

US EPA ARCHIVE DOCUMENT

A N I ✓

EEE BRANCH REVIEW

DATE: IN 8/15/77 OUT 11/25/77 IN _____ OUT _____ IN _____ OUT _____

AMENDED 9/20/78

FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. 3125 : 283-236-237

PETITION OR EXP., PERMIT NO. 6F1865, 6H5150

DATE DIV. RECEIVED 7/26/77

DATE OF SUBMISSION _____

DATE SUBMISSION ACCEPTED _____

TYPE PRODUCTS(S): I, D, H, F, (N,) R, S Nematicide

DATA ACCESSION NO(S). _____

PRODUCT MGR. NO. (21) Wilson

PRODUCT NAME(S) Nemacur 3; Nemacur 15; Nemacur 10

COMPANY NAME Chemagro

SUBMISSION PURPOSE Registration Citrus

CHEMICAL & FORMULATION Ethyl 3-Methyl-4- (Methylthio) phenyl (1-methylethyl) phosphoramidate

- Nemacur 3 (3125-283)-----35% A.I.
- Nemacur 15 (3125-236)-----15% A.I.
- Nemacur 10 (3125-237)-----10% A.I.

51 pages with attached amendment (11 pages)

100.0 Pesticidal Use

Nemacur 3, 15G and 10G are nematicides intended for band and broadcast treatment to control nematodes on citrus.

100.1 Applications Methods: Rates

Nemacur 3 Emulsifiable Nematicide35% A.I.
 Contains 3 lb/gal A.I.

<u>CROP FRUIT</u>	<u>PEST</u>	<u>DOSAGE NEMACUR 3/Acre</u>	<u>REMARKS</u>
Citrus	Nematodes	5 to 10 gallons 15-30 lb A.I.	Apply specified dosage in 20 to 40 gallons of water per acre as a water emulsion broadcast spray to the soil surface. Under dry conditions, follow with ½ to 1 inch of overhead or flood irrigation. Do not apply more than once per season nor within 180 days of harvest. Do not graze livestock on the areas.

Nemacur 15 Granular15% A.I.

<u>CROP FRUIT</u>	<u>PEST</u>	<u>DOSAGE NEMACUR 15% Gran./Acre</u>	<u>REMARKS</u>
Citrus	Nematodes	100 to 200 lbs. 15-30 lb. A.I.	Apply specified dosage per acre as a broadcast application. Immediately after application, incorporate the granules into the soil by light raking or tilling. Under dry conditions, follow with ½ to 1 inch of overhead or flood irrigation. Do not apply more than once per season nor within 180 days of harvest. Do not graze livestock on treated areas.

Nemacur 10 Granular10% A.I.

<u>CROP</u> <u>FRUIT</u>	<u>PEST</u>	<u>DOSAGE NEMACUR</u> <u>10% Gran./Acre</u>	<u>REMARKS</u>
Citrus	Nematodes	150 tp 300 pounds 15 to 30 lb. A.I.	Apply specified dosage per acre as a broadcast application. Immediately after application, incorporate the granules into the soil by light raking or tilling. Under dry conditions, follow with 1/2 to 1 inch of overhead or flood irrigation. Do not apply more than once per season nor within 180 days of harvest. Do not graze livestock on treated areas.

Expected residues following application of specified dosage per acre as broadcast application.

Nemacur 3 with ^{out} light soil incorporation

D - 1" = 333.8 ppm at 15 lbs. A.I./acre
= ~~88.2~~ ppm at 30 lbs. A.I./acre
_{661.6}

*Put
9/11/78*

Nemacur 15 granular with light soil incorporation (SDF=10)

0 - 1" = 15.6 mg/ft² at 15 lb. A.I./acre
= ~~31.6~~ mg/ft² at 30 lbs. A.I./acre on ppm basis
= 33.38 at 15 lbs. and ~~88.2~~ ppm at 30 lbs.
_{66.2}

Nemacur 10 granular with light soil incorporation (SDF=10)

0 - 1" = 15.6 mg/ft² at 15 lbs. A.I./acre
= ~~31.6~~ mg/ft² at 30 lbs. A.I./acre
= 33.38 ppm at 15 lbs. A.I./acre
= ~~88.2~~ ppm at 30 lbs. A.I./acre
_{66.2}

100.3 Labeling:

When the registration package is completed for this product the Environmental Safety portion of the label should be updated.

The Namacur 3, 10 & 15 label needs the addition of the following Statement to the Environmental Safety Section, "Do not contaminate water by cleaning of equipment or disposal of waste." "This pesticide is toxic to bees exposed to direct application or to residues remaining on the treated area."

The label directions for Namacur 10G & 15G use on citrus state, "Immediately after application incorporate the granules into the soil by light raking or tilling. Under dry conditions follow with $\frac{1}{2}$ to 1 inch of overhead or flood irrigation." The Environmental Safety Staff does not feel that these use directions are adequate to eliminate adverse ecological effects.

The label should read:

Immediately after application completely incorporate the granules into 6 inches of soil by through tilling and then immediately follow with $\frac{1}{2}$ to 1 inch of overhead or flood irrigation.

The Namacur 3 label for citrus should read:

Follow with $\frac{1}{2}$ to 1 inch of overhead or flood irrigation after application.

101.0 Chemical and Physical Properties

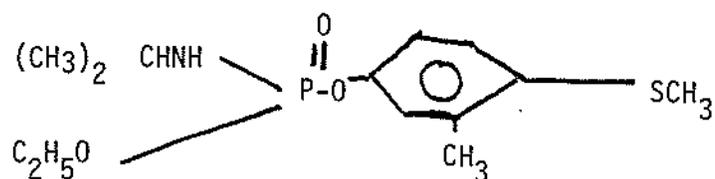
101.1 Chemical Name

Ethyl 3-methyl-4-(methyl thio) phenyl (1-methylethyl) phosphoramidate

101.2 Common Name

Namacur

101.3 Structural Formula



101.4 Molecular Weight: 303

101.5 Physical State

Tan Waxy Solid

101.6 Solubility

Soluble in most organic solvents soluble in water : Ca 400 ppm.

102.0 Behavior in the Environment

The following information is extracted from an Environmental Chemistry Review dated 10/3/73 (R. W. Cook). A current review is not available.

102.1 Soil

Nemacur adsorbs to soil particles but can leach in soils which have a low adsorption coefficient. These would tend to be light soils with less organic matter or fine clay particles. Nemacur generally converts to sulfoxide and Sulfone phenols within 3 weeks but residues of (20 lbs. A.I.) nemacur and its metabolites have been found in a soil sample 2 years after the last application. These residues were noted to be tightly bound to soil particles in heavier soils. Hydrolysis is not a mode of soil degradation as nemacur binds to soil molecule. Because of this some runoff occurs.

102.2 Water

The half life of nemacur in water pH 7 was noted to be about 5 days. The degradation products of hydrolysis were not identified.

102.3 Plant

Nemacur and its soil metabolites sulfoxide and sulfone are adsorbed by plants. The metabolites undergo further thiooxidation, followed by hydrolysis. [INFORMATION: EDD

GROSS, PESTICIDE PET. #3F1399 (Sulfoxide and sulfone phenols constitute the major residue in plants, perhaps as much as 10 X the level of the original cholinesterase inhibitor. These phenols seem to bear similarity to the hydrolysis products of Fenthion)]. It should also be noted here that technical nemacur is comprised of impurities in the form of

Information on photo-degradation is not available.

102.4 Animal

The effects of nemacur on soil microorganisms is not known. Nemacur does not appear to bioaccumulate in fish.

103.0 Toxicological Properties

103.1 Mammal

TEST: Acute Mammal LD50
SPECIES: Female rat
RESULT: LD50 - 25 mg/kg
CHEMICAL: Bay 68138 3 lb. (35% A.I.)

TEST: Acute Mammal LD50
SPECIES: Rat
RESULT: LD50 from 15 - 19 mg/kg
CHEMICAL: Reported to be technical

TEST: Acute Mammal LD50
SPECIES: Rat
RESULTS: LD50 = 4.75 - 8.1 mg/kg
CHEMICAL: Unknown (data from previous EEEB Review) chemical
dosed in water with an emulsifier

TEST: Acute Dermal Mammal
SPECIES: Female rats
RESULT: 80.1 mg/kg
CHEMICAL: A.I.

The above mammal studies are deferred to Human Toxicology for data validation.

INFORMATION ON IMPURITIES (MANUFACTURING INFORMATION) IS NOT INCLUDED

103.1.2 Bird

DATA REVIEW NUMBER: ES C1

TEST: Avian Acute Oral Quail

SPECIES: Bobwhite Quail (Colinus virginianus)

RESULTS: LD50 = 0.8 mg/kg (0.7-0.9) mg/kg - male
LD50 = 0.9 mg/kg (0.7-1.0) mg/kg - female

CHEMICAL: Bay 68138 A.I. (unknown)

RESULTS: LD50 = 2.2 (1.9-2.5) mg/kg - male
LD50 = 2.5 (1.9-2.8) mg/kg - female

CHEMICAL: Bay 68138 3 lbs. formulation 35% A.I.

TITLE: Acute Toxicity Evaluations of Bay 68138 with Fish
and Wildlife.

ACCESSION NO: 091689 Report 26212

STUDY DATE: November 21, 1969

RESEARCHER: Keichline, S. and J. Bradburn
Environmental Sciences
Gulf South Research Inst., New Iberia, LA

REGISTRANT: Chemagro Corporation

VALIDATION CATEGORY: Supplemental [Formulation]

CATEGORY REPARIABILITY: N.A.

ADDITIONAL INFORMATION: Dose related intoxication reactions consisted of tremors, convulsions and frothy nasal discharge at high dose levels and depression, dyspnea, and incoordination at lower levels. The formulated product contains [REDACTED] in the inerts and the inerts will probably have an impact upon toxicity. This reviewer does not want to speculate on the effect.

INFORMATION ON INERT INGREDIENTS IS NOT INCLUDED

103.1.2 Bird

DATA REVIEW NUMBER: ES C2

TEST: Avian Acute Oral Mallard

SPECIES: Mallard (Anas platyrhynchos)

RESULTS: Male and Female LD₅₀ between 2.5 - 3 mg
Formulation/kg

CHEMICAL: Bay 68138 3 lbs./gal. (% A.I. assumed 35%)

TITLE: The Acute Oral Toxicity of Bay 68138 3 lbs/gal.
S.C. to Mallard Ducks

ACCESSION NO: 091689 Report No. 26544

STUDY DATE: Unknown

RESEARCHER: Crawford, C. R. and O. L. Nelson
Chemagro Corporation
Research Division

REGISTRANT: Chemagro Chemical Corp.

VALIDATION CATEGORY: Supplemental [Formulation]

CATEGORY REPAIRABILITY: No - The study did not test 10
birds dose level, did not properly identify the
% A.I. tested, did not show statistical analysis
and did not give a detailed outline of methods.
Interpolation of the LD50 value to 100% A.I.
assuming 35% A.I. tested gives .87 mg/kg which
agrees with other research. The study tested the
formulated product rather than the technical.

103.1.2 Bird

DATA REVIEW NUMBER: ES C3

TEST: Avian Acute Oral

SPECIES: Canary (species?)

RESULTS: LD₅₀ between 0.5 - 1 mg/kg

CHEMICAL: Bay 68138 Technical

TITLE: Bayer Letter - Bay 68138 Bird Toxicity-Lorke,
Institut für Toxikologie, Bayer AG
Leverkusen-Bayerwerk, West Germany

ACCESSION NO: 120301 Report 22241

STUDY DATE: March 7, 1968

RESEARCHER: Farbenfabriken Bayer AG

REGISTRANT: Chemagro Corporation

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: Yes - This letter does not supply
enough information upon which to judge the study.
LD₅₀ values seem to compare with others reported.

103.1.2 Bird

DATA REVIEW NUMBER: ES C4

TEST: Avian Acute Oral

SPECIES: Canary (Serinus canarius)

RESULTS: LO50 between 1 - 2 mg/kg

SPECIES: Pigeon (Columba livia)

RESULT: LD50 between 0.5 and 1 mg/kg

CHEMICAL: SRA (Bay 6B138) B1.6% A.I.

TITLE: Bird Toxicity of SRA (Bay 6B138) and SRA (Bay 93820)

ACCESSION NO: 120301 Report No. 28468

STUDY DATE:

RESEARCHER: Dr. Herman
Inst. of Animal Pests, Bayer AG
Leverkusen Bayerwerk, West Germany

REGISTRANT: Chemago Corporation

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: NO - The study was conducted for 7 days only, complete test methods are not given, the material tested is not pure (only 81% A.I.). It appears only 2 birds were tested per test level and for canary only 2 test levels were used. The pigeon test used 7 test levels, but some levels it appears only tested one bird. The species of canary tested is similiar to caged canary, does not represent a wild species. The pigeon is the European Rock Dove an introduced species.

103.1.2 Bird

DATA REVIEW NUMBER: ES C5

TEST: Avian Acute Oral

SPECIES: Mallard Duck (Anas platyrhynchos)

RESULTS: LO_{50} = 1.68 mg/kg

SPECIES: Ring-necked Pheasant (Phasianus colchicus)

RESULTS: LD_{50} between 0.5 - 1.0 mg/kg

CHEMICAL: Nemacur (81% A.I.)

TITLE: The Acute Oral Toxicity of Nemacur Technical to
Mallard Drakes and Ring-necked Pheasant Cocks.

ACCESSION NO: 091689 Report No. 32258

STUDY DATE: January 13, 1972

RESEARCHER: Hudson, Rick H.
Denver Wildlife Research Center

REGISTRANT: Chemagro

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - For the Mallard test, only 4 groups of 3 drakes each were employed, the birds were 12 - 13 weeks old rather than 16 weeks and the dose levels and response to the levels were not shown. The pheasant study only tested 7 birds one each at 4 levels and 2 birds at 1 mg.

103.1.3 Fish

DATA REVIEW NUMBER: ES G1

TEST: Fish Acute 96 hour LC₅₀ (Coldwater)

SPECIES: Rainbow Trout (Salmo gairdneri)

RESULTS: 96-hour LC₅₀ = 0.11 ppm (0.09-0.13) ppm
95% C.L.

CHEMICAL: Active Ingredient, Bay 68138

RESULT: 96-hour LC₅₀ = 0.31 ppm (0.25-0.36) ppm 95% C.L.

CHEMICAL: Formulation 35% A.I. (Bay 68138)

TITLE: Acute Toxicity Evaluations of Bay 68138 with Fish
and Wildlife.

ACCESSION NO: 091689 Report 26212

STUDY DATE: November 21, 1969

RESEARCHER: Keichline, S. and J. Bradburn
Environmental Sciences, Gulf South Research Inst.
New Iberia, LA

REGISTRANT: Chemagro

VALIDATION CATEGORY: Supplemental [Formulation]

CATEGORY REPAIRABILITY: N.A.

This test was conducted using a formulated product which contains as inerts [REDACTED] [REDACTED] may have effects upon the toxicity of the product, therefore values for the A.I. may be different. This reviewer does not care to speculate upon the related effect.

Study would be core data for the formulated product if an aquatic use was involved.

INFORMATION ON INERT INGREDIENTS IS NOT INCLUDED

103.1.3 Fish

DATA REVIEW NUMBER: ES G2

TEST: Fish Acute 96-hour LC₅₀ (Coldwater)

SPECIES: Rainbow trout (Salmo gairdneri)

RESULTS: 96-hour LC₅₀ = 72.1 ppb (61.2 to 84.7 ppb)
95% C.L. Nemacur Technical

RESULTS: 96-hour LC₅₀ = 563 ppb (454 to 698 ppb) 95%
C.L. Nemacur 15% Granular

Acetone Solvent used with technical.

CHEMICAL: Nemacur Technical 81% A.I.
Nemacur 15% Granular (15% A.I.)

TITLE: Acute Toxicity of Nemacur Technical and Nemacur 15%
Granular to Fish

ACCESSIDN NO: 120301 Report No. 34014

STUDY DATE: June 1, 1972.

RESEARCHER: Lamb, D.W. and D.J. Roney
Chemagro Division of Baychem Corp.
Research and Development

REGISTRANT: Chemagro Chemical Corporation

VALIDATION CATEGORY: Core

CATEGORY REPAIRABILITY: The study provides raw data on
dose levels tested and response at each dose
level. Statistical analysis of data agrees
satisfactorily. The methods used in the study
are acceptable.

*Rainbow LC50
Nemacur
Technical*

17.5	
0.	
29.8	
10.	
50.6	
0.	
86.2	
80.	
146.4	
100.	
5.	N
0.738	R ²
0.216	S
0.108	M
58.514	ppb LD50
16.189	LDCL
211.488	UPCL
42.532	LD10
11.739	LDCL
154.098	UPCL
80.501	LD90
21.217	LDCL
305.441	UPCL

*Rainbow
15%
Nemacur*

142.	
0.	
Σ-	
142.	
0.	
241.	
0.	
410.	
20.	
698.	
70.	
1186.	
100.	
4.	N
0.975	R ²
0.057	S
0.103	M
524.995	ppb LD50
341.663	LDCL
806.702	UPCL
387.038	LD10
248.674	LDCL
602.389	UPCL
712.126	LD90
458.801	LDCL
1105.324	UPCL

*Rainbow
15% Nemacur
with extra
dose level*

142.	
0.	
Σ-	
142.	
0.	
0.918	R
0.121	
0.123	
480.012	ppb LD5
233.812	LDCL
985.456	UPCL
334.112	LD1
162.420	LDCL
687.299	UPCL
689.623	LD9
326.751	LDCL
1455.484	UPCL

103.1.3 Fish

DATA REVIEW NUMBER: ES F1

TEST: Fish Acute 96-hour LC₅₀ (Warmwater)

SPECIES: Catfish (Ictalurus sp?)

RESULTS: 96-hour LC₅₀ = 3.8 ppm (3.5-4.1) ppm 95% C.L.

CHEMICAL: Bay 68138 A.I. (Interpolation)

RESULTS: 96-hour LC₅₀ = 10.5 ppm (9.7 - 11.4) ppm 95% C.L.

CHEMICAL: Formulation 35% A.L. (Bay 68138)

TITLE: Acute Toxicity Evaluation of Bay 68138 with Fish and Wildlife.

ACCESSION NO: 091689 Report 26212

STUDY DATE: November 21, 1969

RESEARCHER: Keichline, S.A. and J. Bradburn
Environmental Sciences
Gulf South Research Institute
New Iberia, LA

REGISTRANT: Chemagro Corporation

VALIDATION CATEGORY: Supplemental [Formulation]

CATEGORY REPAIRABILITY: N.A. - This study was conducted using the formulated product. The LC₅₀ value for the A.I. was derived by interpolation of 35% to 100% A.I. The inert contains [REDACTED] which may have one effect upon the toxicity of this compound. This reviewer does not care to speculate upon the nature of that effect.

Study would be Core Data for the formulated product if an aquatic use was involved.

INFORMATION ON INERT INGREDIENTS IS NOT INCLUDED

103.1.3 Fish

DATA REVIEW NUMBER: ES F2

TEST: Fish Acute 96-hour LC₅₀ (Warmwater)

SPECIES: Gambusia affinis, Poecilia (Mollienesia)
latipinnia

RESULTS: Mortality was not differentiated during study
by species.

Bay 68138 Technical and 40% LC₁₀₀ < 0.2 ppm within
24 hours - this seems to conflict with other fish
studies which report higher LC₅₀ values for warm
water fish.

CHEMICAL: Bay 68138 Technical
Bay 68138 40% EC

TITLE: Herbicide Report No. 7/69, Fish Toxicity Trial No. 1
1/69 - W.A. Galletta, Vero Beach Laboratories, Inc.,
Vero Beach, Florida

ACCESSION NO: 12D3D1 Report No. 24992

STUDY DATE: April 22, 1969

RESEARCHER: Galletta, William A.
Vero Beach Laboratories, Inc.
Vero Beach, Florida

REGISTRANT: Chemagro Corporation

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - Only five fish per test level
were used and only 4 test levels for the 40%
formulation were used. Test procedures listed
are not sufficient and the species tested are not
adequate because of the following facts:

Gambusia affinis is a livebearing species and
Poecilia (Amazon molly - warm water tropical)
ruling them out as species to use for
assessing hazard.

103.1.3 Fish

DATA REVIEW NUMBER: ES F3

TEST: Fish Acute 96-hour LC₅₀ - (Warmwater)

SPECIES: Black Bullhead (Ictalurus melas)

RESULTS: 24-hour LC₅₀ = 10 ppm

96-hour LC₅₀ = 10 ppm

CHEMICAL: Bay 68138 Technical

TITLE: Fish Toxicity Data for Bay 68138.

ACCESSION NO: 120301 Report 26B78

STUDY DATE: March 2, 1970

RESEARCHER: L. Y. Marking
U.S.D.I. Bureau of Sport Fisheries and Wildlife
LaCrosse, Wisconsin

REGISTRANT: Chemagro

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - Only 10 fish were tested per test level and only 3 test levels were conducted. In addition the black bullhead is not considered a sensitive indicator species for evaluation of environmental hazard. In addition the method of estimation D of 50% mortality is not sufficient for determination of an accurate LC₅₀.

103.1.3 Fish

DATA REVIEW NUMBER: ES F4

TEST: Fish Acute 96-hour LC₅₀ (Warmwater)

SPECIES: Poecilia (Mollienesia) latipinnia
Gambusia affinis holbrookei

RESULTS: 24-hour LC₁₀₀ < .2 ppm
Technical

24-hour LC₁₀₀ < .1 ppm
40% A.I.

Species were not separated in results as far as mortality breakdown.

CHEMICAL: Bay 68138 Technical
Bay 68138 40%

TITLE: Herbicide Report No. 66/69, Fish Toxicity Trial
No. 2/69.

ACCESSION NO: 120301 Report No. 26929

STUDY DATE: October 1, 1969

RESEARCHER: Rowehl, E. R.
Vero Beach Laboratories, Inc.
Vero Beach, Florida

REGISTRANT: Chemagro Chemical Corporation

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - A 96-hour LC₅₀ was never calculated, methods were not given and the species used are not acceptable. *Gambusia* is a live bearing fish and *Poecilia* is an exotic, the Amazon molly

103.1.3 Fish

DATA REVIEW NUMBER: ES F5

TEST: Fish Acute 96-hour LC₅₀ (Warmwater)

SPECIES: Goldfish (species?)

RESULTS: 96-hour LC₅₀ between 5 and 10 ppm

Goldorfs (the Environmental Safety section does not know what type of creature this is)

RESULTS: 96-hour LC₅₀ between 0.1 and 1 ppm.

CHEMICAL: Bay 68138 (% A.I. not identified)

TITLE: Fish Toxicity of SRA 3886 = Bay 68138 and
SRA 13382 - Bay 93820

ACCESSION NO: 120301 Report No. 28468

STUDY DATE: March 24, 1970

RESEARCHER: Dr. Cichorius
Institute of Animal Pests, Bayer AG
Leverkusen Bayerwerk, West Germany

REGISTRANT: Chemagro

VALIDATION CATEGORY: Invalid

CATEGORY REPAIRABILITY: No - Species tested are unacceptable, the material tested was not given, the study implies aeration occurred, the number of fish tested, the test levels and test methods are not described.

103.1.3 Fish

DATA REVIEW NUMBER: ES F6

TEST: Fish Acute 96-hour LC₅₀ (Warmwater)

SPECIES: Eastern mosquito fish (Gambusia affinis)

RESULTS: LC₅₀ <0.1 ppm

No attempt was made to determine a lower value.

CHEMICAL: Bay 68138 (74.1% A.I.)

TITLE: Fish Toxicity

ACCESSION NO: 120301 Report No. 32665

STUDY DATE: March 21, 1971

RESEARCHER: Metcalf, Jerry and Edward R. Rowehl
Vero Beach Laboratories, Inc.
Vero Beach, Florida

REGISTRANT: Chemagro Corporation

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - It would appear that three test levels were conducted with 10 fish/test level. No other information is provided on test conditions or statistical analysis. *Gambusia* is not an acceptable species for hazard assessment.

103.1.3 Fish

DATA REVIEW NUMBER: ES F7

TEST: Fish Acute 96-hour LC₅₀ (Warmwater)

SPECIES: Bluegill Sunfish (Lepomis macrochirus)

RESULTS: 96-hour LC₅₀ = 17.7 ppb (14.4 - 21.6 ppb) 95% C.L.

Technical 81% A.I. in acetone solvent

96-hour LC₅₀ = 151 ppb (114 to 201 ppb) 95% C.L.

CHEMICAL: Nema-cur 15% Granular (15% A.I.)

TITLE: Acute Toxicity of Nema-cur Technical and Nema-cur
15% Granular to Fish

ACCESSION NO: 120301 Report No. 34014

STUDY DATE: June 1, 1972

RESEARCHER: Lamb, O. W. and D. J. Roney
Chemagro Division of Baychem Corp.
Research and Development

REGISTRANT: Chemagro Chemical Corp.

VALIDATION CATEGORY: Core

CATEGORY REPAIRABILITY: The study provides raw data on dose levels tested and response at each dose level. Statistical analysis of data agrees satisfactorily. The methods used in the study are acceptable.

Bluegill
 Technical
 Nemacur

6.1
 0.
 10.4
 0.

17.5
 60.
 29.8
 90.
 50.6
 100.

5. N
 0.776 R₂
 0.198 S
 0.124 M

16.707 ppb LD50
 5.142 LOCL
 54.287 UPCL

11.587 LD10
 3.433 LOCL
 39.111 UPCL

24.090 LD90
 7.254 LOCL
 79.999 UPCL

95. %CON
 3. DF
 2.353 TVAL

Bluegill
 Nemacur
 15% A.V.

49.
 84.
 10.

142.
 60.

241.
 70.

410.
 100.

5. N
 0.939 R₂
 0.104 S
 0.140 M

140.886 ppb LD50
 75.971 LOCL
 261.267 UPCL

93.166 LD10
 49.388 LOCL
 175.748 UPCL

213.048 LD90
 113.080 LOCL
 401.393 UPCL

103.1.3 Fish

DATA REVIEW NUMBER: ES FB

TEST: Fish Acute 96-hour LC₅₀ (Warmwater)

SPECIES: Bluegill Sunfish (Lepomis Macrochirus)

RESULTS: Reported LC₅₀ = 2.0 ppm (1.8 - 2.3 ppm) 95% C.L.

Nemacur Sulfoxide is the degradation product of Nemacur^a technical - is 50% at 7 days and 100% at 23 days.

CHEMICAL: Nemacur Sulfoxide (99% A.I.)

TITLE: Acute Toxicity of Nemacur Sulfoxide to Bluegill.

ACCESSION NO: 120301 Report No. 35010

STUDY DATE: November 2, 1972

RESEARCHER: Lamb, O. W. and D. J. Roney
Chemagro Division of Baychem Corporation
Research and Development

REGISTRANT: Chemagro Chemical Company

VALIOATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: The LC₅₀ value derived came from a test that had only 4 test levels. Two fish were used per dose level and two levels had 10% mortality and two levels had 100% mortality. The study cannot be used to fit the definition of a definitive test because only one level of partial mortality was achieved and a definitive test should have a mortality, 100% mortality or partial mortality above and below 50%. The study does indicate the relative toxicity of the degradate Nemacur sulfoxide to aquatic organisms.

4.9
100%

2.9
100%

Manure
Sulfonide
Bluegill

4.
0.802
0.162
0.092

N
R
S
M

1.712
0.273
10.744

LD50
LOCL
UPCL

1.304
0.163
9.313

LD10
LOCL
UPCL

2.247
0.373
13.524

LD90
LOCL
UPCL

10.86956522

103.1.4 Aquatic Invertebrates

DATA REVIEW NUMBER: ES S1

TEST: 48-hour Acute LC₅₀

SPECIES: Eastern Oyster (Crossostrea virginica)

RESULTS: No effect at 1.0 ppm.
There was a 50% decrease in shell deposition noted compared to controls at 96-hours exposure.

CHEMICAL: Namacur 68138 3 lbs/gal spray conc. (35% A.I.)

TITLE: Toxicity Studies on Crustacea, Mollusks and Fish.
J. L. Lowe
USDI Bureau of Commercial Fisheries
Gulf Breeze, Florida

ACCESSION NO: 120301 Report No. 26522

STUDY DATE: January 12, 1970

RESEARCHER: Jack L. Lowe
Bureau of Commercial Fisheries
Pesticide Field Station
Gulf Breeze, Florida
(Now EPA Pest Research Lab)

REGISTRANT: Chemagro

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - This study only tested three dose levels and did not determine any mortality effect, while only testing up to 1 ppm.

103.1.4 Aquatic Invertebrates

DATA REVIEW NUMBER: ES MI

TEST: Acute 48-hour LC₅₀

SPECIES: Pink Shrimp (Penaeus duorarum)

RESULTS: 24-hour EC₅₀ 0.28 mg/l (ppm)

48-hour EC₅₀ 0.15 mg/l (ppm)

screening test

CHEMICAL: Nema-cur 3 lbs/gal spray concentrate (35% A.I.)

TITLE: Toxicity Studies on Crustacea, Mollusks and Fish
J. L. Lowe
USDI, Bureau of Commercial Fisheries
Gulf Breeze, Florida

ACCESSION NO: 120301 Report No. 26522

STUDY DATE: January 12, 1970

RESEARCHER: Jack L. Lowe
Bureau of Commercial Fisheries
Pesticide Field Station
Gulf Breeze, Florida
(Now EPA Pest Research Lab.)

REGISTRANT: Chemagro

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: Yes - The study could go to Core for Formulated product if all test methods were submitted, particularly the number of organisms used/dose level. This study cannot support technical grade material, and it is not a fresh water invertebrate. Study was not a 96-hour LC₅₀ as required.

103.1.3 Fish

DATA REVIEW NUMBER: ES Q1

TEST: Fish Acute 96-hour LC₅₀ - marine

SPECIES: Sheepshead minnow (Cyprinodon variegatus)

RESULTS: 24-hour EC₄₀ = 1.0 ppm

48-hour EC₅₀ = 0.32 ppm

CHEMICAL: Nemacur 6B138 3 lbs/gal spray concentrate
(35% A.I.).

TITLE: Toxicity Studies on Crustacea, Mollusks and Fish.
J. L. Lowe
USDI, Bureau of Commercial Fisheries
Gulf Breeze, Florida

ACCESSION NO: 120301 Report No. 26522

STUDY DATE: January 12, 1970

RESEARCHER: Jack L. Lowe
Bureau of Commercial Fisheries
Pesticide Field Station
Gulf Breeze, Florida
(Now EPA Pest Research Lab)

REGISTRANT: Chemagro

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - Only 3 test levels were tested,
methods were not outlined and the number of fish
tested were not given.
The study was not an 96-hour LC₅₀.

103.5.0 Field Toxicity

DATA REVIEW NUMBER: ES CC1

TEST: Simulated Field Study

SPECIES: Rice Bird (Lonchura punctulata)
Pheasant (Phasianus colchicus)

RESULTS: Pheasants and rice birds were exposed to pineapples sprayed with Nemacur. The birds were held in cages positioned over a treated area to give 0, 50 and 100 percent exposure for a 14-day period. Some mortalities occurred among rice birds in the 100 percent exposure area. No behavioral differences, toxic symptoms or deaths resulted from 50 percent exposure for rice birds. Pheasants caged in the 50 and 100 percent exposure areas demonstrated no behavioral difference, weight decrease, cholinergic symptoms or deaths throughout the study.

CHEMICAL: Nemacur 3lbs/gal (35% A.I.) Sprayed at 5 lbs. A.I./acre.

TITLE: Toxicity of Nemacur 3 lbs/gal S.C. to Pheasants and Rice Birds Under Simulated Field Conditions for Pineapples.

ACCESSION NO: 120301 Report No. 29053

STUDY DATE: January 4, 1971

RESEARCHER: Lamb, D. W. and D.L. Nelson
Chemagro Corporation, Research Department

REGISTRANT: Chemagro Chemical Corporation

VALIDATION CATEGORY: Supplemental (regardless of use pattern)

CATEGORY REPAIRABILITY: No - Test birds were supplemented in their diet in such a manner that they would probably not have any reason to be exposed to chemical. Pheasants from a game farm fed cracked corn daily will eat cracked corn.

Other discrepancies noted were that only 10 birds were challenged, the pens were not moved daily, birds were positioned on test area after application,

not prior to it. The rice birds that died were not necropsied to determine cause of death. Only one test level was used and this study does not indicate hazard for higher application rates requested, up to 40 lbs. A.I./acre on some crops.

ADDITIONAL INFORMATION: Twenty rice birds and twenty pheasants were used in the study.

Pheasants were caged in pens within one hour of application - birds were penned, 4 pheasants, (2 pair) 8' x 5' cages exposed to 50% treated area. One pair of pheasants were put into three 4' x 5' cages with 100% of the cage area exposed. Food was provided during the study by spreading cracked corn or bird seed on the ground, and the food supply was replenished every day. The birds were not identified as to sex used in the cage, and exposure period was 14 days.

The test procedure for the rice birds was identical. The control plot contained the same number of birds and cages. Therefore, only 10 birds (pheasant and rice birds) were tested. Two mortalities occurred among the rice birds in the 100 percent exposure area. The birds were from different cages and died within 2-3 days of exposure.

Location: Pineapple Research Institute Field Station
Wahiaha, Hawaii

Nemacur was applied at the rate of 5 lbs. A.I. per 250 gallons of water per acre. The 327 sq. ft. experimental area received 47.3 ml of the formulation or 17 g A.I. in 1.9 gallons of water by means of a hand spray boom. This is approximately 0.052 grams/square foot (52 mg/Ft²).

103.5.0 Field Toxicity

DATA REVIEW NUMBER: ES CC2

TEST: Simulated Field Study

SPECIES: Rice Bird (Lonchura punctulata)
Pheasant (Phasianus colchicus)

RESULTS: Pheasants and Rice Birds were exposed to a pineapple bed incorporated with Nemacur 15% Granular. Birds were held in cages positioned over the treated area to give 0, 50 and 100 percent exposure for a 14-day period. Mortalities occurred among rice birds in the 100% exposure area. No behavioral differences, toxic symptoms or deaths resulted from the 50 percent exposure for rice birds. Pheasants caged in the 100 percent exposure area demonstrated one death, no behavioral changes, weight changes or cholinergic symptoms. Under simulated pineapple cultivated practices Nemacur 15% Granular at 40 lbs. A.I./acre did not constitute a significant hazard to rice birds or pheasants.

CHEMICAL: Nemacur 15% Granular (40 lbs. A.I./acre)

TITLE: Toxicity of Nemacur 15% Granular to Pheasants and Rice Birds Under Simulated Field Conditions for Pineapples.

ACCESSION NO: 120301 Report No. 29159

STUDY DATE: January 13, 1971

RESEARCHER: Lamb, D. W.; W. S. McLeod and W. M. Zeck
Research and Development Div.
Chemagro Division of Baychem Corp.

REGISTRANT: Chemagro Chemical Corporation

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - Test birds were supplemented in their diet on a daily basis and the cages were not moved on a daily basis. Only one test level was utilized and portions of the cage area were eliminated from exposure by spreading a 24 inch plastic sheet covered with mulch, so it is not possible to accurately predict the actual exposure levels.

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120301-6
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120301-99
120301-100

Only 10 birds were tested, and when mortalities occurred mention is not made of replacement. The dead birds were not necropsied to determine cause of death. This study was ~~probably~~ conducted in a manner so that hazard was kept at a minimum and actual field conditions *were not duplicated*

ADDITIONAL INFORMATION: Twenty Rice birds and twenty Pheasants were used in this study located at the Pineapple Research Institute Field Station, Wahiaha, Hawaii.

Nemacur 15% was applied to a soil bed at 40 lbs. A.I./acre. The soil bed was 56" x 70" (327 sq. ft.) and 906 g of the Formulation was applied. The nemacur was incorporated into the soil to a 6 inch depth with a tractor mounted roto-teller. [Label says incorporate from 2 to 6 inches for Nemacur 15, 2 inches would increase hazard and would not be equally representative of the hazard level that was tested in this study.]

Eight cages were positioned over the plants. Two cages were 8' x 5' (40 ft²) and six cages were 4' x 5' (20 ft²). The 8' x 5' cages had 50 percent exposure to treatment, the 4' x 5' had 100 percent exposure. All cages were exposed to a total of 110 grams of Nemacur if not soil incorporated, with soil incorporation 4 - 6 inches the exposure level should be 9.098 mg/sq. ft.

The field study talks about laying a 24" plastic mulch strip, covering the edges with soil and planting the pineapple through the plastic, which is the conventional manner. The study does not make it clear as to how much of the ground surface was then covered, therefore, making the granular material unavailable to test birds.

Two pair of pheasants were introduced into the 8' x 5' cages and one pair was introduced into three of the 4' x 5' cages. The same number of rice birds were released into the remaining four cages. A control plot contained an identical number of birds and cages.

Food was provided in the form of cracked corn or songbird seed and the food supply was replenished daily.

103.5.0 Field Toxicity

DATA REVIEW NUMBER: ES CC3

TEST: Simulated Field Study

SPECIES: English Sparrow (Passer domesticus)
Bobwhite Quail (Colinus virginianus)
New Zealand Rabbit (species question)

RESULTS: English Sparrows suffered higher mortality in treated areas where the granular material was not watered in than in control areas or irrigation areas. In the non irrigated pens where feed was withheld for 8 hours mortality was highest. The mortality in all pens decreased as the study progressed, and with the occurrence of two rain storms mortality seemed to further decrease.

In the Bobwhite Quail portion of the study the only (2 birds) mortality to occur was in the non irrigated treated portion. All birds lost weight during the study, with the treated irrigated birds losing 7 1/2 grams average treated non-irrigated losing 14 grams and the control birds losing 8 grams.

There were no deaths in the rabbit study, the treated irrigated study had the lowest weight gain, the treated non irrigated rabbits next lowest and the control rabbits had the highest weight gain.

CHEMICAL: Nema-cur 15% Granular 134 lbs. Formulation/acre (20 lbs).

TITLE: Toxicity of Nema-cur 15% Granular to English Sparrows, Bobwhite Quail and New Zealand Rabbits Under Simulated Field Conditions.

ACCESSION NO: 120301 Report No. 34835

STUDY DATE: October 5, 1972

RESEARCHER: Lamb, D. W. and R. E. Jones
Chemagro Division of Baychem Corp.
Research and Development

REGISTRANT: Chemagro Chemical Corporation

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - The study has several discrepancies, the major one involving not moving the pens to keep the test animals exposed. The cages were not present prior to application and the duration between treatment and test are not given. The rabbit cages had woven wire fencing on the bottom and the cages were not moved. The test animals were given food on a regular basis and the distribution as far as coverage of the cage area was not given.

ADDITIONAL INFORMATION: Study conducted in Kansas.

Nemacur 15% Granular was applied at the rate of 134 lbs. Formulation/acre. This is the equivalent of 20 lbs. A.I./acre or .21 grams/ft² (= .000462 lbs/sq. ft. or 208.2 mg/sq. ft.). The residue in ppm would be approximately 441 ppm before watering in. The control plot and the two treated plots were each 660 sq. ft. Each treated plot received 921 grams of the compound and then one of the plots received hand irrigation at the rate of 1/2 inch of water (206 gallons). Eighteen cages each 4' x 5' x 3' were used (20 sq. ft. surface area). Each cage received one pair of animals and each plot had 6 cages of each of the three species. The quail and rabbits were randomly caged. Each of the groups of six cages of a species on a test plot were given the following treatment. Control with feed, control feed withheld 8 hours, treatment irrigated with feed, treatment irrigated with feed withheld eight hours, treated non irrigated with feed, and non irrigated with feed withheld for eight hours. The rabbit cages had woven wire fencing on the bottom. The cages in this study were not moved after placement and placement did not occur until after treatment and after irrigation. Natural feed was supplemented on a daily basis.

The study was conducted for 14 days, and the method of applying the free choice feed is not clearly given. The study did not make any statistical analysis in the results section to determine if there was a statistical difference in mortality between control and treatment groups or differences in weight gains between control and treatment groups. A one way ANOVA of the English sparrow portion of the study and a Duncans Multiple Range Test indicates

that there was a significant difference in mortality (0.05 level) between control birds both feed withheld and not withheld, treatment non irrigated feed not withheld and irrigated treatment area feed withheld and not withheld versus the non irrigated group feed withheld which displayed the highest mortality. It should also be noted that the mortality in the irrigated group of birds was near 50 percent. In the quail portion the treated non irrigated pens had mortality and the highest weight loss, in the rabbit portion this area also had weight loss. No statistical analysis of these studies was attempted.

English Sparrow
Field Study
5% granular Kemacur

Control
Feed
Withheld

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.2857142857
.6326530612

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Control
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withheld

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.0714285714
.0663265306

- 6

treatment
Feed withheld
not irrigated

treatment
feed not
withheld
non irrigated

u4
.5714285714 - 3
.8163265306

treated
irrigated
Feed
Withheld

u5
.3571428571 - 9
.2295918367

treated
irrigated
feed not
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103.5.D Field Toxicity

DATA REVIEW NUMBER: ES CC4

TEST: Simulated Field Study

SPECIES: Bobwhite Quail (colinus virginianus)

RESULTS: The treatment area was a peach orchard. Birds populations were monitored on pretreatment Ex. days 8, 6, 4 and 1 and post-treatment days 1, 3, 8, 10, 13 and 15 by recording whether birds flew over, landed or were heard. The control area was monitored from 7:30 to 8:00 a.m., the treated area from 8:00 to 8:30 a.m. on each observation day. A transect was used on both control and treated area on Ex. day 1 and 15. This portion of the study did not produce any effect in noted bird populations that could be attributed to the treatment.

In the quail simulated field study one treated female died on experiment day 7 after losing 62 grams. The bird exhibited toxic symptoms similiar to cholin-
eastrase poisoning.

CHEMICAL: Nema-cur 15% Granular applied at 133 lbs Formulation/
acre (20 lbs. A.I.).

TITLE: Toxicity of Nema-cur 15% Granular to natural bird
population under field conditions and Bobwhite quail
under simulated field conditions for non bearing
fruit trees.

ACCESSION NO: Report No. 42063

STUDY DATE: November 13, 1974

RESEARCHER: Lamb, D. W.; J. R. Horton and R. E. Jones
Chemagro Agricultural Division
Research and Development

REGISTRANT: Chemical Research Division

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - the Bobwhite portion of the study
did not follow recommended protocol for a simulated
field study. The cages were not moved daily.

The study does not indicate how the food supplement is given to the test birds. The bird that died was not necropsied.

ADDITIONAL INFORMATION: Study done in Kansas.

The bird census portion of this study noted bird activity in three parameters. These parameters were birds observed in the plot/flying over the plot and birds heard but not seen in the plot. A bird census in an orchard that has been treated with a granular toxic material would be most applicable to those species which as a result of their feeding niche would be most likely exposed. This would probably apply to seed eating birds or duff scratching birds or even birds which tend to be insectivorous but spend time on the ground. If one only considers birds that would be effected in this fashion and not all bird activity a different picture emerges from the field census. Activity of Red-wing blackbirds, Quail, Robins, Sparrows tend to drop off. It should also be noted that the census ~~is~~ taken at a slightly different time of day in each area. The transect that is mentioned was on day 1 and day 15. The Quail that developed toxic symptoms died on day 7. It is possible that the census transects did not find dead birds that occurred and the carcasses were consumed by rodents or other scavengers. The length of the transect lines are not listed.

The simulated field study rising Quail did not mention movement of the pens on a regular basis. The Granular material was incorporated into the soil but one mortality was noted. The dead bird was not necropsied, and the 62 grams that it lost in body weight was not considered when the authors made weight change calculations. It is not likely, however that if the bird that died and the one that replaced it were eliminated from a comparison of weight changes that any significant difference would be found. The study is not clear as to the method and timing of food used supplements during the study.

103.5.0 Field Toxicity

DATA REVIEW NUMBER: ES GG

TEST: Field Observation Report

SPECIES: Avian

RESULTS: During the application of Nema-cur 3SC and 10G in a non bearing fruit orchard at Hilltop Orchards, Hartford, Michigan, a one hour search before appli-cation, and 8 days after observation gave the approximately the same number of birds and species as pretreatment. Dead birds were not observed along a 1/4 mile of trees and shrubs next to the treated area on day 8 post-treatment. The report concluded that under the conditions of the study there were no adverse effects on birds.

CHEMICAL: Nema-cur 15G 15 lbs. A.I./acre.
Nema-cur 3SC 10 lbs. A.I./acre.

TITLE: Observations on Birds in a Fruit Orchard at Hartford, Michigan.

ACCESSION NO: Report No. 411D6

STUDY DATE: July 2, 1974

RESEARCHER: Fisher, Robert A.
Chemagro Division of Baychem Corp.

REGISTRANT: Chemagro Chemical Corp.

VALIDATION CATEGORY: Supplemental

CATEGORY REPAIRABILITY: No - This is a one page letter which gives a report on field observations during the appli-cation of Nema-cur in an EUP program. The letter does not give specific details but it would appear that actual census techniques were not used. It should also be noted here that looking for dead birds 8 days after application of the material has no real mean-ingful significance. Dead birds would probably be consumed by scavengers, and if bird territories were available they would be filled by ingress.

104.0 Hazard Assessment

104.1 Discussion

Nemacur is an organophosphate compound which produces cholinesterase inhibition in effected species. It is used as a nematicide because it degrades to sulfoxide and sulfone and these compounds are picked up systemically by plants. Sulfoxide and sulfone are persistent, bind readily to soil particles and are not mobile away from the application site. This application is for registration on citrus for Nemacur 3, Nemacur 15 granular and Nemacur 10 granular. The application rates in this submission range from 15 lbs. up to 30 lbs A.I./acre for each of the formulations. The label enclosed mentioned light soil incorporation. ^{for discussion} If this light soil incorporation is equivalent to 0 - 1" soil incorporation, the following residues will occur based upon the maximum application rate.

Nemacur 3 at 30 lbs. A.I. = ^{66.2}~~88.2~~ ppm (^{31.2}~~41.6~~ mg/ft²)
 Nemacur 15 at 30 lbs. A.I. = ^{66.2}~~88.2~~ ppm (^{31.2}~~41.6~~ mg/ft²)
 Nemacur 10 at 30 lbs. A.I. = ^{66.2}~~88.2~~ ppm (^{31.2}~~41.6~~ mg/ft²)

If soil incorporation were to be done at 4 to 6 inches as some of the field studies were, the residue would change accordingly.

Nemacur 3 at 30 lbs. A.I. = ^{13.2}~~73.5~~ ppm - 4-6 inches soil incorporation
 Nemacur 15 granular at 30 lbs. A.I. = ^{13.2}~~17.64~~ ppm (^{6.24}~~8.32~~ mg/sq ft) with 4-6 inches soil incorporation
 Nemacur 10 granular at 30 lbs. A.I. = ^{13.2}~~17.64~~ ppm (^{6.24}~~8.32~~ mg/sq ft) with 4-6 inches soil incorporation.

104.1.1 Likelihood of Exposure to Non-target Organisms

Nemacur is a highly toxic organophosphate compound, which does not appear to be particularly specific in the nature of its toxicity to different species. The use of Nemacur in citrus groves will produce a high likelihood of exposure to birds and mammals. This use must be considered as a major crop addition. In 1975 in the United States 1,187,500.0 acres of citrus fruits were in production. These figures are based upon fruit production defined as the quantity of oranges, tangerines, temples, grapefruit, lemons, limes and tangelos sold or utilized in a production year. Citrus production on a less commercial scale is not included in these figures. Nemacur could be used in these non-commercial orchards if it were

registered further increasing risk. The label calls for light tilling followed by 1/2 to 1 inch of irrigation if conditions are dry.

The irrigation practice is not specific enough to assure that it will always follow application. Light tilling of nemacur at the rates called for can be expected to produce exposure to a large number of species. Wildlife utilization of citrus orchards is high as evidenced by Shell's "Wildlife Utilization of Croplands". There are 27 avian species listed as utilizing citrus orchards. The state listed in this publication is Arizona, which may not have the avian utilization that citrus groves in Florida and California may have due to more temperate climates. Exposure to small mammals is also expected to be high because of rodent use in orchards. Aquatic exposure can also be anticipated because of the areas where orchards are located are often chosen because of the need to be in the close proximity of irrigation water. Namacur binds readily to soil particles and surface transport during heavy rains is therefore, likely. If this transport were to take place it is very likely that aquatic damage would occur. Namacur is toxic to fish in the ppb range and its degradates are also toxic in the ppm range. Toxicological information on Namacurs effects on aquatic invertebrates are not available and complete environmental chemistry data on namacurs behavior in the environment are not available.

Because of the application methods described on the Namacur label and typical orchard practices the residue rates for the granular materials should be adjusted to account for broadcast application of the granular material in strips between the trees. For the purpose of this hazard evaluation we will assume that the normal orchard will have trees in 20 feet spacing and that the normal tree will have a canopy of approximately 20 feet. The area taken up by the tree = $\pi R^2 = 3.14159 (10^2) \times 90$; the # of trees/acre = 28274 sq. ft. It is estimated that due to the limitations in mechanized equipment the strips will be extended only partially under the canopy, and therefore, a doubling factor of the area actually covered by Namacur granules can be applied. The area that the Environmental Safety Section estimates that will be treated in one acre is approximately 30,572 sq. ft. ($43560 - 28274 = 15286 \times 2 = 30572$ sq. ft.). The application residue rates for granular material that hazard evaluation will be based upon are, therefore, increased by 33%. The light soil incorporation will be considered as the method that will produce normal exposure. The following expected residues and resultant exposure of toxic material will occur.

I. Expected Residues

	<u>Nemacur 3^a</u>	<u>Nemacur 15</u>	<u>Nemacur 10</u>
seeds	360 ppm	-	-
forage	1800 ppm	-	-
long grass	3000 ppm	-	-
ground surface	882 ppm (41.6 mg/ft ²)	117.2 ppm (54.1 mg/ft ²)	117.2 ppm (54.1 mg/ft ²)

^{a/} Estimates of Nemacur 3 are based upon treatment of all area in the acre.

II. Body Weight and Food Consumption Data

	<u>Ave. Weight (g)</u>	<u>Ave. Daily Food Cons.</u>
Bobwhite Quail	190 g	15.2 g
Mallard	1200 g	50 g
White Footed Mouse	30 g	4.5 g
Meadow Vole	70 g	7.0 g

III. Converting LD₅₀ Data From mg/kg to mg/animal Equivalent

	<u>LD₅₀ mg/kg</u>	<u>mg/Animal</u>
Bobwhite Quail	.8 mg/kg	0.152 mg
Mallard	1.68 mg/kg	2.016 mg
White Footed Mouse	4.75 mg/kg ^b	0.1425 mg
Meadow Vole	4.75 mg/kg ^b	0.3325 mg

^{b/} Based upon rat acute oral and the assumption that toxicity parallels that of above species.

IV. Potential Acute Exposure mg/day^c

<u>Species</u>	<u>Seed</u>	<u>Forage</u>	<u>Long grass</u>	<u>Granular</u>
Bobwhite	5.472	27.36	45.6	54.1 mg/ft ²
Mallard	18.0	90.0	150.0	54.1 mg/ft ²
White Footed Mouse	1.62	8.1	13.5	54.1 mg/ft ²
Meadow Vole	2.52	12.6	21.0	54.1 mg/ft ²

$$c/ \text{based upon} = \frac{\text{expected residue (ppm)} \times \text{ave. daily food cons. (g/day)}}{1000}$$

V. Comparison of Potential Acute Exposure (mg)/day to Toxicity (mg/animals).

<u>Species</u>	<u>Exposure (mg)</u>	<u>mg/animal</u>
Bobwhite Quail	5.472 (Seed) 27.36 (Forage) 45.6 (Long grass) 54.1 mg/ft ² Surface	> 0.152
Mallard	18.0 (Seed) 90.0 (Forage) 150.0 (Long grass) 54.1 mg/ft ² Surface	> 2.016
White Footed Mouse	1.62 (Seed) 8.1 (Forage) 13.5 (Long grass) 54.1 mg/ft ² Surface	> 0.1425
Meadow Vole	2.52 (Seed) 12.6 (Forage) 21.0 (Long grass) 54.1 mg/ft ² Surface	> 0.3325

Based upon the comparisons in V above it can be shown that adverse ecological effects can certainly be anticipated at the high application rates, particularly if irrigation does not immediately follow application.

The adverse ecological effects are even in stronger evidence due to the simulated field studies that Chemagro conducted. In the course of these field studies when Namacur was watered in mortality was decreased, but without irrigation there was strong evidence that Namacur would produce significant kills even at 6 inches of soil incorporation. These field studies were not conducted at 30 to 40 lbs. of A.I./acre that the label calls for on some crops, therefore, the maximum hazard was not approached. The label is also not specific enough as to the depth of soil incorporation and it is felt that the simulated field studies do not represent the actual conditions of application that the label implies and that the field studies, therefore, put the product in a more favorable position than it should hold.

It should also be pointed out that the registrant has not made any attempt to deal with [REDACTED] impurities that occur in Namacur. The Environmental Safety Section has not been provided with any data relating to the toxicity or persistence of these compounds.

The Section is also without important dietary studies for birds or mammals, which would be helpful in correctly assessing hazard. This data would also provide information that might be used in establishing a mini-chronicity ratio, which could be used in determination of need for chronic studies.

Namacur has also been noted to be particularly toxic to honey bees. It is not known at this time if it will have similar effects upon other non target beneficial insects, or whether honey bees or non target wasps will pick up granular materials to take back to the hives. It would appear the Namacur does not have adverse effects on soil microbes, but information on soil arthropods and annelids are not available. Namacur is not expected to represent any phytotoxic hazard to non target plants because of its systemic nature.

104.1.2 Endangered Species Considerations

Namacur use on citrus can be expected to be heaviest in orchards in Arizona, California, Florida and Texas. Citrus production occurs in other states but use would be considered very minor. The above mentioned states are known to have endangered species of birds, mammals, fishes and amphibians. The Environmental Safety Section does not have any toxicity information related to amphibians but it does have enough information to indicate that if endangered species of birds and mammals were to be associated with the use of Namacur in orchards a serious hazard would exist.

INFORMATION ON IMPURITIES (MANUFACTURING INFORMATION) IS NOT INCLUDED

In Florida a problem is not expected to exist for the Florida Key Deer, the Florida Kite, the Cape Sable Sparrow or the Dusky Seaside Sparrow because of differences in habitat requirements.

In California several endangered species occur in habitat similiar to orchards. Of particular note are the Santa Barbara Song Sparrow and the San Clemente Sage Sparrow but the Santa Barbara Song Sparrow is limited to salt marsh habitat and the Sage Sparrow to San Clemente Island. Other endangered species listed in California are the San Joaquin Ket Fox, the Salt Marsh Harvest Mouse, the Morro Bay Kangaroo Rat, the California Clopper Rail, the Santa Cruz Long Toed Salamander, the Blunt Nosed Leopard Lizard and the San Francisco Garter Snake. These species should not be impacted upon because they occur in habitat that is not suited to citrus production unless altered. Existing citrus groves will not be expected to harbor these species. In Arizona the Masked Bobwhite Quail and the Yuma Clapper Rail do not utilize habitat that would expose them to Namacur. In Texas the Mexican Duck and the Attwater Prairie Chicken are not found in habitat where they would be exposed. In general all the above listed endangered species exist only in limited habitat. This habitat is also endangered.

104.1.3 Adequacy of Toxicity Data

- I. The following studies have been reviewed and validated and have been found acceptable for making an environmental hazard assessment, as well as meeting basic data requirements.
 - A. The Fish Acute 96-hour LC₅₀ Coldwater Fish Species, Rainbow Trout, Review #ES G2.
 - B. The Fish Acute 96-hour LC₅₀ Warmwater Fish Species, Bluegill, Review # ES F7.
- II. The following studies have been reviewed and have not been found acceptable to meet basic data requirements.

Supplemental

 - A. Avian Acute Oral, Bobwhite Quail; Review # ES C1, This study was done on a formulated product containing [REDACTED] may seriously alter toxicity values.

INFORMATION ON INERT INGREDIENTS IS NOT INCLUDED

- B. Avian Acute Oral, Mallard Duck; Review # ES C2. This study did not identify the material tested and did not outline test protocols used.
- C. Avian Acute Oral, Canary; Review # ES C3. This was a letter that did not provide adequate information to assess value reported.
- D. Avian Acute Oral, Canary, Pigeon; Review # ES C4. This study does not follow acceptable test protocol.
- E. Avian Acute Oral, Mallard Duck, Pheasant; Review # ES C5. This study was nothing more than a screening test. Protocols used are not acceptable.
- F. Fish Acute 96-hour LC₅₀ - Rainbow. Review # ES G1. This study was conducted using a formulated product. This study could support Core data for aquatic uses.
- G. Fish Acute 96-hour LC₅₀ Warmwater - Catfish; Review # ES F1. This study used the formulated product. It would support Core data requirements for an aquatic use.
- H. Fish Acute 96-hour LC₅₀ Warmwater - Gambusia and Poccililia. Review # ES F2. The species of fish tested and the test protocols do not meet basic data requirements.
- I. Fish Acute 96-hour LC₅₀ Warmwater - Black Bullhead. Review # ES F3. The species of fish tested, number of fish and test protocols do not meet basic data requirements.
- J. Fish Acute 96-hour LC₅₀ Warmwater - Gambusia and Poccililia; Review # ES F4. The species of fish tested and test protocols do not meet basic data requirements.
- K. Fish Acute 96-hour LC₅₀ Warmwater - Gambusia; Review # ES F5. The species of fish tested and test protocol are not adequate to meet basic data requirements.
- L. Fish Acute 96-hour LC₅₀ Warmwater - Bluegill; Review # ES F8. The test did not follow protocols that meet basic data requirements.

- M. 48-hour Acute LC₅₀ Eastern Oyster; Review # ES S1. The study only tested 3 dose levels and did not determine an LC₅₀.
- N. 48-hour Acute LC₅₀ Shrimp; Review # ES M1. This study needs to have test method described and raw data submitted.
- O. Fish Acute 96-hour LC₅₀ - Marine; Review # ES Q1. This study did not follow test protocols which satisfy basic data requirements.
- P. Simulated Field Study, Review # ES CC1. The study did not follow recommended protocols.
- Q. Simulated Field Study, Review # ES CC2. The study did not follow recommended protocols.
- R. Simulated Field Study, Review # ES CC3. The study did not follow recommended protocols.
- S. Simulated Field Study, Review # ES CC4. The study did not follow recommended protocols.
- T. Field Observation Report, Review # ES 66. This is a letter summarizing findings. It does not provide data which can be used to assess conclusion reached.

III. The following study was found inadequate:

- A. Fish Acute 96-hour LC₅₀ Warmwater; Review # ES F5. The study was aerated.

1D4.1.4 Additional Data Required

The following basic data requirements have not been submitted or referenced.

- A. The Dietary LC₅₀ for one species of waterfowl (Mallard Duck) and one species of upland game bird (Bobwhite Quail or Ring-necked Pheasant).
- B. The acute 48-hour LC₅₀ for an aquatic invertebrate (Daphnia sp. preferably).

The following studies were submitted and have been reviewed, and do not support basic data requirements. These studies must be conducted again following recommended protocols.

- C. The Avian Acute Oral LD₅₀ for One Species of Waterfowl (Mallard Duck preferably) or One Species of Upland Game Bird (Ring-necked Pheasant or Bobwhite Quail). The above studies are required on technical grade Nemacur.

The following conditional studies have been submitted and have been found inadequate to answer questions relating to the safe use of this product. This study should be conducted using protocols recommended by the Environmental Safety Section.

- A. The small pen simulated field test utilizing mammals and birds should be conducted under field conditions that represent this use pattern.

The following conditional studies are required to support registration of this product. These decisions are reached as a result of the toxic nature of the technical, the persistence of its degradates and the application rates at which it is applied and residues expected after application.

- A. An Avian Reproduction study is required on Bobwhite Quail and Mallard Duck. This study is required on technical grade Nemacur.
- B. Studies on non target insects that are considered beneficial will be required due to the toxic nature of this chemical to honey bees.
- C. A Mammal Acute Oral LD₅₀ on a representative species of wild mammal that is likely to be exposed.

The Environmental Safety Section requires additional current information from Environmental Chemistry before reaching decisions on other conditional studies that may be required. An area that needs additional information is the behavior of the [REDACTED] that are listed as impurities in technical Nemacur. This additional information should cover these impurities from the stand point of persistence and what they degrade into. It may also be appropriate to conduct the basic toxicity tests on those impurities that are present in the largest quantities or that may disassociate from the other compounds.

INFORMATION ON IMPURITIES (MANUFACTURING INFORMATION) IS NOT INCLUDED

107.0 Conclusions

107.1 Environmental Fate and Toxicology

The Environmental Safety Section has not been supplied with a current review of either Environmental Chemistry Data or Human Toxicology data upon which decisions related to mammalian toxicity or fate of the chemical in the environment can be made.

107.2 Classification

This chemical lacks basic data that is required before classification can proceed.

107.4 Data Adequacy

The following data have been found acceptable to support registration.

- A. The Fish Acute 96-hour LC_{50} coldwater fish species, technical grade Nema-cur.
- B. The Fish Acute 96-hour LC_{50} warmwater fish species, technical grade Nema-cur.

107.5 Data Requests

The following data are required by the Environmental Safety Section before an Environmental Hazard assessment can be made. These data requests are to fill data gaps where previously studies have been submitted and found unacceptable, or data has not been referenced or submitted and a need is felt to exist of the studies.

- A. The Avian Acute Oral LD_{50} for one species of waterfowl (Mallard Duck, preferably) or one species of upland game bird, (Ring-necked Pheasant or Bobwhite Quail). The studies submitted are not acceptable because they were not conducted using the technical grade material as is required.
- B. The dietary LC_{50} for one species of waterfowl (Mallard Duck) and one species of upland game bird (Bobwhite Quail or Ring-necked Pheasant). This study must be conducted on the technical grade material.

- C. The Acute 48-hour LC₅₀ for an aquatic invertebrate (Daphnia sp., preferably). This study must be conducted on the technical grade material.
- D. An Avian Reproduction Study is required on Bobwhite Quail and Mallard Duck. This study is required for the technical grade material. Levels that should be tested will depend upon dietary LC₅₀ values for these species and residue levels that will be expected under field conditions. The registrant should contact the Environmental Safety Section for guidance.
- E. An mammal acute LD₅₀ on a representative species of wild mammal will be required due to the toxic nature of the chemical, the likelihood of exposure and the possibility of exposure to endangered species.
- F. Small pen simulated field studies utilizing birds and mammals will be required. These studies should be conducted under field conditions that most closely represent this use pattern rates of application and label directions. The registrant should contact the Environmental Safety Section for guidance.
- G. The registrant should also be informed that the Environmental Safety Section is concerned about the [redacted] impurities in Technical Nema-cur. Pending input of information from the Environmental Chemistry, additional toxicity data may be required for the impurities and their degradates. The registrant should address this problem and the relative persistence of these impurities and their degradates.
- H. The registrant should also be informed that the Environmental Safety Section is concerned about the toxic nature of this chemical as it relates to beneficial insects. The registrant should address means of identifying if exposure problems will occur. The registrant should also stay informed of possible data requirements that may come into existence in the future for beneficial insects.

107.7 Recommendations

The Environmental Safety Section cannot concur with the Registration of Nema-cur 3, 10G and 15G on citrus. The reasons for this decision are as follows:

INFORMATION ON IMPURITIES (MANUFACTURING INFORMATION) IS NOT INCLUDED

1. The use pattern is considered as a major crop addition.
2. Environmental Chemistry and Toxicology Reviews are not available for use in a hazard assessment.
3. Basic data required for registration is not available.
4. Application rates of this product are high and without all basic data it is not possible to predict the severity of adverse ecological effects.

Thomas F O'Brien HRC

Thomas F. O'Brien
Environmental Safety Section
EEEB RD WH 567

November 25, 1977

104.0 Hazard Assessment104.1 Discussion

Nemacur is an organophosphate compound which acts by inhibiting cholinesterase in affected species. It is used as a soil nematicide, but has an additional advantage in that it is taken up systemically by the roots, thereby being efficacious for nematodes that have burrowed into the roots. Its systemic action also confers some insecticidal benefit against sucking insects such as mites and aphids. Nemacur, as the parent compound, is effective against the target pests, but the sulfone and sulfoxide degradates probably contribute substantially to the overall effectiveness (R. Michell, personal communication). The activity is moderately persistent, with 100% efficacy being achieved at 10kg/ha for 3 months following a single application (B. Homeyer, 1971. Nemacur, a highly effective nematocide for protective and curative application. Pflanzenschutz-Nachrichten, 24(1):48-68). Nemacur and its degradates bind readily to soil particles and are not transported down from the application site.

This application is for registration on citrus for Nemacur 3, Nemacur 15 granular, and Nemacur 10 granular. The proposed application rates are 15-30 pounds a.i. per acre for each of the formulations. The submitted label specified, for the granulars, immediate incorporation by light raking or tilling. If this incorporation is equivalent to 0-1 inch soil incorporation, then expected residues following application at the maximum rate will be 66.2 ppm (31.2 mg/ft²) for each of the granulars (ref: R. Felthousen memo on classification of granulated formulations, 9/9/77). Since no soil incorporation was specified for Nemacur 3, maximum expected residues would be 662 ppm (312 mg/ft²) on the soil surface. The label for all formulations calls for 1/2 - 1 inch of flood or overhead irrigation under dry conditions. The efficacy review by R. Michell requested that, for Nemacur 3, such irrigation occur under all conditions unless a "drench" application is made.

A substantial reduction in surface residues could be made through soil incorporation to a depth of 4-6 inches, as was done in several of the field studies. Such incorporation would result in residues in the top 0.1 inch of 13.2 ppm (6.24 mg/ft² for granulars) for all formulations.

104.1.1 Likelihood of Exposure to Non Target Organisms

Nemacur is a highly toxic organophosphate pesticide. It is not only toxic to the target nematodes, but is also highly toxic to all animal species that have been tested, including birds, fish, mammals, and some arthropods. The use of Nemacur on citrus crops will produce a high likelihood of exposure to birds and mammals. This use must be considered a major crop addition, as there were 1,179,200 acres of commercial citrus (oranges, tangerines, temples, grapefruit, lemons, limes, and tangelos) in the U.S. in 1975 (USDA, 1977. Agricultural Statistics, 614 pp). This acreage includes all citrus grown on all farms, but does not include a limited amount of non-commercial production.

Wildlife utilization of citrus orchards would be expected to be high, both for birds and mammals. Gusey and Maturgo (Wildlife Utilization of Croplands, Shell Oil Co., 1972) give information on only two states. They list 27 different "primary" avian species that utilize citrus in Arizona and deer and racoon feeding in orange groves in Florida. Small mammals would be expected to have moderate to high utilization of citrus orchards also. Considering the geographic spread of citrus, this would include a wide variety of cricetid, heteromyid, and sciurid rodents, lagomorphs, insectivores, and bats. In some areas, particularly in Florida, exposure to aquatic organisms is also likely to occur. Ground water contamination should not be a problem. However, Nemacur binds to the soil and surface transport may occur during heavy rains. Considering that all tested birds, fish, and mammals are quite sensitive to Nemacur, the likelihood of adverse effects is high.

Because of the application methods described on the Nemacur label and typical orchard practices, the residue rates for the granular materials should be

adjusted to account for broadcast application of the granular material in strips between the trees. For the purpose of this hazard evaluation it is assumed that the normal orchard has trees in 20 feet spacing and that the normal tree will have a canopy of approximately 20 feet. The area taken up by the tree = $\pi R^2 = 3,14159 (10^2) \times 90$; the # of trees/acre = 28274 sq. ft. It is estimated that due to the limitations in mechanized equipment, the strips will be extended only partially under the canopy. The area that Ecological Effects estimates will be treated in one acre is approximately 30,572 sq. ft. ($43560 - 28274 = 15286 \times 2 = 30572$ sq. ft. The application residue rates for granular material that hazard evaluation will be based upon are, therefore, increased by 33%. The light soil incorporation will be considered as the method that will produce normal exposure. The following expected residues and resultant exposure of toxic material will occur.

I. Expected Residues

	<u>Nemacur 3</u> ^a	<u>Nemacur 15</u> ^b	<u>Nemacur 10</u> ^b
seeds	360 ppm	-	-
forage	1800 ppm	-	-
long grass	3000 ppm	-	-
ground surface	662 ppm (31.2 mg/ft ²)	88.3 ppm ₂ (41.6 mg/ft ²)	88.3 ppm (41.6 mg/ft ²)

^a Estimates of Nemacur 3 are based upon treatment of all area in the acre.

^b Residues calculated based upon initial residues following incorporation and increased by 33% for application method (see above paragraph).

II. Body Weight and Food Consumption Data

	<u>Ave. Weight (g)</u>	<u>Ave. Daily Food Cons.</u>
Bobwhite Quail	190 g	15.2 g
Mallard	1200 g	50 g
White Footed Mouse	30 g	4.5 g
Meadow Vole	70 g	7.0 g

III. Converting LD₅₀ Data from mg/kg to mg/animal Equivalent

	<u>LD₅₀ mg/kg</u>	<u>mg/Animal</u>
Bobwhite Quail	.8 mg/kg	0.152 mg
Mallard	1.68 mg/kg	2.016 mg
White Footed Mouse	4.75 mg/kg ^c	0.1425 mg
Meadow Vole	4.75 mg/kg ^c	0.3325 mg

^c Based upon rat acute oral and the assumption that toxicities are comparative.

IV. Potential Acute Exposure mg/day^d

<u>Species</u>	<u>Seed</u>	<u>Forage</u>	<u>Long Grass</u>	<u>Granular</u> ^e
Bobwhite	5.472	27.36	45.6	41.6 mg/ft ²
Mallard	18.0	90.0	150.0	41.6 mg/ft ²
White Footed Mouse	1.62	8.1	13.5	41.6 mg/ft ²
Meadow Vole	2.52	12.6	21.0	41.6 mg/ft ²

^d Based upon = $\frac{\text{expected residue (ppm)} \times \text{ave. daily food cons.}}{1000 (\text{g/day})}$

^e Based upon granules available on soil surface following light incorporation (See Table I above).

V. Comparison of Potential Acute Exposure (mg)/day to Toxicity (mg/animals).

<u>Species</u>	<u>Exposure</u>	<u>mg/animal</u>
Bobwhite	5.472 (Seed)	
	27.36 (Forage)	> 0.152
	45.6 (Long ₂ grass)	
	41.6 mg/ft ² Surface	
Mallard	18.0 (Seed)	
	90.0 (Forage)	> 2.016
	150.0 (Long ₂ grass)	
	41.6 mg/ft ² Surface	
White Footed Mouse	1.62 (Seed)	
	8.1 (Forage)	> 0.1425
	13.5 (Long ₂ grass)	
	41.6 mg/ft ² Surface	

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Meadow Vole	2.52 (Seed)	
	12.6 (Forage)	> 0.3325
	21.0 (Long ₂ grass)	
	41.6 mg/ft ² Surface	

Based upon the comparisons in V above it can be shown that adverse ecological effects can be anticipated at the high application rates, particularly if irrigation does not immediately follow application.

There is strong evidence of adverse effects from the simulated field studies that Chemagro conducted. In these field studies, when Nemacur was watered in, mortality was decreased, but without irrigation there was strong evidence that Nemacur would produce significant kills even at 6 inches of soil incorporation. These field studies were not conducted at 30 to 40 lbs. of A.I./acre that the label calls for on some crops. Therefore, the maximum hazard was not approached. The label is also not specific enough as to the depth of soil incorporation. It is felt that the simulated field studies do not represent the actual conditions of application for the proposed use on citrus.

Ecological Effects is lacking important avian dietary studies that are necessary for accurately assessing the hazards to nontarget animals. Information from these studies would also be useful in determining the potential chronic hazard and subsequent chronic studies that may be required.

Nemacur is also toxic to honeybees. The contact LD₅₀ for BAY 68138 to honeybees is 1.87 mcg/bee (A.W. Vaughan, personal communication). There is also a potential, because of the systemic nature of Nemacur, for exposure through nectar. This applies not only to nectar-feeding insects, but also to hummingbirds, which are listed in Gusey and Maturgo as avian species utilizing citrus orchards. Environmental Chemistry data indicate little effect upon soil microbes, but based upon the available data, adverse effects can be expected upon soil arthropods and probably earthworms. Nemacur is not expected to represent a phytotoxic hazard to nontarget plants.

In the absence of several minimum studies, the above discussion should not be considered definitive. Data are needed for acute toxicity to birds and aquatic invertebrates along with avian dietary studies. In addition, an analysis of the acute hazard to birds and mammals requires knowledge of the size of the granules. A better definition of the environmental fate is also necessary. A more complete hazard assessment will be made when all such data are available.

104.1.2 Endangered Species Considerations

Nemacur use on citrus can be expected to be heaviest in orchards in Arizona, California, Florida and Texas. Citrus production occurs in other states but use would be considered very minor. The above mentioned states are known to have endangered species of birds, mammals, fishes and amphibians. The Environmental Safety Section does not have any toxicity information related to amphibians but it does have enough information to indicate that if endangered species of birds and mammals were to be associated with the use of Nemacur in orchards a serious hazard could exist.

In Florida a problem is not expected to exist for the Florida Key Deer, the Florida Kite, the Cape Sable Sparrow or the Dusky Seaside Sparrow because of differences in habitat requirements.

In California several endangered species occur in habitat similar to orchards. Of particular note are the Santa Barbara Song Sparrow and the San Clemente Sage Sparrow, but the Santa Barbara Song Sparrow is limited to salt marsh habitat and the Sage Sparrow to San Clemente Island. Other endangered species listed in California are the San Joaquin Kit Fox, the Salt Marsh Harvest Mouse, the Morro Bay Kangaroo Rat, the California Clapper Rail, the Santa Cruz Long Toed Salamander, the Blunt Nosed Leopard Lizard and the San Francisco Garter Snake. These species should not be impacted upon because they occur in habitat that is not suited to citrus production unless altered. Existing citrus groves will not be expected to harbor these species. In Arizona the Masked Bobwhite Quail and the Yuma Clapper Rail do not utilize habitat that would expose them to Nemacur. In Texas the Mexican Duck and the Attwater Prairie Chicken are not found in habitat where they would be exposed. In general all the above listed endangered species exist only in limited habitat. These habitats are also endangered.

104.1.3 Adequacy of Toxicity Data

- I. The following studies have been reviewed and validated and have been found acceptable for making an environmental hazard assessment, as well as meeting basic data requirements:

- A. The Fish Acute 96-hour LC₅₀ Coldwater Fish Species, Rainbow Trout; Review #ES G2.
- B. The Fish Acute 96-hour LC₅₀ Warmwater Fish Species, Bluegill; Review #ES F7.

II. The following studies have been reviewed and have not been found acceptable to meet basic data requirements, but do provide supplemental information:

- A. Avian Acute Oral, Bobwhite Quail; Review # ES C1. This study was done on a formulated product containing [REDACTED] may seriously alter toxicity values.
- B. Avian Acute Oral, Mallard Duck; Review # ES C2. This study did not identify the material tested and did not outline test protocols used.
- C. Avian Acute Oral, Canary; Review # ES C3. This was a letter that did not provide adequate information to assess the reported results.
- D. Avian Acute Oral, Canary, Pigeon; Review # ES C4. This study does not follow acceptable test protocol.
- E. Avian Acute Oral, Mallard Duck, Pheasant; Review # ES C5. This study was a screening test. Protocols used are not acceptable.
- F. Fish Acute 96-hour LC₅₀ - Rainbow; Review # ES G1. This study was conducted using a formulated product. This study could support Core data for aquatic uses.
- G. Fish Acute 96-hour LC₅₀ Warmwater- Catfish; Review # ES F1. This study used the formulated product. It would support Core data requirements for an aquatic use.
- H. Fish Acute 96-hour LC₅₀ Warmwater- Gambusia and Poecilia; Review # ES F2. The species of fish tested and the test protocols do not meet basic data requirements.

INFORMATION ON INERT INGREDIENTS IS NOT INCLUDED

- I. Fish Acute 96-hour LC₅₀ Warmwater- Black Bullhead; Review # ES F3. The species of fish tested, number of fish and test protocols do not meet basic data requirements.
- J. Fish Acute 96-hour LC₅₀ Warmwater- Gambusia and Poecilia; Review # ES F4. The species of fish tested and test protocols do not meet basic data requirements.
- K. Fish Acute 96-hour LC₅₀ Warmwater- Gambusia; Review # ES F5. The species of fish tested and test protocol are not adequate to meet basic data requirements.
- L. Fish Acute 96-hour LC₅₀ Warmwater- Bluegill; Review # ES F8. The test did not follow protocols that meet basic data requirements.
- M. Forty-eight-hour Acute LC₅₀ Eastern Oyster; Review # ES S1. The study only tested 3 dose levels and no LC₅₀ was determined.
- N. Forty-eight-hour Acute LC₅₀ Shrimp; Review # ES M1. This study needs to have test method described and raw data submitted.
- O. Fish Acute 96-hour LC₅₀ - Marine; Review # ES Q1. This study did not follow test protocols which satisfy basic data requirements.
- P. Simulated Field Study, Review # ES CC1. The study did not follow recommended protocols.
- Q. Simulated Field Study, Review # ES CC2. The study did not follow recommended protocols.
- R. Simulated Field Study, Review # ES CC3. The study did not follow recommended protocols.
- S. Simulated Field Study, Review # ES CC4. The study did not follow recommended protocols.

- T. Field Observation Report, Review # ES 661. This is a letter summarizing findings. It does not provide data which can be used to assess conclusion reached.

III. The following study was found inadequate:

- A. Fish Acute 96-hour LC₅₀ Warmwater; Review # ES F5. The study was aerated.

104.1.4 Additional Data Required

The following basic data requirements have not been submitted or referenced:

- A. The Dietary LC₅₀ for one species of waterfowl (Mallard Duck) and one species of upland game bird (Bobwhite Quail or Ring-neck Pheasant).
- B. The Acute 48-hour LC₅₀ for an aquatic invertebrate (Daphnia sp. preferably).

The following studies were submitted and have been reviewed. They do not meet basic data requirements to support registration.

- C. The Avian Acute Oral LD₅₀ for One Species of Waterfowl (Mallard Duck preferably) or One species of Upland Game Bird (Ring-necked Pheasant or Bobwhite Quail). The above studies are required on technical grade Namacur.

The following additional studies have been submitted and have been found inadequate to answer questions relating to the safe use of this product on citrus.

- A. The small pen simulated field test utilizing mammals and birds should be conducted under field conditions that represent this use pattern.

107.0 Conclusions

107.1 Environmental Fate and Toxicology

Ecological Effects has not been supplied with a current review of either Environmental Chemistry Data or Human Toxicology data upon which decisions related to mammalian toxicity or fate of the chemical in the environment can be made.

107.2 Classification

Classification decision is deferred until data requirements have been satisfied.

107.4 Data Adequacy

The following data have been found acceptable to support registration:

- A. The Fish Acute 96-hour LC_{50} coldwater fish species, technical grade Nemacur.
- B. The Fish Acute 96-hour LC_{50} warmwater fish species, technical grade Nemacur.

107.5 Data Requests

The following data are required by Ecological Effects before an Environmental Hazard assessment can be made. These data requests are to fill data gaps where studies were found unacceptable, or data have not been referenced or submitted.

- A. The Avian Acute Oral LD_{50} for one species of waterfowl (Mallard Duck, preferably) or one species of upland game bird, (Ring-necked Pheasant or Bobwhite Quail). The studies submitted are not acceptable because they were not conducted using the technical grade material.
- B. The dietary LC_{50} for one species of waterfowl (Mallard Duck) and one species of upland game bird (Bobwhite Quail or Ring-necked Pheasant). These studies must be conducted on the technical grade material.

9/20/78

- C. The Acute 48-hour LC₅₀ for an aquatic invertebrate (*Daphnia* sp., preferably). This study must be conducted on the technical grade material.
- D. Small pen simulated field studies utilizing birds and mammals are required. These studies should be conducted under conditions that closely simulate rates of application and label directions for citrus.
- E. Information on the toxic nature of this chemical as it related to beneficial insects should be provided.

107.7 Recommendations

The Environmental Safety Section cannot concur with the Registration of Nema-cur 3, 10G and 15G on citrus. There are insufficient fish and wildlife data to complete a hazard assessment.

Originally reviewed by T.F. O'Brien, 11/25/77. Amended by:

Larry W. Turner
 Larry W. Turner

Ecological Effects Branch, Section 1
September 20, 1978

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 James W. Akerman, Section Head
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9/20/78