United States
Environmental Protection
Agency

Office of Prevention, Pesticides
and Toxic Substances
(7501C)

PESTICIDE FACT SHEET

Name of Chemical: **DIMETHOMORPH**
Reason for Issuance: **New Pesticide Registration**
Date Issued: **September 30, 1998**

DESCRIPTION OF CHEMICAL

Generic Name:	(E,Z) 4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)-1-oxo-2-propenyl]morpholine
Common Name:	Dimethomorph
Trade Names/EPA Reg. Nos.:	Acrobat® Fungicide Technical/241-382 Acrobat® MZ Fungicide/241-383 Acrobat® WDG Fungicide/241-395
EPA Chemical Code:	268800
Chemical Abstracts Service (CAS) No:	110488-70-5
Year of Initial Registration:	1998
Pesticide Type:	Systemic Morpholine Fungicide
U.S. Producer:	American Cyanamid Company

USE PATTERNS AND FORMULATIONS

Application Sites: Dimethomorph is a systemic morpholine fungicide for use on potatoes. Its mode of action is the inhibition of sterol (ergosterol) synthesis. Morpholines are all systemic with curative and preventative qualities. Dimethomorph was developed for downy mildews, late blights, crown and root rots for grapes, potatoes, tomatoes, and other vegetables. Time-limited tolerances (in conjunction with Section 18 requests) are also established under 40 CFR §180.493 for residues of the fungicide dimethomorph in or on various raw agricultural commodities (RAC's) including cantaloupes, cucumbers, potatoes, squash, tomatoes, and watermelons.

Formulation Types:

98.98% dimethomorph	Solid powder
9.00% dimethomorph + 60% mancozeb	Water-dispersible granules
9.00% dimethomorph + 60% mancozeb	Wettable powder

Application Types and Methods: Ground and aerial application and through sprinkler irrigation systems (center-pivot, lateral move, side (wheel) roll and solid set), or hand-move irrigation systems.

Application Rates: A maximum of five applications at a rate of 2.25 lb. per acre of formulated product (0.2 lb. dimethomorph active ingredient per acre) per season.

Carrier: Water

SCIENCE FINDINGS

Summary Science Statements

A tolerance is established for residues of the fungicide dimethomorph [(E,Z) 4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)-1-oxo-2-propenyl]morpholine] in or on potatoes at 0.05 ppm and potatoes, wet peel at 0.25 ppm. Based upon a battery of acute toxicity studies, dimethomorph technical is relatively non-toxic when administered acutely to laboratory animals and is classified as Toxicity Category III. EPA determined a reference dose (RfD) of 0.1 mg/kg/day based on the NOAEL of 11 mg/kg/day from the rat oncogenicity study and was supported by similar results in the rat chronic dietary study in which there were significant body weight decrement and liver effects in female rats at the LOAEL of 46.3 mg/kg/day. An uncertainty factor (UF) of 100 which was applied to account for both the interspecies extrapolation and the intraspecies variability. EPA has classified dimethomorph as "not likely to be a human carcinogen" based on no increased incidence of neoplasms in the rat chronic or carcinogenicity studies or in the mouse carcinogenicity study.

The toxicology data on dimethomorph provides no indication of enhanced sensitivity of infants and children based on the results from developmental studies conducted with rats and rabbits as well as a two-generation reproduction study conducted with rats. In neither the rat developmental toxicity study nor in the two-generation study were any toxic effects observed at doses lower than in the parents. No developmental toxicity was demonstrated in the rabbit developmental toxicity study. EPA determined that the 10x factor to account for enhanced sensitivity of infants and children be removed based on the available hazard and exposure data and the following considerations: 1) The developmental and reproductive toxicity data did not indicate increased susceptibility of rats or rabbits to in utero and/or postnatal exposure to dimethomorph; 2) The dietary (food only) exposure assessment did not indicate a concern for potential risk to infants and children as unrefined field study data were used, resulting in an overestimate of dietary exposure; 3) A worst case modeling scenario to compensate for the uncertainties in the environmental fate data base resulted in drinking water levels of

dimethomorph which were less than EPA's level of concern; 4) There are currently no registered residential uses for dimethomorph.

Chronic dietary (food only) exposure estimates for dimethomorph do not exceed EPA's level of concern. The most highly exposed population subgroup was children age 1 to 6 years old at 4 percent of the chronic RfD. In conducting the chronic dietary risk assessment, EPA made very conservative assumptions: that all commodities having dimethomorph tolerances will contain residues of dimethomorph, and that these residues will be at the level of the tolerance. This results in an overestimate of human dietary exposure.

The predicted dimethomorph surface and ground water concentrations are well below EPA's drinking water level of concern (DWLOC). EPA used the SCI-GROW (Screening Concentration In Ground Water) model to estimate the Estimated Environmental Concentration (EEC) of dimethomorph residues in ground water. The reported EEC for dimethomorph residues using SCI-GROW is 0.26 ppb. EPA used the Generic Estimated Environmental Concentration (GENEEC) model to estimate acute and chronic EECs of dimethomorph residues in surface water. The GENEEC model estimated that, with the present use pattern, surface water concentrations of dimethomorph ranged from a peak of 28 ppb to a 56 day concentration of 24 ppb. EPA's level of concern for chronic exposure to residues of dimethomorph range from 960 ppb for children 1-6 years old to 3400 ppb for the US population and males 13 years and older. Therefore, exposure from water is below EPA's level of concern for all of the populations examined. In addition, the aggregate (food and water) chronic exposure for infants, children and adults does not exceed EPA's level of concern and adverse health effects from chronic exposure to dimethomorph in food and water are not expected in these populations.

The risk assessment evaluated occupational risk to workers who could be exposed to dimethomorph through simultaneous dermal and inhalation exposure. Agricultural workers evaluated in this analysis include ground mixer/loaders, ground applicators, aerial mixer/loaders and aerial applicators. The dermal and inhalation short-term margin of exposure (MOE) ranged from 1,200 for aerial mixer/loaders using the wettable powder (WP) to 190,000 for aerial applicators. The intermediate-term MOEs range from 290 for aerial mixer/loaders using WP to 47,000 for aerial applicators. Exposure from post-application of dimethomorph resulted in MOEs ranging from 23,000 for short-term to 5,800 for intermediate-term. None of these MOEs exceed EPA's level of concern (i.e., acceptable MOE > 100) for occupationally exposed workers. Therefore, these workers are unlikely to experience adverse health effects under the conditions evaluated.

No residential uses are requested in this petition, nor does dimethomorph have any registered residential uses; therefore, the risk assessment does not evaluate residential dermal or inhalation exposures.

EPA has concluded that residue data submitted in support of the tolerance for imported potatoes indicate that a tolerance level of 0.05 ppm and 0.25 ppm for potatoes, wet peel are adequate levels for domestic potatoes. A review of domestic field trial data indicates that dimethomorph

residues do not pose an adverse health risk to humans under the use conditions. Therefore, EPA has no objection to the establishment of tolerances of 0.05 ppm in or on potatoes and 0.25 ppm for potatoes, wet peel for residues of the fungicide dimethomorph [(E,Z) 4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)-1-oxo-2-propenyl]morpholine] under 40 CFR 180.493.

Chemical Characteristics of Dimethomorph Technical and Formulations			
STUDY NAME	**ACROBAT TECHNICAL**	**ACROBAT MZ**	**ACROBAT WDG**

Empirical Formula	**$C_{20}H_{22}ClNO_4$**	**$C_{20}H_{22}ClNO_4$**	**$C_{20}H_{22}ClNO_4$**
Molecular Weight	**375.9**		
Color	**Colorless - Grey**		
Physical State	**Crystalline solid**	**Solid**	**Solid**
Odor	**Odorless**		
Melting Point	**125 - 149 °C**		
Density	**1.318 g/cm^3 at 20°C (pycnometer method)**	**22.69 lbs./cu. ft.**	**40.2 lbs./cu. ft.**
Solubility	**Solvent — Solubility at 20°C** **water, pH 5 — 19 mg/L** **water, pH 7 — 18 mg/L** **water, pH 9 — 16 mg/L** **n-hexane — 0.11mg/mL** **methanol — 39 mg/mL** **ethyl acetate — 48.3 mg/mL** **toluene — 49.5 mg/mL** **acetone — 100 mg/mL** **dichloromethane — 461 mg/mL**		
Vapor Pressure	**E-isomer: 9.7 x 10^{-7} Pa at 25°C** **Z-isomer: 1.0 x 10^{-6} Pa at 25°C**		
Dissociation Constant	**Not determinable (the solubility of dimethomorph is very low, and the ionized and unionized forms have identical absorption coefficients)**		
Octanol/Water Partition	**E-isomer: K_{ow}=430 (log K_{ow}=2.63 at 20°C** **Z-isomer: K_{ow}=543 (log K_{ow}=2.73 at 20°C**		
pH	**Not applicable - not soluble in water**	**6.89 (2% solution)**	**6.80 (2% solution)**
Stability	**Thermally and hydrolytically stable**		
Oxidizing or Reducing Action	**Dimethomorph was determined to have oxidizing properties in the sense that it can**		**Some reaction with potassium**
Flammability	**Not flammable because it could not be ignited with a flame**	**Not Applicable**	**Not Applicable**
Explodability	**When exposed to thermal and mechanical stress, no reaction was observed, therefore it was concluded that dimethomorph is not explosive under conditions of the test.**	**Not Applicable**	**Not explosive**
Storage Stability	**Stable after 1 year of storage at 25°C in fiber drums lined with a polypropylene plastic liner. The percent compositional change was <1%. The E/Z isomer ratio was stable. Packaging material remained unchanged. Dimethomorph is chemically stable when stored at 54°C for 14 days. Decomposition of the test substance was found to be <1%.**	**Not Required**	**Data gap - study in progress**
Viscosity/	**Not applicable - dimethomorph is a solid**	**Not Applicable**	**Not Applicable**

Corrosion Characteristics	**See comments under Storage Stability**	**Not corrosive**	**Not corrosive**

Toxicology Characteristics of Dimethomorph

Acute Toxicity for Acrobat Fungicide Technical		
Acute Toxicity Study	**Results**	**Toxicity Category**
Acute Oral - Rats	**LD_{50} = 3900 (3300-4500) mg/kg (M,F)**	**III**
Acute Oral - Mice	**LD_{50} =M>5000 mg/kg=F3699 (2402-7927) mg/kg**	**IV**
Z-isomer Acute Oral - Rats	**LD_{50}≥5000 mg/kg (M,F)**	**IV**
E-isomer Acute Oral - Rats	**LD_{50}=5000 mg/kg (F)5000 mg/kg (M)**	**IV**
Acute Dermal	**LD_{50}≥2000 mg/kg**	**III**
Acute Dermal	**LD_{50} ≥5000 mg/kg**	**IV**
Acute Inhalation	**LC_{50} ≥4.24 mg/L**	**III**
Primary Eye Irritation	**Conjunctival irritation clearing in 4 days**	**III**
Primary Eye Irritation	**Grade I irritation clearing in 48 hrs**	**IV**
Primary Skin irritation	**Grade I irritation at abraded skin sites only, clearing by Day 2**	**IV**
Primary Skin Irritation	**No irritation reported**	**IV**
Dermal Sensitization	**Negative in the Magnusson procedure**	**Not a sensitizer**

Acute Toxicity for Acrobat MZ Fungicide		
Acute Toxicity Study	**Results**	**Toxicity Category**
Acute Oral - Rats	**LD_{50} = 3900 (3300-4500) mg/kg (M,F)**	**III**
Acute Oral - Mice	**LD_{50} =M>5000 mg/kg=F3699 (2402-7927) mg/kg**	**IV**
Z-isomer Acute Oral - Rats	**LD_{50}≥5000 mg/kg (M,F)**	**IV**
E-isomer Acute Oral - Rats	**LD_{50}=5000 mg/kg (F)5000 mg/kg (M)**	**IV**
Acute Dermal	**LD_{50}≥2000 mg/kg**	**III**

Acute Dermal	**LD_{50} ≥5000 mg/kg**	**IV**
Acute Inhalation	**LC_{50} ≥4.24 mg/L**	**III**
Primary Eye Irritation	**Conjunctival irritation clearing in 4 days**	**III**
Primary Eye Irritation	**Grade I irritation clearing in 48 hrs**	**IV**

Acute Toxicity for Acrobat MZ Fungicide		
Primary Skin irritation	**Grade I irritation at abraded skin sites only, clearing by Day 2**	**IV**
Primary Skin Irritation	**No irritation reported**	**IV**
Dermal Sensitization	**Negative in the Magnusson procedure**	**Not a sensitizer**

Acute Toxicity for Acrobat WDG Fungicide		
Acute Toxicity Study	**Results**	**Toxicity Category**
Acute Oral - Rats	**LD_{50} = 3900 (3300-4500) mg/kg (M,F)**	**III**
Acute Oral - Mice	**LD_{50} =M>5000 mg/kg=F3699 (2402-7927) mg/kg**	**IV**
Z-isomer Acute Oral - Rats	**LD_{50}≥5000 mg/kg (M,F)**	**IV**
E-isomer Acute Oral - Rats	**LD_{50}=5000 mg/kg (F)5000 mg/kg (M)**	**IV**
Acute Dermal	**LD_{50}≥2000 mg/kg**	**III**
Acute Dermal	**LD_{50} ≥5000 mg/kg**	**IV**
Acute Inhalation	**LC_{50} ≥4.24 mg/L**	**III**
Primary Eye Irritation	**Conjunctival irritation clearing in 4 days**	**III**
Primary Eye Irritation	**Grade I irritation clearing in 48 hrs**	**IV**
Primary Skin irritation	**Grade I irritation at abraded skin sites only, clearing by Day 2**	**IV**
Primary Skin Irritation	**No irritation reported**	**IV**
Dermal Sensitization	**Negative in the Magnusson procedure**	**Not a sensitizer**

Subchronic Toxicity: In the 90-day rat feeding study, technical grade dimethomorph (98.7 % a.i.) was administered in the diet to groups of 10 male and 10 female Charles River CD Sprague-Dawley rats at concentrations of 0, 40, 200, or 1000 ppm (0, 2.9, 14.2, or 73 mg/kg/day for male rats, and 0, 3.2, 15.8, or 82 mg/kg/day for female rats, respectively) for 13 weeks, 4 days. A Lowest Observed Adverse Effect Level (LOAEL) was not established because the highest dose tested produced no biologically significant effects. The No Observed Adverse Effect Level (NOAEL) is >1000 ppm (73 mg/kg/day for males, and 82 mg/kg/day for females).

In the 90-day dog feeding study, dimethomorph (technical, 96.6% a.i.) was administered to four male and four female Beagle dogs/dose group in the diet at concentrations of 0, 150, 450, or 1350 ppm (equivalent to doses of 0, 5, 15 or 43 mg/kg/day for males, and 0, 6, 15 or 44 mg/kg/day for females) for 13 weeks. Prostate fibrosis occurred in all four of the high-dose males but not in any other male. Clinical signs were limited to intermittent incidences of salivation, lip-licking, tremors, and subdued behavior; these signs were more prevalent in the 150 and 1350 ppm groups but were not considered of toxicologic significance. The critical toxic effect appeared to be a significant decrease in the mean absolute and relative prostate weights of the high-dose (1350 ppm) male dogs relative to untreated controls. Therefore, based upon a decrease in the absolute and relative weights of the prostate and possible threshold liver effects(increased alkaline phosphatase activity at weeks 6 and 13), the LOAEL is 1350 ppm (43 mg/kg/day). The NOAEL is 450 ppm (15 mg/kg/day).

Chronic Toxicity: In the rat study, the LOAEL for systemic toxicity was 750 ppm (57.7 mg/kg/ day) for female rats based on decreased body weight and significant increase in the incidence of "ground glass" foci in the liver and 2000 ppm (99.9 mg/kg/day) for male rats based on decreased body weight and increased incidence of arteritis. The corresponding NOAEL's are 200 ppm (11.9 mg/kg/day) for females, and 750 ppm (36.2 mg/kg/day) for males.

In the dog study at 1350 ppm, ALK phosphatase activity was increased throughout the study in both sexes (245% males, 310% females). The LOAEL for systemic toxicity is 1350 ppm, based on decreased prostate weight in males. The NOAEL was 450 ppm.

Carcinogenicity: In the rat study, dimethomorph had no significant effect on the development of neoplasms in male or female rats at the doses tested. Dimethomorph was tested at adequate doses based on significant decreases in body weight (17% and 13%) and body weight gains (27% and 14%) in females and males, respectively, in the high dose groups. The LOAEL for systemic toxicity was 2000 ppm in males and 750 ppm in females. The NOAEL's were 750 ppm (33.9 mg/kg/day) for males and 200 ppm (11.3 mg/kg/day) for females.

In the mouse study, there were no treatment-related increases in the incidence of any neoplastic lesions. The chemical was adequately tested based on decreased body weight gain (17% and 22% less than control in males and females respectively at 1000 mg/kg/day). The NOAEL for systemic toxicity was 100 mg/kg/day.

Reproductive Toxicity: In the rat study, the maternal LOAEL = 160 mg/kg/day, based on

decreased mean body weight on gestation days 10-15; decreased body weight gain on gestation days 10-15, decreased food consumption days 6-15; Maternal NOAEL = 60 mg/kg/day; the developmental LOAEL = 160 mg/kg/day based on increased resorptions; and the developmental NOAEL = 60 mg/kg/ day.

In the rabbit study, the maternal LOAEL = 650 mg/kg/day based on decreased body weights and body weight gain; the maternal NOAEL = 300 mg/kg/day. No developmental toxicity was observed in this study. The developmental NOAEL = 650 mg/kg/day.

In the 2-generation rat reproduction study, the parental toxicity LOAEL = 1000 ppm based on decreased body weights and body weight gain; the parental NOAEL = 300 ppm (20.8 mg/kg/ day for males; 24 mg/kg/day for females); the developmental toxicity LOAEL = 1000 ppm based on delayed incisor eruption at day 10 postpartum; the developmental toxicity NOAEL = 300 ppm; and the reproductive toxicity NOAEL = 1000 ppm (69 mg/kg/day for males; 79.3 mg/kg/ day for females).

Mutagenicity: The studies indicate that dimethomorph did not cause gene mutations in Salmonella or E. Coli bacterial strains, as well as in mammalian gene mutation studies. It was negative for structural chromosomal aberrations in the mouse micronucleus assay at up to 5000 mg/kg after oral treatment, and up to 200 mg/kg when administered i.p. However, dimethomorph gave positive responses when tested in CH lung and in human lymphocytes. It was negative in the cell transformation assay in Syrian hamster embryo cells with and without activation at up to cytotoxic levels.

Dermal Penetration: Radio-labeled ^{14}C-dimethomorph(97.6%; labeled in the chlorophenyl ring) was administered dermally to 4 male SD rats/group in water for 8 hours at doses of 7.73 (2.5% w/v aqueous suspension) or 79.62(25% w/v aqueous suspension)mg/kg. Dermal absorption was 0.05%, 0.07% and 0.27% of the administered dose from rats 4, 8, and 24 hours after dermal treatment at 7.73 mg/kg, and 0.02%, 0.16% and 0.12% of the dose at 79.62 mg/kg. Six days after treatment the percent total absorption of the dose in the 7.73 and 79.62 mg/kg was 4.76 and 1.20 percent respectively. Mean percent recovery of the ^{14}C for dose levels of 7.73 and 79.62 mg/kg was 104.1% and 92.1%, respectively.

Neurotoxicity: There are no acute, subchronic, or developmental neurotoxicity studies available in the data base for dimethomorph. However, in none of the subchronic, chronic, developmental, or reproduction studies was there any indication that the nervous system was affected by administration of dimetho-morph. No evidence of neurotoxicity was observed in the available data base.

General Metabolism: Rat Oral administration of dimethomorph (10 mg/kg single dose; 10 mg/kg 14-day repeated dose; 10 mg/kg 7-day repeated dose; 500 mg/kg single dose) results in rapid excretion into the urine and feces of rats. For all treatment protocols, most (80-90%) of the radiolabel administered was excreted in the feces. A considerably smaller amount (6-16%) was excreted in the urine and only minimal levels (0.1-0.4%) were detected in the organs and tissues.

Rapid absorption may be inferred by the rapid excretion of metabolites in the urine and bile. Saturation of absorption following single high doses (500 mg/kg) was indicated by large amounts (≈50%) of radioactivity in the feces being associated with parent compound. For low- or high-dose treatment, urinary excretion in female rats tended to be greater (up to 2-fold in low-dose rats) than that of male rats. Retention of dimethomorph or ^{14}C-dimethomorph-derived radioactivity was generally ≤1% for most tissues although the liver exhibited slightly higher levels (1.4%) and higher levels in the gastrointestinal tract organs were due to radioactivity in the lumenal contents. Urinary metabolites resulted from demethylation of the dimethoxyphenyl ring and oxidation of the morpholine ring. Biliary excretion exhibited first-order kinetics with a low-dose (10 mg/kg) half-life of approximately three hours and a high-dose (500 mg/kg) half-life of 11 hours for males and about 6 hours for females. Biliary metabolites accounted for most of the fecal excretion following low-dose treatment. The major biliary metabolites were glucuronides of one and possibly two of the compounds produced by demethylation of the dimethoxyphenyl ring. The report provided a proposed metabolic pathway for dimethomorph.

Environmental Characteristics

The available environmental fate data for dimethomorph indicates that it is: moderately mobile in Swiss and standard German soils (Kd 2.09 - 11.67 mL/g and K_{oc} values were 290 - 566); microbial metabolism is the primary route of dissipation; moderately persistent with aerobic soil metabolism half-lives of 66 and 117 days in two soils; and no aerobic soil metabolism degradates were identified other than small amounts of $^{14}CO_2$; stable to hydrolysis at pH 4, 7 and 9 when incubated for 10 weeks at 70 and 90°C. As dimethomorph degraded, most of the radioactivity was not extracted from the soil. Although it appears that dimethomorph will degrade in anaerobic aquatic and terrestrial systems, additional data are required to confirm the rates because the submitted studies had additional carbon sources which may have significantly accelerated the degradation rates. A pair of isomers of mono-desmethyl dimethomorph were isolated and identified as primary intermediates for the anaerobic studies. Dimethomorph did not hydrolyze or photo degrade in the submitted studies.

Ground Water Assessment: The SCI-GROW2 (Screening Concentration In Ground Water) estimated that ground water concentrations of dimethomorph are not expected to exceed 0.26 ppb when it is applied at the maximum recommended application rate of 0.20 lbs. active ingredient per acre per application with a maximum of five applications. This estimate is determined primarily by dimethomorph's Freundlich K_{oc} value of 402 used in the model with inputs from supplemental studies and no monitoring data were used.

Surface Water Assessment: The GENEEC (Generic Estimated Environmental Concentration) model is a tier one screening model for aquatic pesticide exposure and is used to estimate surface water concentrations of dimethomorph. Dimethomorph is applied at the maximum recommended application rate of 0.20 lbs. a.i./acre with a maximum of five applications. The application methods for dimethomorph are by chemigation or by ground or aerial application. The model was run considering an aerial application for a worst case drift scenario with the following predicted surface water concentrations of dimethomorph: Peak value (acute) =

27.7μg/L; average 4-day = 27.48μg/L; average 21-day = 26.25μg/L; average 56-day (chronic) = 24.40μg/L. Refined surface water modeling (PRZM/EXAMS) was not requested for the use on potatoes due to the low toxicity to aquatic animals and to the relatively high drinking water level of concern for dimethomorph used in the drinking water assessment.

Drink Water Assessment: There is no established Maximum Contaminant Level for dimethomorph in drinking water. No health advisory levels have been established for residues of dimethomorph in drinking water. The predicted dimethomorph surface and ground water concentrations are well below EPA's drinking water level of concern (DWLOC). EPA used the SCI-GROW (Screening Concentration In Ground Water) Model to estimate the Estimated Environmental Concentration (EEC) of dimethomorph residues in ground water. The reported EEC for dimethomorph residues using SCI-GROW is 0.26 ppb. EPA used GENEEC (Generic Estimated Environmental Concentration) model to estimate acute and chronic EECs of dimethomorph residues in surface water. The GENEEC model estimated that, with the present use pattern, surface water concentrations of dimethomorph ranged from a peak of 28 ppb to a 56 day concentration of 24 ppb. EPA's level of concern for chronic exposure to residues of dimethomorph range from 960 ppb for children 1-6 years old to 3400 ppb for the U.S. population and males 13 years and older. Therefore, exposure from water is below EPA's level of concern for all of the populations examined.

Ecological Characteristics

The available toxicity data for dimethomorph indicate that it is: practicaly nontoxic to birds on an acute oral basis (LD_{50}>2,000 mg/kg) and on a subacute dietary basis (LC_{50}>5,300 ppm); practically nontoxic to mammals based on a rat study (LD_{50}=3,600 mg/kg); practically nontoxic to honey bees ((LD_{50}>50 μg/bee); moderately toxic on an acute basis to rainbow trout fish (LC_{50} of 1.5 to 6.2 ppm); slightly toxic to estuarine fish (LC_{50} =11.3 ppm); moderately toxic to estuarine invertebrates (EC_{50} =5.13 ppm for mollusks and 33 ppm for mysid shrimp.

The available toxicity data for Acrobat® (dimethomorph + mancozeb) shows the mixture is: very highly toxic to freshwater fish with a (LC_{50} =0.03 ppm dimethomorph concentrations and 0.26 ppm mancozeb); very highly toxic to highly toxic to freshwater invertebrates (LC_{50} =0.08 ppm dimethomorph and 0.73 ppm mancozeb in one supplemental study and LC_{50} =0.41 ppm dimethomorph and 2.8 ppm mancozeb in a second supplemental study). The concentrations at which LC_{50} values for Acrobat® components were determined based on the proportion of measured dimethomorph and mancozeb. Evaluation of the acute toxicity of Acrobat® to fish indicates that the LC_{50} for dimethomorph would be 0.03 ppm if the toxicity of mancozeb, dimethomorph and the inert ingredients is equal. Based on the LC_{50} value for rainbow trout, however, ranging from 1.5 to 6.2 ppm, it appears as though acute toxicity can be attributed primarily to mancozeb or to synergistic effects from dimethomorph and mancozeb combination.

To estimate risk, data on toxicity of dimethomorph were combined with data on exposure. An evaluation of the potential risk to nontarget organisms from the use of dimethomorph indicates low risks to most non-target organisms. Risk quotients for avian organisms were estimated for

four scenarios distinguished by categories of food items that birds eat: short grass, tall grass, broadleaf plants and fruits. The chronic LOC trigger for multiple broadcast applications of dimethomorph is marginally exceeded under the short grass scenario if no degradation is assumed. Avian chronic risk quotients based on average residues for multiple, broadcast applications of non-granular products did not exceed the LOC. There is a slight chronic risk to birds from use of dimethomorph.

SUMMARY OF REGULATORY POSITION AND RATIONALE

Available data provide adequate information to support the conditional registration of dimethomorph as a technical product (Acrobat Fungicide Technical) and for the two formulations (Acrobat MZ and Acrobat WDG) for use in or on potatoes at 0.05 ppm and potatoes, wet peel at 0.25 ppm.

SUMMARY OF DATA GAPS

The following data are required to confirm the information submitted in previous studies: 72-1A Acute Fish - Bluegill, 72-2A Acute Aquatic Invertebrate, 72-4A/B Freshwater and Estuarine Fish Early Life Stage, 72-4B Estuarine Aquatic Invertebrate Life Cycle, 162-2 Anaerobic Soil Metabolism, 162-3 Anaerobic Aquatic Metabolism, Aerobic Aquatic Metabolism, 163-1 Mobility, 164-1 Terrestrial Field Dissipation, 165-1 Confined Rotational Crops, 165-2 Field Rotational Crops - Wheat (Reserved pending results of confined rotational crop studies), and 165-4 Bioaccumulation in Fish.

Because the potential for synergistic effects between dimethomorph and mancozeb are not clear, the registrant must (1) submit the following studies on the typical end-use product (TEP): 71-1A/B Acute Avian Oral - Quail/Duck, 71-2A/B Acute Avian Diet - Quail/Duck, 71-4A/B Avian Reproduction - Quail/Duck, 72-1B Acute Fish Bluegill, 72-3D/E/F Acute Estuarine/Marine Toxicity - Fish/Mollusk/Shrimp, 72-4B Estuarine Aquatic Invertebrate Life Cycle, and 72-5 Freshwater Life Cycle Fish, or (2) submit or reference acceptable mancozeb studies as would be required to support this use pattern and provide a rationale for why TEP testing would not be necessary, i.e., why the potential for synergistic effects should not be considered a factor.

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