Date Out EFB JUL 2 2 1982

TO: Product Manager 25 Taylor
TS-767

FROM: Sam Creeger
Acting Chief, Review Section No. 1
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: 7969-LI

Chemical: 2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one

Type Product: Herbicide

Product Name: Poast

Company Name: BASF

Submission Purpose: Use on soybeans

ZBB Code: 3(c)(5)

ACTION CODE: 110

Date in: 5/5/82

EFB # 311

Date Completed: 7/22/82

TAIS (Level II)	Days
63	12.5

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

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1.0 INTRODUCTION

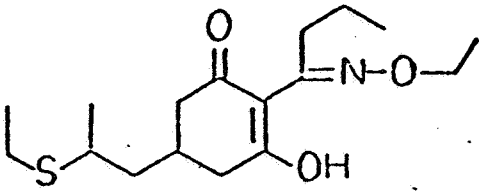
BASF Wyandotte has submitted data in support of their application for registration of Poast (BAS-9052 H, NP-55) for use on soybeans.

1.1 Chemical

Trade name: Poast

Chemical Name: 2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one

Chemical structure:



Type Pesticide: Post-emergence herbicide
1.53 lb. a.i./gallon.

2.0 USE DIRECTIONS

Use directions are appended to this review.

3.0 DISCUSSION OF DATA

Much of the data submitted by reference has been reviewed by EFB:

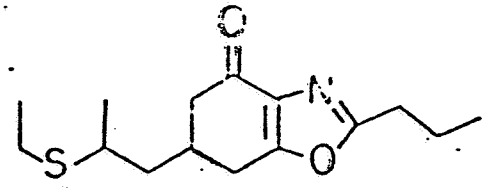
EFB review November 24, 1980, H. Manning
EFB review February 18, 1982, E. Regelman

This review will only summarize those studies reviewed previously.

3.1 Hydrolysis

Reviewed November 24, 1980, H. Manning - Conclusions:

Poast (NP-55) is fairly stable to hydrolysis with a half-life of about 40 days (41 days of 5 ppm, 38.7 days at 20 ppm) under environmental-like conditions of pH 6 and 25°C. At 25°C and pH6 and pH9, the half-lives were 47 days and 767 days, respectively. NP-55 was hydrolyzed almost exclusively to M2S.



M2S

3.2 Photolysis

3.2.1 Photolysis of NP-55 Under Anaerobic and Aerobic Conditions. May 30, 1980, PP# OG2396, Table. J-2, Accession #099539.

Experimental

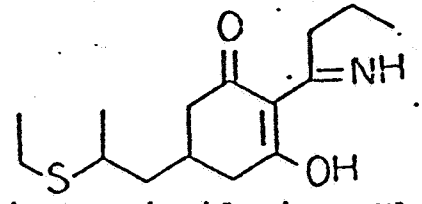
Aqueous solutions were fortified to 5 ppm with 4-^{14}C-NP-55. The solutions were placed in a rotary photochemical reactor equipped with a high pre mercury lamp. Nitrogen gas was passed through the anaerobic reaction solution (pH 6.5) and air through the aerobic reaction solution (pH 5.5). Any volatiles formed were trapped in ice-cooled methanol. An aliquot was held as a dark control. Solutions were sampled at selected intervals up to 120 minutes.

The aliquots were acidified and extracted with dichloromethane. Aqueous polar products were separated by column chromatography and eluted with methanol. Analysis was by TLC, LCS and MS.

Results

No volatile components were produced during photolysis under both bubbling conditions. Most of the radioactivity was extracted with dichloromethane, but polar compounds increased with time. After 120 minutes, 19% of the initial radioactivity was counted in the aqueous fraction.

The half-lives of NP-55 were about 23 and 38 minutes under anaerobic and aerobic conditions, respectively. The principal photoproducts were M1-type compounds, the amine derivatives. The M1S metabolite accounted for 25-32% of the initial NP-55 after 90 minutes irridation.



M1S

After 120 minutes irridation, M1-type compounds accounted for 50- 64% of the initial radioactivity applied. The M2- and M4-type compounds were in smaller amounts. Unidentified compounds accounted for about 20% of the initial radioactivity after 120 minutes irridation. See Tab J-1 Tables 3 & 4.

3.2.2 Photodegradation of NP-55 by Sunlight. January, 1980. PP 0G2396. Tab J-3, Accession # 099539.

Experimental

Sufficient non-labeled NP-55 was added to distilled water to 5 ppm fortification. The solution was exposed to natural sunlight for 7 days. Aliquots were taken at selected intervals. The photolysis of NP-55 metabolites (MSO, MSO_2, M1S, M1SO, and $M1SO_2$) was similarly done.

The photolyzed solutions were acidified and extracted with dichloromethane. Analysis was by TLC and HPLC.

Table 3

Material Balance of Photolyzates of NP-5S and Its Related Compounds in Water Irradiated with Sunlight

Figures are % for the initial amount of the compound in molar basis

Compound Applied	Compound Found	Irradiation time (hours) 0	3	6	12	18	24	36
NP-5S	NP-5S	95.0	67.5	44.0	24.8	12.6	5.9	-
	M-SO	-*	-	-	-	-	0	0
	M-SO_2	0	0	0	0	-	-	0
	M1-S	0	5.3	8.7	13.1	15.3	14.9	11.7
	M1-SO	0	-	-	-	-	5.1	7.7
	M1-SO_2	0	0	0	0	0	0	0
	M1-O	0	-	5.4	10.9	12.2	14.2	13.1
	M2-S	-	-	-	-	-	-	-
	M2-SO	0	-	3.9	7.3	8.4	9.4	9.5
	M2-SO_2	0	0	0	0	0	0	0
	Total	95.0	72.8	62.0	56.1	48.5	49.5	42.0
M-SO	M-SO	108.6	94.2	73.6	46.7	29.6	23.5	13.1
	M-SO_2	0	0	0	0	0	0	0
	M1-SO	0	-	10.1	17.4	21.4	21.2	20.8
	M1-SO_2	0	0	0	0	0	0	0
	M2-SO	0	-	14.1	18.5	18.3	17.6	12.1
	M2-SO_2	0	0	0	0	0	0	0
	Total	108.6	94.2	97.8	82.6	61.3	62.3	46.0
M-SO_2	M-SO_2	98.7	83.6	62.9	42.4	33.3	24.0	17.7
	M1-SO_2	0	-	5.6	17.1	20.8	21.2	23.3
	M2-SO_2	0	-	10.6	14.6	18.3	20.1	21.7
	Total	98.7	83.6	79.1	74.1	72.4	65.3	62.7

* The amount was too small to be quantified

Table 4

Material Balance of Photolyzates of NP-5S Related Compounds in in Water Irradiated with Sunlight

Figures are % for the initial amount of the compound in molar basis

Compound Applied	Compound Found	Irradiation time (hours) 0	3	6	12	18	24	36	48	69
M1-S	M1-S	96.9		99.2	92.6		86.6	86.0	75.7	71.6
	M1-SO	0		0	-*		6.7	6.7	6.7	9.4
	M1-SO_2	0		0	0		0	0	0	0
	M1-O	0		0	-		-	-	-	-
	Total	96.9		99.2	92.6		93.3	92.7	82.4	81.0
M1-SO	M1-SO	100.0		98.0	95.7		95.2	87.9	87.0	86.1
	M1-SO_2	0		0	0		0	0	0	0
M1-SO_2	M1-SO_2	100.0		...	92.7		91.2	87.4	86.0	85.2
M2-S	M2-S	103.4	95.8	77.9	48.2	34.0	30.3			
	M2-SO	0	0	-	-	-	-			
	M2-SO_2	0	0	0	0	0	0			
Linuron	Linuron	100.0			96.2		97.0	94.8	93.1	87.6

* The amount was too small to be quantified

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Results

The M1-type compounds, including NP-55, were unstable and formed M1- and M2-type compounds. The M1 compounds were relatively stable to sunlight. The half-lives of each compound, calculated on a kinetic equation for a first order reaction, are as follows:

Compound	Half-Life (Hours)
NP-55	5.8
MSO	12.2
MSO_2	13.9
M1S	138.6
M1SO	208.2
$M1SO_2$	266.6
M2S	15.4

(For identify of photoproducts, see Tab J-3 Tables 3 & 4)

3.2.3 Investigation on the Photolytic Degradation of BAS 9052-H (NP-55) on Soil. August, 1981. PP# 2F2670, Table J-7, Accession #070822.

Experimental

Static test - A loamy sand from Germany (83% sand, 7% silt, 10% clay, 2.6% organic matter, pH 6.8, CEC = 10 m Val/100 g) was fortified with ^{14}C-BAS 9052 H to 10 ppm. Ten gram sub-samples were transferred to six open shallow metal bores each with an open surface area of 83 cm^2. The soil was then exposed to a xenon arc radiation lamp with IR and UV filters simulating the natural sunlight spectrum. Sample temperature was maintained at 35 $\pm$ 5°C. Sample boxes were removed after 1, 2, 4 and 6 hours of exposure.

Dynamic test - The soil was fortified with ^{14}C-BAS-905H to 10 ppm and transferred to a rotary evaporator apparatus. The soil, in an Erlenmeyer flask, revolved near the light source. Sample temperature did not rise above 40°C + 5°C during the test. Soil samples were removed at 1, 2, 4 and 8 hour.

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Table 3

Material Balance in Photolysis of MP-SS under Anaerobic Condition

Figures are % for the radioactivity applied.

Time (min.)	MP-SS	M-SO	M1-S	M1-O	M1-SO	M2-S	M2-SO	M4-S	Sum of identified compounds
0	95.1	1.8	0.7	0.0	0.0	0.6	0.0	0.0	98.2
15	50.0	7.8	14.9	6.1	1.8	3.1	0.5	1.3	93.5
30	38.6	9.8	24.4	12.3	3.1	2.5	1.1	0.7	92.5
45	28.3	7.7	26.8	14.4	10.4	5.0	2.0	1.3	87.9
60	16.4	5.9	27.7	16.0	11.9	4.7	2.1	1.3	86.9
90	8.9	3.9	28.2	19.0	13.3	4.8	1.9	1.1	81.1
120	5.8	2.3	31.4	16.8	16.2	2.8	1.6	1.3	78.2
120 (Dark control)	93.4	5.5	0.8	0.0	0.0	1.5	0.0	0.0	101.3

•) The presence of the SO_2 type compounds(M-SO_2, M1-SO_2, M2-SO_2) and M2-SO_2H(presumed) were observed, but the amounts were too small to be quantified.

Table 4

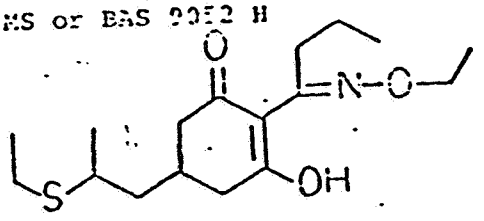
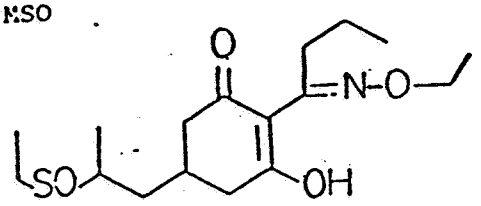
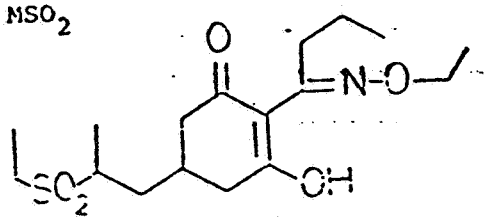
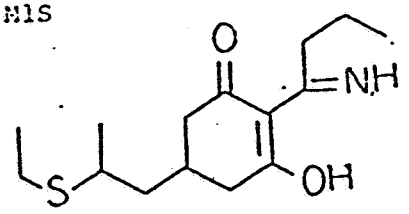
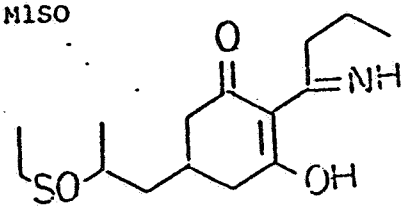
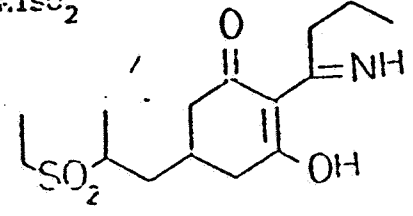
Material Balance in Photolysis of MP-SS under Aerobic Condition•

Figures are % for the radioactivity applied.

Time (min.)	MP-SS	M-SO	M1-S	M1-O	M1-SO	M2-S	M2-SO	M4-S	Sum of identifi compound
0	96.9	1.5	0.2	0.0	0.0	0.0	0.0	0.0	98.6
15	75.8	4.2	10.1	2.7	0.6	2.8	0.0	0.5	96.9
30	61.1	8.2	13.7	4.8	1.7	3.2	0.0	0.0	92.7
45	42.7	9.6	19.1	9.8	5.1	3.1	0.8	0.4	90.8
60	31.3	8.8	23.4	11.8	7.3	4.3	1.3	0.7	88.5
90	19.7	7.7	25.0	16.4	12.2	4.8	2.0	0.0	86.4
120	18.9	6.3	23.5	14.8	12.3	4.5	2.1	0.0	82.4
120 (Dark control)	94.6	1.2	1.3	0.0	0.0	0.9	0.0	0.0	98.0

•) See the footnote of Table 3.

LIST OF STRUCTURES AND NOMENCLATURE

ABBREVIATION AND STRUCTURAL FORMULA	MOLECULAR WEIGHT	CHEMICAL NAME
MS or BAS 9052 H 	327	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
MSO 	343	2-[1-(ethoxyimino)butyl]-5-[2-(ethylsulfinyl)propyl]-3-hydroxy-2-cyclohexen-1-one
MSO_2 	359	2-[1-(ethoxyimino)butyl]-5-[2-(ethylsulfonyl)propyl]-3-hydroxy-2-cyclohexen-1-one
M1S 	283	2-[1-(imino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
M1SO 	299	2-[1-(imino)butyl]-5-[2-(ethylsulfinyl)propyl]-3-hydroxy-2-cyclohexen-1-one
$M1SO_2$ 	315	2-[1-(imino)butyl]-5-[2-(ethylsulfonyl)propyl]-3-2-cyclohexen-1-one

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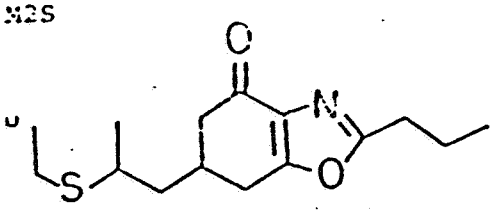
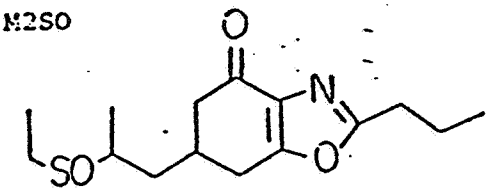
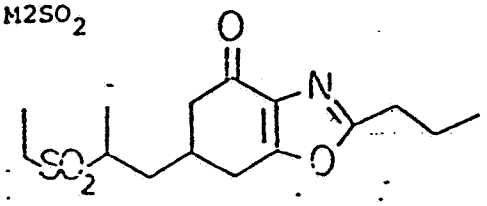
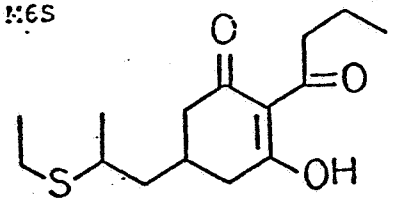
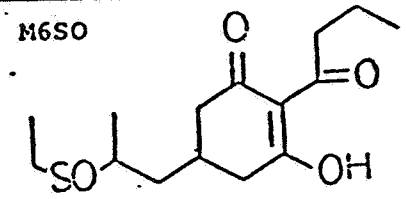
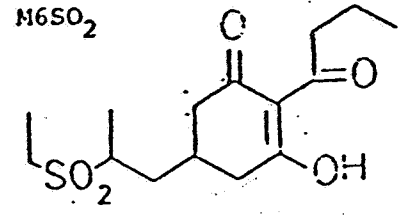
LIST OF STRUCTURES AND NOMENCLATURE

ABBREVIATION AND STRUCTURAL FORMULA	MOLECULAR WEIGHT	CHEMICAL NAME
M2S 	281	6-[2-(ethylthio)propyl]-6,7-dihydro-2-propyl-4(5H)-benzoxazolone
M2SO 	297	6-[2-(ethylsulfinyl)propyl]-6,7-dihydro-2-propyl-4(5H)-benzoxazolone
$M2SO_2$ 	313	6-[2-(ethylsulfonyl)propyl]-6,7-dihydro-2-propyl-4(5H)-benzoxazolone
M6S 	284	2-(1-oxobutyl)-5-[2-(ethylthio)-propyl]-3-hydroxy-2-cyclohexen-1-one
M6SO 	300	2-(1-oxobutyl)-5-[2-(ethylsufinyl)-propyl]-3-hydroxy-2-cyclohexen-1-one
$M6SO_2$ 	316	2-(1-oxobutyl)-5-[2-(ethylsulfonyl)-propyl]-3-hydroxy-2-cyclohexen-1-one

Analysis involved methanol and methylene chloride extraction. Extracts were further analyzed by TLC, HPLC and GC-MS. The extracted soil was combusted and $^{14}CO_2$ determined LSC.

Results

The soil photolysis study determined that the half-life of the herbicide in a loamy sand to be 36-37 hours. After 6 hours, 44.6% of the extracted radioactivity, was BAS 9052 H in the static test. After 8 hours, 20.6% of the extracted radioactivity was parent compound.

The predominant degradation product was MSO (see appendix for structures) along with small amounts of M1SO. After half-life, trace amounts of M1S, M25 and M2SO were found (see Tab J-7, Tables 3, & 4).

Conclusions

BAS-9052 H will photodegrade in water and on soil surfaces with a half-life of approximately 30 minutes and 3-1/2 hours, respectively.

3.3 Degradation of BAS 9052 H (NP-55) in a Loamy Soil Under Aerobic, Anaerobic and Sterile/Aerobic Conditions. September 1981. PP# 2F2670, Table J-8, Accession # 070822.

Experimental

A loamy sand soil from Germany (83% sand, 7% silt, 10% clay, 2.6% organic matter, pH 6.8, CEC = 10 meq/100g) was fortified with 6 mg ^{14}C-BAS 9052 H/kg moist soil and placed in flasks.

Aerobic incubation: flasks were covered with cotton plugs and incubated at 22°C ± 1°C.

Anaerobic incubation: Anaerobic conditions were established at the beginning of the study rather than aging for 30 days. Flasks were flushed with nitrogen and soil covered with 50 ml water.

Sterile/aerobic incubation: Soil sterilized 3X for 1 hour at 120°C. After cooling, soil was fortified with ^{14}C-BAS 9052 H. Flasks were closed with sterile, cotton plugs and incubated at 22 ± 1°C.

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Tab J-3 Table 3: MCA-results, static system

(balance of radioactivity peaks on TLC 2)

Irrad. time (hours)	CH_2Cl_2-extract mg/kg	Rf = M1SO		Rf = MSO		Rf = M1S		Rf = BAS 9052 H/NP 55	
		%	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg
0	9.90	-	-	6.4	0.63	-	-	93.7	9.28
4 (dark)	9.95	-	-	8.9	0.89	-	-	91.0	9.05
1	9.71	3.8	0.37	27.1	2.63	-	-	69.1	6.71
2	9.20	4.3	0.39	34.1	3.14	-	-	61.7	5.68
4	8.24	5.9	0.49	39.3	3.24	-	-	49.4	4.07
6	7.83	6.4	0.50	39.3	3.08	7.7	0.60	44.6	3.49

% values are calculated relativ to the amount of mg/kg in the respective CH_2Cl_2-extracts

Table 4: MCA-results, dynamic system

(balance of radioactivity peaks on TLC 4 and 6)

Irrad. time (hours)	CH_2Cl_2-extract mg/kg	Rf = M1SO		Rf = MSO		Rf = BAS 9052 H/NP 55	
		%	mg/kg	%	mg/kg	%	mg/kg
0	9.24	-	-	6.5	0.60	92.1	8.51
4 (dark)	9.03	-	-	7.8	0.70	91.3	8.24
1	8.77	0.4	0.04	18.7	1.64	78.7	6.90
2	8.33	2.6	0.22	28.0	2.33	66.4	5.53
4	7.91	6.6	0.52	38.1	3.01	51.0	4.03
8	6.45	17.0	1.10	48.5	3.13	20.6	1.33

% values are calculated relativ to the amount of mg/kg in the respective CH_2Cl_2-extracts

Soil was sampled at 0, 3, 7, 14, 30 and 64 days.

Extraction of soil involved methanol and methylene chloride. Standard combustion and LSC counting procedures were used in addition to TLC, HPLC and GC/MS.

Results

In all three situations; aerobic, anaerobic, sterile/aerobic, extractable residues decreased with time while soil bound residues increased with time. Transfer was approximately the same in all cases. Overall loss of radioactivity in the aerobic soil with time suggests mineralization of residues occurred.

^{14}C Recovery - Percent of Starting Concentration

	Day	Methanol Extractable Residues	Soil Residues	Total Recovery
Aerobic	Day 0	94.6	5.2	99.8
	Day 64	15.3	29.0	44.3
Anaerobic	Day 0	95.6	4.4	100.0
	Day 64	68.6	21.3	89.9
Sterile/ Aerobic	Day 0	92.8	4.	97.2
	Day 64	75.9	22.7	98.6

EFB notes that in the report when methanol extractable residues were partitioned with dichloromethane/water the total recovery (reported as $_3$ in Table 2) for days 7, 14, 30 were off 12-20% than $_1$ totals reported.

Concentration of parent BAS 9052 H (NP-55) decreased with time in all three cases. Greatest decrease was in the aerobic soil (and least amount of metabolites present). Greatest metabolite concentration occurred in sterile/aerobic soil. This suggests that mineralization of BAS 9052 H occurs through formation of these metabolites.

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^{14}C Recovery - Percent of Starting Concentration

Date	Parent Total	Total	Metabolite Distribution						
			MSO	MSO_2	$M2SO_2$	M2SO	M1SO	M2S	M1S
Aerobic									
Day 0	63.6	24.1	14.8	5.4	2.2	1.7	-	-	-
Day 64	0.5	5.6	1.5	1.9	2.2	-	-	-	-
Anarobic									
Day 0	70.3	14.0	12.3	1.7	<1	-	-	-	-
Day 64	32.7	39.0	10.6	1.2	-	1.3	5.4	4.7	15.8
Sterile/Aerobic									
Day 0	83.6	6.1	5.1	1.0	<1	-	-	-	-
Day 64	14.1	56.4	15.6	-	-	30.4	-	10.4	-

Parent BAS 9052 H had a half-life of less than 3 days under aerobic conditions and of 20 to 50 days under anaerobic conditions (See Tab J-7 Figures 1, 2, & 3).

Conclusion

BAS 9052 H degrades in loamy sand soil under aerobic, sterile/aerobic and anaerobic conditions. Loss of radioactivity suggests that microbial activity is primarily responsible for its disappearance under both aerobic and anaerobic conditions. While MSO was the primary metabolite occurring in all 3 situations, its formation was slowed under sterile/aerobic conditions.

3.4 Investigations Into the Aerobic Soil Metabolism of BAS 9052 H/NP-55, R. Huber, BASF Wyandotte Corp., Lab Report # 1692, Table # J-5, Accession # 099539.

This study was reviewed November 24, 1980. Conclusions: BAS 9052 H degrades fairly rapidly in soil. Half-life in loamy sand was determined to be 4-5 days and in loam about 11 days. In loamy sand, total radioactive residues decreased to 54% of applied after 3 months. The loss was mainly due to mineralization to $^{14}CO_2$ (36% of applied after 45 days). In loam soil, aerobic metabolism was slower.

Figure

Aerobic Conditions

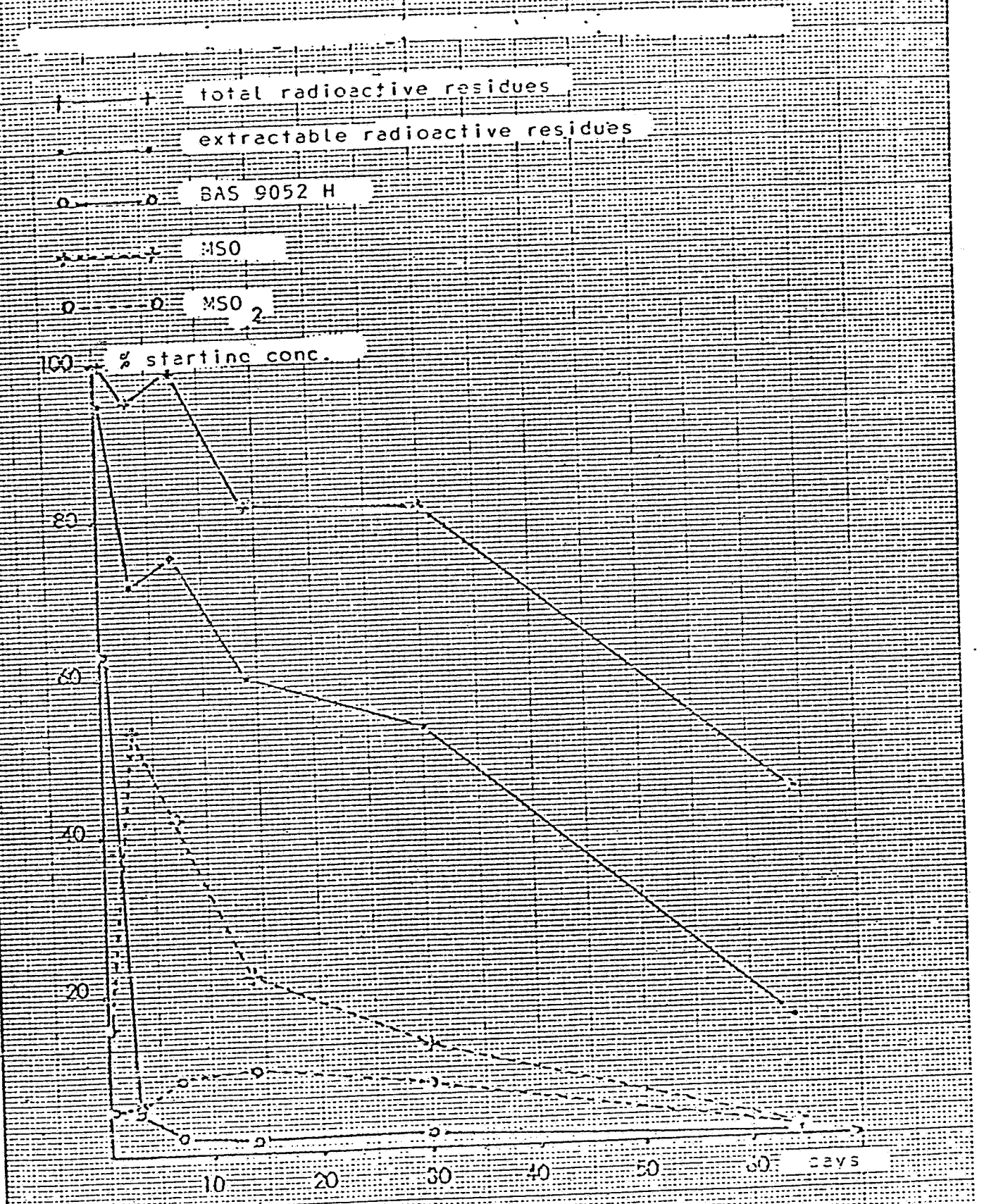
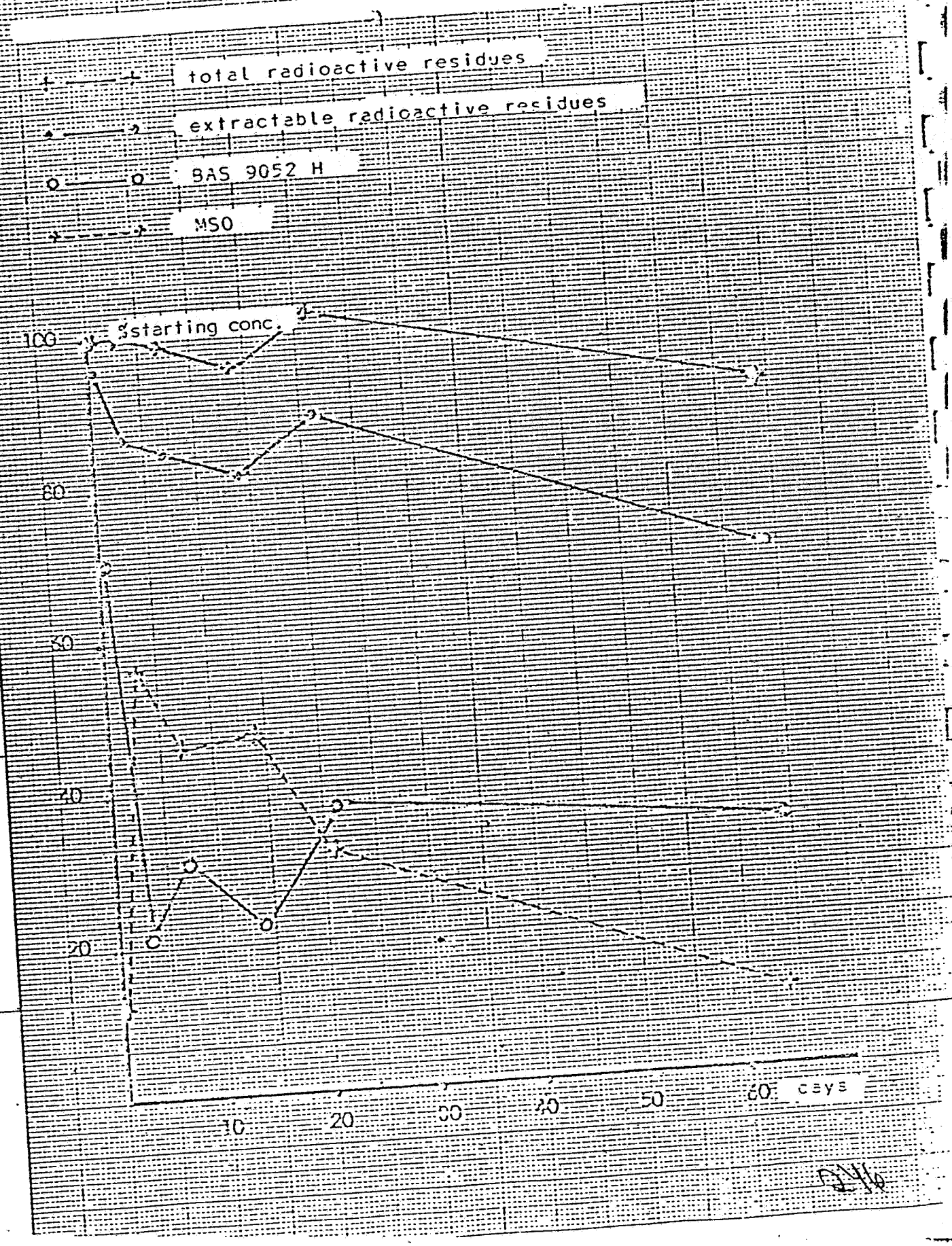


Figure 2

Anaerobic Conditions



Steril-aerobic Conditions

o——o total radioactive residues

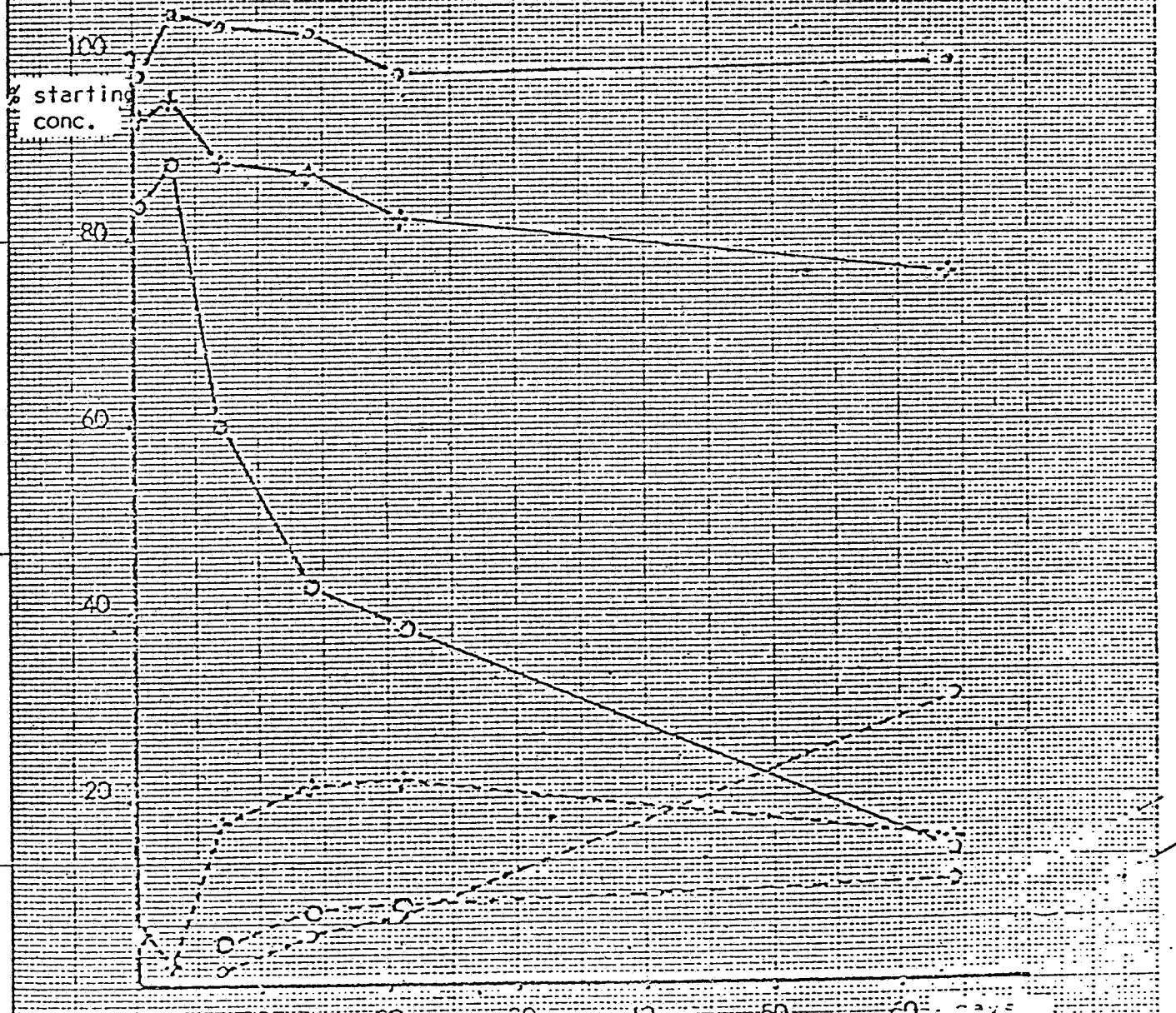
+——+ extractable radioactive residues

o——o BAS 9052 H

+- - - -+ M5O

o- - - -o M2SO

o- - - -o M2S



947

In both soils MSO was the major metabolite formed. The leaching experiment (aged leaching in loamy sand) showed that some 38% of the applied 14_C was found in the leachate. 42.9% had leached down into the column.

3.5 Soil Dissipation and Leaching of Poast Under Field Conditions. April 1982, Report J-10, PP# 2F2670, Accession No. 070822.

Experimental

Field leaching-dissipation studies were conducted in four states:

Location	Soil Type	Soil pH	% Organic Matter
Hollandale, MN	sandy loam	7.9	6.2
Creneseo, IL	silty clay loam	5.6	3.0
Greenville, MS	silt	6.8	2.0
Dinuba, CA	sandy loam	6.9	0.8

Soil treatments were 0.5, 0.75 or 1.0 lb. a.i./A or split application of 1.5 lb. a.i./A (second application 14 to 25 days after first). Soil samples were taken at time intevals ranging from 0 to 29 days and up to 554 days after first of split applications. Sample were taken at 0-4, 4-8, and 8-12 inch depths.

Analytical

Soil was extracted with 0.1 N NaOH and methanol (2:1). Filtrate was acidified and residues partitioned into dichloromethane. Residues of BAS 9052 H and its metabolites were converted to the common moiety 3-[2-ethyl sulfonyl)-propyl]-pentenedioic acid, then converted to the dimethyl ester. Analysis was by gas chromatography equipped with a flame photometric detector in the sulfur-specific mode. The method is sensitive to 0.05 ppm BAS 9052 H equivalents in soil. Average recovery was 86 $\pm$ 14% (range 63 to 98%) for BAS 9052 H and metabolites. The following tables give results of analyses.

Results

Location: Hollandale, MN

Treatment (lb. a.i./A)	Days After Application		Soil Depths (inches) 0-4	4-8	8-12
0.5	0	ppm BAS 9052 H	0.43	0.15	0.25
	1	equivalents	0.22	<0.05	<0.05
	3	"	0.12	<0.05	<0.05
	7	"	0.05	<0.05	<0.05
	14	"	0.12	<0.05	<0.05
	28	"	0.07	<0.05	<0.05
	92, 310, 366	"	<0.05	<0.05	<0.05
0.75	0	ppm BAS 9052 H	0.18	<0.05	0.07
	1	equivalents	0.09	<0.05	<0.05
	3	"	0.09	<0.05	<0.05
	7	"	0.05	<0.05	<0.05
	14	"	<0.05	<0.05	<0.05
0.75	0	ppm BAS 9052 H	0.42	0.09	0.10
	1	"	0.25	<0.05	<0.05
	3	"	0.25	<0.05	<0.05
	7	"	0.10	<0.05	<0.05
	14	"	0.11	<0.05	<0.05
	28	"	0.14	<0.05	<0.05
	92	"	0.07	<0.05	<0.05
	310	"	0.05	<0.05	<0.05
	366	"	0.05	<0.05	<0.05
0.75.+ 0.75	(14)* 0**	ppm BAS 9052 H	0.45	<0.05	<0.05
	(15) 1	"	0.34	<0.05	0.05
	(17) 3	"	0.28	<0.05	0.06
	(21) 7	"	0.25	<0.05	<0.05
	(28) 14	"	0.22	<0.05	<0.05
	(44) 30	"	0.19	<0.05	<0.05
	(104) 90	"	0.11	<0.05	<0.05
	(310)296	"	0.08	<0.05	<0.05
	(366)352	"	0.05	<0.05	<0.05

* Day after first treatment.
** Day after second treatment.

Location: Genesco, TN

Treatment (lb. a.i./A)	Days After Application		Soil Depths (inches) 0-4	4-8	8-12
0.75	0	ppm BAS 9052H	0.18	<0.05	0.07
	1	equivalents	0.09	<0.05	<0.05
	3	"	0.09	<0.05	<0.05
	7	"	0.05	<0.05	<0.05
	14	"	<0.05	<0.05	<0.05
	15	"	<0.05	<0.05	<0.05
0.75 + 0.75	(15) 0	ppm BAS 9052H	0.08	0.05	<0.05
	(16) 1	equivalents	0.07	<0.05	<0.05
	(18) 3	"	0.14	<0.05	<0.05
	(22) 7	"	0.06	0.06	<0.05
	(29) 14	"	0.08	<0.05	<0.05
	(45) 30	"	<0.05	<0.05	NA*
	(106) 91	"	<0.05	<0.05	NA
	(142)127	"	<0.05	<0.05	NA
1.0	0	ppm BAS 9052H	0.09	<0.05	0.05
	1	equivalents	<0.05	<0.05	<0.05
	3	"	<0.05	<0.05	<0.05
	7	"	<0.05	<0.05	<0.05
	14	"	0.05	<0.05	<0.05
	30	"	<0.05	<0.05	NA

* NA - Not analyzed.

Location: Greenville, MS

Treatment (lb. a.i./A)	Days After Treatment		Soil Depths (inches) 0-4	4-8	8-12
0.75	0	ppm BAS 9052 H	0.17	<0.05	<0.05
	1	equivalents	0.25	0.05	<0.05
	3	"	0.28	<0.05	<0.05
	7	"	0.17	<0.05	<0.05
	14	"	0.12	<0.05	<0.05
	24	"	0.09	<0.05	NA
0.75 + 0.75	(24) 0	ppm BAS 9052 H	0.38	<0.05	<0.05
	(25) 1	equivalents	0.35	<0.05	<0.05
	(28) 4	"	0.18	<0.05	<0.05
	(31) 7	"	0.15	<0.05	<0.05
	(39) 15	"	0.13	<0.05	<0.05
	(56) 32	"	0.09	<0.05	NA
	(93) 69	"	<0.05	<0.05	NA
	(115) 91	"	<0.05	<0.05	NA
1.0	0	ppm BAS 9052H	0.25	0.09	<0.05
	1	equivalents	0.31	0.06	<0.05
	3	"	0.52	<0.05	<0.05
	7	"	0.29	<0.05	<0.05
	14	"	0.19	<0.05	<0.05
	31	"	0.16	<0.05	NA
	93	"	0.06	<0.05	NA
	183	"	<0.05	<0.05	NA

Location: Dinuba, CA

Treatment (lb. a.i./A)	Days After Application		Soil Depths (inches) 0-4	4-8
0.5	0	ppm BAS 9052H	0.06	NA
	1	equivalents	<0.05	NA
	3	"	0.06	NA
	7	"	0.09	NA
	14	"	<0.05	NA
	29	"	<0.05	<0.05
0.75	0	ppm BAS 9052H	0.07	NA
	1	"	0.07	NA
	3	"	0.10	NA
	7	"	0.09	NA
	14	"	<0.05	NA
	29	"	<0.05	<0.05
0.75 + 0.75	(14) 0	ppm BAS 9052H	0.07	NA
	(15) 1	equivalent	0.20	NA
	(17) 3	"	0.21	NA
	(21) 7	"	0.17	<0.05
	(28) 14	"	0.14	<0.05
	(46) 32	"	0.11	<0.05
	(104) 90	"	0.10	<0.05
	(195) 181	"	0.12	<0.05
	(375) 361	"	<0.05	<0.05
	(554) 540	"	<0.05	<0.05

Conclusions

In the field leaching/dissipation study, BAS 9052H (1) did not leach beyond the first 4 inches of soil; and (2) did not persist in the soil. EFB concludes this study adequately demonstrates that BAS 9052H will not persist in the soil.

No data on application, sampling methodology, or techniques nor monthly rainfall or irrigation records were provided.

3.6 Uptake of ^{14}C-BAS 9052 H (NP-55). Residues by Rotational Crops Under Field Conditions. August 1981.

This study was reviewed February 18, 1982. E. Regelman. Conclusions:

- The planting of rotational crops in soil 30 days or more post-treatment with BAS 9052 H does not result in the accumulation of residues. Measured residues were all at or below 0.06 ppm in all vegetative samples. (based on total ^{14}C activity)

- The soil residues rapidly declined.

Based on results of this study, the 1 year crop rotation restriction was waived by EFB.

3.7 BASF Wyandotte Corporation ^{14}C-BAS 9052 Bluegill Sunfish, Lepomis macrochirus Rafinesque, Bioconcentration Study. January 22, 1981. Report I-8 PP# 2F2670, Accession No. 070822.

Experimental

Test vessels were of all glass and silicone sealant construction. Constant water volume was maintained at 88 liters. Test fish had mean length of 40 ± 4 mm and mean weight of 0.79 ± 0.21 gm. Water used for exposure and depuration periods was aerated well water (pH 7.7-8.1; 8.5 mg/l O_2 concentration; total hardness of 283 mg/l as $CaCO_3$). Temperature was maintained at a mean of 22.4°C (range 17.0-24.8°C). The test consisted of a 24-hour equilibrium period, a 30-day uptake/exposure and a 14-day depuration period. After exposure period, bluegills were transferred to an identical vessel containing BAS-9052-free water (pH 7.98-8.12, 9.0 mg/l O_2 concentration, total hardness 248 mg/l as $CaCO_3$). Photoperiod throughout study was 16 hours light, 8 hours dark. Water was delivered to both control and test vessels at the rate of 1.5 liters every 6 minutes. Turnover at this rate, during uptake and depuration, was 4.1 volumes per day. During equilibrium and exposure periods sufficient ^{14}C-BAS-9052 was metered into the tanks to maintain a nominal concentration of 2.65 ppm.

Water samples were analyzed for radioactivity directly by LSC. In whole fish, viscera and muscle tissue, all analyses were for total radioactivity by combustion and resulting $^{14}CO_2$ collected. The estimated sensitivity of detection with a 1 gm tissue sample was 0.54 ppm. The minimum detectable concentration in water, with a 9 ml sample, was 0.06 ppm.

Results

Water: During exposure, mean measured concentration of ^{14}C-BAS-9052 in water was 2.78 ± 0.3 ppm.

Fish: The mean measured ^{14}C residue concentration present in fish during exposure phase are given below with bioconcentration factors (BCF):

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$$BCF = \frac{\text{Concentration of } ^{14}C \text{ in fish tissue}}{\text{Concentration of } ^{14}C \text{ in water}}$$

Whole fish: The mean measured ^{14}C residue concentration present in whole fish during exposure was 4.49 ppm (BCF = 1.53) at day 1; increased to 16.6 ppm (BCF = 6.98) at day 14, then declined to 11.4 ppm (BCF = 4.29) by day 30.

RESIDUE ACCUMULATION IN BLUEGILL SUNFISH

Day Exposure	Mean ^{14}C Concentrations				Bioconcentration Factor		
			Tissue		Whole	Tissue	
	Water	Whole Fish	Edible	Non-Edible	Fish	Edible	Non-Edible
1	2.94	4.49	2.39	4.84	1.53	0.812	1.64
3	2.56	11.1	4.24	9.94	4.33	1.66	3.89
7	2.53	11.2	5.69	13.8	4.44	2.25	5.45
10	2.86	14.2	6.07	14.3	4.96	2.12	5.01
14	2.37	16.2	6.82	18.2	6.98	2.87	7.66
22	3.05	13.9	5.23	12	4.55	1.72	3.95
30	2.67	11.4	5.79	12.7	4.29	2.17	4.75
(31)* 1		5.79	2.86	6.28			
( ) 4		3.20	0.898	2.62			
(37) 7		0.885	0.563	0.959			
(41) 11		0.633	0.434	0.626			
(44) 14		0.54	0.487	0.558			

* Depuration

BASF Wyandotte Corporation
^{14}C-BAS 9052 Bluegill Sunfish Bioconcentration Study

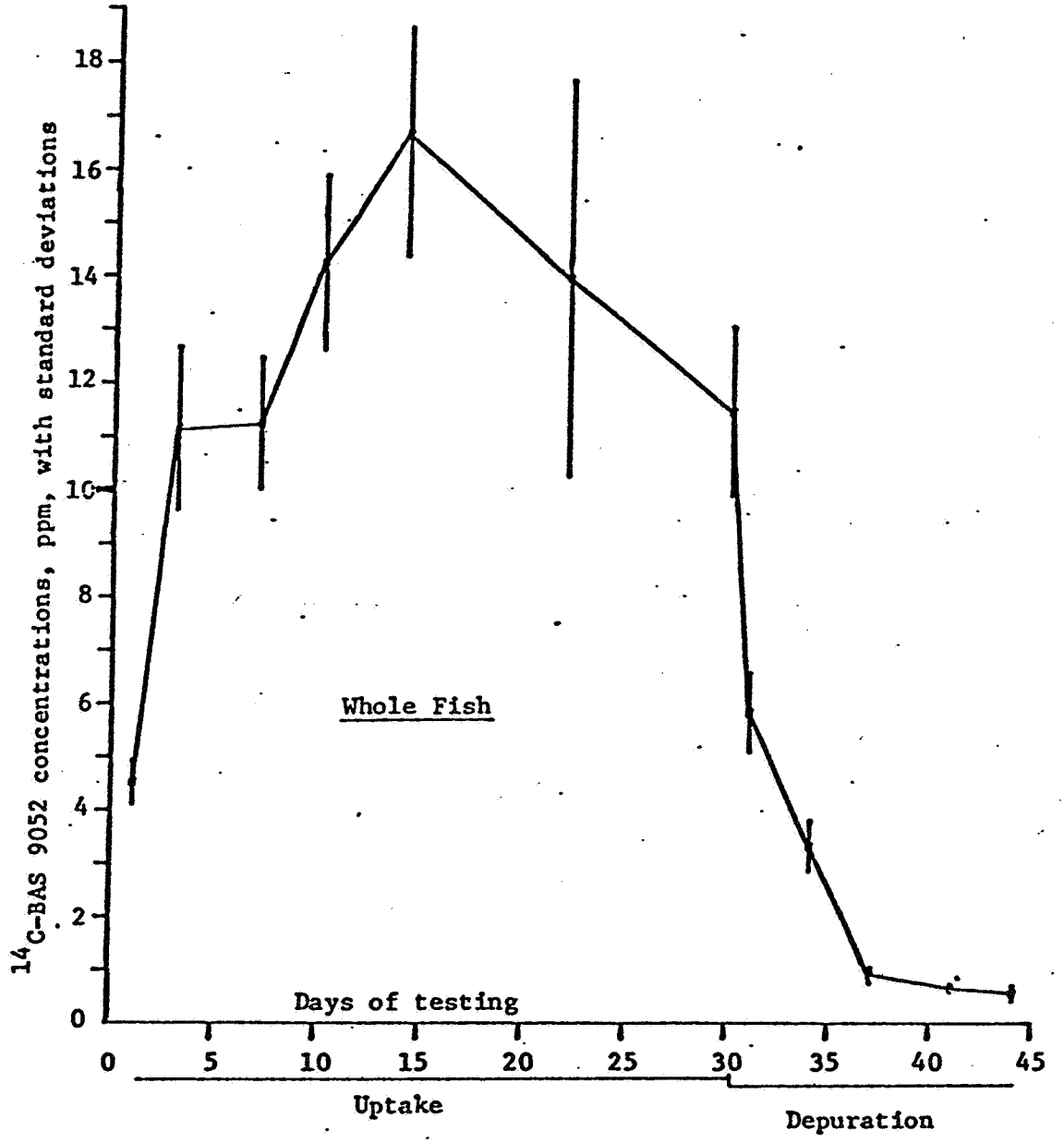

Fig. 3. Mean ^{14}C concentrations in whole fish (data values from Table 4).

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BASF Wyandotte Corporation
^{14}C-BAS 9052 Bluegill Sunfish Bioconcentration Study

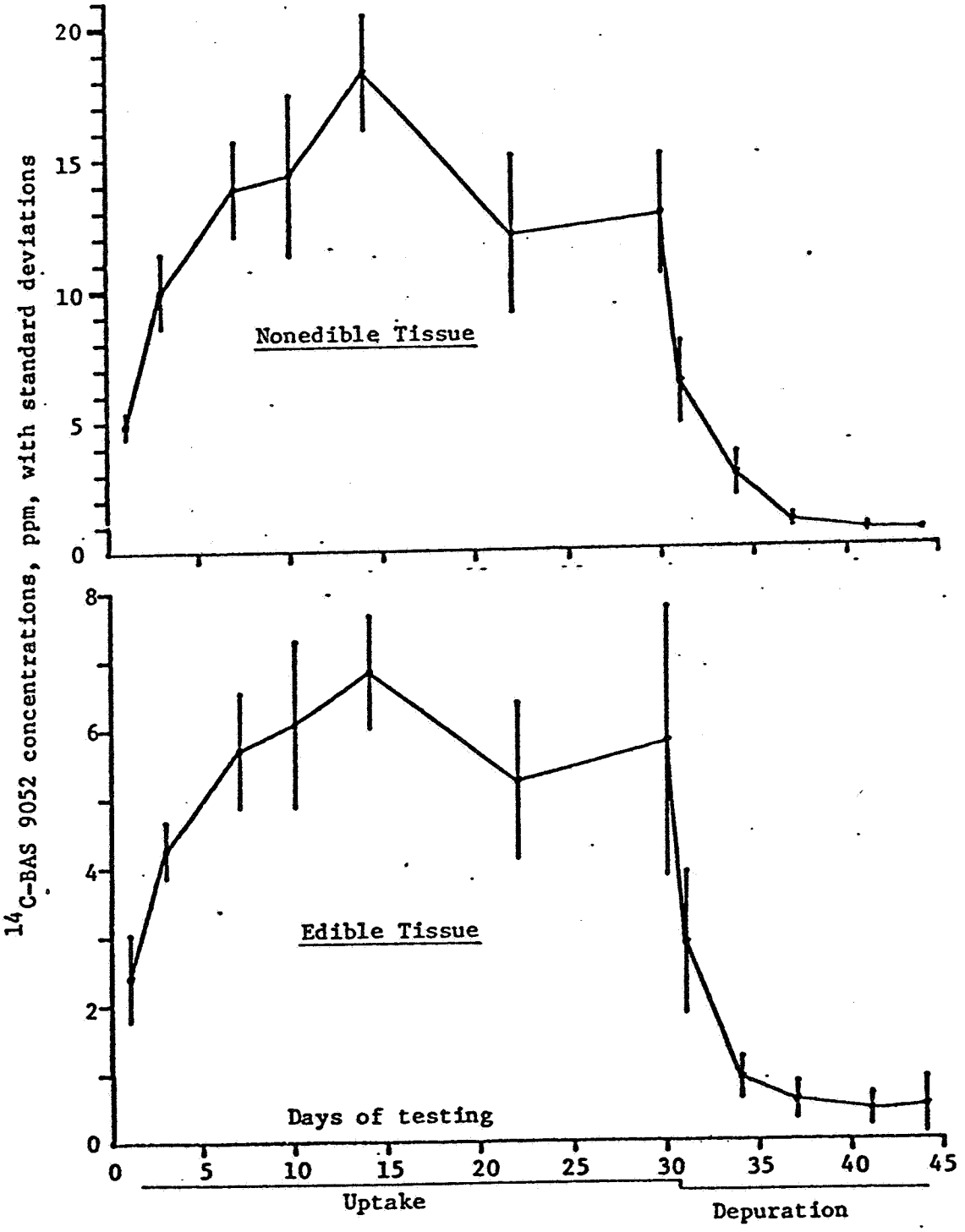

Fig. 4. Mean ^{14}C concentrations in edible and nonedible tissues (data values from Table 4).

256

Edible tissue: The mean measured concentration was 2.39 ppm (BCF = 0.812) at day 1; increased to 6.82 ppm (BCF = 2.87) by day 14, and maintained this level to day 30 (5.79 ppm, BCF = 2.17).

Non-edible tissue: The mean measured concentration was 4.84 ppm (BCF = 1.64) at day 1; increased to 18.2 ppm (BCF = 7.66) by day 14, and declined to 12.7 ppm (BCF = 4.75) by day 30.

Depuration: The level of ^{14}C in whole fish, edible and non-edible, fell during the depuration period. After 14 days depuration, the ^{14}C concentration in whole fish was 3.3% of the maximum during uptake; in edible tissue, 7.1%; and in non-edible, 3.1%.

Conclusions

Bluegill sunfish did not accumulate residues of BAS 9052 H. When exposed to BAS 9052 H residues in water,maximum acumulation in whole fish was about 7X the water concentration. After 14 days depuration, residue levels fell over 90% of the maximum accumulated.

No data on the identification of ^{14}C residues in water, whole fish or fish tissue were submitted. Most likely, however, residues were parent and the M2S metabolite since BAS 9052 H is fairly stable to hydrolysis under environmental conditions ($T_{1/2}$ 47 days at pH 6, 25°C). M2S is the major hydrolysis product.

3.8 BASF Wyandotte Corporation ^{14}C-BAS 9052 Channel Catfish, Ictalurus punctatus (Rafinesque), Bioconcentration Study. January 29, 1981. Report I-9, PP# 2F2670, Accession No. 070822.

Experimental

A sandy loam soil (pH 7.0) was treated at a rate of 0.5 lb. a.i./A ^{14}C-BAS-9052 (equivalent to water concentration of 0.084 ppm) and aged aerobically for 14 days. It was then flooded with well water and aged an additional 30 days, after which time the catfish were added.

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The aging and uptake phases of the study were conducted in an air-temperature controlled environment maintained at 25-30°C. Mean water temperature in test material tank during uptake was 25.6°C (range 24-27°C). Depuration water had pH 7.69-7.97, total hardness 278 mg/l as $CaCO_3$, 8.6 mg/l O_2 concentration, mean temperature of 25°C. Test period was 34 day exposure followed by by a 14-day depuration phase. Photoperiod throughout study was 16 hours light, 8 hours dark. Test fish had a mean weight at 6.5 $\pm$ 1.6 gm.

In water samples, radioactivity was determined by LSC directly. Tissue samples were oxidized by combustion and resulting $^{14}CO_2$ collected. Individual whole fish and non-edible tissue of individual fish were blended to obtain a sample that weighed less than one gram. Edible tissues were cut into portions of less than one gram.

Results

Water-soil: During water-soil aging, ^{14}C leached steadily into water to a maximum on day 30 of 0.086 ppm. This level remained fairly consistent during the 34-day exposure period.

Fish: The mean measured ^{14}C residue concentration present in fish during exposure phase are given with the bioaccumulation factors (BCF).

$$BCF = \frac{\text{Concentration of } ^{14}C \text{ in fish tissue}}{\text{Concentration of } ^{14}C \text{ in water}}$$

Whole fish: The mean measured ^{14}C residue concentration present in whole fish during exposure was 0.0419 ppm. Uptake levels increased from day 1 to day 7. Between days 14 and 34, whole fish tissue levels remained fairly constant. The mean BCF during exposure was 0.491.

Edible tissues: The mean measured concentration was 0.0275 ppm, giving a mean BCF of 0.584 during the exposure period.

Non-edible tissue: The mean measured concentration was 0.499 ppm, giving a mean BCF of 0.584 during the exposure period.

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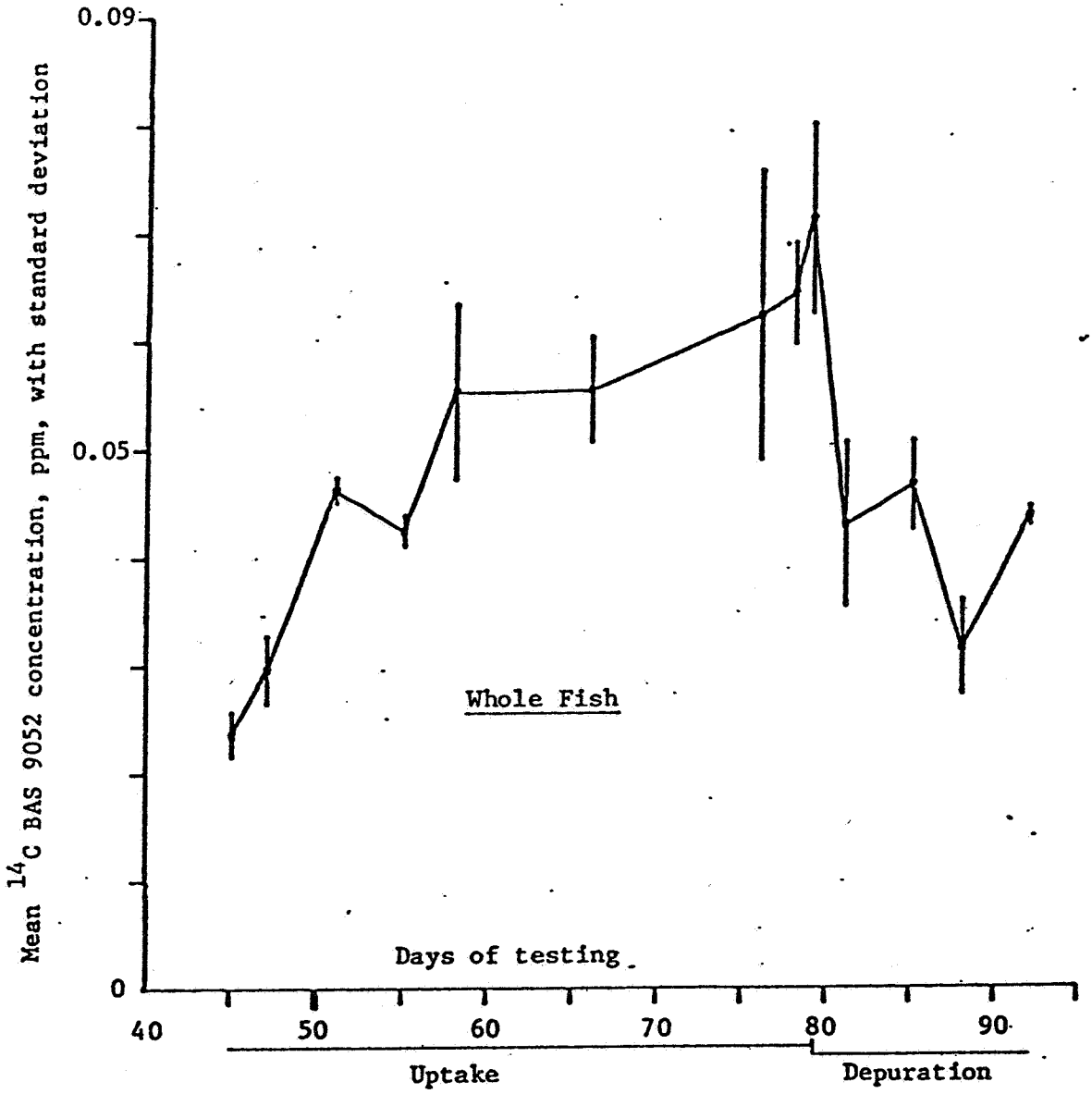

Fig. 2. Mean whole fish ^{14}C tissue residue values. Data values from Table 4.

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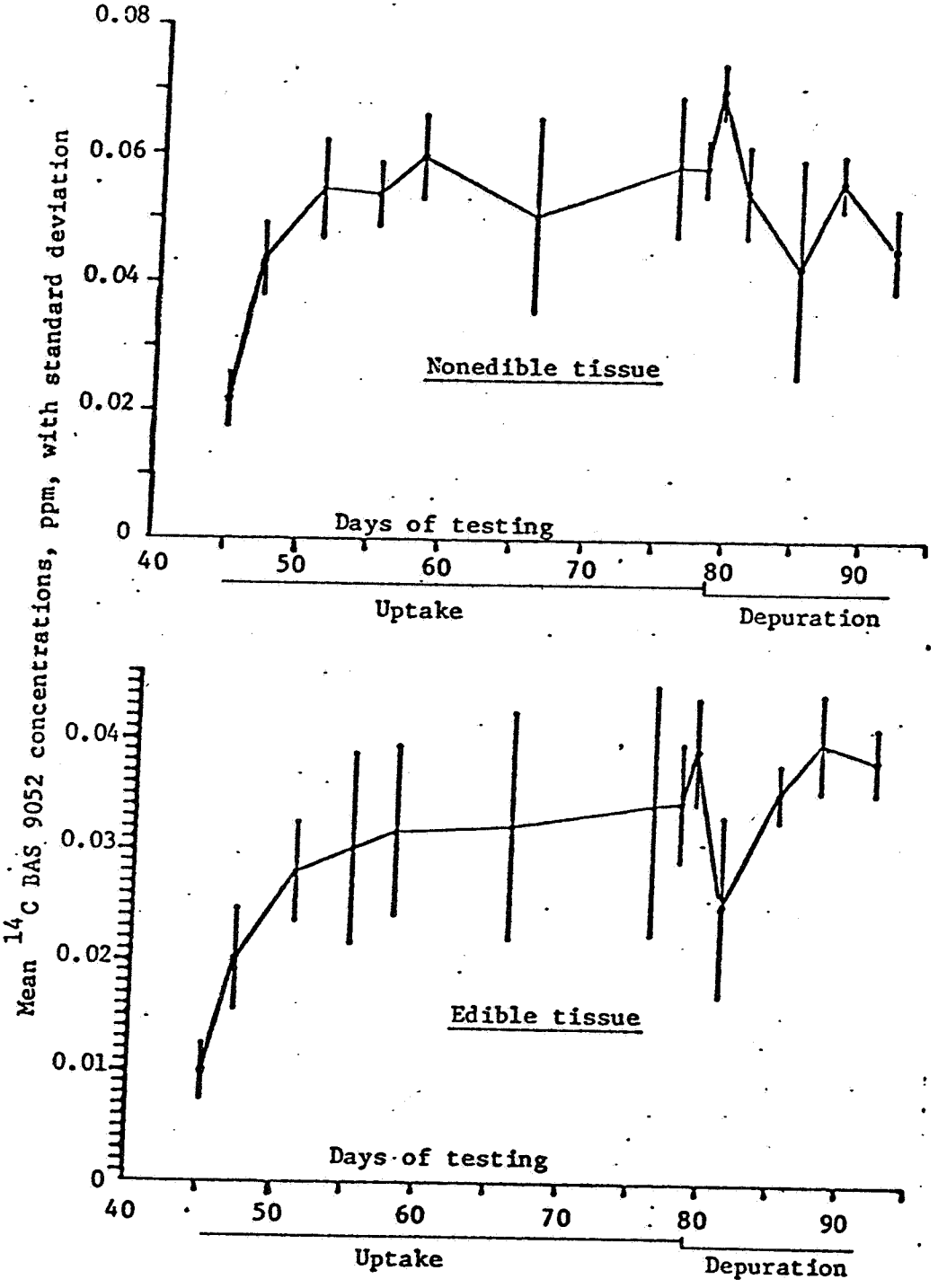

Fig. 3. Mean ^{14}C edible and non-edible tissue residue values. Data values from Table 5.

The level of ^{14}C residues in whole fish and non-edible tissue dissipated slowly during the depuration phase. After 14 days depuration, the ^{14}C residues in whole fish and non-edible tissue were 68% and 76%, respectively, of the maximum reached during uptake. There was no appreciable change in levels of residues in edible tissue during depuration.

Conclusions

Accumulation levels of BAS 9052 in catfish are not expected to exceed 1X.

No data on the identification of residues in soil, water or fish were submitted. Most likely residues present were parent and the M2S metabolite since BAS 9052H is fairly stable to hydrolysis under environmental conditions (Half-life = 47 days at pH 6, 25°C), and M2S is major hydrolysis metabolite.

3.9 Adsorption behavior of Active Ingredients of Plant Protection Products in the System Soil/Water. September, 1981. Report J-9, PP# 2F2670, Accession No. 070822.

Experimental

Standard German soils #2.1, #2.2, #3 and Pfungstadt were air-dried and sieved to less than 1 mm particle size.

Physical Properties of Soils

Soil	% Organic Matter	pH	% Particles <0.02 mm	CEC (mVal
2.1	0.69	7.0	10.7	5.0
2.2	2.44	6.0	14.9	10.0
2.3	0.91	7.3	23.2	9.0
Pfungstadt	0.58	7.3	40.0	13.0

Soil (25 g) was mixed with 100 ml of 0.01 N $CaSO_4$ and 10 ug, 100 ug, and 1000 ug of BAS 9052H. The samples were taken 24 hours at 22°C temperature until equilibrium was reached.

Analytical

After rearrangement of the active ingredient to form M2S and extraction with dichloromethane, the sample extract was analyzed by GC.

Results

Soil	Active ingredient concentration: Starting concentration in water µg/ml	Adsorbed in soil C_B µg/g	Remained in water C_W µg/ml	Adsorption coefficient K_A	Adsorption exponent $\frac{1}{n}$
2.1	10	0.052	0.087	0.3039	0.7869
	100	0.212	0.947		
	1 000	2.095	9.476		
2.2	10	0.240	0.040	0.7420	0.3915
	100	0.520	0.870		
	1 000	2.120	9.470		
2.3	10	0.180	0.055	0.5205	0.4664
	100	0.264	0.934		
	1 000	2.120	9.470		
Pfungstadt	10	0.156	0.061	0.3408	0.3511
	100	0.216	0.946		
	1 000	0.960	9.760		

Conclusions

1. BAS 9052 H has a low soil adsorption coefficient (mean = 0.4768, range 0.3039-0.7420). Therefore, it would have potential leaching.

   Several significant deficiencies make this study unacceptable as is. No information was submitted indicating equilibrium was reached in 24 hours. Data on the analytical methodology is limited in the study (e.g., no recovery data, sample chromatograms). The concentration of the solutions, 10, 100, 1000 ug/ml or ug/vessel should be clarified (paragraphs 3. and 6. in the report).

   However, the study confirms the results of the laboratory leaching study, which also shows a leaching potential.

3.10 Octanol/Water Partition Coefficient of NP-55 Related Compounds. July 31, 1981. Tab J-11, PP# 2F2670, Accession # 070822.

This study is now considered ancillary data and will not be reviewed in depth:

Results

Using ultra-violet (UV) spectra calibration, the partition coefficients of NP-55 related compounds were:

Compound	Partition Coefficient
MSO	1.6-6.9
MSO_2	1.6-9.7
$M2SO_2$	2.6-3.0
5-OH MSO_2	0.9-3.7
6-OH $M2SO_2$	

4.0 EXECUTIVE SUMMARY

Poast (BAS 9052 H) is fairly stable to hydrolysis with a half-life of about 47 days under environmental-like conditions of pH 6 and 25°C. At pH6 and pH9, half-lives were 47 and 767 days, respectively. The major hydrolysis metabolic is M2S, an oxazole derivative. Poast photodegrades rapidly in water and on soil surfaces. Its half-lives in aerobic and anaerobic aqueous solutions were about 23 and 38 minutes, respectively, and 3.6-3.7 hours hours on soil surface.

The major photoproducts were deethoxylated compounds such as M1O and M1SO in aqueous solution. Exposure to sunlight gave a half-life of 5.8 hours and major products were M1S and M1O. On soil surface the predominant degradation product was MSO along with small amounts of M1SO.

Under aerobic soil conditions, BAS 9052 H will degrade fairly rapidly in soil. The half-life in loamy sand soil ranged from less than 3 to 5 days and in loam soil was about 11 days. Mineralization to CO_2 suggests microbial activity to be a major route of disappearance. In both soils, MSO was a major metabolite formed. Under anaerobic conditions, BAS 9052 H had a half-life of less than 3 days in a loamy sand soil. While MSO was the major metabolite formed under aerobic, sterile/aerobic, and anaerobic conditions, its formation was slower under sterile/aerobic conditions. Soil binding increased with time during the studies. Soil leaching data shows that aged BAS 9052 H residues could leach in soils. This is supported by the low soil adsorption coefficient (K = 0.3039 for soil with 0.69% organic matter (O.M. and K = 0.740 for soil with 2.44% O.M. However, field leaching studies indicated that, under natural environmental conditions, aged BAS 9052 H residues did not leach below the top 4 inches of soil. No climatic data was submitted with this study.

Rotational crops, even planted 30 days post-treatment will not take up significant amounts of residues.

Fish accumulation data for bluegill and catfish indicate they will not accumulate residues of BAS 9052 H. When exposed to BAS 9052 H residues in water, maximum accumlation for bluegill whole fish was about 7X the water concentration at day 14. Edible

tissue had a bioconcentration factor of 2.87, peaking at day 14. After 14 days depuration, over 90% of the maximum accumulated residues were eliminated. In catfish, the mean bioconcentration factor during exposure in whole fish was 0.491. Residue levels declined slowly during depuration period. After 14 days depuration the ^{14}C residues in whole fish and non-edible tissue were 68% and 76%, respectively, of the maximum reached during uptake. There was no appreciable change in levels of residues in edible tissue.

Deficiencies in the adsorption/desorption studies are noted. It was not established that equilibrium was reached within the 24 hour equilibration period. Information on recoveries, sample chromatograms, etc and clarification of the study's concentration were not provided. However, since the laboratory leaching study supports the findings of the adsorption study, these deficiencies are resolved.

5.0 RECOMMENDATIONS

Except for the deficiencies noted above, the environmental fate data are adequate and support the proposed use. Rainfall and temperature data for the areas used in the field dissipation study (Tab J-10) which show that normal climatic conditions existed during the study should be submitted within a reasonable time.

Clinton Fletcher
Review Section # 1
Environmental Fate Branch
Hazard Evaluation Division