

103.4 Chronic

103.4.3 Fish

DATA REVIEW NUMBER: ES X1

TEST: Chronic Reproduction Freshwater Fish

SPECIES: Fathead Minnow (Pimephales promelas)

RESULTS: Mean measured concentration of 0.91 and .41 ppb significantly reduced the percent survival of fry during 30 days exposure. Fathead minnows which survived the initial exposure period, demonstrated normal ranges of measured parameters of survival, growth, reproduction and egg hatchability. Based upon the data, the researcher concluded the maximum acceptable concentration of FMC 33297 for fathead minnows is estimated to be >0.30 and <0.41 ppb.

CHEMICAL: FMC 33297 (Technical 95.7% a.i.)

TITLE: Chronic Toxicity of FMC 33297 to the Fathead Minnow (Pimephales promelas)

ACCESSION NO: 096699

STUDY DATE: October 1977

RESEARCHER: E.G. & G. Bionomics
Aquatic Toxicology Lab.
Wareham, Mass.

REGISTRANT: FMC Corp.

VALIDATION CATEGORY: Core

CATEGORY REPAIRABILITY: This study followed the protocols of the National Water Quality Lab., Duluth, Minn. Recommended bioassay procedures for fathead minnow (Pimephales promelas) rafinesque chronic tests. EPA 1971. This study also included residue analysis of fish tissue and bio-concentration information.



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VALIDATOR: Tom O'Brien - 1/17/78

ADDITIONAL INFORMATION:

During the preliminary pre screen tests to determine levels at which the chronic test should be conducted the following LC_{50} values were determined (mortality corrected for control by Abbotts Formula):

7 day LC_{50} = 1.016 ppb (.943 - 1.094 ppb)
95% C.L.

14 day LC_{50} = .929 ppb (.863 - 1 ppb)
95% C.L.

21 day LC_{50} = .855 ppb (.795 - .92 ppb)
95% C.L.

Statistical analysis by Finney Probit.

Based upon the above results nominal concentrations selected for the chronic test were 1.0, 0.50, 0.25, 0.13 and 0.063 ug/L. During the initial 35 days of the chronic test, mean measured concentrations of FMC 33297 were well below nominal concentrations. This trend increased as fish increased in size and the quantity of food increased. To reverse the trend nominal concentrations were increased to 1.5, 0.75, 0.38, 0.19 and 0.094 ug/L. The measured concentrations, therefore, upon which survival and percent hatch were compared to control, from percent egg hatch to survival to 63 days were as follows:

0 - 35 days: 0.41; 0.14; 0.092; <0.032 and
<0.023 ppb

0 - 63 days: 0.55; 0.23; 0.17; 0.083; and
<0.043 ppb

Percent hatch and survival was significantly diff. ($P = 0.05$) at the 0.41 level. After 156 days exposure surviving females were returned to spawning chambers in the ratio (where-ever possible) of 3 males to 7 females. The levels tested at measured concentrations were 0.87, 0.32, 0.22, 0.16 and <0.073 ppb. At the 0.87 ppb level there were

no female survivors. At levels of 0.32 and less; survival, weight, length and eggs/female did not differ significantly from controls. The second generation eggs were then exposed to mean measured concentrations of 0.91, 0.41, 0.30, 0.17, and <0.11 ppb. The percent hatch for these levels did not differ significantly from controls but the survival of second generation fry at >0.41 ppb was significantly different than controls ($P = 0.05$). To observe if there were residual effects of the chemical, fry were transferred from control groups to the 0.41 ppb test level and vice versa. Survival of 0.41 ppb fry transferred to control was significantly greater than those transferred to the 0.41 ppb test level.

Of special note the solvent used in this chronic fish study was Dimethyl Sulfoxide (DMSO). DMSO has several biological properties which usually preclude its use, except for very insoluble chemicals. It tends to be synergistic, causes fat soluble compounds to bioconcentrate more than normal and produces fairly even distribution of the compound in the water table.

Chronic
Fish Fathead
Minnow Fry.

FMC Tech 33297
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7 day

0.63
3.4
8C.

1.3
65.
8C.

2.5
8C.
8C.

5.
8C.
8C.

8.347 M
4.944 YINT
1.318 LW M
0.047 CHI²

1.016 LD50
0.943 LDCL
1.054 UPCL

0.713 LD10
0.637 LDCL
0.798 UPCL

1.447 LD90
1.309 LDCL
1.558 UPCL

14 day

0.63
5.8
8C.

1.3
71.7
8C.

2.5
8C.
8C.

5.
8C.
8C.

8.650 M
5.277 YINT
1.305 LW M
0.008 CHI²

0.929 LD50
0.863 LDCL
1.000 UPCL

0.660 LD10
0.596 LDCL
0.732 UPCL

1.307 LD90
1.164 LDCL
1.442 UPCL

21 day

0.63
9.3
8C.

1.3
75.9
8C.

2.5
8C.
8C.

5.
8C.
8C.

8.987 M
5.609 YINT
1.292 LW M
0.001 CHI²

0.855 LD50
0.795 LDCL
0.920 UPCL

0.616 LD10
0.560 LDCL
0.677 UPCL

1.188 LD90
1.071 LDCL
1.318 UPCL

FORMULA:		SC#		CHEMICAL NAME		IA	IB	IC	FD	EC	R	
95.7% a.i. technical				Permethrin		Validator:		Date:				
						R. Balcomb		2/24/78				
						Test Type:						
						Chronic Fish:						
						Fathead Minnow						
						Test ID #		ES-X				

Citation: Chronic Toxicity of FMC 33297 to the Fathead Minnow (*Pimephales promelas*) E. G. & G., Bionomics Aquatic Toxicity Laboratory. Wareham, Massachusetts.

Validation Category: Core

Results: Mean measured concentrations of 0.91 and 0.41 ppb significantly reduced the percent survival of fry during 30 days exposure. Minnows which survived the initial exposure period demonstrated normal ranges of measured parameters of survival, growth, reproduction and egg hatchability. Based on the data, the researcher concluded the maximum acceptable concentration of FMC 33297 for Fathead Minnows is estimated to be 0.30 and 0.41 ppb.

↑ between

Residue analysis of fish showed bioaccumulation in female minnows as high as 4600x the water concentration. The majority of these residues were eliminated after 14 days in uncontaminated water.

Validation Category Rationale: The study generally followed the protocols of the National Water Quality Lab, Duluth, Minnesota for bioassay with the Fathead Minnow.

Test Repairability: NA

Additional Comments: (from review T. O'Brien, FMC-Pounce, 2/78)

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