9-25-73

ENVIRONMENTAL CHEMISTRY REVIEW FOR AMMONIUM ETHYL CARBAMOYLPHOSPHONATE (KRENITE)

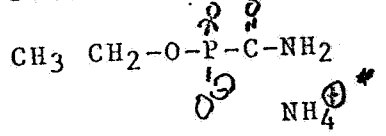
EXP-352

Du Pont

I. INTRODUCTION.

1. Krenite (DPX 1108) is a new Brush Control Agent.

2. Structure and properties



Emp. Form	:	$C_3 H_{11} N_2 O_4 P$
Mol. Wt.	:	170.1
Phys. form:		Crystalline solid
Color	:	White
Odor	:	Negligible
Mt. pt.	:	175°C
Sol.	:	H_2O 179 grams/100 grams at 25°C.
Sp. Gr.	:	1.33
Stability	:	Aqueous formulations and spray-tank solutions are stable. Subject to rapid decomposition in soil.

3. Use for brush control on industrial sites, power lines, railroad and highway right-of-way.

4. Product name is Krenite Brush Control Agent 4 Lbs. A/Gallon

II. DIRECTIONS FOR USE.

Apply at the rate of 1/2 to 1 1/2 gal/100 gal of spray (2 to 6 lbs. A).

Use in 150 to 300 gal/A.

Apply ary time after plants are in full leaf and branch terminals have elongated.

Best results made during the period within 2 months of leaf senescence in the fall.

Plants response to Krenite applied in late summer or early fall is generally not observed until the following spring. Treated plants fail to leaf out and subsequently die. Spring application

generally results in growth retardation accompanied by some branch dieback.

III. DISCUSSION OF DATA.

1. Hydrolysis

^{14}C study carried out in darkness at 20°C

Weeks	pH5	7	9
0	100	Stable	Stable
1	80	"	"
3	0	"	"

Conclusions

a. Parent compound degrades totally in 3 weeks at pH5 but is stable at pH 7 and 9.

b. Carbamoylphosphic acid (CPA) was found.

c. No loss of ^{14}C was observed at any pH tested.

d. ^{14}C identity and percentage are unaccounted for at this time.

2. Photodegradation in water. Photo-double-tubed GE-40BL lamp (300-500 mm). Lamp was 7 inches from surface of samples. Irradiation intensity at H_2O surface was 1200 watts/sq.cm. about 1/2 the intensity of the sun at noon.

H_2O samples pH 7.9, 15°C. Two control samples stored in darkness at 24°C.

Conclusions

a. About 2% decline in 8 weeks.

b. Degradation to CPA did take place at pH6.5 and in darkness. This is due to hydrolysis not photodegradation.

c. Krenite did not photodegrade.

3. Soil dissipation study.

^{14}C was added to two soil at the rate of 10 ppm (equiv. to 7.5 lbs. A/A). Soil was kept at 21°C to 30°C, humidity 50 to 80% and water holding capacity 50%.

Percentage found in two soils

Sandy Loam				Silt Loam		
pH I Weeks	H_2O Extractable	pH 10 Ext.	Bound	H_2O Ext.	pH 10 Exp.	Bound
0	68	29.7	1.9	63	36	2.1
1	69	25.4	5.1	67	27.4	3
2	58	34.8	6.2	60.2	30.8	5.6
4	28	57.4	10.6	42.4	48.9	4.3
8	29	58.4	8.3	40.8	49.7	7.9
12	28.3	58.6	9.3	40.9	44.9	7.6

Conclusions

a. The 1/2 life of parent (Krenite) was two weeks.

b. H_2O extractable residue was CPA and an unknown.

c. The pH extractable residue would be considered to be bound residues.

d. Total percent of original ^{14}C found at 12 weeks was 77.2% in sandy loam and 53.2% in silt loam soil.

e. This study shows that the ^{14}C part of the molecule is persistent and CPA to be persistent.

[A7] [A] Is the product persistent in soil to the extent that label cautions are needed for rotational crops.

(1) This is a non-food use. Rotational restrictions are not needed.

(2) 1/2 life of parent is 1-2 weeks. The degradation product, CPA is fairly persistent as well as pH 10 extractable residues and bound residues.

(3) Data are acceptable for the permit.

(4) Rat feeding study - ^{14}C study

	Percentage found
Feces	88.36%
Urine	11.72%

This rest in CO_2 and in tissue. 99.2% of total recovered as ^{14}C.

3

[B] Potential for accumulation in the food chain.

(1) A fish accumulation study is requested for permanent registration but is not needed for the permit.

(2) At this time accumulation potential in wildlife cannot be determined.

5. Leaching study.

Field study ^{14}C on Keyport silt loam.

	Percentage of original ^{14}C activity				
Weeks	0-2"	2-4"	4-8"	8-15"	Total percentage found
0	99.1	.1	.1	.1	99.2
1	98.6	1.2	.3	.1	100.1
2	94.1	.6	.3	.1	95.0
6	81.1	.7	.4	.1	82.2

Weeks	H_2O Ext.	pH 10 Ext.	Bound	parent Krenite	CPA
0	68.3	29.1	3.1	96	1
1	32.8	61	6.1	49.3	1
2	27.3	64	8.2	27.5	26.7
6	20.8	69.3	8.9	5.6	10.4

Conclusions

a. This study is in close agreement with the soil dissipation study.

b. About 80% remained at 6 weeks, 18% loss of ^{14}C at 6 weeks. Krenite did not exhibit special propensity toward leaching.

6. Aged leaching study ^{14}C study with 10 ppm aged 30 days in silt loam and sandy loam. Columns were leached with 1 inch H_2O/4 hours for a total of 20 inches.

[C] Does Krenite exhibit special propensity for mobility?

(1) Did not leach.

(2) No runoff studies.

IV. RECOMMENDATION.

A. Data are acceptable for the permit. The following comments are to be made on an RL basis.

1. The environmental chemistry data are acceptable for a temporary permit but would not be acceptable for permanent registration for the proposed uses. The following are needed to support registration.

a. An analytical method with the capability of analyzing parent compound and major degradation product(s) in soil as needed.

b. The soil dissipation study should be extended until the following is noted.

(1) Decline of the pH 10 extractables to a point to predict when only 10% remains.

(2) Decline of the water extractable residues to a point when only 10% remains.

(3) A time interval that the maximum level of bound residue would be reached is needed.

c. An anaerobic soil degradation and dissipation study is needed. There are several studies by which to obtain this data. The soil may be completely under water or purged with CO_2 or nitrogen to drive off oxygen. If an aquatic type use or use near an aquatic site is anticipated, it is preferred that the soil be under water.

(1) DPX1108 should be aged in a sandy loam soil for 30 days under aerobic condition prior to initiating anaerobic study. If done under water no aging in soil is necessary.

(2) Directly compare the degradation products to the aerobic metabolism study.

(3) Sampling intervals are to be randomly selected and analyzed for a time interval of up to 90 days. Accountability of non-extractable residues (bound) is to be determined.

d. The hydrolysis study does not account for loss. A material balance is needed.

e. A fish accumulation study is needed. This study is to be done with ^{14}C parent compound and CPA for bluegill exposure. It is suggested that ^{14}C parent material be aged in a sandy loam soil for 30 days. The fish (catfish) would then be exposed to the treated soil.

(1) Catfish are to be exposed for 30 days. If a plateau level has not been reached in 30 days the study is to continue for an additional 30 days.

(2) The rate of dissipation is to be determined by placing the catfish in pesticide free environment at end of exposure time.

(3) Residue determination of edible tissue are needed throughout the study. When a plateau level is reached or at an interval of high residues in the edible tissue, determination for polar and nonpolar extractable residues are needed along with determination of unextractable residues. Determination for residues in catfish viscera should be made at several intervals to correspond with other sampling intervals.

(4) Accumulation factors should be recorded.

(5) Determination for amount of residues in soil and in water should be made along with catfish sampling.

f. Pesticide runoff characteristics should be determined. A sandy loam soil should be used. Slope of the soil surface should be at least 5° (9%), but not more than 10° (18%). The upper 1/3 of the slope (soil) should be uniformly treated. The entire soil surface should be subjected to artificial rainfall at 1, 3 and 7 day intervals after treatment. Artificial rainfall should be applied so that a maximum runoff of 50 ml will occur within a two hour watering period. A separate analysis should be run on the water and sediment. Soil analyses are also needed at several intervals down slope.

g. All radiolabeled studies should be supported with the following.

(1) Sample calculations.

(2) Counting efficiencies.

(3) Counting time.

(4) Background level.

(5) Probable error with scentillation techniques.

h. The data requested are to support the proposed uses. This does not mean that it would support uses around food crops, aquatic sites, etc. Only after review of the results of the data requested, can a determination be made on its acceptability. Results of the studies may indicate that additional data may be needed.

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