METHAMIDOPHOS

Task 3: Environmental Fate Profile

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Final Report

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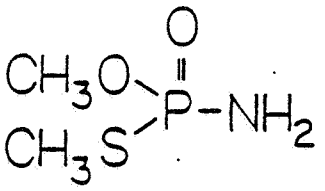
METHAMIDOPHOS

Task 3

METHAMIDOPHOS, MONITOR, TAMARON



O,S-Dimethyl phosphoramidothioate

Environmental Fate Profile

Available data are insufficient to fully assess the environmental fate of methamidophos.

The following products were identified in alkaline and acid hydrolysates (10% NaOH and 10% HCl) of technical methamidophos (~70% purity) at 80 C: O-methyl phosphoric acid, S-methyl phosphorothioate, methanol, methyl mercaptan, and ammonia (Magee, 00014039). The mechanisms by which these compounds originated cannot be determined due to deficiencies in the protocols of the study.

Methamidophos at 1 ppm had half-lives of 2-6 days in silt, loam, and sandy soils at 21 C (Leary and Tutass, 00014076). Methamidophos at 20 ppm had a half-life of 10-12 days in a sandy loam soil at 24 C (Tucker, 00014991). In another study, methamidophos levels declined ~50% (from 1.3 ppm) within 9 days after the last of three applications to a sandy loam soil over a 33-day period at room temperature (Tucker, 00014497). Lubkowitz (05017379) identified the following products in three types of soils incubated with methamidophos at 22 C: O,S-dimethyl phosphorothioate, O-methyl phosphoric acid, S-methyl phosphoroamidothioate, O-methyl phosphoroamidate, and phosphate ion.

More than 90% of the ^{14}C had dissipated from a silt soil 1 week after application of [S-methyl-^{14}C]methamidophos at 0.2 ppm and incubation at

37 C (Leary and Tutass, 00014076). ^{14}C was detected in the form of amino acids and carbohydrates, indicating that microorganisms metabolized methamidophos. Microbial metabolism was also demonstrated by the fact that only ~10% of the applied ^{14}C dissipated after 1 week in sterile soil at 37 C. Only 8% of the applied ^{14}C dissipated in a volatile form after 3 days in anaerobic soil, versus 70% in aerobic soil.

Studies by Focht and Joseph (00015233 and 05017226), Ramadan and Zidan (05019841 and 05019842), and Zidan and Ramadan (05017741) indicate that methamidophos at actual use levels in soil will not have a long-term adverse effect on populations of bacteria (including nitrogen fixers) and fungi, or on microbial soil respiration, cellulose decomposition, ammonification, sulfur oxidation, and nitrification. Observed inhibitory effects were not severe, and generally lasted less than 1 month.

In soil thin-layer chromatography studies (Thornton et al., 00029887; Tucker, 00014992), [^{14}C]methamidophos was moderately mobile to very mobile in nine soil types (sand, loamy sand, sandy loam, sandy clay loam, silt loam, silty clay, silty clay loam, loam, and clay).

Methamidophos exhibited a bioaccumulation factor of <2 on the 7th day of exposure of the marine diatom Cylindrotheca fusiformis at 1-10 ppm (Tucker, 00014496), on the 8th day of exposure of bass at 0.01 ppm (Stanley, 0001 4014 and 00014018; Chemagro Corporation, 00014017 and 00014019), and over a 28-day period of exposure of bass at 0.8-1.5 ppm (Baychem Corporation, 00014015 and 00014016). In the bass, depuration to nonquantifiable levels (<0.014 ppm) occurred on the 1st day of depuration. ^{14}C residues had a bioaccumulation factor of ~2 in Daphnia magna on the 3rd day of exposure to [^{14}C]methamidophos at 0.1 ppm (Tucker, 00015242). Methamidophos is very soluble in water (Farm Chemicals Handbook, 1981, Meister Publishing Co., Willoughby, OH) and therefore should have a low octanol/water partition coefficient.

In summary, methamidophos had a half-life of <2 weeks in soil under aerobic conditions. The S-methyl group is metabolized and incorporated into amino

acids and carbohydrates. Products formed in soil and water are O,S-dimethyl phosphorothioate, O-methyl phosphoric acid, S-methyl phosphorothioate, S-methyl phosphoroamidothioate, O-methyl phosphoroamidate, methanol, methyl mercaptan, ammonia, and phosphate ion. Some temporary inhibitory effects on soil microbes and their functions may occur in some soils, but long-term adverse effects are not expected as a result of methamidophos use. Methamidophos will be moderately mobile to very mobile in most types of soils, but degradate mobility is unknown. If methamidophos enters an aquatic system, it will be transformed and residues are not expected to accumulate in aquatic non-target organisms.

Summary of Major Data Gaps

The major data gaps for this chemical are: hydrolysis studies; photodegradation studies in water, on soil, and in air; aerobic and anaerobic soil metabolism studies; a degradate mobility study; laboratory and field volatility studies; and terrestrial field dissipation studies.

Label Restrictions

At present, there are no label restrictions regarding the environmental chemistry of methamidophos.

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