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

28 MAR 1988

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

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

FROM: Allen W. Vaughan, Entomologist
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C)
Allen W. Vaughan 3.17.88

THRU: Otto Gutenson, Acting Head - Section 4
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C)
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."

295

9

(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)

296

NEW MEXICO	
Chihuahua chub	Grant
Gila trout	Catron and Grant
New Mexican ridge-nosed rattlesnake	Hidalgo
Pecos bluntnose shiner	Chaves, DeBaca and Eddy
Pecos Gambusia	Chaves, Eddy
Socorro isopod	Socorro
NORTH CAROLINA	
Freshwater mollusks	Edgecombe, Nash and Pitt
Spotfin chub	Macon and Swain
NORTH DAKOTA	
Interior least tern	Burleigh, Emmons, McKenzie, 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	
Freshwater mollusks	Williams and Washington
Scioto Madtom	Pickaway
OKLAHOMA	
Leopard darter	Pushmataha and McCurtain
Ozark cavefish	Delaware
OREGON	
Borax lake chub	Harney
Foskett speckled dace	Lake
Hutton tui chub	Lake
Warner sucker	Lake
SOUTH DAKOTA	
Interior least tern	Clay, Haakon, Hughs, Potter, Stanley, Sully, Union, Walworth, Yankton and Ziebach
Piping plover	Clay, Hughs, Potter, Stanley, Sully, Union, Walworth and Yankton
TENNESSEE	
Amber darter	Bradley and Polk
Conasauga logperch	Bradley and Polk
Freshwater mollusks	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
Slackwater darter	Lawrence and Wayne

TENNESSEE	
Slender chub	Claiborne and Hancock
Snail darter	Blount, Bradley, Hamilton, Knox, Loudon, Marion, Meigs and Polk
Spotfin chub	Cumberland, Hawkins, Morgan and Sullivan
Yellowfin madtom	Claiborne, Hancock and Monroe
TEXAS	
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	
Colorado squawfish	Carbon, Emery, Garfield, Grand, San Juan, Uintah and Wayne
Bonytail chub	
Humpback chub	
Desert tortoise	Washington
June sucker	Utah
Woundfin	Washington
VIRGINIA	
Slender chub	Lee and Scott
Spotfin chub	Scott and Washington
Yellowfin madtom	Lee, Russell and Scott
Freshwater mollusks	Lee, Russell, Scott, Smyth, Tazewell, Washington and Wise
WISCONSIN	
Freshwater mollusks	Crawford, Grant, Iowa, Pierce, Polk, Richland, St. Croix and Vernon
WYOMING	
Kendall Warm Springs dace	Sublette
Wyoming toad	Albany
Whooping crane	Lincoln and Sublette

Paiute cutthroat trout	Alpine, Madera and Mono
Santa Cruz long-toed salamander	Monterey and Santa Cruz
Unarmored threespine stickleback	Los Angeles, San Bernardino and Santa Barbara
Valley elderberry longhorn beetle	Butte, Colusa, Glenn, Merced, Sacramento, Sutter, Tehema and Yolo
COLORADO	
Colorado squawfish	Delta, Mesa, Moffat and Rio Blanco
Bonytail chub	Mesa and Moffat
Humpback chub	Mesa and Moffat
Greenback cutthroat trout	Boulder, Larimer and Park
FLORIDA	
Eastern indigo snake	Statewide
Florida grasshopper sparrow	Glades, Highlands, Osceola, Okeechobee and Polk
Okaloosa darter	Okaloosa and Walton
GEORGIA	
Amber darter	Cherokee, Murray and Whitfield
Conasauga logperch	Murray and Whitfield
Eastern indigo snake	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
Snail darter	Catoosa
HAWAII	
Hawaiian goose	Islands of Maui, Hawaii and Kauai
IDAHO	
Whooping crane	Caribou, Bear Lake and Bonneville
ILLINOIS	
Freshwater mollusks	Gallatin, Henderson, Jo Daviess, Massac, Mercer, Pike, Pulaski, Rock Island and White
INDIANA	
Freshwater mollusks	Dekalb and Posey
IOWA	
Freshwater mollusks	Allamakee, Clayton, Clinton, Des Moines, Dubuque, Fayette, Jackson, Louisa, Muscatine and Scott

KANSAS	
Interior least tern	Clark, Comanche, Meade and Stafford
Piping plover	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	Claiborne, Copiah and Hinds,
Freshwater mollusks	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
Niangua darter	Benton, Camden, Dallas, Greene, Hickory, Miller, Osage, Polk, St. Clair and Webster
Ozark cavefish	Barry, Christian, Greene, Jasper, Lawrence, Newton and Stone
MONTANA	
Piping plover	Garfield, McCone, Sheridan and Valley
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	Nye
Ash Meadows speckled dace	Nye
Cui-ui	Washoe
Devils hole pupfish	Nye
Pahranagat bonytail	Lincoln
Pahrump killifish	Clark and White Pine
Warm springs pupfish	Nye
Woundfin	Clark

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

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 NOXUBEE

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

287

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	MCCURTAIN AND PUSHMATAHA
Ozark cavefish	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 LC_{50} data indicate that diazinon is more toxic to the mallard than previous data had indicated. As noted above, the mallard LC_{50} was found to be <47 ppm. All birds died at the lowest test level. A new study is required, to determine a definitive LC_{50}.

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.

285

4

ENDANGERED SPECIES LABELING FOR CROP[1] 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).

886

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	Lauderdale
Freshwater mollusks	Colbert, Greene, Jackson, Lamar, Lauderdale, Limestone, Madison, Marshall, Morgan and Sumter
Snail darter	Jackson, Madison and Marshall
Slackwater darter	Lauderdale, Limestone and Madison
Stirrup shell	Greene, Lamar, Pickens and Sumter
Watercress darter	Jefferson
ARIZONA	
Arizona (Apache) trout	Apache, Graham and Greenlee
Bonytail chub	Mohave
Gila topminnow	Graham, Maricopa, Pima, Pinal and Santa Cruz
Masked Bobwhite	Pima
Woundfin	Mohave
Gila trout	Yavapai
ARKANSAS	
Freshwater mollusks	Clark, Clay, Cross, Lawrence, Lee, Poinsette, Randolph, Sharp and St. Francis
Ozark cavefish	Benton
Leopard darter	Polk
CALIFORNIA	
Aleutian Canada goose	Colusa, Merced, Stanislaus and Sutter
Blunt-nosed leopard lizard	Kern, Kings, Fresno, Madera, Merced, San Luis Obispo, Santa Barbara, Stanislaus and Tulare
California condor	Fresno, Kern, Kings, Los Angeles, Monterey, San Luis Obispo, Santa Barbara, Tulare and Ventura
Delta green ground beetle	Solano
Desert pupfish	Imperial and Riverside
Inyo Brown Towhee	Inyo
Kern Primrose sphinx moth	Kern
Least Bell's Vireo	Inyo, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura
Little Kern golden trout	Tulare
Modoc sucker	Modoc
Owens River pupfish	Inyo and Mono
Owens tui chub	Mono

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)

H.T. Craven

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

277

10

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 LD_{50} values ranging from 3.2 mg/kg for Red-winged Blackbirds (Hudson et al.,1984, HC0STA01) to 10 mg/kg for Bobwhite Quail (Hill and Camardese, 1983, RO0DI002). Avian dietary toxicity data indicate diazinon is "highly toxic" for species tested, with LC_{50} values ranging from 167 ppm for Japanese Quail (Hill and Camardese, 1986, RO0DI003) 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 LC_{50} 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 LC_{50} 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, RO0DI008) 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 (LD_{50}=1.8 mg/kg for Red-winged Blackbirds; Balcomb et al., 1984, RO0DI0001). Microencapsulated diazinon (23% ai) is "highly toxic", on an acute oral basis, to Bobwhite Quail (LD_{50}=108.5 mg/kg, Pennwalt, 1979, RO0DI004). Microencapsulated 23% ai diazinon is also "highly toxic" to birds on a dietary basis (LC_{50}=345 ppm for Bobwhite Quail; Pennwalt, 1979, RO0DI004). Data indicate AG500 (48% ai EC) is "highly toxic" to Japanese Quail tested in dietary studies (LC_{50}=101 ppm, Hill and Camardese, 1986, RO0DI003). The 53% ai wettable powder is also "highly toxic" to Bobwhite Quail on a dietary basis (LC_{50}=140 ppm, Woodard Research Corp., 1964, 00104923).

Microencapsulated diazinon (23% ai) is "very highly toxic" to freshwater invertebrates (LC_{50}=.522 ppb for Daphnia magna; Agchem, 1982, 00121283) and to fish (LC_{50}=512 ppb for Bluegill Sunfish; Calmbacher, 1978,ROODI009).

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 (PQUA, 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)(PQUA, 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, ROODI006) 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 occured 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 (LC_{50}) 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 occured. In a few instances diazinon residues were found in the fish samples analysed. The reported kills include loss of 1,150 fish in

30

12

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 LC_{50} measured in avian test animals when diazinon is applied to grass and agricultural crops:

Mallard Duck LC_{50} = 191 ppm Bobwhite Quail LC_{50} = 245 ppm

Diazinon Residues

GRASS: Average residue per 1 lb application (RUD) = 53 ppm (Wildlife International, 1986, RO0DI006). 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, RO0DI001) and 5 granules of 14.3% ai killed 100% of test Red-winged Blackbirds (Balcomb et al, 1984, RO0DI001).

Inasmuch as only a few granules are required to kill birds, residues in terms of number of granules will exceed 1/5 the LC_{50} 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.

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 (coton)
San Marcos salamander (cotton)
Scioto madtom (corn and soybeans)
Slackwater darter (corn, soybeans and cotton)

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
Pahranagat 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.

35

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, parsely, 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.

[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	
Bonytail chub	MOHAVE	
Gila topminnow	GRAHAM	PINAL
	MARICOPA	SANTA CRUZ
	PIMA	
ARKANSAS (Atlanta,GA.)	CLAY	RANDOLPH
Freshwater mussels	CLARK	SHARP
	CROSS	ST. FRANCIS
	LAWRENCE	
Ozark cavefish	BENTON	
Leopard darter	POLK	

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

STATE (Regional office FWS) Species	COUNTY	
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	MARION
	DOUGLAS	UMATILLA
	HOOD RIVER	WASCO
	JACKSON	
TENNESSEE (Atlanta, GA.)	LAWRENCE	
Slackwater darter	WAYNE	
Slender chub	CLAIBORNE	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	CARBON	KANE
	DUCHESNE	SAN JUAN
	EMERY	UINTAH
	GARFIELD	WAYNE
	GRAND	

STATE (Regional office FWS) Species	COUNTY	
VIRGINIA (Newton Corners, MA.)		
Spotfin chub	SCOTT	WASHINGTON
Freshwater mussels	LEE RUSSELL SCOTT SMYTH	TAZEWELL WASHINGTON WISE
Yellowfin madtom	LEE RUSSELL	SCOTT
WASHINGTON (Portland, OR.)		
American peregrine falcon	SKAMANIA	
WISCONSON (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	Lauderdale
Slackwater darter	Lauderdale, Limestone and Madison
Snail darter	Jackson and Madison
Watercress darter	Jefferson
Freshwater mussels	Colbert, Jackson, Marshall and Morgan and Monroe
ARIZONA (Albuquerque, N.M./San Francisco, CA.)	
Arizona (Apache) trout	Apache, Graham and Greenlee
Bonytail chub	Mohave
Woundfin	Mohave
Gila and Yaqui topminnow	Graham, Maricopa, Pima, Pinal and Santa Cruz
Masked Bobwhite	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	County (unless specified otherwise)
CALIFORNIA (continued) Paiute cutthroat trout	Alpine, Madera and Mono
Little Kern golden trout	Tulare
Santa Cruz long-toed salamander	Monterey and Santa Cruz
Delta green ground beetle	Solano
Valley elderberry longhorn beetle	Merced
Kern Primrose sphinx moth	Kern
COLORADO (Denver, CO.) Greenback cutthroat trout	Boulder, Larimer, Gilpin, Park and Fremont
Colorado squawfish Bonytail chub Humpback chub	Blanco, Delta, Garfield, Mesa, Moffat Rio and Routt
FLORIDA (Atlanta, GA.) Okaloosa darter	Okaloosa and Walton
Eastern indigo snake	Statewide
GEORGIA (Atlanta, GA.) Snail darter	Catoosa
Eastern indigo snake	S.E. Georgia
HAWAII (Portland, OR.) Hawaiian goose	Islands of Maui and Hawaii
IDAHO (Portland, OR.) Whooping crane	Caribou, Bear Lake and Bonneville
KENTUCKY (Atlanta, GA.) Freshwater mussels	Ballard, Edmundson, Jackson, Laurel, Marshall, McCracken, Pulaski, Rockast. Warren and Wayne
MARYLAND (Newton Corners, MA./Philadelphia, PA.) Maryland darter	Harford
MISSISSIPPI (Atlanta, GA.) Bayou darter	Claiborne and Copiah
Mississippi sandhill crane	Jackson

314

STATE (Regional Office FWS) Species	County (unless specified otherwise)
NEVADA (Portland, OR./San Francisco, CA.)	
Ash Meadows speckled dace	Nye
Ash Meadows Amargosa pupfish	Nye
Cui-ui	Washoe
Devils hole pupfish	Nye
Pahranagat bonytail	Lincoln
Pahrump killifish	Clark and White Pine
Warm springs pupfish	Nye
Woundfin	Clark
NEW MEXICO (Albuquerque, N.M./Dallas, TX.)	
Chihuahua chub	Grant
Gila trout	Catron and Grant
New Mexican ridge-nosed rattlesnake	Hidalgo
Pecos Gambusia	Chaves, Eddy
Socorro isopod	Socorro
NORTH CAROLINA (Atlanta, GA.)	
Spotfin chub	Macon and Swain
OHIO (Twin Cities, MN./Chicago, IL.)	
Scioto Madtom	Champagne, Franklin, Logan, Madison, Pickaway and Union
OKLAHOMA (Albuquerque, N.M./Dallas, TX.)	
Leopard darter	Pushmataha and McCurtain
OREGON (Portland, OR./Seattle, WA.)	
Borax lake chub	Harney

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, Pentress 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

316

STATE (Regional Office FWS) Species	County (unless specified otherwise)
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, Wasnington 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.

317

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

Species	% ai	LD_{50} (mg/kg)	Author	Date	Fiche ID No.	Fulfills Requirement
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	RO0DI002	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:

Species	% ai	LC_{50} (ppm)	Author	Date	Fiche ID No.	Fulfills Requirement
Japanese Quail	99	167	Hill & Camardese	1986	RO0DI003	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.

320

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:

Species	%ai	Formulation	Author	Date	Fiche ID No	Results	Fulfills Requirement
Bobwhite Quail	48	AG500	Stromborg	1981	RO0DI010	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 daily food intake equals reprod. effect. NOEL=1.05-2.1 mg/day	No

Thess 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 [redacted] Under 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 LD_{50}=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:

Species	% ai	Formulation	LD_{50} (mg.ai/kg)	Author	Date	Fiche ID No.	Requirement
Bobwhite Quail	14	Granular	8(6-11)	Hill & Camardese	1983	RO0DI002	Yes[1/]
Bobwhite Quail	23	Microen-capsulated	108.5	Pennwalt	1979	RO0DI004	Yes[1/]
House Sparrow	14	Granular	2.5	Balcomb et al.	1984	RO0DI001	Yes[1/]
Redwinged Blackbird	14	Granular	1.8	Balcomb et al.	1984	RO0DI001	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 LD_{50} may be tested instead of mg ai/kg.

The following dietary studies were evaluated:

Species	% ai	Formulation	LC_{50} (ai;ppm) (95% CI)	Author	Date	Fiche ID No.	Fulfills Requireme
Bobwhite Quail	23	microencap-sulated	345	Pennwalt	1979	RO0DI004	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	RO0DI004	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	RO0DI003	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%

322

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:

Species	% ai	Formulation	No. Granules= % Mortality	Author	Date	Fiche ID No.	Fulfills Requirement
House Sparrow	14	Granular	1 = 40; 5-10 = 80	Balcomb et al.	1984	RO0DI001	No 1/
Redwinged Blackbird	14	Granular	5 = 100	Balcomb et al.	1984	RO0DI001	No 1/

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:

Species	Conditions	Results	Author	Date	Fiche ID No.	Fulfill Require
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

323

21

Bobwhite Quail	Pen with 23%ai microen-capsulated	no effects	Pennwalt	1979	RO0DI004	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	RO0DI005	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	RO0DI006	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	RO0DI005	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.

324

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 LD_{50} is $\leq$ 100 mg/kg, the lowest avian dietary LC_{50} 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 LD_{50} information

325

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 LD_{50}=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 requires 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 LD_{50} 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.

Author	Date	MRID No.
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 LC_{50} study using technical diazinon.

324

The acceptable studies are listed below:

Species	% ai	LC_{50} and 95% CI (ug/L)	Author	Date	MRID No.	Fulfills Guideline Requirement
Daphnia magna	>89	0.96 (0.83-1.1) NOEL=0.56	Vilkas	1976	00109022	Yes
Daphnia pulex	89	0.8 (0.6-1.1)	Johnson & Finley	1980	00003503	Yes
Gammarus fasciatus	89	0.2 (0.15-0.28)	Johnson & Finley	1980	00003503	Yes
Pteronarcys	89	2.5 (2.0-3.0)	Johnson & Finley	1980	00003503	Yes
Simocephalus	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 LC_{50} 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 CRF 158,145(b) and as detailed under the avian topical review.

The following study using formulated product was evaluated:

Species	% ai	Formulation	LC_{50} (ug/L)	Author	Date	Fiche ID No	Fulfill Require.
Daphnia magna	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 LC_{50} studies of freshwater invertebrates using the 48% ai emulsifiable concentrate and the 14% ai granular formulated products are required for hazard evaluation since the LC_{50} of the technical grade of active ingredient is $\leq$ the maximum measured residue level of 19 ppb reported in runoff water (Ritter et.al., 1974: Core study from EAB/HED).

327

23

An invertebrate life cycle study using D. magna is required as per 40 CFR 158.145 because 1) invertebrate LC_{50} 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 LC_{50} 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.

Author	Date	MRID No.
Johnson & Finley	1980	00003503
Allison & Hermanutz	1977	RODI007
Goodman, et. al.	1979	RODI008
Woodard Research Corp.	1964	00104923
Calmbacher	1978	RODI0009

The minimum data required to establish the acute toxicity of diazinon to freshwater fish are the results from two 96-hour LC_{50} studies using technical material, one using a coldwater species (preferably the rainbow trout), and one using a warmwater species (preferably the bluegill sunfish).

328

The acceptable studies are listed below:

Species	% ai	LC_{50} and 95% CI (ug/L)	Author	Date	Fiche ID No	Fulfills Requirements
Bluegill Sunfish	92	168 (120-220)	Johnson & Finley	1980	00003503	Yes
Bluegill Sunfish	92	460	Allison & Hermanutz	1977	R00DI007	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	R00DI007	No
Flagfish	92	1600	Allison & Hermanutz	1977	R00DI007	No
Brook Trout	92	770	Allison & Hermanutz	1977	R00DI007	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 LC_{50} 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 LC_{50} studies have been conducted

339

24

with formulated material as follows:

Species	Formulation & % ai	LC_{50} and 95% CI (ug/L)	Author	Date	Fiche ID No	Fulfills Guideline Requirement
Bluegill Sunfish	23 (microencapsulated)	512 (392-672)	Calmbacher	1978	RO0DI009	Yes
Rainbow Trout	23 (microencapsulated)	635 (420-960)	Calmbacher	1978	RO0DI009	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 LC_{50} 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 LC_{50} 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.

330

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.

Species	%ai	LC_{50} (ug/L)	Author	Date	Fiche No	Fulfills Requiremen
Sheepshead Minnow	>89	1400	Goodman et. al.	1979	R00DI008	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.

331

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.

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

332

TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON

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)?
145 Wildlife and Aquatic Organisms					
AND MAMMALIAN TESTING					
- Avian Single-Does Oral LD_{50}	TGAI	A,B,C,(E,I)[17], H	Yes[3]	HCOSTA01,ROODI002, 00109015,00020560	No
(SULFOTEPP)	TGAI	A,B,C,(E,I)[17],H	No		Yes[9]
	TEP	A,B,C,H	Partially	ROODI001,ROODI002, ROODI004	Yes[4]
- Avian dietary LC_{50}	TGAI	A,B,C,(E,I)[17,18] H	Yes	00034769	No
(SULFOTEPP)	TGAI	A,B,C,(E,I)[17],H	No		Yes[9]
	TEP	A,B,C,H	Partially	ROODI004,ROODI003,	Yes[5]
- Wild Mammal Toxicity	TGAI	A,B,C,H	No		Yes[6]
(SULFOTEPP)	TGAI	A,B,C,H	No		Yes[9]
	TEP	A,B,C,H	No		Yes[6]
- Avian Reproduction	TGAI	A,B,C,H	No		Yes[7]
- Simulated and Actual Field Testing for Mammals & Birds	TEP	A,B,C,H	No		Yes[8]

TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont)

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)?
TIC ORGANISM TESTING					
- Freshwater Fish LC_{50}	TGAI	A,B,C,(E,I)[17,18] H	Yes	00003503	No
(SULFOTEPP)	TGAI	A,B,C,H	No		Yes[9]
	TEP	A,B,C,H	Partially	R00DI009	Yes[10]
- Acute LC_{50} Aquatic Invertebrates	TGAI	A,B,C,(E,I)[17],H	Yes	00109022,00003503	No
(SULFOTEPP)	TGAI	A,B,C,H	No		Yes[9]
	TEP	A,B,C,H	Partially	00121283	Yes[10]
- Acute LC_{50} Estuarine and Marine Organisms	TGAI	A,B,C	Partially	R00DI008	Yes[11]
	TEP	A,B,C	No		Reserved[12]
- Fish Early Life-Stage and Aquatic Invertebrate Life-Cycle	TGAI	A,B,C	No		Yes[13]
- Fish Life-Cycle	TGAI	A,B,C,H	No		Reserved[14]
- Aquatic Organism Accumulation	TGAI	A,B,C	No		Yes[15]
- Simulated or Actual Field Testing for Aquatic Organisms	TEP	A,B,C,H	No		Yes[16]

TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont)

a 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)?
3.150 Plant Protection					
ET AREA PHYTOTOXICITY					
-1 - Target area Phytotoxicity	TEP	B	No		No
TARGET AREA PHYTOTOXICITY					
TIER I					
-1 - Seed Germination/ Seedling Emergence	TGAI	B	No		Yes
-1 - Vegetative Vigor	TGAI	B	No		Yes
-2 - Aqutic 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/
-2 - Aquatic Field	TGAI	B	No		Reserved 20/

TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont)

FOOTNOTES

/ Composition: TGAI = 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 fulfills the requirement individually, but the combination of all studies does fulfill the requirement.

/ Avian single-dose oral LD_{50} testing with waterfowl and upland gamebird species required with granular products containing 2%,5%, and 10% ai, and with emulsifiable concentrate products containing 3%,12.5%,20%,32%, and 48% ai.

/ Avian dietary LC_{50} testing with waterfowl and upland gamebird species required with emulsifiable concentrate products containing 3%,12.5,20%,and 32%ai. Testing with waterfowl species with 48% 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 5% and 14.3% ai granular products and 3%,20%,32%, and 48% 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.

TABLE A

GENERIC DATA REQUIREMENTS FOR DIAZINON (cont)

Actual field testing with birds is required as per 40 CFR 158.145. With a 48% ai emulsifiable concentrate product, initial crops to be tested are almonds, plums, and alfalfa. With a 14.3% 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.

)/ Acute EC_{50} studies with a freshwater invertebrate and warm and cold water fish species are required. Formulated products to be tested include a 14.3% ai granular product and a 48% 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 1.

/ Reserved pending results of Tier 11.

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 SATISIFIED ___ NOT SATISFIED ___

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

REVIEWED BY: Margaret Rostker
TITLE: Wildlife Biologist
ORG: EEB/HED
LOC/TEL: 557-7600
SIGNATURE: H.T. Craven DATE: 06/13/86 5/5/87

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB/HED
LOC/TEL: 557-1741
SIGNATURE: H.T. Craven DATE: 5/6/87

Summary paper but acceptable for use in a hazard assessment.

339

29

114. Phosphoric acid, dimethyl ester with 3-hydro-*N*-methyl crotonimide (E-) (Azodrin)	3.3[c]	1.9–6.0	1.0	0.56–1 8	23	
115. Phosphoric acid, dimethyl ester with *cis*-3-hydroxy-*N*,*N*-dimethyl crotonamide (Bidrin)	2.7[c]	0.85–8.5	1.6[c]	0.5–5.0	22	
116. Phosphoric acid, dimethyl ester with *N*-hydroxynaphthalimide (Bay 9002)	>100	—	2.4	1.3–4.2	70–75	
117. Phosphoric acid, dimethyl-, methyl thiophenyl ester (GC 6506)	0.56	—	0.56	—	7	
118. Phosphoric acid, dimethyl-, 2,4,5-trichlorophenyl ester (Dowco 101)	>100	—	18	10–32	—	
119. Phosphorodiamidic acid, *N*,*N*-dimethyl phenyl ester (Dowco 169)	75	—	13	5.6–32	—	
120. Phosphorodithioic acid, *S*-[[(*p*-chlorophenyl)thio]methyl] *O*,*O*-diethyl ester (Carbophenothion)	5.6	3.2–10	7 5	—	24	
121. Phosphorodithioic acid, *S*-[[(*p*-chlorophenyl)thio]methyl] *O*,*O*-dimethyl ester (Methyl trithion)	> 78	—	18	5.6–56	200	
122. Phosphorodithioic acid, *O*,*O*-diethyl *S*-[2-(ethylthio)ethyl] ester (Disulfoton)	>32	—	3.2	1.8–5 6	10	
123. Phosphorodithioic acid, *O*,*O*-diethyl *S*-[(ethylthio)methyl] ester (Phorate)	7.5	—	1.0	0.56–1 8	3.7	
124. Phosphorodithioic acid, *O*,*O*-diethyl *S*-9-thiabicyclo[3.3.1]non-6-en-2-yl ester (HRS 1635)	>100	—	75	—	140	
125. Phosphorodithioic acid, *O*,*O*-dimethyl ester, *S* ester with *N*-methyl acetamide (Dimethoate)	32	25–41	6.6	3.6–12	250	
126. Phosphorodithioic acid, *O*,*O*-dimethyl-, *S*-ester with 3-(mercapto-methyl)-1,2,3-benzotriazin-4(3*H*)-one (Guthion)	27	15–48	8.5	—	13	
127. Phosphorodithioic acid, *O*,*O*-dimethyl-, *S*-ester with *N*-(mercapto-methyl)phthalimide (Imidan)	>100	—	18	10–32	216	
128. Phosphorodithioic acid, *O*,*O*,*O*′,*O*′-tetraethyl-, *S*,*S*′-methylene ester (Ethion)	>304	—	45	—	96	
129. Phosphorothioic acid, *O*-2,4-dichlorophenyl *O*,*O*-diethyl ester (VC 13)	80	25–250	14	—	270	
130. Phosphorothioic acid, *O*,*O*-diethyl *O*-[2-(ethylthio)ethyl]ester mixture with *O*,*O*-diethyl *S*-[2-(ethylthio)ethyl] ester (Demeton)	2[b]	—	—	—	1.7–7.5	
131. Phosphorothioic acid, *O*,*O*-diethyl *O*-(2-isopropyl-6-methyl 4-pyrimidinyl) ester (Diazinon)	110	60–200	2.0	—	150–220	
132. Phosphorothioic acid, *O*,*O*-diethyl *O*-[*p*-(methylsulfinyl)phenyl] ester (Bay 25141)	0.56	0.32–1.0	0.24	—	5	

DATA EVALUATION RECORD PAGE 1 OF ___

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 SATISIFIED ___ NOT SATISFIED ___

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

REVIEWED BY: Margaret Rostker
TITLE: Wildlife Biologist
ORG: EEB/HED
LOC/TEL: 557-7562
SIGNATURE: M.T. Craven DATE: 06/13/86 5/4/87

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB/HED
LOC/TEL: 557-1741
SIGNATURE: H.T. Craven DATE: 5/4/87

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

341

30

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 conc.[b]	No. birds/ conc.	Toxicity Statistics LC50[c]	(95% C.L.)	Slope[d]	(S.D.)	RTD[e]	(95% C.L.)
DDT									
Bobwhite	23	5	7	611	(514- 726)	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)
DDVP									
Japanese quail	14	6	10	298	(257- 345)	6.533	(1.369)	5.1	(4.2 - 6.2)
Ring-necked pheasant	10	6	10	568	(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	(0.941)	8.3	(6.0 -12.5)
Demeton									
Bobwhite	14	6	8	596	(472- 768)	4.510	(1.289)	13.3[f]	—
Japanese quail	12	6	10	275	(228- 327)	5.168	(1.314)	5.2	(4.0 - 6.9)
Ring-necked pheasant	10	6	8	665	(572- 773)	7.238	(1.915)	10.2	(8.3 -12.5)
Mallard	10	6	11	398	(488- 733)	2.689	(0.873)	4.3	(3.2 - 5.8)
Diazinon									
Bobwhite	10	4	8	245	(178- 324)	10.771	(3.271)	6.41	(4.29 - 9.48)
Japanese quail	6	5	18	47	(40- 54)	6.962	(1.017)	1.11	(0.91 - 1.33)
Ring-necked pheasant	22	4	8	[illegible]	(177- 322)	6.796	(1.794)	6.01	(4.19 - 9.18)
Mallard	10	5	10	191	(138- 253)	3.687	(1.186)	0.94	(0.63 - 1.33)

CASE: 238 DIAZINON

72-1

CONT-CAT: 01 GUIDELINES: [redacted]

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 SATISIFIED √ NOT SATISFIED ___

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

REVIEWED BY: Margaret Rostker H.T. Craven 5/4/87
TITLE: Ecologist
ORG: EEB/HED
LOC/TEL: 557-7562
SIGNATURE:

APPROVED BY: Harry Craven H.T. Craven 5/4/87
TITLE: Section Head
ORG: EEB/HED
LOC/TEL: 557-1741
SIGNATURE:

Formulation Testing: 50W

Supplemental for Bluegill LC_{50} = 0.136 ppm
Supplemental for Rainbow LC_{50} = 0.40 ppm;
Invalid for unacceptable test species goldfish;
Supplemental for Bobwhite LC_{50} = 140 ppm;
Supplemental for Mallard LC_{50} = 180 ppm

343

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

346

Data Review Number: (ES) VII F-2

Test: 96-Hour Acute LC_{50} (Warmwater Fish)

Species: Bluegill Sunfish

Results: LC_{50} = 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 (± 1 °C). The LC_{50} data derieved during this test provides useful supplemental information for hazard assessment. However, the test must be conducted at the specified temperature (22° ± 1 °C) in order to receive validation as a "core" study.

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 LC_{50} (Coldwater Fish)

Species: Rainbow Trout

Results: LC_{50} = 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 LC_{50} value determined from this test provides useful supplemental information for hazard evaluation. However, this study is not an acceptable 96-hour acute LC_{50} test because:

1. Insufficient number of mortality levels for calculations of LC_{50}.
2. Water temperature not within specified limits.
3. Incomplete information of protocol.

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 LC_{50} (Warmwater Fish)

Species: Goldfish

Results: LC_{50} = 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 LC_{50}.
3. Goldfish is not acceptable test species.

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%

352

Data Review Number: (ES) VII D-1

Test: Avian Dietary LC_{50} (Upland gamebird)

Species: Bobwhite Quail

Results: LC_{50} = 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.

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 E-1

Test: Avian Dietary LC_{50} (Waterfowl)

Species: Mallard

Results: Diazinon 50W: LC_{50} = 180 ppm (135.3 to 239.4 ppm)
Diazinon a.i.*: LC_{50} 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.

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 Carbicde Corp., submitted by Ciba-Geigy Corp., Greensboro, NC; CDL:231800-P).

REVIEW RESULTS:

VALID ✓ INVALID ___ INCOMPLETE ___

GUIDELINE: SATISFIED ✓ PARTIALLY SATISIFIED ___ NOT SATISFIED ___

DIRECT RVW TIME = 30 Minutes START DATE: 06/13/86 END DATE: 06/13/86

REVIEWED BY: 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: H.T. Craven 5/4/87 DATE:

Core study showing Daphnia LC_{50} = 0.83 ppb for technical diazinon.

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.

TDMS DATA EVALUATION RECORD PAGE 1 OF

CASE GS ___ _____ PM ___ ___/___/___

CHEM Diazinon _____

BRANCH EEB DISC ___

FORMULATION Technical, 14G (14.3% ai granular)

FICHE/MASTER ID ~~R00D1002~~ 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 H. T. Craven
ORG: EEB
LOC./TEL: 557-7600
SIGNATURE: 5/4/87

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB
LOC./TEL: 557-7600
SIGNATURE: Henry T. Craven 5/4/87

This study is supplemental due to lack of all raw data and miner deviations from guidelines. It is useful in hazard assessment and shows Diazinon LD_{50} = 10 mg ai/kg to bobwhite Quail when technical material is tested, and Bobwhite LD_{50} = 8 mg ai/kg when granular 14.37% ai (14G) is tested.

359

Data Review Number: (ES) VII H-1

Test: 48-Hour Acute LC_{50} (Aquatic invertebrate)

Species: Daphnia magna

Results: LC_{50} = 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 LC_{50} was calculated from high mortality rates (65% and 95%) recorded at only two concentration levels of the toxicant.

EPA protocol for 48-hour acute LC_{50} 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 LC_{50} value (LC_{50} = 0.96 ppb) reported for this study is questionable. However, there was no mortality of test organisms at 0.56 ppb. Clearly, the true LC_{50} concentration level is between 0.56 ppb and 1.00 ppb.

Because the median LC_{50} value for Daphnia magna exposed to Diazinon technical was calculated from test results which did not conform completely with EPA criteria, the Enviromnental Safety Section will use the low 95 percent confidence limit of the median value (LC_{50} = 0.83 ppb) in its hazard assessment of the toxicant.

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:

LD_{50} = 10 mg ai/kg for technical grade and LD_{50} = 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.

340

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: Henry T. Craven — Date: 5/4/87

7. Conclusions:

Diazinon LD_{50} = 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

DATA EVALUATION RECORD

1. Chemical: Diazinon

2. Formulation: Knox Out 2FM (23% Microencapsulated)

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).

4. Reviewed By: John S. Leitzke
Ecological Section III
EEB/HED
Signature:
Date:

5. Date Reviewed: September 11, 1980

6. Test Type: Aquatic Invertebrate Acute LC_{50}

Test Species: Daphnia magna

7. Reported Results:

48-hr LC_{50} = 5.03 (4.45 to 5.67) ppb total test material (23% diazinon).

8. Reviewer's Conclusions:

The 48-hr LC_{50} equals 0.522 (459 to 0.585) ppb nominal ppb active ingredient, indicating a very high toxicity to aquatic invertebrates. The test is scientifically sound. However, it is unacceptable in meeting the Guidelines minimum requirement for an acute LC_{50} on aquatic invertebrates using the formulation, Knox Out 2FM, and will be reconsidered upon receipt of actual measured concentrations for all test levels.

DATA EVALUATION RECORD PAGE 1 OF ___

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 Enviornmental 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 SATISIFIED ___ NOT SATISFIED ___

DIRECT RVW TIME = 30 Minutes START DATE: 06/13/86 END DATE: 06/13/86

REVIEWED BY: Margaret Rostker
TITLE: Ecologist
ORG: EEB/HED
LOC/TEL: 557-1741
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 DATE: 5/4/87

Core study showing Daphnia 48-hour LC_{50} = 0.522 ppb nominal active ingredient.

Tol

DATA EVALUATION RECORD

1. Chemical: Diazinon 2FM Microencapsulated

2. Formulation: Formulated Product

O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyremidinyl) 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 LC_{50} 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.

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 LC_{50} was verified on log-probit paper.

11. Results/Discussion:

There was only 5 percent control mortality during the test. The 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 LC_{50}. Test levels were in terms of nominal concentrations and not measured.

b. Results/Discussion: The nominal 48-hr LC_{50} 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.

363

41

9. Materials and Methods:

Fifteen liters of water (hardness 250 mg/L as $CaCO_3$, 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 aceptable but with a revised LC_{50} 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 LC_{50} 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.

3646

7. Reported Results:

Concentration - 10 micrograms/liter Knox Out 2FM

Sampling Time (hr)	Added ug/L ai	Found ug/L Total	Released ug/L	% of Total
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 LC_{50} for the formulated product 23 percent active material was 5.03 (4.45 to 5.67) ppb. The adjusted LC_{50} 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 LC_{50} 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

Sampling Time (hr)	Added ug/L ai	Found ug/L Total	Released ug/L	% of Total
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 LC_{50} for the formulated product 23 percent active material was 5.03 (4.45 to 5.67) ppb. The adjusted LC_{50} 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 LC_{50} 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.

DATA EVALUATION RECORD

1. Chemical: Diazinon 2FM Microencapsulated

2. Formulation: Formulated Product

O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyremidinyl) 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 LC_{50} 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.

367

TDMS DATA EVALUATION RECORD PAGE 1 OF

CASE GS ___ _____ PM ___ ___/___/___

CHEM Diazinon _____

BRANCH EEB DISC ___

FORMULATION 14 G (14.3% ai granular)

FICHE/MASTER ID ~~R00DI001~~ 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 H. T. Craven
ORG: EEB/HED 5/4/87
LOC./TEL: 557-7600

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.

SD

9. Materials and Methods:

Fifteen liters of water (hardness 250 mg/L as $CaCO_3$, 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 aceptable but with a revised LC_{50} 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 LC_{50} 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.

369

44

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. LD_{50} calculated by probit analysis or graphical extrapolation for diazinon.

12. Reported Results:

One granule kills 40 percent house sparrows; five granules kills 80 percent, LD_{50} = 2.5 mg ai/kg.

Five granules kill 100 percent red-winged blackbirds; LD_{50} = 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.

372

DATA EVALUATION RECORD

1. Chemical: Diazinon

2. Formulation: Diazinon 14.3% active ingredient; granules

3. Study Type: Avian LD_{50} 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: 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 blacksbirds 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.

371

45

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 LC_{50}

Test Species: Rainbow Trout (Salmo gairdneri)

7. Reported Results:

96-hour LC_{50} = 60.3 (43.83.2) ppm total test material (23% diazinon).

8. Reviewer's Conclusions:

The 96-hour LC_{50} 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 LC_{50} on coldwater fish using the formulation, Knox Out 2FM, and will be reconsidered upon receipt of actual measured concentrations for all test levels.

TDMS DATA EVALUATION RECORD PAGE 1 OF

CASE GS ___ _____ PM ___ ___/___/___

CHEM Diazinon _____

BRANCH 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 5/4/87
ORG: EEB
LOC./TEL: 557-7600

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 LC_{50} = .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.

373

Diazonon-Knox Out
Rbt - 24 hr LC_{50}

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

	2.798	M
df=2	-1.741	YINT
	2.277	LW M
	0.879	CHI^2

NS

256.522	LD_{50}
160.881	LOCL
409.018	UPCL
89.319	LD_{10}
49.469	LOCL
161.270	UPCL
736.724	LD_{90}
256.756	LOCL
2113.919	UPCL

Diazonin-Knox Out
Rbt - 48 hr LC_{50}

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

	3.874	M
	-3.359	YINT
df=2	1.812	LW M
	1.559	CHI^2

NS

143.860	LD_{50}
180.615	LOCL
190.541	UPCL
67.141	LD_{10}
41.957	DOCL
107.442	UPCL
308.241	LD_{90}
189.151	LOCL
502.308	UPCL

Diazonin-Knox Out
Rbt - 46 hr LC_{50}

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

	2.541	M
df=3	0.572	YINT
	2.475	LW M
	3.272	CHI^2

NS

55.280	LD_{50}
36.611	LOCL
83.469	UPCL
17.299	LD_{10}
7.157	LOCL
41.814	UPCL
176.655	LD_{90}
97.002	LOCL
321.714	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 LC_{50}. Test levels were in terms of nominal concentrations and not measured.

b. Statistical Analysis: There were enough partial mortalities to adequately calculate an LC_{50}, 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 LC_{50}'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.

375

47

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 LC_{50} 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 LC_{50} must be adjusted to reflect the new data. The registrant reported an LC_{50} of 60.3 ppm with the formulated product; whereas, EEB calculated the LC_{50} as 55.3 (36.6 to 83.5). EEB used its LC_{50} value to calculate the nominal LC_{50} for the ai. The 96 hour LC_{50} 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 LC_{50} of the adjusted, nominal ai because the 32 mg/L concentration is more representative than the higher concentration.

Therefore using the LC_{50} 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 LC_{50} .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 LC_{50} will be noted in EEB's diazinon file and used in future assessments.

378

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 LC_{50}: Rainbow Trout (Salmo gairdneri).

The LC_{50} 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

Sampling Time (hr)	Added mg/L ai	Found mg/L Total	Released	% of Nominal
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

317

48

Shaugh. No. 57801

EAB Log Out Date SEP 29 1986

Init. SHL

To:
Product Manager (15)
Registration Division (TS-767)

From: Carolyn K. Offutt, Chief
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

380

9. Materials and Methods:

Fifteen liters of soft water (hardness 50 mg/L as $CaCO_3$, 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 LC_{50} 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 LC_{50}.

d. Conclusions:

1. Category: Upgraded to Core upon the acceptance of a revised LC_{50} .635 (0.42 to 0.96) ppm.

2. Rationale: Data was provided as to the expected amount of diazion in solution.

3. Repairability: None.

3A

49

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 applicaton
3. Immmediately 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 diazinion of the samples taken. A value of zero means less than 1.

	Days After Treatment				
Application Rate AI/A	-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

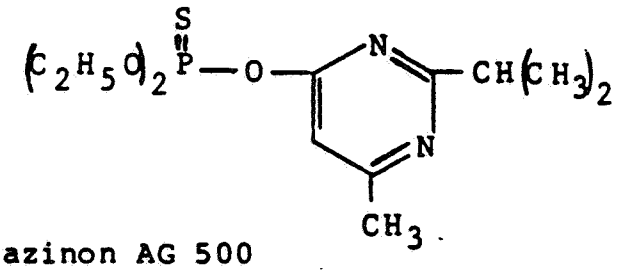
382

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. REVIWED 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/cm^2 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/cm^2.

8. RECOMMENDATIONS:

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

38

DATA EVALUATION RECORD

1. Chemical: Diazinon

2. Formulation: Knox Out 2FM (23% Microencapsulated)

3. Citation: Beavers, J.B. (1978c) Eight-Day Dietary LC_{50} - 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 LC_{50}

Test Species: Mallards (Anas platyrhynchos)

7. Reported Results:

LD_{50} = 649 (464-908) ppm of test material (23% diazinon).

8. Reviewer's Conclusions:

In terms of active ingredient (ai), the LC_{50} 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 LC_{50} using a waterfowl on the formulation, Knox Out 2FM.

Calculation of units from ppm to ng/cm^2 can be accomplished by dividing my 100 cm^2/g (estimated area/weight for grass) Following through with the units, the conversion factor for this case (grass) ppm X 10 = ng/cm^2.

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 immmediately 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 safey 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)

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

Reentry level = 10 ng/cm^2 (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/cm^2.

10. COMPLETION OF ONE-LINER: NA

11. CBI APPENDIX: NA

383

Diazinon Knox Out
Mallard - LC_{50}
Wildl Int'l
78

	100.	
	0.	
	10.	
	178.	
	2.	
	10.	
	316.	
	2.	
	10.	
	562.	
	3.	
	10.	
	1000.	
	6.	
	10.	
	1780.	
	9.	
	10.	
	3160.	
	10.	
	10.	
	2.497	M
df=5	-2.032	YINT
	2.515	LW M
	3.836	CHI^2
NS		
	655.498	LD_{50}
	464.597	LOCL
	924.839	UPCL
	200.952	LD_{10}
	115.219	LOCL
	350.480	UPCL
	2138.208	LD_{90}
	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 LC_{50} is less than the recalculated value and will be used in all hazard evaluations.

d. Validation: Core.

429

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 toa 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 only 1 mortality in the 5 control groups. Decreases in body weight gain and feed comsumption 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 recommened protocol.

b. Statistical Analysis: The Chisquare statistic indicated a homogeneous dose-response relationship within the test groups.

c. Discussion/Results: The LC_{50} was recalculated from the given dose-response data as 1503 (1127-2005) ppm total test material.

d. Validation: Core.

432

DATA EVALUATION RECORD

1. Chemical: Diazinon

2. Formulation: Knox Out 2FM (23% Microencapsulated)

3. Citation: Beavers, J.B. (1978b) Eight-Day Dietary LC_{50} - 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 LC_{50}

Test Species: Bobwhite Quail (Colinus virginianus)

7. Reported Results:

LD_{50} = 1515 (1147-2002) ppm of test material (23% diazinon).

8. Reviewer's Conclusions:

In terms of active ingredient (ai), the LC_{50} 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 accpetable in meeting the Guidelines minimum data requirement for an avian 5(+3)-day dietary LC_{50} using an upland gamebird on the formulation, Knox Out 2FM.

TDMS DATA EVALUATION RECORD PAGE 1 OF

CASE GS ___ _____ PM ___ ___/___/___

CHEM Diazinon _____

BRANCH EEB DISC ___

FORMULATION technical, 92.5% ai diazinon

FICHE/MASTER ID ~~R00DI007~~ 40910904

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:

Diazinon Knox Out
Bobw Q - LC_{50}
Wildl Int'l
78

562.
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	CHI^2
1503.350	LD_{50}
1127.314	LOCL
2004.819	UPCL
656.469	LD_{10}
404.091	LOCL
1066.471	UPCL
3442.754	LD_{90}
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: 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 LC_{50} = 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

435

55

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 LC_{50} Tests: Fathead minnows: 20 fish/concentration; five concentrations. 1-1, 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 LC_{50}'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 LC_{50}'s for diazinon under flow-through conditions were 7.8, 1.6, 0.77, and 0.46 mg/L, respectively, for fathead minnos, 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 progency 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

436

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

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.

437

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 ~~R00D1003~~ 40910905

CITATION: Hill, E.F.; Camardese, M.B. (1986) Lethal Dietary Toxicities of Environmental Contaminants and Pesticides to Coturnixm 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 5/4/87
ORG: EEB
LOC./TEL: 557-7600

SIGNATURE:

APPROVED BY: Harry Craven
TITLE: Supervisory Biologist
ORG: EEB
LOC./TEL: 557-7600 5/4/87

SIGNATURE: Harry T. Craven

This study is sound and useful in a hazard assessment. It shows Coturnix LC_{50} = 167 ppm for technical diazin and LC_{50} = 101 ppm for A6500 (48% ai emulsifiable concentrate).

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

Dietary concentration	Response chronology (day of occurrence) 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

Dietary concentration	Food consumption (grams per bird-day) 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

Toxicity Summary

LC50: 101 ppm	95% CI: 81–126 ppm	Slope: 7.53	SE: 1.65

Dietary concentration	Response chronology (day of occurrence) Onset of signs	First death	Last death	Remission of signs	Total mortality
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) Day 1	Day 2	Day 3	Day 4	Day 5	Total mortality
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) Day 1	Day 2	Day 3	Day 4	Day 5	Total mortality
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

443

TDMS DATA EVALUATION RECORD PAGE 1 OF

CASE GS ___ _____ PM ___ ___/___/___

CHEM Diazinon _____

BRANCH EEB DISC ___

FORMULATION Technical Diazinon

FICHE/MASTER ID ~~R00D1008~~ 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 LC_{50} = 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 LC_{50} requirements and useful in hazard assessment.

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 $\geq$ 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 LC_{50}; 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 LC_{50} = 1470 ug/L (95% CL = 1070 to 3310 ug/L). Test organisms in all concentrations visably 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 detectabel 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 LC_{50} values for freshwater fishes exposed to diazinon under flow-through conditions. fish are affected by chronic exposures to diazinon concentrations two to four ordes of magnitude less than concentrations equal to LC_{50}'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.

447

DATA EVALUATION RECORD

1. Chemical: Diazinon

2. Test Material: Technical diazinon

3. Study Type: Chronic toxicity to Sheepshead Minnow

4. Study ID: Goodwin, 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: Margaret Rostker, Wildlife Biologist, EEB/HED — Signature: H.T. Craven — Date: 5/4/87

6. Approved by: Harry Craven, Supervisory Biologist, EEB/HED — Signature: Henry T. Craven — Date: 5/4/87

7. Conclusions:

In a flow-through 96 hour acute test, the LC_{50} = 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 fecumdity, is < 0.47 ppb; the application factor (MATC LC_{50}) is < 0.0003.

This study is sound and provides useful data for a hazard assessment. It fulfills guideline requirements for an LC_{50} for sheepshead minnow.

8. Recommendations: N/A

9. Background: N/A

10. Discussion of Individual Test: N/A

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 LD_{50} 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.

448

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:

Group	Number of Birds Male	Female	Dose Level (mg a.i./kg of body weight)
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: LD_{50} 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 Number Tested Male	Female	% Dead	Test Day Found Dead
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.

450

63

"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.

"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 (LD_{50}) 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

452

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 LD_{50} 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.

(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 LD_{50} 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

454

65

ONE LINER SHEET

Shaughnessey No._____ Chemical Name Diazinon MG8 Chemical Class _____ Page ___ of ___

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

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14-Day Single Dose Oral LD_{50} — LD_{50} = 6.66 mg/kg — 95% C.L. (5.12 - 8.90) — Contr. Mort. (%) = 0

Species: Mallard Duck — Slope = 3.91 — # Animals/Level = 10 — Age (Weeks) = 16 — Sex = ♂♂ + ♀♀ — Liner/ 2-15-88 — Core

Lab: Bio-Life, Ltd. — 86.6

AC #: 87 DD 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.

ESA

CONC.	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	6.548841	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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456

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: 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 LD_{50} of 6.38 (95% c.i. of 4.90 - 8.50 mg/kg) MIBK Process Diazinon (97% a.il.) 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).

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 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 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:

458

67

Group	Number of Birds Male	Female	Dose Level (mg a.i./kg of body weight)
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: LD_{50} 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 3:37 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

459

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 Number Tested Male	Female	% Dead	Test Day Found Dead
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

46

88

[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 (LD_{50}) 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."

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 LD_{50} 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 LD_{50}.

(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,

462

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

(4) Descriptive Categorization of Results. With an LD_{50} 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

ONE LINER SHEET

Shaughnessey No._____ Chemical Name MIBK 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 LD_{50}		LD_{50} = 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)		
AC #: 87 DD 49		0.57 (0), 0.91 (0), 1.46 (0), 2.34 (0), 3.75 (30), 6.00 (40), 9.60 (80), 15.40 (90)		

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

CONC.	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	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
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C)

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

THRU: Michael W. Slimak, Chief
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)

71

Effects on Beneficial Insects

The following studies received full review under this topic:

AUTHOR	IDENTIFICATION #
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

Species	Formulation	Results	Author	Date	MRID#
Honey bee (*Apis mellifera*)	Technical	Contact LD_{50} = 0.372 micrograms per bee (highly toxic)	Atkins et al.	1975	00036935
Honey bee	Technical	Contact LD_{50} = 0.22 micrograms 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 LD_{50} study (00036935, 05004151) and a foliar residue toxicity study (05008936).

Effects on Nontarget Soil and Surface Invertebrates

The following studies received full review under this topic:

AUTHOR	IDENTIFICATION #
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.

Species	Formulation	Results	Author	Date	MRID#
Predaceous mite (*Amblyseius fallacis*)	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 (*Amblyseius hibisci*)	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.

468

The following studies received abbreviated reviews:

AUTHOR	IDENTIFICATION #
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.

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 Conccinellid 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 Agricuture 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.

470

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)?[3/]
§158.155 Nontarget Insect					
NONTARGET INSECT TESTING - POLLINATORS:					
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/]
NONTARGET INSECT TESTING - AQUATIC INSECTS:					
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 thru 143-3 - NONTARGET INSECT TESTING-PREDATORS AND PARASITES	[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 at to whether the data requirement should be established.

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: Laboratory Studies. By University of California, Dept. of Entomology. ?: UC, Cooperative Extension. (Leaflet 2287; published study.)

SUBST. CLASS = S.

DIRECT RVW TIME = (MH) 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: H. T. Craven DATE: 7/7/86

472

74

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.

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.

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

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

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

A list of the LD_{50} and slope values determined at 48 hours ter treatment at 80F (26.7C) and 65 percent relative humidity the laboratory is given for 203 pesticides in table 1. A st of pesticides not toxic in the laboratory at dosages below µg per honey bee is given for 196 pesticides in table 2. her commonly used pesticide names or name designations appear gether in tables 1 and 2. The pesticide names or other signations appearing in table 1 or 2 are arranged in alpha- tical order in table 3 preceded with a numerical reference to eir position in table 1 or 2 and giving the chemical definition.

LC_{50} is the lethal concentration of a chemical giving a bee mortality of 50 percent; LD_{50} is the lethal dosage in micrograms per bee of a chemical giving 50 percent mortality.

TABLE 1. LD_{50} 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	tepp	0.001	6.64
2	thionazin; Zinophos®; Nemaphos®; AC-18133; ENT 25580	0.062	9.08
3	chlorpyrifos; Dursban®; Dowco 179	0.114	7.80
4	dieldrin	0.139	4.65
5	carbofuran; Furadan®; NIA-10242; ENT 27164	0.160	4.31
6	parathion	0.175	7.66
7	GC-6506	0.178	8.19
8	dimethoate; Cygon®; DE-FEND®; ENT 24650	0.186	3.94
9	methidathion; Supracide®; GS-13005; ENT 27197	0.236	9.06
10	EPN; [illegible]-300	0.245	5.08
11	[illegible]; ENT 27764	0.268	9.39
12	C-[illegible]; ENT 27625	0.283	6.11
13	aldicarb; Temik®; UC-21149; ENT 27093	0.285	5.64
14	methyl parathion	0.291	6.26
15	dicrotophos; Bidrin®; SD-3562; ENT 24482	0.300	16.50
16	phoxim; Valexon®; Baythion®; BAY-77488; ENT 27448	0.305	6.80
17	phenthoate; CIDIAL®; Papthion®; BAY-33051; ENT 27386	0.306	4.95
18	fenthion; Baytex®; BAY-29493; ENT 25540	0.308	7.20
19	Zectran®; Dowco 139®; ENT 25766; mexacarbate	0.308	4.92
20	monocrotophos; Azodrin®; SD-9129; ENT 27129	0.350	7.77
21	fensulfothion; Dasanit®; BAY-25141; ENT 24945	0.350	5.46
22	aldrin	0.353	4.98
23	mevinphos; Phosdrin®; OS-2046; ENT 22374	0.360	7.94
24	diazinon; [illegible]®; G-24480	0.372	8.97
25	Mesurol®; BAY-9026; BAY-37344; ENT 25726	0.375	3.20
26	Methyl Dursban; Dowco 214	0.383	10.23
27	fenitrothion; Accothion®; Folithion®; Sumithion®; BAY-41831; CP-47114; ENT 25715	0.383	4.94
28	NIA-10586	0.408	4.26
29	famphur; Famophos®; CL-38023	0.417	4.85
30	Imidan®; NC-A-480; ENT 27041	0.423	8.69
31	azinphosmethyl; Guthion®; BAY-17147	0.423	6.84
32	Isolan®; G-23611	0.471	8.70
33	naled; Dibrom®; RE-4355	0.480	18.18

475

	[illegible]® B-36	0.326	3.16
37	GS-12968	0.330	8.91
38	lindane; gamma BHC	0.562	5.07
39	Hercules [illegible]26	0.574	8.60
40	Hercules [illegible]13; ENT 27615	0.581	3.90
41	NIA-11637	0.609	3.53
42	pirimiphos-ethyl; PP-211	0.616	15.11
43	NIA-10559	0.624	4.30
44	UC-8305	0.628	2.68
45	pirimiphos-methyl; PP-511	0.639	13.89
46	malathion; Cythion®	0.709	8.06
47	Bomyl®; GC-3707	0.743	9.09
48	Hercules [illegible]62; ENT 27405	0.829	3.90
49	UC-30045; ENT 27393	0.880	4.02
50	Hercules [illegible]7; UC-10854	0.937	6.34
51	Methyl Iso-Systox	0.937	3.48
52	azinphos-ethyl; Ethyl Guthion®; BAY-16259; ENT 22014	0.981	7.32
53	Sevin 4-Oil	1.02	4.37
54	C-9673; ENT 27564	1.04	8.76
55	Imidan®; Prolate®; R-1504	1.06	4.77
56	RP-11783	1.08	7.11
57	Carbamult®; promecarb; Schering 34615; EP-316; SN-316	1.13	2.22
58	Matacil®; BAY-44646; ENT 25784	1.16	3.72
62	propoxur; aprocarb; Baygon®; Unden®; BAY-39007; OMS-33; ENT 25671	1.35	3.30
63	Monitor; Tamaron®; BAY-71628; [illegible]-9006	1.37	10.32
64	Gardona®; Rabon®; SD-8447	1.37	21.45
65	AC-12008	1.38	3.60
66	phosphamidon; Dimecron®	1.44	14.28
67	Methyl Trithion®	1.44	6.64
68	C-8874; ENT 27409	1.46	3.93
69	Iso-Systox	1.49	1.65
70	methomyl; Lannate®; SD-1179; Nudrin®	1.51	3.83
71	Abate®; Biothion®; AC-52160; CL-52160; ENT 27165	1.55	8.85
72	landrin; Compd. 711	1.61	2.63
73	[illegible]-4434; ENT 27760	1.64	16.06
74	[illegible]®; Ortho 5353; [illegible]-5353; ENT 27127	1.66	5.12
75	Hercules 9007; ENT 27334	1.66	3.30
76	Dow ET-15	1.83	6.12
77	[illegible]®; BAY-46138	1.87	5.25
78	Sevimol® 4	1.88	3.82
79	I-1642	1.90	3.00

Group II - Moderately Toxic to Honey Bees

80	endrin; Compd. 269	2.02	4.20
81	RE-5030	2.08	5.28
82	leptophos; Abar®; PHOSVEL®; VCS-506; ENT [illegible]	2.19	3.80
83	Elocron®; dioxacarb; C-8353	2.21	2.98
84	Hercules 3895 C	2.25	2.84
85	Ciodrin®; SD-4294; crotoxyphos	2.26	17.10
86	AC-12000	2.28	3.48
87	trichloronate; Agritox®; BAY-37289; ENT [illegible]	2.33	3.26
88	Banol®; [illegible]; U-12927; carbanolate	2.36	5.91
89	H-4543	2.48	2.76
90	Ortho [illegible]; PP-9; [illegible]-11	2.51	4.55
91	demeton; Systox®; BAY-8169	2.60	1.85
92	EI-43064	2.62	4.55
93	Akton®; SD-9098	2.66	4.07
94	G-30494	2.70	4.06
95	Pyramat®; G-23330	2.95	4.07
96	oxydemeton-methyl; Meta Systox-R®; BAY-21097	3.00	2.32
97	C-10015; ENT 27410	3.16	2.70
98	chlordane, α & γ isomers; HCS-3260	3.16	2.45
99	Cytrolane®; EI-47470	3.51	6.28
100	TD-72	3.58	4.72
101	BAY-38156; ENT 25713	3.60	2.10
102	BAY-30911; ENT 25635	3.75	3.68
103	GS-10128	3.84	6.21
104	UC-8812	3.94	3.75
105	iodofenphos; Alfacron®; C-9491; ENT 27408	3.99	3.12
106	GC-9160; ENT 27156	4.09	3.98
107	GC-10884	4.19	3.21
108	Cyolane®; EI-47031	4.23	7.32
109	TD-73	4.29	5.64
110	carbophenothion; Trithion®; R-1303	4.47	8.39
111	Perthane®; Q-137	4.47	6.05
112	GS-8879	4.90	4.14
113	SD-7438	5.08	6.09
114	Mesurol®; [illegible]	5.14	3.87
115	disulfoton; Di-Syston®; BAY-19639	5.14	1.14
116	chlordene	5.23	3.24
117	UC-27094B; UC-34096; ENT 27673	5.35	2.75
118	DDT, p,p' isomer	5.36	4.63
119	SD-8448	5.74	8.72
120	ronnel; Korlan®; Trolene®; Dow ET-14; Dow ET-57	5.76	2.10
121	[illegible]®; U-27415; ENT 27646	5.73	4.13
122	GC-10101	5.78	8.50
123	dimetilan; Dimetilan®; GS-13332	5.84	6.08
124	DDT; ENT 1506	5.95	4.89
125	isopropyl parathion; ENT-2168	6.41	6.06

476

127	[illegible]	7.12	6.43
128	mirex; GC-1283	7.15	3.23
129	GC-3582; SD-8210	7.74	3.37
130	endosulfan (ex VP30); Thiodan®	7.81	3.15
131	endothion; NIA-5767; AC-18737	8.00	7.02
132	Tranid®; UC-20047A; ENT 25962	8.10	3.27
133	chlordane	8.80	2.34
134	phosalone; Zolone®; RP-11974	8.94	3.83
135	HRS-1422	9.25	3.20
136	phorate; Thimet®; AC-3911	10.07	1.34
137	Vydate®; [illegible]-1410	10.32	6.43
138	chlordecone; Kepone®; Compd. 1189	10.39	4.83
139	CP-10302	11.00	3.62
140	[illegible]; [illegible]®; PP-175	11.06	2.03
141	binapacryl; Morocide®; NIA-9044	11.60	9.97
142	SD-17250	12.00	5.71
143	sabadilla	12.33	6.20
144	formetanate; Carzol SP®; EP-332; ENT 27566	14.27	3.97
145	CP-10316	14.50	3.20
146	endosulfan (ex. tech.);	16.14	2.34
147	fluenethyl; Lambrol®; Mytrol®; M-2060; TH-367-I	16.62	3.60
148	α endosulfan	17.42	3.02
149	[illegible]®; [illegible]	17.43	3.79
150	pirimicarb; Pirimor®; PP-062	18.72	2.88
151	ethion; Nialate®	20.55	0.95
152	dioxathion; Delnav®; Hercules AC-528; ENT 22897	21.27	5.05
153	β endosulfan	21.79	3.31
154	methoxychlor; Marlate®; DMDT	23.57	1.35
155	Bandane®	25.60	4.00
156	BAY-39731	26.39	1.27
157	dinocap; Karathane®; ENT 27727	33.39	2.87
158	Torak®; Hercules 14503; ENT 27320; dialifor	34.65	1.30
159	dinoseb; Sinox® PE; DNBP, alkanolamine salt	36.26	4.93
160	Plictran®; Dowco 213; ENT 27395; M-3180	38.19	4.92
161	Dilan®; CS-708	40.49	1.70
162	R-23233	40.59	4.23
163	ziram; Zerlate®	46.65	2.12
164	EP-334-[illegible]	46.75	1.98
165	dinobuton; Acrex®; Dessin®; UC-19786; ENT 27244	48.42	5.90
166	[illegible]	50.40	1.67
167	EP-417	51.46	3.18
168	EP-418	52.82	3.46
169	trichlorfon; Dylox®; Dipterex®; ENT 19763	59.83	2.81
170	GC-3582	60.43	4.92
171	GC-10433	62.80	9.45
172	PPG-124	65.87	2.40
173	oxythioquinox; Morestan®; BAY-36205; ENT 25606	66.47	1.36
174	SYLOID® 266 - Grade 68; SG-68	67.08	2.18
175	thiram; Arasan®; Tersan® 75; Thylate®	73.72	1.18
176	calcium arsenate	78.56	4.10
177	Dri-Die®; SYLOID® 235-Grade 235; SG-67	96.69	4.40
178	GC-8993; ENT 25207	96.69	1.37
179	RH-2300	97.89	1.90
180	GC-9832; [illegible]	98.00	2.68
181	SYLOID® 378-Grade 78; SG-78	108	3.18
182	monuron; CMU; Telvar®	110	0.78
183	Eradex®; BAY-30686; chinomethionat	121	1.14
184	dicofol; Kelthane®; FW-293	145	1.52
185	Rhothane®; DDD; TDE; ENT 4225	161	0.98
186	SYLOID® 308-Grade 77; SG-77	163	2.65
187	Q-128	179	0.75
188	BAY-38733; ENT 27323	198	2.18
189	nitrofen; TOK®; FW-925	275	3.08
190	propachlor; Ramrod®; CP-31393	311	2.81
191	Polyram®; ENT 26711	437	1.53
192	fenson; Murvesco®; TriFenson®; GC-980	483	8.07
193	molasses (feed grade)	494	6.79
194	propham; Chem-Hoe®; IPC	604	0.96
195	Hi-Sil® 233	616	2.47
196	SYLOID® 74-Grade 74; SG-74	800	0.99
197	ryania	977	1.26
198	sulfur	1,031	1.38
199	chlorobenzilate; Acaraben®; Geigy 338; G-23992	1,849	1.01
200	dinitrocyclohexylphenol; Dinex®; DN-111; DNOCHP	2,175	0.65
201	SYLOID® 63-Grade 63; SG-63	3,625	0.91
202	SD-14114; Vendex Miticide; ENT 27738	3,982	0.57
203	GC-6936	10,031	0.63

477

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

Reference No.	Pesticide	% Mortality	μg/bee
204	allethrin; pyrethrins, synthetic; [illegible] 17[illegible]	6.00	0.314
205	Rentinin®	6.79	~~0.334~~ 0.336
206	pyrethrum	11.00	0.63
207	rotenone; cube; derris	12.00	2.42
208	parinol; [illegible]®	2.90	2.42
209	paraquat	2.74	6.04
210	dichlone; Phygon®	7.04	7.25
211	nicotine	3.00	8.70
212	dichlofluanid; Euparen®; BAY-47531	3.91	9.06
213	Alamine 21, primary amine; AL-21	2.38	9.06
214	Armeen L-15; ARL-15	2.38	9.06
215	Alamine 11, primary amine; AL-11	0	9.06
216	Alamine 15, primary amine; AL-15; Tall oil	0	9.06
217	Aliquat 221, tertiary amine; ALQ-221	0	9.06
218	Duomeen L-15; DL-15	0	9.06
219	methyl [illegible]	1.09	9.67
220	Aramite®	26.00	12.00
221	ferbam; Fermate®	10.61	12.09
222	Vegadex®; CDEC	10.03	12.09
223	folpet; Phaltan®	8.97	12.09
224	DDT antiresistant; WARF antiresistant for DDT; [illegible]-6766	7.79	12.09
225	merphos; Folex®	6.14	12.00
227	Eptam®; EPTC	3.91	12.09
228	TD-71	3.83	12.00
229	nabam; Parzate®	3.71	12.09
230	glyodin; Glyoxide®	3.08	12.09
231	Randox®; CDAA	4.73	12.09
232	Triton X-100®	4.31	12.09
233	Benzac®; Trysben®; 2,3,6-TBA	4.36	12.00
234	amitrole; Amizol®; Cytrol®; ATA	4.10	12.00
235	cuprous oxide	3.32	12.09
236	maneb; Manzate®	2.98	12.09
237	Tuton S-1956	2.00	12.00
238	dodine; Cyprex®	2.43	12.09
239	[illegible]; Compd. 900A; [illegible]-900	2.17	12.09
240	picloram; Tordon® 22K	7.40	14.30
241	benefin; Balan®	7.10	14.30
242	copper oxychloride sulfate; C-O-C-S	7.00	14.30
243	BAY-[illegible]	6.83	14.30
244	barban; Carbyne®	5.60	14.30
245	2,4-DB (dimethylamine salt); Butyrac®-118; 4-(2,4-DB)	3.97	14.30
246	cypromid; Clobber®; S-6000	2.98	14.30
247	amiben (ammonium salt); Amiben®; chloramben	2.80	14.30
248	bensulide; Prefar®; S-6173	2.40	14.30
249	bromacil; Hyvar®; [illegible]®	2.00	14.30
250	D-6	3.33	16.92
251	ceton; [illegible]®; [illegible]®	6.60	18.13
252	2,4-D (Low volatile oil soluble form); Esteron®	6.44	18.13
253	AC-94554	6.20	18.13
254	chlorbenside; Chlorparacide®; Mitox®; [illegible] 20696	2.80	18.13
255	Omite®; Comite®; DO-14; [illegible] 27226	1.85	18.13
256	mecoprop; MCPP; CMPP; 2-MCPP	1.67	18.13
257	D-048 (analogue of Aramite®)	0	18.13
258	U-36059; [illegible] 27967	9.94	21.15
259	HP-2929	1.28	21.70
260	[illegible]; [illegible]®; HP-17623	1.38	21.70
261	Acarol®; GS-19851; [illegible] 27552	3.30	24.00
262	Dimite®; DMC; chlorfenethol	4.95	24.03
263	GC-2066	22.87	24.17
264	GC-2131	13.66	24.17
265	trifluralin; Treflan®	12.85	24.17
266	sesone; Sesin®; 2,4-DES	7.46	24.17
267	Mylone®; DMTT	6.25	24.17
268	Ansar® 170; [illegible]®; MSMA	6.17	24.17
269	dalapon; Dowpon®; Radapon®	4.38	24.17
270	2,4-D (sodium salt)	3.70	24.17
271	Indopol® Polybutene H-300	3.70	24.17
272	propanil; DPA; Rogue®; Stam® F-34; BAY 30130	3.69	24.17
273	Weedar®; MCPA; Dow MCP amine weed killer	3.62	24.17
274	DCPA®	2.99	24.17
275	[illegible]; [illegible]®; [illegible]	2.00	24.17
276	2,4,5-T	1.93	24.17
277	C-940; [illegible]-C940	1.62	24.17
278	bensulide; Betasan®; Prefar®; R-4461	1.60	24.17
279	chlorpropylate; Acaralate®; G-24163; [illegible] 26999	1.60	24.17
280	Glytac®	0.85	24.17
281	GS-13798	0.79	24.17
282	silikil	0	24.17
283	butylate; Sutan®; R-1910	14.95	26.01
284	DDE, p,p' isomer	16.81	26.39
285	DDT, p,p' isomer	16.43	26.39
286	DDE, p,p' isomer	15.00	26.39
287	pebulate; PEBC; Tillam®; R-2061	13.18	29.01
288	[illegible]-10656	11.97	29.01
289	vernolate; Vernam®; R-1607	10.89	29.01
290	molinate; Ordram®; R-4572	10.22	29.01
291	cycloate; Ro-Neet®; R-2063	7.06	29.01
292	UC-21436	6.50	30.22
293	UC-21427	3.70	30.22
294	Aroclor® 1221	2.30	30.22
295	Aroclor® 1248; [illegible] 8876	1.36	30.22
296	Aroclor® 1254	1.36	30.22
297	Aroclor® 1260	1.20	30.22
298	Aroclor® 1232	0	30.22
299	Aroclor® 1242	0	30.22
300	IPC + PPG - 124 @ 4:1	11.30	~~32.26~~ 9.10

302	CIPC + PPG - 124 @ 4:1	4.50	~~36.26~~ 9.10
303	maleic hydrazide; MH-30®	4.32	36.26
304	HCCPT	2.39	36.26
305	dimethyl sulfoxide; DMSO	2.47	36.26
306	metham; SMDC; VPM®; Vapam®	2.40	36.26
307	Kuron®; 2(2,4,5-TP); silvex acid, PGBE ester	2.10	36.26
308	diallate; Avadex®; DATC; CP-15364	2.00	36.26
309	Pipron®	2.00	36.26
310	triallate; Avadex BW®; DATC-BW	1.82	36.26
311	asulam; Asulox® 40; MLB 9037	1.28	36.26
312	Polysorbate 80®; Tween 80®	0.86	36.26
313	alachlor; Lasso®; CP-50144	0.61	36.26
314	[illegible]-2840	2.56	45.30
315	SN-38107; EP-475	9.68	48.34
316	FLIT® MLO; BPRL-3833-2	9.52	48.34
317	MBC	8.34	48.34
318	BPRL-3337-2	7.61	48.34
319	polyisobutylene	7.34	48.34
320	polyisobutylene; Polytrap®	5.60	48.34
321	TCA, acid	4.18	48.34
322	pentachlorophenol, PCP:		
	Dowicide® 7 Flake tech	2.35	48.34
	Dowicide® G sodium salt	2.16	48.34
323	NIA-10637	0.85	48.34
324	dichloropropene; Telone®	6.38	60.43
	[illegible]	6.33	60.43
327	NaTCA (inhibited); Sodium TCA	3.70	60.43
328	ethyl formate	2.39	60.43
329	Ammate® X; AMS	2.90	60.43
330	Premerge®; [illegible]®	2.50	60.43
331	Sencor®; BAY-94337	2.82	60.00
332	dicamba; Banvel D®	2.58	90.65
333	prometryne; Caparol®; G-34161	10.36	96.69
334	captafol; Folcid; Difolatan®; OS-5865	0.91	96.69
335	simazine; Princep®	6.32	96.69
336	ametryne; ametryne; Ametrex®; Evik® GS-34162	6.49	96.69
337	atrazine; AAtrex®; Atranex®; G-30027	4.79	96.69
338	SUMITOL®; GS-14254	4.55	96.69
339	monuron; [illegible]®	3.09	96.69
340	propazine; Milogard®	2.47	96.69
341	[illegible]®; [illegible]®	13.80	100.00
342	[illegible]®; BAY-22555	40.46	102.00
343	naptalam; Alanap®; NPA	0.41	113.20
344	fentin hydroxide; TPTH; DuTer®	12.70	114.82
345	chlordimeform; chlorphenamidine; Fundal®; Galecron®; ENT 27567; ENT 27335; EP-333; C-8514	8.49	114.82
346	[illegible]®; SC-28299	3.80	114.82
347	Dyrene®; Kemate®; B-622	4.27	117.23
348	benomyl; Benlate®; F-1991	8.16	120.86
349	Maloran®; C-6313	7.25	120.86
350	linuron; Lorox®	6.47	120.86
351	metobromuron; Patoran®; C-3126	3.39	120.86
352	fluorodifen; Preforan®; C-6989	3.40	120.86
353	siduron; Tupersan®	3.30	120.86
354	GC-10379	4.58	120.86
355	chloroxuron; Tenoran®	4.50	120.86
356	ovex; Ovotran®; K-6451	3.17	120.86
357	dichlobenil; Casoron®	3.09	120.86
358	Trefmid® (=trifluralin, 50% + diphenamid, 3.7%)	2.70	120.86
359	diuron; Karmex®	2.77	143.03
360	cacodylic acid; Phytar® 138	3.60	157.12
361	Dibar® ([illegible]® H-45, 74% + Karmex®, 6%)	14.39	~~178.87~~ 14.50
362	chlorothalonil; Daconil® 2787; Bravo®	14.28	181.29
363	nitralin; Planavin®; SD-11831	6.80	181.29
364	Plantvax®; F-461	5.90	181.29
365	dicloran; Botran®; DCNA; ditranil; Allisan®	5.32	181.29
366	Kerb®; RH-315	4.90	181.29
367	methazole; Probe®; VCS-438	3.79	181.29
368	dithianon; Thynon®; Delan®	3.09	181.29
369	carboxin; Vitavax®; D-735	2.00	181.29
370	karbutilate; Tandex®; NIA-11092	8.50	193.38
371	fluometuron; Cotoran®	3.80	193.38
372	Dithane® M-45	3.70	193.38
373	pyrazon; Pyramin®; PCA	3.30	193.38
374	terbacil; Sinbar®	2.40	193.38
375	cyanazine; Bladex®; SD-15418	2.11	193.38
376	terbutol; Azak®; Hercules 9573	1.66	193.38
377	bromacil; Hyvar® X	1.20	193.38
378	Alar®	3.80	205.46
379	captan; Merpan®; Orthocide® 406; ENT 26538	9.86	215.00
380	methar; DSMA; Ansar® 184	9.80	217.33
381	[illegible]; [illegible]®	4.33	217.33
382	cryolite	1.45	217.33
383	Dacthal®-T; DAC 893; DCPA	3.18	229.63
384	GS-16068; Sancap®	6.20	235.68
385	terbutryn; Igran®; GS-14260	2.90	236.40
386	Can-Trol®; Thistrol®; MCPB (sodium salt)	4.00	237.37
387	diatomaceous earth	10.33	241.72
388	[illegible]	12.11	241.72
389	calcium carbonate	8.22	241.72
390	diphenamid; Dymid®; Enide®	7.29	241.72
391	phenmedipham; Betanal®; EP-452; S-4075	2.95	241.72
392	alumina clay	2.02	241.72
393	VIRON/H®; *Heliothis* virus	0.30	241.72
394	[illegible] (heavy)	0.69	241.72
395	Attaclay®	0.43	241.72
396	[illegible]; silvex acid(tech.); 2(2,4,5-TP)	0.61	241.72
397	cycloheximide; ACTI-AID®; Actidione®	0	241.72
398	pyrophyllite, Pyrax®	1.28	242.60
399	*Bacillus thuringiensis* Berliner; Thuricide®; Biotrol®	non-toxic @ 726,000 spores/bee	

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		Aphytis	
			Accept.	Tox.	Accept.	Tox.	Accept.	Tox.	Accept.	Tox.
Tartar emetic	Tech	.1908	23	0	43	O-L	26	L	34	L-M
TDE	50% WP	.0954	87	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	M	16	M	5	M	8	M
Zineb	75% WP	.1240	99	O-L	100	0	100	O-L	100	0

a Toxicity expressed as H (High) if LT_{50} <1day; 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 (Bulan®).

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

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

Material	Formulation	% toxicant (act.) in honey w/w (low concn)	Response to high concentration of toxicant in honey							
			Lindorus		Cryptolaemus		Metaphycus		Aphytis	
			Accept.	Tox.	Accept.	Tox.	Accept.	Tox.	Accept.	Tox.
Aldrin	40% WP	0.0477	18	L	22	O	42	O-L	17	O-L
Aramite®[b]	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	H-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	H-H
Dilan®[c]	25% WP	.0954	5	O-L	4	L-H	0	H	9	L
Dimethoate	4 lb/gal EC	.0477	13	H	8	H	46	H	18	H
Dimetilan	50% WP	.0477	30	L	9	H-H	10	H	19	H
Dinocap	25% WP	.0239	4	O	0	O	13	H	8	H
Dioxathion	25% WP	.0239	50	L	18	L	43	H	24	H
DN-111®[d]	20% WP	.0191	30	O	12	O	12	L	85	O-L
Endosulfan	25% WP	.0477	61	O	32	H-H	95	L	100	L
Endrin	50% WP	.0477	6	L	10	H	17	H	29	H
Ethion	25% WP	.0477	11	O	3	O	20	H	5	H

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		Aphytis	
			Accept.	Tox.	Accept.	Tox.	Accept.	Tox.	Accept.	Tox.
Fenthion	4.0 lb/gal EC	.0477	10	M-H	2	L	5	H	5	H
Ferbam	67% WP	.1279	33	O	9	O	32	O-L	8	O-L
Genite 923	50% EC	.0954	1	O-L	0	O-L	3	O	11	L
Heptachlor	25% WP	.0477	45	O-L	15	O-L	12	L	39	L
Lead arsenate (acid)	32% As_2O_5	.2863	98	O	41	O-L	97	O-L	36	O-L
Lime sulfur soln.	29° Baume	3.9809	0	O	0	O	0	O-L	0	O-L
Lindane	25% WP	0.0239	85	L	15	O	20	M-H	8	L-M
Malathion	25% WP	.0477	11	H	9	H	0	H	3	H
Methoxychlor	50% WP	.0954	33	O-L	7	H	13	H	15	L
Mevinphos	4 lb/gal E	.0239	4	H	1	H	5	H	4	H
Morestan	25% WP	.0477	47	L	10	O-L	75	H	20	L
Naled	8 lb/gal EC	.0477	25	O-L	6	O-L	34	H	29	H
Neotran	40% WP	.0572	51	O	45	O	56	O-L	6	L
Nicotine sulfate soln.	40%	.0746	16	O	31	O	0	O-L	5	L
Oil, light-medium	92% U.R. Emul	1.0903	72	O-L	45	O	30	H	37	H
Oil-kerosene	Tech	1.0903	31	O-L	59	O-L	30	O-L	86	O-L
Ovex	50% WP	.0716	71	O	17	O-L	72	O-L	53	L
Parathion	25% WP	.0477	1	O-L	1	L	2	H	3	H
Perthane	25% WP	.0477	52	O-L	38	O	17	O-L	10	H
Phosphamidon	4 lb/gal E	.0239	19	H	6	H	15	H	11	H
Rotenone	6.4% gr. root	.0244	6	H	2	L-H	4	H-H	7	L-H
Ryania	100 gr. stem	.3817	9	L-H	6	O-L	44	L	93	O-L
Sabadilla	2.25% alkaloid	.0065	73	O-L	51	O-L	0	H	6	H
Schradan	4 lb/gal EC	.0239	61	O	94	O	76	H	5	H-H
Sulfur	325 mesh WP	.2863	76	O	8	O	20	L	16	H
Sulphenone	50% WP	.1431	15	O	4	O-L	9	L	5	L

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		Aphytis	
			Accept.	Tox.	Accept.	Tox.	Accept.	Tox.	Accept.	Tox.
Tartar emetic	Tech	.1908	14	O	14	L-M	11	H	13	H
TDE	50% WP	.0954	24	O-L	7	O-L	6	L	45	L
Tepp	20% E	.0239	40	O	53	O-L	70	O	8	M
Tetradifon	25% WP	.0353	100	O	78	O	84	O	72	O-L
Toxaphene	40% WP	.1908	4	O	0	O-L	15	L-M	15	L-M
Trichlorfon	50% sol. pow.	.0477	34	O-L	42	O-L	97	L-M	97	M
Zectran	25% WP	.0477	12	H	1	H	0	H	1	H
Zineb	75% WP	.1240	100	O-L	100	O	70	O-L	93	O-L

a Toxicity expressed as H (High) if LT_{50} <1day; 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.

MULTIPLE

TDMS0030 DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0014 ~~ENDOSULFAN-A~~ (10/19/79) PM 110 11/21/79

CHEM ~~079401~~ ~~Endosulfan (hexachlorohexahydromethanol)~~

BRANCH EEB 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 th 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: EEB/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. Craven DATE: 7/7/86

504

80

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 ~~most~~ of the insecticides tested, at a rate equivalent to ~~0.77~~ 1.0 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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95

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.Endosulfan	EC 35% W/V	0.77	3	0	2	0	—
10.Oxydemeton-methyl	EC 25% W/V	0.38	3	0	2	0	—
11.Trichlorfon	SP 80% W/W	1.20	3	0	0	0	—
12.Vamidothion	EC 40% W/V	0.50	3	37	5	0	—

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

81

MULTIPLE

TDMS0030 DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS0014 ~~ENDOSULFAN A - (10/19/79)~~ PM 110 11/21/79

CHEM ~~079401~~ ~~Endosulfan (hexachlorohexahydromethano-~~

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 #2
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.

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

Chemical	Formulation	Rate/ 100 gal.	Strain											
			Ricks (S)						Cupper-S (R)					
			SD[a]	R_0[b]	R_5[b]	R_{10}	R_{15}	R_{20}	SD	R_0	R_5	R_{15}	R_{10}	R_{20}
Azinph@smethyl	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	—	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	—	—
Phosalone	3 EC	1. pt	100	100	100	100	—	—	85	100	100	93	—	—
Phosalone	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	98	88	92	58	45	—	100	96	89	49	34	—
Fundal SP	SP	.25 lb	100	79	4	—	—	—	100	92	20	—	—	—

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.

510

83

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DIAZINON

TDMS0030 DATA EVALUATION RECORD MULTIPLE
PAGE 1 OF 4
CASE GS0021 ~~KELTHANE~~ PM

CHEM ~~040501~~ ~~1,1-Bis(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:

54

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.

572

Material	Formulation	Dosage lb actual/100 gal	Deposit ug/cm²	Rating to A. bilarti
Aldrin	40% W.P.	0.50	6.44	L-M
Aramite	15% W.P.	.45	5.79	0
Azodrin	7.5 lbs. Tech./gal.	.50	6.44	M
BHC	10% γ W.P.	.2 ✓	2.57	M
Bordeaux mixture	10-10-50 2 pkg.	40.0	$14.86	0-L
Calcium arsenate	70% $Ca_3(AsO_4)_2$	3.0	38.62	M
Captan	50% W.P.	1.0	12.87	0
Carbaryl	50% W.P.	0.50	6.44	M
Carbophenothion	25% W.P.	.25	3.22	M
Chlordane	40% W.P.	1.0	12.87	M-H
Chlorobenzilate	25% W.P.	0.25	3.22	L
Chlorthion	25% W.P.	.50	6.44	M
Cryolite (natural)	95%	2.85	36.68	0-L
DDT	50% W.P.	1.0	12.87	M-H
DDT+kerosene	50% W.P.	0.75+1.5 gal.	9.65+ker.	M
Demeton	2 lbs./gal. E.C.	.25	3.22	M-H
Diazinon ✓	25% W.P.	.50	6.44	M
Dieldrin	50% W.P.	.50	6.44	M
Dilan	25% W.P.	1.0	12.87	M-H
Dimethoate	4 lbs./gal. E.C.	0.50	6.44	M
Dinocap	25% W.P.	.25	3.22	L-M
Dioxathion	25% W.P.	.25	3.22	M-H
EN-111	20% W.P.	.20	2.57	L
Endosulfan	25% W.P.	.50	6.44	M
Endrin	50% W.P.	.50	6.44	M
Ethion	25% W.P.	.50	6.44	M
Ethiothion	4 lbs./gal. E.C.	.50	6.44	M
Ferbam	67% W.P.	1.34	17.24	0
Genite 923	50% E.C.	1.0	12.87	L-M
Guthion	25% W.P.	0.50	6.44	M
Heptachlor	25% W.P.	.50	6.44	M
Malthane	18.5% W.P.	.50	6.44	M
Lead arsenate (acid)	32% As_2O_5	3.0	38.62	0-L
Lime-sulphur soln.	29° Baumé	5.0 gals.	$36.48	M
Lindane	25% γ W.P.	0.25 γ	3.22	M
Malathion	25% W.P.	0.50	6.44	M
Malathion+oil	25% W.P.+L-M. oil	.25+1.67 gal.	3.22+oil	M
Methoxychlor	50% W.P.	1.0	12.87	0-L
Novinphos	4 lbs./gal.E.	.25	3.22	M
Naled	8 lbs./gal.E.C.	.50	6.44	M
Neotran	40% W.P.	.60	7.70	L-M
Nicotine sulphate soln.	40%+Cal. caseinate	.75 pt.	10.06	0
Oil, light-medium	92% UR.E.	1.67 gals.	$57.12	0
Omex	50% W.P.	0.75	9.66	L-M
Parathion	25% W.P.	.50	6.44	M
Parathion+oil	25% W.P.+L-M.oil	.25+1.67 gal.	3.22+oil	M
Parthane	25% W.P.	.50	6.44	0
Phosphamidon	4 lbs./gal.E.	.25	3.22	M
Rotenone	6.4% from gr. root	.256	3.30	M
Quassia	100% gr. stems	4.0	$1.48	0
Sabadilla+sugar	2.25% alkaloids W.P.	0.068 alk.+5.0 sugar	0.87 alk.	M
Schradan	4 lbs./gal.E.C.	.25	3.22	M-H
Sulphenone	50% W.P.	1.50	20.31	M-H
Sulphur	325 mesh W.P.	3.0	38.62	M-H
Tartar emetic+sugar	Tech.	2.0+2.0 sugar	25.74	M
TDE	50% W.P.	1.0	12.87	M
Tepp	20% E.	0.25	3.22	0-L
Tetradifon	25% W.P.	.37	4.75	0
Thanphene	40% W.P.	2.0	25.74	M
Trichlorfon	50% Sol.P.	.50	6.44	M
Zineb	75% W.P.	1.3	16.73	0-L
Neotran	25% W.P.	.50	6.44	M

* Toxicity designated as high (H) if LT_{50} <1 day; medium (M) if LT_{50} >1 day and <4 days; low (L) if LT_{50} >4 days; and none (0) if 50 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.

574

85

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.

516

(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 of 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 facilites.

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 Carribean. 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.

517

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.

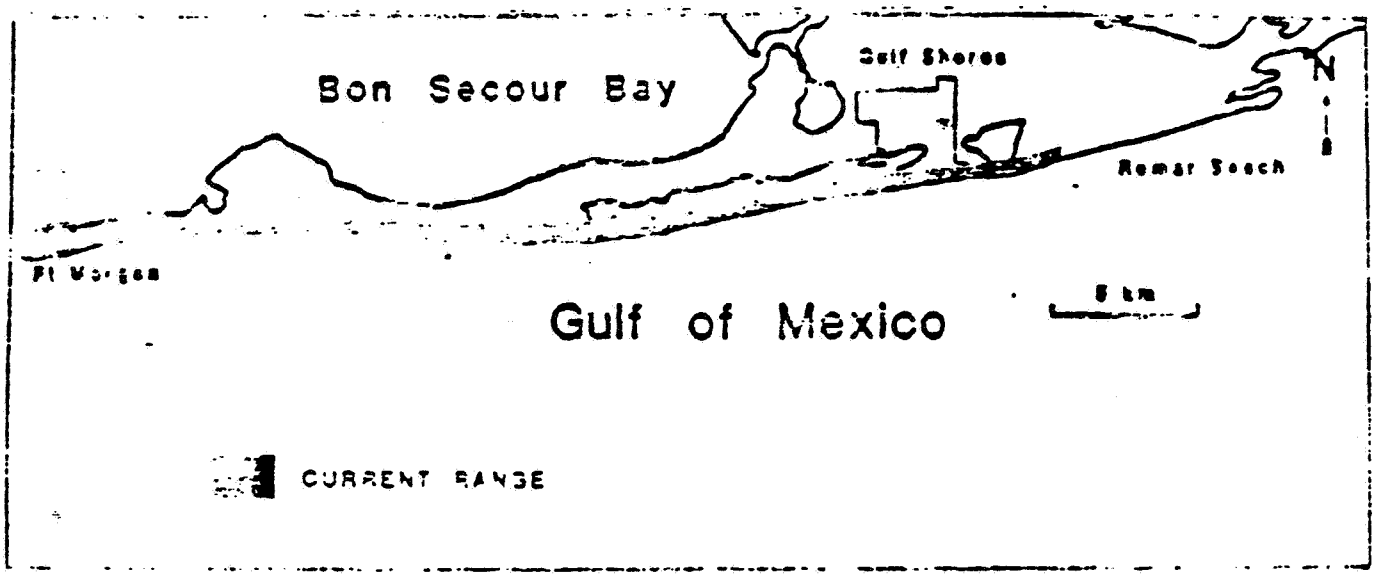
The SFGS has been documented at Laguna Salada, a cattail-lined pond at the Sharp Park Golf Course. Barry (1978) reported observing a total of two snakes here, in 350 man-hours of search effort. He attributed the seemingly low abundance of the population to heavy human use (i.e., golfers) around extant 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).

518

87

RANGE MAP

ALABAMA BEACH MOUSE



2/85

519

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.

Conservaton 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

520

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,

Stephen W. Penny

ACTING Regional Director