and Exposure Assessment

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Final Report

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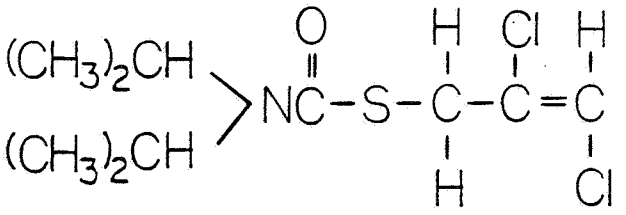
Environmental Fate and Exposure Assessment

Diallate

DIALLATE, AVADEX, DATC, CP 15336



S-(2,3-dichloroallyl)-diisopropylthiocarbamate

Diallate is a selective herbicide registered for the control of wild oats on a variety of field and vegetable crop sites. Approximately 0.75-1.0 million pounds of active ingredient are applied annually in the United States, of which, 60% is used on sugar beets, 10% on flax, ∿11% on lentils, and ∿7% on dry peas. Use of diallate on lentils and dry peas has essentially been replaced by triallate since 1978; however, current usage information is not available in order to update percentages. Diallate is applied at ∿1-3 lb ai/A and is formulated into a 10% granular and a 4 lb/gal emulsifiable concentrate. Although diallate must be soil incorporated immediately after application, it may be applied by using ground equipment (principal method) or aircraft (EC formulation). The specific type of equipment is determined by site, formulation, and equipment availability. Applicators must be certified or under the direct supervision of applicators certified to apply diallate.

Available data are insufficient to fully assess the environmental fate of diallate and the exposure of humans, wildlife, and non-target organisms to diallate.

Cis and trans diallate (3.3 lb/gal EC) photodegrades fairly rapidly on soil and as thin films on glass when exposed to artificial sunlight and to UV radiation (peak emission at 254 nm) (Nassar and Ebing. 1978. No MRID). On soil, the half-lives of both cis and trans isomers were >8 days for exposure to UV radiation compared to >16 days for artificial sunlight. Photodegradation was accelerated in thin films, but was more pronounced under UV radiation (half-lives were ∿3 days for both isomers) than under artificial

sunlight (half-lives were ∿12 for cis and ∿8 for trans isomers). A major unidentified degradate appeared during irradiation with UV and artificial sunlight, but was more pronounced in thin films exposed to UV light.

Diallate at 1-10 ppm (≥normal application rates) degrades fairly rapidly with half-lives of ≤9-56 days in aerobic soils incubated at 22-25 C and ≤field capacity (Anderson. 1981. No MRID; Anderson and Domsch. 1976. No MRID; Anderson and Domsch. 1980a. No MRID; Anderson and Domsch. 1980b. No MRID; Marvel et al. 1978. No MRID; 00086386; and 00068698). Increasing soil moisture (up to field capacity) and temperature (37 C) enhanced the dissipation rate of diallate (Anderson. 1981. No MRID; Anderson and Domsch. 1980b. No MRID; Burns and Gibson. 1980. No MRID; and 00086386). Higher application rates (20-50 ppm) extended diallate half-life values to 10-16 weeks in aerobic soil incubated at 22-25 C and ∿field capacity as compared to application rates of 1-10 ppm. Soil sterilization (autoclaving) greatly reduced the dissipation rate of diallate applied at 1-4 ppm, but had little or no effect with diallate at 20 ppm as compared to non-sterile soils treated at the same rates. The only degradate identified was CO_2. Fungi isolated from five soils in which diallate was degraded were capable of metabolizing diallate in liquid culture and when added back to sterile soil (Anderson and Domsch. 1976. No MRID).

As determined by a bioassay, diallate was immobile to slightly mobile in five soils ranging in texture from sand to clay loam to peaty muck (Koren et al. 1969. No MRID). The columns were eluted with an insufficient amount of water to fully assess the mobility of diallate. However, the mobility of diallate phytotoxic residues appears to decrease as soil organic matter (0.5-52%) and CEC (3-68.3 meq/100 g) increase. Diallate was strongly adsorbed to peat moss with a Freundlich K value of 1,080 (00002536). [^{14}C]Diallate rapidly adsorbed to a loam soil (pH 5.4, 1.3% total C); 99.6% of the applied dose adsorbed within 4 hours (Anderson. 1981. No MRID). Coefficients were not presented. Although available data are insufficient to fully assess the mobility of diallate in soil, the potential for contamination of groundwater is expected to be lowest in soils with high organic matter contents and CECs.

[^{14}C]Diallate mixed with diallate EC volatilizes slowly from soil (pH 5.4, 1.3% total C) incubated at 22 C and ∿12% moisture (Anderson. 1981. No MRID; Anderson and Domsch. 1980a,b. No MRID. During a 3- to 30-week incubation period, 2-24%

of the applied diallate (0.5-50 ppm) volatilized. The percentage of applied diallate volatilized increased with application rate. Soil moisture in the range of 9 to 19% does not appear to influence the volatilization rate of diallate; however, at lower levels (2.4%) the volatilization rate is slowed.

In the field, diallate phytotoxic residues persisted for 2-4 months in two Austrian soils (~2.5% humus) treated with diallate (formulation unspecified) at 4 kg/ha (05021883). Soil sampling depth was not reported.

Application by aircraft increases the potential for exposure of humans, wildlife, and non-target organisms to diallate due to spray drift and volatilization of diallate prior to soil incorporation. Human exposure to diallate during application and soil incorporation operations could be minimized by the use of approved respirators and other protective clothing. Exposure during reentry operations after soil incorporation is thought to be minimal. However, data are not available to fully assess such exposures.

Operator exposure to diallate (EC) during tank fill operations using three closed-transfer systems was minimal (00067388 and 00071162). Inhalation exposure ranged from <0.18 to 1.0 $\mu g/m^3$. Diallate was not detected on cotton gloves worn under neoprene gloves (<0.061 $\mu g/cm^2$) or on the head, neck, and upper torso (<0.005 $\mu g/cm^2$) of operators. Equal operator protection was provided by the Chemprobe, Protect-O-Loader, and Chemductor systems tested.

Dermal and ocular exposure due to splashing may occur during mixing and handling operations involving the emulsifiable concentrate formulation when closed-transfer systems are not utilized. Exposure during application is expected to be mainly dermal, although use of aircraft may increase the potential for inhalation exposures. Exposure from the granular formulation is expected to be mainly dermal. Such exposure could be greatly minimized by the use of gloves and other protective clothing during handling and application.

In summary, diallate photodegrades fairly rapidly on soil and glass with half-lives of >8-16 days. Diallate degrades in aerobic soils with half-lives

of <9-56 days. Increasing soil moisture and temperature tend to increase the dissipation rate of diallate. Microbial metabolism is expected to contribute to the degradation of diallate in soils treated at normal application rates. The mobility of diallate could not be assessed from the submitted data; however, its mobility appears to decrease as soil organic matter and CEC increase. In the field, diallate phytotoxic residues can persist for 2-4 months in soils treated with diallate at 4 kg/ha. The volatility of diallate after incorporation into soil at normal application rates appears to be low. Operator exposure to diallate (EC) during tank fill operations using closed-transfer systems was minimal.

In order to fully assess the environmental fate and transport of, and the potential exposure to diallate (EPA Guidelines for Registering Pesticides, 1982) the following data are required: hydrolysis studies; photodegradation studies in water; aerobic and anaerobic soil metabolism studies; leaching studies; terrestrial and long-term field dissipation studies; accumulation studies on rotational crops and fish; and reentry and exposure studies.

Label Restriction

Do not plant domestic oats in fields where diallate was applied at 1.5 lb ai/A the previous year.

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