

6/5/74

ENVIRONMENTAL CHEMISTRY REVIEW FOR USE OF: O-isopropoxyphenyl methyl carbamate (Baygon)

PP No. 2F1244, Reg. Nos. 3125-ETE, 3125-ETG

Chemagro Corp.

I. INTRODUCTION

1. Baygon is a systemic carbamate insecticide (cholinesterase-inhibitor). There have been no previous environmental chemistry reviews. However, in connection with PP No. 9G0765 (CB memo of 1/24/69), soil persistence data were evaluated.

2. Technical Baygon is 94% active (minimum); more typically, it is 97.5% (or more) active. 

3. Physical and chemical properties:

When pure, Baygon is a white, crystalline substance.

Melting point- 91.5°C

Solubility-Highly soluble in organic solvents; 0.2% in water at 25°C .

Vapor pressure-0.01 mm Hg at 20°C .

(The material is volatile--technical has a half-life of 13 days at 25°C)

Unstable under alkaline conditions.

Empirical Formula: $\text{C}_{11}\text{H}_{15}\text{NO}_3$

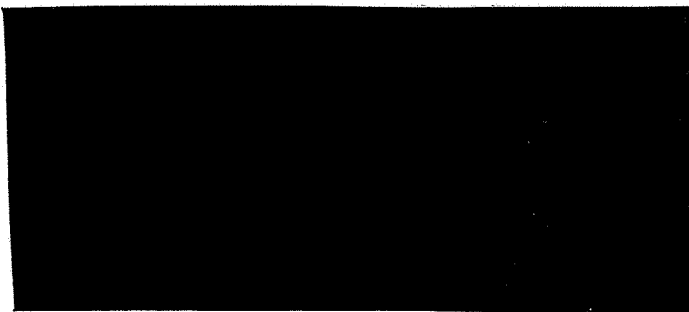
4. The petition (presently in reject status) is proposing tolerances for the following:

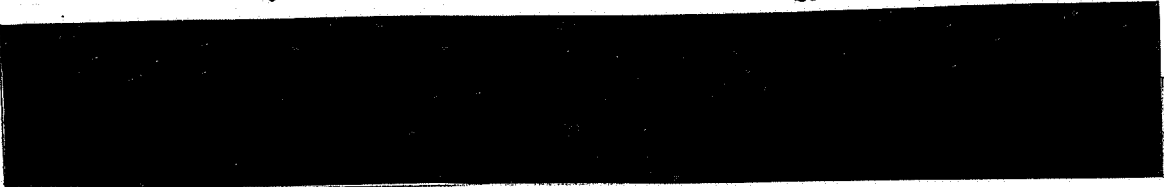
Alfalfa and pasture grasses and their hays, oats (fodder, forage, grain and straw), mild, meat, fat and meat byproducts of cattle, sheep and goats.

5. Name and formulation of the product:

Baygon 70% Wettable Powder

Active Ingredient 70%





II. DIRECTIONS FOR USE

1. Oats: 4 ozs. active ingredient per 100 lbs of seed, applied as a slurry and mixed to achieve uniformity.

Restriction: Do not graze or feed green fodder (sic) to livestock within 30 days of planting.

2. Alfalfa: 0.5 to 1.0 lb active per acre. Aerial applications are permitted. Applications up to the day of cutting are permitted.

Restrictions: Do not apply more than twice per cutting at the 0.5 lb act/A. Apply only once per cutting at rates above 0.5 lb act/A. Do not apply when bees are actively visiting the treated area.

3. Pasture grasses: 3 to 6 ounces active per acre. Aerial applications are permitted. Two applications per cutting may be made with the last application permitted up to the day of cutting or grazing.

Restriction: If pasture grass is not cut for hay, apply only twice per season.

Note: For pasture grasses and alfalfa, label is silent with respect to presence of livestock during applications

III. DISCUSSION OF DATA

1. Analytical Methods: When radiolabeled Baygon was used, tritium and/or carbon-14 activities were measure by liquid scintillation spectrometry. Non-labeled Baygon was quantitated using GLC; the GLC analysis measures Baygon and its metabolites separately. Qualitative analyses were carried out using TLC.

Conclusions

The analytical methods used are acceptable.

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2. Soil metabolism study (laboratory) (Report No. 30590) ^3H -isopropoxy and ^{14}C -carbonyl labeled Baygon was admixed with unlabeled Baygon, which in turn was admixed at a level of 2.5 ppm with three soil types (sandy loam, silt loam and high-organic silt loam). The soils were adjusted to 15% moisture content, which level was maintained throughout the study. The soils, in constant humidity flasks, were held at room temperature for 116 days, with samples taken at 0, 20, 56, and 116 days. This study showed that the activity in all three soils tended to remain essentially constant throughout the 116 days (89 to 99% of the applied activity remained at the end of the test); furthermore, it was organosoluble and identified by TLC as Baygon per se. Soil culture samples showed no changes in the microflora when compared with those from untreated soil

Kd factors were determined on 3 soils as follows:

Soil	% OM	pH	% Clay	Kd
Sandy loam	1.4	7.7	18	0.62
Silt loam	2.0	6.3	38	0.49
H. organic Silt loam	4.4	6.1	40	1.12

Tere appears to be no relationship between OM, pH or % clay on Kd.

Conclusion

No definitive conclusions can be drawn from this laboratory study since the soils were not subject to any leaching, photodegradation or normal field temperature ranges. However, it does indicate that chemical degradation due to soil constituents is not a route of degradation for Baygon in soil, it also appears that metabolism of Baygon by microflora may be a rather slow process.

Note: (As will be discussed below, the results of this study is in contrast to those reported for the field degradation soil studies)

3. Leaching study: (Report 30589) Three different soils (as above) were fortified with 10 ppm tritium-isopropoxy and ^{14}C -carbonyl Baygon the material was carefully placed at the top surface of a columns were leached with one "void volume" (the difference in weight of water, converted into mls, of saturated soil column vs. dry soil column). After leaching, segments of the columns were separately analyzed for activity.

Results

This study showed that the activity moved with the leading edge of the water. The calculated amount of rainfall to move the surface residues of Baygon 12" into the soil ranged from 13.2 to 15.2". All applied activity was accounted for.

Conclusions:

Baygon is subject to rapid leaching.

4. Water stability studies: (Report 30589)

- a. A plastic pool was filled with 2" of bottom silt and 10" of lake water (pH7) with a temperature range at 27-36°C. The system was treated with the equivalent of 10 ppm non-labeled Baygon. The pool was out of doors and protected only by a thin polyethylene sheet held three feet above the vessel. The plastic sheet allowed sunlight and air to freely enter the pool, but prevented any dilution by rainfall. Samples were taken periodically to determine the half-life of the insecticide under these conditions.

Results:

The half-life of Baygon in the plastic pond holding bottom sediment and lake water was slightly over 12 hours.

Conclusions:

Baygon is rapidly degraded in waters containing aquatic microflora and exposed to sunlight.

In a companion study, sealed containers of lake water (250 mls each), pH7, were fitted so as to contain small plastic beakers containing 10 grams of lake silt; the containers were fitted with sidearms plugged with cotton to permit equilibration with the atmosphere. One of the two containers was sterilized after assembly; both containers were fortified with radiolabeled (^{14}C and ^3H) Baygon so that the water-soil system contained 10 ppm. Both containers were placed out of doors and exposed to sunlight which passed through the quartz covers. Samples of water and silt were taken at intervals to determine the half-life of Baygon under these conditions. The temperature range during these studies was 5-22°C.

Results:

Under non-sterile conditions, the half-life was 55 hours; under sterile conditions, the half-life was 81 hours.

Conclusions:

Considering the lower temperatures involved in this study (as compared to those involved in the plastic pool study), we conclude, as above, that Baygon is rapidly degraded in water containing aquatic microflora and exposed to sunlight.

5. Hydrolysis (Report 30589) In the third study of degradation of Baygon in water, Baygon was added to phosphate buffers of pH 5, 7 and 9 and placed in constant temperature baths one held at 30°C and the other at 50°C. All solutions were in capped amber, bottles to preclude the possibility of photodegradation.

Results:

At pH₃, Baygon was quite stable; showing no measureable change at 30°C after 31 days, and demonstrating a half-life of over 1600 hours at 50°C. At pH 7, Baygon was somewhat stable to the test conditions, half-life of over 700 hours at 30°C; which dropped to 23 hours at 50°C. At pH 9, Baygon was quite unstable, showing a half-life of 1.2 hrs at 30°C and only 0.1 hour at 50°C. GLC and TLC analyses show that the hydrolysis product of Baygon is o-isopropoxyphenol, a volatile compound.

Conclusions:

Baygon is subject to alkaline hydrolysis; the data at pH 7, when related to the studies discussed immediately above, indicate that photolysis may be an effect in aqueous media. These data, and those from the previous studies, indicate that the degradation products of Baygon in soils and water are o-isopropoxyphenol, CO₂ and methyl amine all of which volatilize into the atmosphere or enter the metabolic pools of plants and microflora.

6. Soil persistence studies (Report 30534) Two plots in Kansas, one of clay soil and the other of silt loam, were treated with Baygon (in both a granular and soluble concentrate form) at 10 lbs act./A and incorporated in the soils. Samples were taken at 1, 35, 93, 184 and 365 days and analyzed for Baygon per se.

Results:

Under the field conditions, the granular formulation soil residues had a half-life of approximately 40 days; the estimated half-life of the soluble concentrate residues was between 50 and 60 days.

Conclusion

Baygon appears to be quite susceptible to leaching; however, except under acid conditions, leached residues would be subject to rapid hydrolysis. In surface water, Baygon under rapid degradation with a half-life of less than on day. Considering the proposed uses, we anticipate no problems as to persistence, residues in rotational crops or accumulation in fish.

IV. RECOMMENDATION

A. RL registration

B. All requirement for data needed to support PR Notice 70-15 have not been met. For examples the followint deficiencies and noted:

1. How much is bound in soil ?
2. What is the 1/2 life of Baygon ?
3. What is the time when only 10% of total residues remain ?
4. What are the soil degradation products ?
5. Will residues show up in rotation crops ?
6. Will residues accumulate in fish ?
7. Hydrolysis studies ?

Answers to these questions maybe needed in the future.

RDH 6/6/74

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