



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

28 MAR 1988

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Registration Standard (RSTR) for Diazinon -
Nontarget Insect Studies

FROM: Allen W. Vaughan, Entomologist *Allen W. Vaughan*
Ecological Effects Branch *3/17/88*
Hazard Evaluation Division (TS-769-C)

THRU: Otto Gutenson, Acting Head - Section 4
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C) *Otto Gutenson*
3/17/88

THRU: Henry T. Craven, Acting Chief
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C) *Henry T. Craven*
3/22/88

TO: George LaRocca, PMT-15
Insecticide/Rodenticide Branch
Registration Division (TS-767-C)

The Ecological Effects Branch (EEB) has reexamined the Diazinon Registration Standard with regard to nontarget insects. EEB's nontarget insect hazard evaluation remains essentially unchanged. Diazinon is highly toxic to honey bees and displays residual toxicity under certain field conditions. Based on data reviewed under the standard, labels for diazinon products (except granulars) intended for outdoor use should bear the following statement:

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

Also, the following auxiliary statements should be placed in the use directions as appropriate:

- (A) Foliar application to alfalfa, peas, or beans: "Do not apply if the crop or weeds in the treatment area are in bloom."

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(B) Foliar application to corn: "Do not apply to corn during the pollen shed period."

(C) Foliar application to listed fruit trees (apple, cherry, peach, plum, citrus): "Do not apply when trees or substantial numbers of weeds in the orchard (grove) are in bloom."

No further testing is required on diazinon effects on nontarget insects.

cc: B. Lowery (SPSMS/HED)
E. Saito (SIPS/HED)

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NEW MEXICO

Chihuahua chub
Gila trout
New Mexican ridge-nosed rattlesnake
Pecos bluntnose shiner
Pecos Gambusia
Socorro isopod

NORTH CAROLINA

Freshwater mollusks
Spotfin chub

NORTH DAKOTA

Interior least tern

Piping plover

OHIO

Freshwater mollusks
Scioto Madtom

OKLAHOMA

Leopard darter
Ozark cavefish

OREGON

Borax lake chub
Foskett speckled dace
Hutton tui chub
Warner sucker

SOUTH DAKOTA

Interior least tern

Piping plover

TENNESSEE

Amber darter
Conasauga logperch
Freshwater mollusks

Slackwater darter

Grant
Catron and Grant
Hidalgo
Chaves, DeBaca and Eddy
Chaves, Eddy
Socorro

Edgecombe, Nash and Pitt
Macon and Swain

Burleigh, Emmons, McKensie, McLean,
Mercer, Morton and Oliver
Banson, Bottineau, Burke, Burleigh,
Divide, Dunn, Eddy, Foster, Kidder,
Logan, McHenry, McIntosh, McKenzie,
McLean, Morton, Mountrail, Nelson,
Oliver, Pierce, Ramsey, Ranville,
Rolette, Sheridan, Sioux, Stutsman,
Towner, Ward, Wells and Williams

Williams and Washington
Pickaway

Pushmataha and McOurtain
Delaware

Harney
Lake
Lake
Lake

Clay, Haakon, Hughs, Potter,
Stanley, Sully, Union, Walworth,
Yankton and Ziebach
Clay, Hughs, Potter, Stanley, Sully,
Union, Walworth and Yankton

Bradley and Polk
Bradley and Polk
Bedford, Blount, Claiborne, Decatur,
Franklin, Hancock, Hardin, Hawkins,
Hickman, Knox, Lincoln, Loudon,
Marshall, Maury, Meigs, Monroe,
Rhea, Roane, Scott, Sequatchie,
Smith, Sullivan, Trousdale and Wayne
Lawrence and Wayne

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TENNESSEE

Slender chub
Snail darter

Spotfin chub
Yellowfin madtom

TEXAS

Clear creek gambusia
Comanche springs pupfish
Fountain darter
Houston toad
Leon springs pupfish
Pecos gambusia
San Marcos gambusia
San Marcos salamander

UTAH

Colorado squawfish
Bonytail chub
Humpback chub

Desert tortoise
June sucker
Woundfin

VIRGINIA

Slender chub
Spotfin chub
Yellowfin madtom
Freshwater mollusks

WISCONSIN

Freshwater mollusks

WYOMING

Kendall Warm Springs dace
Wyoming toad
Whooping crane

Claiborne and Hancock
Blount, Bradley, Hamilton, Knox,
Loudon, Marion, Meigs and Polk
Cumberland, Hawkins, Morgan and Sullivan
Claiborne, Hancock and Monroe

Menard
Jeff Davis and Reeves
Comal and Hays
Bastrop, Burleson and Harris
Pecos
Jeff Davis, Pecos and Reeves
Hays
Hays

Carbon, Emery, Garfield,
Grand, San Juan, Uintah and
Wayne

Washington
Utah
Washington

Lee and Scott
Scott and Washington
Lee, Russell and Scott
Lee, Russell, Scott, Smyth, Tazewell,
Washington and Wise

Crawford, Grant, Iowa, Pierce, Polk,
Richland, St. Croix and Vernon

Sublette
Albany
Lincoln and Sublette

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Paiute cutthroat trout
Santa Cruz long-toed salamander
Unarmored threespine stickleback

Valley elderberry longhorn beetle

COLORADO

Colorado squawfish
Bonytail chub
Humpback chub
Greenback cutthroat trout

FLORIDA

Eastern indigo snake
Florida grasshopper sparrow

Okaloosa darter

GEORGIA

Amber darter
Conasauga logperch
Eastern indigo snake

Snail darter

HAWAII

Hawaiian goose

IDAHO

Whooping crane

ILLINOIS

Freshwater mollusks

INDIANA

Freshwater mollusks

IOWA

Freshwater mollusks

Alpine, Madera and Mono
Monterey and Santa Cruz
Los Angeles, San Bernardino and
Santa Barbara
Butte, Colusa, Glenn, Merced, Sacramento,
Sutter, Tehama and Yolo

Delta, Mesa, Moffat and Rio Blanco
Mesa and Moffat
Mesa and Moffat
Boulder, Larimer and Park

Statewide
Glades, Highlands, Ocoosa, Okeechobee
and Polk
Okaloosa and Walton

Cherokee, Murray and Whitfield
Murray and Whitfield
Appling, Atkinson, Bacon, Baker,
Ben Hill, Bleckley, Berrien,
Brantley, Brooks, Bryan, Bullock,
Calhoun, Camden, Candler, Charlton,
Chatham, Clinch, Coffee, Colquitt,
Cook, Crisp, Decatur, Dodge, Dooly,
Dougherty, Early, Echols, Effingham,
Emanuel, Evans, Glynn, Grady, Irwin,
Jeff Davis, Jenkins, Johnson, Lanier,
Laurens, Lee, Liberty, Long, Lowndes,
Macon, McCintosh, Miller, Mitchell,
Montgomery, Pierce, Pulaski, Screven,
Seminole, Telfair, Tattnall, Thomas,
Tift, Toombs, Treutlen, Turner, Ware,
Wayne, Wheeler, Wilcox and Worth
Catoosa

Islands of Maui, Hawaii and Kauai

Caribou, Bear Lake and Bonneville

Gallatin, Handerson, Jo Daviess,
Massac, Mercer, Pike, Pulaski,
Rock Island and White

Dekalb and Posey

Allamakee, Clayton, Clinton, Des Moines,
Dubuque, Fayette, Jackson, Louisa,
Muscatine and Scott

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KANSAS

Interior least tern
Piping plover

Clark, Comanche, Meade and Stafford
Clark, Comanche, Meade and Stafford

KENTUCKY

Freshwater mollusks

Ballard, Butler, Edmundson, Green,
Hart, Jackson, Laurel, Livingston,
Marshall, McCracken, McCreary,
Pulaski, Rockcastle, Taylor, Warren
and Wayne

MARYLAND

Maryland darter

Harford

MINNESOTA

Freshwater mollusks

Houston and Washington

MISSISSIPPI

Bayou darter
Freshwater mollusks

Claiborne, Copiah and Hinds,
Itawamba, Lowndes, Monroe and Noxubee

Mississippi sandhill crane

Jackson

MISSOURI

Freshwater mollusks

Bollinger, Butler, Cedar, Cole,
Franklin, Gasconade, Jefferson,
Massack, Miller, Ralls, Ripley,
St. Louis and Wayne
Benton, Camden, Dallas, Greene, Hickory,
Miller, Osage, Polk, St. Clair and Webster
Barry, Christian, Greene, Jasper,
Lawrence, Newton and Stone

Niangua darter

Ozark cavefish

Garfield, McCone, Sheridan and
Valley

MONTANA

Piping plover

NEBRASKA

Interior least tern
and Piping plover

Boyd, Brown, Buffalo, Butler, Cass,
Cedar, Colfax, Dawson, Dodge,
Douglas, Hall, Hamilton, Holt, Howard,
Kearney, Keya Paha, Knox, Merrick,
Nance, Phelps, Platte, Polk, Rock,
Sarpy and Saunders

NEVADA

Ash Meadows Amargosa pupfish
Ash Meadows speckled dace
Cui-ui
Devils hole pupfish
Pahranagat bonytail
Pahrump killifish
Warm springs pupfish
Woundfin

Nye
Nye
Washoe
Nye
Lincoln
Clark and White Pine
Nye
Clark

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Piping plover

Clay, Hughs, Potter, Stanley, Sully, Union,
Walworth and Yankton

TENNESSEE

Slackwater darter

LAWRENCE AND WAYNE

Freshwater mussels

BEDFORD, BLOUNT, CLAIBORNE, DECATUR, FRANKLIN,
HANCOCK, HARDIN, HICKMAN, KNOX, LINCOLN, LOUDON,
MARSHALL, MAURY, MEIGS, MONROE, RHEA, ROANE, SCOTT,
SEQUATCHIE, SMITH, SULLIVAN, TROUSDALE AND WAYNE

TEXAS

Aplomado falcon

CAMERON

Attwater's greater
prairie chicken

ARANSAS, AUSTIN, COLORADO, FORT BEND, GOLIAD,
REFUGIO AND VICTORIA

Comanche Springs
pupfish

JEFF DAVIS AND REEVES

Pecos gambusia

JEFF DAVIS, PECOS AND REEVES

Texas blind salamander

HAYS

San Marcos salamander

COMAL AND HAYS

San Marcos gambusia

HAYS

Houston toad

BASTROP, BURLESON AND HARRIS

Fountain darter

COMAL AND HAYS

UTAH

Woundfin

WASHINGTON

June sucker

UTAH

VIRGINIA

Freshwater mussels

LEE, RUSSEL, SCOTT, SMYTH, TAZEWELL,
WASHINGTON AND WISE

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Delta green ground beetle SOLANO

Valley elderberry
longhorn beetle BUTTE, COLUSA, GLENN, MERCED, SACRAMENTO,
SUTTER, TEHEMA AND YOLO

Kern primrose sphinx moth KERN

FLORIDA

Everglade Snail Kite BROWARD, DADE, GLADES, INDIAN RIVER, OSCEOLA,
PALM BEACH, POLK AND ST. LUCIE

Wood stork ALACHUA, BAKER, BRADFORD, BREVARD, BROWARD,
CHARLOTTE, CITRUS, CLAY, COLLIER, COLUMBIA,
DADE, DE SOTO, DIXIE, DUVAL, FLAGLER, GADSDEN,
GILCHREST, GLADES, HARDEE, HENDRY, HERNANDO,
HIGHLANDS, HILLSBOROUGH, INDIAN RIVER, JEFFERSON,
LAFAYETTE, LAKE, LEE, LEON, LEVY, MADISON, MANATEE,
MARION, MARTIN, MONROE, NASSAU, ORANGE, OKEECHOBEE,
OSCEOLA, PALM BEACH, PASCO, PINELLAS, POLK,
PUTNAM, ST. JOHNS, ST. LUCIE, SARASOTA, SEMINOLE,
SUMTER, SUWANNEE, TAYLOR, UNION, VOLUSIA AND
WAKULLA

GEORGIA

Wood stork BRANTLEY, BRYAN, BULLOCH, BURKE, CAMDEN,
CANDLER, CHARLTON, CHATHAM, EFFINGHAM, EMANUEL,
EVANS, GLASCOCK, GLYNN, JEFFERSON, JENKINS,
JOHNSON, LIBERTY, LONG, MCINTOSH, PIERCE, RICHMOND,
SCREVEN, WARE, WASHINGTON AND WAYNE

KANSAS

Interior least tern Clark, Comanche, Meade and Stafford

Piping plover Clark, Comanche, Meade and Stafford

KENTUCKY

Freshwater mussels BALLARD, BUTLER, EDMUNDSON, GREEN, HART,
JACKSON, LAUREL, LIVINGSTON, MARSHALL, McCRACKEN,
McCREARY, PULASKI, ROCKCASTLE, TAYLOR, WARREN AND
WAYNE

MISSISSIPPI

Bayou darter CLAIBORNE, COPIAH AND HINDS

Freshwater mollusks ITAWAMBA, LOWNDES, MONROE AND NOLBEE

MISSOURI

Niangua darter BENTON, CAMDEN, DALLAS, GREENE, HICKORY,
MILLER, OSAGE, POLK AND ST. CLAIR

Ozark cavefish BARRY, CHRISTIAN, GREENE, JASPER, LAWRENCE,
NEWTON AND STONE

MONTANA

Piping plover Garfield, McCone, Sheridan and Valley

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NEBRASKA

Interior least tern

Boyd, Brown, Buffalo, Butler, Cass, Cedar, Colfax, Dawson, Dodge, Douglas, Hall, Hamilton, Holt, Howard, Kearney, Keya Paha, Knox, Merrick, Nance, Phelps, Platte, polk, Rock, Sarpy and Saunders

Piping plover

Boyd, Brown, Buffalo, Butler, Cass, Cedar, Colfax, Dawson, Dodge, Douglas, Hall, Hamilton, Holt, Howard, Kearney, Keya Paha, Knox, Merrick, Nance, Phelps, Platte, polk, Rock, Sarpy and Saunders

NEW MEXICO

Pecos gambusia

CHAVES AND EDDY

Pecos bluntnose shiner

CHAVES, DEBACA AND EDDY

NEVADA

Woundfin

Clark

NORTH CAROLINA

Freshwater mollusks

EDGECOMBE, NASH AND PITT

NORTH DAKOTA

Interior least tern

Burleigh, Emmons, McKensie, McLean, Mercer, Morton and Oliver

Piping plover

Benson, Bottineau, Burke, Burleigh, Divide, Dunn, Eddy, Foster, Kidder, Logan, McHenry, McIntosh, McKenzie, McLean, Morton, Mountrail, Nelson, Oliver, Pierce, Ramsey, Ranville, Rolette, Sheridan, Sioux, Stutsman, Towner, Ward, Wells and Williams

OHIO

Scioto madtom

PICKAWAY

OKLAHOMA

Leopard darter
Ozark cavefish

MCCURTAIN AND PUSHMATAHA
DELAWARE

OREGON

Hutton tui chub

LAKE

Warner sucker

LAKE

SOUTH CAROLINA

Wood stork

AIKEN, BARNWELL, BEAUFORT, BERKELY, CHARLESTON, COLLETON, DORCHESTER, GEORGETOWN, HAMPTON, HORRY, JASPER AND MARION

SOUTH DAKOTA

Interior least tern

Clay, Haakon, Hughs, Potter, Stanley, Sully, Union, Walworth, Yankton and Ziebach

The new LC₅₀ data indicate that diazinon is more toxic to the mallard than previous data had indicated. As noted above, the mallard LC₅₀ was found to be <47 ppm. All birds died at the lowest test level. A new study is required, to determine a definitive LC₅₀.

The new field studies have a variety of deficiencies but, collectively, largely confirm our concern for the risk to birds on large grassy sites. The data were not adequate to confirm safety at the application rates tested.

Current Data Requirements

Current data requirements for all use patterns have been previously outlined in the Agency's Data Call-In Notice and updated in EEB's memorandum of March 24, 1988.

Endangered Species Labeling

The following pages provide updated labeling for uses of diazinon covered by existing "cluster" Biological Opinions. These uses include corn, cotton, soybeans and sorghum, which are among the crops covered in the current crop cluster. Also covered are rangeland and pasture grass uses, included in the range and pastureland cluster. This labeling information has been compiled by Richard Stevens of EEB.

For uses of diazinon included in "case-by-case" Biological Opinions on other pesticides (where jeopardy was found) the Agency will need to receive confirmation from the U.S. Fish and Wildlife Service that these Opinions also apply to diazinon. Please note that the "non-jeopardy" assumptions for certain uses, included in the July 25, 1986 EEB chapter, do not currently apply. For any other diazinon uses that "may effect" federally-listed species, the Agency will need to formally consult with USFWS.

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ENDANGERED SPECIES LABELING FOR CROP¹ USE PRODUCTS -- Diazinon

Registrants will be notified when the following restrictions apply:

"ENDANGERED SPECIES RESTRICTIONS"

Before using this pesticide on [corn, soybeans, sorghum, or cotton] in the counties listed below, you must obtain the PESTICIDE USE BULLETIN FOR PROTECTION OF ENDANGERED SPECIES for the county in which the product is to be used. The bulletin is available from your County Extension Agent, State Fish and Game Office, or your pesticide dealer. Use of this product in a manner inconsistent with the PESTICIDE USE BULLETIN FOR PROTECTION OF ENDANGERED SPECIES is a violation of Federal laws."

ALABAMA

Slackwater darter

LAUDERDALE, LIMESTONE AND MADISON

Alabama cavefish

LAUDERDALE

Freshwater mollusks

COLBERT, GREENE, JACKSON, LAMAR, LAUDERDALE,
LIMESTONE, MARSHALL, MORGAN, PICKENS AND SUMTER

ARIZONA

Woundfin

MOHAVE

Bonytail chub

MOHAVE

Gila topminnow

GRAHAM, MARICOPA, PIMA, PINAL AND SANTA CRUZ

ARKANSAS

Freshwater mussels

CLAY, CLARK, CROSS, LAWRENCE, LEE, POINSETT,
RANDOLPH, SHARP AND ST. FRANCIS

Ozark cavefish

BENTON

Leopard darter

POLK

CALIFORNIA

Aleutian Canada goose

COLUSA
MERCED

SUTTER
STANISLAUS

Modoc sucker

MODOC

Desert pupfish

IMPERIAL AND RIVERSIDE

Least bell's vireo

INYO, LOS ANGELES, ORANGE, RIVERSIDE,
SAN BERNARDINO, SAN DIEGO, SANTA BARBARA
AND VENTURA

^{1/} Crop uses are corn, cotton, soybeans, sorghum and small grains (wheat, oats, barley and rye).

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Registrants will be notified when the following restrictions apply:

"ENDANGERED SPECIES RESTRICTIONS"

Before using this pesticide on [range and/or pastureland] in the counties listed below, you must obtain the PESTICIDE USE BULLETIN FOR PROTECTION OF ENDANGERED SPECIES for the county in which the product is to be used. The bulletin is available from your County Extension Agent, State Fish and Game Office, or your pesticide dealer. Use of this product in a manner inconsistent with the PESTICIDE USE BULLETIN FOR PROTECTION OF ENDANGERED SPECIES is a violation of Federal laws."

ALABAMA

Alabama cavefish
Freshwater mollusks

Snail darter
Slackwater darter
Stirrup shell
Watercress darter

Lauderdale
Colbert, Greene, Jackson, Lamar,
Lauderdale, Limestone, Madison,
Marshall, Morgan and Sumter
Jackson, Madison and Marshall
Lauderdale, Limestone and Madison
Greene, Lamar, Pickens and Sumter
Jefferson

ARIZONA

Arizona (Apache) trout
Bonytail chub
Gila topminnow

Masked Bobwhite
Woundfin
Gila trout

Apache, Graham and Greenlee
Mohave
Graham, Maricopa, Pima, Pinal and
Santa Cruz
Pima
Mohave
Yavapai

ARKANSAS

Freshwater mollusks

Ozark cavefish
Leopard darter

Clark, Clay, Cross, Lawrence, Lee,
Poinsette, Randolph, Sharp and St.
Francis
Benton
Polk

CALIFORNIA

Aleutian Canada goose
Blunt-nosed leopard lizard

California condor

Delta green ground beetle
Desert pupfish
Inyo Brown Towhee
Kern Primrose sphinx moth
Least Bell's Vireo

Little Kern golden trout
Modoc sucker
Owens River pupfish
Owens tui chub

Colusa, Merced, Stanislaus and Sutter
Kern, Kings, Fresno, Madera, Merced,
San Luis Obispo, Santa Barbara,
Stanislaus and Tulare
Fresno, Kern, Kings, Los Angeles,
Monterey, San Luis Obispo, Santa
Barbara, Tulare and Ventura
Solano
Imperial and Riverside
Inyo
Kern
Inyo, Los Angeles, Orange, Riverside,
San Bernardino, San Diego, Santa
Barbara and Ventura
Tulare
Modoc
Inyo and Mono
Mono

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

25 JUL 1986

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

Memorandum

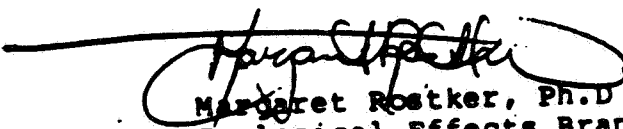
To: George LaRocca, PM 15
Insecticide/Rodenticide Branch
Registration Division (TS-767C)

Thru: Harry Craven, Registration Standards Coordinator
Ecological Effects Branch
Hazard Evaluation Division (TS-769C)

Thru: Michael Slimak, Chief
Ecological Effects Branch
Hazard Evaluation Division (TS-769C)

Subject: Diazinon Registration Standard

Attached are EEB's Topical Discussions, Disciplinary Review, and Generic Data Requirements Table for Diazinon. The Data Evaluation Records will be provided at a later date under separate cover.


Margaret Rostker, Ph.D.
Ecological Effects Branch
Hazard Evaluation Division (TS-769C)

cc: Margaret Rostker, SIS(EEB)/HED
Judy Heckman, MSS/HED

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ECOLOGICAL EFFECTS
Disciplinary Review

1. Ecological Effects Profile

a. Manufacturing Use

Avian acute oral toxicity data indicate diazinon is "very highly toxic" to the species tested, with LD₅₀ values ranging from 3.2 mg/kg for Red-winged Blackbirds (Hudson et al., 1984, HCOSTA01) to 10 mg/kg for Bobwhite Quail (Hill and Camardese, 1983, ROODI002). Avian dietary toxicity data indicate diazinon is "highly toxic" for species tested, with LC₅₀ values ranging from 167 ppm for Japanese Quail (Hill and Camardese, 1986, ROODI003) to 245 ppm for Bobwhite Quail (Hill et al., 1975, 00034769).

Freshwater invertebrate acute toxicity data indicate diazinon is "very highly toxic" to the species tested, with LC₅₀ values as low as 0.2 ppb for Gammarus fasciatus (Johnson and Finley, 1980, 00003503). Freshwater fish acute toxicity data indicate diazinon is "very highly toxic" to the species tested, with LC₅₀ values as low as 90 ppb for Rainbow Trout (Johnson and Finley, 1980, 00003503). A single estuarine fish study on Sheepshead Minnow (Goodman et al., 1979, ROODI008) showed diazinon to be moderately toxic at 1400 ppb.

b. Formulated Products

Avian acute oral toxicity data indicate diazinon 14G (14.3% ai granular) is "very highly toxic" to species tested (LD₅₀=1.8 mg/kg for Red-winged Blackbirds; Balcomb et al., 1984, ROODI0001). Microencapsulated diazinon (23% ai) is "highly toxic", on an acute oral basis, to Bobwhite Quail (LD₅₀=108.5 mg/kg, Pennwalt, 1979, ROODI004). Microencapsulated 23% ai diazinon is also "highly toxic" to birds on a dietary basis (LC₅₀=345 ppm for Bobwhite Quail; Pennwalt, 1979, ROODI004). Data indicate AG500 (48% ai EC) is "highly toxic" to Japanese Quail tested in dietary studies (LC₅₀=101 ppm, Hill and Camardese, 1986, ROODI003). The 53% ai wettable powder is also "highly toxic" to Bobwhite Quail on a dietary basis (LC₅₀=140 ppm, Woodard Research Corp., 1964, 00104923).

Microencapsulated diazinon (23% ai) is "very highly toxic" to freshwater invertebrates (LC₅₀=0.522 ppb for Daphnia magna; Agchem, 1982, 00121283) and to fish (LC₅₀=512 ppb for Bluegill Sunfish; Calmbacher, 1978, R00DI009).

Numerous pen studies have been conducted with Bobwhite Quail and waterfowl (see bird topical summary).

2. Ecological Hazard Assessment

Diazinon is an organophosphate insecticide presently registered in 964 end-use products for use on 127 crops and other sites (EPA Draft Index, March 13, 1986). The highest application rates are generally on citrus and vegetables (e.g., beans, beets, carrots, cabbage, radish, turnip, corn, lettuce, peas, tomatoes) with maximum rates of 10 lb ai/A. Orchard crops (e.g., almonds, apples, pears) have maximum rates of 6 lb ai/A. Grass sites have rates as high as 11 lb ai/A. Based on the Preliminary Quantitative Usage Analysis (POUA, 1986) for diazinon, about 40% of the market is professional applicators/golf course uses, another 40% is home and garden use, and the remaining 20% is used in agriculture. In the agriculture category, the major use is on fruit and nut crops, with the largest volume of use in almonds (53,700 lb ai), followed by prune plums (41,000 lb ai) and apples (27,000 lb ai) (POUA, 1986).

GOLF COURSES AND SOD FARMS

Based on avian hazard, in January, 1986, the EPA initiated a Special Review of diazinon use on golf courses and sod farms. The Special Review identified an unreasonable risk to birds and proposed cancellation of diazinon use on these two sites. The scientific case for the proposed cancellation was approved by the EPA Scientific Advisory Panel in May, 1986. A public document announcing the EPA final decision to cancel diazinon use on golf courses and sod farms is scheduled for publication on September 30, 1986.

LAWNS, PARKS AND OTHER GRASSY SITES

Hazard to birds from grassy sites such as home lawns, athletic fields, parks, etc. is substantially the same as the hazard on golf courses and sod farms. Exposure to residues on grass is the same, and data on diazinon residues on grass (Wildlife Inter., 1986, R00DI006) are applicable to these various grassy sites. The data showed average residue

per unit dose (RUD) as 53 ppm per application to turf grass of one pound active ingredient followed by irrigation with 0.25 inches water. The data were obtained from a test with the 48% ai emulsifiable concentrate.

A record of at least 30 bird kills on grassy sites such as lawns and parks supports the concern that hazardous exposure regularly and routinely occurs. In total, over 80 bird kills associated with diazinon have been reported to the EPA. Over 50 of these incidents occurred on grassy sites, including lawns, parks and golf courses.

Based upon the toxicity of diazinon, measured residues on grass, and confirmed exposure of birds to diazinon as indicated by the record of bird kills the Special Review criterion for avian hazard from use of diazinon on all grassy sites is met. No additional data are needed to permit a full hazard assessment of the avian hazard on grassy sites (see Special Review documents).

AGRICULTURAL AND OTHER SITES

Dietary exposure to diazinon on gardens, ornamental plantings, and crops occurs when birds feed on grass, roots, seed, nuts, grain, fruit, and/or the invertebrates associated with the site. Birds may also ingest diazinon granules accidentally while feeding. Dermal exposure to diazinon residues may also occur as they feed.

Exposure to high concentrations of diazinon in water may also occur. Rain or irrigation (watering in) after diazinon application may result in the formation of pools of contaminated water (puddling), which poses an additional hazard to birds. Irrigation is recommended by the label for control of certain pests. If the water is not immediately absorbed by the soil, puddles with high concentrations of diazinon may form.

Bird kills from diazinon application have been associated with irrigation and puddling. The Agency is concerned that even if applicators comply with label directions, diazinon may still be hazardous because of the practical difficulties in achieving proper irrigation.

In addition to the potential hazard from exposure to residues on food items, birds may accidentally ingest granules because the granules may be mistaken for dietary grit. Diazinon granules are within the size range of grit for birds, and ingestion of only a few granules has been shown to be lethal to small birds.

Over 80 bird kills associated with use of diazinon have been reported to the Agency. The record of kills, which includes applications made by trained pesticide applicators, includes grass sites, orchards, and other agricultural sites. The kills are reported from States throughout the country and occurred throughout the year. Waterfowl were frequently involved but 23 species in total have been reported as killed from exposure to diazinon.

Based upon residue data and reports of bird kills, diazinon appears to pose an extremely serious hazard to birds. Additional data are needed to permit a full hazard assessment of the avian hazard on agricultural sites. Residue monitoring is needed to help determine if hazardous residues are present on avian food items. Avian field studies are needed to determine if birds are being killed by exposure to diazinon, and if reproduction or survivorship of birds is being adversely affected by exposure to non-lethal but physiologically impairing levels of residues.

Aquatic Hazards

EEB reviewed several valid ecological effects studies which characterize diazinon as very highly toxic to fish and aquatic invertebrates. The median lethal concentration which kills 50 percent of the test organisms (LC₅₀) ranged, for freshwater invertebrates, from 0.2 ppb for Gammarus fasciatus and 0.522 ppb for Daphnia magna to, for fish, 90 ppb for rainbow trout and 168 ppb for Bluegill Sunfish. These data demonstrate that diazinon is very highly toxic to fish and aquatic invertebrates.

As a result of this toxicity, EEB is concerned about the hazard of diazinon to aquatic organisms. Eight fish kills that implicate diazinon have been reported to the Agency. In most cases other pesticides may have been involved and in most situations misuse appears to have occurred. In a few instances diazinon residues were found in the fish samples analysed. The reported kills include loss of 1,150 fish in

Westwood, Pennsylvania; loss of 50 fish in Chester County, Pennsylvania; loss of 1,210 fish in Honolulu, Hawaii; loss of over 100 Cutthroat Trout in Hood River, Oregon; loss of over 200 Rainbow Trout in Milton-Freewater, Oregon; loss of 35,000 suckers and sticklebacks in Sonia County, Michigan; loss of 25-50 fish in Sacramento, California; and an non-quantified loss of fish in Grove, Oklahoma.

Drift and/or runoff from application to agricultural and home sites may pose a hazard to aquatic communities. One study (Ritter et. al, 1974) reported maximum runoff of 17 ppb for diazinon. More data are necessary in order to determine the extent of aquatic hazard from agricultural and other site uses of diazinon. However, based upon the toxicity of diazinon, runoff data, and reported fish kills, diazinon appears to potentially pose an environmental hazard to nontarget aquatic organisms.

Classification

As per 40 CFR 162.11, Classification Criteria for Previously Registered Products, diazinon is ineligible for general use classification and should be designated as a restricted use pesticide. This classification is for all formulations and for both home and agricultural use products. The very high toxicity to birds and the record of bird kills from exposure to diazinon indicate diazinon poses lethal exposure to birds. Further, as shown below, residues are estimated to exceed 1/5 the subacute dietary LC50 measured in avian test animals when diazinon is applied to grass and agricultural crops:

Mallard Duck LC50 = 191 ppm Bobwhite Quail LC50 = 245 ppm

Diazinon Residues

GRASS: Average residue per 1 lb application (RUD) = 53 ppm (Wildlife International, 1986, ROODI006). At typical application rate of 4 lb ai/A, residues estimated at 212 ppm.

FORAGE CROPS: Estimated typical residue (Kenaga, 1972): RUD = 33 ppm. At typical application rate of 6 lb ai/A, residues estimated at 198 ppm.

LEAVES AND LEAFY CROPS: Estimated typical residue (Kenaga, 1972): RUD = 35 ppm. At typical application rate of 6 lb ai/A, residues estimated at 210 ppm.

GRANULAR PRODUCTS: Diazinon granules are very highly toxic to birds: one granule of 14.3% ai killed 40% of test House Sparrows (Balcomb et al, 1984, ROODI001) and 5 granules of 14.3% ai killed 100% of test Red-winged Blackbirds (Balcomb et al, 1984, ROODI001).

Inasmuch as only a few granules are required to kill birds, residues in terms of number of granules will exceed 1/5 the LC50 under all application rates and practices. Diazinon granules are of a size that birds will ingest the granules as dietary grit and also when granules are adhered to food items such as insects, leaves, and grass.

Additional Statements to Protect Endangered/Threatened Species:
See following pages.

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Endangered/Threatened Species

Based on terrestrial residue analysis, aquatic runoff data, and incident data, it appears that certain use patterns of diazinon have sufficient exposure to pose a hazard to endangered/threatened species. This confirms the analysis of the various crops covered under the Cluster approach. The analysis shows hazard to birds, aquatic organisms, amphibians, reptiles and insects.

Since 1982 cotton, corn, small grains (wheat, barley, rye, and oats), sorghum, soybeans, rangeland, forest, and mosquito larvicide registrations have been reviewed under the cluster project. Diazinon has labeled uses for some of these sites. The hazard to endangered species for other uses of diazinon can be determined by review, which may or may not lead to formal consultation, or by examining consultations of pesticide with "similar" toxicity and with the same use pattern(s). In these investigations, use of diazinon was found to pose potential hazards to the following endangered species:

- A. Cluster Opinions: The various cluster opinions and subsequent communications resulted in the following jeopardy findings which apply to diazinon:

- Alabama cavefish (cotton)
- Aleutian Canada goose (corn)
- Attwater's Greater Prairie chicken (corn, cotton, soybeans, sorghum)
- Bayou darter (cotton)
- Comanche Springs pupfish (cotton)
- Delta green ground beetle (corn)
- Everglade kite (corn)
- Fountain darter (cotton)
- Gila topminnow (cotton)
- Houston toad (cotton)
- Kern Primrose sphinx moth (corn and soybeans)
- Leopard darter (cotton)
- Mollusks (corn, soybeans and sorghum)
- San Marcos gambusia (cotton)
- San Marcos salamander (cotton)
- Scioto madtom (corn and soybeans)
- Slackwater darter (corn, soybeans and cotton)

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A. Cluster Opinions: (continued)

Texas Blind salamander (cotton)
Valley Elderberry Longhorn beetle (corn)
Woundfin (corn and sorghum)

(grass and pastureland)

Aleutian Canada goose
California condor
Whooping crane
Masked bobwhite
Santa Cruz long-toed salamander
Eastern indigo snake
Hawaiian goose
New Mexican ridge-nosed rattlesnake
Mississippi sandhill crane
San Marcos salamander
Mollusks
Houston toad
Wyoming toad
Slackwater darter
Desert tortoise
Snail darter
Valley elderberry longhorn beetle
Watercress darter
Kern primrose sphinx moth
Alabama cavefish
Delta green ground beetle
Okaloosa darter
Socorro isopod
Maryland darter
Bayou darter
Spotfin chub
Scioto madtom
Yellowfin madtom
Slender chub
Blunt-nosed leopard lizard

Kendall warm springs dace
Leon Springs pupfish
Fountain darter
San Marcos gambusia
Comanche Springs pupfish
Arizona (Apache) trout
Bonytail chub
Woundfin
Gila topminnow
Owens River pupfish
Unarmored three-spine stickleback
Paiute cutthroat trout
Little kern golden trout
Greenback cutthroat trout
Colorado squawfish
Humpback chub
Ash Meadows speckled dace
Ash Meadows Amargosa pupfish
Cui-ui
Devils hole pupfish
Pahrump killifish
Warm Springs pupfish
Pahranaqat bonytail
Pecos gambusia
Gila trout
Chihuahua chub
Leopard darter
Borax Lake chub
Clear Creek gambusia

(non-crop)

Awaiting completion of Non-crop Cluster and referral to OES for formal opinion.

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Non-jeopardy decisions

[Biological Opinions for the following active ingredients had indicated that OES considered the following uses, but did not specifically indicate jeopardy to any species resulting from their use on these sites (assumptions of non-jeopardy)]

Furadan (tobacco, peppers, sugarbeets, potatoes, sugarcane, strawberries, sweet potatoes and grapes)

Chlorpyrifos (broccoli, brussel sprouts, cabbage, citrus, cauliflower, nectarines, radish and tomatoes)

Temik (tomatoes and citrus)

Thimet (hops, tomatoes, sugarcane, sugarbeets, alfalfa, beans, lettuce, potatoes and brussel sprouts.

C. Remaining uses:

Diazinon is registered for several uses that have not been reviewed in the cluster project or in registration submissions. It is anticipated that little exposure to additional listed species will occur with the rest of the uses: almonds, banana, beans, beets, Bermudagrass, berries, cabbage, cantalope, carrots, casava melon, collards, cauliflower, cherry, clover, coffee, cowpeas, crenshaw melon, cucumbers, dewberry, endive, fig, filbert, forage-fodder, guar, honeydew melon, kale, kidney beans, lespedeza, lima beans, melons, olive, onion, parsley, parsnips, peas, pineapple, plum, prune, pumpkins, radish, spinach, squash, swiss chard, turnips, walnuts, watermelon, watercress, ornamentals, greenhouse crops, cranberries, and indoor uses. Though these (future) crop reviews may add endangered species to the list thus far established, few additions are likely due to the broad geographical distribution of the crops already reviewed (hence the likelihood that these uses will involve only those species already identified for existing crops).

The following are endangered species labeling information for Diazinon. Labels are based on the bulletin approach. It is hoped that bulletins will be ready before labels containing this endangered species information 'hit the streets'. Any labeling submitted to the Agency as a result of the Diazinon Standard or Special Review must come through EEB to ensure accuracy.

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[DIAZINON ENDANGERED SPECIES LABELING INFORMATION FOR CROP USES]

ENDANGERED SPECIES RESTRICTIONS

The use of any pesticide in a manner that may kill or otherwise harm an endangered or threatened species or adversely modify their habitat is a violation of federal laws. The use of this product is controlled to prevent death or harm to endangered or threatened species that occur in the following counties or elsewhere in their range.

Before using this pesticide in the following counties you must obtain the EPA Cropland Endangered Species Bulletin. The use of this pesticide is prohibited in these counties unless specified otherwise in the Bulletin. The EPA Bulletin is available from either your County Agricultural Extension Agent, the Endangered Species Specialist in your State Wildlife Agency Headquarters or the appropriate Regional Office of either the U.S. Fish and Wildlife Service (FWS) or the U.S. Environmental Protection Agency. THIS BULLETIN MUST BE REVIEWED PRIOR TO PESTICIDE USE.

STATE (Regional office FWS) Species	COUNTY
ALABAMA (Atlanta, GA.)	LAUDERDALE MADISON
Slackwater darter	LIMESTONE
Alabama cavefish	LAUDERDALE
Freshwater mussels	COLBERT MARSHALL JACKSON MORGAN
ARIZONA (Albuquerque, N.M.)	
Woundfin	MOHAVE
Bonvtail chub	MOHAVE
Gila topminnow	GRAHAM PINAL MARICOPA SANTA CRUZ PIMA
ARKANSAS (Atlanta, GA.)	
Freshwater mussels	CLAY RANDOLPH CLARK SHARP CROSS ST. FRANCIS LAWRENCE
Ozark cavefish	BENTON
Leopard darter	POLK

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CALIFORNIA (Portland, OR.)		
Delta green ground beetle	SOLANO	
Valley elderberry longhorn beetle	MERCED SACRAMENTO	
Aleutian Canada goose	COLUSA	SUTTER
	MERCED	STANISLAUS
Kern primrose sphinx moth	KERN	
American peregrine falcon	HUMBOLT	SAN LUIS OBISPO
	LOS ANGELES	SAN MATEO
	MARIPOSA	SANTA CLARA
	MENDOCINO	SANTA CRUZ
	MONTEREY	SONOMA
	SAN DIEGO	TUOLUMNE
Blunt-nosed leopard lizard	FRESNO	MONTEREY
	KERN	SAN LUIS OBISPO
	KINGS	SANTA BARBARA
	MADERA	STANISLAUS
	MERCED	TULARE
Santa Cruz long-toed salamander	MONTEREY	SANTA CRUZ
Unarmored three-spine stickelback	LOS ANGELES	SANTA BARBARA
COLORADO (Denver, CO.)		
Colorado squawfish	BLANCO	MOFFAT
	DELTA	RIO
	GARFIELD	ROUTT
	MESA	
Humpback chub	MESA	
FLORIDA (Atlanta, GA.)		
Everglade Kite	BROWARD	GLADES
	DADE	PALM BEACH
KENTUCKY (Atlanta, GA.)		
Freshwater mussels	BALLARD	MCCRACKEN
	EDMUNDSON	PULASKI
	JACKSON	ROCKCASTLE
	LAUREL	WARREN
	MARSHALL	WAYNE
MARYLAND (Newton Corners, MA.)		
Maryland darter	HARFORD	
MICHIGAN (Twin Cities, MN.)		
American peregrine falcon	LEE VANAU	
MINNESOTA (Twin Cities, MN.)		
American peregrine falcon	CHISAGO	WABASHA
	DAKOTA	WASHINGTON
	GOODHUE	WINONA
	HOUSTON	
MISSISSIPPI (Atlanta, GA.)		
Bayou darter	CLAIBORNE	
	COPIAH	
MISSOURI (Twin Cities, MN.)		
Ozark cavefish	CHRISTIAN	NEWTON
	GREENE	BARRY
	JASPER	STONE
	LAWRENCE	
NEVADA (Portland, OR.)		
Woundfin	CLARK	
Pahranagat bonytail	LINCOLN	
Cui-ui	WASHOE	
	CLARK	WHITE PINE

STATE (Regional office FWS)	COUNTY	
Species		
NEW MEXICO (Albuquerque, N.M.)	CHAVES	
Pecos gambusia	EDDY	
NORTH CAROLINA (Atlanta, GA.)		
Spotfin chub	MACON	SWAIN
OHIO (Twin Cities, MN.)	CHAMPAGNE	MADISON
Scioto madtom	FRANKLIN	PICKAWAY
	LOGAN	UNION
OKLAHOMA (Albuquerque, N.M.)	MCCURTAIN	
Leopard darter	PUSHMATAHA	
Ozark cavefish	DELAWARE	
OREGON (Portland, OR.)		
American peregrine falcon	CLACKAMUS ⁿ	MARION
	DOUGLAS	UMATILLA
	HOOD RIVER	WASCO
	JACKSON	
TENNESSEE (Atlanta, GA.)	LAWRENCE	
Slackwater darter	WAYNE	
Slender chub	CLATBORNE	HANCOCK
Spotfin chub	CUMBERLAND	MORGAN
	FENTRESS	
Freshwater mussels	BLOUNT	MARSHALL
	CLAIBORNE	MAURY
	DECATUR	RHEA
	FRANKLIN	ROANE
	HANCOCK	SCOTT
	HARDIN	SEQUATCHIE
	LINCOLN	SMITH
	LOUDON	SULLIVAN
Yellowfin madtom	CLAIBORNE	HANCOCK
TEXAS (Albuquerque, N.M.)	ARANSAS	GOLIAD
Attwater's Greater	AUSTIN	REFUGIO
Prairie Chicken	COLORADO	VICTORIA
	FORT BEND	
Comanche Springs	JEFF DAVIS	
pupfish	REEVES	
Pecos gambusia	JEFF DAVIS	REEVES
	PECOS	
Texas blind salamander	HAYS	
San Marcos salamander	COMAL	HAYS
San Marcos gambusia	HAYS	
Houston toad	BASTROP	HARRIS
	BURLESON	
Fountain darter	COMAL	HAYS
UTAH (Denver, CO.)		
Woundfin	WASHINGTON	
Humpback chub	GRAND	
Bonytail chub	GRAND	
Colorado squawfish	CARSON	KANE
	DUCHESNE	SAN JUAN
	EMERY	UINTAH
	GARFIELD	WAYNE
	GRAND	

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STATE (Regional office FWS) Species	COUNTY	
VIRGINIA (Newton Corners, MA.)		
Spotfin chub	SCOTT	WASHINGTON
Freshwater mussels	LEE RUSSELL SCOTT SMITH	TAEWELL WASHINGTON WISE
Yellowfin madtom	LEE RUSSELL	SCOTT
WASHINGTON (Portland, OR.)		
American peregrine falcon	SKAMANIA	
WISCONSIN (Twin Cities, MN.)		
American peregrine falcon	CRAWFORD DANE DOOR	RICHLAND SAUK TREMPEALEAU

[DIAZINON LABELING INFORMATION FOR RANGE AND PASTURELAND USES]

ENDANGERED SPECIES RESTRICTIONS

The use of any pesticide in a manner that may kill or otherwise harm an endangered or threatened species or adversely modify their habitat is a violation of federal laws. The use of this product is controlled to prevent death or harm to endangered or threatened species that occur in the following counties or elsewhere in their range:

STATE (Regional Office FWS/EPA)
Species

County (unless specified otherwise)

ALABAMA (Atlanta, GA.)

Alabama cavefish

Slackwater darter

Snail darter

Watercress darter

Freshwater mussels

Lauderdale

Lauderdale, Limestone and Madison

Jackson and Madison

Jefferson

Colbert, Jackson, Marshall and Morgan
and Monroe

ARIZONA (Albuquerque, N.M./San Francisco, CA.)

Arizona (Apacne) trout

Bonytail chub

Woundfin

Gila and Yaqui topminnow

Masked Bobwhite

Apache, Graham and Greenlee

Mohave

Mohave

Graham, Maricopa, Pima, Pinal and
Santa Cruz

Pima

ARKANSAS (Atlanta, GA./Dallas, TX.)

Freshwater mussels

Clark, Clay, Cross, Lawrence, Randolph,
Sharp and St. Francis

CALIFORNIA (Portland, OR.)

Owens River pupfish

Inyo and Mono

Unarmored threespine stickleback

Los Angeles and Santa Barbara

Aleutian Canada goose

Colusa, Merced, Stanislaus and Sutter

California condor

Fresno, Kern, Kings, Los Angeles,
Monterey, San Benito, San Luis Obispo,
Santa Barbara, Tulare and Ventura.

Blunt-nosed leopard lizard

Kern, Kings, Fresno, Madera, Merced,
Monterey, San Luis Obispo, Santa
Barbara, Stanislaus and Tulare

STATE (Regional Office FWS)
Species

CALIFORNIA (continued)

Paiute cutthroat trout

Little Kern golden trout

Santa Cruz long-toed salamander

Delta green ground beetle

Valley elderberry longhorn beetle

Kern Primrose sphinx moth

COLORADO (Denver, CO.)

Greenback cutthroat trout

Colorado squawfish

Bonytail chub

Humpback chub

FLORIDA (Atlanta, GA.)

Okaloosa darter

Eastern indigo snake

GEORGIA (Atlanta, GA.)

Snail darter

Eastern indigo snake

HAWAII (Portland, OR.)

Hawaiian goose

IDAHO (Portland, OR.)

Whooping crane

KENTUCKY (Atlanta, GA.)

Freshwater mussels

MARYLAND (Newton Corners, MA./Philadelphia, PA.)

Maryland darter

MISSISSIPPI (Atlanta, GA.)

Bayou darter

Mississippi sandhill crane

County (unless specified otherwise)

Alpine, Madera and Mono

Tulare

Monterey and Santa Cruz

Solano

Merced

Kern

Boulder, Larimer, Gilpin, Park and
Fremont

Blanco, Delta, Garfield, Mesa, Moffat
Rio and Routt

Okaloosa and Walton

Statewide

Catoosa

S.E. Georgia

Islands of Maui and Hawaii

Caribou, Bear Lake and Bonneville

Ballard, Edmundson, Jackson, Laurel,
Marshall, McCracken, Pulaski, Rockast.
Warren and Wayne

Harford

Claiborne and Copiah

Jackson

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STATE (Regional Office FWS)

Species

NEVADA (Portland, OR./San Francisco, CA.)

Ash Meadows speckled dace

Ash Meadows Amargosa pupfish

Cui-ui

Devils hole pupfish

Pahrnagat bonytail

Pahrump killifish

Warm springs pupfish

Woundfin

NEW MEXICO (Albuquerque, N.M./Dallas, TX.)

Chihuahua chub

Gila trout

New Mexican ridge-nosed rattlesnake

Pecos Gambusia

Socorro isopod

NORTH CAROLINA (Atlanta, GA.)

Spotfin chub

OHIO (Twin Cities, MN./Chicago, IL.)

Scioto Madtom

OKLAHOMA (Albuquerque, N.M./Dallas, TX.)

Leopard darter

OREGON (Portland, OR./Seattle, WA.)

Borax lake chub

County (unless specified otherwise)

Nye

Nye

Washoe

Nye

Lincoln

Clark and White Pine

Nye

Clark

Grant

Catron and Grant

Hidalgo

Chaves, Eddy

Socorro

Macon and Swain

Champagne, Franklin, Logan, Madison,
Pickaway and Union

Pushmataha and McCurtain

Harney

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STATE (Regional Office FWS)

Species

County (unless specified otherwise)

TENNESSEE (Atlanta, GA.)

Freshwater mussels

Blount, Claiborne, Decatur, Franklin, Hancock, Hardin, Hawkins, Lincoln, Loudon, Marshall, Maury, Rhea, Roane, Scott, Sequatchie, Smith and Sullivan

Slackwater darter

Lawrence, Wayne,

Slender chub

Claiborne and Hancock

Snail darter

Bradley, Hamilton, Knox, Loudon, Marion, Meigs and Polk

Spotfin chub

Cumberland, Fentress and Morgan

Yellowfin madtom

Claiborne, Hancock and Monroe

TEXAS (Albuquerque, N.M./Dallas, TX.)

Clear creek gambusia

Menard

Comanche springs pupfish

Jeff Davis and Reeves

Fountain darter

Comal and Hays

Houston toad

Bastrop, Burleson and Harris

Leon springs pupfish

Pecos

Pecos gambusia

Jeff Davis, Pecos and Reeves

San Marcos gambusia

Hays

San Marcos salamander

Hays

UTAH (Denver, CO.)

Desert tortoise

Washington

Colorado squawfish

Bonytail chub

Humpback chub

Carbon, Duchesne, Emery, Garfield, Grand, Kane, San Juan, Uintah and Wayne

Woundfin

Washington

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STATE (Regional Office FWS)

<u>Species</u>	<u>County (unless specified otherwise)</u>
VIRGINIA (Newton Corners, MA./Philadelphia, PA.)	
Slender chub	Lee and Scott
Spotfin chub	Scott and Washington
Yellowfin madtom	Lee, Russell and Scott
Freshwater mussels	Lee, Russell, Scott, Smyth, Tazewell, Washington and Wise
WYOMING (Denver, CO.)	
Kendall Warm Springs dace	Sublette
Wyoming toad	Albany
Whooping crane	Lincoln and Sublette

Before using this pesticide in the above counties you must first obtain the Rangeland Endangered Species Bulletin (EPA/ES-RANGE). The use of this pesticide is prohibited in these counties unless specified otherwise in the Bulletin. The EPA Bulletin is available from either your County Agricultural Extension Agent, the Endangered Species Specialist in your State Wildlife Agency Headquarters or the appropriate Regional Office of either the U.S. Fish and Wildlife Service (FWS) or the U.S. Environmental Protection Agency (EPA). THIS BULLETIN MUST BE REVIEWED PRIOR TO PESTICIDE USE.

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The acceptable acute oral toxicity data for use in a hazard assessment are listed below:

<u>Species</u>	<u>% ai</u>	<u>LD₅₀ (mg/kg)</u>	<u>Author</u>	<u>Date</u>	<u>Fiche ID No.</u>	<u>Fulfills Requirement</u>
Mallard	89	3.54	Hudson et al.	1984	HCOSTA01	No ¹ /
Ringnecked Pheasant	89	4.33	Hudson et al.	1984	HCOSTA01	No ¹ /
Bobwhite Quail	99	10.0	Hill & Camardese	1983	ROODI002	No ¹ /
Bobwhite Quail	89	5.2 (3.5-7.6)	Fink	1976	00109015	No ¹ /
House Sparrow	> 90	7.5	Schafer	1972	00020560	No ¹ /
Redwinged Blackbird	> 90	3.2	Schafer	1972	00020560	No ¹ /

1/ In combination, these studies fulfill the Guideline requirement.

The data indicate that technical diazinon is very highly toxic to birds on an acute oral basis. The Guidelines requirement for an avian acute oral toxicity study is fulfilled.

The acceptable avian dietary toxicity studies for use in a hazard assesment are listed below:

<u>Species</u>	<u>% ai</u>	<u>LC₅₀ (ppm)</u>	<u>Author</u>	<u>Date</u>	<u>Fiche ID No.</u>	<u>Fulfills Requirement</u>
Japanese Quail	99	167	Hill & Camardese	1986	POODI003	No ¹ /
Bobwhite Quail	99	245	Hill et al.	1975	00034769	Yes
Mallard Duck	99	191	Hill et al.	1975	00034769	Yes
Ringnecked Pheasant	99	244	Hill et al.	1975	00034769	Yes

1/ Study is valid but not conducted on recommended species.

The data indicate that technical diazinon is highly toxic to birds on a subacute dietary basis. The Guideline requirements for avian dietary studies are fulfilled.

Avian reproduction studies with technical diazinon are required by 40 CFR 158.145, since birds may be subjected to repeated exposure preceding and/or during the breeding season. Current labeling permits repeat applications for many use sites and rates (e.g., apples, cherries, citrus, grapes, peaches, strawberries, broccoli), sometimes without specific restrictions as to the number of such applications.

The following avian reproduction studies were evaluated:

<u>Species</u>	<u>Lot</u>	<u>Formulation</u>	<u>Author</u>	<u>Date</u>	<u>Fiche ID No</u>	<u>Results</u>	<u>Fulfills Requirement</u>
Bobwhite Quail	48	AG500	Stromborg	1981	ROODI010	Weight loss; reduced egg production at 35 ppm.	No
Ring-necked Pheasant		Pen study of treated corn seed fed to breeding hens	Stromborg	1975	00104083	6-12% of daily food intake equals reprod. effect. NOEL=1.05-2.1 mg/day	No

These studies identify some negative effects due to three week dietary exposure to diazinon, especially weight loss and reduced egg productivity. Results are similar for both Bobwhite Quail and Ring-necked Pheasants. Avian reproduction studies with Bobwhite Quail and Mallard Ducks are required.

In addition to the above required tests with technical diazinon, special testing for avian oral and dietary toxicity with technical grade sulfotepp is required. This is necessary because certified limits for diazinon show sulfotepp contamination at levels up to 40 CFR 158.145(b) testing may be required when, among other possible conditions, an ingredient in the end-use product other than the active ingredient is expected to enhance the toxicity of the active ingredient. Sulfotepp is very highly toxic to mammals (Rat LD₅₀=10 mg/kg) and may be toxic to birds also.

Formulated diazinon product testing is required because the technical grade is very highly toxic to birds. Both oral and dietary testing is required.

The following acute oral studies were evaluated:

<u>Species</u>	<u>% ai</u>	<u>Formulation</u>	<u>LD50</u> (<u>mg.ai</u> <u>kg</u>)	<u>Author</u>	<u>Date</u>	<u>Fiche</u> <u>ID No.</u>	<u>Requirement</u>
Bobwhite Quail	14	Granular	8(6-11)	Hill & Camardese	1983	ROODI002	Yes ¹ /
Bobwhite Quail	23	Microen-capsulated	108.5	Pennwalt	1979	ROODI004	Yes ¹ /
House Sparrow	14	Granular	2.5	Balcomb et al.	1984	ROODI001	Yes ¹ /
Redwinged Blackbird	14	Granular	1.8	Balcomb et al.	1984	ROODI001	Yes ¹ /

1/ In combination, these studies characterize the acute oral toxicity of 14G to bobwhite quail and small passerine birds. The 14G and microencapsulated product must be tested with a waterfowl. Granular products containing 2%, 5%, and 10% ai must be tested with a waterfowl and bobwhite quail. Number of granules to equal an LD₅₀ may be tested instead of mg ai/kg.

The following dietary studies were evaluated:

<u>Species</u>	<u>% ai</u>	<u>Formulation</u>	<u>LC50</u> (<u>ai;ppm</u>) (<u>95% CI</u>)	<u>Author</u>	<u>Date</u>	<u>Fiche</u> <u>ID No.</u>	<u>Fulfills</u> <u>Requireme</u>
Bobwhite Quail	23	microencap-sulated	345	Pennwalt	1979	ROODI004	Yes ¹ /
Bobwhite Quail	53	wettable powder	140 (97-205)	Woodard Res.Corp	1964	00104923	No ³ /
Mallard Duck	23	microencap-sulated	149 (107-209)	Pennwalt	1979	ROODI004	Yes ¹ /
Mallard Duck	53	wettable powder	180 (135.3-239.4)	Woodard Res.Corp	1964	00104923	No ³ /
Japanese Quail	48	emulsifiable concentrate	101 (81-126)	Hill & Camardese	1986	ROODI003	Yes ² .

1/ In combination these studies characterize the dietary toxicity of 23% ai microencapsulated diazinon to bobwhite quail and the mallard duck. 2/ The formulated product testing with the 48%

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ai emulsifiable concentrate is adequate to characterize dietary toxicity to the Japanese quail but waterfowl testing must be done with this product. 3/ The 53% ai wettable powder is characterized for the mallard and the bobwhite quail.

Also evaluated were the following studies which tested for the number of granules necessary to induce avian mortality on an acute oral basis:

<u>Species</u>	<u>% ai</u>	<u>Formulation</u>	<u>No. Granules = % Mortality</u>	<u>Author</u>	<u>Date</u>	<u>Fiche ID No.</u>	<u>Fulfills Requirement</u>
House Sparrow	14	Granular	1 = 40; 5-10 = 80	Balcomb et al.	1984	ROODI001	No1/
Redwinged Blackbird	14	Granular	5 = 100	Balcomb et al.	1984	ROODI001	No1/

1/ These studies characterize the acute oral toxicity in terms of number of granules necessary to induce mortality in House Sparrows and Redwinged Blackbirds.

The following field and simulated field (pen) studies were evaluated under the topic of avian hazard:

<u>Species</u>	<u>Conditions</u>	<u>Results</u>	<u>Author</u>	<u>Date</u>	<u>Fiche ID No.</u>	<u>Fulfill Require</u>
Bobwhite Quail	Pen with 48%ai EC @ 1.5lb/A; 14.3%ai G @ 17.5 lb/A & 14.3%ai G soil incorp. @ 3-4 inches in seed bed	no effects	Gulf South Research Institute	1974	00109019	No
Bobwhite Quail	Pen with 5%ai liquid @ 3lb/1000 ft ²	no effects	Fink	1974	00109021	No
Bobwhite Quail	Pen with 5%ai G @ approx. 20 lb/1000 ft ²	27.8% mortality in first 5 days. Mortality not affected by irrigation	Knott	1973	00109020	No

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Bobwhite Quail	Pen with 23%ai microen- capsulated	no effects	Pennwalt	1979	ROODI004	No
Mallards, Canada Geese	Pen with 48%ai EC @ 6 lb ai/A & 14.3%ai G @ 6.2 lb ai/A	No mallard mortality, 1 mortality of goose @ 2.5 hours of first day. Weight loss for all groups	Fink	1983	00131004	No
Mallards, Canada Geese	Brain AcHE	Response dose dependent with critical level @ 10mg/kg	Wildlife Inter.Ltd.	1982	ROODI005	No
Song Birds	Range Spray	3-8oz/A resulted in sig. population reductions	McEwen et al.	1972	00058747	No
Canada Geese	Turf/Pen with 48%ai EC and 0.25inches irri- gation @ 2,4,6 lb ai/A	no mortality, weight losses for all groups, RUD=53ppm/lb ai/A	Wildlife Inter. Ltd.	1986	ROODI006	No
Residues	Turf/Pen with 48%ai EC @ 6 lb ai/A & 14.3%ai G @ 6.2lb ai/A	Max. residues of 144ppm for 48%ai EC & 19ppm for 14.3% ai G, without irrigation	Wildlife Inter. Ltd.	1982	ROODI005 N	

These studies do not fulfill guideline requirements for field testing of formulated products using sensitive species under actual or realistically simulated test conditions.

Actual field testing with birds is required as per 40 CFR 158.145. Due to the very high acute toxicity of diazinon to birds, there is a potential hazard to wild birds at virtually any application site where they would be exposed. Also, some formulated products have been shown to be more toxic to birds than is the technical grade.

Test Material/Sites

The company is required to identify which formulated products are most commonly used on these sites, and these products should be tested. Also, those products with the greatest amount ai and labeled for use on these sites should be tested, for a worst-case situation.

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Emulsifiable Concentrate

The emulsifiable concentrate should be field tested on almonds plums, and alfalfa.

Granular

Granular formulations should be field tested on apples, cherries, and citrus.

Test Parameters

Testing must include a study of dietary exposure and thorough carcass searching to determine whether there is diazinon-induced mortality, and if so, its extent. Research on the almond, apple, and alfalfa areas must also determine, by nest survey, whether avian breeding is disrupted, and collect complete natality, mortality, emigration, and immigration data.

Bird populations must be defined and a determination made if the populations are affected by use of diazinon. Multiple sites, a minimum of three sites and a control per crop, are required for all use patterns that must be tested. A minimum of two years study per site is required. Cancellation of any of the above use patterns would obviate the need for testing of such uses. However, since many crop registrations are intended to be supported by these test crops, other representative sites may be required to be substituted. Protocols that identify proposed sites and site-specific methodology must be approved by the Agency prior to initiation of the studies. Acceptable protocols must be submitted to the Agency no later than 90 days prior to the proposed date for study initiation. The studies are due 30 months from publication of this Registration Standard.

Precautionary Labeling

As per 40 CFR 162.10 and proposed 40 CFR 156.55, the statement "This pesticide is extremely toxic to wildlife" is appropriate since the lowest avian acute oral LD₅₀ is < 100 mg/kg, the lowest avian dietary LC₅₀ is $\leq$ 500 ppm, and approximately 80 cases are reported of avian mortality (see Disciplinary Review).

Effects on Wild Mammals

Diazinon is considered to be only "moderately toxic" to laboratory mammals, based on acute oral LD₅₀ information

available from Toxicology Branch (see Disciplinary Review). However, diazinon has a reported two-generation reproductive no-effect level of 4 ppm for the rat, and a three-generation reproductive no-effect level of 8 ppm for the rat. Also, as previously noted, sulfotepp, a contaminant of diazinon, is very highly toxic to mammals, with a rat LD₅₀=10 mg/kg. Residues of diazinon may approach or exceed these levels in wild mammal habitat (as adapted from Kenaga (1972): at 6 lb ai/A, estimated average residues immediately after application to forage crops may equal 193 ppm, and after six weeks, 6 ppm). For many crops repeated applications are permitted, and residues may be increased as a result. Therefore, due to concern for wild mammal exposure, additional data on wild mammals are required as per 158.145 (Guideline 71-3). The initial tests required are eight-day dietary studies, using technical and formulated materials. These tests must include an emulsifiable concentrate product and a granular material in addition to a test with technical material. The test species should be a native species of rodent (e.g., the subfamily Microtinae). These tests will provide information on a species actually exposed in the field, with an exposure more closely similar to that in the field than occurs with LD₅₀ testing. Reproductive testing may be required pending results of the dietary studies.

As previously noted, sulfotepp, is very highly toxic in laboratory tests with rats. Special testing for toxicity of sulfotepp to wild mammals is required.

Effects on Freshwater Invertebrates

Six studies, within three references, were evaluated under this topic. All were acceptable for use in hazard evaluation.

<u>Author</u>	<u>Date</u>	<u>MRID No.</u>
Vilkas	1976	00109022
Johnson & Finley	1980	00003503
Agchem	1982	00121283

The minimum data required to establish the acute toxicity of diazinon to freshwater invertebrates are the results of an acute LC₅₀ study using technical diazinon.

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The acceptable studies are listed below:

<u>Species</u>	<u>% ai</u>	<u>LC₅₀ and 95% CI (ug/L)</u>	<u>Author</u>	<u>Date</u>	<u>MRID No.</u>	<u>Fulfills Guideline Requirement</u>
<u>Daphnia magna</u>	>89	0.96 (0.83-1.1) NOEL=0.56	Vilkas	1976	00109022	Yes
<u>Daphnia pulex</u>	89	0.8 (0.6-1.1)	Johnson & Finley	1980	00003503	Yes
<u>Gammarus fasciatus</u>	89	0.2 (0.15-0.28)	Johnson & Finley	1980	00003503	Yes
<u>Pteronarcys</u>	89	2.5 (2.0-3.0)	Johnson & Finley	1980	00003503	Yes
<u>Simocephalus</u>	89	1.4	Johnson & Finley	1980	00003503	Yes

There is sufficient information to place diazinon in the EEB category "very highly toxic" for all invertebrates tested. The Guideline requirement for a freshwater invertebrate LC₅₀ with technical diazinon has been met.

Testing, for acute toxicity to a freshwater invertebrate, with technical grade sulfotepp, a contaminant of diazinon is required as per 40 CFR 158.145(b) and as detailed under the avian topical review.

The following study using formulated product was evaluated:

<u>Species</u>	<u>% ai</u>	<u>Formulation</u>	<u>LC₅₀ (ug/L)</u>	<u>Author</u>	<u>Date</u>	<u>Fiche ID No</u>	<u>Fulfill Require.</u>
<u>Daphnia magna</u>	23	microencap- sulated	0.522 (0.459-0.585)	Agchem	1982	00121283	Yes

The requirement for testing for acute toxicity to a freshwater invertebrate with the 23% ai microencapsulated formulated product is fulfilled.

Acute LC₅₀ studies of freshwater invertebrates using the 48% ai emulsifiable concentrate and the 14% ai granular formulated products are required for hazard evaluation since the LC₅₀ of the technical grade of active ingredient is < the maximum measured residue level of 19 ppb reported in runoff water (Ritter et.al., 1974: Core study from EAB/HED).

An invertebrate life cycle study using D. magna is required as per 40 CFR 158.145 because 1) invertebrate LC₅₀ values are below 1 mg ai/L, and 2) diazinon has broad and repeated use on numerous use sites.

EEB presumes substantial acute hazard to aquatic invertebrates from diazinon (see 40 CFR 154.7). Estimates of aquatic exposure are greater than many acute LC₅₀ values, and aquatic field kills have been reported (see Disciplinary Review).

Aquatic residue monitoring and field studies are required of formulated materials. These studies are detailed under the section concerning effects on freshwater fish.

Precautionary Labeling

Labeling for aquatic invertebrate hazard is not specified by current 40 CFR 162.10. Proposed 40 CFR 156.55 indicates that a specific statement is not required for invertebrates since a hazard statement is already specified for fish (see below).

Effects on Freshwater Fish

Fourteen studies, within five references, were evaluated under this topic. Thirteen studies are acceptable for use in hazard assessment.

<u>Author</u>	<u>Date</u>	<u>MRID No.</u>
Johnson & Finley	1980	00003503
Allison & Hermanutz	1977	ROODI007
Goodman, <u>et. al.</u>	1979	ROODI008
Woodard Research Corp.	1964	00104923
Calmbacher	1978	ROODI0009

The minimum data required to establish the acute toxicity of diazinon to freshwater fish are the results from two 96-hour LC₅₀ studies using technical material, one using a coldwater species (preferably the rainbow trout), and one using a warmwater species (preferably the bluegill sunfish).

The acceptable studies are listed below:

<u>Species</u>	<u>% ai</u>	<u>LC50 and 95% CI (ug/L)</u>	<u>Author</u>	<u>Date</u>	<u>Fiche ID No</u>	<u>Fulfills Requirements</u>
Bluegill Sunfish	92	168 (120-220)	Johnson & Finley	1980	00003503	Yes
Bluegill Sunfish	92	460	Allison & Hermanutz	1977	ROODI007	Yes
Bluegill Sunfish	91	136 (100-186)	Woodard Res. Corp.	1964	00104923	Yes
Rainbow Trout	89	90	Johnson & Finley	1980	00003503	Yes
Rainbow Trout	91	400 (230-700)	Woodard Res. Corp.	1964	00104923	Yes
Cutthroat Trout	92	1700 (1390-2090)	Johnson & Finley	1980	00003503	Yes
Lake Trout	92	602 (400-906)	Johnson & Finley	1980	00003503	Yes
Fathead Minnow	92	*7800	Allison & Hermanutz	1977	ROODI007	No
Flagfish	92	1600	Allison & Hermanutz	1977	ROODI007	No
Brook Trout	92	770	Allison & Hermanutz	1977	ROODI007	No

There is sufficient information to characterize diazinon as "very highly toxic" to all of the fish species tested. The Guideline requirement for freshwater fish acute LC50 data with technical material has been met.

Testing with technical grade sulfotepp is required as per 40 CFR 158.145(b) and as detailed in the avian topical review section.

Two acceptable 96-hour LC50 studies have been conducted

with formulated material as follows:

<u>Species</u>	<u>Formu- lation & % ai</u>	<u>LC₅₀ and 95% CI (ug/L)</u>	<u>Author</u>	<u>Date</u>	<u>Fiche ID No</u>	<u>Fulfills Guideline Requirement</u>
Bluegill Sunfish (mic- roencap- sulated)	23	512 (392-672)	Calmbacher	1978	ROODI009	Yes
Rainbow Trout (mic- roencap- sulated)	23	635 (420-960)	Calmbacher	1978	ROODI009	Yes

The testing required for 23% ai microencapsulated products is fulfilled.

A fish embryolarvae study is required as per 40 CFR 158.145 because 1) fish LC₅₀ values are below 1 mg ai/L, and 2) diazinon has broad and repeated use on numerous use sites.

Following submission and review of the fish embryolarvae study specified above, a fish full life cycle study may be required as per 40 CFR 158.145.

EEB presumes substantial acute hazard to fish from diazinon (see 40 CFR 154.7). Estimates of aquatic exposure are greater than many acute LC₅₀ values, and aquatic field kills have been reported. Aquatic residue monitoring is required on alfalfa, almonds, apples, citrus, and cranberry sites.

Additional residue monitoring studies are reserved pending results of these studies. Full field testing examining effects on aquatic invertebrates and fish in addition to residue monitoring is required on alfalfa, almonds, apples and citrus. Additional field testing may be required on other sites pending results from these tests.

Cancellation of any of the above use patterns would obviate the need for testing of these uses. However, since further studies are pending the results of the above initial testing, other sites may be required to be substituted. Protocols for conducting the studies must be submitted to the Agency for review and approval well in advance of the anticipated study initiation.

Precautionary Labeling

As per 40 CFR 162.10 and proposed 40 CFR 156.155, the statement "This pesticide is extremely toxic to fish" is required, based on toxicity data and reported fish kills.

Effects on Estuarine and Marine Organisms

Acute toxicity studies with estuarine and marine organisms are needed for hazard evaluation as per 40 CFR 158.145 due to existing registrations on crops (e.g., cotton, soybeans) with greater than 300,000 acres in coastal counties of the U.S.

One study under one citation was evaluated. The study was acceptable for use in a hazard assessment.

<u>Species</u>	<u>%ai</u>	<u>LC50 (ug/L)</u>	<u>Author</u>	<u>Date</u>	<u>Fiche No</u>	<u>Fulfills Requirement</u>
Sheepshead Minnow	>89	1400	Goodman <u>et. al.</u>	1979	ROODI008	Yes ^{1/}

1/ This study fulfills the portion of the data requirement concerning testing with a fish.

This study fulfills the requirement to test for toxicity to a fish, but testing must be done with a shrimp and oyster.

Ecological Effects

The following studies were sent to EEB via the Pesticide Document Management System (PDMS) but are not cited in the Topical Discussions. They received only abbreviated reviews.

<u>Author</u>	<u>Mrid No.</u>
Bathe <u>et al</u>	00109024
DeWitt <u>et al</u>	00030114
Fink	00114081
Heath <u>et al</u>	00058746
Hill <u>et al</u>	00022923
Posner & Reimer	00109012
Sanders	00097842
Scott & Sons	00004352
US Fish & Wildlife Service	00014476

TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON

Requirement	Does EPA Have		Must Additional	
	Composition ^{1/}	Pattern ^{2/}	Data To Satisfy This Requirement? (Yes, No or Partially)	Biblio-graphic FIFRA Section Citation 3(c)(2)(B)?
<u>145 Wildlife and Aquatic Organisms</u>				
<u>AND MAMMALIAN TESTING</u>				
- Avian Single-Doses Oral LD ₅₀	TGAI	A,B,C,(E,I) ^{1/} , H	Yes ^{3/}	HCETA01, RODDI002, 00109015, 00020560
(SULFOTEP)	TGAI	A,B,C,(E,I) ^{1/} , H	No	
	TEP	A,B,C,H	Partially	RODDI001, RODDI002, RODDI004
- Avian dietary LC ₅₀	TGAI	A,B,C,(E,I) ^{1/} , H	Yes	00034769
(SULFOTEP)	TGAI	A,B,C,(E,I) ^{1/} , H	No	
	TEP	A,B,C,H	Partially	RODDI004, RODDI003,
- Wild Mammal Toxicity (SULFOTEP)	TGAI	A,B,C,H	No	
	TGAI	A,B,C,H	No	
	TEP	A,B,C,H	No	
- Avian Reproduction	TGAI	A,B,C,H	No	
- Simulated and Actual Field Testing for Mammals & Birds	TEP	A,B,C,H	No	

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TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont)

Requirement	Composition ¹ Use		Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)		Biblio- graphic Citation		Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)?	
	Pattern ²	Partially ³						
<u>FTC ORGANISM TESTING</u>								
- Freshwater Fish LC ₅₀	TCAI	A,B,C,(E,I) ^{17,18} _H	Yes	00003503			NO	
(SULFOTEP)	TCAI	A,B,C,H	NO				Yes ⁹ /	
	TEP	A,B,C,H	Partially	R0001009			Yes ¹⁰ /	
- Acute LC ₅₀ Aquatic Invertebrates	TCAI	A,B,C,(E,I) ¹⁷ _H	Yes	00109022,00003503			NO	
(SULFOTEP)	TCAI	A,B,C,H	NO				Yes ⁹ /	
	TEP	A,B,C,H	Partially	00121283			Yes ¹⁰ /	
- Acute LC ₅₀ Estuarine and Marine Organisms	TCAI	A,B,C	Partially	R0001008			Yes ¹¹ /	
	TEP	A,B,C	NO				Reserved ¹² /	
- Fish Early Life-Stage and Aquatic Invertebrate Life-Cycle	TCAI	A,B,C	NO				Yes ¹³ /	
- Fish Life-Cycle	TCAI	A,B,C,H	NO				Reserved ¹⁴ /	
- Aquatic Organism Accumulation	TCAI	A,B,C	NO				Yes ¹⁵ /	
- Simulated or Actual Field Testing for Aquatic Organisms	TEP	A,B,C,H	NO				Yes ¹⁶ /	

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TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont)

Requirement	Composition ¹⁷	Use Pattern ²¹	Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)	Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)?
<u>8.150 Plant Protection</u>				
<u>SET AREA PHYTOTOXICITY</u>				
-1 - Target area Phytotoxicity	TGP	B	No	No
<u>TARGET AREA PHYTOTOXICITY</u>				
TIER I				
-1 - Seed Germination/Seedling Emergence	TGAI	B	No	Yes
-1 - Vegetative Vigor	TGAI	B	No	Yes
-2 - Aquatic Plant Growth	TGAI	B	No	Yes
TIER II				
-1 - Seed Germination/Seed Emergence	TGAI	B	No	Reserved ¹⁹ /
-1 - Vegetative Vigor	TGAI	B	No	Reserved ¹⁹ /
-2 - Aquatic Plant Growth	TGAI	B	No	Reserved ¹⁹ /
TIER III				
-1 - Terrestrial Field	TGAI	B	No	Reserved ²⁰ /
-1-2 - Aquatic Field	TGAI	B	No	Reserved ²⁰ /

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TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont.)

FOOTNOTES

- / Composition: TGA1 = Technical grade of the active ingredient; TEP = Typical end-use product.
- / The use patterns are coded as follows: A = Terrestrial, Food Crop; B = Terrestrial, Nonfood; C = Aquatic, Food Crop; D = Aquatic, Nonfood; E = Greenhouse, Food Crop; F = Greenhouse, Nonfood; G = Forestry; H = Domestic Outdoor; I = Indoor.
- / None of the studies fulfill the requirement individually, but the combination of all studies does fulfill the requirement.
- / Avian single-dose oral LD50 testing with waterfowl and upland gamebird species required with granular products containing 20, 50, and 100 ai, and with emulsifiable concentrate products containing 30, 12.50, 200, 320, and 480 ai.
- / Avian dietary LC50 testing with waterfowl and upland gamebird species required with emulsifiable concentrate products containing 30, 12.5, 200, and 320 ai. Testing with waterfowl species with 480 ai emulsifiable concentrate product is required.
- / An eight-day dietary study is required as per 40 CFR 158.145 to provide information on a species actually exposed in the field, with a dietary feeding type of ingestion. Test species should be a native species of rodent. Technical grade ai plus 50 and 14.30 ai granular products and 30, 200, 320, and 480 ai emulsifiable concentrate products should be tested.
- / Avian reproduction studies with technical grade ai are required for an upland gamebird and waterfowl species. The standard protocol, as in the guidelines, should be expanded to include behavioral monitoring for such effects as decreased nest attentiveness (i.e., birds must be allowed to naturally incubate eggs). Protocol must be submitted to Agency for approval a minimum of 90 days prior to anticipated date of test initiation.

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TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont.)

Actual field testing with birds is required as per 40 CFR 158.145. With a 488 ai emulsifiable concentrate product, initial crops to be tested are almonds, plums, and alfalfa. With a 14.38 ai granular product, initial crops to be tested are citrus, cherries, and apples. Initial testing must include 3 sites plus a control in one location per crop, residue analysis of avian food items, and carcass searching to determine the extent of diazinon-induced mortality. These are single use season studies for the plum, citrus and cherry crops. The research on the almond, alfalfa and apple sites must additionally determine by nest survey whether avian breeding is disrupted, and must obtain natality, mortality, emigration and immigration data. The duration for these studies on almond, alfalfa, and apple sites is a minimum of two (2) years. Additional field testing is reserved pending results of these studies.

Cancellation of any of the above use patterns would obviate the need for testing of these uses. However, since further studies are pending the results of the above initial testing, other sites may be required to be substituted. Protocols for conducting the studies, including quantitative descriptions of the proposed test sites and detailed descriptions of proposed methodology and sample sizes, must be submitted to the Agency no later than 90 days prior to the anticipated date of study initiation. The study is due 30 months from publication of this Registration Standard.

Technical sulfotepp, a very highly toxic contaminant of diazinon, must be tested for acute toxicity to wild mammals, birds, freshwater invertebrates, and fish as per guideline procedures for basic tests.

1/ Acute EC50 studies with a freshwater invertebrate and warm and cold water fish species are required. Formulated products to be tested include a 14.38 ai granular product and a 488 ai emulsifiable concentrate.

1/ Acute toxicity testing with the technical grade ai is required because diazinon is labeled for use on crops grown in more than 300,000 acres in coastal counties. Shrimp and oyster tests are required.

2/ Formulated product testing for acute toxicity to estuarine and marine organisms, is reserved pending the results of testing with technical grade ai.

3/ Both the fish early life stage and aquatic invertebrate life cycle studies are required.

TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont)

- / Testing is reserved pending the results of the the fish early life-stage testing.
- / Testing is required as per 158.165.5 Environmental Chemistry Data Requirements (Exposure Assessment Branch).
- / Aquatic residue monitoring is required on a cranberry crop. A minimum of three sites for cranberry monitoring is required; the study duration is a single use season. Additional residue monitoring studies are reserved pending results of this study. Full field testing, plus aquatic residue monitoring, to exam effects on aquatic invertebrates and fish is also required on alfalfa, almonds, apples, and citrus. A minimum of three sites per crop are required. The study duration is a minimum of two (2) years. Mesocosm studies are an alternative to full field testing, and would satisfy both residue and full field study requirements for the above crops. Additional field testing may be required on other sites pending results of these initial studies. Cancellation of any of the above uses would obviate the need for testing of those uses. However, since further studies are pending the results of the above initial testing, other sites may be required to be substituted. Protocols for conducting the studies, including quantitative descriptions of the proposed test sites and detailed descriptions of proposed methodology and sample sizes, must be submitted to the Agency no later than 90 days prior to the anticipated date of study initiation. The study is due 30 months from publication of this Registration Standard.
- / To support the manufacturing use product used to reformulate the end-use product.
- / Only one species is required.
- / Reserved pending results of Tier I.
- / Reserved pending results of Tier II.

DATA EVALUATION RECORD

PAGE 1 OF

CASE: 238

DIAZINON

CONT-CAT: 02 GUIDELINES: 71-1

MRID: 20560

Schafer, E.W. (1972) The Acute Oral Toxicity of 369 Pesticidal, Pharmaceutical and other Chemicals to Wild Birds. Toxicology and Applied Pharmacology 21 (?):315-330. (Also In Unpublished Submission Received April 25, 1978 under 476-2180; Submitted By Stauffer Chemical Co., Richmond, Calif.; CDL:233577-C).

REVIEW RESULTS:VALID INVALID INCOMPLETE GUIDELINE: SATISFIED PARTIALLY SATISFIED NOT SATISFIED -----
DIRECT RVW TIME = 10 Minutes START DATE: 06/13/86 END DATE: 06/13/86

REVIEWED BY: *MR* Margaret Rostker
 TITLE: Wildlife Biologist
 ORG: EEB/HED
 LOC/TEL: 557-7600
 SIGNATURE: *H.T. Craven*

5/5/87
DATE: 06/13/86

APPROVED BY: Harry Craven
 TITLE: Supervisory Biologist
 ORG: EEB/HED
 LOC/TEL: 557-1741
 SIGNATURE: *H.T. Craven*

DATE: *5/5/87*

Summary paper but acceptable for use in a hazard assessment.

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114. Phosphoric acid, dimethyl ester with 3-hydro-*N*-methyl crotonimide (E-) (Azodrin)
115. Phosphoric acid, dimethyl ester with *cis*-3-hydroxy-*N,N*-dimethyl crotonamide (Bidrin)
116. Phosphoric acid, dimethyl ester with *N*-hydroxynaphthalimide (Bay 9002)
117. Phosphoric acid, dimethyl-, methyl thiophenyl ester (GC 6506)
118. Phosphoric acid, dimethyl-, 2,4,5-trichlorophenyl ester (Dowco 101)
119. Phosphorodithioic acid, *N,N*-dimethyl phenyl ester (Dowco 101)
120. Phosphorodithioic acid, *S*-(*p*-chlorophenyl)thio) methyl ester (Duwco 169)
121. Phosphorodithioic acid, *S*-(*p*-chlorophenyl)thio) methyl ester (Carbophenothion)
122. Phosphorodithioic acid, *S*-(*p*-chlorophenyl)thio) methyl ester (Disulfoton)
123. Phosphorodithioic acid, *O,O*-diethyl *S*-(2-ethylthio)ethyl ester (Blorag)
124. Phosphorodithioic acid, *O,O*-diethyl *S*-(ethylthio)methyl ester *en*-2-yl ester (HRS 1635)
125. Phosphorodithioic acid, *O,O*-diethyl ester, *S* ester with *N*-methyl acetamide (Dimehoac)
126. Phosphorodithioic acid, *O,O*-diethyl-, *S*-ester with *N*-methyl methyl-1,2,3-benzotriazin-4(3*H*)-one (Guthion)
127. Phosphorodithioic acid, *O,O*-dimethyl-, *S*-ester with *N*-(mercapto-methyl)phthalimide (Imidan)
128. Phosphorodithioic acid, *O,O,O',O'*-tetraethyl-, *S,S'*-methylene ester (Ithion)
129. Phosphorothioic acid, *O*-2,4-dichlorophenyl *O,O*-diethyl ester (VC 13)
130. Phosphorothioic acid, *O,O*-diethyl *O*-(2-ethylthio)ethyl ester mixture with *O,O*-diethyl *S*-(2-ethylthio)ethyl ester (Deneton)
131. Phosphorothioic acid, *O,O*-diethyl *O*-(2-isopropyl-6-methyl-4-pyrimidinyl) ester (Diazinon)
132. Phosphorothioic acid, *O,O*-diethyl *O*-[*p*-(methylsulfinyl)phenyl] ester (Bay 25141)

3.3'	1.9-6.0	1.0	0.56-1.8	23
2.7'	0.85-8.5	1.6'	0.5-5.0	22
>100	—	2.4	1.3-4.2	70-75
0.56	—	0.56	—	7
>100	—	18	10-32	—
75	—	13	5.6-32	—
5.6	3.2-10	7.5	—	24
> 78	—	18	5.6-56	200
>32	—	3.2	1.8-5.6	10
7.5	—	1.0	0.56-1.8	3.7
>100	—	75	—	140
32	25-41	6.6	3.6-12	250
27	15-48	8.5	—	13
>100	—	18	10-32	216
>304	—	45	—	96
80	25-250	14	—	270
27'	—	—	—	1.7-7.5
110	60-200	2.0	—	150-220
0.56	0.32-1.0	0.24	—	5

CASE: 238

DIAZINON

CONT-CAT: 02 GUIDELINES: 71-2

MRID: 22923

Hill, E.F.; Heath, R.G.; Spann, J.W.; et al. (1975) Lethal Dietary Toxicities of Environmental Pollutants to Birds: Special Scientific Report--Wildlife No. 191. (U.S. Dept. of the Interior, Fish and Wildlife Service, Patuxent Wildlife Research Center; Unpublished Report)

REVIEW RESULTS:VALID ☒ INVALID ☐ INCOMPLETE ☐GUIDELINE: SATISFIED ☒ PARTIALLY SATISFIED ☐ NOT SATISFIED ☐-----
DIRECT RVW TIME = 10 Minutes START DATE: 06/13/86 END DATE: 06/13/86
-----REVIEWED BY: *M* Margaret Rostker
TITLE: Wildlife Biologist

ORG: EEB/HED

LOC/TEL: 557-7562

SIGNATURE: *H.T. Craven**5/4/87*
DATE: 06/13/86
-----APPROVED BY: Harry Craven
TITLE: Supervisory Biologist

ORG: EEB/HED

LOC/TEL: 557-1741

SIGNATURE: *H.T. Craven**5/4/87*
DATE: *5/4/87*

This MRID number is changed to 0034769. The study is core.

341

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D. Williams *Records* 6-24-83

Table 1. Dietary toxicities of 131 compounds tested in 5-day diets of young bobwhites, Japanese quail, ring-necked pheasants, or mallards (1964-73)--continued

Compound	Species	Age (days) ^a	No. of cons. ^b	No. birds/ cons. ^c	LC ₅₀ ^e (95% C.L.)	Slope ^d (S.D.)	RTD ^f (95% C.L.)	
DVT	Bobwhite	23	5	7	611	(514-724)	7.357 (2.489)	16.6 (13.4-20.8)
	Japanese quail	7	6	12	568	(470-687)	4.770 (1.367)	10.1 (7.9-13.0)
	Ring-necked pheasant	21	4	7	311	(256-374)	10.982 (4.644)	7.3 (5.9-8.9)
	Mallard	17	6	10	1869	(1500-2372)	3.896 (0.956)	9.6 (7.1-13.1)
DVT	Japanese quail	14	6	10	298	(237-345)	6.533 (1.369)	5.1 (4.2-6.2)
	Ring-necked pheasant	10	6	10	368	(473-675)	5.521 (1.315)	10.1 (8.1-12.7)
	Mallard	16	3	10	>5000	(10% mortality at 1250 ppm, 30% at 5000 ppm)		
	Mallard	5	6	10	1317	(1043-1674)	2.349 (0.961)	8.3 (6.0-11.5)
DVT	Bobwhite	14	6	8	596	(472-768)	4.510 (1.289)	13.5 ^g
	Japanese quail	12	6	10	275	(228-327)	5.168 (1.314)	5.2 (4.0-6.3)
	Ring-necked pheasant	10	6	8	665	(572-773)	7.238 (1.915)	10.2 (8.3-12.5)
	Mallard	10	6	11	598	(488-733)	2.609 (0.873)	4.3 (3.2-5.8)
DVT	Bobwhite	10	4	8	245	(178-324)	10.771 (3.271)	6.41 (4.29-9.48)
	Japanese quail	6	5	10	47	(40-54)	6.962 (1.017)	1.11 (0.91-1.35)
	Ring-necked pheasant	22	4	8	144	(177-322)	6.796 (1.796)	6.01 (4.19-9.18)
	Mallard	10	5	10	191	(138-253)	3.687 (1.186)	0.94 (0.63-1.33)

342 (20)

CASE: 238

DIAZINON

72-1

CONT-CAT: 01

GUIDELINES: ~~XXXX~~

MRID: 104923

Woodard Research Corp. (1964) Diazinon Safety Evaluation on
Fish and Wildlife. (Unpublished Study Received July 23,
1965 under Unknown Admin. No.; Submitted by Ciba-Geigy
Corp., Greensboro, NC; CDL:165060-A).

REVIEW RESULTS:

VALID ☒ INVALID ☐ INCOMPLETE ☐GUIDELINE: SATISFIED ☐ PARTIALLY SATISFIED ☒ NOT SATISFIED ☐

DIRECT RVW TIME = 10 Minutes START DATE: 06/13/86 END DATE: 06/13/86

REVIEWED BY: ~~h~~Margaret Rostker

H.T. Craven

TITLE: Ecologist

ORG: EEB/HED

LOC/TEL: 557-7562

SIGNATURE:

5/4/87

APPROVED BY: Harry Craven

H.T. Craven

TITLE: Section Head

ORG: EEB/HED

LOC/TEL: 557-1741

SIGNATURE:

5/4/87

Formulation Testing: 50W

Supplemental for Bluegill LC₅₀ = 0.136 ppm
Supplemental for Rainbow LC₅₀ = 0.40 ppm;
Invalid for unacceptable test species goldfish;
Supplemental for Bobwhite LC₅₀ = 140 ppm;
Supplemental for Mallard LC₅₀ = 180 ppm

343

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EEB BRANCH REVIEW

DATE: IN 06/08/77 OUT 07/11/77 IN _____ OUT _____ IN _____ OUT _____
 FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. _____

PETITION OR EXP. PERMIT NO. 100-EUP-56

DATE DIV. RECEIVED 06/05/77

DATE OF SUBMISSION 04/13/77

DATE SUBMISSION ACCEPTED _____

TYPE PRODUCT(S): (I,) D, H, F, N, R, S _____

PRODUCT MGR. NO. L. Zink

PRODUCT NAME(S) Diazinon AG 500

COMPANY NAME Ciba-Geigy Corp.

SUBMISSION PURPOSE EUP - Wheat

CHEMICAL & FORMULATION Diazinon: O,O-diethyl-O-(2-isopropyl-4-methyl-6-pyrimidinyl)phosphorothioate 53.4%
Inert Ingredients 46.6%

344

EEB BRANCH REVIEW

DATE: IN 06/08/77 OUT 07/11/77 IN _____ OUT _____ IN _____ OUT _____

FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO.

PETITION OR EXP. PERMIT NO. 100-EUP-56

DATE DIV. RECEIVED 06/05/77

DATE OF SUBMISSION 04/13/77

DATE SUBMISSION ACCEPTED

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

PRODUCT MGR. NO. L. Zink

PRODUCT NAME(S) Diazinon AG 500

COMPANY NAME Ciba-Geigy Corp.

SUBMISSION PURPOSE EUP - Wheat

CHEMICAL & FORMULATION	<u>Diazinon: O,O-diethyl-O-(2-isopropyl-4-methyl-6-</u>	
	pyrimidinyl)phosphorothioate	53.4%
	Inert Ingredients	46.6%

3416

Data Review Number: (ES) VII F-2

Test: 96-Hour Acute LC₅₀ (Warmwater Fish)

Species: Bluegill Sunfish

Results: LC₅₀ = 0.136 ppm (0.100 to 0.186 ppm)

Chemical: Diazinon (Technical - 91%)

Title: Diazinon Safety Evaluation in Fish and Wildlife:
Acute Toxicity in Sunfish.

Accession No. 228039

Study Date: April 20, 1965

Researcher: Woodard Research Corporation

Registrant: Ciba-Geigy Corporation

Validation Category: Supplemental

Category Repairability: No

Abstract:

- Initial mortality (30%) at 0.10 ppm.
- 100% mortality at 0.32 ppm.
- Fish exposed to diazinon tended to expire slowly and sink to bottom of container.

Validation Category Rationale:

Water temperature ranged from 15 to 18 °C during this test. Guideline standards (draft) specify that water temperature should be 22 °C ($\pm$ 1 °C). The LC₅₀ data derieved during this test provides useful supplemental information for hazard assessment. However, the test must be conducted at the specified temperature (22° $\pm$ 1 °C) in order to receive validation as a "core" study.

345

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EEB BRANCH REVIEW

DATE: IN 06/08/77 OUT 07/11/77 IN _____ OUT _____ IN _____ OUT _____
 FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. _____

PETITION OR EXP. PERMIT NO. 100-EUP-56

DATE DIV. RECEIVED 06/05/77

DATE OF SUBMISSION 04/13/77

DATE SUBMISSION ACCEPTED _____

TYPE PRODUCT(S): (I,) D, H, F, N, R, S _____

PRODUCT MGR. NO. L. Zink

PRODUCT NAME(S) Diazinon AG 500

COMPANY NAME Ciba-Geigy Corp.

SUBMISSION PURPOSE EUP - Wheat

CHEMICAL & FORMULATION Diazinon: O,O-diethyl-O-(2-isopropyl-4-methyl-6-pyrimidinyl)phosphorothioate 53.4%
Inert Ingredients 46.6%

Data Review Number: (ES) VII G-1

Test: 96-Hour Acute LC₅₀ (Coldwater Fish)

Species: Rainbow Trout

Results: LC₅₀ = 0.40 ppm (0.23 to 0.70 ppm)

Chemical: Diazinon (Technical - 91%)

Title: Diazinon Safety Evaluation in Fish and Wildlife:
Acute Toxicity in Rainbow Trout.

Accession No. 228039

Study Date: April 20, 1965

Researcher: Woodard Research Corporation

Registrant: Ciba-Geigy Corporation

Validation Category: Supplemental

Category Repairability: No

Abstract: - The only mortality levels recorded were 60%
(at 0.32 ppm and at 0.56 ppm) and 80% (at 1.0
ppm).
- Fish exposed to Diazinon tended to expire slowly
and sink to bottom of container.

Validation Category Rationale:

The LC₅₀ value determined from this test provides useful supplemental information for hazard evaluation. However, this study is not an acceptable 96-hour acute LC₅₀ test because:

1. Insufficient number of mortality levels for calculations of LC₅₀.
2. Water temperature not within specified limits.
3. Incomplete information of protocol.

347

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EEB BRANCH REVIEW

DATE: IN 06/08/77 OUT 07/11/77 IN _____ OUT _____ IN _____ OUT _____
 FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. _____
 PETITION OR EXP. PERMIT NO. 100-EUP-56
 DATE DIV. RECEIVED 06/05/77
 DATE OF SUBMISSION 04/13/77
 DATE SUBMISSION ACCEPTED _____
 TYPE PRODUCT(S): (I,) D, H, F, N, R, S _____
 PRODUCT MGR. NO. L. Zink
 PRODUCT NAME(S) Diazinon AG 500
 COMPANY NAME Ciba-Geigy Corp.
 SUBMISSION PURPOSE EUP - Wheat
 CHEMICAL & FORMULATION Diazinon: O,O-diethyl-O-(2-isopropyl-4-methyl-6-
pyrimidinyl)phosphorothioate 53.4%
Inert Ingredients 46.6%

350

Data Review Number: (ES) VII F-1

Test: 96-Hour Acute LC₅₀ (Warmwater Fish)

Species: Goldfish

Results: LC₅₀ = 9.0 ppm (7.3 to 11.2 ppm)

Chemical: Diazinon (Technical - 91%)

Title: Diazinon Safety Evaluation in Fish and Wildlife:
Acute Toxicity in Rainbow Trout.

Accession No. 228039

Study Date: April 20, 1965

Researcher: Woodard Research Corporation

Registrant: Ciba-Geigy Corporation

Validation Category: Invalid

Category Repairability: No

Abstract: - The only mortality levels observed in this test
were 80% (at 10.0 ppm) and 100% (at 18.0 ppm)

Validation Category Rationale:

This test was classified invalid because:

1. Water temperature below specifications (11 to 17 °C
vs 22 °C).
2. Insufficient number of mortality levles for calculation
of LC₅₀.
3. Goldfish is not acceptable test species.

349

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EEB BRANCH REVIEW

DATE: IN 06/08/77 OUT 07/11/77 IN _____ OUT _____ IN _____ OUT _____
 FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. _____

PETITION OR EXP. PERMIT NO. 100-EUP-56

DATE DIV. RECEIVED 06/05/77

DATE OF SUBMISSION 04/13/77

DATE SUBMISSION ACCEPTED _____

TYPE PRODUCT(S): (I,) D, H, F, N, R, S _____

PRODUCT MGR. NO. L. Zink

PRODUCT NAME(S) Diazinon AG 500

COMPANY NAME Ciba-Geigy Corp.

SUBMISSION PURPOSE EUP - Wheat

CHEMICAL & FORMULATION Diazinon: O,O-diethyl-O-(2-isopropyl-4-methyl-6-pyrimidinyl)phosphorothioate 53.4%
Inert Ingredients 46.6%

552

Data Review Number: (ES) VII D-1

Test: Avian Dietary LC₅₀ (Upland gamebird)

Species: Bobwhite Quail

Results: LC₅₀ = 140 ppm (97 to 205 ppm)

Chemical: Diazinon 50W

Title: Diazinon Safety Evaluation in Fish and Wildlife:
Acute Toxicity in Rainbow Trout.

Accession No. 228039

Study Date: April 20, 1965

Researcher: Woodard Research Corporation

Registrant: Ciba-Geigy Corporation

Validation Category: Supplemental

Category Repairability: No

- Abstract:
1. Initial mortality (10%) observed 80 ppm.
 2. 100% mortality at 320 ppm.
 3. Diarrhea observed in birds on Diazinon 50W at all treatment levels.
 4. Death of test birds on Diazinon 50W was preceded by paralysis.

Validation Category Rationale:

This test was classified supplemental because:

1. Test material was Diazinon 50W (48.6% Technical).
2. Test birds were too old (7 to 9 weeks).
3. Some test methods did not conform with specified protocol.

357

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EEB BRANCH REVIEW

DATE: IN 06/08/77 OUT 07/11/77 IN _____ OUT _____ IN _____ OUT _____
 FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. _____

PETITION OR EXP. PERMIT NO. 100-EUP-56

DATE DIV. RECEIVED 06/05/77

DATE OF SUBMISSION 04/13/77

DATE SUBMISSION ACCEPTED _____

TYPE PRODUCT(S): (I,) D, H, F, N, R, S _____

PRODUCT MGR. NO. L. Zink

PRODUCT NAME(S) Diazinon AG 500

COMPANY NAME Ciba-Geigy Corp.

SUBMISSION PURPOSE EUP - Wheat

CHEMICAL & FORMULATION Diazinon: O,O-diethyl-O-(2-isopropyl-4-methyl-6-pyrimidinyl)phosphorothioate 53.4%
Inert Ingredients 46.6%

354

Data Review Number: (ES) VII E-1

Test: Avian Dietary LC₅₀ (Waterfowl)

Species: Mallard

Results: Diazinon 50W: LC₅₀ = 180 ppm (135.3 to 239.4 ppm)
Diazinon a.i.*: LC₅₀ 90 ppm (67.7 to 119.7 ppm)

*Calculated from above data.

Chemical: Diazinon 50W

Title: Diazinon Safety Evaluation in Fish and Wildlife:
Subacute Toxicity in Mallard Ducks/

Accession No. 228039

Study Date: April 20, 1965

Researcher: Woodard Research Corporation

Registrant: Ciba-Geigy Corporation

Validation Category: Supplemental

Category Repairability: No

Abstract:

- No effect concentration level was 100 ppm.
- 100% mortality at 560 ppm (within 2 days).
- Food consumption and body weight gains were low among all test birds treated with Diazinon 50W.
- No gross effect of toxicity among test birds treated with 100 ppm Diazinon 50W.

Validation Category Rationale:

Test procedures reported for this study were scientifically sound. This test was classified "supplemental" because test material used was not technical of active ingredient as required per Section 3 Regulations.

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DATA EVALUATION RECORD

PAGE 1 OF

CASE: 238

DIAZINON

CONT-CAT: 01 GUIDELINES: 72-2

MRID: 109022

Vilkas, A. (1976) Acute Toxicity of Diazinon Technical to the Water Flea, *Daphnia magna* straus: AES Proj. No. 7613-500. (Unpublished Study Received September 15, 1977 under 100-524; prepared by Union Carbide Corp., submitted by Ciba-Geigy Corp., Greensboro, NC; CDL:231800-P).

REVIEW RESULTS:

VALID ☒ INVALID ☐ INCOMPLETE ☐GUIDELINE: SATISFIED ☒ PARTIALLY SATISFIED ☐ NOT SATISFIED ☐-----
DIRECT RVW TIME = 30 Minutes START DATE: 06/13/86 END DATE: 06/13/86
-----REVIEWED BY: *M* Margaret Rostker

TITLE: Ecologist

ORG: EEB/HED

LOC/TEL: 557-7562

SIGNATURE: _____

H.T. Craven 5/4/87
DATE: 06/13/86

APPROVED BY: Harry Craven

TITLE: Section Head

ORG: EEB/HED

LOC/TEL: 557-1741

SIGNATURE: _____

DATE: *H.T. Craven*
5/4/87Core study showing Daphnia LC₅₀ = 0.83 ppb for technical diazinon.

356

Data Review Number: (ES) VII E-1

Test: 96-Hour Shell Deposition

Species: Oyster

Results: N/A.

Chemical: Diazinon

Title: Diazinon Summary of Safety Evaluation on Fish and
Wildlife: Diazinon Effect on Shell Growth of Oysters.

Accession No. 228039

Study Date: July 7, 1965

Researcher: Woodard Research Corporation

Registrant: Ciba-Geigy Corporation

Validation Category Rationale:

This study was not reviewed by Environmental Safety Section because it is not a basic or conditional requirement for registration of this proposed use pattern of diazinon AG 500.

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CASE GS _____

PM ____/____/____

CHEM DiazinonBRANCH EEB

DISC _____

FORMULATION Technical, 14G (14.3% ai granular)FICHE/MASTER ID RO0BI002 148703

CITATION: Hill, E.F.; Camardese, M.B. (1984) Toxicity of
Anticholinesterase Insecticides to Birds; Technical
Grade Versus Granular Formulations. Ecotoxicology
and Environmental Safety. 8:551-563.

SUBST. CLASS=

OTHER SUBJECT DESCRIPTORS
PRIM:

DIRECT REVIEW TIME= 1 week (MH) START DATE April 1986 END DATE April
1986

REVIEWED BY: Margaret Rostker
TITLE: Wildlife Biologist
ORG: EEB
LOC./TEL: 557-7600

*H. T. Craven**5/4/87*

SIGNATURE:

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB
LOC./TEL: 557-7600

SIGNATURE: *Harry T. Craven**5/4/87*

This study is supplemental due to lack of all raw data and
minor deviations from guidelines. It is useful in hazard
assessment and shows Diazinon LD₅₀ = 10 mg ai/kg to bobwhite
Quail when technical material is tested, and Bobwhite LD₅₀ = 8
mg ai/kg when granular 14.37% ai (14G) is tested.

358

Data Review Number: (ES) VII H-1

Test: 48-Hour Acute LC₅₀ (Aquatic invertebrate)

Species: Daphnia magna

Results: LC₅₀ = 0.96 ppb (0.83 to 1.10 ppb)

Chemical: Diazinon (Technical)

Title: Acute Toxicity of Diazinon Technical to the Water Flea (Daphnia magna straus)

Accession No. 228039

Study Date: August 10, 1976

Researcher: Aquatic Environmental Sciencies

Registrant: Ciba-Geigy Corporation

Validation Category: Core

Category Repairability: N/A

Abstract: - No effect concentration level was 0.56 ppb.
- 95% mortality at 1.80 ppb.

Validation Category Rationale:

The test procedures reported were determined to be scientifically sound. The 48-hour acute LC₅₀ was calculated from high mortality rates (65% and 95%) recorded at only two concentration levels of the toxicant.

EPA protocol for 48-hour acute LC₅₀ tests for aquatic invertebrates (U.S. Environmental Protection Agency, 1975. Methods for acute toxicity tests with fish, macroinvertebrates, and amphibians. EPA-660/3-75-00, 61 pp.) specify that one treatment must have affected less than 35 percent of the organisms exposed to it. Therefore, the accuracy of the LC₅₀ value (LC₅₀ = 0.96 ppb) reported for this study is questionable. However, there was no mortality of test organisms at 0.56 ppb. Clearly, the true LC₅₀ concentration level is between 0.56 ppb and 1.00 ppb.

Because the median LC₅₀ value for Daphnia magna exposed to Diazinon technical was calculated from test results which did not conform completely with EPA criteria, the Environmental Safety Section will use the low 95 percent confidence limit of the median value (LC₅₀ = 0.83 ppb) in its hazard assessment of the toxicant.

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11. Materials and Methods:

- a. Test Animals: Ten to twelve week old Bobwhite Quail from Fayetteville, North Carolina were purchased and held in test facilities. The Bobwhite were tested at 16 to 20 weeks of age, with mean weight = 205 g.
- b. Dose: Oral dosing.
- c. Design: 5 dose levels, geometrically spaced; 10 birds per dose level.
- d. Statistics: Probit analysis; two-tailed to test.

12. Reported Resulted:

LD₅₀ = 10 mg ai/kg for technical grade and LD₅₀ = 8 mg ai/kg for 14G.

13. Study Author's Conclusions/QA Measures:

See reported results.

14. Reviewer's Discussion and Interpretation of Study:

- a. Test Procedures: The study is in accordance with guideline protocols.
- b. Statistical Analysis: The analysis was properly conducted.
- c. Discussion/Results: See reported results. Diazinon is considered "very highly toxic" to birds.

15. Adequacy of Study:

- 1. Classification: Supplemental.
- 2. Rationale: Guideline deviations though only minor.
- 3. Repair: N/A.

DATA EVALUATION RECORD

1. Chemical: Diazinon
2. Test Material: Technical and 14.3% ai granular (14G).
3. Study Type: Single oral dose to Bobwhite Quail
4. Study ID: Hill, E.F.; Camardese, M.B. (1986) Toxicity of Anticholinesterase Insecticides to Birds: Technical Grade Versus Granular Formulations. Ecotoxicology and Environmental Safety. 8:551-563.

5. Reviewed by: Margaret Rostker
Wildlife Biologist
EEB/HED

Signature: *H.T. Craven*

Date: *5/4/87*

6. Approved by: Harry Craven
Supervisory Biologist
EEB/HED

Signature: *Harry T. Craven*

Date: *5/4/87*

7. Conclusions:

Diazinon LD₅₀ = 50 mg/kg ai for technical and 8 mg/kg ai for 14G for Bobwhite Quail.

The study provides useful data for a hazard assessment but are classed Supplemental because the tests were not conducted strictly according to guidelines.

8. Recommendations: N/A
9. Background: N/A
10. Discussion of Individual Test:

Diazinon is discussed in this DER.

359

1. Chemical: Diazinon

3. Citation: Morrissey, A.E. (1978) The Acute Toxicity of Knox Out 2FM to the Water Flea, Daphnia magna Straus, UCES Proj. No. 11506-41-08; Prepared by Union Carbide Environ. Serv.; Submitted by Pennwalt Corp. (Acc. No. 240993).

Date:

6. Test Type: Aquatic Invertebrate Acute LC₅₀

7. Reported Results:

8. Reviewer's Conclusions:

362.

CASE: 238

DIAZINON

CONT-CAT: 01 GUIDELINES: 72-2

MRID: 121283

Agchem (1982) Daphnia Magna Toxicity--Knox Out 2FM Insecticide
Concentrations in Water Used for Union Carbide Environmental
Service Report 11506-41-08. (Unpublished Study Received
December 15, 1982 under 4581-335; CDL:249076-D)

REVIEW RESULTS:

VALID ✓ INVALID INCOMPLETE GUIDELINE: SATISFIED ✓ PARTIALLY SATISFIED NOT SATISFIED
-----DIRECT RVW TIME = 30 Minutes START DATE: 06/13/86 END DATE: 06/13/86
-----REVIEWED BY: *M* Margaret Rostker

TITLE: Ecologist

ORG: EEB/HED

LOC/TEL: 557-1741

SIGNATURE: _____

H. T. Craven
5/4/82
DATE: 06/13/86

APPROVED BY: Harry Craven

TITLE: Supervisory Biologist

ORG: EEB/HED

LOC/TEL: 557-1741

SIGNATURE: _____

H. T. Craven
DATE: *5/4/87*

Core study showing Daphnia 48-hour LC₅₀ = 0.522 ppb nominal
active ingredient.

361

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DATA EVALUATION RECORD

1. Chemical: Diazinon 2FM Microencapsulated
2. Formulation: Formulated Product
O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl)
phosphorothioate 23%
Inert Ingredients 77%
3. Citation: Application for Registration of Knox Out®
Fire Ant Control Section IX.
Fish and Wildlife Safety October 1982.
Submitted by Agchem Division Pennwalt Corporation.
Accession No. 248821, Registration No. 4581-GLR.
4. Reviewed by: Wayne C. Faatz, Ph.D.
Wildlife Biologist
5. Date Reviewed: January 5, 1983
6. Test Type: Daphnia magna

Toxicity - Knox Out 2FM Insecticide Concentrations in Water.
Union Carbide Environmental Report: 11506-41-08.

This report is a supplement to the data evaluation record by J. Leitzke September 11, 1980 on "The acute toxicity of Knox Out 2FM to the water flea, Daphnia magna Straus, UCES Proj. No. 11506-41-08; prepared by Union Carbide Environ. Serv; submitted by Pennwalt Corp. (Accession No. 240993).

The LC₅₀ was determined using nominal ppm active ingredient. Microencapsulated diazinon is a time release insecticide so actual measured concentrations are necessary for the test to be meaningful. The measured concentrations of the toxicant in the original test was not initially available. EEB is willing to upgrade the aquatic study to acceptable if the toxicant concentrations of the original solutions were available or measurements of new prepared solutions are determined (Faatz, August 24, 1981). The registrant chose the latter.

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9. Materials and Methods:

The test material is the formulated product Knox Out 2FM (23% diazinon) since this test using the formulation is required for registration.

Daphnia magna (first instar) were assigned 5 to a group with 4 replicates in standard, reconstituted water at 20 °C. Spacing of doses was at 75 to 80 percent increments.

10. Statistic Analysis

Since there was only one partial mortality (70%), 0, and 100 percent mortalities, the LC₅₀ was verified on log-probit paper.

11. Results/Discussion:

There was only 5 percent control mortality during the test. There was no effect on pH noted even though it was initially at 8.4, and DO levels were within acceptable levels.

12. Reviewer's Evaluation:

a. Test Procedure: The test procedure generally complies with recommended protocol. The spacing of doses of 75 to 80 percent increments is greater than recommended, but 70 percent partial mortality enable an adequate verification of the reported LC₅₀. Test levels were in terms of nominal concentrations and not measured.

b. Results/Discussion: The nominal 48-hr LC₅₀ is 0.522 (0.459 to 0.585) ppb total test material.

c. Validation: Supplemental

- Reconsideration upon receipt of actual measured concentrations for all test levels.

9. Materials and Methods:

Fifteen liters of water (hardness 250 mg/L as CaCO₃, pH 8.23) was placed in a five gallon polyethylene bucket at a room temperature of 21° to 22 °C. Knox Out 2FM was added at 10 ug/L. Only one rate was used because the concentration was so low the sensitivity of the method would not permit lower rates. One hundred mL samples were taken at intervals of 0, 24, and 48 hours and the concentration determined for total and released diazinon. Quantitation was done using a Hewlett-Packard gas chromatograph equipped with a photometric detector. For the released diazinon, the water samples were filtered through a 0.45 micron Millipore filter to remove all the capsules, then the filtered was extracted.

No statistical analysis of the data was done.

10. Reviewer's Evaluation:

- a. Test Procedure: The test procedure is adequate for the purposed intended.
- b. Statistical Analysis: None is needed.
- c. Discussion/Results: The original Daphnia study was unacceptable because the amount of diazinon available in solution was unknown. This study can now be considered acceptable but with a revised LC₅₀ of 0.522 (0.459 to 0.585) ppb which reflects the amount of active ingredient available to the test organism.
- d. Conclusions
 1. Category: Core with the acceptance of a revised LC₅₀ 0.522 (0.459 to 0.585) ppb.
 2. Rationale: The assay measured the amount of diazinon in solution available to the test organisms.
 3. Repairability: N/A.

7. Reported Results:

Concentration - 10 micrograms/liter Knox Out 2FM

<u>Sampling Time (hr)</u>	<u>Added ug/L ai</u>	<u>Found ug/L Total</u>	<u>Released ug/L</u>	<u>% of Total</u>
0	2.32	1.76	0.37	21.0
24	2.32	1.69	0.76	45.0
48	2.32	1.71	0.75	43.9

The amount of total diazinon found in the water was 73 percent to 76 percent of what was added so these results fall within the efficiency of the method at this low concentration. At 24 and 48 hours, about 45 percent of the total diazinon found had been released from the capsules.

8. Reviewer's Conclusion

The registrants conclusions are reasonable based on the data. EEB requested measurement of solution diazinon at all test levels. The registrant provided measurements at only the highest test level. A complete series could better characterize the release of diazinon in water, however, the limited data is sufficient to complete a hazard assessment for aquatic invertebrates.

In J. Leitzke's original data evaluation the 48-hour LC₅₀ for the formulated product 23 percent active material was 5.03 (4.45 to 5.67) ppb. The adjusted LC₅₀ for nominal active ingredient is 1.16 (1.02 to 1.30) ppb. Further adjustment is necessary because the submitted data indicates that only 45 percent of the available diazinon is in solution. The LC₅₀ should be 0.522 (0.459 to 0.585) ppb. This indicates that diazinon is very highly toxic to aquatic invertebrates. Also, at the end of 48 hours there has been no degradation of the total amount of diazinon. This could have serious consequences if diazinon contaminated viable waters.

7. Reported Results:

Concentration - 10 micrograms/liter Knox Out 2FM

<u>Sampling Time (hr)</u>	<u>Added ug/L ai</u>	<u>Found ug/L Total</u>	<u>Released ug/L</u>	<u>% of Total</u>
0	2.32	1.76	0.37	21.0
24	2.32	1.69	0.76	45.0
48	2.32	1.71	0.75	43.9

The amount of total diazinon found in the water was 73 percent to 76 percent of what was added so these results fall within the efficiency of the method at this low concentration. At 24 and 48 hours, about 45 percent of the total diazinon found had been released from the capsules.

8. Reviewer's Conclusion

The registrants conclusions are reasonable based on the data. EEB requested measurement of solution diazinon at all test levels. The registrant provided measurements at only the highest test level. A complete series could better characterize the release of diazinon in water, however, the limited data is sufficient to complete a hazard assessment for aquatic invertebrates.

In J. Leitzke's original data evaluation the 48-hour LC₅₀ for the formulated product 23 percent active material was 5.03 (4.45 to 5.67) ppb. The adjusted LC₅₀ for nominal active ingredient is 1.16 (1.02 to 1.30) ppb. Further adjustment is necessary because the submitted data indicates that only 45 percent of the available diazinon is in solution. The LC₅₀ should be 0.522 (0.459 to 0.585) ppb. This indicates that diazinon is very highly toxic to aquatic invertebrates. Also, at the end of 48 hours there has been no degradation of the total amount of diazinon. This could have serious consequences if diazinon contaminated viable waters.

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DATA EVALUATION RECORD

1. Chemical: Diazinon 2FM Microencapsulated

2. Formulation: Formulated Product

O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl)
phosphorothioate 23%
Inert Ingredients 77%

3. Citation: Application for Registration of Knox Out®
Fire Ant Control Section IX.
Fish and Wildlife Safety October 1982.
Submitted by Agchem Division Pennwalt Corporation.
Accession No. 248821, Registration No. 4581-GLR.

4. Reviewed by: Wayne C. Faatz, Ph.D.
Wildlife Biologist

5. Date Reviewed: January 5, 1983

6. Test Type: Daphnia magna

Toxicity - Knox Out 2FM Insecticide Concentrations in Water.

Union Carbide Environmental Report 11506-41-08.

This report is a supplement to the data evaluation record by J. Leitzke September 11, 1980 on "The acute toxicity of Knox Out 2FM to the water flea, Daphnia magna Straus, UCES Proj. No. 11506-41-08; prepared by Union Carbide Environ. Serv; submitted by Pennwalt Corp. (Accession No. 240993).

The LC₅₀ was determined using nominal ppm active ingredient. Microencapsulated diazinon is a time release insecticide so actual measured concentrations are necessary for the test to be meaningful. The measured concentrations of the toxicant in the original test was not initially available. EEB is willing to upgrade the aquatic study to acceptable if the toxicant concentrations of the original solutions were available or measurements of new prepared solutions are determined (Faatz, August 24, 1981). The registrant chose the latter.

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CASE GS _____

PM ____/____/____

CHEM DiazinonBRANCH EEB

DISC _____

FORMULATION 14 G (14.3% ai granular)FICHE/MASTER ID R00DT001 148695

CITATION: Balcomb, R.; Steven, R.; Brown II, C. (1984) Toxicity
of 16 Granular Insecticides to Wildcaught Songbirds.
Bull. Environ. Contam. Toxicol. 33:302-297.

SUBST. CLASS=

OTHER SUBJECT DESCRIPTORS

PRIM:

DIRECT REVIEW TIME= 2 hrs. (MH) START DATE May 1, 1986 END DATE May
1, 1986

REVIEWED BY: Margaret Rostker
TITLE: Wildlife Biologist
ORG: EEB/HED
LOC./TEL: 557-7600

*H. T. Craven**5/4/87*

SIGNATURE:

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB
LOC./TEL: 557-7600

SIGNATURE:

*Henry T. Craven**5/4/87*

Study useful to assess hazard of granules to songbirds. No
guidelines address this type of test.

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9. Materials and Methods:

Fifteen liters of water (hardness 250 mg/L as CaCO₃, pH 8.23) was placed in a five gallon polyethylene bucket at a room temperature of 21° to 22 °C. Knox Out 2FM was added at 10 ug/L. Only one rate was used because the concentration was so low the sensitivity of the method would not permit lower rates. One hundred mL samples were taken at intervals of 0, 24, and 48 hours and the concentration determined for total and released diazinon. Quantitation was done using a Hewlett-Packard gas chromatograph equipped with a photometric detector. For the released diazinon, the water samples were filtered through a 0.45 micron Millipore filter to remove all the capsules, then the filtered was extracted.

No statistical analysis of the data was done.

10. Reviewer's Evaluation:

- a. Test Procedure: The test procedure is adequate for the purposed intended.
- b. Statistical Analysis: None is needed.
- c. Discussion/Results: The original Daphnia study was unacceptable because the amount of diazinon available in solution was unknown. This study can now be considered acceptable but with a revised LC₅₀ of 0.522 (0.459 to 0.585) ppb which reflects the amount of active ingredient available to the test organism.
- d. Conclusions
 1. Category: Core with the acceptance of a revised LC₅₀ 0.522 (0.459 to 0.585) ppb.
 2. Rationale: The assay measured the amount of diazinon in solution available to the test organisms.
 3. Repairability: N/A.

11. Materials and Methods:

- a. Test Animals: Wild-caught adult birds from Laurel, Maryland.
- b. Dose: Granules of Diazinon 14G, placed in Lilly No. 5 gelatin capsules, lubricated with glycerine and orally administered.
- c. Design: Five birds randomly assigned to each treatment level. Treatment levels were number of granules: 1, 5, 10, 20, 40.
- d. Statistics: Summary only; percentages calculated. LD₅₀ calculated by probit analysis or graphical extrapolation for diazinon.

12. Reported Results:

One granule kills 40 percent house sparrows; five granules kills 80 percent, LD₅₀ = 2.5 mg ai/kg.

Five granules kill 100 percent red-winged blackbirds; LD₅₀ = 1.8 mg ai/kg.

13. Study Author's Conclusions/QA Measures:

See reported results #11 above.

14. Reviewer's Discussion:

- a. Test Procedures: No guideline protocols available. The study was well designed for test objectives.
- b. Statistical Analysis: No additional work needed.
- c. Discussion/Results: EEB agrees with reported results. Diazinon 14G "very highly toxic" to house sparrows and red-winged blackbirds.
- d. Adequacy of Study:
 1. Classification: Supplemental for Diazinon 14G (14.3% ai).
 2. Rationale: Formulation test with nonrecommended species. Discrete granule dosing not addressed in guidelines.
 3. Repair: N/A.

DATA EVALUATION RECORD

1. Chemical: Diazinon
2. Formulation: Diazinon 14.3% active ingredient; granules
3. Study Type: Avian LD₅₀ for Redwinged Blackbirds and House Sparrows
4. Study ID: Balcomb, R.; Stevens, R.; Bowen II, C. (1984)
Toxicity of 16 Granular Insecticides to Wild-caught Songbirds. Bull. Environ. Contam. Toxicol. 33:302-307.
5. Reviewed by: *[Signature]* Margaret Rostker
Wildlife Biologist
EEB/HED
Signature: *H.T. Craven*
Date: *5/4/87*
6. Approved by: Harry Craven
Supervisory Biologist
EEB/HED
Signature: *H.T. Craven*
Date: *5/4/87*
7. Conclusions:

The study is scientifically sound and shows that one granule of 14G Diazinon will kill 40 percent of exposed house sparrows and five granules will kill 80 percent. The study also shows that 100 percent of exposed red-winged blackbirds are killed when dosed with five granules of Diazinon 14G.

This study provides useful information of the toxicity of Diazinon 14G to wild-caught songbirds. This study does not fulfill any specific guideline requirement but may be used to assess end-product hazard to wild birds.
8. Recommendations: N/A
9. Background: N/A
10. Discussion of Individual Test: This DER is for Diazinon 14G.

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DATA EVALUATION RECORD

1. Chemical: Diazinon
2. Formulation: Knox Out 2FM (23% Microencapsulated)
3. Citation: Calmbacher, C.W. (1978a) The Acute Toxicity of Kox Out 2FM to the Rainbow Trout, Salmo Gairdneri Richardson, UCES Project No. 11506-41-06; Prepared by Union Carbide Environ. Serv.; Submitted by Pennwalt Corp. (Accession No. 240993).
4. Reviewed by: John S. Leitzke
Ecologist, Section 3
EEB/HED
5. Date Reviewed: September 11, 1980
6. Test Type: Fish Acute LC₅₀
Test Species: Rainbow Trout (Salmo gairdneri)
7. Reported Results:

96-hour LC₅₀ = 60.3 (43.83.2) ppm total test material (23% diazinon).
8. Reviewer's Conclusions:

The 96-hour LC₅₀ equals .635 (0.42 to 0.96) nominal ppm active ingredient (ai), indicating a toxicity to coldwater fish. The test is scientifically sound. However, it is unacceptable in meeting the Guidelines minimum requirement for an acute LC₅₀ on coldwater fish using the formulation, Knox Out 2FM, and will be reconsidered upon receipt of actual measured concentrations for all test levels.

CASE GS _____

PM ____/____/____

CHEM DiazinonBRANCH EEB

DISC _____

FORMULATION Knox Out 2FM (23% ai Microencapsulated)FICHE/MASTER ID ~~R00D1009~~ 118393

CITATION: Calmbacher, C.W. (1978a) The Acute Toxicity of Knox
Out 2FM to the Rainbow Trout, Salmo Gairdneri
Richardson, UCES Project No. 11506-41-06; Prepared
by Union Carbide Environ. Serv.; Submitted y
Pennwalt Corp. (Accession No. 240993).

SUBST. CLASS=

OTHER SUBJECT DESCRIPTORS
PRIM:

DIRECT REVIEW TIME= 1 hour (MH) START DATE May 1986 END DATE May
1986

REVIEWED BY: Margaret Rostker *H.T. Craven*
TITLE: Wildlife Biologist
ORG: EEB
LOC./TEL: 557-7600 *5/4/87*

SIGNATURE:

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB
LOC./TEL: 557-7600

SIGNATURE: *Harry T. Craven 5/4/87*

The study is core for LC₅₀ = .635 ppm ai for Rainbow Trout
tested with 23% ai microencapsulated diazinon. This fullfills
guideline requirements for testing with 2FM formulated product
and coldwater fish.

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Diazonon-Knox Out

Rbt - 24 hr LC50

UCES 56.
78 0.
10.
100.
2.
10.
180.
3.
10.
320.
6.
10.

df=2 2.798
-1.741
2.277
0.879

NS

256.522
160.881
409.018
89.319
49.469
161.270
736.724
256.756
2113.919

M
YINT
LW M
CHI2

LD50
LOCL
UPCL

LD10
LOCL
UPCL

LD90
LOCL
UPCL

Diazonin-Knox Out

Rbt - 48 hr LC50

UCES 56.
78 0.
10.
100.
4.
10.
180.
6.
10.
320.
9.
10.

df=2 3.874
-3.359
1.812
1.559

NS

143.860
180.615
190.541
67.141
41.957
107.442
308.241
189.151
502.308

M
YINT
LW M
CHI2

LD50
LOCL
UPCL

LD10
DOCL
UPCL

LD90
LOCL
UPCL

Diazonin-Knox Out

Rbt - 46 hr LC50

UCES 32.
78 3.
10.
56.
4.
10.
100.
9.
10.
180.
8.
10.
320.
10.
10.

df=3 2.541
0.572
2.475
3.272

NS

55.280
36.611
83.469
17.299
7.157
41.814
176.655
97.002
321.714

M
YINT
LW M
CHI2

LD50
LOCL
UPCL

LD10
LOCL
UPCL

LD90
LOCL
UPCL

9. Materials and Methods:

The test material is the formulated product Knox Out 2FM (23% diazinon) since this test using the formulation is required for registration.

Rainbow trout fingerlings (avg wt 1.59 gm; avg l. 56 mm) were assigned 10 to a group in standard, reconstituted water at 12 °C. The loading was 1.06 g/l. Spacing of doses was at 75 to 80 percent increments.

- a. Statistical Analysis: The reported dose-response data were analyzed on EEB's TI-59 calculator using the Finney Probit Program (attached).
- b. Discussion/Results: There were no control mortality. No major effect on pH was noted, and DO levels were generally within acceptable levels. Major symptoms observed were surfacing, irritation, and erratic swimming.

10. Reviewer's Evaluation:

- a. Test Procedures: The test procedure complies with recommended protocols in most respects. Although the loading of 1.06 g/L is higher than the recommended level of 0.8 g/L, this was not considered a serious problem since DO levels usually remained within acceptable levels. The spacing of dose at 75 to 80 percent increments is also greater than recommended, but enough partial mortalities occurred to adequately determine an LC50. Test levels were in terms of nominal concentrations and not measured.
- b. Statistical Analysis: There were enough partial mortalities to adequately calculate an LC50, and the Chisquare statistic indicated a homogeneous dose-response relationship within the test groups.
- c. Discussion/Results: The nominal, recalculated 24, 48, and 96 hour LC50's are 256.6, 143.9 and 55.3 ppm total test material, respectively.
- d. Validation:
 1. Supplemental.
 2. Core.
 3. Reconsideration upon receipt of actual measured concentrations for all test levels.

The amount of total diazinon found in the water at the 32 mg/L rate was 91 to 110 percent and in the 320 mg/L rate was 93 to 104 percent of what was added. Due to the technique in taking samples of water with suspended capsules and the extraction efficiency, these results fall within the accuracy of the analytical method. About 5 to 7 percent of the total diazinon added was released into the water from 24 through 96 hours at the 32 mg/L rate. At the 320 mg/L rate, the released diazinon increased from 6.5 to 13 percent at 24 hours through 96 hours.

8. Reviewer's Conclusions:

The registrant's conclusions adequately reflect the data presented. However, the registrant did an assay only on the highest and lowest concentrations used in the LC₅₀ test, not an assay of all test levels requested. As would be expected under such circumstances the desorption rate of diazinon is not clearly evident. The data is sufficient for assessment purposes and upgraded the study to core status. However, the LC₅₀ must be adjusted to reflect the new data. The registrant reported an LC₅₀ of 60.3 ppm with the formulated product; whereas, EEB calculated the LC₅₀ as 55.3 (36.6 to 83.5). EEB used its LC₅₀ value to calculate the nominal LC₅₀ for the ai. The 96 hour LC₅₀ based upon a 23 percent active ingredient was 12.7 (8.4 to 19.2) ppm.

Since the product is microencapsulated, the pesticide is not immediately available. The data submitted by the registrant indicates that approximately 5 percent of the total diazinon is released into the water by 96 hours at the 32 mg/L concentration. This is approximately one half of the released diazinon at the 320 mg/L concentration. The 5 percent datum is used to calculate the LC₅₀ of the adjusted, nominal ai because the 32 mg/L concentration is more representative than the higher concentration.

Therefore using the LC₅₀ of the ai calculated by EEB (12.7 (8.4-19.2) ppm), and taking 5 percent of these values which represents the available diazinon at the end of 96 hours yields an LC₅₀ .635 (0.42 to 0.96) ppm for the rainbow trout. On this basis encapsulated diazinon can be considered highly toxic to coldwater fish.

The data indicate also that the total amount of diazinon degrades little, if any, at the end of 96 hours.

This adjusted LC₅₀ will be noted in EEB's diazinon file and used in future assessments.

DATA EVALUATION RECORD

1. Chemical: Diazinon 2FM
Microencapsulated
2. Formulation: Formulated Product

Active Ingredient:
0,0-Diethyl 0-(2-isopropyl-6-methyl-4-
pyrimidinyl)phosphorothioate 23%
Inert Ingredients: 77%
3. Citation: Application for Registration of Knox Out® Fire
Ant Control Section IX; Fish and Wildlife Safety,
(October 1982) Submitted by Agchem Division
Pennwalt Corporation. (Accession No. 248821);
Registration No. 4581-GLR.
4. Reviewed by: Wayne C. Faatz, Ph.D.
Wildlife Biologist
5. Date Reviewed: December 20, 1982
6. Test Type: Rainbow Trout Knox Out® 2FM Insecticide
Concentrations in Water

Union Carbide Environmental Service Report 11506-41-06.

This report is a supplement to the Data Evaluation
Record by J. Leitzke September 11, 1980 on Fish Acute LC50:
Rainbow Trout (Salmo gairdneri).

The LC50 was determined using nominal ppm active ingredient.
Microencapsulated diazinon is a time release insecticide so
actual measured concentrations are necessary for the test to be
meaningful. The measured concentrations of the toxicant in the
original test were not available. EEB is willing to upgrade
the aquatic study to acceptable if the toxicant concentrations
of the original solutions were available if the toxicant
concentrations of the original solutions were available or
measurements of new prepared solutions are determined
(Faatz August 24, 1981). The registrant chose the latter.

7. Reported Results:

Concentration: 32 mg/L Knox Out 2FM

<u>Sampling Time (hr)</u>	<u>Added mg/L ai</u>	<u>Found mg/L Total</u>	<u>Released</u>	<u>% of Nominal</u>
0	7.4	8.16	0.01	0.135
24	7.4	7.23	0.52	7.02
48	7.4	7.49	0.43	5.81
96	7.4	6.76	0.34	4.59

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Shaugh. No. 57801
EAB Log Out Date SEP 29 1986
Init. SK

To: Product Manager (15)
Registration Division (TS-767)
From: Carolyn K. Offutt, Chief *Carolyn K. Offutt*
Environmental Processes and Guidelines Section
Exposure Assessment Branch, HED (TS-769)

Attached please find the environmental fate review of:

Reg./File No.: 100-524

Chemical: Diazinon

Type Product: I

Product name: Diazinon AG 500

Company name: Ciba Geigy

Submission Purposes: Calculation of lawn reentry interval.

Data In: 7/23/86

Action Code 400

Date Completed: 9/26/86

EAB #: 6737

TAIS (Level II) Days
2

Deferrals To:

☐ Ecological Effects Branch
☐ Residue Chemistry Branch
☐ Toxicology Branch

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9. Materials and Methods:

Fifteen liters of soft water (hardness 50 mg/L as CaCO₃, pH 7.2) were placed in a glass tanks with the water temperature theromostated at 11.5 ° to 12.5 °C. Knox Out 2FM was added at 32 mg/L in one tank and 320 mg/L in the other tank. Samples were taken at intervals of 0, 24, 48, and 96 hours and the concentrations determined for total and release diazinon.

Statistical Analysis: No analysis was done or needed.

10. Reviewer's Evaluation:

- a. Test Procedure: The test procedure was adequate though the value of the information could have been enhanced if all test concentrations were measured for the amount of active ingredient in solution. The information provided is adequate for a hazard assessment.
- b. Statistical Analysis: Statistical analysis is not needed.
- c. Discussion/Results: Based on the information. (See Reviewers Conclusions) the LC₅₀ is 0.653 (0.42 to 0.96) ppm for rainbow trout, active ingredient. The files will be noted as to the change in the LC₅₀.
- d. Conclusions:
 1. Category: Upgraded to Core upon the acceptance of a revised LC₅₀ .635 (0.42 to 0.96) ppm.
 2. Rationale: Data was provided as to the expected amount of diazion in solution.
 3. Repairability: None.

9. BACKGROUND:

This study has two parts. The first part deals with the toxicity effect of diazinon on Canada Geese. It was performed at St. Augustine, FL in January 1986 for Ciba Geigy by Wildlife International, Inc.

Concurrently, a diazinon turf residue study was performed to determine diazinon residues in the treated turf. Ciba Geigy collected turf samples and had EN-CAS Analytical Services, NC measure diazinon residues.

10. DISCUSSION OF STUDY:

A. The experiment was set up such that three diazinon treatment levels were done. Application levels of 2, 4, and 6 lb AI/A were made. Of the seven enclosed plots (1900 square feet), two plots were allotted for each treatment level and one plot was not treated. Geese were allowed to feed in the plots and the toxicological effects noted.

This report, however, addresses only the diazinon residue levels in the plots. All plots were irrigated with 0.25 inch of water immediately following application. Sampling of the plot grass was accomplished by collecting 3 composite samples per pen. Each sample represents 5 random square foot areas within the pen.

Sampling was conducted:

1. 3 days prior to application
2. Immediately after application
3. Immediately after watering
4. After 24 hours (1 day)
5. After 60 hours (5 days)

All samples were quick frozen with dry ice and shipped for analysis to EN-CAS Analytical Laboratories in North Carolina.

B. REPORTED RESULTS:

Table 4 of the report summarized the diazinon residues found in ppm fresh weight. The table below represents mean ppm diazinon of the samples taken. A value of zero means less than 1.

Application Rate AI/A	<u>Days After Treatment</u>				
	-3	0	0+water	1	5
0	0	0	0	0	0
2	0	134	67	75	40
4	0	272	104	120	46
6	0	413	217	218	77

Evaluation of Diazinon Data for Reentry Level

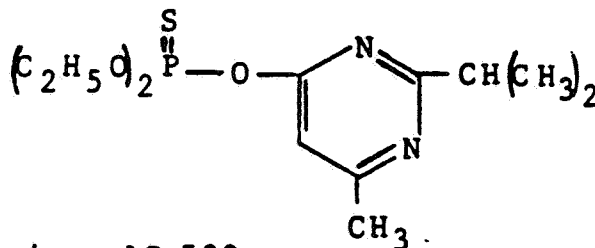
1. CHEMICAL:

Common Name: Diazinon

Product Name: Diazinon AG 500

Chemical Name: O,O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidyl) phosphorothioate

Structure:



2. TEST MATERIAL: Diazinon AG 500

3. STUDY/ACTION TYPE: A simulated study on turf to determine the effects upon Canada Geese. Final Report. Project No. 108-256. Ecological Effect Study.

4. STUDY IDENTIFICATION:

Registration File No. 100-524

Accession No. 262151

Record No. 177412

5. REVIEWED BY:

Harold R. Day, Chemist
Environmental Processes
and Guidelines Section, EAB (TS-769)

Harold R. Day
9/29/86

6. APPROVED BY:

Carolyn K. Offutt, Chief
Environmental Processes
and Guidelines Section, EAB (TS-769)

Carolyn K. Offutt
9/29/86

7. CONCLUSIONS:

Using the one liner from Toxicology Branch, the allowable exposure is 80 ug/hr (based on a NOEL of 0.009 mg/kg/day). This corresponds to grass residue of 10 ng/cm². Based on this level, the experiment was not carried out far enough to determine a safe reentry level. The residues after 5 days still exceed 40 ng/cm².

8. RECOMMENDATIONS:

According to the data, the experiment needs to be carried out beyond 5 days to obtain a reentry level.

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DATA EVALUATION RECORD

1. Chemical: Diazinon
2. Formulation: Knox Out 2FM (23% Microencapsulated)
3. Citation: Beavers, J.B. (1978c) Eight-Day Dietary LC₅₀ - Mallard Duck Knox Out 2FM, Final Report, Project No. 110-120; Prepared by Wildlife Intl. Ltd.; Submitted Pennwalt Corp. (Accession No. 240993).
4. Reviewed by: John S. Leitzke
Ecologist, Section 3
EEB/HED
5. Date Reviewed: July 17, 1980
6. Test Type: Avian 5(+3)-Day Dietary LC₅₀
Test Species: Mallards (Anas platyrhynchos)
7. Reported Results:
LD₅₀ = 649 (464-908) ppm of test material (23% diazinon).
8. Reviewer's Conclusions:

In terms of active ingredient (ai), the LC₅₀ equals 149 (107 to 209) ppm ai, indicating a high toxicity to avian wildlife such as water fowl in their diet. The study is scientifically sound and is acceptable in meeting the Guidelines minimum data requirement for an avian 5(+3)-day dietary LC₅₀ using a waterfowl on the formulation, Knox Out 2FM.

Calculation of units from ppm to ng/cm² can be accomplished by dividing my 100 cm²/g (estimated area/weight for grass) Following through with the units, the conversion factor for this case (grass) ppm X 10 = ng/cm².

C. Authors Conclusions/Quality Assurance

The residues of diazinon were listed in a report separate from the toxicology section. This report (No. 86-21, 86-22) from EN-CAS laboratories provides a detailed description of analytical procedures use, recoveries of spiked samples, analytical equipment, and blanks. They appear to have used good practices in performing the analytical work.

The authors concluded irrigation immediately after application reduces diazinon residues by 50%. Halflife of diazinon, under the experimental conditions was less than 5 days for all treatment levels.

D. Reviewer's Discussion

The data clearly indicate a dramatic reduction in residue levels following watering-more than 50%. Subsequent losses are more gradual. The half life is less than 5 days. The measured residues represent whole leaf residues; it is possible the dislodgeable fraction would result in lower residue levels.

Calculation of Reentry Level:

Assumptions*: 70 kg person
8 hr work day
0.009 mg/kg/day NOEL
10 fold safety factor
10% dermal penetration

*Weight and work day length also approximately equal to a 20 kg child playing for 3 hrs.

Allowable Exposure Level (AEL)

$$AEL = \frac{NOEL (Weight)}{(SF) (DP)} = 0.63 \text{ mg/day divided by } 8 \text{ hr} = 80 \text{ ug/hr}$$

Reentry level = 10 ng/cm² (from Poppendorf correlation)

Since levels of diazinon exceed the above level even after the 5 days, it is impossible to set a reentry level. The experiment needs to be continued until the residue levels drop below 10 ng/cm².

10. COMPLETION OF ONE-LINER: NA

11. CBI APPENDIX: NA

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Diazinon Knox Out

Mallard - LC50

Wildl Int'l 100.
78 0.
10.

178.
2.
10.

316.
2.
10.

562.
3.
10.

1000.
6.
10.

1780.
9.
10.

3160.
10.
10.

df=5 2.497 M
-2.032 YINT
2.515 LW M
3.836 CHI²

NS

655.498 LD50
464.597 LOCL
924.839 UPCL

200.952 LD10
115.219 LOCL
350.480 UPCL

2138.208 LD90
1199.116 LOCL
3812.754 UPCL

9. Materials and Methods:

The test material is the formulated product Knox Out 2FM (23% diazinon) since this test using the formulation is required for registration.

Mallard ducklings at 14 days of age were 10 to a group and exposed to a 14L: 10D lighting regime. Examination of each groups average initial body weights indicated a random, nonheterogeneous assignment of birds to test and control groups. Test birds were exposed to treated feed for 5-days followed by 3-days observation on clean feed.

- a. Statistical Analysis: The reported dose-response data were analyzed on EEB's TI-59 calculator using the Finney Probit Program (attached).
- b. Discussion/Results: There was no mortality in any of the five control groups. Decreases in body weight gain and feed consumption were noted all test groups the lowest being 23 ppm ai. Depression, reduced reaction to external stimuli and loss of coordination were some of the major symptoms noted. Not all deaths occurred in the first several days; several occurred in the last part of the test.

10. Reviewer's Evaluation:

- a. Test Procedures: The test procedure generally complies with recommended protocol.
- b. Statistical Analysis: The Chisquare statistic indicated a homogeneous dose-response relationship within the test groups.
- c. Discussion/Results: The reported LC₅₀ is less than the recalculated value and will be used in all hazard evaluations.
- d. Validation: Core.

9. Materials and Methods:

The test material is the formulated product Knox Out 2FM (23% diazinon) since this test using the formulation is required for registration.

Bobwhite quail chicks at 14 days of age were assigned 10 to a group and exposed to a 14L:10D lighting regime. Examination of each group's average initial body weights indicated a random, nonheterogeneous assignment of birds to test and control groups. Test birds were exposed to treated feed for 5 days followed by 3-days observation on clean feed.

- a. Statistical Analysis: The reported dose-response data were analyzed on EEB's TI-59 calculator using the Finney Probit Program (attached).
- b. Discussion/Results: There was only 1 mortality in the 5 control groups. Decreases in body weight gain and feed consumption were noted in the 129 ppm ai and higher groups. Depression, reduced reaction to external stimuli, weakness and loss of coordination were some of the major symptoms noted. Not all deaths occurred in the first several days; several occurred in the last part of the test.

10. Reviewer's Evaluation:

- a. Test Procedure: The test procedure generally complied with recommended protocol.
- b. Statistical Analysis: The Chi-square statistic indicated a homogeneous dose-response relationship within the test groups.
- c. Discussion/Results: The LC₅₀ was recalculated from the given dose-response data as 1503 (1127-2005) ppm total test material.
- d. Validation: Core.

DATA EVALUATION RECORD

1. Chemical: Diazinon
2. Formulation: Knox Out 2FM (23% Microencapsulated)
3. Citation: Beavers, J.B. (1978b) Eight-Day Dietary LC₅₀ - Bobwhite Quail 2FM, Final Report, Project No. 110-121; Prepared by Wildlife Intl. Ltd.; Submitted Pennwalt Corp. (Accession No. 240993).
4. Reviewed by: John S. Leitzke
Ecologist, Section 3
EEB/HED
5. Date Reviewed: July 17, 1980
6. Test Type: Avian 5(+3)-Day Dietary LC₅₀
Test Species: Bobwhite Quail (Colinus virginianus)
7. Reported Results:

LD₅₀ = 1515 (1147-2002) ppm of test material (23% diazinon).
8. Reviewer's Conclusions:

In terms of active ingredient (ai), the LC₅₀ equals 345 (259-461) ppm ai, indicating a high toxicity to avian wildlife such as upland gamebirds in their diet. The study is scientifically sound and is acceptable in meeting the Guidelines minimum data requirement for an avian 5(+3)-day dietary LC₅₀ using an upland gamebird on the formulation, Knox Out 2FM.

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CASE GS _____

PM ____/____/____

CHEM DiazinonBRANCH EEB

DISC _____

FORMULATION technical, 92.5% ai diazinonFICHE/MASTER ID ~~RO0DI007~~ 409/0904

CITATION: Allison, D.T.; Hermanutz, D.T. (1977) Toxicity of diazinon to Brook Trout and Fathead Minnows. U.S. EPA Environmental Research laboratory-Duluth, Office of Research and Development, Duluth, Minnesota, EPA-600/3-77-060.

SUBST. CLASS=

OTHER SUBJECT DESCRIPTORS
PRIM:

DIRECT REVIEW TIME= 1 week (MH) START DATE May 1986 END DATE May 1986

REVIEWED BY: Margaret Rostker
TITLE: Wildlife Biologist
ORG: EEB
LOC./TEL: 557-7600

H.T. Craven
5/4/87

SIGNATURE:

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB
LOC./TEL: 557-7600

Harry Craven
5/4/87

SIGNATURE:

434

Diazinon Knox Out

Bobw Q - LC50

Wildl Int'l 562.

78 0.

10.

1000.

4.

10.

1780.

6.

10.

3160.

8.

10.

5620.

10.

10.

3.563.

M

-6.319

YINT

1.908

LW M

2.356

CHI²

1503.350

LD50

1127.314

LOCL

2004.819

UPCL

656.469

LD10

404.091

LOCL

1066.471

UPCL

3442.754

LD90

2176.540

LOCL

5445.593

UPCL

433

DATA EVALUATION RECORD

1. Chemical: Diazinon
2. Test Material: Technical diazinon (92.5% ai).
3. Study Type: Chronic toxicity to Brook Trout and Fathead Minnows.
4. Study ID: Allison, D.T.; Hermanutz, R.O. (1977) Toxicity of diazinon to Brook Trout and Fathead Minnows. U.S. EPA, Environmental Research Laboratory-Duluth, Office of Research and Development, Duluth, Minnesota. EPA-600/3-77-060.
5. Reviewed by *jr* Margaret Rostker
Wildlife Biologist
EEB/HED
Signature: *H.T. Craven*
Date: *5/4/87*
6. Approved by: Harry Craven
Supervisory Biologist
EEB/HED
Signature:
Date: *H.T. Craven*
5/4/87
7. Conclusions:

Flow-through 96-hour LC₅₀ = 7.8 mg/L (ppm) for Fathead minnow; 1.6 mg/L for Flagfish; 0.77 mg/L for Brook Trout, and 0.46 mg/L for Bluegill Sunfish.

The study is sound and results are useful in hazard assessment. The study is classified as core.
8. Recommendations: N/A
9. Background: N/A
10. Discussion of Individual Test: N/A

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11. Materials and Methods:

- a. Test Animals: All fish were obtained from laboratory stock or commercial hatcheries.
- b. Dose: All tests were flow-through; proportional diluters delivered five dose concentrations plus control water. to duplicate exposure chambers in all tests.
- c. Design: 96-hour LC₅₀ Tests: Fathead minnows: 20 fish/concentration; five concentrations. 1-l, 2.1, 3.4, 6.0, 11.7 ppm (mg/L); Bluegill Sunfish: 20 fish/concentration; five concentrations: 0.04, 0.08, 0.22, 0.44, 0.89 ppm (mg/L); Brook Trout: 20 fish/concentration; five concentrations: 0.04, 0.08, 0.16, 0.39, 0.92 ppm (mg/L); Flagfish: 40 fish/concentration; five concentrations: 0.2, 0.36, 0.82, 1.6, 3.1 ppm (mg/L).

Chronic Test: Fathead Minnows: 50 fish/concentration; five concentrations: 69, 118, 229, 511, 1099 ug/L (ppb); Brook Trout: 6 fish/concentration; five concentrations: 0.55, 1.1, 2.4, 4.8, 9.6 ug/L (ppb).
- d. Statistics: 96-hour LC₅₀'s calculated with methods described by Litchfield and Wilcoxon. Chronic tests analysed with one-way analysis of variance and Dunnett's comparison of means.

12. Reported Results:

Average 96-hour LC₅₀'s for diazinon under flow-through conditions were 7.8, 1.6, 0.77, and 0.46 mg/L, respectively, for fathead minnows, flagfish, brook trout, and bluegills.

The chronic effects of diazinon on fathead minnows and brook trout were determined in flow-through systems with constant toxicant concentrations. Fathead minnows exposed to the lowest concentration tested (3.2 ug/L) from 5 days after hatch through spawning had a significantly higher incidence of scoliosis than the control ($P = 0.05$). Hatch of their progeny was reduced by 30 percent at this concentration. Yearling brook trout exposed to 4.8 ug/L and above began developing scoliosis and lordosis within a few weeks. Growth of brook trout was substantially inhibited during the first 3 months at 4.8 ug/L and above. Neurological symptoms were evident in brook trout at 2.4 ug/L and above early in the tests, but were rarely observed after 4 or 5 months of exposure. Exposure of mature brook trout for 6 to 8 months to concentrations ranging from 9.6 ug/L to the

lowest tested (0.55 ug/L) resulted in equally reduced growth rates for their progeny. Transfer of progeny between concentrations indicated that effects noted for progeny of both species at lower concentrations were the result of parental exposure alone and not the exposure of progeny following fertilization.

13. Study Author's Conclusions/QA Measures:

See Reported Results.

14. Reviewer's Discussion and Interpretation of Study:

- a. Test Procedures: The procedures were in general conformance with guidelines.
- b. Statistical Analysis: The analysis was appropriate.
- c. Discussion/Results: See Reported Results.
- d. Adequacy of Study:
 1. Classification: Core.
 2. Rationale: Guidelines.
 3. Repair: N/A.

TDMS

DATA EVALUATION RECORD

PAGE 1 OF

CASE GS _____

PM ____/____/____

CHEM Diazinon

BRANCH EEB

DISC _____

FORMULATION Technical and 48% ai emulsifiable concentrate (AG500)

FICHE/MASTER ID ~~RO0DI003~~ 40910905

CITATION: Hill, E.F.; Camardese, M.B. (1986) Lethal Dietary Toxicities of Environmental Contaminants and Pesticides to Coturnix USDI, FWS Technical Report 2., Washington, DC.

SUBST. CLASS=

OTHER SUBJECT DESCRIPTORS
PRIM:

DIRECT REVIEW TIME= 1 day (MH) START DATE May 1986 END DATE May 1980

REVIEWED BY: Margaret Rostker
TITLE: Wildlife Biologist *H.T. Craven*
ORG: EEB
LOC./TEL: 557-7600

5/4/87

SIGNATURE:

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB
LOC./TEL: 557-7600

5/4/87

SIGNATURE:

This study is sound and useful in a hazard assessment. It shows Coturnix LC50 = 167 ppm for technical diazin and LC50 = 101 ppm for A6500 (48% ai emulsifiable concentrate).

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Diazinon

Principal Ingredient: Phosphorothioic acid *O,O*-diethyl *O*-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl]ester; technical grade, 99% AI; CAS 333-41-5

Alternate Names: Alfa-tox; AG 500; Basudin; Ciazinon; Dassitox; Dazzel; Diagran; Diazatol; Diazide; Diazol; ENT 19507; G-24480; Gardentox; Neocidal; Nipsan; Sarolex; Spectracide

Principal Use: Insecticide; nematocide

Experimental: Concentrations tested (*n*): 5 (Control Reference: 81-5)
 Extreme concentrations: 85-240 ppm
 Birds per concentration: 15
 Diluent: Corn Oil

Toxicity Summary

LC50: 167 ppm	95% CI: 131-212 ppm		Slope: 6.01		SE: 1.35	
	Response chronology (day of occurrence)					
Dietary concentration	Onset of signs	First death	Last death	Remission of signs	Total mortality	
85 ppm	2	-	-	8	0/15	
240 ppm	2	3	6	6	13/15	
	Food consumption (grams per bird-day)					
Dietary concentration	Day 1	Day 2	Day 3	Day 4	Day 5	Total mortality
Control (n = 3)	11.5	10.6	12.0	11.8	12.2	0/45
85 ppm	10.1	8.0	9.4	9.1	8.5	
Deaths	0	0	0	0	0	0/15
170 ppm	5.6	4.2	5.2	4.6	3.8	
Deaths	0	0	0	0	2	8/15

Diazinon (AG 500)

Principal Ingredient: Phosphorothioic acid *O,O*-diethyl *O*-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl]ester; commercial formulation, 48% AI; CAS 333-41-5

Alternate Names: ENT 19507; G-24480

Principal Use: Insecticide

Experimental: Concentrations tested (*n*): 4 (Control Reference: 80-2)
 Extreme concentrations: 45-150 ppm
 Birds per concentration: 15
 Diluent: Propylene Glycol

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Toxicity Summary

LC50: 101 ppm	95% CI: 81-126 ppm	Slope: 7.53	SE: 1.65			
Dietary concentration	Response chronology (day of occurrence)					Total mortality
	Onset of signs	First death	Last death	Remission of signs		
30 ppm		No overt signs of toxicity				0/15
67 ppm	2	5	5	7		2/15
100 ppm	3	4	6	7		6/15

Dietary concentration	Food consumption (grams per bird-day)					Total mortality
	Day 1	Day 2	Day 3	Day 4	Day 5	
Control (n = 3)	10.6	11.1	12.9	11.5	11.6	0/45
45 ppm	9.6	8.7	10.9	9.7	9.5	
Deaths	0	0	0	0	0	0/15
100 ppm	5.4	4.4	5.7	4.1	4.2	
Deaths	0	0	0	2	1	6/15

Dicamba

Principal Ingredient: 3,6-Dichloro-2-methoxybenzoic acid; technical grade, 89.3% AI; CAS 1918-00-9

Alternate Names: Banex; Banvel D; Dianat; Mediben; Mondak; Vel 58-CS-11; Velsicol Compound R

Principal Use: Herbicide

Experimental: Concentrations tested (n): 3 (Control Reference: 80-6)
 Extreme concentrations: 1,000-5,000 ppm
 Birds per concentration: 15
 Diluent: Corn Oil

Toxicity Summary

LC50: > 5,000 ppm	No overt signs of toxicity to 5,000 ppm					
Dietary concentration	Food consumption (grams per bird-day)					Total mortality
	Day 1	Day 2	Day 3	Day 4	Day 5	
Control (n = 3)	12.9	11.4	13.4	13.2	13.1	0/45
2,236 ppm	11.0	10.5	12.0	13.1	12.5	
Deaths	0	0	0	0	0	0/15

Dichlobenil

Principal Ingredient: 2,6-Dichlorobenzonitrile; technical grade, 96.4% AI; CAS 1194-65-6

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CASE GS _____

PM ____/____/____

CHEM DiazinonBRANCH EEB

DISC _____

FORMULATION Technical DiazinonFICHE/MASTER ID ~~ROODI000~~ 40914801

CITATION: Goodman, L.R.; Hansen, D.J.; Coppage, D.L.; Moore, J.C.; Matthews, E. (1979) Diazinon Chronic Toxicity to, and Brain Acetylcholinesterase Inhibition in, the Sheepshead Minnow, Cyprinodon variegatus. Trans. Amer. Fish. Soc. 108:479-488.

SUBST. CLASS=

OTHER SUBJECT DESCRIPTORS
PRIM:

DIRECT REVIEW TIME= 1 day (MH) START DATE June 1986 END DATE June 1986

REVIEWED BY: Margaret Rostker
TITLE: Wildlife Biologist
ORG: EEB
LOC./TEL: 557-7600

SIGNATURE: H.T. Craven

5/12/87

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB
LOC./TEL: 557-7600

SIGNATURE: H.T. Craven

5/12/87

Flow-through 96 hour LC₅₀ = 1470 ug/L (ppb) for Sheepshead Minnow and MATC < 0.47 ug/L. Diazinon concentrated an average of 169 times water concentrations in tissues of adult sheepshead minnows. This study core for fish LC₅₀ requirements and useful in hazard assessment.

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11. Materials and Methods:

- a. Test Animals: Juvenile sheepshead minnows collected near gulf Breeze, Florida. At collection, average length = 22 mm, average weight = 0.38 g. Tested at reproductive size of ≥ 26 mm SL.
- b. Dose: Flow-through with acetone solvent for acute toxicity; with triethylene glycol for partial life-cycle toxicity test.
- c. Design: 20 organisms per dose; dose levels: 160, 340, 640, 820, 1400 ug/L (ppb) for acute toxicity test. 110 organisms per dose; dose levels: 0.47, 0.98, 1.8, 3.5, and 6.5 ug/L for partial life-cycle toxicity test. Controls for both tests.
- d. Statistics: Probit analysis for LC₅₀; analysis of variance for life-cycle data. T-test, Duncan's multiple range test and nonlinear regression techniques used also.

12. Reported Results:

96-hour LC₅₀ = 1470 ug/L (95% CL = 1070 to 3310 ug/L). Test organisms in all concentrations visibly poisoned within 24 hours. Mean egg production significantly reduced at all dose levels. Data on AChE suggest that residual effects of diazinon can occur in fish that have no detectable residues in tissues and exhibit no significant depression of AChE. Mortality and growth of surviving progeny not significantly affected by exposure to diazinon. AChE inhibition directly related to dose level. Significant inhibition occurred by day 4 of exposure to 1.8 and 3.5 ug/L and by day 1 with 6.5 ug/L exposure. Uptake of diazinon was rapid, reaching steady state within 4 day in the 3 highest concentrations. MATC = 0.47 ug/L.

13. Study Author's Conclusions/QA Measures:

See reported results. The acute toxicity of diazinon to sheepshead minnows is comparable to the 96-hour LC₅₀ values for freshwater fishes exposed to diazinon under flow-through conditions. fish are affected by chronic exposures to diazinon concentrations two to four orders of magnitude less than concentrations equal to LC₅₀'s in acute toxicity tests. Impaired reproduction in sheepshead minnows and AChE inhibition of 27 percent occur concurrently during continuous longterm exposure to diazinon; but reproduction can remain impaired for at least 3 to 4 weeks after fish

are placed in clean water, even when their AChE activity is normal and they contain no detectable residues. The authors conclude that the environmental hazard of diazinon to both freshwater and saltwater fishes is related to its sublethal effects at very low concentrations, effects unlikely to be seen as fish kills and that may not be detected by typical monitoring for diazinon residues.

14. Reviewer's Discussion and Interpretation of Study:

- a. Test Procedures: To a large extent the test procedures were in accordance with guidelines. For some tests in this study no guidelines are available; in these case the tests were reasonably designed and scientifically sound.
- b. Statistical Analysis: The analyses presented are correct.
- c. Discussion/Results: See Reported Results and Study Author's Conclusions.
- d. Adequacy of Study:
 1. Classification: Core.
 2. Rationale: Guidelines.
 3. Repair: N/A.

DATA EVALUATION RECORD

1. Chemical: Diazinon
2. Test Material: Technical diazinon
3. Study Type: Chronic toxicity to Sheepshead Minnow
4. Study ID: Goodwin^{no. 1}, L.R.; Hansen, D.J.; Coppage, D.L.; Moore, J.C.; Matthews, E. (1979) Diazinon: Chronic Toxicity to, and Brain Acetylcholinesterase Inhibition in, the Sheepshead Minnow, Cyprinodon variegatus. Trans. Amer. Fisher. Soc. 108:479-488.

5. Reviewed by: *for* Margaret Rostker
Wildlife Biologist
EEB/HED

Signature: *H.T. Craven*

Date: *5/4/87*

6. Approved by: Harry Craven
Supervisory Biologist
EEB/HED

Signature:

Date: *Harry F. Craven*
5/4/87

7. Conclusions:

In a flow-through 96 hour acute test, the LC₅₀ = 1470 ppb (ug/L) to juvenile sheepshead minnow. In a partial life-cycle test, 0.47 ppb (ug/L) exposure significantly reduced the number of eggs spawned by continuously exposed fish. AChE activity varied inversely with exposure concentrations, with fish and the highest concentrations (6.5 ppb) averaging 71 percent inhibition. The concentration of diazinon measured in adult fish averaged 169 times the concentration measured in the water. The maximum acceptable toxicant concentration (MATC), based on reduced fecundity, is < 0.47 ppb; the application factor (MATC LC₅₀) is < 0.0003.

This study is sound and provides useful data for a hazard assessment. It fulfills guideline requirements for an LC₅₀ for sheepshead minnow.

8. Recommendations: N/A
9. Background: N/A
10. Discussion of Individual Test: N/A

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DATA EVALUATION RECORD

1. CHEMICAL: Diazinon MG8
2. TEST MATERIAL: Diazinon MG8, FL No. 861103, 86.6% a.i.
3. STUDY TYPE: 14-Day Acute Avian Oral
Species Tested: Mallard Duck
MRID: 40922901
4. CITATION: Fletcher, D. W. 1987. 14-Day Acute Oral Toxicity Study with Diazinon MG8 in Mallard Ducks. Performed by Bio-Life Associates, Ltd., Neillsville, WI for Ciba-Geigy Corporation, Greensboro, NC. BLAL 87 DD 48.

5. REVIEWED BY:

Jeffrey L. Lincer, Ph.D.
Eco-Analysts, Inc.
Sarasota, FL

Signature: ..
Date: 2/15/88

6. APPROVED BY:

James R. Newman, Ph.D.
Proj. Mgr., KBN Engineering
and Applied Sciences, Inc.

Signature: *James R. Newman*
Date: *2/25/88*

Henry T. Craven
Chief EEB/HED
USEPA

Signature: *Henry T. Craven*
Date: *12/5/88*

7. CONCLUSIONS:

The study is scientifically sound. With an LD₅₀ of 6.66 mg/kg (95% c.i. of 5.12 - 8.90 mg/kg), Diazinon MG8 is very highly toxic to mallard ducks when given as an oral dose. Applicant should be requested to verify the test species by its scientific name.

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8. RECOMMENDATIONS: When reporting results, use the actual dose (i.e. 3.75 mg/kg) rather than the group number (i.e. T-V). Identify the experimental species by its Latin name, in addition to its common name. Provide 10-hour light (14-hour dark lighting regime) until guidelines are revised.

9. BACKGROUND: N/A

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES: N/A

11. MATERIALS AND METHODS (PROTOCOLS):

A. Test Animals: The birds employed in the study were unmated (16 weeks old) Mallard ducks received from Whistling Wings, Inc., Hanover, Ill. The birds selected for the study had been under observation for a 22-day quarantine period to determine their suitability as test birds based on their general physical condition, and to acclimatize them to laboratory conditions. The birds were identified by means of metal leg bands embossed with numbers unique within the study. Prior to the initiation of the project, all birds were examined and determined to be suitable for testing.

B. Dosage and Design: Dose levels were based on a geometric scale of 1.6. The ducks were randomly assigned to test groups, and were weighed individually at 0 hour on test day 1. Subsequent individual body weights were obtained on test days 3, 7, and 14.

All birds were fasted (with water allowed) for approximately 21> to 22> hours prior to dosing at 0 hour on test day 1. The birds were permitted a standard laboratory diet plus water ad libitum at all other times. Food consumption was recorded on test days 3, 7, and 14. Test material premix solutions were prepared and the doses for the individual test birds were volumetrically measured and administered via disposable syringes at 0 hour on test day 1. All test and vehicle control birds received a constant dosage volume of approximately 4 ml/kg of body weight. The vehicle control birds each received corn oil only.

Birds were administered the test chemical as indicated below:

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Group	Number of Birds		Dose Level (mg a.i./kg of body weight)
	Male	Female	
VC	5	5	0
T-I	5	5	0.57
T-II	5	5	0.91
T-III	5	5	1.46
T-IV	5	5	2.34
T-V	5	5	3.75
T-VI	5	5	6.00
T-VII	5	5	9.60
T-VIII	5	5	15.40

- C. Statistics: LD₅₀ was calculated using the method of Litchfield and Wilcoxon ("A simplified method of evaluating dose-effect experiments," The Journal of Pharmacology and Exp. Therapeutics, 96(2), June 1949).

12. REPORTED RESULTS:

Group	Dose Level (mg a.i./kg of body weight)	Number Dead		% Dead	Test Day Found Dead
		Male	Female		
VC	0	0/5	0/5	0	-
T-I	0.57	0/5	0/5	0	-
T-II	0.91	0/5	0/5	0	-
T-III	1.46	0/5	0/5	0	-
T-IV	2.34	0/5	0/5	0	-
T-V	3.75	2/5	1/5	30	1,1,1
T-VI	6.00	0/5	3/5	30	1,1,1
T-VIII	9.60	3/5	5/5	80	1,1,1,1,1,1,1,1
T-VIII	15.40	5/5	4/5	90	1,1,1,1,1,1,1,1,1

- - No mortalities occurred.

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"A. Reactions

"Treatment related signs of toxicity noted in birds receiving Diazinon MG8 [3.75, 6.00, 9.60, and 15.40 mg/kg groups only] included ataxia, regurgitation, lethargy, paralysis (legs stretched behind body), and penile protrusion.

"The vehicle control birds were dosed on June 26, 1987, from 1:30 p.m. to 1:35 p.m. The test group birds were dosed from 1:36 p.m. to 2:34 p.m. with the dosing order being [from lowest to highest]. At 3:20 p.m., bird #289F [15.40 mg/kg] was down with its legs stretched behind its body while [two others in that group] stumbled and fell down with their legs also stretched behind their bodies. One [15.40 mg/kg] male and one [3.75 mg/kg] male were regurgitating and one [15.40 mg/kg] male displayed penile protrusion. At 3:27 p.m., one [9.60 mg/kg] male and one ... female were regurgitating and two other ... females were down with their legs stretched behind their bodies. At 3:33 p.m. (1 hour post-dosing), bird #289F [15.40 mg/kg] was found dead. Seven of the nine remaining [15.4 mg/kg] birds were down and wouldn't walk. At 3:45 p.m., [5 deaths were recorded for the 15.40 mg/kg group and 3 for the 9.60 mg/kg group]. Also at this time, one [15.40 mg/kg] female was up walking but the other three ... birds [in that group] were down. Four [9.60 mg/kg] birds and two [3.75 mg/kg] males were down and wouldn't walk. One [6.00 mg/kg] female was regurgitating.

"On June 27, 1987, at 8:10 a.m., the following deaths were recorded: [3 in the 3.75 mg/kg; 3 - 6.00; 5 - 9.60; 3 - 15.40]. Examination of the area under the [3.75 mg/kg] pen revealed that regurgitation had occurred in this pen. All remaining birds appeared to be normal and active at this time and remained so for the balance of the project.

"The vehicle control, [and the 0.57 through the 2.34 mg/kg groups] were normal and active throughout the entire investigation."

"B. Mortality and Post-Mortem Examinations

"No mortalities occurred in the [control through the 2.34 mg/kg] groups. Three mortalities were recorded in the [3.75 mg/kg] group, three in the [6.00 mg/kg] group, eight in the [9.60 mg/kg] group, and nine in the [15.40 mg/kg] group.

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"Post-mortem examinations revealed no visible abnormal tissue alterations in the test birds found dead during the investigation. However, all birds died with legs stretched behind their bodies.

"Gross pathological examinations on test day 14 of two male and two female birds sacrificed [from each of the controls through the 6.00 mg/kg groups as well as the surviving birds from the 9.60 and 15.40 mg/kg groups] revealed no abnormal tissue alterations."

"C. Body Weight Data

"Statistical evaluation of the body weight data was conducted using Analysis of Variance. Statistical analysis of the body weights at each weighing interval revealed no statistically significant differences in the test groups' body weights when compared to the control group values."

"D. Food Consumption Data

"Food consumption values in the vehicle control group ranged from 113 to 126 grams/bird/day during the investigation.

"Severe food avoidance was noted during the first three days of the project in the [2.34 through the 15.40 mg/kg groups] when compared to the vehicle control group. Also, severe food avoidance was noted through test day 7 in the [15.40 mg/kg] test group. Food consumption values during test days 8 through 14 in the [0.57 and 6.00 mg/kg] test groups were depressed when compared to the vehicle control group."

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:

"The results of the 14-Day Acute Oral Toxicity Study conducted with Diazinon MG8 in Mallard ducks showed the acute oral median lethal dose (LD₅₀) of the test material to be 7.90 mg a.i./kg of body weight with 95% confidence limits of 5.72 to 10.90 mg a.i./kg of body weight.

"In accordance with BLAL Laboratories' intent that all studies conducted at our facilities are designed and function in conformance with good laboratory practice regulations and the protocols for individual laboratory studies, an inspection of the final report for Diazinon MG8

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was conducted and found to be in acceptable form by our Quality Assurance Officer. A final inspection of all data and records on July 19, 1987 indicates that the report submitted to you is an accurate reflection of the study as it was conducted by BLAL Laboratories."

14. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

A. Test Procedure(s):

- (1) Raw data for mortality, body weight and food consumption was consistent with written report.
- (2) Study, basically, followed guidelines with the following exceptions:
 - (a) Test Organism. Test species was not verified by its scientific name (SEP, pg. 3).
 - (b) Body Weight and Food Consumption. Vomiting was reported for individuals in each of the following groups on Day 1: 1 in the 3.75 mg/kg; 1 - 6.00 mg/kg; 2 - 9.6 mg/kg and 1 - 15.4 mg/kg. On Day 2, at least one individual in the 3.75 mg/kg group vomited also. SEP (pg. 7) indicates that if vomiting is a problem, the test may need to be rerun.

B. Statistical Analysis: The LD₅₀ calculated by the Probit Method using Toxanal is slightly lower and has a narrower c.i. than the author's values. See attached printouts.

C. Discussion/Results:

- (1) Mortality and Behavioral Observations. The distribution of mortality over dosage tracked the behavioral observations and no inconsistencies were obvious to the reviewer. The observed behavioral effects, such as ataxia, lethargy, paralysis and penile protrusion (down to 3.75 mg/kg) have negative implications which could affect the bird's ability to develop and survive in the wild. Although vomiting was observed, it seems to have been limited and fairly equally distributed across relevant dosage groups.

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- (2) Implications of Dose-Mortality Response. The NOEL, for this study, was not established, since food consumption, for days 8 through 14, in the lowest exposure group (0.57 mg/kg), was depressed. The dose/mortality curve is steep, with a narrow range between no mortality (at 2.34 mg/kg) and 90% (at 15.40 mg/kg).
- (3) Gross Necropsy. Gross necropsies were performed but then revealed no abnormal tissue alterations, according to the author. All birds died with legs stretched out behind their bodies.
- (4) Descriptive Categorization of Results. With an LD₅₀ of 6.66 mg/kg (95% c.i. of 5.12 - 8.90 mg/kg), Diazinon MG8 is very highly toxic to mallard ducks.

D. Adequacy of the Study:

- (1) Classification: This study is Core, subject to the verification of the test species by its scientific name.
- (2) Rationale: N/A
- (3) Reparability: N/A

15. COMPLETION OF ONE-LINER FOR STUDY: Yes, on February 15, 1988.
16. CBI APPENDIX: N/A

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ONE LINER SHEET

Shaughnessey No. _____ Chemical Name Diazinon MGS Chemical Class _____ Page _____ of _____

Study/Species/Lab/ Accession # _____ Chemical % a.i. _____ Results _____ Reviewer/ Date _____ Validation Status _____

14-Day Single
Dose Oral LD₅₀

LD₅₀ = 6.66 mg/kg 95% C.I. (5.12 - 8.90) Contr. Mort. (%) = 0

Slope = 3.91 # Animals/Level = 10 Age (Weeks) = 16 Lincor/ 2-15-88
Sex = ♂ + ♀ Core

Lab: Bio-Life, Ltd. 86.6

AC #: 87 00 48

14-Day Dose Level mg/kg (% Mortality)
0.57 (0), 0.91 (0), 1.46 (0), 2.34 (0), 3.75 (30), 6.0 (30), 9.60 (80), 15.40 (90)

Comments: Test species needs to be confirmed by scientific name.

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LC50L	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
15.4	10	9	90	1.074219
9.600001		10	8	80
5.46875				
6	10	3	30	17.1875
3.75	10	3	30	17.1875
2.34	10	0	0	9.765625E-02
1.46	10	0	0	9.765625E-02
.91	10	0	0	9.765625E-02
.57	10	0	0	9.765625E-02

THE BINOMIAL TEST SHOWS THAT 2.34 AND 15.4 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 7.212907

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
4	.167754	6.548941	5.022105	8.845975

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
5	.178348	1	.8380141

SLOPE = 3.906195
95 PERCENT CONFIDENCE LIMITS = 2.256559 AND 5.555831

LC50 = 6.657593
95 PERCENT CONFIDENCE LIMITS = 5.122672 AND 8.904984

LC10 = 3.149145
95 PERCENT CONFIDENCE LIMITS = 1.739745 AND 4.238886

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DATA EVALUATION RECORD

1. CHEMICAL: MIBK Process Diazinon
2. TEST MATERIAL: MIBK Process Diazinon, FL No. 871790, 97.0% a.i.
3. STUDY TYPE: 14-Day Acute Avian Oral
Species Tested: Mallard Duck
MRID: 40922902
4. CITATION: Fletcher, D. W. 1987. 14-Day Acute Oral Toxicity Study with MIBK Process Diazinon in Mallard Ducks. Prepared by Bio-Life Associates, Ltd., Neillsville, WI for Ciba-Geigy Corporation, Greensboro, NC. BLAL 87 DD 49.

5. REVIEWED BY:

Jeffrey L. Lincer, Ph.D.
Eco-Analysts, Inc.
Sarasota, FL

Signature:
Date: 2/16/88

6. APPROVED BY:

James R. Newman, Ph.D.
Proj. Mgr., KBN Engineering
and Applied Sciences, Inc.

Signature:
Date:

James R. Newman
2/25/88

Henry T. Craven
Chief EEB/HED
USEPA

Signature:
Date:

Henry T. Craven
12/5/88

7. CONCLUSIONS:

The study is scientifically sound. With an LD₅₀ of 6.38 (95% c.i. of 4.90 - 8.50 mg/kg) MIBK Process Diazinon (97% a.i.) is very highly toxic to mallard ducks when given as an oral dose. Applicant should be requested to verify the test species by its scientific name and respond to 14C(4).

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8. RECOMMENDATIONS: When reporting results, use the actual dose (i.e. 3.75 mg/kg) rather than the group number (i.e. T-V). Identify the experimental species by its Latin name, in addition to its common name. Provide 10-hour light (14-hour dark lighting regime until guidelines are revised).
9. BACKGROUND: N/A
10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES: N/A
11. MATERIALS AND METHODS (PROTOCOLS):
 - A. Test Animals: The birds employed in this study were unmatd (16 weeks old) Mallard ducks received from Whistling Wings, Inc., Hanover, Ill. The birds selected for the study had been under observation for a 22-day quarantine period to determine their suitability as test birds based on their general physical condition, and to acclimatize them to laboratory conditions. The birds were identified by means of metal leg bands embossed with numbers unique within the study. Prior to the initiation of the project, all birds were examined and determined to be suitable for testing.
 - B. Dosage and Design: Dose levels were based on a geometric scale of 1.6. The ducks were randomly assigned to test groups, and were weighed individually at 0 hour on test day 1. Subsequent individual body weights were obtained on test days 3, 7, and 14.

All birds were fasted (with water allowed) for approximately 22> to 23> hours prior to dosing at 0 hour on test day 1. The birds were permitted a standard laboratory diet (Purina Duck Grower w/o) plus water ad libitum at all other times. Food consumption was recorded on test days 3, 7, and 14. The doses for the individual test birds were volumetrically measured and administered via disposable syringes at 0 hour on test day 1. All test and vehicle control birds received a constant dosage volume of approximately 4 ml/kg of body weight. The vehicle control birds each received corn oil only.

Dosage and experimental design were as follows:

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Group	Number of Birds		Dose Level (mg a.i./kg of body weight)
	Male	Female	
VC	5	5	0
T-I	5	5	0.57
T-II	5	5	0.91
T-III	5	5	1.46
T-IV	5	5	2.34
T-V	5	5	3.75
T-VI	5	5	6.00
T-VII	5	5	9.60
T-VIII	5	5	15.40

- C. Statistics: LD₅₀ was calculated using the method of Litchfield and Wilcoxon ("A simplified method of evaluating dose-effect experiments," The Journal of Pharmacology and Exp. Therapeutics, 96(2), June 1949).

12. REPORTED RESULTS:

"A. Reactions

"Treatment related signs of toxicity noted in birds receiving MIBK Process Diazinon included ataxia, regurgitation, lethargy, paralysis (legs stretched behind body), and penile protrusion.

"The vehicle control birds were dosed on June 26, 1987, from 1:30 p.m. to 1:35 p.m. The test group birds were dosed from 2:37 p.m. to 3:20 p.m. with the dosing order [following increasing concentration].

"At 8:30 a.m. on June 27, 1987 (17 hours post-dosing), the following deaths were recorded: [3 in the 3.75 mg/kg group; 4 - 6.00 mg/kg; 8 - 9.60 mg/kg; and 9 - 15.40 mg/kg. The remaining bird in the 15.40 mg/kg group] was aggressive and ataxic. Two [3.75 mg/kg] birds were aggressive and two [9.60 mg/kg] birds were lethargic at this time. Regurgitation had occurred in the [1.4 mg/kg] and [2.34 mg/kg] pens as evidenced by

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examination under the pens and on the sides of the pens.

"At 8:20 a.m. on June 28, 1987, all birds appeared to be normal and active and remained so for the balance of the project.

"The vehicle control, [0.57 and 0.91 mg/kg] birds were normal and active throughout the entire investigation."

"B. Mortality and Post-Mortem Examinations

"No mortalities occurred in the [control through the 2.34 mg/kg] groups. Three mortalities were recorded in the [3.75 mg/kg] group, four in the [6.00 mg/kg] group, eight in the [9.60 mg/kg] group, and nine in the [15.40 mg/kg] group ... [see below]."

Group	Dose Level (mg a.i./kg of body weight)	Number Dead		%	Test Day Found Dead
		Number Tested	Male	Female	
VC	0	0/5	0/5	0	-
T-I	0.57	0/5	0/5	0	-
T-II	0.91	0/5	0/5	0	-
T-III	1.46	0/5	0/5	0	-
T-IV	2.34	0/5	0/5	0	-
T-V	3.75	2/5	1/5	30	1,1,1
T-VI	6.0	2/5	2/5	40	1,1,1,1
T-VIII	9.60	5/5	3/5	80	1,1,1,1,1,1,1,1
T-VIII	15.40	4/5	5/5	90	1,1,1,1,1,1,1,1,1

- - No mortalities occurred.

"Post-mortem examinations revealed no visible abnormal tissue alterations in the test birds found dead during the investigation. However, all birds died with legs stretched behind their bodies.

"Gross pathological examinations on test day 14 of two male and two female birds sacrificed in the [control through the 6.00 mg/kg] groups as well as the surviving

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[9.60 and 15.40 mg/kg] groups revealed no abnormal tissue alterations."

"C. Body Weight Data

"Statistical evaluation of the body weight data was conducted using Analysis of Variance. Statistical analysis of the body weights at each weighing interval revealed no statistically significant differences in the test groups' body weights when compared to the control group values.

"D. Food Consumption Data

"Food consumption values in the vehicle control group ranged from 113 to 126 grams/bird/day during the investigation.

"Severe food avoidance was noted during the first three days of the project in all of the test groups when compared to the vehicle control group. Food consumption remained depressed during test days 4 through 7 in the [0.57 and 9.60 mg/kg] test groups. Food consumption values were dose-correlatedly depressed during test days 8 through 14 in the [0.91, 3.75, 6.00, 9.60, and 15.40 mg/kg] test groups."

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:

"The acute oral median lethal dose (LD₅₀) of MIBK Process Diazinon in Mallard ducks was determined to be 7.00 mg a.i./kg of body weight with 95% confidence limits of 5.11 to 9.59 mg a.i./kg of body weight.

"In accordance with BLAL Laboratories' intent that all studies conducted at our facilities are designed and function in conformance with good laboratory practice regulations and the protocols for individual laboratory studies, an inspection of the final report for MIBK Process Diazinon was conducted and found to be in acceptable form by our Quality Assurance Officer. A final inspection of all data and records on July 19, 1987 indicates that the report submitted to you is an accurate reflection of the study as it was conducted by BLAL Laboratories."

4/6/

14. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

A. Test Procedure(s):

- (1) Raw data for mortality, body weight and food consumption was consistent with text.
- (2) Study, basically, followed guidelines with the following exceptions:
 - (a) Test Organism. Test species was not verified by its scientific name (SEP, pg. 3).
 - (b) Body Weight and Food Consumption. Vomiting was reported for individuals in the 1.46 and 2.34 mg/kg groups. SEP (pg. 7) indicates that if vomiting is a problem, the test may need to be rerun.

B. Statistical Analysis: The calculated LD₅₀ by the Probit method using Toxanal is slightly lower and has a narrower c.i. than the author's values. See attached printouts.

C. Discussion/Results:

- (1) Mortality and Behavioral Observations. The distribution of mortality over dosage tracked the behavioral observations and no inconsistencies were obvious to the reviewer. The observed behavioral effects, such as ataxia, lethargy, paralysis and aggression (down to 3.75 mg/kg) have negative implications which could affect the bird's ability to develop and survive in the wild. Although vomiting was observed, it seems to have been limited to dosage groups, which would not have affected the LD₅₀.
- (2) Implications of Dose-Mortality Response. The NOEL, for this study, was not established, since food consumption, for days 4 through 7, in the lowest exposure group (0.57 mg/kg), was depressed. The dose/mortality curve is steep, with a narrow range between no mortality (at 2.34 mg/kg) and 90% (at 15.40 mg/kg).
- (3) Gross Necropsy. Gross necropsies were performed but then revealed no abnormal tissue alterations.

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according to the author. All birds died with legs stretched out behind their bodies.

- (4) Descriptive Categorization of Results. With an LD₅₀ of 6.38 mg/kg (95% c.i. of 4.90 - 8.50 mg/kg), MIBK Process Diazinon is very highly toxic to mallard ducks.

D. Adequacy of the Study:

- (1) Classification: This study is Core, subject to the verification of the test species by its scientific name.
- (2) Rationale: N/A
- (3) Reparability: N/A

15. COMPLETION OF ONE-LINER FOR STUDY: Yes, on February 16, 1988.

16. CBI APPENDIX: N/A

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ONE LINER SHEET

Shaughnessy No. _____ Chemical Name HIBK Process Diazinon Chemical Class _____ Page 1 of 1

Study/Species/Lab/ Accession # _____ Chemical % a.i. _____ Results _____ Reviewer/ Date _____ Validation Status _____

14-Day Single
Dose Oral LD₅₀

LD₅₀ = 6.38 mg/kg 95% C.L. (4.90 - 8.50) Contr. Mort. (%) = 0

Species: Mallard Duck

Slope = 3.89 # Animals/Level = 10 Age (Weeks) = 16

Sex = equal

Lincer/

2-16-88

Core

Lab: Bio-Life, Ltd. 97.0

14-Day Dose Level mg/kg (% Mortality)

0.57 (0), 0.91 (0), 1.46 (0), 2.34 (0), 3.75 (30), 6.00 (40), 9.60 (80), 15.40 (90)

AC #: 87 00 49

Comments: Test species needs to be confirmed by scientific name.

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
15.4	10	9	90	1.074219
9.800001		10	8	60
5.46875				
8	10	4	40	37.69531
3.75	10	3	30	17.1875
2.34	10	0	0	9.765625E-02
1.46	10	0	0	9.765625E-02
.91	10	0	0	9.765625E-02
.57	10	0	0	9.765625E-02

THE BINOMIAL TEST SHOWS THAT 2.34 AND 15.4 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 6.717126

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
4	.1677539	6.273546	4.781142	8.380658

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
5	.1733351	1	.9345225

SLOPE = 3.892062
95 PERCENT CONFIDENCE LIMITS = 2.271659 AND 5.512465

LC50 = 6.376417
95 PERCENT CONFIDENCE LIMITS = 4.904668 AND 8.497744

LC10 = 3.007957
95 PERCENT CONFIDENCE LIMITS = 1.670586 AND 4.051303

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

09 JUL 1986

MEMORANDUM

SUBJECT: Registration Standard for diazinon -
Nontarget Insect Studies

FROM: Allen W. Vaughan, Entomologist *Allen W. Vaughan*
Ecological Effects Branch *6/30/86*
Hazard Evaluation Division (TS-769-C)

THRU: Henry T. Craven, Head-Section 4 *H.T. Craven*
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C)

THRU: Michael W. Slimak, Chief *M.W. Slimak*
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C)

TO: George LaRocca, PMT-15
Insecticide/Rodenticide Branch
Registration Division (TS-767-C)

Attached is EEB's completed review of the nontarget insect studies received under the Registration Standard for diazinon. Attached material includes DER's, topical summary, disciplinary review, and data table.

Attachment

cc: J. Heckman (OD/HED)
K. Barbehenn (SIS)

4/6/86

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Diazinon Registration Standard - Nontarget Insects

Effects on Beneficial Insects

The following studies received full review under this topic:

<u>AUTHOR</u>	<u>IDENTIFICATION #</u>
Atkins et al.	00036935
Stevenson	05004151
Palmer-Jones	05004413
Clinch	05008936

Studies are outlined in Table 1.

Table 1. Toxicity studies on beneficial insects with diazinon

<u>Species</u>	<u>Formulation</u>	<u>Results</u>	<u>Author</u>	<u>Date</u>	<u>MRID#</u>
Honey bee (<u>Apis mellifera</u>)	Technical	Contact LD ₅₀ = 0.372 micro- grams per bee (highly toxic)	Atkins et al.	1975	00036935
Honey bee	Technical	Contact LD ₅₀ = 0.22 micro- grams per bee. Oral LD ₅₀ = 0.20 micrograms per bee (highly toxic)	Stevenson	1968	05004151
Honey bee	40% WP	Highly toxic residues at 1.0 lb a.i. per acre.	Clinch	1967	05008936
Honey bee	16% EC	Highly toxic through feeding, residues, direct contact, and fumigation	Palmer- Jones	1958	05004413

There is sufficient information to characterize diazinon as highly toxic to honey bees. These studies fulfill the guideline requirements for a honey bee acute contact LD₅₀ study (00036935, 05004151) and a foliar residue toxicity study (05008936).

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Effects on Nontarget Soil and Surface Invertebrates

The following studies received full review under this topic:

<u>AUTHOR</u>	<u>IDENTIFICATION #</u>
Bartlett	05003978
Bartlett	05004148
Bartlett	05005640
Croft and Nelson	05009345

Studies are outlined in Table 1.

Table 1. Toxicity studies on nontarget soil and surface invertebrates with diazinon.

<u>Species</u>	<u>Formulation</u>	<u>Results</u>	<u>Author</u>	<u>Date</u>	<u>MRID#</u>
Predaceous mite (<u>Amblyseius fallacis</u>)	50% WP	Highly toxic at 1 lb a.i. per 100 gal.	Croft and Nelson	1972	05009345
Eleven species of parasitic wasps and predaceous beetles	25% WP	At 0.5 lb a.i. per 100 gal., highly toxic to parasitic wasps, moderately to highly toxic to predaceous beetles	Bartlett	1963	05003978
Predaceous mite (<u>Amblyseius hibisci</u>)	25% WP	At 0.5 lb a.i. per 100 gal., highly toxic	Bartlett	1964	05004148
Two spp. of parasitic wasps; two spp. of predaceous beetles	25% WP	Zero to low toxicity to beetles, high toxicity to wasps.	Bartlett	1966	05005640

There is sufficient information to indicate that diazinon, used at standard field rates, is generally highly toxic to predaceous mites, parasitic wasps, and predaceous beetles.

Guideline requirements for testing on predaceous and parasitic insects are currently reserved.

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Diazinon Registration Standard - Nontarget Insects

The following studies received abbreviated reviews:

<u>AUTHOR</u>	<u>IDENTIFICATION #</u>
Anon.	00004409
Bowen et al.	00008707
Anderson et al.	05003871
Singh and Malhotra	05004376
Hain and Wallner	05008194
Axtell	05011413
Torchio	05012786

Statements for Disciplinary Review

Effects of diazinon on beneficial insects

Diazinon was shown to be highly toxic to honey bees in a number of laboratory studies (Atkins et al. 1975, Clinch 1967, Palmer-Jones 1958, Stevenson 1968).

Effects of diazinon on nontarget soil and surface invertebrates

Acute toxicity studies indicate that diazinon is highly toxic to predaceous mites (Bartlett 1964, Croft and Nelson 1972), as well as parasitic wasps and predaceous beetles (Bartlett 1963, 1966).

Label Statements

On the basis of the data reviewed under this standard, diazinon products intended for outdoor use should bear the following statement on the product label:

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

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References (for Disciplinary Review)

- Atkins, E.L.; Greywood, E.A.; Macdonald, R.L. (1975) Toxicity of Pesticides and Other Agricultural Chemicals to Honey Bees: Laboratory Studies. By University of California, Dept., of Entomology. ? UC, Cooperative Extension, (Leaflet 2287; published study). MRID # .00036935.
- Bartlett, B.R. 1963. The contact toxicity of some pesticide residues to hymenopterous parasites and Coccinellid predators. J. Econ. Entomol. 56(5):694-698. MRID # 05003978.
- Bartlett, B.R. 1964. The toxicity of some pesticide residues to adult Amblyseius hibisci, with a compilation of the effects of pesticides upon Phytoseiid mites. J. Econ. Entomol. 57(4): 559-562. MRID 05004148.
- Bartlett, B.R. 1966. Toxicity and acceptance of some pesticides fed to parasitic hymenoptera and predatory Coccinellids. J. Econ. Entomol. 59(5): 1142-1149. MRID 05005640.
- Clinch, P.G. (1967) The residual contact toxicity to honey bees of insecticides sprayed on to white clover (Trifolium repens L) in the laboratory. New Zealand Journal of Agricultural Research 10(2): 289-300. MRID # 05008936.
- Croft, B.A.; Nelson, E.E. (1972) Toxicity of apple orchard pesticides to Michigan populations of Amblyseius fallacis. Environmental Entomology 1(5): 576-579. MRID # 05009345.
- Palmer-Jones, T. (1958) Laboratory methods for measuring the toxicity of pesticides to honey bees. New Zealand Journal of Agriculture Research 1:290-300. MRID # 05004413.
- Stevenson, J.H. (1968) Laboratory studies on the acute contact and oral toxicities of insecticides to honey bees. Annals of Applied Biology 61(3): 467-472. MRID # 05004151.

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Data Requirement	Composition ^{1/}	Use Pattern ^{2/}	Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)	Bibliographic Citation	Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)?
<u>\$158.155 Nontarget Insect</u>					
<u>NONTARGET INSECT TESTING - POLLINATORS:</u>					
141-1 - Honeybee acute contact LD ₅₀	TGAI	A,B,G,H	Yes	00036935 05004151	No
141-2 - Honeybee - toxicity of residues on foliage	TEP	A,B,G,H	Yes	05008936	No
141-4 - Honeybee subacute feeding study	[Reserved] ^{4/}				
141-5 - Field testing for pollinators	TEP	A,B,G,H	No		No ^{5/}
<u>NONTARGET INSECT TESTING - AQUATIC INSECTS:</u>					
142-1 - Acute toxicity to aquatic insects	[Reserved] ^{6/}				
142-2 - Aquatic insect life-cycle study	[Reserved] ^{6/}				
142-3 - Simulated or actual field testing for aquatic insects	[Reserved] ^{6/}				
143-1 - <u>NONTARGET INSECT TESTING-</u> thru <u>PREDATORS AND PARASITES</u>					
143-3	[Reserved] ^{6/}				

1/ Composition: TGAI = Technical grade of the active ingredient; TEP = Typical end-use product.

2/ The use patterns are coded as follows: A = Terrestrial, Food Crop; B = Terrestrial, Nonfood; C = Aquatic, Food Crop; D = Aquatic, Nonfood; E = Greenhouse, Food Crop; F = Greenhouse, Nonfood; G = Forestry; H = Domestic Outdoor; I = Indoor.

3/ Data must be submitted no later than _____.

4/ Reserved pending development of test methodology.

5/ Data reviewed in lower-tier studies do not indicate the need for field testing.

6/ Reserved pending Agency decision as to whether the data requirement should be established.

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CASE GS0108

DIAZINON

PM 200 09/16/82

CHEM 057801

BRANCH EEB DISC 40 TOPIC 05050045

FORMULATION 00 -

FICHE/MASTER ID 00036935

CONTENT CAT 11

Atkins, E.L., Greywood, E.A., Macdonald, R.L. (1975) Toxicity of
Pesticides and Other Agricultural Chemicals to Honey Bees: Labo-
ratory Studies. By University of California, Dept. of Entomolo-
gy. 7: UC, Cooperative Extension. (Leaflet 2287; published
study.)

SUBST, CLASS = S.

DIRECT RVN TIME = (MM) START-DATE 6/24/86 END DATE 6/24/86

REVIEWED BY: Allen W. Vaughan

TITLE: Entomologist

ORG: EEB/HED

LOC/TEL: Crystal Mall #2 / 557-1737

SIGNATURE:

Allen W. Vaughan

DATE: 6/25/86

APPROVED BY:

TITLE:

ORG:

LOC/TEL:

SIGNATURE:

J. T. Craven

DATE:

7/7/86

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1. CHEMICAL: Multiple chemicals. See tables
2. FORMULATION: Technical
3. CITATION: Atkins, E.L., E.A. Greywood, and R.L. Macdonald. 1975. Toxicity of pesticides and other agricultural chemicals to honey bees. Laboratory studies. Univ. of Calif., Div. Agric. Sci. Leaflet 2287. 38pp.
FICHE/MASTER ID 00086935
4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED
5. DATE REVIEWED: December 2, 1981
6. TEST TYPE: Toxicity to honey bee
 - A. Test Species: Honey bee (Apis mellifera)
7. REPORTED RESULTS: Diazinon (#24) was determined to be highly toxic to honey bees in a laboratory acute contact toxicity test. (LD50 = 0.372 micrograms per bee). For data on other pesticides, see tables.
8. REVIEWER'S CONCLUSIONS: This study is scientifically sound, and shows diazinon to be highly toxic to honey bees. This study fulfills the guideline requirement for an acute contact toxicity test on honey bees with the technical material.

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Materials and Methods

Test Procedures

A bell-jar vacuum duster is used to apply the pesticide, mixed with a pyrolite dust diluent, to the test bees. Dosages of dust are weighed, bees are aspirated into dusting cages and treated, and bees are then transferred into holding cages. Observations are recorded at 12, 24, 48, 72, and 96 hours.

Statistical Analysis

Analysis of the data was performed to enable the authors to determine LD50 values of pesticides from either dosage-mortality curves or from LC50 values. The slope value was also obtained from the dosage-mortality curve.

Discussion/Results

See tables for LD50 values, slope values, and toxicity categories.

Reviewer's Evaluation

A. Test Procedure

Procedures were sound.

B. Statistical Analysis

Analysis as performed by the authors was assumed to be valid. No validation was performed by EEB.

C. Discussion/Results

This study is scientifically sound.

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the other factors (0.5, 0.75, 1.25 and 1.5) to obtain the proper range of field dosages in pounds per acre. Then, using the slope value closest to the known slope value for the particular pesticide, the anticipated percent mortalities will be valid for that chemical.

We wish to emphasize that there are a few exceptions to the above rule of thumb method--those pesticides which are less hazardous as well as more hazardous than one can anticipate from laboratory data.

It is our desire that, by presenting this data and these methods, decisions can be made (to select a pesticide, determine the dosage, and apply the chemical in the safest way and at the appropriate time of day) maximizing the control of pest species while minimizing the adverse effects upon beneficial species in the treated area.

A list of the LD₅₀ and slope values determined at 48 hours after treatment at 80°F (26.7°C) and 65 percent relative humidity, the laboratory is given for 203 pesticides in table 1. A list of pesticides not toxic in the laboratory at dosages below 1 µg per honey bee is given for 196 pesticides in table 2.

her commonly used pesticide names or name designations appear together in tables 1 and 2. The pesticide names or other designations appearing in table 1 or 2 are arranged in alphabetical order in table 3 preceded with a numerical reference to the position in table 1 or 2 and giving the chemical definition.

LD₅₀ is the lethal concentration of a chemical giving a bee mortality of 50 percent; LD₅₀ is the lethal dosage in micrograms per bee of a chemical giving 50 percent mortality.

TABLE 1. LD₅₀ and Slope Values Showing the Comparative Toxicity to Honey Bees in the Laboratory at 48 Hours at 80°F (26.7°C) and 65-Percent Relative Humidity.

Reference No.	Pesticide	LD ₅₀ in µg/bee	Slope Value
Group I - Highly Toxic to Honey Bees			
1	lapp	0.001	6.64
2	thionazin; Zinophos [®] ; Demaphos [®] ; AC-8823; EHT 25580	0.042	9.08
3	chlorpyrifos; Durban [®] ; Durox 179	0.114	7.80
4	dieldrin	0.139	4.65
5	carbofuran; Furadan [®] ; NIA-10242; EHT 27164	0.160	4.31
6	parathion	0.175	7.64
7	GC-428	0.178	8.19
8	diazinon; Cygon [®] ; GC-7282; EHT 26430	0.188	3.94
9	methidathion; Supracide [®] ; GS-13005; EHT 27197	0.234	9.06
10	EPR; EHT-300	0.245	5.08
11	NOE-8880; EHT 27764	0.268	9.39
12	C-2349; EHT 27625	0.283	6.11
13	aldicarb; Temik [®] ; UC-21149; EHT 27093	0.285	5.64
14	methyl parathion	0.291	6.24
15	dicrotophos; Bidrin [®] ; SD-3562; EHT 26482	0.300	16.50

16	phosin; Valamin [®] ; Baythion [®] ; BAY-77488; EHT 27648	0.305	6.80
17	phosphamidon; CENTAL [®] ; Pophion [®] ; BAY-13051; EHT 27384	0.306	4.95
18	demeton; Baygon [®] ; BAY-29493; EHT 25540	0.308	7.20
19	Zectran [®] ; Durox 139 [®] ; EHT 25764; demeton-methyl	0.308	4.92
20	omethoate; Acephal [®] ; SD-9129; EHT 27129	0.350	7.77
21	demeton-methyl; Demeton [®] ; BAY-25141; EHT 24945	0.350	3.46
22	aldrin	0.353	4.98
23	oxydemeton; Phosphor [®] ; SD-2844; EHT 22374	0.360	7.94
24	diazinon; DIAZINON [®] ; C-34480	0.372	8.97
25	demeton [®] ; BAY-9026; BAY-27344; EHT 25726	0.375	3.20
26	methyl Durban; Durox 214	0.383	10.23
27	demeton-methyl; Acephal [®] ; Polichion [®] ; Demeton [®] ; BAY-41831; CP-47114; EHT 25715	0.383	4.94
28	NIA-10586	0.408	4.26
29	famphur; Famphur [®] ; CL-38023	0.417	4.85
30	Robax [®] ; UC-A-680; EHT 27041	0.423	8.69
31	azinphosmethyl; Guthion [®] ; BAY-17147	0.423	6.84
32	Isolan [®] ; C-23611	0.471	8.70
33	malathion; Bidrin [®] ; SD-4355	0.480	18.18

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	Orion [®] B-34	0.526	5.16
37	GE-12948	0.530	8.91
38	lindane; gamma HCH	0.562	9.07
39	Berulac 2834	0.574	8.60
40	Berulac 2843; HNT 27613	0.581	3.90
41	WLA-11437	0.609	3.53
42	pirimiphos-methyl; PP-211	0.614	13.11
43	WLA-10339	0.624	6.30
44	UC-8305	0.628	2.66
45	pirimiphos-methyl; PP-211	0.639	13.09
46	omethion; Cythion [®]	0.709	8.04
47	Bonyl [®] ; GE-3707	0.743	9.09
48	Berulac 2842; HNT 27405	0.829	3.90
49	UC-30043; HNT 27293	0.880	4.02
50	Berulac 2847; UC-10834	0.937	6.34
51	Methyl Is-o-octen	0.937	3.68
52	carbamethion; Ethyl Cythion [®] ; BAY-1648P; HNT 23014	0.981	7.32
53	Sovlin 4-HE	1.02	4.37
54	C-9473; HNT 27364	1.04	8.76
55	Endos [®] ; Endos [®] ; R-1504	1.06	4.77
56	EP-11783	1.08	7.11
57	Carbamil [®] ; promecarb; Schering 34613; EP-316; GE-316	1.13	2.22
58	Mutacil [®] ; HNT-44644; HNT 25784	1.16	3.72

62	propoxur; aprocarb; Baygon [®] ; Omet [®] ; BAY-39087; GE-33; HNT 23471	1.33	3.30
63	omethion; Temovar [®] ; BAY-71428; GE-9086	1.37	10.32
64	Gordon [®] ; Rabon [®] ; GE-8447	1.37	21.43
65	AC-12008	1.38	3.00
66	phosphamidon; Dimetion [®]	1.44	14.28
67	Methyl Trichlor [®]	1.44	6.64
68	G-8874; HNT 27409	1.46	3.93
69	Is-o-octen	1.49	1.45
70	omethion; Temovar [®] ; GE-1179; Omet [®]	1.51	3.83
71	Absor [®] ; Biothion [®] ; AC-52160; GE-52160; HNT 27163	1.55	2.85
72	Lindrin; Campd. 711	1.61	2.63
73	GE-4434; HNT 27740	1.64	16.06
74	HEC [®] ; Omet 3353; GE-5353; HNT 27127	1.66	5.12
75	Berulac 2807; HNT 27334	1.66	2.30
76	Bow ET-15	1.83	6.12
77	Summar [®] ; BAY-68138	1.87	3.23
78	Sovlin [®] 4	1.88	3.82
79	I-1642	1.90	3.00

Group II - Moderately Toxic to Honey Bees

80	omethion; Campd. 269	2.02	4.20
81	GE-3030	2.08	3.28
82	Isopropyl; Absor [®] ; FIDUCIEL [®] ; VCH-304; HNT 23288	2.19	3.00
83	Electro [®] ; dimetion; C-8353	2.21	2.98
84	Berulac 2895 G	2.23	2.84
85	Ciodrin [®] ; GE-4294; cyromazine	2.26	17.10
86	AC-12009	2.28	3.68
87	trichloromethane; Agrion [®] ; BAY-27289; HNT 23742	2.33	3.26
88	Bonyl [®] ; HNT [®] ; G-12927; carbamethion	2.34	3.91
89	B-4543	2.44	2.76
90	Omet 1285; GE-9; GE-11	2.51	4.35
91	omethion; Omet [®] ; BAY-6149	2.60	1.85
92	GI-43044	2.62	4.35
93	AC-12008; GE-9098	2.64	4.07
94	G-30494	2.70	4.04
95	Pyrimar [®] ; G-23230	2.95	4.07
96	omethion; Mota System-2 [®] ; BAY-2387	3.00	2.32
97	C-10013; HNT 27410	3.14	2.70
98	chlorfenvinphos & diazinon; HCH-3260	3.14	2.45
99	Cyrolac [®] ; GE-47470	3.31	6.28
100	TD-72	3.58	4.32
101	BAY-38126; HNT 25713	3.60	2.10

102	BAY-38911; HNT 23435	3.75	3.68
103	GE-10128	3.84	6.21
104	UC-6812	3.94	3.75
105	Isopropyl; Alder [®] ; C-9491; HNT 27408	3.99	3.12
106	GE-9168; HNT 27134	4.09	3.98
107	GE-10084	4.19	3.21
108	Cyrolac [®] ; GE-47031	4.23	7.32
109	TD-73	4.29	3.64
110	carbamethion; Trichlor [®] ; R-1303	4.47	8.39
111	Parthion [®] ; Q-137	4.47	4.05
112	GE-9879	4.90	4.14
113	GE-7438	5.08	6.09
114	Electro [®] ; HNT	5.14	3.87
115	dimetion; GE-9098; HNT-19439	5.14	1.14
116	chlorfenvinphos	5.23	3.24
117	GE-270948; GE-34096; HNT 27473	5.35	2.75
118	HNT, B.E. Lamm	5.36	4.43
119	GE-8448	5.74	8.72
120	omethion; Berion [®] ; Trion [®] ; Bow ET-14; Bow ET-57	5.74	2.10
121	Bonyl [®] ; G-27415; HNT 27444	5.75	4.13
122	GE-10181	5.78	8.58
123	dimetion; Dimetion [®] ; GE-13332	5.84	4.08
124	HNT; HNT 1386	5.95	4.89
125	Isopropyl parathion; HNT-2168	6.41	6.06

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127	ENT	7.12	6.43
128	silica; GE-1283	7.13	3.23
129	GC-3583; GE-8210	7.74	3.37
130	endosulfan (as WP30); Thiodan [®]	7.81	3.13
131	endosulfan; FEA-3767; AC-18737	8.00	7.02
132	Trinid [®] ; UC-200474; ENT 25942	8.10	3.27
133	chloridene	8.80	2.34
134	phthalate; Salom [®] ; EP-11974	8.94	3.83
135	HES-1432	9.35	3.30
136	phorate; Thimer [®] ; AC-3911	10.07	1.34
137	Pyrate [®] ; BE-1410	10.32	6.43
138	chloridene; Kopar [®] ; Compd. 1189	10.39	6.83

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127	CP-18302	11.00	3.82
140	ammonia; Saphor [®] ; PP-173	11.04	2.83
141	bisoprostyl; Norelde [®] ; FEA-9044	11.60	9.97
142	GE-17250	12.00	2.71
143	cededilla	12.33	6.20
144	Artemisate; Caroni [®] EP [®] ; EP-332; ENT 27544	14.27	3.97
145	CP-10316	14.50	3.20
146	endosulfan (as. tech.);	16.14	2.34
147	Flomethy; Lambrol [®] ; Nyrac [®] ; B-2060; BE-347-1	16.62	3.60
148	α endosulfan	17.42	3.02
149	ACTOP [®] ; HVS	17.43	3.79
150	pirimicarb; Pirimic [®] ; PP-042	18.72	2.80
151	ochlon; Dialate [®]	20.55	0.95
152	dinoseb; Dolmar [®] ; Norelde AC-528; ENT 23897	21.27	3.05
153	α endosulfan	21.79	3.31
154	methoxychlor; Mavlor [®] ; ENT	23.37	1.55
155	Endos [®]	23.60	4.00
156	BAY-39731	26.59	1.27
157	dinoseb; Karathane [®] ; ENT 27727	33.39	2.87
158	Terac [®] ; Norelde 14383; ENT 27330; dialate	34.45	1.30
159	dinoseb; Dinor [®] PE; ENT; aluminum salt	36.26	4.93

160	Plictran [®] ; Bruno 213; ENT 27395; B-3180	38.19	4.92
161	Silam [®] ; GE-708	40.49	1.70
162	B-23233	40.59	4.23
163	silam; Zarlate [®]	44.65	2.12
164	EP-334-HE	44.75	1.98
165	dinoseb; Accur [®] ; Dossin [®] ; UC-19784; ENT 27244	48.42	5.90
166	ompham	50.40	1.67
167	EP-417	51.46	3.18
168	EP-418	52.82	3.46
169	cricklorin; Dylon [®] ; Dyptran [®] ; ENT 19788	59.83	2.81
170	GC-3582	60.43	4.92
171	GC-10435	62.00	9.45
172	PPC-124	65.87	2.40
173	orythioquinn; Norelde [®] ; BAY-34384; ENT 25404	66.67	1.36
174	STLOID [®] 2M - Grade 60; GC-60	67.08	2.18
175	chiron; Ammon [®] ; Teram [®] 75; Thylate [®]	73.72	1.18
176	calcium ammate	78.36	4.10
177	Tri-814 [®] ; STLOID [®] 235-Grade 235; GC-67	96.69	4.40
178	GC-8993; ENT 25207	96.69	1.37
179	BE-2300	97.89	1.90
180	GC-9832; ABE	98.00	2.68
181	STLOID [®] 37B-Grade 78; GC-78	108	3.18

182	ammonia; GE; Tolvar [®]	110	0.78
183	Endos [®] ; BAY-30400; chionchlorin	121	1.14
184	dialate; Kalcham [®] ; PP-293	145	1.52
185	Norelde [®] ; HVS; ENT 4225	161	0.98
186	STLOID [®] 305-Grade 77; GE-77	163	2.65
187	Q-128	179	0.75
188	BAY-36733; ENT 27323	190	2.18
189	nitrofen; HVS [®] ; PP-925	275	3.08
190	propachlor; Ramor [®] ; CP-31393	311	2.81
191	Polytran [®] ; ENT 26711	437	1.53
192	Ammon; Norelde [®] ; TriFonate [®] ; GC-908	483	8.07
193	ammonia (food grade)	494	4.79
194	propachlor; Chas-Hor [®] ; LFC	604	0.96
195	BE-811 [®] 233	616	2.67
196	STLOID [®] 74-Grade 74; GE-74	880	0.99
197	cyania	977	1.26
198	caldur	1,031	1.36
199	chlorobenzilate; Ammon [®] ; Geigy 330; G-23992	1,049	1.01
200	dinitrophenylphosphonate; Dinor [®] ; BE-111; HVSCH	2,175	0.45
201	STLOID [®] 63-Grade 63; GE-63	3,625	0.91
202	BE-14114; Vandox; Norelde [®] ; ENT 27738	3,982	0.57
203	GC-4934	10,031	0.63

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at 80°F (26.7°C) and 65 Percent Relative Humidity.
Group III - Relatively Nontoxic to Honey Bees

Reference No.	Pesticide	% Mortality	ug/bee
204	allethrin pyrethrin, cyanoethoxy; BHT 1728	6.00	0.314
205	Bacillus [®]	6.79	0.334 0.136
206	pyrethrum	11.00	0.63
207	rotamone; embo; dorrin	12.00	1.41
208	parimol; Sumat [®]	2.90	2.42
209	paraquat	2.74	6.04
210	dichloro; Dypag [®]	7.04	7.25
211	minotins	3.00	0.70
212	dichloromethide; Supracid [®] ; BAY-67531	3.91	9.06
213	Alamine H, primary amine; AL-21	2.30	9.06
214	Alamine L-15; AL-15	2.30	9.06
215	Alamine H, primary amine; AL-11	0	9.06
216	Alamine H, primary amine; AL-15; Tall oil	0	9.06
217	Alaquat H, tertiary amine; ALQ-221	0	9.06
218	Sumcon L-15; HL-15	0	9.06
219	ethyl chloroacetate	1.09	9.67
220	Armit [®]	26.00	12.00
221	Gordon; Sumac [®]	10.61	12.00
222	Vegetol [®] ; GNC	10.03	12.00
223	Salpet; Sumat [®]	0.97	12.00
224	BHT anticonformant; BAY anticonformant for BHT; EC-6766	7.79	12.00

225	carphos; Polar [®]	6.14	12.00
227	Spam [®] ; EPTC	9.91	12.00
228	TD-71	3.83	12.00
229	amban; Parvat [®]	3.71	12.00
230	glycidin; Glycidol [®]	3.00	12.00
231	Sumat [®] ; CHA	4.73	12.00
232	Tricon E-100 [®]	4.31	12.00
233	Sumac [®] ; Trypan [®] ; 2,3,6-TBA	4.34	12.00
234	amavolo; Sumcon [®] ; Oxytol [®] ; ALA	4.10	12.00
235	supcon sulfo	3.32	12.00
236	amban; Summac [®]	2.90	12.00
237	Tricon E-100 [®]	2.00	12.00
238	dodine; Oxytol [®]	2.43	12.00
239	SDS-900; Camp. 900A; HIA-900	2.17	12.00
240	picloram; Dordon [®] 22K	7.40	14.30
241	Sumacin; Sumat [®]	7.10	14.30
242	supcon sulphuric acid; C-0-C-0	7.00	14.30
243	BAY-67531	6.83	14.30
244	Sumat; Sumat [®]	3.60	14.30
245	2,4-DB (dimethylamine salt); Sumat [®] -110; 4-(2,4-DB)	3.97	14.30
246	oxytol; Clotol [®] ; S-6000	2.90	14.30
247	amban (ammonium salt); amban [®] ; chloramban	2.00	14.30
248	Sumcon; Supid [®] ; S-6173	2.40	14.30
249	Sumat [®] ; Sumat [®] ; Sumat [®]	2.00	14.30
250	S-6	3.33	16.02

251	amban; Sumat [®] ; Sumat [®]	6.60	16.13
252	2,4-DB (low volatility oil soluble form); Sumat [®]	6.64	16.13
253	AC-94554	6.20	16.13
254	chloramban; Chloramban [®] ; HIA [®] ; BHT 20496	2.00	16.13
255	Sumat [®] ; Sumat [®] ; SO-14; BHT 27236	1.83	16.13
256	Sumat [®] ; BHT; BHT; 2-BHT	1.67	16.13
257	S-646 (analogue of Armit [®])	0	16.13
258	S-34099; BHT 27947	9.94	21.13
259	BP-2929	1.20	21.70
260	Sumat [®] ; Sumat [®] ; BP-17623	1.20	21.70
261	Sumat [®] ; SO-6021; BHT 27332	3.30	24.00
262	Sumat [®] ; HIA; chloramban	4.93	24.03
263	EC-3066	22.87	24.17
264	EC-2131	13.66	24.17
265	trifluoromethyl Sumat [®]	12.85	24.17
266	Sumat [®] ; Sumat [®] ; 2,4-DB	7.66	24.17
267	Mylen [®] ; BHT	6.23	24.17
268	Amec [®] 170; Sumat [®] ; HIA	6.17	24.17
269	dalapon; Sumat [®] ; Sumat [®]	4.30	24.17
270	2,4-DB (medium salt)	3.70	24.17
271	Endop [®] ; Polybutene H-300	3.70	24.17
272	propamit; HIA; Sumat [®] ; Sumat [®] F-34; BAY 30130	3.69	24.17
273	Sumat [®] ; HIA; Sumat [®] and wood killer	3.62	24.17
274	BHT	2.99	24.17

275	Sumat [®] ; Sumat [®] ; HIA	2.00	24.17
276	2,4,5-T	1.93	24.17
277	C-940; HIA-C940	1.62	24.17
278	Sumat [®] ; Sumat [®] ; Sumat [®] ; S-4461	1.60	24.17
279	chloramban; Sumat [®] ; S-24163; BHT 20496	1.60	24.17
280	Glycol [®]	0.83	24.17
281	SO-13790	0.79	24.17
282	clitk11	0	24.17
283	Sumat [®] ; Sumat [®] ; S-1910	14.95	26.01
284	HIA, S-E' Sumat	16.81	26.99
285	BHT, S-E' Sumat	16.43	26.99
286	HIA, S-E' Sumat	15.00	26.99
287	Sumat [®] ; HIA; HIA; S-2001	13.18	29.01
288	HIA-40036	11.97	29.01
289	Sumat [®] ; Sumat [®] ; S-1607	10.89	29.01
290	Sumat [®] ; Sumat [®] ; S-4572	10.32	29.01
291	Sumat [®] ; Sumat [®] ; S-2063	7.04	29.01
292	EC-21436	6.30	30.22
293	EC-21427	3.70	30.22
294	Sumat [®] 1221	2.90	30.22
295	Sumat [®] 1246; BHT 2070	1.24	30.22
296	Sumat [®] 1254	1.24	30.22
297	Sumat [®] 1260	1.20	30.22
298	Sumat [®] 1232	0	30.22
299	Sumat [®] 1242	0	30.22
300	LPC + PFC - 134 @ 4:1	11.30	32.74 9.10

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302	CIPC + PHE - 134 @ 6:1	4.50	36.26 9.10	327	MetCA (inhibited); Sodium TCA	4.33	60.43
303	maleic hydrazide; ME-30 [®]	4.32	36.26	328	ethyl formate	2.99	60.43
304	SOCP [®]	2.99	36.26	329	Amato [®] Z; AME	2.90	60.43
305	dimethyl sulfide; DMSO	2.67	36.26	330	Proton [®] ; Tams [®]	2.30	60.43
306	methan; MEK; VPO [®] ; Vapor [®]	2.40	36.26	331	Somax [®] ; BAY-94337	2.82	60.00
307	Enved [®] ; ZCL-4,5-TF; silver acid, FOME ester	2.10	36.26	332	diamba; Somax [®] P [®]	2.50	90.65
308	diallate; Amstar [®] ; BAYC; CP-15344	2.00	36.26	333	permatex; Capota [®] ; G-34161	10.36	96.60
309	Piproc [®]	2.00	36.26	334	capitol; Solid; Bolelone [®] ; ME-3065	0.91	96.60
310	crillatex; Amstar [®] SP [®] ; BAYC-SH	1.82	36.26	335	citratine; Primax [®]	6.52	96.60
311	acilan; Amstar [®] 60; ME 9037	1.28	36.26	336	ameryne; acrymeryne; Ameryne [®] ; Boli [®] GE-34162	6.40	96.60
312	Polyorbene 60 [®] ; Tress 60 [®]	0.86	36.26	337	otrasine; AACT [®] ; AACT [®] ; G-30027	4.79	96.60
313	alashlor; Amstar [®] ; CP-30144	0.61	36.26	338	SHETAC [®] ; GE-14254	4.53	96.60
314	HTI-2840	2.54	45.30	339	avon; Neoban [®]	2.09	96.60
315	SH-30107; SH-473	9.68	48.34	340	puspatine; Hilegore [®]	2.47	96.60
316	FLIT [®] MLC; BPEL-3035-2	9.32	48.34	341	Wamper [®] ; Pannax [®]	12.00	100.00
317	MBC	8.34	48.34	342	Quam [®] ; BAY-22355	40.44	102.00
318	BPEL-3337-3	7.61	48.34	343	unpalam; Alama [®] ; WBL	0.41	113.30
319	polyisobutylene	7.34	48.34	344	Santa hydrazide; UPII; Boli [®]	12.70	114.82
320	polyisobutylene; Polytray [®]	5.60	48.34	345	chloridamine; chlorophenamide; Fundat [®] ; Galecor [®] ; HT 27347; HT 27333; HT-333; G-4314	8.49	114.82
321	TCA, acid	4.18	48.34	346	FHE [®] ; EC-30079	3.80	114.82
322	pentachlorophenol, PCP; Dowicide [®] 7 Fluka tech Dowicide [®] 6 sodium salt	2.35 2.16	48.34	347	Pyroc [®] ; Kama [®] ; B-422	4.27	117.23
323	WLA-10437	0.83	48.34	348	bombyl; Sunit [®] ; P-1091	0.16	120.06
324	dichloropropene; Telone [®]	6.38	60.43	349	Malcor [®] ; C-4313	7.23	120.06
				350	limon; Lene [®]	6.47	120.06

351	unoxymuron; Poxuron [®] ; C-3126	5.39	120.06	377	bromail; Syner [®] X	1.20	193.30
352	fluorodifluor Proform [®] ; C-4409	5.40	120.06	378	Alor [®]	5.80	203.44
353	cidaron; Topyran [®]	5.30	120.06	379	captan; Mopar [®] ; Orthocid [®] 406; HT 26530	9.04	215.00
354	GC-10379	4.58	120.06	380	methar; BML; Amstar [®] 104	9.00	217.55
355	chloroxuron; Topyran [®]	4.50	120.06	381	metadifluor; Sunit [®]	4.33	217.55
356	ovon; Ovomon [®] ; E-4431	3.17	120.06	382	arylita	1.43	217.55
357	dichlorobenzil; Casaron [®]	3.09	120.06	383	Seethal [®] -T; BAC 003; BCHA	3.18	229.63
358	Tradin [®] (dimifluralin, 50% + diphomand, 3.12)	2.70	120.06	384	GE-16066; Somax [®]	6.20	235.68
359	diuron; Kama [®]	2.77	143.03	385	carbocryl; Igum [®] ; GE-14260	2.90	236.40
360	oxydylid acid; Phytar [®] 130	3.60	157.12	386	Om-Trol [®] ; Thelone [®] ; MEPS (sodium salt)	4.80	237.37
361	Bihar [®] (dimethan [®] N-45, 74% + Karathane [®] , 60% 14.99	179.87 14.99		387	dichloromethane earth	18.23	241.72
362	chlorothachmil; Somax [®] 2787; Borev [®]	14.28	181.29	388	Primax [®] ME	12.11	241.72
363	nitralin; Hemon [®] ; SD-11831	6.00	181.29	389	calium carbamate	8.22	241.72
364	Plamex [®] ; P-461	5.90	181.29	390	diphomand; Synt [®] ; Boli [®]	7.29	241.72
365	dialuron; Borev [®] A; BCHA; dicronil; Allison [®]	5.32	181.29	391	phosphatophen; Somax [®] ; HT-482; G-4075	2.95	241.72
366	Ker [®] ; SH-SH	4.90	181.29	392	clamba clay	2.02	241.72
367	methacilo; Borev [®] ; VCS-438	3.79	181.29	393	VIRN [®] /V [®] ; Boli [®] thia virus	0.39	241.72
368	dichloron; Borev [®] ; Bolar [®]	3.09	181.29	394	alithil (new)	0.49	241.72
369	carbocryl; Borev [®] ; B-735	2.80	181.29	395	Acenaley [®]	0.43	241.72
370	carbocryl; Tams [®] ; WLA-11092	8.50	193.30	396	Somax [®] ; silver acid (tech.); 3(2,4,5-TF)	0.61	241.72
371	fluomethox; Catoran [®]	3.80	193.30	397	apolethamide; ACTI-417 [®] ; Acridian [®]	0	241.72
372	Bithan [®] N-45	3.70	193.30	398	pyrochylite; Pyro [®]	1.20	242.60
373	Pyram; Pyram [®] ; PCA	3.30	193.30	399	Sealing thiriacinole Seilmer; Thericide [®] ; Borev [®]	non-acute @ 725,000 apores/bac	
374	carbocryl; Borev [®]	2.40	193.30				
375	cyamoxine; Borev [®] ; SD-15418	2.11	193.30				
376	carbocryl; Borev [®] ; Borev [®] 9573	1.64	193.30				

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Table 1.--Percent acceptance and toxicity ratings of pesticides fed exclusively as stomach poisons to certain hymenopterous parasites and coccinellid predators. (Cont.)

Material	Formulation	% toxicant (act.) in honey w/w (low concn)	Response to low concentration of toxicant in honey							
			Lindorus		Cryptolaemus		Metaphycus		Aphyt's	
			Accept.	Tox.	Accept.	Tox.	Accept.	Tox.	Accept.	Tox.
Tartar emetic	Tech	.1908	23	0	43	O-L	26	L	34	L-M
TDX	50% WP	.0954	67	0	49	0	24	O-L	58	L
Tepp	20% E	.0239	100	0	100	0	100	0	16	O-L
Tetradifon	25% WP	.0353	100	O-L	100	0	100	0	85	O-L
Toxaphene	40% WP	.1908	23	0	13	0	91	O-L	76	L-M
Trichlorfon	50% sol. pow.	.0477	94	O-L	72	0	100	L	100	L
Zectran	25% WP	.0477	40	H	16	H	5	H	8	H
Zineb	75% WP	.1240	99	O-L	100	0	100	O-L	100	0

a Toxicity expressed as H (High) if $LT_{50} < 1$ day; M (Medium) if $1 < LT_{50} < 4$ days; L (Low) if $LT_{50} > 4$ days; O if none.

b 2(p-tert-butylphenoxy) isopropyl-2-chloroethyl sulfite.

c A mixture of 1 part of 1,1-bis(p-chlorophenyl)-2-nitropropane (Prolanone) and 2 parts of 1,1-bis(p-chlorophenyl)-2-nitrobutane (Bulanone).

d 2-cyclohexyl-4,6-dinitrophenol, dicyclohexylamine salt.

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Table 1.--Percent acceptance and toxicity ratings of pesticides fed exclusively as stomach poisons to certain hymenopterous parasites and coccinellid predators.

			Response to high concentration of toxicant in honey							
Material	Formulation	% toxicant (act.) in honey w/w (low concn)	Lindorus		Cryptolaemus		Metaphycus		Aphytis	
			Accept. Tox.	Accept. Tox.	Accept. Tox.	Accept. Tox.	Accept. Tox.	Accept. Tox.		
Aldrin ^b	40% WP	0.0477	18	L	22	O	42	O-L	17	O-L
Aramite ^c	15% WP	.0429	30	O	28	O	90	O-L	38	O-L
Azinphosmethyl	25% WP	.0477	2	H	3	H	2	H	5	H
Benzene hexachloride	10% WP	.0191	21	L	21	L	47	L	55	O-H
Bidrin	7.5 lb tech/gal.	.0477	4	H	4	H	15	H	8	H
Bordeaux mixture	10-10-50 2 pkg.	3.8168	3	O	0	O-L	0	L	7	L
Calcium arsenate	70% Ca ₃ (AsO ₄) ₂	0.2863	10	L-H	41	H	28	H	9	H
Captan	50% WP	.0954	25	L	7	O	68	L	68	O-L
Carbaryl	50% WP	.0477	13	H	5	H	0	H	10	H
Carbophenothion	25% WP	.0239	3	O	2	O-L	50	H	29	H
Chlordane	40% WP	.0954	41	O-L	3	O-L	26	O	26	O-L
Chlorobenzilate	25% WP	.0239	11	O	4	O	8	L	12	L
Cryolite (natural)	95%	.2719	16	O-L	14	L	52	H	57	H
DDT	50% WP	.0954	14	O-L	15	H	12	L-H	8	H
Demeton	2 lb/gal EC	.0239	8	H	7	M-H	0	H	21	H
Diazinon	25% WP	.0477	10	O	6	L	10	H	10	H
Dicofol	18.5% WP	.0477	9	O	2	O	6	O	20	L
Dieldrin	50% WP	.0477	43	O	18	O	11	L	37	M-H
Dilane ^c	25% WP	.0954	5	O-L	4	L-H	0	M	9	L
Dimethoate	4 lb/gal EC	.0477	13	H	8	H	46	H	18	H
Dimetilan	50% WP	.0477	30	L	9	M-H	10	H	19	H
Dinocap	25% WP	.0239	4	O	0	O	13	M	8	M
Dioxathion	25% WP	.0239	50	L	18	L	43	H	24	H
DN-111 ^c	20% WP	.0191	30	O	12	O	12	L	85	O-L
Endosulfan	25% WP	.0477	61	O	32	M-H	95	L	100	L
Endrin	50% WP	.0477	6	L	10	M	17	H	29	H
Ethion	25% WP	.0477	11	O	3	O	20	H	5	H

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Table 1.--Percent acceptance and toxicity ratings of pesticides fed exclusively as stomach poisons to certain hymenopterous parasites and coccinellid predators. (Cont.)

Material	Formulation	% toxicant (act.) in honey w/w (low concn)	Response to high concentration of toxicant in honey					
			Lindorus		Cryptolaemus		Metaphous	
			Accept. Tox.	Accept. Tox.	Accept. Tox.	Accept. Tox.	Accept. Tox.	Aphytis
Fenthion	4.0 lb/gal EC	.0477	10 M-H	2 L	5 L	5 H	5 H	5 H
Perbam	67% WP	.1279	33 O	9 O	32 O-L	8 O-L	8 O-L	8 O-L
Genite 923	50% EC	.0954	1 O-L	0 O-L	3 O	11 L	11 L	11 L
Heptachlor	25% WP	.0477	45 O-L	15 O-L	12 L	39 L	39 L	39 L
Lead arsenate (acid)	32% As ₂ O ₅	.2863	98 O	41 O-L	97 O-L	36 O-L	36 O-L	36 O-L
Lime sulfur soln.	29% Naume	3.9809	0 O	0 O	0 O-L	0 O-L	0 O-L	0 O-L
Lindane	25% WP	0.0239	85 L	15 O	20 M-H	8 L-M	8 L-M	8 L-M
Malathion	25% WP	.0477	11 H	9 H	0 H	3 H	3 H	3 H
Mathoxychlor	50% WP	.0954	33 O-L	7 H	13 M	15 L	15 L	15 L
Mevinphos	4 lb/gal E	.0239	4 H	1 H	5 H	4 H	4 H	4 H
Morestan	25% WP	.0477	47 L	10 O-L	75 M	20 L	20 L	20 L
Maled	8 lb/gal EC	.0477	25 O-L	6 O-L	34 H	29 H	29 H	29 H
Neotran	40% WP	.0572	51 O	45 O	56 O-L	6 L	6 L	6 L
Nicotine sulfate soln. 40%		.0746	16 O	31 O	0 O-L	5 L	5 L	5 L
Oil, light- medium	92% U.R. Emul Tech	1.0903	72 O-L	45 O	30 H	37 H	37 H	37 H
Oil-kerosene	50% WP	1.0903	31 O-L	59 O-L	30 O-L	86 O-L	86 O-L	86 O-L
Over	25% WP	.0716	71 O	17 O-L	72 O-L	53 L	53 L	53 L
Parathion	25% WP	.0477	1 O-L	1 L	2 H	3 H	3 H	3 H
Perthane	25% WP	.0477	52 O-L	38 O	17 O-L	10 H	10 H	10 H
Phosphamidon	4 lb/gal E	.0239	19 H	6 H	15 H	11 H	11 H	11 H
Rotenone	6.4% gr. root	.0244	6 H	2 L-M	4 M-H	7 L-M	7 L-M	7 L-M
Ryania	100 gr. stem	.3817	9 L-M	6 O-L	44 L	93 O-L	93 O-L	93 O-L
Sabadilla	2.25% alkaloid	.0065	73 O-L	51 O-L	0 M	6 H	6 H	6 H
Schradan	4 lb/gal EC	.0239	61 O	94 O	76 H	5 M-H	5 M-H	5 M-H
Sulfur	325 mesh WP	.2863	76 O	8 O	20 L	16 H	16 H	16 H
Sulphenone	50% WP	.1431	15 O	4 O-L	9 L	5 L	5 L	5 L

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Table 1.--Percent acceptance and toxicity ratings of pesticides fed exclusively as stomach poisons to certain hymenopterous parasites and coccinellid predators. (Cont.)

Material	Formulation	% toxicant (act.) in honey w/w (low concn)	Response to high concentration of toxicant in honey					
			Lindorus		Cryptolaemus		Metaphycus	
			Accept. Tox.	Accept. Tox.	Accept. Tox.	Accept. Tox.	Accept. Tox.	Aphytis
Tartar emetic	Tech	.1908	14	O	14	L-M	11	H
TDE	50% WP	.0954	24	O-L	7	O-L	6	L
Tepp	20% E	.0239	40	O	53	O-L	70	O
Tetradifon	25% WP	.0353	100	O	78	O	84	O
Toxaphene	40% WP	.1908	4	O	0	O-L	15	L-M
Trichlorfon	50% sol. pow.	.0477	34	O-L	42	O-L	97	L-M
Zectran	25% WP	.0477	12	H	1	H	0	H
Zineb	75% WP	.1240	100	O-L	100	O	70	O-L

a Toxicity expressed as H (High) if $LT_{50} < 1$ day; M (Medium) if > 1 day and < 4 days; L (Low) if > 4 days; O if none.

b 2(p-tert-butylphenoxy) isopropyl-2-chloroethyl sulfite.

c A mixture of 1 part of 1,1-bis(p-chlorophenyl)-2-nitropropane (Prolane) and 2 parts of 1,1-bis(p-chlorophenyl)2-nitrobutane (Bulane).

d 2-cyclohexyl-4,6-dinitrophenol, dicyclohexylamine salt.

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CASE GS0014

~~ENDOSULFAN~~

(10/19/79)

PM 110 11/21/79

CHEM ~~079487~~

Endosulfan (hexachlorohexahydromethanol)

BRANCH KEB

DISC 40

TOPIC 05050025

GUIDELINE 40 CFR

FORMULATION 12 - EMULSIFIABLE CONCENTRATE (EC OR E)

FICHE/MASTER ID 05008936

CONTENT CAT 01

Clinch, P.G. (1967) The residual contact toxicity to honey bees of insecticides sprayed on the white clover (Trifolium repens L) in the laboratory. New Zealand Journal of Agricultural Research 10(2):289-300.

SUBST. CLASS = S.

DIRECT RVW TIME = 4 Hr. (MH) START-DATE 8/15/80

END DATE 8/18/80

REVIEWED BY: Allen W. Vaughan

TITLE: Entomologist

ORG: KEB/HED

LOC/TEL: Crystal Mall #2 557-0268

SIGNATURE: *Allen W. Vaughan*

DATE: 11/5/80

APPROVED BY:

TITLE:

ORG:

LOC/TEL:

SIGNATURE: *H.T. Caven*

DATE: 7/7/86

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CONCLUSIONS: This study is scientifically sound.

METHODS AND MATERIALS:

A. Test Type - Toxicity to honey bees.

B. Test Species - Honey bee (Apis mellifera)

C. Test Procedures - A spray tower was used to apply test insecticides to clover blossoms. Honey bees were caged on the blossoms for a one hour period at various time intervals following application. Mortality was assessed 24 hours later.

D. Statistical Analysis - Results were corrected for control mortality using Abbott's formula.

REPORTED RESULTS: A spray tower was adapted to enable application of insecticide sprays to clover blossoms. Honey bees were enclosed with the flowers for an hour (3 hours after application) to determine the residual contact toxicity of the spray. Endosulfan 35% EC, applied at a rate equivalent to 0.77 lb a.i./acre, caused no more than 2% mortality in any of the tests. See table for other results.

Data indicated that ^{diazinon} endosulfan was among the ^{most toxic} ~~least~~ of the insecticides tested, at a rate equivalent to ^{1.0} ~~0.77~~ lb a.i./acre.

DISCUSSION:

A. Test Procedure Procedure is sound.

B. Statistical Analysis Abbott's formula only - see above.

C. Discussion/Results This study is scientifically sound.

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TABLE 1. Residual toxicity

Insecticide	Formulation and % active material	Equivalent rate of application per acre (lb active material)	Residual Contact				
			Time between application and exposure (hours)	Percentage mortality* 24 hours after exposure to deposits on white clover flowers			
				Full rate	1/2 rate	1/4 rate	1/8 rate
1. Carbaryl	WP 80% W/W	2.00	18	100	97	97	63
			42	100	100	95	58
✓ 2. Diazinon	WP 40% W/W	1.00	18	100	100	65	43
			42	95	26	13	1
3. Malathion	EC 50% W/V	1.25	18	97	33	9	7
			42	66	3	5	—
4. Malathion	WP 25% W/W	1.25	18	100	99	51	0
			42	100	69	0	0
5. Phentho- ate	EC 50% W/V	1.25	18	100	100	67	25
			42	100	98	5	2
6. DDT	EC 20% W/V	1.00	3	2	3	0	—
7. DDT	WP 50% W/W	1.00	3	100	65	49	49
8. Demeton- O-methyl	EC 25% W/V	0.38	3	0	0	3	—
9. Endosul- fan	EC 35% W/V	0.77	3	0	2	0	—
10. Oxydeme- non-methyl	EC 25% W/V	0.38	3	0	2	0	—
11. Tri- chlorfon	SP 80% W/W	1.20	3	0	0	0	—
Vami- dothion	EC 40% W/V	0.50	3	37	5	0	—

*Corrected for mortality in the controls using the method of Abbott (1925).

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TDMS0030

DATA EVALUATION RECORD

PAGE 1 OF 4

CASE GS0014

~~ENDOSULFAN A - (10/19/79)~~

PM 110 11/21/79

CHEM ~~879401~~

~~Endosulfan (hexachlorocyclohexanemethane)~~

BRANCH EEB DISC 40 TOPIC 05050045

FORMULATION 06 - WETTABLE POWDER (WP OR W)

FICHE/MASTER ID 05009345

CONTENT CAT 01

Croft, B.A.; Nelson, E.E. (1972) Toxicity of apple orchard
pesticides to Michigan populations of Amblyseius fallacis.
Environmental Entomology 1(5):576-579.

SUBST. CLASS = S.

OTHER SUBJECT DESCRIPTORS

PRIM: EFF -10-1004001

SEC: EEB -40-15000045

DIRECT RVW TIME = 3 hrs (MH) START-DATE Aug 20, 1980 END DATE Aug 21, 1980

REVIEWED BY: Allen W. Vaughan

TITLE: Entomologist

ORG: EEB/HED

LOC/TEL: Crystal Mall #1
557-0268

SIGNATURE:

Allen W. Vaughan

DATE: 11/4/80

APPROVED BY:

TITLE:

ORG:

LOC/TEL:

SIGNATURE:

DATE:

507

CONCLUSIONS: This study is scientifically sound.

METHODS AND MATERIALS:

A. Test Type - Toxicity to insect predator

B. Test Species - Predaceous mite, Amblyseius fallacis

C. Test Procedures -

Two methods were used to evaluate pesticide toxicity to the test mites:

- 1) mites were exposed via the standard slide-dip method;
- 2) residue toxicity tests were conducted on apple leaf disks.

D. Statistical Analysis - None reported.

REPORTED RESULTS: When evaluated for toxicity to azinphosmethyl-susceptible and resistant strains of A. fallacis, diazinon was highly toxic at rates equivalent to 1 lb a.i./100 gal. For numerical data on diazinon and other chemicals, see table.

DISCUSSION:

A. Test Procedure Procedure is sound.

B. Statistical Analysis None reported

C. Discussion/Results This study is scientifically sound.

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Toxicity (%) of 23 chemicals to azinphosmethyl susceptible (S) and resistant (R) strains of A. fallacis.

Strain														
Chemical	Formulation	Rate/ 100 gal.	Ricke (S)					Copper-S (R)						
			SD ^a	R ₀ ^b	R ₅ ^b	R ₁₀	R ₁₅	R ₂₀	SD	R ₀	R ₅	R ₁₀	R ₁₅	R ₂₀
Azinphosmethyl	50 WP	0.5 lb	7	20	—	—	—	—	—	—	0	10	—	—
Carbaryl	50 WP	1. lb	100	100	100	100	100	100	100	100	100	100	100	100
Demeton	6 EC	.33 pt.	100	100	4	—	—	—	—	—	100	100	0	—
Demeton	6 EC	.18 pt	99	100	6	—	—	—	—	—	55	93	5	—
Diazinon	50 WP	1 lb	88	100	15	—	—	—	—	—	78	100	7	—
Diazinon	50 WP	.5 lb	38	99	4	—	—	—	—	—	28	99	0	—
Dimethoate	2.67 EC	1.5 pt	100	82	7	—	—	—	—	—	80	38	0	—
Dimethoate	2.67 EC	.75 pt	95	45	—	—	—	—	—	—	22	11	—	—
Endosulfan	50 WP	1. lb	40	58	0	—	—	—	—	—	42	63	0	—
Endosulfan	50 WP	.5 lb	8	12	—	—	—	—	—	—	0	6	—	—
Gardona	75 WP	.67 lb	92	86	95	95	95	95	—	56	89	92	91	85
Gardona	75 WP	.33 lb	91	93	89	91	—	—	—	49	60	34	16	—
Imidan	50 WP	1. lb	0	6	—	—	—	—	—	0	3	—	—	—
Leptophos	3 EC	1. pt	95	96	100	51	—	—	—	75	87	91	14	—
Phthalone	3 EC	1. pt	100	100	100	100	—	—	—	85	100	100	93	—
Phthalone	3 EC	.5 pt	99	100	100	100	—	—	—	89	100	100	100	—
Phosphamidon	8 EC	.25 pt	91	100	41	4	—	—	—	53	83	13	0	—
Phosphamidon	8 EC	.13 pt	56	97	5	—	—	—	—	28	69	0	—	—
Supracide	2 EC	1. pt	99	100	91	73	—	—	—	82	100	67	47	—
Fundal SP	SP	.5 lb	90	88	92	58	45	—	—	100	96	89	49	34
Fundal SP	SP	.25 lb	100	79	4	—	—	—	—	100	92	20	—	—

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Omite	30 WP	1.25 lb	13	0	—	—	—	—	9	0	—	—	—
Oxythioquinox	25 WP	.5 lb	6	84	66	57	47	—	7	88	88	73	72
Oxythioquinox	25 WP	.25 lb	13	71	28	13	—	—	10	67	32	8	—
Plictran	50 WP	.37 lb	18	77 ^c	41 ^c	44 ^c	—	—	22	66 ^c	33 ^c	36 ^c	—
Plictran	50 WP	.13 lb	4	0	—	—	—	—	2	0	—	—	—
Benomyl	50 WP	.37 lb	4	0	—	—	—	—	2	0	—	—	—
Captan	50 WP	2. lb	1	0	—	—	—	—	3	0	—	—	—
Dikar	80 WP	2. lb	2	48	4	—	—	—	2	69	10	—	—
Dodine	65 WP	.5 lb	9	0	—	—	—	—	4	0	—	—	—
Triarimol	25 WP	.13 lb	4	0	—	—	—	—	1	0	—	—	—
Dinocap	25 WP	.5 lb	21	69	0	—	—	—	43	89	2	—	—
Dithianon	75 WP	.5 lb	1	0	—	—	—	—	2	0	—	—	—

^a Mortality as determined by the slide-dip method.

^b Mortality as determined by the residue method at day 0, day 5, etc.

^c Evaluated at 72 hr.

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057801

DIAZINON

TDMS0030

DATA EVALUATION RECORD

MULTIPLE

PAGE 1 OF 4

PM

CASE GS0021

~~XELTHANE~~

CHEM ~~840501~~

~~1,1-Di-(chlorophenyl) 2,2,2-trichloroethanol~~

BRANCH EEB

FORMULATION WP

FICHE/MASTER ID 05004148

Bartlett, B.R. 1964. The toxicity of some pesticide residues to adult Amblyseius hibisci, with a compilation of the effects of pesticides upon Phytoseiid mites. J. Econ. Entomol. 57(4): 559-562.

SUBST. CLASS =

DIRECT RVW TIME = 1/4 Hr.(MH) START-DATE 11/10/80 END DATE 11/10/80

REVIEWED BY: Allen W. Vaughan
TITLE: Entomologist
ORG: EEB/HED
LOC/TEL: Crystal Mall #2/70268

SIGNATURE: *Allen W. Vaughan*

DATE: 2-4-81

APPROVED BY:
TITLE:
ORG:
LOC/TEL:

SIGNATURE:

DATE:

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1. CHEMICAL: Multiple chemicals. See table.
2. FORMULATION: Multiple formulations. See table.
3. CITATION: Bartlett, B.R. 1964. The toxicity of some pesticide residues to adult Amblyseius hibisci, with a compilation of the effects of pesticides upon Phytoseiid mites. J. Econ. Entomol. 57(4):559-563. ID 05004148
4. REVIEWER: Allen W. Vaughan
Entomologist
EEB/HED
5. DATE REVIEWED: December 4, 1979
6. TEST TYPE: Toxicity to predators and parasites in fruit and nut crops.
 - A. Test species: Amblyseius hibisci
7. REPORTED RESULTS:

The relative toxicities of the 62 test pesticides, reported in terms of toxicity ratings, are provided in the table. There was a great deal of variation in the responses of adult A. hibisci to the different pesticides tested.
8. REVIEWER'S CONCLUSIONS:

This study is scientifically sound.

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Material	Formulation	Doseage lb actual/100 gal	Doseage lb un/100	Rating to A. kill 100
Alidin	40% W.P.	0.50	6.44	L-M
Armito	15% W.P.	.45	5.79	0
Alidin	7.5 lbs. Tech./gal.	.50	6.44	N
ACC	100% W.P.	.2✓	3.57	N
Ardeux mixture	10-10-50 2 pkg.	40.0	514.00	0-L
Calcium arsenate	70% Ca ₃ (AsO ₄) ₂	3.0	38.02	N
Capten	50% W.P.	1.0	12.87	0
Carbaryl	50% W.P.	0.50	6.44	N
Carbophenothion	25% W.P.	.25	3.22	N
Chlorane	40% W.P.	1.0	12.87	N-M
Chlorobenzilate	25% W.P.	0.25	3.22	L
Chlorthion	25% W.P.	.50	6.44	N
Cryolite (natural)	95%	2.85	36.60	0-L
DIT	50% W.P.	1.0	12.87	N-M
Dithiopyrene	50% W.P.	0.75+1.5 gal.	9.65+her.	N
Emeton	2 lbs./gal. E.C.	.25	3.22	N-M
Maxinon✓	25% W.P.	.50	6.44	N
Meldrin	50% W.P.	.50	6.44	N
Milan	25% W.P.	1.0	12.87	N-M
Mimethate	4 lbs./gal. E.C.	0.50	6.44	N
Mimocap	25% W.P.	.25	3.22	L-M
Mimethion	25% W.P.	.25	3.22	N-M
M-111	20% W.P.	.20	3.57	L
Indosulfan	25% W.P.	.50	6.44	N
Merlin	50% W.P.	.50	6.44	N
Mthion	25% W.P.	.50	6.44	N
Methion	4 lbs./gal. E.C.	.50	6.44	N
Merban	67% W.P.	1.34	17.24	0
Merite 923	50% E.C.	1.0	12.87	L-M
Methion	25% W.P.	0.50	6.44	N
Myptachlor	25% W.P.	.50	6.44	N
Malthane	18.5% W.P.	.50	6.44	N
and arsenate (acid)	32% As ₂ O ₃	3.0	38.62	0-L
Amo-sulphur soln.	2% Bismut	5.0 gals.	536.48	N
Indane	25% W.P.	0.25✓	3.22	N
Malathion	25% W.P.	0.50	6.44	N
Malathion+oil	25% W.P.+L-M. oil	.25+1.67 gal.	3.22+oil	N
Methoxychlor	50% W.P.	1.0	12.87	0-L
oxyphos	4 lbs./gal.E.	.25	3.22	N
aled	8 lbs./gal.E.C.	.50	6.44	N
Acetron	40% W.P.	.60	7.70	L-M
Miscible sulphate soln.	40% Cal. caseinate	.75 pt.	10.06	0
ML, light-medium	92% UR.E.	1.67 gals.	157.12	0
Merx	50% W.P.	0.75	9.66	L-M
Merthion	25% W.P.	.50	6.44	N
Merthion+oil	25% W.P.+L-M. oil	.25+1.67 gal.	3.22+oil	N
Merthane	25% W.P.	.50	6.44	0
Merphamidon	4 lbs./gal.E.	.25	3.22	N
Merone	6.4% from gr. root	.256	3.30	N
Merina	100% gr. stems	4.0	51.48	0
Meradilla+sugar	2.25% alkaloids W.P.	0.068 alk.+5.0 sugar	0.87 alk.	N
Merredan	4 lbs./gal.E.C.	.25	3.22	N-M
Mulphomons	50% W.P.	1.50	20.31	N-M
Mulphur	325 mesh W.P.	3.0	38.62	N-M
Mutar emetic+sugar	Tech.	2.0+2.0 sugar	25.74	N
ME	50% W.P.	1.0	12.87	N
Mpp	20% E.	0.25	3.22	0-L
Mutridifen	25% W.P.	.37	4.75	0
Muphene	40% W.P.	2.0	25.74	N
Trichlorfon	50% Sol.P.	.50	6.44	N
Mineb	75% W.P.	1.3	16.73	0-L
Acetron	25% W.P.	.50	6.44	N

* Toxicity designated as high (H) if LT₅₀ <1 day; medium (M) if LT₅₀ >1 day and <4 days; low (L) if LT₅₀ >4 days; and none (0) if no kill within 4 days.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
ONE GATEWAY CENTER, SUITE 700
NEWTON CORNER, MASSACHUSETTS 02158

JAN 17 1986



Mr. Michael Slimak, Chief
Ecological Effects Branch
Hazard Evaluation Division
U. S. Environmental Protection Agency
Washington, DC 20460

Dear Mr. Slimak:

This responds to your October 4, 1985, request for formal Section 7 consultation on the registration of products containing diazinon for use on golf courses and sod farms. We received your request on October 11, 1985. During the course of the consultation, we contacted: our regional offices in Albuquerque, NM, Atlanta, GA, Denver, CO, Anchorage, AK, Portland, OR, and Twin Cities, MN, for information on species which might be impacted by its application; and, Arnold Julin, Regional Contaminant Specialist for information on effects of diazinon on fish and wildlife. We also contacted Margaret Rostker, wildlife biologist, EPA to advise that the opinion would be completed during the week of January 13.

Proposed Action

This Biological Opinion considers possible impacts of products containing diazinon registered for use on golf courses and sod farms. In preparing this Opinion, we have made the following assumptions:

1. The total area of use for the product will be relatively small.
2. Data on toxicity of diazinon to amphibians and reptiles is scant or non-existent
3. Diazinon does not bio-accumulate in animal tissue

Effects on Listed Species:

Birds are the class of vertebrates most seriously affected by the pesticide diazinon. Most reported incidents of wildlife mortality have involved various bird species, particularly waterfowl. However, we believe that wild fish can also be seriously impacted by diazinon in circumstances where applications are made adjacent to water having a nearly neutral pH.

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Impacts presented in this opinion fall into two categories (1) "is likely to jeopardize" and (2) "may affect, but will not jeopardize." "Jeopardy" means we believe that use of the material threatens the species' existence. "May affect, no jeopardy" means that some individuals may be killed, but the species' survival is not at stake. For "jeopardy" findings, we have indicated reasonable and prudent alternatives to preclude jeopardy. In the case of "may affect" findings, we have provided conservation recommendations to minimize impact to each species.

Jeopardized Species

It is my Biological Opinion that the following species are likely to be jeopardized by use of diazinon:

1. MOHAVE TUI CHUB (Gila bicolor mohavenis)

Species Status

The Mohave tui chub is currently found in two widely scattered locations. Within its historic range, the chub occupies a natural spring and an artificial pond, Lake Tuende, at Soda Dry Lake at the downstream terminus of the Mohave River, San Bernardino County, California. The natural spring contains a fairly small but healthy population of chubs. Lake Tuende does not at this time provide ideal chub habitat and is supporting a small number of chub of reproductive size. Until habitat conditions in the pond are improved by dredging, the population structure of the fish is not expected to change for the better. The Mohave tui chub also occurs in G-1 and Lark Seeps and a connecting channel on the China Lake Naval Weapons Center (CLNWC) in northwestern San Bernardino County.

The Mohave tui chub is federally listed as an endangered species. The recovery plan for this species specifies that six populations of 500 or more individuals must be viable for a minimum of five years before the fish can be downgraded to threatened status. Complete delisting could occur when the chub is reestablished within the Mohave River proper. The two populations previously mentioned will be supplemented by two additional populations in artificial ponds along the Mohave River within the next year. Sites for further reintroductions are not presently available. Although the Mohave tui chub was introduced into the China Lake seeps, the population is considered stable and very healthy. Chub from China Lake will most likely be used in any reintroductions conducted in the foreseeable future.

Impacts of Diazinon Registration

The seeps and channel containing Mohave tui chub at CLNWC are located approximately 1.8 miles north of the base's golf course. The golf course lies at an elevation of approximately 2,220 feet, while chub habitat occurs between approximately 2,160 to 2,200 feet; therefore, drainage is in the direction of the seeps and connecting channel. Golf course runoff may constitute a present source of water at the seeps (Feldmeth pers. comm.). Additional surface flows from the course into chub habitat could easily occur during storms.

Available information indicates that diazinon could be transported from the golf course to the seep area following periods of rainfall. Data provided by the Environmental Protection Agency (EPA) indicate that sufficient diazinon could persist to harm the chub either indirectly or directly. Indirect effects could include elimination of invertebrate prey species. The LC50 of diazinon for Mohave tui chub is unknown; however, since rainbow trout exhibit a 96-h LC50 of 90 mg/L, it can be assumed that diazinon would also have deleterious effects on chubs (Johnson and Finley 1980). Using a worst case scenario, a flash flood, which periodically occurs in the Mohave Desert, could transport very large quantities of diazinon to the seeps if such an event occurred soon after the application of the pesticide to the golf course.

The subject registration will appreciably reduce the likelihood for survival and recovery of the chub by directly or indirectly reducing numbers in the largest and healthiest population, which is presently designated to provide stock for all future reintroductions.

Reasonable and Prudent Alternatives

The EPA shall contact in writing the Commander of China Lake Naval Weapons Center, (U. S. Navy, Environmental Branch, Code 26309, China Lake, CA 93585) and reaffirm the following information with that office: the federally endangered Mohave tui chub inhabits Lark and G-1 Seeps and a connecting channel at CLNWC; chub habitat at CLNWC is subject to runoff of surface waters from the base's golf course; and the pesticide, diazinon, is highly toxic to aquatic life. To ensure that the registration of diazinon will not jeopardize the continued existence of the Mohave tui chub, it must be resolved that diazinon will not be applied in any form to the vegetation in and around the CLNWC's golf course or other terrestrial habitat where the potential for runoff into Mohave tui chub habitat exists.

A copy of this letter should be sent to the Fish and Wildlife Service's Endangered Species Offices in Laguna Niguel and Sacramento, California.

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(2) HAWAIIAN GOOSE (Neoschen (= Branta) sandvicensis)

Species Status

Now living on the high mountain slopes and lava flows on the islands of Maui and Hawaii, this endemic bird was formerly found in much larger numbers and at lower elevations on those, and possibly other, islands of the state of Hawaii. Due to predation, destruction of habitat, and over-hunting, by 1900 the Hawaiian goose (also known as the nene) had decreased to only a small population on the island of Hawaii. Through a captive breeding and rearing program in conjunction with prohibitions on hunting and with some protection from predators, nene have in recent years been released on the islands of Hawaii and Maui to increase the wild populations.

The current population is estimated to be between 400 and 600 birds. This increase is largely due to the continual supplementation of the wild flocks by captive reared birds. Studies indicate that the poor natural recruitment of wild birds may be the result of multiple limiting factors such as poor nutrition, predation of eggs and young by mongoose and other predators, and possibly other negative pressures.

Impacts of Diazinon Registration

One of the primary recovery actions approved for the nene involves the captive propagation and release of birds at the Hawaii Volcanoes National Park (HVNP) on the island of Hawaii. The Hawaiian goose may be affected by the use of diazinon for golf courses in that the bird feeds on the grass of a golf course directly adjacent to both the HVNP and one of the nene propagation and release facilities.

Reasonable and Prudent Alternatives

The use of diazinon on this or any other golf course which provides habitat for the Hawaiian goose should not be permitted.

Adversely Impacted Species

In addition to the two species jeopardized by registration of diazinon for use on golf courses and sod farms, we believe the following species would be adversely impacted by use of the material:

1. BROWN PELICAN (Pelecanus occidentalis)

This species is still designated as endangered in the Caribbean. Juvenile pelicans use several golf courses in Puerto Rico as loafing and feeding grounds. They could be impacted through direct contact with the diazinon products.

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Conservation Recommendation - Do not register diazinon for golf courses in Puerto Rico.

2. ALABAMA BEACH MOUSE (Peromyscus polionotus ammobates)

Golf course construction is proposed within critical habitat for this species in Baldwin County, Alabama. In 1982, there were an estimated 875 mice on 332.6 acres. (See map of habitat). If the golf course is constructed, the impact will change from "may affect" to "jeopardy."

Conservation Recommendation - Do not use diazinon in the species range.

3. SAN FRANCISCO GARTER SNAKE (Thamnophis sirtalis tetrataenia)

Species Status

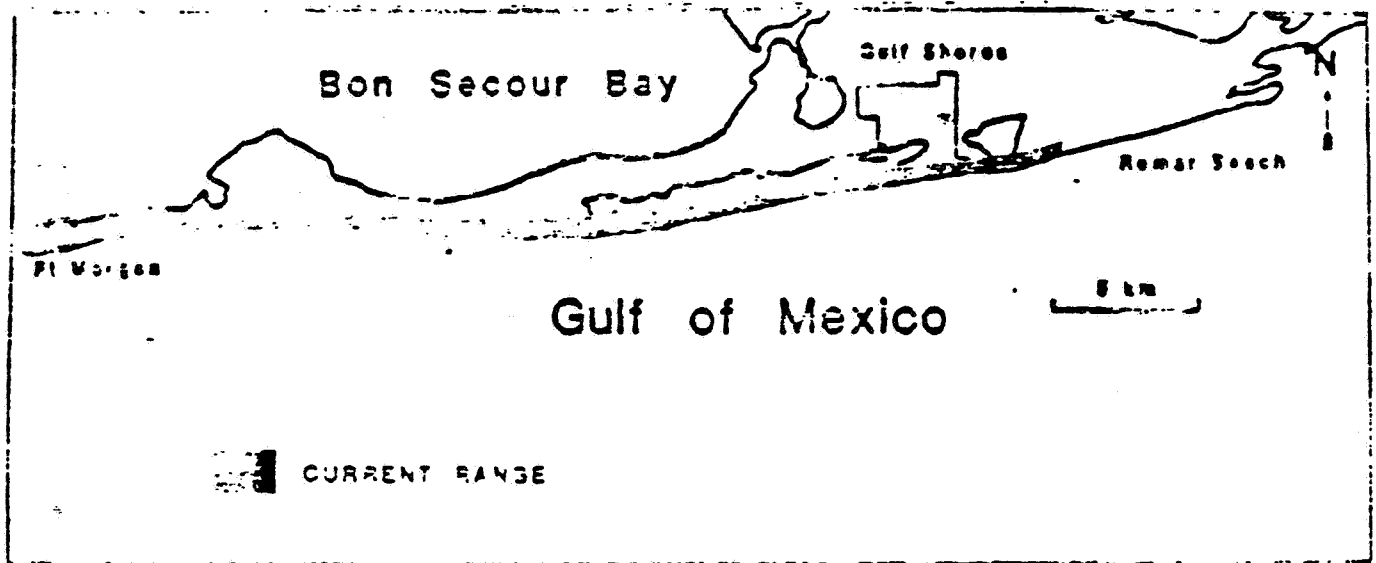
The San Francisco garter snake (SFGS) is restricted to the San Francisco Peninsula, in San Mateo County, California. It is closely associated with wetland vegetation consisting of cattails (Typha sp.), bulrush (Scirpus sp.) and reeds (Juncus sp.) which border ponds, reservoirs, and slow-moving streams. Food consists of invertebrates, fish, amphibians, and possibly small mammals. The taxon is endangered principally due to development related loss of habitat. Illegal collecting of snakes is also a significant threat. The bright, sharply contrasting color pattern of this subspecies makes it particularly sought after by collectors.

Prior inventories of favorable habitats (Barry 1978; McGinnis 1984a, 1984b, 1984c) have documented its occurrence at several distinct localities ranging from San Bruno Mountain (north) to the vicinity of Ano Nuevo Point (south). Known SFGS population sites include Ano Nuevo State Reserve, Pescadero Marsh Natural Preserve, San Francisco State Fish and Game Refuge (i.e., Lower and Upper Crystal Springs Reservoirs), Sharp Park Golf Course (i.e., Laguna Salada), Cascade Ranch, and Milbrae (i.e., San Francisco Airport). All of these localities are in San Mateo County, California.

The SFGS has been documented at Laguna Salada, a cattail-lined pond at the Sharp Park Golf Course. Barry (1978) reported observing a total of two snakes here, in 350 man-hours of search effort. He attributed the seemingly low abundance of the population to heavy human use (i.e., golfers) around extant habitat, and probably heavy collecting pressure. A subsequent investigation of this site during the fall of 1984 (McGinnis 1984a), expending 870 trap-days of effort, failed to locate additional specimens. On a scale of 1 (poor) to 12 (excellent), this site was rated "8" in terms of habitat components favorable for the SFGS (McGinnis 1984a).

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RANGE MAP
ALABAMA BEACH MOUSE



2/85

Impacts of Diazinon Registration

No information is available on the direct effects of diazinon on reptiles or amphibians. Based on available information, we estimate that the SFGS population present at Laguna Salada may be adversely affected indirectly from lowered prey base populations. McGinnis (1984a), when assessing prey populations at this site, noted the occurrence of fish and Pacific treefrogs (Hyla regilla). Diazinon is utilized for control of turf invertebrate pest species. We project that dramatic reductions in these species may result in adverse effects to the SFGS population by: (1) lowering invertebrate populations which may be directly utilized by juvenile and adult snakes; and (2) reducing the prey base for toads and frogs which are preyed upon heavily by adult snakes.

Conservation Recommendations

A 100-foot-wide buffer zone prohibiting diazinon throughout the year be placed around the Laguna Salada pond at Sharp Park Golf Course to reduce potential mortality to SFGS prey base populations or direct adverse effects to individual snakes.

Application of diazinon at the entire Sharp Park Golf Course should be curtailed between 15 March and 30 September, which corresponds to the period of seasonal activity of the SFGS.

4. OREGON SILVERSPOT BUTTERFLY (Speyeria zerene hippolyta)

This threatened butterfly may be impacted by the use of diazinon on golf courses in Clatsop County, Oregon. This species and its preferred host plant, Viola adunca, occur in open coastal grassland and meadow communities. In Clatsop County, Oregon, golf courses occur near or adjacent to one known population of butterflies and their habitat. While we do not believe the application of diazinon would jeopardize the species, application of diazinon on golf courses in Clatsop County could eliminate this one population of butterflies and hamper recovery actions at this location.

Conservation Recommendation

To safeguard this population of Oregon silverspot butterflies, application of diazinon should not be used on golf courses in Clatsop County, Oregon (T7N R10W).

5. JUNE SUCKER, (Chasmistes liorus)

The June sucker, a species proposed for endangered status, occurs in Provo Bay, Utah. Runoff from the Provo City

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Municipal Golf Course entering Provo Bay could impact this species. Final designation as endangered is anticipated this year.

Conservation Recommendation - Do not use diazinon on this golf course.

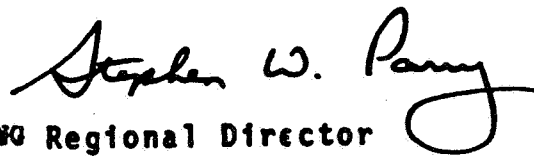
This concludes the list of species which might be jeopardized or affected by the proposed registration action. Only one of the three species referred to in your letter was found to be impacted. That species, the San Francisco garter snake would be affected but not jeopardized.

It is the responsibility of the Fish and Wildlife Service to advise EPA on new species listings, and it is the responsibility of EPA to insure that the use of diazinon is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat.

The Endangered Species Act does not require formal consultations on proposed species, however, Section 7 (a) (4) does require that a Federal agency "confer" with the Fish and Wildlife Service on any agency action likely to jeopardize the continued existence of any proposed species. As noted above, we identified the June sucker, indicated the potential impact and provided a conservation recommendation.

Any questions on this opinion should be directed to Paul Nickerson at 617-965-5100, extension 316.

Sincerely yours,



ACTING Regional Director