Proposed Re-evaluation Decision PRVD2019-03

Dimethomorph and Its Associated End-use Products

Consultation Document

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Proposed Re-evaluation Decision

Under the authority of the *Pest Control Products Act*, all registered pesticides must be regularly re-evaluated by Health Canada's Pest Management Regulatory Agency (PMRA) to ensure that they continue to meet current health and environmental safety standards and continue to have value. The re-evaluation considers data and information from pesticide manufacturers, published scientific reports, and other regulatory agencies. Health Canada applies internationally accepted risk assessment methods as well as current risk management approaches and policies.

Dimethomorph is a commercial fungicide registered for the management of disease in various vegetable and fruit crops, ginseng, and ornamentals grown under field and greenhouse conditions.

This document presents the proposed regulatory decision for the re-evaluation of dimethomorph including the proposed risk mitigation measures to further protect human health and the environment, as well as the science evaluation on which the proposed decision was based. All products containing dimethomorph registered in Canada are subject to this proposed re-evaluation decision. This document is subject to a 90-day public consultation period during which the public, including the pesticide manufacturers and stakeholders, may submit written comments and additional information to the PMRA Publications Section. The final re-evaluation decision will be published taking into consideration the comments and information received.

Outcome of Science Evaluation

Dimethomorph is important for the management of potato late blight tuber rot, and sudden oak death on many high value outdoor, container and field grown ornamental plants in nurseries and landscape plantings, especially considering the limited number of registered alternatives for these diseases. Due to its protectant and antisporulant activity, and lower risk for resistance development, dimethomorph is valued as a rotational product in disease management programs.

With respect to human health, risks are considered to be acceptable for all dimethomorph uses when used according to the proposed revised label directions.

Dimethomorph enters the environment when used to control moulds on a variety of agricultural food and feed crops and outdoor ornamentals, or when it is present in water discharges from use in greenhouses. When used according to the proposed label directions, environmental risks associated with the use of dimethomorph were determined to be acceptable.

Proposed Regulatory Decision for Dimethomorph

Under the authority of the *Pest Control Products Act* and based on the evaluation of currently available scientific information, Health Canada is proposing that products containing dimethomorph are acceptable for continued registration in Canada, provided that the required risk mitigation measures are in place.

Registered pesticide product labels include specific directions for use. Directions include risk mitigation measures to protect human health and the environment that must be followed by law.

As a result of the re-evaluation of dimethomorph, further risk mitigation measures are being proposed.

Human Health

To protect mixer/loader/applicators, updated statements for personal protective equipment (PPE) to reflect current standards are required; a label restriction against applications as a mist or fog will also be added.

To protect workers entering treated sites, updated restricted-entry intervals (REIs) are proposed for certain agricultural uses.

To protect bystanders from spray drift, a statement is proposed to promote best management practices in order to minimize human exposure.

Residue Definition for Enforcement:

- The residue definition for the dietary risk assessment and enforcement is expressed as the parent compound, ethyl 2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl)amino]carbonyl]amino] sulfonyl] benzoate for all food commodities. No change to the residue definition is proposed.

Environment

To protect the environment:

- Hazard statements on the label to inform the user that dimethomorph is toxic to aquatic organisms,

- Buffer zones to mitigate the risk of exposure to non-target aquatic organisms,
- A label statement to inform the user to not discharge dimethomorph-contaminated effluent from greenhouses into aquatic environments,
- A label statement informing users of ways to reduce the potential for runoff; and
- A label statement indicating dimethomorph may leach to groundwater.

International Context

Dimethomorph is currently acceptable for use in other Organisation for Economic Co-operation and Development (OECD) member countries, including the European Union, the United States and Australia.

No decision by an OECD member country to prohibit all uses of dimethomorph for health or environmental reasons has been identified.

Next Steps

The public, including registrants and stakeholders, are encouraged to submit comments during the 90-day public consultation period[1] upon publication of this proposed re-evaluation decision.

All comments received during the 90-day public consultation period will be taken into consideration in preparation of re-evaluation decision document,[2] which could result in revised risk mitigation measures. The re-evaluation decision document will include the final re-evaluation decision, the reasons for it and a summary of comments received on the proposed re-evaluation decision with Health Canada's responses.

Additional Scientific Information

- None

1 "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

2 "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

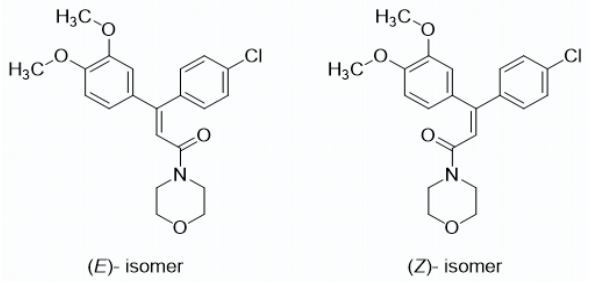
Science Evaluation

1.0 Introduction

Dimethomorph is a locally systemic fungicide with protectant and antisporulant activity. Its mode of action, classified as a Group 40 by the Fungicide Resistance Action Committee, acts by inhibiting fungal cell wall biosynthesis. Appendix I, Table 1 lists all dimethomorph products that are currently registered under the authority of the *Pest Control Products Act* as of 7 January 2019. Appendix I, Table 2 lists all commercial uses for which dimethomorph is registered. All uses were supported by the registrant at the time of re-evaluation initiation and were therefore considered in the health and environmental risk assessments of dimethomorph.

2.0 Technical Grade Active Ingredient

2.1 Identity

Common name	Dimethomorph
Function	Fungicide
Chemical Family	Cinnamamide
Chemical name	
1 International Union of Pure and Applied Chemistry (IUPAC)	(*EZ*)-4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)acryloyl]morpholine
2 Chemical Abstracts Service (CAS)	4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)-1-oxo-2-propen-1-yl]morpholine
CAS Registry Number	110488-70-5
Molecular Formula	$C_{21}H_{22}ClNO_4$
Structural Formula	 (*E*)- isomer (*Z*)- isomer
Molecular Weight	387.9
Purity of the Technical Grade Active Ingredient	98%
Registration Number	24545

2.2 Physical and Chemical Properties

Property	Result
Vapour pressure at 25°C	(E)-isomer = 0.00097 mPa (Z)-isomer = 0.001 mPa
Ultraviolet (UV) / visible spectrum	No absorbance at λ >300 nm
Solubility in water at 20-25°C	49.2 mg/L (pH 7)
n-Octanol/water partition coefficient	(E)-isomer: log K_{ow} = 2.63 (Z)-isomer: log K_{ow} = 2.73
Dissociation constant	N/A

3.0 Human Health Assessment

3.1 Toxicology Summary

Dimethomorph is a mixture of E- and Z-isomers in the ratio of approximately 1:1. A detailed review of the toxicological database for dimethomorph was conducted. The database is complete, consisting of the full array of toxicity studies currently required for hazard assessment purposes. The studies were carried out in accordance with accepted international testing protocols and Good Laboratory Practices. The scientific quality of the data is acceptable and the database is considered adequate to define the majority of the toxic effects that may result from exposure to dimethomorph.

Dimethomorph was well absorbed following oral gavage dosing in rats. Following a single low, single high or repeat low dose administration, radiolabelled dimethomorph was rapidly excreted, with the majority eliminated via the feces and lesser amounts via urine. No radioactivity was detected in expired air. The elimination half-life following low-dose administration was approximately 3 hours for both sexes, and following high-dose administration half-lives were 11 and 6 hours, for males and females respectively. Tissue levels were low 48 hours after administration with the highest levels found in liver and muscle. In bile-duct cannulated rats, biliary excretion declined and excretion half-life increased with increasing dose level, suggesting saturation of absorption and metabolism. The main pathways of metabolism involved demethylation of one of the methoxyl groups of the dimethoxy-phenyl ring with subsequent conjugation of the resulting metabolites before excretion in the urine and feces, and catabolism of morpholine ring. There were no sex-related differences in the metabolism of dimethomorph following single low oral dosing. Following single high-dose administration, there were minor differences in the urinary metabolite profile between the sexes. In animals given a single or repeat low dose, only an oxidative metabolite CUR 7117 (resulting from cleavage of the morpholine ring) was identified in the urine. Following a single high dose, two metabolites formed by demethylation of the dimethoxyphenyl ring (predominantly at the 4 rather than 2 position, in a ratio 9:1) were detected in the urine.

In acute studies dimethomorph was of low oral (rats and mice) and inhalation toxicity (rats), and of low dermal toxicity in the rat and rabbit. In rabbits, dimethomorph was non-irritating to the skin and minimally irritating to the eye. In guinea pigs, dimethomorph was not a dermal sensitizer. The Z- and E-isomers of dimethomorph were of similar oral acute toxicity in rats.

No treatment-related effects occurred at the limit dose of testing in a rat repeat-dose dermal toxicity study. A repeat-dose inhalation toxicity study was not available.

In short-term repeat-dose dietary toxicity studies in mice, rats and dogs, the liver was the main target organ with increased liver weights observed. Additional liver effects in rat included hyperplasia and hypertrophy of hepatocytes, liver discoloration, and clinical chemistry changes associated with liver pathology (increased serum GGT, bilirubin, decreased A/G ratio, BUN). In short-term gavage studies with pure isomers in rats, slight mid-zonal hepatocellular cytoplasmic lipid vacuolation was noted. In the dog, additional liver effects included increases in intracellular lipid and serum ALP levels. Liver effects in dogs and rats increased in incidence and or severity with increasing dose level and duration of treatment.

In supplemental rat 28-day dietary studies, digestive system effects at high dose levels included swollen abdomen, small intestine distension and acute inflammation of the ileum. These effects were not noted in other short term studies in rats at lower dose levels. Following long-term dietary exposure in rats at lower dose levels than in the 28-day studies, arteritis in abdominal/mesenteric blood vessels and dilated mesenteric blood vessels associated with arteritis were noted. In mice, dilation of villa and/or villous atrophy of the ileum were observed with longer treatment duration.

Colon inflammation was also noted in dogs following 90 days, but not 1 year, of dietary exposure at lower dose levels than in the rats. In dogs, subdued behaviour, occasional vomiting, lip licking and tremors were also noted after repeated dietary dosing. Other treatment-related effects in dogs included decreased prostate weight, prostatitis and prostate fibrosis, as well as increased testicular weight, following exposure to dimethomorph for 90days. Dogs also experienced alterations in body weight along with increased thyroid, kidney and uterine weights at higher doses.

Mild anemia occurred in rats, as indicated by decreased erythrocyte counts and hemoglobin levels, increased hepatic pallor along with increased splenic and sternal hematopoiesis, following short-term high-dose dietary exposure and in long-term studies conducted at lower dose levels.

Long-term dietary exposure to dimethomorph contributed to a decrease in body weight and reduced body weight-gain in rats and mice. Hepatic effects noted were “ground glass” foci and accumulation of pigment in hepatocytes in rats, and increased ALP and AST in mice. An increased incidence of swollen hind feet in males, and swollen hind feet and limbs in females was noted at the high dose level. Lumbar lymph node cysts in males at the high dose level, and ovarian cysts in females at mid- and high-dose levels were observed in rats. There was no evidence that dimethomorph was oncogenic. Overall, dimethomorph was considered negative for genotoxicity in a battery of in vitro and in vivo studies. Equivocal findings were noted in two in vitro chromosomal aberration studies, one in the absence of a positive control.

In a 2-generation rat dietary reproductive toxicity study, a reduction in premating body weights and body weight gain was noted at the high dose level in F_0 and F_1 dams. Dimethomorph treatment did not affect reproductive performance, fertility, gestation, litter size, sex ratio of the offspring or pup survival. Effects in offspring included an equivocal delay in tooth eruption. There was no indication of sensitivity of the young in the reproductive toxicity study.

In a rabbit gavage developmental toxicity study, a slight increased incidence of abortions was observed at the high dose level in the presence of maternal toxicity (decreased body weight gain and food consumption). A high incidence of abortions was also noted in a range-finding study at the highest dose level, which was the limit dose of testing. In a rat gavage developmental toxicity study, an increased incidence of early resorptions (total litter loss) was noted at the high dose level along with the decrease in body weights in dams. There was no evidence of treatment-related malformations in rats or rabbits and no indication of sensitivity of the young in the developmental toxicity studies.

In a rat acute neurotoxicity study, decreased motor activity, rearing and habituation were observed at the lowest dose tested. At the next higher dose level, further gait impairment and reduced exploration were noted. At the highest dose level, which was the limit dose of testing, there was an increased incidence of clinical signs and mortality. There was no evidence of selective neurotoxicity. In a rat short-term dietary neurotoxicity study, there were no treatment-related effects on mortality, clinical signs of toxicity, motor activity or neuropathology. At the highest dose level, body weight, body-weight gain, food consumption and food efficiency were reduced.

No treatment-related effects on spleen or thymus weights, or on the humoral immune response, were observed in a rat 28-day dietary immunotoxicity study.

The toxicology reference values used for human health risk assessment are summarized in Appendix II, Table 1. The results of toxicology studies conducted in laboratory animals with dimethomorph are summarized in Appendix II, Table 2.

Epidemiology

There were no epidemiological studies relevant for risk assessment purposes.

3.1.1 *Pest Control Products Act* Hazard Characterization

For assessing risks from potential residues in food or from products used in or around homes or schools, the *Pest Control Products Act* requires the application of an additional 10-fold factor to threshold effects to take into account completeness of the data with respect to the exposure of, and toxicity to, infants and children, and potential prenatal and postnatal toxicity. A different factor may be determined to be appropriate on the basis of reliable scientific data.

With respect to the completeness of the toxicity database as it pertains to the toxicity to infants and children, the standard complement of required studies were available, including gavage developmental toxicity studies in rats and rabbits, and a dietary multi-generation reproductive toxicity study in rats. A supplemental range-finding developmental toxicity study in rabbits was also available.

With respect to potential pre- and post-natal toxicity, an increased incidence of early resorptions (total litter loss) was noted in the presence of maternal toxicity in the rat developmental toxicity study, and an increased incidence of abortions was noted in the developmental toxicity study in rabbits, also in the presence of maternal toxicity. An increased incidence of abortions was also noted in a range-finding study in rabbits at the limit dose of testing. A slight delay in tooth eruption noted in F_{1a} and F_{2a} pups in a dietary 2-generation reproductive toxicity study was considered equivocal and occurred in the presence of maternal toxicity. In all these studies, maternal toxicity consisted of effects on body weight. There was no evidence of treatment-related malformations in the developmental toxicity studies and no indication of increased susceptibility of the young compared to adult animals.

Overall, the database is adequate for determining the sensitivity of the young and effects on the young are well-characterized. Fetal death noted in the rat developmental toxicity study was considered a serious endpoint for which concern was tempered by the presence of maternal toxicity. Therefore, the 10-fold *Pest Control Products Act* factor (PCPA factor) was reduced to 3-fold for scenarios in which this endpoint was used to establish the point of departure for assessing risk. This endpoint is considered protective of the abortions in the rabbit and the equivocal developmental delays in rat offspring. For all other exposure scenarios the risk was considered well-characterized and the PCPA factor was reduced to onefold.

3.2 Dietary Exposure and Risk Assessment

In a dietary exposure assessment, the PMRA determines how much of a pesticide residue may be ingested with the daily diet. Exposure to dimethomorph from potentially treated imported foods is also included in the assessment. Dietary exposure assessments are age-specific and incorporate the different eating habits of the population at various stages of life (infants, children, adolescents, adults and seniors). For example, the assessments take into account differences in children's eating patterns, such as food preferences and the greater consumption of food relative to their body weight when compared to adults. Dietary risk is then determined by the combination of the exposure and the toxicity assessments. High toxicity may not indicate high risk if the exposure is low. Similarly, there may be risk from a pesticide with low toxicity if the exposure is high.

The PMRA considers limiting use of a pesticide when exposure exceeds 100% of the reference dose. In its science policy note, SPN2003-03 *Assessing Exposure from Pesticides: A User's Guide*, the PMRA presents detailed acute, chronic and cancer risk assessment procedures.

Sufficient information was available to adequately assess the dietary risk from exposure to dimethomorph. Acute and chronic dietary exposure and risk assessments were conducted using the Dietary Exposure Evaluation Model - Food Commodity Intake Database™ (DEEM-FCID™, Version 4.02, 05-10-c) program, which incorporates consumption data from the National Health and Nutrition Examination Survey, What We Eat in America 2005-2010 available through the Centers for Disease Control and Prevention's National Center for Health Statistics. Further details on the consumption data are available in the Science Policy Note, SPN2014-01 *General Exposure Factor Inputs for Dietary, Occupational and Residential Exposure Assessments*. For more information on dietary risk estimates and the residue chemistry information used in the dietary assessment, see Appendix III.

3.2.1 Determination of Acute Reference Dose

Females 13-49 Years of Age

To estimate acute dietary risk for females 13–49 years of age, the developmental toxicity study in rats with a NOAEL of 60 mg/kg bw/day was selected. At the LOAEL of 160 mg/kg bw/day, an increased incidence of early resorptions (total litter loss) was observed. As this serious effect could result from a single dose during development, it is considered relevant to the selection of an acute reference dose (ARfD) for this sub-population. Standard uncertainty factors of 10-fold for interspecies extrapolation and 10-fold for intraspecies variability were applied. As discussed in the *Pest Control Products Act* Hazard Characterization Section, the PCPA factor was reduced to 3-fold for this scenario, thus, the composite assessment factor (CAF) is 300.

The ARfD is calculated according to the following formula:

$$\text{ARfD (females 13–49 years of age)} = \frac{\text{NOAEL}}{\text{CAF}} = \frac{60 \text{ mg/kg bw}}{300} = 0.2 \text{ mg/kg bw of dimethomorph}$$

The ARfD provides a margin of 1500 to the NOAEL of 300 mg/kg bw/day for abortions in the rabbit developmental toxicity study.

General Population (excluding females 13–49 years of age)

To estimate acute dietary risk for the general population, the acute neurotoxicity study in rats with a LOAEL of 250 mg/kg bw was selected. No NOAEL was determined, as this was the lowest dose level tested. At the LOAEL, decreased motor activity, habituation and rearing were observed. Standard uncertainty factors of 10-fold for interspecies extrapolation and 10-fold for intraspecies variability, and an additional 3-fold factor for the lack of NOAEL were applied. The PCPA factor was reduced to onefold as discussed in the *Pest Control Products Act* Hazard Characterization Section. Thus, the CAF is 300.

The ARfD is calculated according to the following formula:

$$\text{ARfD (general population)} = \frac{\text{NOAEL}}{\text{CAF}} = \frac{250 \text{ mg/kg bw}}{300} = 0.8 \text{ mg/kg bw of dimethomorph}$$

3.2.2 Acute Dietary Exposure and Risk Assessment

The acute dietary risk was calculated considering the highest ingestion of dimethomorph that would be likely on any one day, and using food and drinking water consumption and food and drinking water residue values. The expected intake of residues is compared to the ARfD, which is the dose at which an individual could be exposed on any given day and expect no adverse health effects. When the expected intake of residues is less than the ARfD, the acute dietary exposure has been shown to be acceptable.

The acute analysis was conducted assuming food residue values at Canadian MRLs or American tolerances. The percent crop treated was assumed to be 100. Drinking water contribution to the exposure was accounted for by direct incorporation of the appropriate estimated environmental

concentration (EEC), obtained from water modelling (see Section 3.3), into DEEM. DEEM default processing factors were applied. Experimental processing factors were used when values were higher than default DEEM processing factors.

The acute dietary (food and drinking water) exposure estimates at the 95th percentile were shown to be acceptable at less than or equal to 40% of the ARfD for all population subgroups.

3.2.3 Determination of Acceptable Daily Intake

To estimate risk for the general population from repeat dietary exposure, the NOAEL of 15 mg/kg bw/day from a 1-year dietary toxicity study in dogs was selected. At the LOAEL of 45 mg/kg bw/day, increased liver and testis weights, as well as decreased prostate weights were noted. The selection of this end point is supported by a NOAEL of 13 mg/kg bw/day (females) selected from the rat 2-year carcinogenicity study. At the LOAEL of 52 mg/kg bw/day (females) effects included decreased body weight and body weight gains in addition to liver toxicity. Standard uncertainty factors of 10-fold for interspecies extrapolation and 10-fold for intraspecies variability were applied. The PCPA factor was reduced to onefold as discussed in the *Pest Control Products Act* Hazard Characterization Section. Thus, the CAF is 100.

The ADI is calculated according to the following formula:

$$\text{ADI} = \frac{\text{NOAEL}}{\text{CAF}} = \frac{\text{15 mg/kg bw/day}}{100} = 0.2 \text{ mg/kg bw/day of dimethomorph}$$

The ADI provides a margin of 300 to the NOAEL of 60 mg/kg bw/day for increased early resorptions (litter loss) in the rat developmental toxicity study and a margin of 1500 to the NOAEL of 300 mg/kg bw/day for abortions in the rabbit developmental toxicity study.

3.2.4 Chronic Dietary Exposure and Risk Assessment

The chronic dietary risk was calculated using the average consumption of different foods and drinking water and the average residue values on those foods and in drinking water. The estimated exposure was then compared to the ADI. When the estimated exposure is less than the ADI, the chronic dietary exposure has been shown to be acceptable.

The chronic assessment was conducted assuming food residue values at Canadian MRLs or American Tolerances. The percent crop treated was assumed to be 100. Drinking water contribution to the exposure was accounted for by direct incorporation of the appropriate EEC, obtained from water modelling [see Section 3.3], into DEEM. DEEM default processing factors were applied. Experimental processing factors were used when values were higher than default DEEM processing factors.

The chronic dietary exposure estimate from food and drinking water for the general population represents 17% of the ADI. Chronic exposure estimates for the various subpopulations range from 12% for youth 13–19 years of age to 31% of the ADI for children 1–2 years of age. Thus, chronic exposure to dimethomorph residues in food and drinking water were shown to be acceptable.

3.2.5 Cancer Assessment

There was no evidence of oncogenicity in mice or rats.

3.3 Exposure from Drinking Water

Residues of dimethomorph in potential drinking water sources were estimated from modelling.

3.3.1 Concentrations in Drinking Water

Monitoring data and modelling estimates provide different types of information and, therefore, are not directly comparable. Pesticide concentrations in water are highly variable in time and location, and Canadian monitoring data usually are sparse. When possible, monitoring data from the United States are used together with Canadian data to provide a more robust analysis. These two types of data are complementary and are considered in conjunction with each other when estimating the potential exposure of aquatic organisms or humans.

Modelling Estimates

Application Information and Model Inputs

Dimethomorph is a fungicide registered for use on various crops. The use pattern modelled was 5 applications per year of 225 g a.i./ha with a 5 day interval. Modelling used initial application dates between May 1 and July 20. The major input parameters were calculated from data available at the time of modelling, but do not include some studies.

Estimated Concentrations in Drinking Water Sources: Level 1 Modelling

EECs of dimethomorph in potential drinking water sources (groundwater and surface water) were generated using a computer simulation model. Modelling for surface water used a standard Level 1 scenario: a small reservoir adjacent to an agricultural field. EECs in groundwater were calculated by selecting the highest EEC from several selected scenarios representing different regions of Canada. All scenarios were run for 50 years.

The EECs resulting from this Level 1 assessment were calculated using conservative inputs with respect to application rate and timing, and geographic scenario. These EECs should therefore allow for future use expansion into other crops at this application rate and method. EECs of dimethomorph in potential drinking water sources are given in the following table:

Level 1 EECs of dimethomorph in Potential Sources of Drinking Water.

Crop/use pattern	Groundwater (µg a.i./L)		Surface Water (µg a.i./L)	
	Daily[1]	Yearly[2]	Daily[3]	Yearly[4]
Single application of 225 g a.i./ha	201	201	44	11

[1] 90th percentile of daily average concentrations
[2] 90th percentile of 365-day moving average concentrations
[3] 90th percentile of the peak concentrations from each year
[4] 90th percentile of yearly average concentrations

The daily and yearly ground water EEC of 201 µg a.i./L was used in the acute and chronic exposure assessment.

Water Monitoring Data

Background and sources of data

Monitoring data collected from the year 2000 onward were considered relevant for this assessment; older data were deemed unlikely to represent current Canadian use conditions. Water monitoring information was available for dimethomorph from Quebec, New Brunswick and the United States.

Water monitoring data, particularly for surface water, may miss peak concentrations, as sampling is typically sporadic and peak concentrations can be flushed through a system in a short amount of time after a runoff event. Based on available monitoring data, dimethomorph is seldom detected in water, with the maximum concentration detected in potential drinking water sources being 1.1 µg/L, from a surface water sample collected in Quebec. Acute and chronic drinking water EEC values based on Canadian water monitoring data could not be determined due to the relatively small number of samples and low detection frequencies.

3.3.2 Drinking Water Exposure and Risk Assessment

Drinking water exposure estimates were combined with food exposure estimates, with EEC point estimates incorporated directly in the dietary (food and drinking water) assessments. Refer to Sections 3.2.2 and 3.2.4 for details.

3.4 Occupational and Non-Occupational Exposure and Risk Assessment

Occupational and non-occupational risk is estimated by comparing potential exposures with the most relevant endpoint from toxicology studies to calculate a margin of exposure (MOE). This is compared to a target MOE incorporating uncertainty factors protective of the most sensitive subpopulation. If the calculated MOE is less than the target MOE, it does not necessarily mean that exposure will result in adverse effects, but mitigation measures to reduce risk would be required.

3.4.1 Toxicology Endpoint Selection for Residential and Occupational Exposure

3.4.1.1 Short-, Intermediate-term dermal and inhalation routes

For short- and intermediate-term occupational exposures via the dermal and inhalation routes, there were no suitable repeat-dose dermal or inhalation toxicity studies upon which to base the risk assessment. The 21-day dermal toxicity study in rats was not selected for this endpoint as it did not assess the endpoint of concern, namely developmental effects in pups following pre-natal exposure. In the absence of suitable studies, the oral developmental toxicity study in rats was deemed appropriate for these scenarios. A NOAEL of 60 mg/kg bw/day from this toxicity study was selected for risk assessment based on the increased early resorptions (total litter loss) noted at the next dose level. Worker populations could include pregnant or lactating women and

therefore this endpoint was considered appropriate for the occupational risk assessment. The target MOE for these scenarios is 300, which includes uncertainty factors of 10-fold for interspecies extrapolation and 10-fold for intraspecies variability, as well as an additional 3-fold factor for the reasons outlined in the *Pest Control Products Act* Hazard Characterization Section. The selection of this study and MOE is considered to be protective of all populations, including nursing infants and the unborn children of exposed female workers.

3.4.1.2 Long-term Dermal and Inhalation

For long-term occupational exposures via the dermal and inhalation routes, there were no suitable repeat-dose dermal or inhalation toxicity studies upon which to base the risk assessment. In the absence of suitable studies, the 1-year dietary toxicity study in dogs was deemed appropriate for these scenarios. In this dog study, the NOAEL of 15 mg/kg bw/day was selected for risk assessment based on increased liver and testis weights, and decreased prostate weights observed at the LOAEL of 45 mg/kg bw/day. The target MOE for these scenarios is 100, which includes uncertainty factors of 10-fold for interspecies extrapolation and 10-fold for intraspecies variability and onefold factor for the reasons outlined in the *Pest Control Products Act* Hazard Characterization Section. The selection of this study and MOE is considered to be protective of all populations.

3.4.1.3 Dermal Absorption

Various in vivo and in vitro studies were submitted to the PMRA or available in the literature for the re-evaluation of dimethomorph. A dermal absorption value of 23% was chosen, based on results from a rat in vivo study.

3.4.2 Non-Occupational Exposure and Risk Assessment

Non-occupational (residential) risk assessment involves estimating risks to the general population, including youth and children, during or after pesticide application.

Since there are no domestic-class products containing dimethomorph registered, a residential handler assessment was not required. Also, postapplication exposure to residents/bystanders was assumed not to occur, since products used for outdoor ornamentals are prohibited from being used in residential, commercial or industrial landscapes.

3.4.3 Occupational Exposure and Risk Assessment

There is potential for exposure to dimethomorph in occupational scenarios to/for workers handling dimethomorph during the application process and potential for postapplication exposure to workers entering areas previously treated with dimethomorph.

3.4.3.1 Mixer, Loader, and Applicator Exposure and Risk Assessment

There are potential exposures to mixers, loaders, and applicators. The following scenarios were assessed:

- Open mix/load of liquids;
- Open mix/load of wettable powders;
- Open mix/load/apply of liquids with backpack sprayer;
- Open mix/load/apply of liquids with manually-pressurised hand wand (MPHW);
- Open mix/load/apply of liquids with mechanically-pressurised hand gun (MPHG);
- Open mix/load/apply of wettable powders with MPHW;
- Open mix/load/apply of wettable powders with MPHG;
- Open mix/load/apply of wettable powders with backpack sprayer;
- Open cab groundboom application of liquids;
- Open cab airblast application of liquids; and
- Open cockpit aerial application of liquids.

Based on the number and timing of applications, workers applying dimethomorph would generally have a short-term exposure (<30 days). Custom applicators may have intermediate-term exposure (up to several months) for those crops with multiple applications. For workers in greenhouses, there is potential for intermediate-term exposure (up to several months).

Exposure was estimated for baseline PPE**:** long pants, long-sleeved shirt and chemical-resistant gloves.

No appropriate chemical-specific handler exposure data were available for dimethomorph. Therefore, dermal and inhalation exposures were estimated using data from the Pesticide Handlers Exposure Database Version 1.1 (PHED) and the Agricultural Handlers Exposure Task Force (AHETF) studies. The PHED is a compilation of generic mixer/loader applicator passive dosimetry data with associated software which facilitates the generation of scenario-specific exposure estimates based on formulation type, application equipment, mix/load systems and level of PPE. The AHETF was formed in 2001 with the objective of providing more up-to-date generic exposure studies compared to the PHED studies. When available, the more modern AHETF studies were used, which meet current standards of acceptability.

For handheld equipment, including backpack sprayer, only PHED data were available. The data were considered to be limited in terms of number of replicates (less than 15 per body part) or study quality (for example, low or missing field recovery). Furthermore, since exposure studies were not available for mixing/loading and applying wettable powders by backpack sprayer or by mechanically-pressurised hand gun, an estimate for these scenarios was made by using unit exposure values for open mix/load for wettable powders plus open mix/load/apply of liquids by backpack sprayer or mechanically-pressurised hand gun, respectively. This would result in an overestimate of exposure; however, it is the best available data at this time.

Route specific MOEs for mixer/loader and applicators for agricultural crops are outlined in Appendix V, Table 1. Calculated dermal, inhalation, and combined (total exposure from dermal and inhalation routes) MOEs for mixer/loaders and applicators of dimethomorph exceeded target MOEs for all scenarios and were therefore shown to be acceptable.

3.4.3.2 Postapplication Worker Exposure and Risk Assessment

The postapplication occupational risk assessment considered exposures to workers who enter treated sites to conduct agronomic activities involving foliar contact (for example, hand harvesting). Based on the use pattern, there is potential for short to intermediate-term (<6 months) and long term (>6 months) postapplication exposure to dimethomorph residues for workers outdoors and indoors, respectively.

Potential exposure to postapplication workers was estimated using updated activity-specific transfer coefficients (TCs), and default dislodgeable foliar residue (DFR) values, since chemical-specific DFR data were not available (see below). The DFR refers to the amount of residue that can be dislodged or transferred from a surface, such as leaves of a plant. The TC is a measure of the relationship between exposure and DFRs for individuals engaged in a specific activity, and is calculated from data generated in field exposure studies. The TCs are specific to a given crop and activity combination, and reflect standard agricultural work clothing worn by adult workers. Activity-specific TCs from the Agricultural Re-Entry Task Force (ARTF) were used. Post application exposure activities for agricultural crops include (but are not limited to): harvesting, weeding and scouting. For more information about estimating worker postapplication exposure, refer to the PMRA's regulatory proposal, PRO2014-02 U*pdated Agricultural Transfer Coefficients for Assessing Occupational Postapplication Exposure to Pesticides*.

Since no acceptable chemical-specific DFR studies were available for dimethomorph, default values were used (peak DFR of 25% of the application rate for all crops, with 10% dissipation per day for outdoor crops and 2.3% dissipation per day for ornamental greenhouse crops). For further information on these default values, refer to the PMRA's Science Policy Note, SPN2014-02 *Estimating Dislodgeable Foliar Residues and Turf Transferrable Residues in Occupational and Residential Postapplication Exposure Assessments.*

For workers entering a treated site, REIs are calculated to determine the minimum length of time required before people can safely enter after application. An REI is the duration of time that must elapse before residues decline to a level where performance of a specific activity results in exposures above the target MOE.

Postapplication exposure would be primarily via the dermal route. Based on the vapour pressure of dimethomorph, inhalation exposure would be low, provided that the minimum 12-hour REI is followed.

For some crops, the updated risk assessment resulted in shorter REIs than those on the current labels. Provided that the REIs are followed, postapplication risks to workers performing activities such as thinning, pruning, and harvesting, were shown to be acceptable. Updated REIs are proposed to be added to the labels. The postapplication exposure assessment is outlined in Appendix V, Tables 2–7.

3.5 Aggregate Assessment

Aggregate exposure is the total exposure to a single pesticide that may occur from dietary (food and drinking water), residential and other non-occupational sources, and from all known or plausible exposure routes (oral, dermal, and inhalation). Since residential exposure is not expected, the aggregate assessment for dimethomorph consisted of combining food and water exposure only (see Sections 3.2.2 and 3.2.4).

3.6 Cumulative Assessment

The *Pest Control Products Act* requires that the PMRA consider the cumulative exposure to pesticides with a common mechanism of toxicity. For the current evaluation, the PMRA did not identify information indicating that dimethomorph shares a mechanism of toxicity with other pest control products. Therefore, there is no requirement for a cumulative assessment at this time.

3.7 Incident Reports

As of 27 June 2018, no human, domestic animal or environmental incident reports involving dimethomorph had been submitted to the PMRA.

4.0 Environmental Assessment

4.1 Fate and Behaviour in the Environment

A summary of environmental fate data for dimethomorph is presented in Appendix VI.

Dimethomorph is soluble in water and is not expected to volatilize from water or moist soil. Dimethomorph is unlikely to persist in the atmosphere and is not expected to undergo long-range transport. Hydrolysis and phototransformation on soil are not important routes of dimethomorph transformation.

No major transformation products were observed in terrestrial studies. Laboratory studies suggest dimethomorph is moderately persistent in aerobic soils (DT_{50}=115 days) and slightly persistent in anaerobic soils (DT_{50}=16.4 days). Dimethomorph is not expected to bioaccumulate in organisms in aquatic environments.

Some evidence (adsorption/desorption, Cohen criteria and GUS score) suggests dimethomorph has the potential to leach and move through soils. This is further supported by groundwater modelling which predicts some residues in groundwater. Evidence from leaching and terrestrial field dissipation studies indicate dimethomorph has a relatively short to moderate half-life in soil (43 to 112 days) and very limited downward movement into lower soil horizons, with residues being limited to the upper soil horizons (0–10 cm). Although dimethomorph was not detected in the available Canadian groundwater data (305 samples), American groundwater monitoring indicates that dimethomorph is detected (7.5% of 366 samples), with a maximum detection of 0.427µg/L. Considering the available evidence, it is concluded that dimethomorph has the potential to leach to groundwater and an advisory statement is required on product labels. Dimethomorph is also not expected to carry-over into the next growing season.

In aquatic environments, hydrolysis is not expected to be an important transformation pathway. Photolysis is also not expected to be an important transformation pathway in aquatic systems except in clear shallow water, where transformation is expected to be rapid. In aerobic water/sediment systems, dimethomorph is slightly persistent, with a 90th percentile DT_{50} value of 42 days. It partitions rapidly to sediment where non-extracted residues (NER) are expected to accumulate over time. Results also indicate that NER are not residues of concern. In anaerobic systems, dimethomorph is non-persistent to slightly persistent, with DT_{50} values ranging from 0.9 to 18.7 days. Bisdesmethyl dimethomorph was the only major transformation product in anaerobic water systems (>13.2% applied radioactivity at study termination of 103 days).

4.2 Environmental Risk Characterization

The environmental risk assessment integrates the environmental exposure and ecotoxicology information to estimate the potential for adverse effects on non-target species. This integration is achieved by comparing EECs with concentrations that are known to cause significant effects on non-target organisms. EECs are pesticide concentrations within environmental compartments, including food, water, soil and air that are estimated using standard models. These models account for the application rate(s) and associated treatment intervals, as well as the chemical and environmental fate properties for the pesticide, including dissipation of the pesticide between multiple applications and potential to leach or sorb to organic matter. The EEC values for dimethomorph (soil and aquatic) are presented in Appendix VIII. Ecotoxicological information that is used includes acute and chronic toxicity data for various groups of organisms from both aquatic and terrestrial habitats including invertebrates, vertebrates and plants. Toxicological endpoints in this assessment were obtained from registrant submitted data, open literature, and foreign reviews previously conducted for dimethomorph. The endpoints for each taxa that were considered to be appropriate for use in the assessment are presented in Appendix VII.

To account for potential differences in species sensitivity, as well as varying protection goals (i.e., protection at the community, population, or individual level), toxicity endpoints that are used in the risk assessment may be adjusted by applicable uncertainty factors.

Initially, a screening-level risk assessment is conducted to identify those pesticide uses that do not pose potential risks to non-target organisms and to identify those groups of organisms for which there may be a potential risk. The screening-level risk assessment uses simple methods, conservative exposure scenarios (for example, direct application using the maximum cumulative rate) and sensitive toxicity endpoints. A risk quotient (RQ) is calculated in the risk assessment by dividing the EEC associated with a particular pesticide use by the selected toxicological endpoint (uncertainty factor if applicable) for the taxonomical group of interest. The resulting RQ is then compared to the level of concern (LOC). The uncertainty factors and applicable LOCs used in the screening-level risk assessment are presented in the table below.

PMRA Levels of Concern

Risk Category	Risk Quotient	Uncertainty Factor	Level Of Concern (LOC) if Risk Quotient Exceeds:
Birds and Wild Mammals			
Acute Risk	EEC/LD50 or LC50	1/10	1
Chronic Risk	EEC/NOEC	1	1

Risk Category	Risk Quotient	Uncertainty Factor	Level Of Concern (LOC) if Risk Quotient Exceeds:
Aquatic Invertebrates and Fish			
Acute Risk	EEC/LC50 or EC50	1/10 (fish); 1/2 (invertebrates)	1
Chronic Risk	EEC/NOEC	1 (fish); 1 (invertebrates)	1
Honeybees			
Acute Risk	EEC/LD50	1	0.4
Chronic Risk	EEC/NOEC	1	1
Terrestrial Invertebrates			
Arthropods	EEC/LC50	1	2 (glass plate tests for *T. pyri* and *A. rhopalosiphi*) 1 (extended tests and other glass plate test species)
Earthworms	EEC/LC50	1/2	1
Non-Target Aquatic or Terrestrial Plants			
Aquatic Plants	EEC/(EC25 or EC50)	1/2	1
Terrestrial Plants	EEC/EC25	1	1

If the screening level RQ is below the LOC, the risk is considered to be negligible and no further risk characterization is required. If the screening level RQ is equal to or above the application LOC, then a refined risk assessment is performed to further characterize the risk. Refined assessments take into consideration more realistic exposure scenarios (including drift and runoff from field to non-target environments) and may consider alternate toxicity endpoints. Additional refinements that may be considered include exposure modelling data, available monitoring data, incident reports and results from field or mesocosm studies. The refined risk assessment may continue until the risk is adequately characterized or no further refinements are possible.

4.2.1 Risks to Terrestrial Organisms

For assessment of risk, toxicity endpoints from the most sensitive test species were used as surrogates for the wide range of species that can be potentially exposed following exposure to dimethomorph.

At the screening level, risks to earthworms, honeybees, predators, parasitoids, birds, wild mammals and terrestrial plants were not of concern (Appendix IX, Tables 1–12). When used according to label directions, dimethomorph is not expected to pose a risk of concern to terrestrial organisms.

4.2.2 Risks to Aquatic Organisms

A summary of aquatic toxicity data is presented in Appendix VI, Table 2. At the screening level, RQs exceeded the LOCs for freshwater invertebrates, amphibians, freshwater fish and estuarine/marine fish (Appendix IX, Tables 13–15). Risks to freshwater algae, freshwater vascular plants, saltwater algae (using the surrogate freshwater algae endpoint) and marine/estuarine invertebrates were not of concern (Appendix IX, Tables 16–18). A refined risk assessment for spray drift indicated small risks of concern (RQ <1.25) for amphibians and freshwater fish associated with airblast treatments in orchards (Appendix IX, Table 19). The refined spray drift assessment indicated no risk of concern for other aquatic organisms. A refined

risk assessment for runoff used modelled EECs and available freshwater monitoring data. Risks of concern from runoff are not expected for aquatic organisms (Appendix IX, Table 20).

4.2.3 Environmental Incident Reports

There are no environmental incident reports in Canadian and American databases

5.0 Value Assessment

Dimethomorph is registered for use as a foliar application to control or suppress the economically important diseases phytophthora blight and downy mildew on a number of vegetable crops, grapes, ginseng, hops and ornamentals. It is particularly important for the management of potato late blight in the field since a mid- to late-season foliar application can also suppress post-harvest late blight tuber rot. There are few registered alternatives to manage this disease.

Dimethomorph is also one of only a few fungicides available to control downy mildew on many high-value greenhouse and outdoor ornamental crops. It is of value for the suppression of sudden oak death (*Phytophthora ramorum*) on many high value outdoor, container and field grown ornamental plants in nurseries and landscape plantings. Sudden oak death is listed as a quarantine disease by the Canadian Food Inspection Agency. Consequently, dimethomorph plays an important role in the phytosanitary treatment of imported and exported material. There are only two registered alternatives to dimethomorph to suppress sudden oak death: metalaxyl-M and S-isomer and fosetyl-aluminum. Metalaxyl-M and S-isomer poses a high risk of disease resistance development and resistance management is required.

Dimethomorph is one of two fungicides registered in Canada with a Group 40 mode of action, which poses a low to medium risk for disease resistance development. To date, resistance to this fungicide has only been identified in populations of the grape downy mildew pathogen. Its protectant and antisporulant activity make dimethomorph a valuable tank-mix partner or rotational alternative to fungicides from other mode of action groups to manage resistance development.

6.0 Pest Control Product Policy Considerations

The Toxic Substances Management Policy (TSMP) is a federal government policy developed to provide direction on the management of substances of concern that are released into the environment. The TSMP calls for the virtual elimination of Track 1 substances [those that meet all four criteria outlined in the policy, i.e., persistent (in air, soil, water and/or sediment), bio-accumulative, primarily a result of human activity and toxic as defined by the *Canadian Environmental Protection Act*]. During the review process, Dimethomorph and its transformation products were assessed in accordance with the PMRA Regulatory Directive DIR99-03[3] and evaluated against the Track 1 criteria.

[3] DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*

6.1 Toxic Substances Management Policy Considerations

In accordance with the PMRA Regulatory Directive DIR99-03, the assessment of Dimethomorph against Track 1 criteria of TSMP under *Canadian Environmental Protection Act* was conducted. It determined that:

- Dimethomorph does not meet all Track 1 criteria, and is not considered a Track 1 substance (refer to Appendix X).
- Dimethomorph does not form any transformation products that meet all Track 1 criteria.
- The use of dimethomorph is not expected to result in the entry of TSMP Track-1 substances into the environment.

6.2 Formulants and Contaminants of Health or Environmental Concern

During the review process, contaminants in the technical grade active ingredient and formulants and contaminants in the end-use products are compared against the *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* maintained in the *Canada Gazette*.[4] The list is used as described in the PMRA Notice of Intent NOI2005-01[5] and is based on existing policies and regulations including DIR99-03 and DIR2006-02,[6] and taking into consideration the Ozone-depleting Substance Regulations, 1998, of the *Canadian Environmental Protection Act* (substances designated under the Montreal Protocol). The PMRA has reached the following conclusions:

- Technical grade dimethomorph and related commercial end-use product as well as other domestic formulations of dimethomorph do not contain any formulants of health or environmental concern identified in the *Canada Gazette*.
- The use of formulants in registered pest control products is assessed on an ongoing basis through PMRA formulant initiatives and Regulatory Directive DIR2006-02.

7.0 Conclusion of Science Evaluation

In addition to uses on various vegetables and fruit crops, dimethomorph is important for the management of potato late blight tuber rot, and sudden oak death on many high value outdoor, container and field grown ornamental plants in nurseries and landscape plantings, especially considering the limited number of registered alternatives for these diseases. Due to its protectant and antisporulant activity, and lower risk for resistance development, dimethomorph is valued as a rotational product in disease management programs.

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4 *Canada Gazette*, Part II, Volume 139, Number 24, SI/2005-114 (2005-11-30) pages 2641–2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* and in the order amending this list in the *Canada Gazette*, Part II, Volume 142, Number 13, SI/2008-67 (2008-06-25) pages 1611-1613. *Part 1 Formulants of Health or Environmental Concern, Part 2 Formulants of Health or Environmental Concern that are Allergens Known to Cause Anaphylactic-Type Reactions and Part 3 Contaminants of Health or Environmental Concern.*

5 NOI2005-01, *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern under the New Pest Control Products Act.*

6 DIR2006-02, *Formulants Policy and Implementation Guidance Document.*

With respect to human health, risks are considered to be acceptable for all dimethomorph uses when used according to the proposed revised label directions. Mitigation measures are required.

When used according to the proposed revised label directions, environmental risks associated with the use of dimethomorph were determined to be acceptable.

List of Abbreviations

↑	increased
↓	decreased
♂	male
♀	female
%	percentage
λ	wavelength
µg	microgram
A/G	albumin/globulin ratio
abs	absolute
AD	administered dose
ADI	acceptable daily intake
a.i.	active ingredient
AHETF	Agricultural Handlers Exposure Task Force
ALP	alkaline phosphatase
AOPWIN	Atmospheric Oxidation Program for Microsoft Windows, USEPA
appl.	Application
aq	aqueous
AR	applied radioactivity in %
ARfD	acute reference dose
ARTF	Agricultural Re-entry Task Force
ASAE	American Society of Agricultural Engineers
AST	aspartate aminotransferase
atm	atmosphere
ATN	ametoctradin
ATPD	area treated per day
BAF	bioaccumulation factor
BCF	bioconcentration factor
BUN	blood urea nitrogen
bw	body weight
bwg	bodyweight gain
ºC	degree in Celsius
CAF	composite assessment factor
CAS	chemical abstracts service
CEC	cation exchange capacity
CEPA	Canadian environmental protection act
CL	concentration levels
cm	centimeter
cm^2	centimeters squared
d	day(s)
DACO	data code (PMRA)
DAT	day after treatment
DEEM	Dietary Exposure Evaluation Model
dev.per.	developmental period
DFR	dislodgeable foliar residue
DIR	directive

DME	dimethomorph
DOM	dissolved organic matter
DT_{50}	time required for 50% dissipation of the initial concentration
DT_{90}	time required for 90% dissipation of the initial concentration
EC_{50}	effective concentration on 50% of the population
EDE	estimated daily exposure
EEC	estimated environmental concentrations
ELS	early life stage
EPA	Environmental Protection Agency
EPI Suite	estimation programs interface Suite™ under Window®
EUP	end-use product
F_0	parental animals
F_1	1st generation offspring
$F_{1a,b}$	1st generation offspring in two consecutive litters, a= first and b=second
F_2	2nd generation offspring
$F_{2a,b}$	2nd generation offspring in two consecutive litters, a= first and b=second
FAO	Food and Agriculture Organization
fc	food consumption
FDA	US Food and Drug Administration
fe	food efficiency
g	grams
GC-NPD	gas chromatography with nitrogen phosphorous detector
GGT	gamma-glutamyl transferase
GUS	groundwater ubiquity score
ha	hectare
Hb	haemoglobin
HGPRT	hypoxanthine-guanine phosphoribosyltransferase
HPLC-MS/MS	high performance liquid chromatography with tandem mass spectrometry
HPLC-UV	high performance liquid chromatography with UV detector
hr(s)	hour(s)
IORE	indeterminate order rate equation
IUPAC	International Union of Pure and Applied Chemistry
K	constant
kg	kilogram
K_d	adsorption quotient
K_{oc}	adsorption quotient normalized to organic carbon
K_{ow}	*n*-octanol-water partition coefficient
L	litre(s)
lbs	pounds
LC_{50}	lethal concentration on 50% of the population
LC-MS/MS	liquid chromatography with tandem mass spectrometry
LD_{50}	lethal dose on 50% of the population
LOAEL	lowest observed adverse effect level
LOC	level of concern
Log	logarithm
LOQ	limit of quantification
LR_{50}	lethal rate on 50% of the population

m	meter(s)
M	mole
max	maximum
MCV	mean corpuscular volume
meq	milli equivalent (electric conductivity)
mg	milligram
min	minutes
mL	millilitre
M/L/A	mixer/loader/applicator
mm	millimeter
MOE	margin of exposure
mPa	millipascal
MPHG	mechanically pressurised hand gun
MPHW	manually pressurised hand wand
MRID	master record identification number (USEPA)
MRL	Maximum Residue Limit
N/A	not applicable
n/a	not available
ND	not detected
NER	non-extracted residues
nm	nanometer
No.	number
NOAEC	no-observed-adverse-effect concentration
NOAEL	no-observed-adverse-effect level
NOEC	no-observed-effect concentration
NOED	no-observed-effect dose
NOEL	no-observed-effect level
NR	not reported
OECD	Organization for Economic Co-operation and Development
OM	organic matter
Pa	Pascal unit of pressure
PCPA	*Pest Control Products Act*
PEI	Prince Edward Island
pH	hydrogen potential
PHED	pesticide handlers exposure database
pKa	acid dissociation constant on log scale
PMRA	Pest Management Regulatory Agency
PPE	personal protective equipment
ppm	parts per million
RBC	red blood cells
Reg. No.	PCPA Registration Number
REI	restricted-entry interval
Rep.	reported
RQ	risk quotient
s	sediment phase
SCL	silty clay loam
SFO	single first order kinetics

SRBC	sheep red blood cells
ss	statistically significant
t	time
$t_{1/2}$	half-life
TC	transfer co-efficient
Temp	temperature
TLC	thin layer chromatography
™	Trademark
TSMP	Toxic Substances Management Policy
UV	ultraviolet
v	version
VUI	verified use information
w	water phase
WBC	white blood cells
wc	water consumption
WP	wettable powder
wt	weight

Appendix I Dimethomorph Products and Commercial Uses Registered in Canada

Table 1 Dimethomorph Products Registered in Canada as of 7 January 2019 Excluding Discontinued Products or Products with a Submission for Discontinuation Based on the PMRA's Electronic Pesticide Regulatory System (e-PRS) database.

Registration Number	Marketing Class	Registrant Name	Product Name	Formulation Type	Guarantee
24545	Technical	BASF Canada Inc.	Forum Technical (Dimethomorph)	Solid	98.0%
31306	Manufacturing Concentrate	BASF Canada Inc.	Zampro Bulk	Suspension	225 g/L (+300 g/L ATN)
27700	Commercial	BASF Canada Inc.	Acrobat 50 WP Fungicide	Wettable Powder	50%
30321	Commercial	BASF Canada Inc.	Zampro Fungicide	Suspension	225 g/L (+300 g/L ATN)
32026	Commercial	BASF Canada Inc.	Forum Fungicide	Suspension	500 g/L

ATN = ametoctradin

Table 2 Registered Commercial uses of Dimethomorph in Canada as of 28 May 2018

Sites	Pests	Formulation Type	Application Methods and Equipment	Maximum Application Rate (a.i./ha)		Max Number of Application per Year	Minimum Interval Between Application (days)
				Single	Cumulative		
Potato	Late blight and tuber blight (*Phytophthora infestans*)	Suspension, Wettable Powder	Ground: field sprayer; Aerial: fixed-wing or rotary aircraft equipment.	{225 g a.i./ha}	{675 g a.i./ha/ year}	3	5
Brassica leafy vegetables	Downy mildew (*Peronospora parasitica*)	Suspension	Ground: field sprayer; Aerial: fixed-wing or rotary aircraft equipment.	{225 g a.i./ha}	{675 g a.i./ha/ year}	3	7
Brassica vegetables	Downy mildew (*P. parasitica*) - suppression	Suspension, Wettable Powder	Ground: field sprayer; Aerial: fixed-wing or rotary aircraft equipment.	{225 g a.i./ha}	{1125 g a.i./ha/ year}	5	7
Leafy vegetables: lettuce (head and leaf)	Downy mildew (*Bremia lactucae; Peronospora* spp.) -suppression	Suspension, Wettable Powder	Ground -field sprayer; Aerial:fixed-wing or rotary aircraft equipment	{225 g a.i./ha}	{1125 g a.i./ha/ year}	5	5
Cucurbit vegetables	Downy mildew (*Pseudoperonospora cubensis*) -suppression	Suspension, Wettable Powder	Ground: field sprayer; Aerial: fixed- wing or rotary aircraft equipment	{225 g a.i./ha}	{1125 g a.i./ha/ year}	5	5

Sites	Pests	Formulation Type	Application Methods and Equipment	Maximum Application Rate (a.i./ha)		Max Number of Application per Year	Minimum Interval Between Application (days)
				Single	Cumulative		
	Downy mildew (*P. cubensis*), phytophthora blight (*Phytophthora capsici*)	Suspension	Ground: field sprayer; Aerial: fixed-wing or rotary aircraft equipment	{225 g a.i./ha}	{675 g a.i./ha/ year}	3	5
Fruiting vegetables	Phytophthora blight (*P. capsici*)- suppression, late blight (*P. infestans*)	Suspension	Ground: field sprayer; Aerial: fixed-wing or rotary aircraft equipment	{225 g a.i./ha}	{675 g a.i./ha/ year}	3	5
Fruiting vegetables	Late blight (*P. infestans*)	Suspension, Wettable Powder	Ground: field sprayer; Aerial: fixed-wing or rotary aircraft equipment	{225 g a.i./ha}	{1125 g a.i./ha/ year}	5	5
Pepper (all varieties)	Phytophthora blight (*P. capsici*) - suppression	Suspension, Wettable Powder	Ground: Field sprayer	{225 g a.i./ha}	450 g a.i./ha/ year	2	5
Bulb vegetables	Downy mildew (*Peronospora destructor*)	Suspension, Wettable Powder	Ground: field sprayer; Aerial: fixed-wing or rotary aircraft equipment	{225 g a.i./ha}	{1125 g a.i./ha/ year}	5	5
Grapes	Downy mildew (*Plasmopara viticola*)	Suspension, Wettable Powder	Ground: airblast	{225 g a.i./ha}	{900 g a.i./ha/ year}	4	7
Hops	Downy mildew (*Pseudoperonospora humuli*)	Suspension, Wettable Powder	Ground: airblast	{225 g a.i./ha}	{675 g a.i./ha/ year}	3	10
Ginseng	Phytophthora blight (*Phytophthora cactorum*) - suppression	Suspension, Wettable Powder	Ground: field sprayers	225 g a.i./ha	{675 g a.i./ha/ year}	3	5
Outdoor grown ornamentals, herbaceous annual and perennial plants	Downy mildew (*P. parasitica, P. antirrhini, P. phlogina, P. sparsa, P. violae*)	Suspension, Wettable Powder	Ground application equipment except high pressure handheld equipment and backpack sprayers.	{24 g a.i./ 100 L} (not to exceed 225 g a.i./ha)	{900 g a.i. /ha/ crop season}	4	7
Outdoor, container and field grown ornamental plants (including conifers) in nurseries and landscape plantings	Sudden oak death (*Phytophthora ramorum*) -suppression	Suspension, Wettable Powder	Ground application equipment	{24 g a.i./ 100 L} (not to exceed 225 g a.i./ha)	{900 g a.i. /ha/ crop season}	4	10
Greenhouse ornamentals	Downy mildew (*P. parasitica, P. sparsa, P. antirrhini, P. violae, P. phlogina*)	Suspension, Wettable Powder	Ground application equipment except high pressure handheld equipment and backpacks sprayers.	(240g a.i./ ha)	{960 g a.i./ha/ season}	4	7

{ } = Active ingredient (a.i.) rate and cumulative active ingredient (a.i.) rate per year in { } brackets were calculated by the PMRA.

( ) = Product rate, active ingredient rate and spray volume per hectare for greenhouse ornamentals were provided by the registrant.

Appendix II Toxicity Profile and Endpoints for Health Risk Assessment

Table 1 Toxicology Reference Values for the Human Health Risk Assessment of Dimethomorph

Exposure Scenario	Study	Point of Departure and Endpoint	CAF[1] or Target MOE
ARfD (♀ 13-49)	Developmental toxicity in rats	NOAEL=60 mg/kg bw/day LOAEL=160 mg/kg bw/day based on ↑ incidence of total litter loss (early resorptions)	300 (PCPA=threefold)
	ARfD = 0.2 mg/kg bw		
ARfD (general population, excluding ♀ 13-49)	Acute neurotoxicity in rats	LOAEL=250 mg/kg bw based on ↓ motor activity, ↓ habituation and ↓ rearing	300 (threefold for lack of NOAEL)
	ARfD = 0.8 mg/kg bw		
ADI All populations	1-year dietary in dog supported by 2-year carcinogenicity in rats	Dog: NOAEL=15 mg/kg bw/day LOAEL=45 mg/kg bw/day based on ↑ liver and testis wt and ↓ prostate wt (Rat: NOAEL=13 mg/kg bw/day (♀) LOAEL=52 mg/kg bw/day (♀) based on ↓ bw, bwg (♀))	100
	ADI = 0.2 mg/kg bw/day		
Short-term/intermediate dermal and inhalation[2]	Developmental toxicity in rats	NOAEL=60 mg/kg bw/day LOAEL=160 mg/kg bw/day based on ↑ incidence of total litter loss (early resorptions)	300
Long term dermal and inhalation[3]	1-year dietary in dog supported by 2-year carcinogenicity in rats	Dog: NOAEL=15 mg/kg bw/day LOAEL=45 mg/kg bw/day based on ↑ liver and testis wt and ↓ prostate wt (Rat: NOAEL=/13 mg/kg bw/day (♀) LOAEL=52 mg/kg bw/day (♀) based on ↓ bw, bwg (♀))	100
Cancer	Not oncogenic in rats or mice at doses tested		

[1] CAF (composite assessment factor) refers to a total of uncertainty and PCPA factors for dietary assessments; MOE refers to a target MOE for occupational assessments

[2] Since an oral NOAEL was selected, a dermal absorption factor of 23% was used in a route-to-route extrapolation

[3] Since an oral NOAEL was selected, an inhalation absorption factor of 100% (default value) was used in route-to-route extrapolation.

Table 2 Toxicity Profile for Dimethomorph

NOTE: Effects are known or assumed to occur in both sexes unless otherwise noted; in such cases, sex-specific effects are separated by semi-colons. Organ weight effects reflect both absolute organ weights and relative organ to bodyweights unless otherwise noted

Toxicokinetic and Metabolism Studies	
Study/Species	**Results/Effects**
Absorption, Distribution, Metabolism, Elimination - Oral Gavage Sprague Dawley rat PMRA# 1161504, 1163731	<u>Dose regimen:</u> <u>Low (10 mg/kg bw) or high (500 mg/kg bw) single dose:</u> Dimethomorph (14C-chlorophenyl ring) in 0.1% Tween 80 (aq) (expired air collected) <u>Repeated low dose:</u> 14 doses of 10 mg/kg bw/day and one 14C-DME (10 mg/kg bw/day) or 7 doses of 14C-DME (10 mg/kg bw/day) Data collected at 1, 6, 24, 48 and 120h post 7th dose **Single high dose:** Metabolism: some sex-specific differences in urinary metabolites (different compounds, and/or number of the relative proportions of the individual metabolite fractions from corresponding sampling periods). The metabolite profiles of the extractable fecal residues were similar in both sexes (the unchanged DME ~ 46%/50% of administered dose, AD, ♂/♀) Excretion: feces: 86.8% of AD (♂), 88.9% of AD (♀) after 7 days dosing urine: 6.2% of AD (♂), 10.4% of AD (♀) after 7 days dosing carcass: ≥0.2% of AD No radioactivity in expired air **Single low dose:** Metabolism: the most polar metabolite fraction (feces) predominated and only ~5% was as parent compound; there were no sex-related differences in metabolites. Excretion: 90% of dose excreted after 2 days feces: 90.1% of AD (♂), 86.4% of AD (♀) after 7 days dosing urine: 5.6% of AD (♂), 13.6% of AD (♀) after 7 days dosing carcass: 0.1% of AD **Repeat low dose:** Metabolism: similar to single low dose administration Excretion: about 90% of AD after 2 days dosing feces: 89.2% of AD (♂), 80.6 of AD (♀) after 7 days dosing urine: 7.7% of AD (♂), 16.3% of AD (♀) after 7 days dosing

	carcass: 0.4% of AD **Overall excretion**- rapid, mostly in feces (72-88% in 48hrs, 80-90% in 7 days) and urine (5-16% in 48 hrs, 6-16% in 7 days; higher in ♀: 10-16% vs 6-8% in ♂). The urinary excretion rate of the ♀ animals exceeded that of the ♂ animal. **Retention:** <0.2% 48 hrs after administration (liver and muscle). The amount absorbed was limited at the high dose level. DME was efficiently metabolized and rapidly excreted mainly via the faeces. The main pathways of metabolism are demethylation of the dimethoxyphenyl ring and, to a smaller extent, the oxidation of the morpholine ring.
Bile study (gavage) Sprague Dawley rat PMRA# 1161507, 1163731 (summary)	10 or 500 mg/kg bw/day Bile collected every 3hrs **Single low dose:** Absorption: rapidly absorbed, >90% AD in bile within 24 hrs ($t_{1/2}$=3hr), no sex difference Excretion: Faecal and urinary recovery was 15% and 22%, respectively of AD in ♂. First order kinetics, oral AD readily absorbed at low dose and excreted via bile. **Single high dose:** Absorption: lower absorption with 49/31% AD in bile after ($t_{1/2}$= 11/6 hrs, ♂/♀) 48hrs in ♂/♀ respectively, 6/10% of AD in urinary, and 87/89% in fecal excretion in 48 hrs (♂/♀) Metabolism: Repeat (low) dose similar to single low dose: Urine: oxidative metabolite (CUR 7117) formed via cleavage of morpholine ring Feces: CUR 7117, low levels of unchanged DME and traces of other polar metabolites Bile: partial demethylation of the dimethyloxyphenyl ring and subsequent conjugation with macromolecules (for example, glucuronides but not sulphates), acid-labile metabolites Excretion: ↓ biliary excretion and ↑ excretion via feces and/or digestive tract with longer elimination $t_{1/2}$ (indicating saturation of absorption and/or metabolism). Metabolism: Urine: 2 metabolites formed by demethylation (at the 4 not 2 position, ratio of 9:1) of the dimethoxyphenyl ring, small amount of unchanged DME, traces of metabolites formed by oxidation of the morpholine ring Feces: unchanged DME, traces of demethylated metabolites Bile: similar to low dose minus two minor metabolites noted at low dose, and presence of an additional metabolite (none identified) Two degradation pathways were proposed: 1) Demethylation of one of the methoxyl group of the dimethoxy-phenyl ring with subsequent conjugation of the resulting metabolites before excretion in the urine and feces

	2) Catabolism of morpholine ring
Acute Toxicity Studies	
Study/Species	**Results/Effects**
Acute oral toxicity (gavage) Sprague Dawley rat PMRA# 1256562	Rat oral LD50≥3500 mg/kg bw (CL 2800-4200 mg/kg bw) **Low oral toxicity** Clinical signs: piloerection, hunched posture, abnormal gait, lethargy, ↓ respiration, ptosis, pallor, ↓ bwg
Acute oral toxicity (gavage) Sprague Dawley rat PMRA# 1161435	LD50♂ = 4300 mg/kg bw LD50♀ = 3500 mg/kg bw LD50♂/♀ = 3900 mg/kg bw **Low oral toxicity** Clinical signs: Abnormal gait (waddling), lethargy, ↓ respiration, ptosis, pallor, ↓ bwg 5000 mg/kg: ↑ lacrimation and diarrhoea
Acute oral toxicity (gavage) CD1 mouse PMRA# 1161436	Mouse oral LD50≥5000/3700 (♂/♀) **Low oral toxicity** Clinical signs: hypokinesia, prostration, piloerection, ataxia, soiled coat ♀ were the more sensitive sex
Acute oral toxicity (gavage) Z Isomers Wi-AF/Han (SPF) Rat PMRA# 1161438	LD50> 5000 mg/kg bw **Low oral toxicity** No treatment related deaths for Z-isomer at 5000 mg/kg bw Clinical signs: pale feces
Acute oral toxicity (gavage) E isomers Wi-AF/Han (SPF) rat PMRA# 1161437	LD50 = 4472 mg/kg bw (3496-5720 mg/kg bw) LD50♂ = 4715 (4277-5198) mg/kg bw LD50♀ = 4754 (3958/5709) mg/kg bw LD50♂/♀ = 4472 (3496-5720) mg/kg bw **Low oral toxicity** Clinical signs:15-60 min post-dosing: locomotor disturbance (persistent for several days), dyspnea, piloerection, sunken flanks, incomplete eyelid closure, pale feces, salivation, blood-crusted snout, retention of feces, hunched lateral and abdominal position, diarrhea, haemorrhagic lacrimation, wet anal region, transient bw loss, death
Acute dermal toxicity Wi-AF/Han (SPF) rat PMRA# 1161439, 1162746	LD50 >5000 mg/kg bw **Low oral toxicity**
Acute dermal toxicity, dermal irritation and eye irritation Fischer rat	Dermal LD50>2000 mg/kg bw **Low dermal toxicity** (rat) Dermal irritation: **Non-irritating** (rabbit)

NZW rabbits PMRA# 1161440	Eye irritation: crimson-red conjunctiva and slight chemosis 4hrs-post application, resolved after 48hrs **Minimally-irritating** (rabbit)
Dermal irritation NZW rabbit PMRA# 1161443	 **Non-irritating**
Acute inhalation (dust, whole-body) Wistar rat PMRA # 1161442	LC50 >4.24 mg/L, >~643/678 mg/kg bw/day ♂/♀ Non-specific abnormal respiration pattern, no mortality **Low acute inhalation toxicity**
Eye Irritation NZW rabbit PMRA# 1161443	Slight redness to conjunctiva, slight chemosis and slight discharge **Minimally irritating to the eye**
Dermal Sensitization (Magnusson maximization test) Hartley Guinea pigs PMRA# 1161444	Swollen injection sites for up to 2 days, followed by open wounds and scabs No skin reaction following challenge **Not a dermal sensitizer**
Dermal sensitization (Buehler) Dunkin-Hartley guinea pigs PMRA# 1161446	**Not a dermal sensitizer**

Subchronic Toxicity Studies

Study/Species	**Results/Effects**
6-week range-finding (diet) CD-1 mouse PMRA# 1161454, 1161466	Supplemental (range-finding) 1003/926 mg/kg bw/day: ↑ liver wt
28-day range finding (diet) Sprague Dawley rat PMRA# 1161459, 1161466	Supplemental - low number of animals used/dose ≥195/215 mg/kg bw/day: ↓bw, bwg and fc; ↑ rel liver wt and hypertrophy, acute inflammation of ileum (♀) ≥ 286/290 mg/kg bw/day: bw, bwg & fc, ↑ rel liver wt and hypertrophy (♂) ; distension of the small intestine (fluid or gelatinous material), ↑ serosal mononuclear cell infiltration, serosal thickening, and/or mucosal hyperplasia (♀) 372/399 mg/kg bw/day: ↑ piloerection, swollen abdomen, yellow perigenital staining, and/or thinness of animals; distension of the small intestine (fluid or gelatinous material), acute inflammation of ileum, ↑ serosal mononuclear

	cell infiltration, serosal thickening, and/or mucosal hyperplasia, ↓ heart wt (♂); vacuolation in liver (♀)
28-day study (diet) Sprague Dawley rat PMRA# 1161460	Supplemental - low number of animals used/dose ≥81/81 mg/kg bw/day: ↓ pituitary wt (♂); ↑ blood urea nitrogen (BUN), ↓ uterine wt (♀) 306/283 mg/kg bw/day: 3 killed in extremis (1♂, 2♀ with distended small and large intestine filled with fluid), loose stools, swollen abdomen, hunched posture, piloerection, stained fur, emaciated appearance, stomach distended with ingests, ↓ bw, bwg and fc, ↑ neutrophils, ↑ total WBC and platelet count, ↓ total blood protein, ↓ albumin, ↑ globulin fraction, ↑ liver wt, ↑ urine volume with ↓ specific gravity; ↑ BUN, empty seminal vesicles (♂); ↓ wc, ↓ pituitary wt (♀)
28-day study (gavage) with E-isomer Fischer 344 rat PMRA# 1161461	NOAEL = 10 mg/kg bw/day ≥100 mg/kg bw/day: cecal enlargement, slight mid-zonal hepatocellular cytoplasmic lipid vacuolation (all rats) ; ↑ fc, ↑ liver and adrenal wt (♂) 750 mg/kg bw/day: slight normocytic anaemia: ↓ in total blood Hb, ↑ platelet counts, ↑ total protein, bilirubin, cholesterol, calcium, GGT, ↑ serum urea and creatine levels, dark coloration of the liver; ↓ spleen wt (♂); ↑ liver wt (♀)
28-day (gavage) with Z-isomer Fischer 344 rat PMRA# 1161462	NOAEL = 10 mg/kg bw/day ≥100 mg/kg bw/day: ↑ liver wt (9/14%, 36/ 21%, ♂/♀), liver enlargement (0/0, 1/0, 2/3, 7/7, ♂/♀) patchy mid-zonal hepatocellular cytoplasmic lipid vacuolation 750 mg/kg bw/day: ↑ total protein, ↑ bilirubin, ↓ A/G ratio, liver and cecal enlargement (due to fluid content) and liver discoloration
90 day study (diet) Sprague Dawley rat PMRA# 1161463	NOAEL = 14 mg/kg bw/day 73/82 mg/kg bw/day: ↓ urinary pH; ↓ total WBC and lymphocyte count (♂); ↑ liver wt, ↑ heart wt, ↑ ovary wt (♀) Recovery (limited to the hematological, biochemical and urinalysis parameters in 1 control and one high dose animal/sex) : 73/82 mg/kg bw/day: regression of acidity of urine and regression of ↓ WBC; marginal liver wt (♀)
28-day range-finding (diet) Beagle dog PMRA# 1161464	Supplemental Group 1: ≥18/24 mg/kg : ↓fc; occasional vomiting, ↑ urination, subdued behaviour, ↑ micturition, bw loss (♂) Group 2: 41/47 mg/kg bw/day: occasional tremors (♂)
90-day (diet) Beagle dog PMRA# 1161465	NOAEL = 15 mg/kg bw/day 41/42 mg/kg bw/day: licking of lips, subdued behaviour, occasional tremors; ↓ prostate wt, prostatitis and ↑ fibrosis in prostate, ↑ abs testes wt (♂); ↓ fc, ↑ liver wt, colon inflammation (♀)

1-year oral toxicity (diet) Beagle dog PMRA# 1161455	NOAEL = 15 mg/kg bw/day ≥15/16 mg/kg bw/day: ↑ intracellular lipid in the liver, (♂);↑ abs liver wt (♀) 45/47 mg/kg bw/day: ↓ bw, ↑ thyroid wt, ↑ serum ALP; ↑ liver wt, ↑ kidney wt, ↓ prostate wt, ↑ testis wt , ↑ intracellular lipid in the liver (♂); ↑ rel uterus wt and rel ovary wt (♀)
28-day dermal toxicity Wistar rat PMRA# 2361498	NOAEL (systemic toxicity and dermal irritation) ≥ 1000 mg/kg bw/day (limit dose) (♂/♀) No treatment-related effects
Chronic Toxicity/Carcinogenicity Studies	
Study/Species	**Results/Effects**
2-year oncogenicity (diet) CD- 1 mouse PMRA# 1161472, 1161473, 1161474, 1161482	NOAEL = 100 mg/kg bw/day ≥10 mg/kg bw/day: ↓ bwg (♂) (non-adverse) 1000 mg/kg bw/day: ↓ bw, moderate dilation and/or villous atrophy in the ileum; ↑ liver wt, ↑ serum ALP (♂); ↓ bwg, ↑ serum AST (♀) **No evidence of oncogenicity**
2-year chronic (diet) Sprague Dawley rat PMRA# 1161456	NOAEL = 43 mg/kg bw/day (♂/♀) ≥61 mg/kg bw/day: ↑ in "ground-glass" foci in liver, slight hypertrophy and/or accumulation of yellow-brown granular pigment in the periacinar hepatocytes (♀) 116/164 mg/kg bw/day: ↑ incidence of swollen hind feet, ↓ RBC, ↓ Hb (mild anemia); ↑ hepatic pallor and ↑ incidence of dilated blood vessels, lymph node cysts, stomach mass, dilated mesenteric blood vessels, ↑ in "ground-glass" foci in liver, slight hypertrophy and/or accumulation of yellow-brown granular pigment in the periacinar hepatocytes, ↑ arteritis in the abdominal blood vessels (♂); ↓ bw, ↓ bwg, ↑ relative kidney wt, ↑ rel liver wt & slight liver hypertrophy, ↓ ovary wt, ↑ lymphocytes , ↓ hematocrit, ↑ WBCs, ↑ MCV (ss), ↑ cellularity in sternum bone marrow (adaptive to anemia) (♀) **No evidence of oncogenicity**
2-year carcinogenicity (diet) Sprague Dawley rat PMRA# 1162900	NOAEL = 13 mg/kg bw/day (♀) ≥53 mg/kg bw/day: ↓ bw, ↓ bwg (♀) 110/145 mg/kg bw/day: severe swollen hind feet, ↑ in "ground-glass" foci in liver (with pale, granular, acidophilic cytoplasm and variable amount of glycogen); ↓ bw, ↓ bwg, cysts in lumbar lymph nodes and dilated mesenteric vessels, arteritis in mesenteric blood vessels, ↑ dilated abdominal blood vessels (associated with arteritis) (♂); swollen hindlimb, 5♀ sacrificed in extremis (swollen hind limbs week 12), hair loss, ↓ fc, pancreatic masses, inflammation and arteritis, enlarged lymph nodes, ↑ accumulation of pigment in periacinar hepatocytes and slight periacinar hepatocyte hypertrophy (adaptive), ↑ cellularity in sternum bone marrow, spleen

	hematopoiesis, ovarian cysts (♀) **No evidence of oncogenicity**
Developmental/Reproductive Toxicity Studies	
Study/Species	**Results/Effects**
2-generation reproductive toxicity (diet) Sprague Dawley rat PMRA# 1161458, 1161467	Maternal NOAEL = 50/15 mg/kg bw/day 50 mg/kg bw/day: ↓ bw, bwg (♀) Reproductive NOAEL = 50 mg/kg bw/day Reproductive parameters were not affected Offspring NOAEL = 50 mg/kg bw/day 50 mg/kg bw/day: slight delay in tooth eruption in F_{1a} and F_{2a} pups (equivocal) **No evidence of sensitivity of the young**
Developmental toxicity (gavage) Sprague Dawley rat PMRA# 1161474	Maternal NOAEL = 60 mg/kg bw/day 160 mg/kg bw/day: ↓fc, ↓bw, ↓bwg, ↑incidence of early resorptions (total litter loss) Developmental NOAEL= 60 mg/kg bw/day 160 mg/kg bw/day: ↑ incidence of early resorptions (total intrauterine litter loss) **No evidence of treatment-related malformations** **No evidence of sensitivity of the young**
Range-finding developmental toxicity (gavage) NZW rabbit PMRA# 1161475	Supplemental **Maternal Toxicity** ≥600 mg/kg bw/day: ↓ bwg 1000 mg/kg bw/day: ↓ wc, ↓ fc, ↑ incidence of abortions(6/8), 1 total litter loss **Developmental toxicity** 1000 mg/kg bw/day: ↓ fetal bw **No evidence of treatment-related malformations**
Developmental toxicity (gavage) NZW rabbit PMRA# 1161476	Maternal NOAEL=300 mg/kg bw/day ≥135 mg/kg bw: ↓ fc ≥300 mg/kg bw:↓ bwg 650 mg/kg bw: ↑ incidence of abortions (1, 1, 0, 3 from control to high dose, respectively) Developmental NOAEL = 300 mg/kg bw/day 650 mg/kg bw: ↑ incidence of abortions **No evidence of treatment-related malformations** **No evidence of sensitivity of the young**

Genotoxicity Studies	
Study/Species	**Results/Effects**
Reverse Mutation *in vitro* *Salmonella typhimurium* strains TA98, TA100, TA 1535 and TA1537; *Escherichia coli* WP2 uvra PMRA# 116148, 1161479, 1161478	Negative with and without metabolic activation
Gene mutation *in vitro* Chinese hamster V79 cells (HGPRT) PMRA#1161480	No induction of ↑ mutant colonies ±S9 Negative
Chromosome aberration *in vitro* Chinese hamster V79 cells (HGPRT) PMRA# 1161481	Equivocal positive results (only at 1 time point) 12–170 µg/mL no clear dose response 160/170 µg/mL ±S9: ↑ chromosome aberrations (including gaps) 3.5-2.7-fold at 7hrs Supplemental due to absence of adequate positive control
Chromosome aberration *in vitro* Chinese hamster V79 cells (HGPRT) PMRA# 1161468 (confirmatory to the study above)	110–150 µg/mL: 94–98% survival rate + S9, and 85–86% -S9 Slight ↑ (1.5-2.5-fold) in chromosome aberrations at 7hrs Positive for increased chromosome aberrations at high doses and only at one time point Negative at 18hrs
Transformation Assay Syrian hamster embryo (SHE) cells PMRA# 1161469	Negative
Mouse micronucleus test *in vivo* (gavage) mice PMRA# 1161470	Negative
Unscheduled DNA synthesis test *in vitro* Wistar rat;	Negative

Primary hepatocytes PMRA# 1161471	
Immunotoxicity Studies	
Study/Species	**Results/Effects**
28-day immunotoxicity (diet) Primary T-cell dependent antibody response (anti-SRBC IgM ELISA) PMRA# 2361502	NOAEL = 184 mg/kg bw/day (high-dose treatment) No treatment-related effects on spleen or thymus wt or on the humoral immune response 184 mg/kg bw/day: ↓ overall bwg **No evidence of immunotoxicity.**
Neurotoxicity Studies	
Study/Species	**Results/Effects**
Acute oral neurotoxicity (gavage) Wistar rat PMRA# 2361503	LOAEL = 250 mg/kg bw in ♂/♀ (low-dose treatment) No treatment-related effects on body weight, brain weight, gross pathology or neuropathology. ≥ 250 mg/kg bw: ↓ motor activity, ↓ rearing; ↓ habituation (♂) ≥ 500 mg/kg bw: ↓ habituation; ↓ exploration activity (♂); gait impairment (↓ movement) (♀) 2000 mg/kg bw: gait impairment (↓ movement) (♂); ↑ clinical signs of toxicity, ↑ mortality, ↓ exploration activity (♀) **No evidence of selective neurotoxicity**
90-day neurotoxicity (diet) Wistar rat PMRA# 2361508	NOAEL = 59/ 70 mg/kg bw/day (♂/♀) 178/204 mg/kg bw/day**:** ↓ bw, ↓ bwg, ↓ fc, ↓ fe **No evidence of selective neurotoxicity**

Appendix III Dietary Exposure and Risk Estimates for Dimethomorph

Table 1 Acute Dietary Exposure and Risk Estimates for Dimethomorph

Population Subgroup	Acute Dietary[1] (Food and Drinking Water) 95th percentile of exposure	
	Dietary Exposure (mg/kg bw)	%ARfD
General Population[2]	N/A	N/A
All Infants (< 1 year old)	0.075849	9
Children 1–2 years old	0.131843	15
Children 3–5 years old	0.117535	14
Children 6–12 years old	0.076026	9
Males 13–19 years old	0.053971	7
Males 20–49 years old	0.064053	8
Adults 50+ years old	0.075490	9
Females 13–49 years old[3]	0.079159	40

[1]Acute Reference Dose (ARfD) of 0.8 mg/kg bw for all population subgroups excluding females 13-49 years old. [2]The risk estimate was not determined for the general population, as separate ARfDs were selected for females aged 13–49 years and the other population groups. [3]Acute Reference Dose (ARfD) of 0.2 mg/kg bw for females 13-49 years old

Table 2 Chronic Dietary Exposure and Risk Estimates for Dimethomorph

Population Subgroup	Chronic Dietary[1] (Food and Drinking Water)	
	Dietary Exposure (mg/kg bw/day)	%ADI
General Population (total)	0.025270	17
All Infants (< 1 year old)	0.027284	18
Children 1–2 years old	0.046904	31
Children 3–5 years old	0.039067	26
Children 6–12 years old	0.024988	17
Youth 13–19 years old	0.018492	12
Adults 20–49 years old	0.024452	16
Adults 50+ years old	0.024759	17
Females 13–49 years old	0.024297	16

[1]Acceptable Daily Intake (ADI) of 0.2 mg/kg bw/day for all population subgroups

Appendix IV Food Residue Chemistry Summary

Dimethomorph is a morpholine fungicide registered in Canada for foliar use, on brassica vegetables, bulb vegetables, cucurbit vegetables, fruiting vegetables, ginseng, grapes, hops, leafy vegetables, potatoes, greenhouse ornamentals and outdoor (container and field) grown ornamentals. It inhibits the formation of oomycete cell walls through inhibition of sterol synthesis. Dimethomorph is used to treat downy mildew, phytophthora blight and late blight in vegetables, late blight and tuber blight in potatoes and sudden oak death and downy mildew in field grown or greenhouse ornamentals. End-use products are formulated as wettable powders or suspension. Dimethomorph can be applied by field sprayer, airblast or aerial application. The maximum label application rate is 225 g ai/ha.

The nature of the residue in livestock and plant commodities is adequately understood based on acceptable metabolism studies in ruminants, poultry, lettuce, potatoes, grapes and tomatoes. The residue definition in all plant commodities for enforcement and risk assessment is expressed as the parent dimethomorph.

MRLs have been established for dimethomorph and published in the *PMRA MRL database* for MRLs regulated under the *Pest Control Products Act*. No changes to the existing MRLs are proposed for dimethomorph.

Analytical methods were previously reviewed and found to be adequate for data collection and enforcement. The reviewed methods use HPLC-UV, GC-NPD, HPLC-MS/MS and LC-MS/MS with recoveries within the 70%–120% range and LOQs of 0.01- 0.05 ppm. All methods were validated as data-gathering methods and some were found adequate as enforcement methods. According to the results of the *Food and Drugs Act* Multiresidue Analytical Method, Protocol D, Section 232.4 procedures are suitable for the analysis of dimethomorph in crop matrices.

No data deficiencies according to the OECD Guidelines for the Testing of Chemicals, Section 5 were identified for dimethomorph. Sufficient field trial residue data was available to adequately assess the dietary exposure and risk from dimethomorph use. Estimation of potential contamination of drinking water sources, *i.e.,* modelling of EECs was conducted. The dietary exposure and risk assessment included the food and water residue values based on the current uses in Canada and potentially treated imported food commodities.

The dietary (acute and chronic) risk assessment for dimethomorph is a conservative assessment using Canadian MRLs or American Tolerances for residue values, highest experimental or default processing factors, 100% crop treated, and drinking water EECs based on modelling. Since the risk estimates were shown to be acceptable, no refinements to the dietary risk assessment inputs were required.

Appendix V Agricultural Mixer/Loader/Applicator and Postapplication Risk Assessment

Table 1 Mixer/Loader/Applicator Exposure and Risk Assessment of Dimethomorph, Short-, Intermediate-Term

Formulation	Application Equipment	Max Rate (kg a.i./ha)	ATPD (ha/day)	Dermal Exposure[a] (mg/kg bw/day)	Inhalation Exposure[b] (mg/kg bw/day)	Dermal MOE[c]	Inhalation MOE[c]	Combined MOE[d]
Open M/L, Open Cab Application, Baseline PPE: long-sleeved shirt, long pants, chemical-resistant gloves								
L	GB Farmer LFC	0.225	107	5.81E-03	6.95E-04	10330	86310	9230
	GB Custom LFC		360	1.95E-02	2.34E-03	3070	25650	2740
	GB V&F		26	1.41E-03	1.69E-04	42520	355200	37970
	Aerial		400	2.50E-03	7.88E-05	24010	761900	23270
	Aerial		400	1.51E-02	7.09E-04	3970	84660	3790
	Airblast		20	4.95E-02	5.46E-04	1210	109850	1200
	MPHW	0.240[e]	150[f]	1.95E-04	4.07E-05	307255	1474926	254283
	Backpack		150[f]	1.13E-03	3.52E-05	53224	1705030	51613
	MPHG		3800[f]	2.93E-02	3.44E-03	2048	17428	1833
WP	GB Farmer LFC	0.225	107	2.74E-02	2.20E-03	2186	27312	2024
	GB Custom LFC		360	9.23E-02	7.39E-03	650	8118	602
	GB V&F		26	1.41E-03	1.69E-04	42520	355200	37974
	Aerial		400	2.50E-03	7.88E-05	24005	761905	23271
	Aerial		400	9.60E-02	6.32E-03	625	9490	586
	Airblast		20	5.36E-02	8.27E-04	1120	72562	1103
	MPHW	0.240[e]	150[f]	4.09E-03	1.28E-03	14680	46849	11178
	Backpack		150[f]	1.20E-03	4.02E-05	49829	1490757	48217
	MPHG		3800[f]	3.12E-02	3.57E-03	1921	16802	1724

ATPD = area treated per day, MOE = margin of exposure, L = liquid, WP = wettable powder. M/L = Mix/Load, A = Application, GB = Groundboom, LFC = Large Field Crops, V&F = Vegetables and Fruit, MPHW = Manually Pressurized Handwand, MPHG = Mechanically Pressurized Hand Gun

[a] Dermal exposure (mg/kg bw/day) = (dermal unit exposure × ATPD × maximum application rate × 23% dermal absorption)/80 kg body weight

[b] Inhalation exposure (mg/kg bw/day) = (inhalation unit exposure × ATPD × maximum application rate)/80 kg body weight

[c] Short-, Intermediate-Term: Based on a NOAEL of 60 mg/kg bw/day from a dietary dog study, Target MOE = 300.

[d] Combined MOE = NOAEL/(EXP_{derm}+EXP_{inh}), Short-, Intermediate-Term Target MOE = 300

[e] Spray Volume = 500 L/ha

[f] Litres/day

Table 2 Dermal Postapplication Exposure and Risk Assessment of Dimethomorph, Field Vegetables

Crop	Activity	TC (cm^2/hr)[a]	Max App Rate (kg ai/ha)	Maximum Applications per year	Dermal Exposure (mg/kg bw /day)[b]	Dermal MOE (Day_0)[c]	REI (days)
Short-, Intermediate-Term							
Vegetables, hairy[d]	Irrigation (handset)	1750	0.225	5	5.13E-02	1170	0.5
	Harvesting (hand/mechanically assisted), Turning, Training	550		5	1.61E-02	3720	0.5
	Transplanting	230		5	6.74E-03	8900	0.5
	Scouting, Weeding (hand), Pruning (hand), Thinning fruit (hand)	90		5	2.64E-03	22700	0.5
	Irrigation (non-handset), Weeding (mechanical)	NO TC	REI not required[e]				
Vegetables smooth[f]	Irrigation (handset)	1750	0.225	5	5.13E-02	1170	0.5
	Harvesting (hand)	1100		5	3.23E-02	1860	0.5
	Transplanting	230		5	6.74E-03	8900	0.5
	Scouting	210		5	6.16E-03	9740	0.5
	Weeding (hand)	70		5	2.05E-03	29200	0.5
	Irrigation (non-handset), Weeding (mechanical)	NO TC	REI not required[e]				
Vegetables, waxy[g]	Harvesting (hand)	5150	0.225	5	1.51E-01	397	0.5
	Weeding (hand)	4400		5	1.29E-01	465	0.5
	Scouting	4000		5	1.17E-01	512	0.5
	Irrigation (handset)	1750		5	5.13E-02	1169	0.5
	Scouting, Thinning	1300		5	3.81E-02	1574	0.5
	Transplanting	230		5	6.74E-03	8896	0.5
	Irrigation (non-handset), Weeding (mechanical), Fertilizing (injection)	NO TC	REI not required[e]				

Max App Rate = Maximum Application Rate, TC = Transfer coefficient, DFR = Dislodgeable Foliar Residue, MOE = Margin of Exposure, REI = restricted entry interval

Since no DFR studies were submitted, a peak default DFR value of 25% of the application rate and dissipation rate of 10%/day were used. Maximum applications per year and minimum interval between applications were assumed.

[a] The TC values are based on ARTF Studies (2008). The TC value for maximum foliage density was considered as a worst case scenario for the risk assessment.

[b] Dermal exposure (mg/kg bw/day) = DFR (ug/cm^2) × TC (cm^2/hr) × work duration (8 hr) × 23% Dermal Absorption / BW (80 kg)

[c] Dermal MOE = NOAEL/(EXP_{derm}), Short-, Intermediate-Term: Based on a NOAEL of 60 mg/kg bw/day from a dietary dog study, Target MOE = 300

[d] TC values for cantaloupe were chosen to represent the hairy leaf vegetables. Includes Cucurbit Vegetables, Fruiting Vegetables.

[f] TC values for celery were chosen to represent the smooth leaf vegetables. Includes Leafy Vegetables, Fruiting Vegetables, Bulb Vegetables, Potatoes and Ginseng.

[g] TC values for broccoli were chosen to represent the waxy leaf vegetables. Includes Brassica Vegetables, Fruiting Vegetables, Bulb Vegetables.

Table 3 Dermal Postapplication Exposure and Risk Assessment of Dimethomorph, Hops

Crop	Activity	TC (cm^2/hr)[a]	Max App Rate (kg ai/ha)	Dermal Exposure (mg/kg/day)[b]	Dermal MOE[c]	REI (days)
Short-, Intermediate-Term						
Hops	Harvesting (mechanically)	19300	0.225	3.67E-01	163[d]	6
	Irrigation (handset)	1750		3.33E-02	1800	0.5
	Weeding (hand)	640		1.22E-02	4930	0.5
	Stripping, scouting, tying, training	640		1.22E-02	4930	0.5
	Transplanting	230		4.37E-03	13700	0.5

Max App Rate = Maximum Application Rate, TC = Transfer coefficient, DFR = Dislodgeable Foliar Residue, MOE = Margin of Exposure, REI = restricted entry interval

Since no DFR studies were submitted, a peak default DFR value of 25% of the application rate and dissipation rate of 10%/day were used. 3 applications per year with a minimum interval between applications of 10 days. [a] The TC values are based on ARTF Studies (2008). The TC value for maximum foliage density was considered as a worst case scenario for the risk assessment. [b] Dermal exposure (mg/kg bw/day) = DFR (ug/cm^2) × TC (cm^2/hr) × work duration (8 hr) × 23% / BW (80 kg)

[c] Dermal MOE = NOAEL/(EXP_{derm}), Short-, Intermediate-Term: Based on a NOAEL of 60 mg/kg bw/day, from a dietary dog study. Target MOE = 300

[d] Since the pre-harvest Interval of 7 days is specified on the label, the REI does not to be added to the label.

Table 4 Dermal Postapplication Exposure and Risk Assessment of Dimethomorph, Grapes

Crop	Activity	TC (cm^2/hr)[a]	Max App Rate (kg ai/ha)	Dermal Exposure (mg/kg/day)[b]	Dermal MOE[c]	REI (days)[d]
Short-, Intermediate-Term						
Grapes	Girdling, turning	19300	0.225	4.54E-01	132	8
	Harvesting, tying, training, leaf pulling	8500		2.00E-01	300	0.5
	Irrigation	1750		4.11E-02	1463	0.5
	Weeding, propagating, bird control, trellis repair, pruning, scouting	640		1.50E-02	3990	0.5
	Transplanting	230		5.41E-03	11100	0.5

Max App Rate = Maximum Application Rate, TC = Transfer coefficient, DFR = Dislodgeable Foliar Residue, MOE = Margin of Exposure, REI = restricted entry interval

Since no DFR studies were submitted, a peak default DFR value of 25% of the application rate and dissipation rate of 10%/day were used. 4 applications per year with a minimum interval between applications of 7 days

[a] The TC values are based on ARTF Studies (2008). The TC value for maximum foliage density was considered as a worst case scenario for the risk assessment.

[b] Dermal exposure (mg/kg bw/day) = DFR (ug/cm^2) × TC (cm^2/hr) × work duration (8 hr) × 23% / BW (80 kg)

[c] Dermal MOE = NOAEL/(EXP_{derm}), Short-, Intermediate-Term: Based on a NOAEL of 60 mg/kg bw/day, from a dietary dog study, Target MOE = 300

[d] The current label REI of 19-20 days can be reduced to 8 days for girlding and turning. Other label REIs for training, thinning and hand pruning can be reduced to 12 hours or captured under "All Other Activities" on the label with the current REI of 12 hours.

Table 5 Dermal Postapplication Exposure and Risk Assessment of Dimethomorph, Outdoor, container grown ornamentals, herbaceous and perennial plants

Crop	Activity	TC (cm^2/hr)[a]	Max App Rate (kg ai/ha)	Dermal Exposure (mg/kg/day)[b]	Dermal MOE[c]	REI (days)
Short-, Intermediate-Term						
Outdoor grown ornamentals, herbaceous and perennial plants	Irrigation, hand	1750	0.225	4.11E-02	1460	0.5
	All other activities	230		5.41E-03	11100	0.5

Max App Rate = Maximum Application Rate, TC = Transfer coefficient, DFR = Dislodgeable Foliar Residue, MOE = Margin of Exposure, REI = restricted entry interval

Since no DFR studies were submitted, a peak default DFR value of 25% of the application rate and dissipation rate of 10%/day were used. 4 applications per year with a minimum interval between applications of 7 days. [a] The TC values are based on ARTF Studies (2008). The TC value for maximum foliage density was considered as a worst case scenario for the risk assessment. [b] Dermal exposure (mg/kg bw/day) = DFR (ug/cm^2) × TC (cm^2/hr) × work duration (8 hr) × 23% / BW (80 kg)

[c] Dermal MOE = NOAEL/(EXP_{derm}), Short-, Intermediate-Term: Based on a NOAEL of 60 mg/kg bw/day, from a dietary dog study, Target MOE = 300

Table 6 Dermal Postapplication Exposure and Risk Assessment of Dimethomorph, Outdoor, container grown ornamental plants (including conifers) in nurseries and landscape plantings

Crop	Activity	TC (cm^2/hr)[a]	App rate (kg ai/ha)	Dermal Exposure (mg/kg/day)[b]	Dermal MOE[c]	REI (days)
Short-, Intermediate-Term						
Outdoor grown ornamentals, herbaceous and perennial plants, incl. conifers and Christmas trees	Irrigation, hand	1750	0.225	3.43E-02	1750	0.5
	Transplanting. Other activities	230		4.50E-03	13300	0.5

Max App Rate = Maximum Application Rate, TC = Transfer coefficient, DFR = Dislodgeable Foliar Residue, MOE = Margin of Exposure, REI = restricted entry interval

Since no DFR studies were submitted, a peak default DFR value of 25% of the application rate and dissipation rate of 10%/day were used. 4 applications per year with a minimum interval between applications of 10 days. [a] The TC values are based on ARTF Studies (2008). The TC value for maximum foliage density was considered as a worst case scenario for the risk assessment. [b] Dermal exposure (mg/kg bw/day) = DFR (ug/cm^2) × TC (cm^2/hr) × work duration (8 hr) × 23% / BW (80 kg)

[c] Dermal MOE = NOAEL/(EXP_{derm}), Short-, Intermediate-Term: Based on a NOAEL of 60 mg/kg bw/day, from a dietary dog study, Target MOE = 300

Table 7 Dermal Postapplication Exposure and Risk Assessment of Dimethomorph, Greenhouse ornamentals

Crop	Activity	TC (cm^2/hr)[a]	Max App Rate (kg ai/ha)	Dermal Exposure (mg/kg/day)[b]	Dermal MOE[c]	REI (days)
Long-Term						
Greenhouse ornamentals	All activities	230	0.225	9.48E-03	1580	0.5

Max App Rate = Maximum Application Rate, TC = Transfer coefficient, DFR = Dislodgeable Foliar Residue, MOE = Margin of Exposure, REI = restricted entry interval

Since no DFR studies were submitted, a peak default DFR value of 25% of the application rate and dissipation rate of 2.3%/day were used. 4 applications per year with a minimum interval between applications of 10 days. [a] The TC values are based on ARTF Studies (2008). The TC value for maximum foliage density was considered as a worst case scenario for the risk assessment. [b] Dermal exposure (mg/kg bw/day) = DFR (ug/cm^2) × TC (cm^2/hr) × work duration (8 hr) × 23% / BW (80 kg)

[c] Dermal MOE = NOAEL/(EXP_{derm}), Long-Term: Based on a NOAEL of 15 mg/kg bw/day, from a dietary dog study, Long-Term Target MOE = 100

Appendix VI Environmental Exposure and Risk Assessment

Table 1 Abiotic and Biotic Transformation of Dimethomorph in Terrestrial and Aquatic Environments

Type of study	Compound	System	Temp[1] (°C)	pH[2]	OM[3] (%)	Reported DT_{50} (day)	Calculated DT_{50} by PMRA (days)	Kinetic model	Comments [4,5,6]	References
Hydrolysis	DME ^{14}C-chlorophenyl ring	Buffer solution	70	4	N/A	Stable	Stable	SFO	Not a major route of transformation at all tested pHs	1161495 2930940 2930942 1164004 current review
		Buffer solution	70	7	N/A	Stable	Stable	SFO		
		Buffer solution	70	9	N/A	Stable	Stable	SFO		
		Buffer solution	90	4	N/A	Stable	504.0	SFO		
		Buffer solution	90	7	N/A	Stable	**1162.0**	SFO		
		Buffer solution	90	9	N/A	Stable	Stable	SFO		
Photo-transformation on soil	DME ^{14}C-chlorophenyl ring	Ingelheim sandy loam	22.1	7	1.9	75-150	**97.8**	SFO	Not a major route of transformation. Slightly degradable.	1161497 2930940 1164004 2930942 current review
Photo-transformation in water	DME ^{14}C-chlorophenyl ring	Aqueous buffer solution, Xenon arc lamp	25	5	None	Irradiated: 25-28 Dark: stable	**29.6-33.1**	SFO	Fairly degradable.	1161496 current review
						Irradiated: 50-60 Dark: stable	NR	SFO	Fairly degradable.	2930940 1164004 2930942
	DME	Lamps: Philips TLK 05 UVA, Philips TL 01 UVB, Philips TLD 18W/16	> 0 ~ 25	N/A	DOM rich	10-60	N/A	Pseudo SFO	May be a major route of transformation in shallow water in mid-summer	2930946
Photo-transformation in air	NR	12 hours of sunlight	NA	NA	N/A	NR	**0.05**	NA	No volatilization expected and rapid atmospheric photo-oxidation breakdown of DME. No long range transport expected	USEPA AOPWIN™ v1.92A
Aerobic soil bio-transformation	DME ^{14}C-morpholine ring	Woodstock silty clay loam	22	5.8	1.6	80-90	115	t_R IORE	Moderately persistent	1161505 current review
	DME ^{14}C-morpholine ring	Speyer 2.2 loamy sand	20	5.7	2.5	77	131	Slow $t_{1/2}$	Moderately persistent	2930941 current review
	DME ^{14}C-chlorophenyl	New Jersey sandy loam	25	6.8	13.0	51-60	55.5	t_R IORE	Moderately persistent	2930941 current review

Type of study	Compound	System	Temp[1] (°C)	pH[2]	OM[3] (%)	Reported DT_{50} (day)	Calculated DT_{50} by PMRA (days)	Kinetic model	Comments [4,5,6]	References
	DME ^{14}C-morpholine ring	Sandy loam	10	5.7	1.3	74	109	Slow $t_{1/2}$	Moderately persistent	2930941 current review
	DME	NR	NR	NR	NR	66	N/A	N/A	Moderately persistent	2930942
	DME	NR	NR	NR	NR	117	N/A	N/A	Moderately persistent	
	DME	SCL (1 mg a.i./kg soil)	20	6.8	2.5	16.3	N/A	N/A	Slightly persistent	2930949
	DME	SCL (10 mg a.i./kg soil)	20	6.8	2.5	26.6	N/A	N/A	Slightly persistent	2930949
	DME	SCL (100 mg a.i./kg soil)	20	6.8	2.5	28.5	N/A	N/A	Slightly persistent	2930949
	PMRA largest DT_{50} values of DME[7]						**115**		Moderately persistent	
Anaerobic soil bio-transformation	DME ^{14}C-morpholine ring	Woodstock silty clay loam	22	5.8	2.8	20	16.4	SFO	Slightly persistent	1161515
Aerobic aquatic bio-transformation	^{14}C-DME	Bickenbach system	20	8.1 (w), 7.6 (s)	3.2	2.9	3.7	SFO	Non persistent	1161526
	^{14}C-DME	Unter Widdersheim system	20	8.2 (w), 7.5 (s)	8.6	2.1	2.8	SFO	Non persistent	
	DME ^{14}C-morpholine -^{14}C-chlorophenyl	Berghauser	20	7.6 (w) 7.8 (s)	2.2	16.0	15.5	SFO	Slightly persistent	2930943 current review
	DME ^{14}C-morpholine -^{14}C-chlorophenyl	Kellmetschweiher	20	8.5 (w) 8.0 (s)	7.8	59.0	58.8	SFO	Moderately persistent	2930943 current review
	Not reported (MRID 43917233)	NR	20	NR	NR	24.7	N/A	N/A	Slightly persistent	2930942
	Not reported (MRID 48326905)	NR	20	NR	NR	56.9	N/A	N/A	Moderately persistent	2930942
	90th percentile confidence bound on the mean half-life						**41.6**		**Slightly persistent**	
Anaerobic aquatic bio-transformation	DME	Water/sed system 1	20	NR	NR	0.9	N/A	N/A	Non-persistent	2930942
	DME	Water/sed system 2	20	NR	NR	1.3	N/A	N/A	Non-persistent	
	DME	Water/sed system 3	20	NR	NR	18.1	N/A	N/A	Slightly persistent	
	DME	Water/sed system 4	20	NR	NR	18.7	N/A	N/A	Non-persistent	
	Most conservative reported DT_{50} value					**18.7**		Slightly persistent		
Foliar dissipation	DME ^{14}C-chlorophenyl	Tomato plants	NR	NR	NR	**13**	N/A	N/A	N/A	2818374
	NR	NR	NR	NR	NR	35	N/A	N/A	Default EPA DT_{50}	2930942
	NR	NR	NR	NR	NR	10	**10.0**	N/A	Default PMRA DT_{50}	1930629
Canadian Terrestrial Field	DME	Minto loam (Manitoba)	N/A	7.7	6.5	25	112	(t_R IORE)	12.3 ppb residues at 7.5-15 cm depth at 13 DAT3	1174822

Type of study	Compound	System	Temp[1] (°C)	pH[2]	OM[3] (%)	Reported DT_{50} (day)	Calculated DT_{50} by PMRA (days)	Kinetic model	Comments [4,5,6]	References
Dissipation and equivalent ecoregion									Moderately persistent	
	DME	New Glasgow sandy loam (PEI)	N/A	5.7	4.0	35	43.7	(SFO)	60 ppb residues at 0-15 cm depth at 366 DAT Slightly persistent	1174823
	DME	North Rose loamy sand (New York, USA)	N/A	6.9	3.3	8	43.2	(t_R IORE)	22.5 ppb at 15-30 cm depth Slightly persistent	1174824
	90th percentile confidence bound on the mean half-life						**109.4**		Moderately persistent	
Other Terrestrial Field Dissipation with Ecoregions not Equivalent to Canada	DME	Schwabenheim sandy loam	N/A	7.3	2.89	33.8	51.1	(t_R IORE)	Slightly persistent	1163525
	DME	Malborn sandy loam	N/A	5.2	4.65	38.9	39.4	(SFO)	Sligthly persistent	1163527
	DME	Leibertingen clay soil	N/A	7.3	6.8	40.1	46.4	(SFO)	Slightly persistent	1163528
	DME	Schwabenheim sandy loam	N/A	7.3	2.89	45.7	68.7	(t_R IORE)	0.181 ppm at 0-10 cm Moderately persistent	1163529
	DME	Kragsberg loamy sand	N/A	6.6	1.07	52.9	52.3	(SFO)	0.01 ppm at 0-10 cm Moderately persistent	1163530
	DME	UK loamy sand	N/A	6.5	0.4	61	N/A	N/A	Detected at 0-10 cm Moderately persistent	2930941
	DME	France loamy sand	N/A	6.5	NR	34	N/A	N/A	Detected at 0-10 cm Sligthly persistent	2930941
	DME	Spain sandy soil	N/A	6.7	1.5	10	N/A	N/A	Detected at 0-10 cm Non-persistent	2930941
	DME	USA soil 1	N/A	NR	NR	44.4	N/A	N/A	Detected at 7.5-15 cm Slightly persistent	2930942
	DME	USA soil 2	N/A	NR	NR	21.2	N/A	N/A	Detected at 15-30 cm Slightly persistent	2930942
	DME	USA soil 3	N/A	NR	NR	9.8	N/A	N/A	Detected at 15-30 cm Non-persistent	2930942
	DME	USA soil 4	N/A	NR	NR	122	N/A	N/A	Detected at 30-45 cm Moderately persistent	2930942
	DME	Hefei sandy loam (China)	N/A	8.23	1.66	18.1	N/A	N/A	Slightly persistent	2930947
	DME	Zhengzhou sandy loam (China)	N/A	7.26	3.28	11.5	N/A	N/A	Non-persistent	2930947
	DME	Qingdao sandy clay loam (China)	N/A	6.78	1.94	18.5	N/A	N/A	Slightly persistent	2930947

Type of study	Compound	System	Temp[1] (°C)	pH[2]	OM[3] (%)	Reported DT_{50} (day)	Calculated DT_{50} by PMRA (days)	Kinetic model	Comments [4,5,6]	References
	DME	Beijing sandy loam (China)	N/A	6.57	2.31	18.2	N/A	N/A	Slightly persistent for Dimethomorph	2930948

[1] Temp. = temperature; [2]for pH, (w) = water phase; (s) = sediment phase; [3] OM = Organic Matter; [4]Classification of Goring *et al*. 1975 for soils (PMRA 2037242); [5]Classification of McEwen and Stephenson for water (PMRA 2876402); [6] Classification of the FAO (2000) ; [7] Only the soil biotransformation study of PMRA 1161505 was available for review, other DT_{50} values are presented as qualitative information only; NA = Not applicable; NR = Not reported; DME = Dimethomorph; DAT = Day after treatment; SCL = Silty clay loam; DOM = dissolved organic matter; **Bold values are used in the environmental risk assessment of DME.**

Table 2 Mobility of Dimethomorph in Terrestrial and Aquatic Environments

Type of study	System	Temp[1] (°C)	pH	OM[2] (%)	CEC[3] (meq/100g)	Reported K_d value	Reported K_{oc} value	Mobility[4]	References
Soil adsorption/ desorption	BBA - soil 2.1 - Sandy soil	NR	5.7	1.4	4.7	4.47	566	Low	1161500
	BBA - soil 2.2 - Humus sand	NR	6.1	5.0	9.3	11.67	402	Medium	
	BBA - soil 2.3 - Sandy loam	NR	5.4	1.2	5.0	2.09	290	Medium	
	Schwabenheim sandy loamy silt	NR	5.8	1.7	10.0	4.94	515	Low	1161501
	Ingelheim-Moers II sandy loam	NR	7.5	2.3	15.0	8.51	377	Medium	
	Standard soil 2.1 sandy soil	NR	6.0	3.9	5.0	2.72	388	Medium	
	Standard soil 2.3 silty sand	NR	5.4	1.7	8.0	3.03	316	Medium	
	Unknown 1	NR	NR	NR	NR	10.1	787	Low	2930942
	Unknown 2	NR	NR	NR	NR	19.0	1588	Low	
	Unknown 3	NR	NR	NR	NR	11.9	1158	Low	
	Unknown 4	NR	NR	NR	NR	15.7	1485	low	
	PMRA 20th centile					**3.03**	**377**	**Medium mobility**	

Type of study	Compound	System	Temp (°C)	pH	OM (%)	CEC (meq/100g)	Max. soil depth detection (cm)	Detection in leachate (% AR)	Comments	References
Soil column leaching	Morpholine-^{14}C-Dimethomorph	Aged Woodstock silty clay loam	22	5.8	2.8	17.8	0-10	1.0	DME has limited potential for leaching	1161502
	Chlorophenyl-^{14}C-Dimethomorph	German soil 2.1 sandy soil	22	5.4	1.3	5.0	5-10	3.4	DME has limited potential for leaching	1164503
	NR	German soil 2.1 sandy soil	25	5.8	1.2	5	NR	ND	DME has limited potential for leaching	1161683
	NR	German soil 2.2 sandy soil	25	6.0	4.4	10	NR	0.67	DME has limited potential for leaching	
	NR	German soil 2.3 silty sand	25	4.9	1.7	8	NR	ND	DME has limited potential for leaching	

	NR	Ingelheim field sandy loam	25	7.7	2.7	15	NR	ND	DME has limited potential for leaching	
Type of study	**Compound**	**Properties**	**Criteria indicating a potential for leaching**			**Value**		**Meet criteria**	**Comments**	
Criteria of Cohen (1984)[5]	DME	Solubility in water	> 30 mg/L			18 mg/L		No	Soluble	1918520
		K_d	< 5 and usually < 1 or 2			3.03 mL/g		No	N/A	
		K_{oc}	< 300			377 mL/g		No	Moderately mobile	
		Henry's Law Constant	$< 10^{-2}$ atm.m^3/mol			2.06-2.13 × 10^{-10} atm m^3/mole		Yes	Not volatile	
		pKa	Negatively charged (either fully or partially) at ambient pH			pKa = -1.3		Yes	Very strong acid	
		Hydrolysis half-life	> 140 d (> 20 weeks)			Stable at pH 7		Yes	Stable	
		Soil phototransformation half-life	> 7 d (1 week)			97.8 days		Yes	Slightly persistent	
		Soil biotransformation half-life (non-sterile)	> 14 to 21 days (> 2 to 3 weeks)			DT_{50} = 115 d		Yes	Moderately persistent	
	PMRA Interpretation					Five criteria over eight were met suggesting dimethomorph has some potential for leaching				
Type of study	**Compound**	**Parameter**				**Values**			**Comments**	**References**
DME GUS Score[6]	DME	PMRA repr. DT_{50} in soil = 115 d; PMRA 20th centile Koc = 3.03 mL/g; GUS = log10 (115) × (4 – log 10(3.03)) ;				GUS score = 7.24			DME is expected to be a borderline leacher to a leacher	1918524
Type of study	**Compound**	**Parameter**				**Values**			**Comments**	**References**
ETF volatilization	DME	Vapour pressure at 20°C Henry's Law Constant USEPA AOPWIN™ v1.92A; atmospheric half-life USEPA EPI Suite software v4.11 – Volatilization half-life from river model USEPA EPI Suite software v4.11 – Volatilization half-life from lake model				2.0 × 10^{-10} Pa 6.8 × 10^{-16} atm m^3/mole 0.05 days 2.73 × 10^{10} days 2.98 × 10^{11} days			Overall, dimethomorph is not considered to be volatile and is not expected to have a long range transport in the atmosphere	USEPA EPISuite v4.11 (2000)
Type of study	**Compound**	**Parameter**	**Temp (°C)**	**Isomer**	**K_{ow} value**	**Log K_{ow} value**			**Comments**	**References**
Bio-accumulation	DME	Octanol/water partition coefficient	20	E	430	**2.63**			Low potential for bioaccumulation	1161499
			20	Z	543	**2.73**				
		Bioconcentration factor				**BCF = 50**				2885745

[1] Temp. = temperature; [2]OM = Organic Matter; [3] CEC = Cation Exchange Capacity; [4] Classification of McCall *et al*. 1981 for adsorption/desorption (PMRA 2024011); [5] Criteria of Cohen *et al*, 1984 for potential of leaching (PMRA 1918520); [6] GUS Score from Gustafson, 1989 (PMRA 1918524); NA = Not applicable; NR = Not reported; DME = Dimethomorph; DAT = Day after treatment; BCF = bioconcentration factor; **Bold values are used in the environmental risk assessment of DME.**

Appendix VII Toxicity

Table 1 Summary of Terrestrial Toxicity Data Following Exposure to Dimethomorph Technical and Formulations

Compound-Code	Organism	Species	Toxicity type	No. of days	Endpoint	Symbols[1]	Value	PMRA#
Earthworms								
Dimethomorph technical	Earthworms	*Eisenia foetida*	Acute	14	LC_{50}	=	**3309.9 mg a.i./kg soil**	2930949
Dimethomorph technical	Earthworms	*Eisenia foetida*	Acute	NR	LC_{50}	>	500 mg a.i./kg soil	2930943
Dimethomorph formulation (Forum)	Earthworms	*Eisenia foetida*	Acute	NR	LC_{50}	>	99.5 mg a.i./kg soil	2930943
Dimethomorph technical	Earthworms	*Eisenia foetida*	Reproduction (chronic)	56	NOEC	>	**76.0 mg a.i./kg soil**	1871649
Dimethomorph technical	Earthworms	*Eisenia foetida*	Reproduction (chronic)	NR	NOEC	=	60.0 mg a.i./kg soil	2930943
Dimethomorph formulation (Forum)	Earthworms	*Eisenia foetida*	Reproduction (chronic)	NR	NOEC	=	6.4 mg a.i./kg soil	2930943
Honey bees								
Dimethomorph technical	Honey bees	*Apis mellifera*	Acute contact	2	LD_{50}	>	**102.0 µg a.i./bee**	2930943
Dimethomorph technical (50%)	Honey bees	*Apis mellifera*	Acute contact	NR	LD_{50}	>	50.0 µg a.i./bee	2930942
Dimethomorph formulation (BAS 651 00 F; 20.2%)	Honey bees	*Apis mellifera*	Acute contact	NR	LD_{50}	>	42.3 µg a.i./bee	2930942
Dimethomorph technical (50%)	Honey bees	*Apis mellifera*	Acute oral	NR	LD_{50}	>	**50.0 µg a.i./bee**	2930942
Dimethomorph formulation (BAS 651 00 F; 20.2%)	Honey bees	*Apis mellifera*	Acute oral	2	LD_{50}	>	117 µg a.i./bee	1871637
Dimethomorph formulation (BAS 651 00 F; 20.2%)	Honey bees	*Apis mellifera*	Acute oral	NR	LD_{50}	>	49.6 µg a.i./bee	2930942
Dimethomorph formulation (BAS 550 01 F; 50%)	Honey bees	*Apis mellifera*	Acute larvae	3	LD_{50} NOED	> =	**118.9 µg a.i./bee/d** **37.4 µg a.i./larvae/dev. per.**	2885738
Dimethomorph formulation (BAS 550 01 F; 50%)	Honey bees	*Apis mellifera*	Chronic adult	10	1-d NOED 10-d NOED	≥ ≥	**273.3 µg a.i./bee/d** 2733 µg a.i./bee	2885739
Parasitoids								
Dimethomorph technical	Parasitoid hymenopteran	*Aphidius rhopalosiphi*	Extended lab - mortality	NR	LR_{50}	>	**1800 g a.i./ha**	2930943
Dimethomorph technical	Parasitoid hymenopteran	*Aphidius rhopalosiphi*	Extended lab - reproduction	NR	ER_{50}	>	1800 g a.i./ha	2930943
Dimethomorph formulation (BAS 651 00 F, 20.2%))	Parasitoid hymenopteran	*Aphidius rhopalosiphi*	Acute	NR	LR_{50}	>	716.8 g a.i/ha	2930942
Dimethomorph formulation (BAS 651 00 F, 20.2%))	Parasitoid hymenopteran	*Aphidius rhopalosiphi*	Acute	NR	LR_{50}	>	548.8 g a.i./ha	2930942

Compound-Code	Organism	Species	Toxicity type	No. of days	Endpoint	Symbols[1]	Value	PMRA#
Predators								
Dimethomorph technical	Predatory mite (nymph stage)	*Phytoseiulus persimilis*	Acute (floating leaf technique)	1	LR_{50}	>	**2000 g a.i./ha**	2930940
Dimethomorph technical (50%)	Predatory mite (adult)	*Phytoseiulus persimilis*	Acute	NR	LR_{50}	>	996.8 g a.i./ha	2930942
Dimethomorph formulation (CYA 15107)	Predatory mite (proto nymph)	*Phytoseiulus persimilis*	Acute	NR	LR_{50}	>	115 g EUP/ha	2930943
Dimethomorph formulation (BAS 651 00 F, 20.2%))	Predatory mite (adult)	*Typhlodromus pyri*	Acute	NR	LR_{50}	>	716.8 g a.i./ha	2930942
Dimethomorph formulation (CYA 15107)	Predatory mite (proto nymph	*Typhlodromus pyri*	Extended lab	NR	LR_{50}	>	115 g EUP/ha	2930943
Dimethomorph technical	Predatory mite (proto nymph)	*Typhlodromus pyri*	Extended lab - mortality	NR	LR_{50}	>	**1800 g a.i./ha**	2930943
Dimethomorph technical	Predatory mite (proto nymph)	*Typhlodromus pyri*	Extended lab - reproduction	NR	ER_{50}	>	1800 g a.i./ha	2930943
Beneficial arthropods								
Dimethomorph formulation (BAS 651 00 F, 20.2%)	Green lacewing	*Chrysoperla carnea*	Acute	NR	LR_{50}	>	**728 g a.i./ha**	2930942
Dimethomorph technical	Carabid beetles	*Pterostichus melanarius*	Field (pit trap)	10	LR_{50}	>	**180 g a.i./ha**	2930940
Dimethomorph formulation (Acrobat MZ)	Carabid beetles	*Pterostichus melanarius*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph technical	Carabid beetles	*Harpalus rufipes*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph formulation (Acrobat MZ)	Carabid beetles	*Harpalus rufipes*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph technical	Carabid beetles	*Bembidion lampros*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph formulation (Acrobat MZ)	Carabid beetles	*Bembidion lampros*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph technical	Carabid beetles	*Trechus quadristratus*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph formulation (Acrobat MZ)	Carabid beetles	*Trechus quadristratus*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph technical	Staphylinid beetles	*Aleocharinae sp.*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph formulation (Acrobat MZ)	Staphylinid beetles	*Aleocharinae sp.*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph technical	Staphylinid beetles	*Oxytelianae sp.*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph formulation (Acrobat MZ)	Staphylinid beetles	*Oxytelianae sp.*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph technical	Staphylinid	*Tachyporinae sp*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940

Compound-Code	Organism	Species	Toxicity type	No. of days	Endpoint	Symbols[1]	Value	PMRA#
	beetles							
Dimethomorph formulation (Acrobat MZ)	Staphylinid beetles	*Tachyporinae sp*	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph technical	Linyphid spiders	NR	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph formulation (Acrobat MZ)	Linyphid spiders	NR	Field (pit trap)	10	LR_{50}	>	180 g a.i./ha	2930940
Dimethomorph formulation (BAS 651 00 F, 20.2%)	Springtails	*Folsomia candida*	Chronic	NR	NOAEC	=	**204.8 g a.i./ha**	2930942
Wild Birds								
Dimethomorph technical (96.6%)	Northern bobwhite quail	*Colinus virginianus*	Acute oral	14	LD_{50}	>	**2000 mg a.i./kg bw**	2930940 2930942
Dimethomorph formulation (Forum 150 DC)	Northern bobwhite quail	*Colinus virginianus*	Acute oral	14	LD_{50}	>	1243 mg a.i./kg bw (186 mg a.i./kg bw/d)	2930943
Dimethomorph formulation (BAS 650 00 F, 20.2%)	Northern bobwhite quail	*Colinus virginianus*	Acute oral	14	LD_{50}	>	404 mg a.i./kg bw	2930942
Dimethomorph technical (96.6%)	Mallard duck	*Anas platyrhynchus*	Acute oral	14	LD_{50}	>	2000 mg a.i./kg bw	2930940 2930942
Dimethomorph technical (99.7%)	Canary	*Serinus canaria*	Acute oral	NR	LD_{50}	>	2000 mg a.i./kg bw	2930942
Dimethomorph technical	Northern bobwhite quail	*Colinus virginianus*	Dietary	14	LC_{50}	>	5200 mg/kg diet (728.3 mg a.i./kg bw/d)	2930940, 2930943
Dimethomorph technical (96.6%)	Northern bobwhite quail	*Colinus virginianus*	Dietary	NR	LC_{50}	>	5310 mg/kg diet	2930942
Dimethomorph technical	Mallard duck	*Anas platyrhynchus*	Dietary	14	LC_{50}	>	5200 mg/kg diet (937.5 mg a.i./kg bw/d)	2930940, 2930943
Dimethomorph technical (96.6%)	Mallard duck	*Anas platyrhynchus*	Dietary	14	LC_{50}	>	5310 mg/kg diet	2930942
Dimethomorph technical	Northern bobwhite quail	*Colinus virginianus*	Chronic, reproduction	NR	NOEL	=	**58.4 mg a.i./kg bw/d**	2930943
Dimethomorph technical (98.0%)	Northern bobwhite quail	*Colinus virginianus*	Chronic (adult female and hatchling body weight)	NR	NOAEC	=	200 mg a.i./kg diet	2930942
Dimethomorph technical	Mallard duck	*Anas platyrhynchus*	Chronic, reproduction	NR	NOEL	=	78.4 mg a.i./kg bw/d	2930943
Dimethomorph technical (98.0%)	Mallard duck	*Anas platyrhynchus*	Chronic, reproduction	NR	NOAEC	=	800 mg a.i./kg diet	2930942

Compound-Code	Organism	Species	Toxicity type	No. of days	Endpoint	Symbols[1]	Value	PMRA#
Wild Mammals								
Dimethomorph technical	Rat	*Rattus norvegicus*	Acute oral	NR	LD_{50}	≥	**3500 mg a.i./kg bw/d**	1256562
Dimethomorph technical	Rat	*Rattus norvegicus*	Dietary	NR	NOAEL	=	15 mg a.i./kg/d	2930942
Dimethomorph technical	Rat	*Rattus norvegicus*	Chronic, multi-generation, reproduction	NR	NOAEC	=	**50 mg a.i./kg bw/d**	1161458
Terrestrial Plants								
Dimethomorph technical	All species	N/A	Seedling emergence	NR	EC_{25}	>	**1100 g a.i./ha[2]**	2930942
Dimethomorph formulation (BAS 651 00 F, 20.2%)	All species	N/A	Seedling emergence	NR	EC_{25}	>	1098 g a.i./ha	2930942
Dimethomorph formulation (Acrobat MZ, 8.9%)	All species	N/A	Seedling emergence	NR	EC_{25}	>	224 g a.i./ha	2930942
Dimethomorph technical	All species	N/A	Vegetative vigour	NR	EC_{25}	>	**1100 g a.i./ha**	2930942
Dimethomorph formulation (BAS 651 00 F, 20.2%)	All species	N/A	Vegetative vigour	NR	EC_{25}	>	1098 g a.i./ha	2930942
Dimethomorph formulation (Acrobat MZ, 8.9%)	All species	N/A	Vegetative vigour	NR	EC_{25}	>	224 g a.i./ha	2930942

[1] Symbols are greater than, equal, less than. [2]Original value given in lbs a.i./acre × conversion factor of 1.12 = kg a.i./ha. (1 lb = 1120 g, 1 acre = .4047 ha); NR = not reported; NA = Not applicable; **dev. per.** = developmental period

Table 2 Aquatic Toxicity Data Following Exposure to Dimethomorph Technical and Formulations

Compound-Code	Purity (%)	System/ medium	Organism	Species	Toxicity type	No. of days	Endpoint	Symbols[1]	Value (mg a.i./L)	PMRA#
Freshwater Organisms										
Freshwater Invertebrates Acute Exposure										
Dimethomorph technical	NR	Static	Water flea	*Daphnia magna*	Acute	2	EC_{50}	=	**20.0**	2930940
Dimethomorph technical	NR	Static	Water flea	*Daphnia magna*	Acute	2	EC_{50}	>	10.6	2930942 2930943
Dimethomorph/mancozeb formulation (Acrobat MZ)	8.9	Static	Water flea	*Daphnia magna*	Acute	2	EC_{50}	=	0.41	2930940 2930942
Dimethomorph/mancozeb formulation (Acrobat MZ)	8.9	NR	Water flea	*Daphnia magna*	Acute	NR	EC_{50}	=	0.14	2930942
Dimethomorph formulation (BAS 651 00 F)	20.2	NR	Water flea	*Daphnia magna*	Acute	NR	EC_{50}	>	20.2	2930942 1871633

Compound-Code	Purity (%)	System/ medium	Organism	Species	Toxicity type	No. of days	Endpoint	Symbols[1]	Value (mg a.i./L)	PMRA#
Freshwater Invertebrates Chronic Exposure										
Dimethomorph technical	95.6	Semi-static	Water flea	*Daphnia magna*	Chronic	22	NOAEC	=	**0.1**	2930940 2930942
Dimethomorph technical	98.0	NR	Water flea	*Daphnia magna*	Chronic (growth length)	NR	NOAEC	=	0.11	2930942
Dimethomorph/mancozeb formulation 90/600)	NR	Semi-static	Water flea	*Daphnia magna*	Chronic	21	NOEC	=	0.056	2930940
Freshwater Fish Acute Exposure										
Dimethomorph technical	NR	Static, pH 7.3	Rainbow trout	*Onchorhynchus mykiss*	Acute	4	LC_{50}	=	**3.4**	2930940, 2930943
Dimethomorph technical	94.8	NR	Rainbow trout	*Onchorhynchus mykiss*	Acute	4	LC_{50}	=	6.2	2930942
Dimethomorph formulation (BAS 651 00 F)	20.2	Static, pH 7.5-8.5	Rainbow trout	*Onchorhynchus mykiss*	Acute	4	LC_{50}	=	4.9	2930942 1871631
Dimethomorph formulation (Acrobat MZ)	8.9	Semi-static, pH 7.3	Rainbow trout	*Onchorhynchus mykiss*	Acute	4	LC_{50}	=	0.061 0.68 mg/ EUP/L	2930942 2930940
Dimethomorph formulation (Acrobat MZ)	8.9	Semi-static, pH 8.6	Rainbow trout	*Onchorhynchus mykiss*	Acute	4	LC_{50}	=	0.053 0.6 mg EUP/L	2930940
Dimethomorph formulation (Forum)	NR	Semi-static	Rainbow trout	*Onchorhynchus mykiss*	Acute	4	LC_{50}	=	2.64 mg EUP/L (nominal)	2930940
Dimethomorph technical	NR	Static	Carp	*Cyprinus carpio*	Acute	4	LC_{50}	=	14.0	2930940
Dimethomorph technical	94.8	NR	Carp	*Cyprinus carpio*	Acute	NR	LC_{50}	=	18.7	2930942
Dimethomorph technical	NR	Static, pH 7.5	Bluegill	*Lepomis macrichirus*	Acute	4	LC_{50}	=	25.0	2930940
Dimethomorph technical	98.3	NR	Bluegill	*Lepomis macrichirus*	Acute	NR	LC_{50}	>	9.5	2930942
Dimethomorph technical	99.7	NR	Fathead minnow	*Pimephales promelas*	Acute	NR	LC_{50}	>	8.4	2930942
Freshwater Fish Chronic Exposure										
Dimethomorph technical	95.6	Flow-through, pH 7.8	Rainbow trout	*Onchorhynchus mykiss*	Chronic (prolonged)	21	NOEC	=	0.48	2930940 2930942
Dimethomorph technical	NR	Flow-through	Rainbow trout	*Onchorhynchus mykiss*	Chronic ELS	60	NOEC	=	**0.056**	2930943
Dimethomorph technical	98.0	NR	Rainbow trout	*Onchorhynchus mykiss*	Growth	NR	NOAEC	<	0.341[2]	2930943
Dimethomorph formulation (Acrobat MZ)	8.9	Flow-through, pH 7.2	Rainbow trout	*Onchorhynchus mykiss*	Chronic	14	NOAEC	=	0.0085	2930940 2930942
Dimethomorph formulation	NR	Flow-	Rainbow trout	*Onchorhynchus mykiss*	Chronic	28	NOEC	=	0.07 mg	2930943

Compound-Code	Purity (%)	System/ medium	Organism	Species	Toxicity type	No. of days	Endpoint	Symbols[1]	Value (mg a.i./L)	PMRA#
(Forum)		through							EUP/L	
Dimethomorph technical	98.3	NR	Fathead minnow	*Pimephales promelas*	Embryo survival	NR	NOAEC	=	0.11	2930942
Freshwater Algae Acute Exposure										
Dimethomorph technical (CME 151)	94.8	Static	Green algae	*Scenedesmus subspicatus chodat*	Acute	4	EC_{50} NOEC	=	29.2 9.8	1161531, 2930940
Dimethomorph formulation (Acrobat MZ 690)	NR	Static	Green algae	*Scenedesmus subspicatus chodat*	Acute	NR	EC_{50}	=	25.3	1164004 2930944
Dimethomorph technical	94.8	NR	Green algae	*Pseudokirchneriella subcapitata*	Acute	NR	EC_{50} NOEC	=	**23.8 16.3**	2930942
Dimethomorph technical (BAS 550 F)	98.3	Static	Green algae	*Pseudokirchneriella subcapitata*	Acute	3	EC_{50} NOEC	=	41.4 82.2	2885747 2930942
Dimethomorph formulation (BAS 651 00 F)	20.2	Static	Green algae	*Pseudokirchneriella subcapitata*	Acute	3	EC_{50} NOEC	=	14.7 5.03	1871635 2930942 1871635
Dimethomorph formulation (Acrobat MZ)	8.9	Static	Green algae	*Pseudokirchneriella subcapitata*	Acute	5	EC_{50}	=	0.0098	2885751 2930942
Dimethomorph formulation (Acrobat MZ)	8.9	Static	Blue green algae	*Anabaena flos-aquae*	Acute	5	EC_{50}	=	0.0113	2885749 2930942
Dimethomorph formulation (Acrobat MZ)	8.9	Static	Freshwater diatom	*Navicula pelliculosa*	Acute	NR	EC_{50}	=	0.00125	2885750 2930942
Freshwater Vascular Plant Acute Exposure										
Dimethomorph technical	50.5	NR	Duckweed	*Lemna gibba*	Acute	7	EC_{50} NOEC	=	**22.04 3.07**	2930942 1888446
Dimethomorph formulation (Acrobat MZ)	8.9	NR	Duckweed	*Lemna gibba*	Acute	NR	EC_{50} NOEC	=	0.77 0.30	2930942 1888445
Marine/Estuarine Invertebrates Acute Exposure										
Dimethomorph technical	97.6	NR	Mysid (shrimp)	*Mysidopsis bahia (Americamysis bahia)*	Acute	NR	EC_{50}	=	33.0	2930942
Dimethomorph technical	NR	Flow-through	Mysid (shrimp)	*Mysidopsis bahia (Americamysis bahia)*	Acute	4	EC_{50}	=	7.9	2930943
Dimethomorph technical	98.0	NR	Eastern oyster	*Crassostrea viginica*	Acute	4	EC_{50}	=	5.13	2930942
Dimethomorph technical (AC 336379)	97.6	Flow-through	Eastern oyster	*Crassostrea viginica*	Acute	4	EC_{50}	=	**4.42**	2885741 2930943
Marine/Estuarine Invertebrates Chronic Exposure										
Dimethomorph technical (BAS 550 F)	97.5	Flow through	Mysid (shrimp)	*Mysidopsis bahia (Americamysis bahia)*	Chronic (repro.)	28	NOAEC	=	**0.241**	2885742 2930942

Compound-Code	Purity (%)	System/ medium	Organism	Species	Toxicity type	No. of days	Endpoint	Symbols[1]	Value (mg a.i./L)	PMRA#
Marine/Estuarine Fish Acute Exposure										
Dimethomorph technical (AC 336379)	97.6	Flow through	Sheepshead minnow	*Cyprinodon variegatus*	Acute	4	LC_{50}	=	**11.3**	2885744 2930942
Marine/Estuarine Fish Chronic Exposure										
Dimethomorph technical (BAS 550 F)	97.5	Flow through	Sheepshead minnow	*Cyprinodon variegatus*	Chronic (ELS)	40/32	NOAEC	<	**0.063**	2885743 2930942

[1] Symbols are greater than, equal, less than. [2] A NOAEC could not be determined due to adverse effects in all treatment levels; NR = Not reported; bold and shaded values are to be use in the environmental risk assessment.

Appendix VIII Estimated Environmental Concentration

Table 1 Crop and Maximum Application Rate of Canadian Registered Products Containing Dimethomorph Using a Soil DT_{50} of 115 Days

Crop	Application Equipment	Timing[1]	No. of appl.	Droplet size	Max rate of applic. (g a.i./ha)	Time interval between application (day)	Soil EEC, 15 cm depth (mg a.i./kg soil)	Refined drift (%)	Refined Soil EEC, 15 cm depth for drift (mg a.i./kg soil)
Cucurbits	Groundboom	Post emergence	5	Medium	225	5	0.471	6	0.028
Cucurbits	Aerial	Post emergence	5	Medium	225	5	0.471	23	0.108
Grapes	Airblast	Post emergence	4	Fine	225	7	0.376	74	0.278

[1]Based on PMRA Appendix II, VUI Table (PMRA 2718691).

Table 2 The Estimated Environmental Concentration of Dimethomorph in Water (mg a.i./L) at 15 and 80 cm Depth as a Result of Direct Application From Uses on Various Crop scenarios and Using a DT_{50} of 41.6 Days

Crop	Application Equipment	Timing[1]	No. of appl.	Droplet size	Max rate of applic. (g a.i./ha)	Time interval between application (day)	EEC in 15 cm depth (mg a.i./L)	EEC in 80 cm depth (mg a.i./L)
Cucurbits	Groundboom	Post emergence	5	Medium	225	5	0.639	0.120
Cucurbits	Aerial	Post emergence	5	Medium	225	5	0.639	0.120
Grapes	Airblast	Post emergence	4	Fine	225	7	0.508	0.095

Table 3 Refined Estimated Environmental Concentration of Dimethomorph in Freshwater and Marine/Estuarine water (mg a.i./L) at 15 and 80 cm Depth as a Result of Spray Drift From Different Technologies Used to Treat Crops

Crop	Application Equipment	Droplet size	Max rate of applic. (g a.i./ha)	EEC in 15 cm water depth (mg a.i./L)	EEC in 80 cm water depth (mg a.i./L)	Refined drift (%)	Refined EEC in 15 cm depth (mg a.i./L)	Refined EEC in 80 cm depth (mg a.i./L)
Freshwater								
Cucurbits	Groundboom	Medium	958.99	0.639	0.120	6	0.038	0.007
Cucurbits	Aerial	Medium	958.99	0.639	0.120	23	0.147	0.028
Grapes	Airblast	Fine	762.01	0.508	0.095	74	0.376	0.070
Marine and estuarine water								
Cucurbits	Groundboom	Medium	225	0.150	0.028	6	N/A	0.002
Cucurbits	Aerial	Medium	225	0.150	0.028	23	N/A	0.006
Grapes	Airblast	Fine	225	0.150	0.028	74	N/A	0.021

Appendix IX Risk Assessment for Non-target Organisms

Table 1 Risk Quotients for Earthworms (*Eisenia foetida*) Exposed to Dimethomorph

Formulation Type	Reported Endpoint	Endpoint value (mg a.i./kg soil)	Crop scenario	EEC (mg a.i./kg soil)	RQ	LOC exceeded
Dimethomorph						
Acute Toxicity						
Dimethomorph technical	½ 14-d LC_{50}	1655	Cucurbits (groundboom)	0.471	< 0.0003	No
Dimethomorph technical	½ 14-d LC_{50}	1655	Cucurbits (aerial)	0.471	< 0.0003	No
Dimethomorph technical	½ 14-d LC_{50}	1655	Grapes (airblast)	0.376	< 0.0002	No
Chronic toxicity						
Dimethomorph technical	NOEC	76	Cucurbits (groundboom)	0.471	< 0.006	No
Dimethomorph technical	NOEC	76	Cucurbits (aerial)	0.471	< 0.006	No
Dimethomorph technical	NOEC	76	Grapes (airblast)	0.376	< 0.005	No

Risk quotient (RQ) = EEC / endpoint. Shaded value indicate RQ > LOC.

Table 2 Screening Level Risk Assessment for Honey Bees

Measurement Endpoint	Compound	Exposure Route	Application rate (kg a.i./ha)	Exposure Estimate µg a.i./bee [1]	Endpoint (µg a.i./bee/d)	RQ	LOC (0.4) exceeded?
Foliar Applications							
Individual Survival (adults)	DME	Contact	0.225[2]	0.540	LD50 >102	<0.005	No
Individual Survival (adults)	DME formulation	Dietary		6.525	LD50 >117	<0.056	No
Individual Survival (larvae)	DME formulation	Acute dietary		2.378	LD50 >118.9	< 0.02	No
Individual Survival (adults)	DME formulation	Chronic dietary		5.466	NOED ≥ 273.3	< 0.02	No
Soil Applications							
Individual Survival (adults)	DME formulation	Dietary	1.11[3]	N/A	LD50 >117	< 0.01	No
Individual Survival (larvae)	DME formulation	Acute dietary		N/A	LD50 >118.9	< 0.01	No
Individual Survival (adults)	DME formulation	Chronic dietary		N/A	NOED ≥ 273.3	< 0.01	No

[1]For foliar contact exposure, the exposure estimate = (2.4 µg a.i./bee)*(application rate in kg a.i./ha); For foliar dietary exposure, the exposure estimate = (29 µg a.i./bee)*(application rate in kg a.i./ha). This is based on 98 µg a.i./g per 1 kg a.i./ha × 0.292 g/day (28.6 µg a.i./bee per kg a.i./ha); [2] Based on single maximum application rate; [3] Soil EEC value based on 5 applications of 225 g a.i./ha at 5-day interval between applications; N/A = not applicable.

Table 3 Screening Level Risk Assessment for Predators and Parasitoids Exposed to Dimethomorph Technical

Organism	Exposure Route	Single Maximum Rate of Application (g a.i./ha)	Endpoint type	Value (g a.i./ha)	RQ	LOC (2.0) exceeded?
Foliar Application						
Parasitoid						
Aphidius rhopalosiphi	Extended lab	225 (cucurbits – groundboom)	Acute, LR_{50}	> 1800.0	< 0.13	No
	Extended lab	225 (cucurbits – aerial)	Acute, LR_{50}	> 1800.0	< 0.13	No
	Extended lab	225 (grapes)	Acute, LR_{50}	> 1800.0	< 0.13	No
Predator						
Typhlodromus pyri	Extended lab	225 (cucurbits – groundboom)	Acute, LR_{50}	> 1800.0	< 0.13	No
	Extended lab	225 (cucurbits – aerial)	Acute, LR_{50}	> 1800.0	< 0.13	No
	Extended lab	225 (grapes)	Acute, LR_{50}	> 1800.0	< 0.13	No
Beneficials						
Pterostichus melanarius	Field (pit trap)	225 (cucurbits – groundboom)	Acute, LR_{50}	> 180.0	1.25	No
	Field (pit trap)	225 (cucurbits – aerial)	Acute, LR_{50}	> 180.0	1.25	No
	Field (pit trap)	225 (grapes)	Acute, LR_{50}	> 180.0	1.25	No
Folsomia candida	NR	225 (cucurbits – groundboom)	Chronic, NOAEC	204.8[1]	1.10	No
	NR	225 (cucurbits – aerial)	Chronic, NOAEC	204.8[1]	1.10	No
	NR	225 (grapes)	Chronic, NOAEC	204.8[1]	1.10	No

[1] This value was obtained with dimethomorph formulation (BAS 651 00 F, 20.2%).

Table 3 Screening Level Risk Assessment for Dimethomorph Technical to Wild Birds in Cucurbit-Groundboom and Cucurbit-Aerial Production Scenarios Using Maximum Nomogram Values

Animal size and endpoint type	Toxicity (mg a.i./kg bw/d)	Feeding Guild (food item)	EDE[1] (mg a.i./kg bw)	RQ	LOC exceeded?
Small Bird (0.02 kg)					
Acute	18.60	Insectivore	57.63	**3.10**	Yes
Reproduction	58.40	Insectivore	57.63	0.99	No
Medium Sized Bird (0.1 kg)					
Acute	18.60	Insectivore	44.97	**2.42**	Yes
Reproduction	58.40	Insectivore	44.97	0.77	No
Large Sized Bird (1 kg)					
Acute	18.60	Herbivore (short grass)	29.05	**1.56**	Yes
Reproduction	58.40	Herbivore (short grass)	29.05	0.50	No

[1] EDE = Estimated Daily Exposure. Bold and shaded values are above LOC.

Table 5 Screening Level Risk Assessment for Dimethomorph to Wild Birds in Cucurbits-Groundboom Scenario Using On-Field and Off-Field Maximum and Mean Nomogram Values

Bird sizes and endpoint type	Toxicity (mg a.i./ kg bw/d)	Food guild (food item)	Maximum nomogram residues				Mean nomogram residues			
			On-field		Off Field		On-field		Off Field	
			EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ
Small Bird (0.02 kg)										
Acute	18.60	Insectivore	57.63	**3.1**	3.46	0.2	39.79	**2.1**	2.39	0.13
	18.60	Granivore (grain and seeds)	8.92	0.5	0.54	0.0	4.25	0.2	0.26	0.01
	18.60	Frugivore (fruit)	17.84	1.0	1.07	0.1	8.51	0.5	0.51	0.03
Dietary	72.83	Insectivore	57.63	0.8	3.46	0.0	39.79	0.6	2.39	0.03
	72.83	Granivore (grain and seeds)	8.92	0.1	0.54	0.0	4.25	0.1	0.26	0.00
	72.83	Frugivore (fruit)	17.84	0.2	1.07	0.0	8.51	0.1	0.51	0.01
Reproduction	58.40	Insectivore	57.63	1.0	3.46	0.1	39.79	0.7	2.39	0.04
	58.40	Granivore (grain and seeds)	8.92	0.2	0.54	0.0	4.25	0.1	0.26	0.00
	58.40	Frugivore (fruit)	17.84	0.3	1.07	0.0	8.51	0.2	0.51	0.01
Medium Sized Bird (0.1 kg)										
Acute	18.60	Insectivore	44.97	**2.4**	2.70	0.1	31.05	**1.7**	1.86	0.10
	18.60	Granivore (grain and seeds)	6.96	0.4	0.42	0.0	3.32	0.2	0.20	0.01
	18.60	Frugivore (fruit)	13.92	0.7	0.84	0.0	6.64	0.4	0.40	0.02
Dietary	72.83	Insectivore	44.97	0.6	2.70	0.0	31.05	0.4	1.86	0.03
	72.83	Granivore (grain and seeds)	6.96	0.1	0.42	0.0	3.32	0.1	0.20	0.00
	72.83	Frugivore (fruit)	13.92	0.2	0.84	0.0	6.64	0.1	0.40	0.01
Reproduction	58.40	Insectivore	44.97	0.8	2.70	0.0	31.05	0.5	1.86	0.03
	58.40	Granivore (grain and seeds)	6.96	0.1	0.42	0.0	3.32	0.1	0.20	0.00
	58.40	Frugivore (fruit)	13.92	0.2	0.84	0.0	6.64	0.1	0.40	0.01
Large Sized Bird (1 kg)										
Acute	18.60	Insectivore	13.13	0.7	0.79	0.0	9.07	0.5	0.54	0.03
	18.60	Granivore (grain and seeds)	2.03	0.1	0.12	0.0	9.07	0.5	0.06	0.00
	18.60	Frugivore (fruit)	4.06	0.2	0.24	0.0	1.94	0.1	0.12	0.01
	18.60	Herbivore (short grass)	29.05	**1.6**	1.74	0.1	10.32	0.6	0.62	0.03
	18.60	Herbivore (long grass)	17.74	1.0	1.06	0.1	5.79	0.3	0.35	0.02
	18.60	Herbivore (Broadleaf plants)	26.88	**1.4**	1.61	0.1	8.89	0.5	0.53	0.03
Dietary	72.83	Insectivore	13.13	0.2	0.79	0.0	9.07	0.1	0.54	0.01
	72.83	Granivore (grain and seeds)	2.03	0.0	0.12	0.0	9.07	0.1	0.06	0.00
	72.83	Frugivore (fruit)	4.06	0.1	0.24	0.0	1.94	0.0	0.12	0.00
	72.83	Herbivore (short grass)	29.05	0.4	1.74	0.0	10.32	0.1	0.62	0.01
	72.83	Herbivore (long grass)	17.74	0.2	1.06	0.0	5.79	0.1	0.35	0.00

Bird sizes and endpoint type	Toxicity (mg a.i./ kg bw/d)	Food guild (food item)	Maximum nomogram residues				Mean nomogram residues			
			On-field		Off Field		On-field		Off Field	
			EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ
	72.83	Herbivore (Broadleaf plants)	26.88	0.4	1.61	0.0	8.89	0.1	0.53	0.01
Reproduction	58.40	Insectivore	13.13	0.2	0.79	0.0	9.07	0.2	0.54	0.01
	58.40	Granivore (grain and seeds)	2.03	0.0	0.12	0.0	9.07	0.2	0.06	0.00
	58.40	Frugivore (fruit)	4.06	0.1	0.24	0.0	1.94	0.0	0.12	0.00
	58.40	Herbivore (short grass)	29.05	0.5	1.74	0.0	10.32	0.2	0.62	0.01
	58.40	Herbivore (long grass)	17.74	0.3	1.06	0.0	5.79	0.1	0.35	0.01
	58.40	Herbivore (Broadleaf plants)	26.88	0.5	1.61	0.0	8.89	0.2	0.53	0.01

Bold and shaded values are above the LOC

Table 6 Screening Level Risk Assessment for Dimethomorph Technical to Wild Birds in Grape-Airblast Production Scenarios Using Maximum Nomogram Values

Animal size and endpoint type	Toxicity (mg a.i./kg bw/d)	Feeding Guild (food item)	EDE[1] (mg a.i./kg bw)	RQ	LOC exceeded?
Small Bird (0.02 kg)					
Acute	18.60	Insectivore	45.59	**2.45**	Yes
Reproduction	58.40	Insectivore	45.59	0.78	No
Medium Sized Bird (0.1 kg)					
Acute	18.60	Insectivore	35.58	**1.91**	Yes
Reproduction	58.40	Insectivore	35.58	0.61	No
Large Sized Bird (1 kg)					
Acute	18.60	Herbivore (short grass)	22.98	**1.24**	Yes
Reproduction	58.40	Herbivore (short grass)	22.98	0.39	No

[1] EDE = Estimated Daily Exposure. Bold and shaded values are above LOC.

Table 7 Screening Level Risk Assessment for Dimethomorph to Wild Birds in Grapes-airblast Scenario Using On-Field and Off-Field Maximum and Mean Nomogram Values

Bird sizes and endpoint type	Toxicity (mg a.i./ kg bw/d)	Food guild (food item)	Maximum nomogram residues				Mean nomogram residues			
			On-field		Off Field		On-field		Off Field	
			EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ
Small Bird (0.02 kg)										
Acute	18.60	Insectivore	45.59	**2.5**	33.73	**1.8**	31.48	**1.7**	23.29	**1.3**
	18.60	Granivore (grain and seeds)	7.06	0.4	5.22	0.3	3.36	0.2	2.49	0.1
	18.60	Frugivore (fruit)	14.11	0.8	10.44	0.6	6.73	0.4	4.98	0.3
Dietary	72.83	Insectivore	45.59	0.6	33.73	0.5	31.48	0.4	23.29	0.3
	72.83	Granivore (grain and	7.06	0.1	5.22	0.1	3.36	0.0	2.49	0.0

Bird sizes and endpoint type	Toxicity (mg a.i./ kg bw/d)	Food guild (food item)	Maximum nomogram residues				Mean nomogram residues			
			On-field		Off Field		On-field		Off Field	
			EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ	EDE (mg a.i./kg bw)	RQ
		seeds)								
	72.83	Frugivore (fruit)	14.11	0.2	10.44	0.1	6.73	0.1	4.98	0.1
Reproduction	58.40	Insectivore	45.59	0.8	33.73	0.6	31.48	0.5	23.29	0.4
	58.40	Granivore (grain and seeds)	7.06	0.1	5.22	0.1	3.36	0.1	2.49	0.0
	58.40	Frugivore (fruit)	14.11	0.2	10.44	0.2	6.73	0.1	4.98	0.1
Medium Sized Bird (0.1 kg)										
Acute	18.60	Insectivore	35.58	**1.9**	26.33	**1.4**	24.56	**1.3**	18.18	1.0
	18.60	Granivore (grain and seeds)	5.51	0.3	4.07	0.2	2.63	0.1	1.94	0.1
	18.60	Frugivore (fruit)	11.01	0.6	8.15	0.4	5.25	0.3	3.89	0.2
Dietary	72.83	Insectivore	35.58	0.5	26.33	0.4	24.56	0.3	18.18	0.2
	72.83	Granivore (grain and seeds)	5.51	0.1	4.07	0.1	2.63	0.0	1.94	0.0
	72.83	Frugivore (fruit)	11.01	0.2	8.15	0.1	5.25	0.1	3.89	0.1
Reproduction	58.40	Insectivore	35.58	0.6	26.33	0.5	24.56	0.4	18.18	0.3
	58.40	Granivore (grain and seeds)	5.51	0.1	4.07	0.1	2.63	0.0	1.94	0.0
	58.40	Frugivore (fruit)	11.01	0.2	8.15	0.1	5.25	0.1	3.89	0.1
Large Sized Bird (1 kg)										
Acute	18.60	Insectivore	10.39	0.6	7.69	0.4	7.17	0.4	5.31	0.3
	18.60	Granivore (grain and seeds)	1.61	0.1	1.19	0.1	7.17	0.4	0.57	0.0
	18.60	Frugivore (fruit)	3.21	0.2	2.38	0.1	1.53	0.1	1.13	0.1
	18.60	Herbivore (short grass)	22.98	**1.2**	17.00	0.9	8.16	0.4	6.04	0.3
	18.60	Herbivore (long grass)	14.03	0.8	10.38	0.6	4.58	0.2	3.39	0.2
	18.60	Herbivore (Broadleaf plants)	21.26	**1.1**	15.73	0.8	7.03	0.4	5.20	0.3
Dietary	72.83	Insectivore	10.39	0.1	7.69	0.1	7.17	0.1	5.31	0.1
	72.83	Granivore (grain and seeds)	1.61	0.0	1.19	0.0	7.17	0.1	0.57	0.0
	72.83	Frugivore (fruit)	3.21	0.0	2.38	0.0	1.53	0.0	1.13	0.0
	72.83	Herbivore (short grass)	22.98	0.3	17.00	0.2	8.16	0.1	6.04	0.1
	72.83	Herbivore (long grass)	14.03	0.2	10.38	0.1	4.58	0.1	3.39	0.0
	72.83	Herbivore (Broadleaf plants)	21.26	0.3	15.73	0.2	7.03	0.1	5.20	0.1
Reproduction	58.40	Insectivore	10.39	0.2	7.69	0.1	7.17	0.1	5.31	0.1
	58.40	Granivore (grain and seeds)	1.61	0.0	1.19	0.0	7.17	0.1	0.57	0.0
	58.40	Frugivore (fruit)	3.21	0.1	2.38	0.0	1.53	0.0	1.13	0.0
	58.40	Herbivore (short grass)	22.98	0.4	17.00	0.3	8.16	0.1	6.04	0.1
	58.40	Herbivore (long grass)	14.03	0.2	10.38	0.2	4.58	0.1	3.39	0.1
	58.40	Herbivore (Broadleaf plants)	21.26	0.4	15.73	0.3	7.03	0.1	5.20	0.1

Bold and shaded values are above the LOC

Table 8 Screening Level Risk Assessment for Dimethomorph Technical to Wild Mammals in Cucurbit-Groundboom and Cucurbit-Aerial Production Scenarios Using Maximum Nomogram Values

Animal size and endpoint type	Toxicity (mg a.i./kg bw/d)	Feeding Guild (food item)	EDE[1] (mg a.i./kg bw)	RQ	LOC exceeded?
Small Mammal (0.015 kg)					
Acute	350.00	Insectivore	33.15	0.09	No
Reproduction	50.00	Insectivore	33.15	0.66	No
Medium Sized Mammal (0.035 kg)			Insectivore		
Acute	350.00	Herbivore (short grass)	64.29	0.18	No
Reproduction	50.00	Herbivore (short grass)	64.29	**1.29**	Yes
Large Sized Mammal (1 kg)					
Acute	350.00	Herbivore (short grass)	34.35	0.10	No
Reproduction	50.00	Herbivore (short grass)	34.35	0.69	No

[1] EDE = Estimated Daily Exposure. Bold and shaded values are above LOC.

Table 9 Screening Level Risk Assessment for Dimethomorph to Wild Mammals in Cucurbits-Groundboom Scenario Using On-Field and Off-Field Maximum and Mean Nomogram Values

Mammal sizes and endpoint type	Toxicity (mg a.i./ kg bw/d)	Food Guild (food item)	Maximum nomogram residues				Mean nomogram residues			
			On-field		Off Field		On-field		Off Field	
			EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ
Small Mammal (0.015 kg)										
Acute	350.00	Insectivore	33.15	0.1	1.99	0.01	22.89	0.1	1.37	0.0
	350.00	Granivore (grain and seeds)	5.13	0.0	0.31	0.00	2.45	0.0	0.15	0.0
	350.00	Frugivore (fruit)	10.26	0.0	0.62	0.00	4.89	0.0	0.29	0.0
Reproduction	50.00	Insectivore	33.15	0.7	1.99	0.04	22.89	0.5	1.37	0.0
	50.00	Granivore (grain and seeds)	5.13	0.1	0.31	0.01	2.45	0.0	0.15	0.0
	50.00	Frugivore (fruit)	10.26	0.2	0.62	0.01	4.89	0.1	0.29	0.0
Medium Sized Mammal (0.035 kg)										
Acute	350.00	Insectivore	29.06	0.1	1.74	0.00	20.06	0.1	1.20	0.0
	350.00	Granivore (grain and seeds)	4.50	0.0	0.27	0.00	2.14	0.0	0.13	0.0
	350.00	Frugivore (fruit)	8.99	0.0	0.54	0.00	4.29	0.0	0.26	0.0
	350.00	Herbivore (short grass)	64.29	0.2	3.86	0.01	22.83	0.1	1.37	0.0
	350.00	Herbivore (long grass)	39.25	0.1	2.36	0.01	12.82	0.0	0.77	0.0
	350.00	Herbivore (forage crops)	59.48	0.2	3.57	0.01	19.66	0.1	1.18	0.0
Reproduction	50.00	Insectivore	29.06	0.6	1.74	0.03	20.06	0.4	1.20	0.0
	50.00	Granivore (grain and seeds)	4.50	0.1	0.27	0.01	2.14	0.0	0.13	0.0
	50.00	Frugivore (fruit)	8.99	0.2	0.54	0.01	4.29	0.1	0.26	0.0
	50.00	Herbivore (short grass)	64.29	**1.3**	3.86	0.08	22.83	0.5	1.37	0.0

Mammal sizes and endpoint type	Toxicity (mg a.i./ kg bw/d)	Food Guild (food item)	Maximum nomogram residues				Mean nomogram residues			
			On-field		Off Field		On-field		Off Field	
			EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ
	50.00	Herbivore (long grass)	39.25	0.8	2.36	0.05	12.82	0.3	0.77	0.0
	50.00	Herbivore (Broadleaf plants)	59.48	**1.2**	3.57	0.07	19.66	0.4	1.18	0.0
Large Sized Mammal (1 kg)										
Acute	350.00	Insectivore	15.53	0.0	0.93	0.00	10.72	0.0	0.64	0.0
	350.00	Granivore (grain and seeds)	2.40	0.0	0.14	0.00	1.15	0.0	0.07	0.0
	350.00	Frugivore (fruit)	4.81	0.0	0.29	0.00	2.29	0.0	0.14	0.0
	350.00	Herbivore (short grass)	34.35	0.1	2.06	0.01	12.20	0.0	0.73	0.0
	350.00	Herbivore (long grass)	20.97	0.1	1.26	0.00	6.85	0.0	0.41	0.0
	350.00	Herbivore (Broadleaf plants)	31.78	0.1	1.91	0.01	10.51	0.0	0.63	0.0
Reproduction	50.00	Insectivore	15.53	0.3	0.93	0.02	10.72	0.2	0.64	0.0
	50.00	Granivore (grain and seeds)	2.40	0.0	0.14	0.00	1.15	0.0	0.07	0.0
	50.00	Frugivore (fruit)	4.81	0.1	0.29	0.01	2.29	0.0	0.14	0.0
	50.00	Herbivore (short grass)	34.35	0.7	2.06	0.04	12.20	0.2	0.73	0.0
	50.00	Herbivore (long grass)	20.97	0.4	1.26	0.03	6.85	0.1	0.41	0.0
	50.00	Herbivore (Broadleaf plants)	31.78	0.6	1.91	0.04	10.51	0.2	0.63	0.0

Bold and shaded values are above the LOC

Table 10 Screening Level Risk Assessment for Dimethomorph Technical to Wild Mammals in Grape-Airblast Production Scenarios Using Maximum Nomogram Values

Animal size and endpoint type	Toxicity (mg a.i./kg bw/d)	Feeding Guild (food item)	EDE[1] (mg a.i./kg bw)	RQ	LOC exceeded?
Small Mammal (0.015 kg)					
Acute	350.00	Insectivore	26.22	0.07	No
Reproduction	50.00	Insectivore	26.22	0.52	No
Medium Sized Mammal (0.035 kg)					
Acute	350.00	Herbivore (short grass)	50.85	0.15	No
Reproduction	50.00	Herbivore (short grass)	50.85	**1.02**	Yes
Large Sized Mammal (1 kg)					
Acute	350.00	Herbivore (short grass)	27.17	0.08	No
Reproduction	50.00	Herbivore (short grass)	27.17	0.54	No

[1] EDE = Estimated Daily Exposure. Bold and shaded values are above LOC.

Table 11 Screening Level Risk Assessment for Dimethomorph to Wild Mammals in Grapes-airblast Scenario Using On-Field and Off-Field Maximum and Mean Nomogram Values

Mammal sizes and endpoint type	Toxicity (mg a.i. /kg bw/d)	Food Guild (food item)	Maximum nomogram residues				Mean nomogram residues			
			On-field		Off Field		On-field		Off Field	
			EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ
Small Mammal (0.015 kg)										
Acute	350.00	Insectivore	26.22	0.1	19.40	0.1	18.10	0.1	13.40	0.0
	350.00	Granivore (grain and seeds)	4.06	0.0	3.00	0.0	1.94	0.0	1.43	0.0
	350.00	Frugivore (fruit)	8.12	0.0	6.01	0.0	3.87	0.0	2.86	0.0
Reproduction	50.00	Insectivore	26.22	0.5	19.40	0.4	18.10	0.4	13.40	0.3
	50.00	Granivore (grain and seeds)	4.06	0.1	3.00	0.1	1.94	0.0	1.43	0.0
	50.00	Frugivore (fruit)	8.12	0.2	6.01	0.1	3.87	0.1	2.86	0.1
Medium Sized Mammal (0.035 kg)										
Acute	350.00	Insectivore	22.98	0.1	17.01	0.0	15.87	0.0	11.74	0.0
	350.00	Granivore (grain and seeds)	3.56	0.0	2.63	0.0	1.70	0.0	1.26	0.0
	350.00	Frugivore (fruit)	7.11	0.0	5.26	0.0	3.39	0.0	2.51	0.0
	350.00	Herbivore (short grass)	50.85	0.1	37.63	0.1	18.06	0.1	13.36	0.0
	350.00	Herbivore (long grass)	31.05	0.1	22.98	0.1	10.14	0.0	7.50	0.0
	350.00	Herbivore (forage crops)	47.05	0.1	34.82	0.1	15.55	0.0	11.51	0.0
Reproduction	50.00	Insectivore	22.98	0.5	17.01	0.3	15.87	0.3	11.74	0.2
	50.00	Granivore (grain and seeds)	3.56	0.1	2.63	0.1	1.70	0.0	1.26	0.0
	50.00	Frugivore (fruit)	7.11	0.1	5.26	0.1	3.39	0.1	2.51	0.1
	50.00	Herbivore (short grass)	50.85	**1.0**	37.63	0.8	18.06	0.4	13.36	0.3
	50.00	Herbivore (long grass)	31.05	0.6	22.98	0.5	10.14	0.2	7.50	0.2
	50.00	Herbivore (Broadleaf plants)	47.05	0.9	34.82	0.7	15.55	0.3	11.51	0.2
Large Sized Mammal (1 kg)										
Acute	350.00	Insectivore	12.28	0.0	9.09	0.0	8.48	0.0	6.28	0.0
	350.00	Granivore (grain and seeds)	1.90	0.0	1.41	0.0	0.91	0.0	0.67	0.0
	350.00	Frugivore (fruit)	3.80	0.0	2.81	0.0	1.81	0.0	1.34	0.0
	350.00	Herbivore (short grass)	27.17	0.1	20.11	0.1	9.65	0.0	7.14	0.0
	350.00	Herbivore (long grass)	16.59	0.0	12.28	0.0	5.42	0.0	4.01	0.0
	350.00	Herbivore (Broadleaf plants)	25.14	0.1	18.60	0.1	8.31	0.0	6.15	0.0
Reproduction	50.00	Insectivore	12.28	0.2	9.09	0.2	8.48	0.2	6.28	0.1
	50.00	Granivore (grain and seeds)	1.90	0.0	1.41	0.0	0.91	0.0	0.67	0.0

Mammal sizes and endpoint type	Toxicity (mg a.i. /kg bw/d)	Food Guild (food item)	Maximum nomogram residues				Mean nomogram residues			
			On-field		Off Field		On-field		Off Field	
			EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ	EDE (mg a.i./ kg bw)	RQ
	50.00	Frugivore (fruit)	3.80	0.1	2.81	0.1	1.81	0.0	1.34	0.0
	50.00	Herbivore (short grass)	27.17	0.5	20.11	0.4	9.65	0.2	7.14	0.1
	50.00	Herbivore (long grass)	16.59	0.3	12.28	0.2	5.42	0.1	4.01	0.1
	50.00	Herbivore (Broadleaf plants)	25.14	0.5	18.60	0.4	8.31	0.2	6.15	0.1

Bold and shaded values are above the LOC

Table 12 Risk Assessment (on-field and off-field) and Risk Quotients for Terrestrial Vascular Plants (Seedling Emergence and Vegetative Vigour) at the Maximum Rate of Application for Dimethomorph in Three Crop Scenarios

Organism	Exposure	Species	Endpoint value (g a.i./ha)	Site	EEC	RQ[1]	Exceed LOC?
Non-Target Terrestrial							
Cucurbit-groundboom scenario							
Terrestrial Vascular plants	Seedling emergence	All species	EC_{25} = 1100	On-field	0.49 g a.i./ha	0.0004	No
				Off-field[2]	0.03 g a.i./ha	0.00003	No
	Vegetative vigour	All species	EC_{25} = 1100	On-field	708.0 g a.i./ha	0.64	No
				Off-field[2]	42.4 g a.i./ha	0.04	No
Cucurbit-aerial scenario							
Terrestrial Vascular plants	Seedling emergence	All species	EC_{25} = 1100	On-field	0.49 g a.i./ha	0.0004	No
				Off-field[2]	0.11 g a.i./ha	0.0001	No
	Vegetative vigour	All species	EC_{25} = 1100	On-field	708.0 g a.i./ha	0.64	No
				Off-field[2]	162.8 g a.i./ha	0.15	No
Grape-airblast scenario							
Terrestrial Vascular plants	Seedling emergence	All species	EC_{25} = 1100	On-field	0.40 g a.i./ha	0.0004	No
				Off-field[2]	0.29 g a.i./ha	0.0003	No
	Vegetative vigour	All species	EC_{25} = 1100	On-field	560.1 g a.i./ha	0.51	No
				Off-field[2]	414.4 g a.i./ha	0.38	No

[1] Shaded cells and **bold values** indicate that the level of concern is exceeded (RQ > 1); [2] Off –field = groundboom technology and 6% drift); [3] soil depth of 3 cm for seedling emergence.

Table 13 Screening Level Risk Assessment of Dimethomorph to Freshwater Invertebrates Following Application in the Three Crop Scenarios but using DT_{50} of 41.6 Days

Organism	Species	Exposure	Endpoint	Endpoint value (mg a.i./L)	Spray rate (g a.i./ha)	Depth (cm)	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Cucurbit-groundboom and aerial scenario									
Water flea	*Daphnia magna*	Acute	½ EC_{50}	10	959	80	0.120	0.01	No
	Daphnia magna	Chronic	NOAEC	0.1	959	80	0.120	**1.2**	Yes
Grape-airblast scenario									
Water flea	*Daphnia magna*	Acute	½ EC_{50}	10	762	80	0.095	0.01	No
	Daphnia magna	Chronic	NOAEC	0.1	762	80	0.095	0.95	No

[1] Single species freshwater invertebrate toxicity endpoints used in the acute exposure risk assessment are derived by dividing the EC_{50}, LC_{50} from the appropriate laboratory study by a factor of two (2). Bold and Shaded values indicate that the screening level RQ exceeds the LOC of 1.0.

Table 14 Screening Level Risk Assessment of Dimethomorph to Freshwater Fish and Amphibians Following Application in the Three Crop Scenarios

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Cucurbit-groundboom and aerial scenario									
Amphibian (surrogate)	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	959	15	0.639	**1.88**	Yes
Rainbow trout	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	959	80	0.120	0.35	No
Rainbow trout	*Onchorhynchus mykiss*	Chronic	NOAEC	0.056	959	80	0.120	**2.14**	Yes
Grape-airblast scenario									
Amphibian (surrogate)	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	762	15	0.508	**1.49**	Yes
Rainbow trout	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	762	80	0.095	0.28	No
Rainbow trout	*Onchorhynchus mykiss*	Chronic	NOAEC	0.056	762	80	0.095	**1.70**	Yes

[1] Single species freshwater fish toxicity endpoints used in the acute exposure risk assessment are derived by dividing the LC_{50} from the appropriate laboratory study by a factor of ten (10). Amphibian risk assessment is based on the surrogate rainbow trout endpoint in 15 cm water depth; bold and shaded values are above the LOC

Table 15 Screening Level Risk Assessment of Dimethomorph to Marine/Estuarine Fish Following Application in the Three Crop Scenarios.

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Marine/estuarine Fish Acute Exposure									
Cucurbit-groundboom and aerial scenarios									
Sheepshead minnow	*Cyprinodon variegatus*	Acute	1/10 LC_{50}	5.65	959	80	0.120	0.02	No
Grape-airblast scenarios									
Sheepshead minnow	*Cyprinodon variegatus*	Acute	1/10 LC_{50}	5.65	762	80	0.095	0.02	No

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Marine/Estuarine Fish Chronic Exposure									
Cucurbit-groundboom and aerial scenarios									
Sheepshead minnow	*Cyprinodon variegatus*	Chronic	NOEC	0.063	959	80	0.120	**1.9**	Yes
Grape-airblast scenarios									
Sheepshead minnow	*Cyprinodon variegatus*	Chronic	NOEC	0.063	762	80	0.095	**1.5**	Yes

Shaded cells indicate that the screening level RQ exceeds the LOC of 1.0.

Table 16 Screening Level Risk Assessment of Dimethomorph to Freshwater Algae and Plants Following Application in the Three Crop Scenarios

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Freshwater algae									
Cucurbit-groundboom and aerial scenarios									
Green algae	*Pseudokirchneriella subcapitata*	Acute	1/2 EC_{50}	11.9	959	80	0.120	0.01	No
Grape-airblast scenarios									
Green algae	*Pseudokirchneriella subcapitata*	Acute	1/2 EC_{50}	11.9	762	80	0.095	0.008	No
Freshwater vascular plants									
Cucurbit-groundboom and aerial scenarios									
Duckweed	*Lemna gibba*	Acute	1/2 EC_{50}	11.02	959	80	0.120	0.011	No
Grape-airblast scenarios									
Duckweed	*Lemna gibba*	Acute	1/2 EC_{50}	11.02	762	80	0.095	0.009	No

[1] Single species freshwater algae and plant toxicity endpoints used in the acute exposure risk assessment are derived by dividing the EC_{50} from the appropriate laboratory study by a factor of two (2). Shaded cells indicate that the screening level RQ exceeds the LOC of 1.0.

Table 17 Screening Level Risk Assessment of Dimethomorph to Marine/Estuarine Invertebrates Following Application in the Three Crop Scenarios

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Marine/estuarine Invertebrates Acute Exposure									
Cucurbit-groundboom and aerial scenarios									
Mysid shrimp	*Americamysis bahia*	Acute	½ EC_{50}	2.2	959	80	0.120	0.05	No
Grape-airblast scenarios									
Mysid shrimp	*Americamysis bahia*	Acute	½ EC_{50}	2.2	762	80	0.095	0.04	No
Marine/Estuarine Invertebrates Chronic Exposure									
Cucurbit-groundboom and aerial scenarios									
Mysid shrimp	*Americamysis bahia*	Chronic	NOEC	0.241	959	80	0.120	0.50	No
Grape-airblast scenarios									

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Mysid shrimp	*Americamysis bahia*	Chronic	NOEC	0.241	762	80	0.095	0.39	No

[1] Single species marine/estuarine algae toxicity endpoints used in the acute exposure risk assessment are derived by dividing the EC_{50} from the appropriate laboratory study by a factor of two (2). Shaded cells indicate that the screening level RQ exceeds the LOC of 1.0.

Table 18 Screening Level Risk Assessment of Dimethomorph to surrogate Marine/Estuarine Algae Following Application for the Three Crop Scenarios with DT_{50} of 41.6 Days

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Marine/estuarine Invertebrates Acute Exposure									
Cucurbit-groundboom and aerial scenarios									
Surrogate Green algae	*Pseudokirchneriella subcapitata*	Acute	1/2 EC_{50}	11.9	959	80	0.120	0.01	No
Grape-airblast scenarios									
Surrogate Green algae	*Pseudokirchneriella subcapitata*	Acute	1/2 EC_{50}	11.9	762	80	0.095	0.008	No

[1] Single species marine/estuarine algae toxicity endpoints used in the acute exposure risk assessment are derived by dividing the EC_{50} from the appropriate laboratory study by a factor of two (2). Shaded cells indicate that the screening level RQ exceeds the LOC of 1.0.

Table 19 Further Risk Characterization of Dimethomorph to Aquatic Organisms Following Drift Refinement from the three Crop Scenarios

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	drift	EEC[1] (mg a.i./L)	RQ[2]	Exceed LOC?
Freshwater invertebrates chronic exposure										
Cucurbit groundboom scenario										
Water flea	*Daphnia magna*	Chronic	NOAEC	0.1	959	80	0.06	0.007	0.07	No
Cucurbit aerial scenario										
Water flea	*Daphnia magna*	Chronic	NOAEC	0.1	959	80	0.23	0.028	0.28	No
Grape airblast scenario										
Water flea	*Daphnia magna*	Chronic	NOAEC	0.1	762	80	0.74	0.07	0.70	No
Amphibian										
Cucurbit groundboom scenario										
Rainbow trout	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	959	15	0.06	0.038	0.11	No
Cucurbit aerial scenario										
Rainbow trout	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	959	15	0.23	0.147	0.43	No
Grape airblast scenario										
Rainbow trout	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	762	15	0.74	0.380	**1.11**	Yes

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	drift	EEC[1] (mg a.i./L)	RQ[2]	Exceed LOC?
Freshwater fish chronic exposure										
Cucurbit groundboom scenario										
Rainbow trout	*Onchorhynchus mykiss*	Chronic	NOAEC	0.056	959	80	0.06	0.007	0.13	No
Cucurbit aerial scenario										
Rainbow trout	*Onchorhynchus mykiss*	Chronic	NOAEC	0.056	959	80	0.23	0.028	0.50	No
Grape airblast scenario										
Rainbow trout	*Onchorhynchus mykiss*	Chronic	NOAEC	0.056	762	80	0.74	0.07	**1.25**	Yes
Marine/estuarine fish chronic exposure										
Cucurbit groundboom scenario										
Sheepshead minnow	*Cyprinodon variegatus*	Chronic	NOAEC	0.063	225	80	0.06	0.002	0.03	No
Cucurbit aerial scenario										
Sheepshead minnow	*Cyprinodon variegatus*	Chronic	NOAEC	0.063	225	80	0.23	0.006	0.1	No
Grape airblast scenario										
Sheepshead minnow	*Cyprinodon variegatus*	Chronic	NOAEC	0.063	225	80	0.74	0.021	0.33	No

[1] Only a single application is considered in marine/estuarine drift RQ calculatons; Shaded cells indicate that the screening level RQ exceeds the LOC of 1.0.

Table 4 Further Risk Characterization of Dimethomorph Exposed to Aquatic Organisms Using Canadian and American Freshwater Monitoring Data

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	Drift	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
Freshwater invertebrates										
Cucurbit groundboom scenario										
Water flea	*Daphnia magna*	Chronic	NOAEC	0.1	959	80	None	0.011	0.11	No
Cucurbit aerial scenario										
Water flea	*Daphnia magna*	Chronic	NOAEC	0.1	959	80	None	0.011	0.11	No
Grape airblast scenario										
Water flea	*Daphnia magna*	Chronic	NOAEC	0.1	762	80	None	0.011	0.11	No
Amphibian										
Cucurbit groundboom scenario										
Rainbow trout	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	959	15	None	0.044	0.13	No
Cucurbit aerial scenario										
Rainbow trout	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	959	15	None	0.044	0.13	No
Grape airblast scenario										
Rainbow trout	*Onchorhynchus mykiss*	Acute	1/10 LC_{50}	0.34	762	15	None	0.044	0.13	No
Freshwater fish										
Cucurbit groundboom scenario										
Rainbow	*Onchorhynchus*	Chronic	NOAEC	0.056	959	80	None	0.011	0.20	No

Organism	Species	Exposure	Endpoint	Value (mg a.i./L)	Applic. Rate (g a.i./ha)	Water depth (cm)	Drift	EEC (mg a.i./L)	RQ[1]	Exceed LOC?
trout	*mykiss*									
Cucurbit aerial scenario										
Rainbow trout	*Onchorhynchus mykiss*	Chronic	NOAEC	0.056	959	80	None	0.011	0.20	No
Grape airblast scenario										
Rainbow trout	*Onchorhynchus mykiss*	Chronic	NOAEC	0.056	762	80	None	0.011	0.20	No
Marine/estuarine fish										
Cucurbit groundboom scenario										
Sheepshead minnow	*Cyprinodon variegatus*	Chronic	NOAEC	0.063	225	80	None	0.011	0.17	No
Cucurbit aerial scenario										
Sheepshead minnow	*Cyprinodon variegatus*	Chronic	NOAEC	0.063	225	80	None	0.011	0.17	No
Grape airblast scenario										
Sheepshead minnow	*Cyprinodon variegatus*	Chronic	NOAEC	0.063	225	80	None	0.011	0.17	No

Shaded cells indicate that the screening level RQ exceeds the LOC of 1.0.

Appendix X

Table 1 Toxic Substances Management Policy Considerations; Dimethomorph Comparison to TSMP Track 1 Criteria

TSMP Track 1 Criteria	TSMP Track 1 Criterion value		Dimethomorph	Meet criteria
CEPA toxic or CEPA toxic equivalent[1]	Yes		Yes	Yes
Predominantly anthropogenic[2]	Yes		Yes	Yes
Persistence[3]:	Soil	Half-life ≥ 182 days	115 days (aerobic soil) 16.4 days (anaerobic soil)	No
	Water	Half-life ≥ 182 days	46.1 days (aerobic water/sediment system)	No
	Sediment	Half-life ≥ 365 days	Not reported	Unknown
	Air	Half-life ≥ 2 days or evidence of long range transport	Dimethomorph is considered to be of very low volatility, with a vapour pressure of less than 1.0×10^{-6} (25°C) and a Henry's Law Constant of $1.15\text{-}1.18 \times 10^{-10}$ atm m^3/mole. Risk of escape from treated soils or water bodies to reach upper atmosphere is minimal. Atmospheric half-life is 1.2 hr/12 hrs of sunlight	No
Bioaccumulation[4]	Log $K_{OW} \geq 5$		Log K_{ow} = 2.63-2.73	No
	BCF ≥ 5000		NR because of low Log Kow	No
	BAF ≥ 5000		Not expected due to low Log K_{ow}	Unknown
Is the chemical a TSMP Track 1 substance (all four criteria must be met)?			Not all criteria met	Does not meet TSMP Track 1 criteria.

[1]All pesticides will be considered toxic or toxic equivalent for the purpose of initially assessing a pesticide against the TSMP criteria. Assessment of the toxicity criterion may be refined if required (i.e., all other TSMP criteria are met).
[2]The policy considers a substance "predominantly anthropogenic" if, based on expert judgement, its concentration in the environment medium is largely due to human activity, rather than to natural sources or releases. [3] If the pesticide and/or the transformation product(s) meet one persistence criterion identified for one media (soil, water, sediment or air) than the criterion for persistence is considered to be met. [4]Field data (for example, BAFs) are preferred over laboratory data (for example, BCFs) which, in turn, are preferred over chemical properties (for example, log K_{ow}).

Appendix XI Proposed Label Amendments for End-Use Products Containing Dimethomorph

The label amendments presented below do not include all label requirements for individual end-use products, such as first aid statements, disposal statements, precautionary statements and supplementary protective equipment. Information on labels of currently registered products should not be removed unless it contradicts the label statements provided below.

Note: The following information is divided by products. Each section should be read carefully and required changes made to labels.

The following amendments are required on the labels for Forum Technical (Dimethomorph) [Reg. No. 24545] and ZAMPRO Bulk [Reg. No.31306]:

Under* PRECAUTIONS*:

(On Reg. No. 24545)
Add the following statement:

'DO NOT discharge effluent containing this product into sewer systems, lakes, streams, ponds, estuaries, oceans or other waters.'

(On Reg. No. 24545)
Add the section title "**ENVIRONMENTAL PRECAUTIONS**" *before the* "**STORAGE"** *section and add the following statement:*

'TOXIC to aquatic organisms'

(On Reg. No. 31306)
Replace the section title "**ENVIRONMENTAL HAZARDS**" *with* "**ENVIRONMENTAL PRECAUTIONS**"

Under* "DISPOSAL AND DECONTAMINATION"** *(Reg. No. 24545) or* **"DISPOSAL"** *(Reg. No. 31306)**:

Replace (Reg. No. 24545):

"Canadian formulators should dispose of unwanted active ingredients and containers in accordance with municipal or provincial regulations.

For additional details and clean up spills, contact the manufacturer and the provincial regulatory agency.

and (Reg. No. 31306):

"Canadian formulators using this product should dispose of unwanted active ingredient and containers in accordance with municipal or provincial regulations. For additional details and information on clean-up of spills, contact the provincial regulatory agency or the manufacturer.

with:

'Canadian manufacturers should dispose of unwanted active ingredients and containers in accordance with municipal or provincial regulations. For additional details and cleanup of spills, contact the manufacturer or the provincial regulatory agency.'

The following amendments are required on all commercial products containing dimethomorph:

Under* "PRECAUTIONS"*:
(In order to promote best management practices, and to minimize human exposure to spray drift, the following label statement is proposed for all commercial-class labels)

Add/ensure on label:

'Apply only when the potential for drift to areas of human habitation or areas of human activity such as houses, cottages, schools, and recreational areas is minimal. Take into consideration wind speed, wind direction, temperature inversions, application equipment, and sprayer settings.'

Add/ensure on label:

'This product demonstrates the properties and characteristics associated with chemicals detected in groundwater. The use of this product in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.'

Under* "STORAGE"*:
(The following statement is required on all agricultural and domestic product labels under the STORAGE heading)

Add:

- To prevent contamination store this product away from food or feed.

Under "DIRECTIONS FOR USE":
(The following statements are required on all agricultural and commercial pesticide product labels)

Add (on labels with registered greenhouse uses only; Reg. Nos. 27700 and 32026):

- DO NOT allow effluent or runoff from greenhouses containing this product to enter lakes, streams, ponds or other waters.

Under directions for* "FIELD SPRAYER APPLICATION"*:

replace :

DO NOT apply with spray droplets smaller than the American Society of Agricultural Engineers (ASAE) medium classification.

with:

DO NOT apply with spray droplets smaller than the American Society of Agricultural

Engineers (ASAE S572.1) medium classification.

Under directions for* "AERIAL APPLICATION"*:

replace :

DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty. **DO NOT** apply when wind speed is greater than 16 km/h at flying height at the site of application. **DO NOT** apply with spray droplets smaller than the American Society of Agricultural Engineers (ASAE) medium classification. To reduce drift caused by turbulent wingtip vortices, the nozzle distribution along the spray boom length MUST NOT exceed 65 % of the wing- or rotorspan.

with:

DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty. **DO NOT** apply when wind speed is greater than 16 km/h at flying height at the site of application. **DO NOT** apply with spray droplets smaller than the American Society of Agricultural Engineers (ASAE S572.1) medium classification. Reduce drift caused by turbulent wingtip vortices. Nozzle distribution along the spray boom length MUST NOT exceed 65% of the wing- or rotorspan.

The following amendments are required on the labels for Acrobat 50 WP Fungicide [Reg. No. 27700] and Forum Fungicide [Reg. No. 32026]:

*Replace the entire '***BUFFER ZONES***' section with the following:*

BUFFER ZONES

The buffer zones specified in the table below are required between the point of direct application and the closest downwind edge of sensitive freshwater habitats (such as lakes, rivers, sloughs, ponds, prairie potholes, creeks, marshes, streams, reservoirs and wetlands).

Method of application	Crops		Buffer Zones (metres) Required for the Protection of Freshwater Habitat of Depths:	
			< 1 m	> 1 m
Field sprayer	Cucurbit vegetables, leafy vegetables, fruiting vegetables, bulb vegetables, brassica leafy vegetables, potatoes, ginseng, outdoor grown ornamentals, including herbaceous perennial and annual plants, container and field grown ornamental plants (including conifers) in nurseries and landscape plantings		1	0
Airblast	Grapes	Early growth stage	10	0
		Late growth stage	4	0
	Hops	Early growth stage	5	0
		Late growth stage	3	0
Aerial	Cucurbit vegetables, leafy vegetables, fruiting vegetables group, bulb vegetables, brassica vegetables	Fixed or rotary wing	10	0
	Potatoes	Fixed or rotary wing	5	0

For tank mixes, consult the labels of the tank-mix partners and observe the largest (most restrictive) buffer zone of the products involved in the tank mixture and apply using the coarsest spray (ASAE) category indicated on the labels for those tank mix partners.

The buffer zones for this product can be modified based on weather conditions and spray equipment configuration by accessing the Buffer Zone Calculator on the Pest Management Regulatory Agency web site.

The following amendments are required on the label for Zampro Fungicide [Registration No. 30321]

Under PRECAUTIONS:

Replace:

2. During all activities, worker must wear long pants, long-sleeved shirt and socks and shoes.

During mixing, loading, clean-up and repair activities, workers must also wear chemical resistant gloves.

with:

2. Wear a long-sleeved shirt, long pants, chemical-resistant gloves, socks and shoes during mixing, loading, application, clean-up and repair. Gloves are not required during application within a closed cab or cockpit.

Replace:

5. For potatoes and fruiting vegetables, do not enter treated areas within 12 hours after application. For all other crops, see the specific Application Rate Table for the restricted entry interval.

with:

5. **DO NOT** enter or allow worker entry into treated areas during the restricted entry intervals

(REIs) specified in the Application Rate Tables.

Update REIs in the specific Application Rate Tables as follows:

Crop	Post Application Activity	Restricted Entry Interval (REI)
Potatoes; Cucurbit vegetables; Brassica vegetables; Leafy vegetables; Fruiting vegetables; Bulb vegetables; Hops	All activities	12 hours
Grapes	Girdling, turning	8 days
	All other activities	12 hours

*Replace the entire '***BUFFER ZONES***' section with the following:*

BUFFER ZONES

The buffer zones specified in the table below are required between the point of direct application and the closest downwind edge of sensitive freshwater habitats (such as lakes, rivers, sloughs, ponds, prairie potholes, creeks, marshes, streams, reservoirs and wetlands) and estuarine/marine habitats.

Method of application	Crops		Buffer Zones (metres) Required for the Protection of:			
			Freshwater Habitat of Depths:		Estuarine/Marine Habitat of Depths:	
			< 1 m	> 1 m	< 1 m	> 1 m
Field sprayer	Cucurbit vegetables, leafy vegetables, fruiting vegetables, bulb vegetables, brassica leafy vegetables, potatoes		1	1	1	1
Airblast	Grapes, hops	Early growth stage	10	4	3	1
		Late growth stage	5	2	3	1
Aerial	Cucurbit vegetables, leafy vegetables, fruiting vegetables, bulb vegetables, brassica leafy vegetables, potatoes	Fixed or rotary wing	10	1	1	1

For tank mixes, consult the labels of the tank-mix partners and observe the largest (most restrictive) buffer zone of the products involved in the tank mixture and apply using the coarsest spray (ASAE) category indicated on the labels for those tank mix partners.

The buffer zones for this product can be modified based on weather conditions and spray equipment configuration by accessing the Buffer Zone Calculator on the Pest Management Regulatory Agency web site.

The following amendments are required on the label for Acrobat 50 WP Fungicide [Registration No. 27700]

Under PRECAUTIONS:

Replace:

3. During all activities, workers must wear long pants, long-sleeved shirt, chemical-resistant gloves and boots. During mixing, loading, clean-up and repair activities, workers must also wear coveralls and safety goggles or a face shield. During mixing and loading workers must also wear a respirator with a NIOSH/MSHA/BHSE approved vapour removing cartridge with a pre-filter approved for pesticides OR a NIOSH/MSHA/BHSE approved canister for pesticides. If using low-pressure handheld equipment, mixer, loader, and applicator must also wear coveralls and chemical-resistant gloves.

with:

3. During all activities, wear long pants, long-sleeved shirt, chemical-resistant gloves and boots. During mixing, loading, clean-up and repair activities, wear coveralls and safety goggles or a face shield. During mixing and loading workers must also wear a respirator with a NIOSH-approved vapour removing cartridge with a pre-filter approved for pesticides

OR a NIOSH-approved canister for pesticides. Wear coveralls when applying by handheld equipment.

Replace:

5. For potatoes and fruiting vegetables, do not enter treated areas within 12 hours after application. For all other crops, see the specific Application Rate Table for the restricted entry interval."

with:

5. **DO NOT** enter or allow worker entry into treated areas during the restricted entry intervals (REIs) specified in the Application Rate Tables.

Update REIs in the specific Application Rate Tables as follows:

Crop	Post Application Activity	Restricted Entry Interval (REI)
Potatoes; Cucurbit vegetables; Brassica vegetables; Leafy vegetables; Fruiting vegetables; Bulb vegetables; Hops; Ginseng; Outdoor grown ornamentals, herbaceous annual and perennial plants; Outdoor grown ornamentals, container and field grown ornamental plants in nurseries and landscape plantings; Greenhouse ornamental	All activities	12 hours
Grapes	Girdling, turning	8 days
	All other activities	12 hours

Under DIRECTIONS FOR USE:

Add:

DO NOT apply using handheld mist blower/airblast or handheld fogging equipment.

Remove:

DO NOT use high pressure handheld equipment to apply ACROBAT 50 WP Fungicide.
DO NOT use backpack sprayers to apply ACROBAT 50 WP Fungicide.

The following amendments are required on the label for Forum Fungicide [Reg. No. 32026]

Under PRECAUTIONS:

Replace:

2. During all activities, workers must wear long pants, long-sleeved shirt, chemical-resistant gloves and boots. During mixing, loading, clean-up and repair activities, workers must also wear coveralls and safety goggles or a face shield. If using low-

pressure handheld equipment, mixer, loader, and applicator must also wear coveralls and chemical resistant gloves.

with:

2. During all activities, wear long pants, long-sleeved shirt, chemical-resistant gloves and boots. During mixing, loading, clean-up and repair activities, wear coveralls and safety goggles or a face shield. Wear coveralls when applying by handheld equipment.

Replace:

4. For potatoes and fruiting vegetables, do not enter treated areas within 12 hours after application. For all other crops, see the specific Application Rate Table for the restricted entry interval.

with:

4. **DO NOT** enter or allow worker entry into treated areas during the restricted entry intervals (REIs) specified in the Application Rate Tables.

Update REIs in the specific Application Rate Tables as follows:

Crop	Post Application Activities	Restricted Entry Interval
Potatoes; Cucurbit vegetables; Brassica vegetables; Leafy vegetables; Fruiting vegetables; Bulb vegetables; Hops; Ginseng; Outdoor grown ornamentals, herbaceous annual and perennial plants; Outdoor grown ornamentals, container and field grown ornamental plants in nurseries and landscape plantings; Greenhouse ornamental	All activities	12 hours
Grapes	Girdling, turning	8 days
	All other activities	12 hours

Under DIRECTIONS FOR USE:

Add:

DO NOT apply using handheld mist blower/airblast or handheld fogging equipment.

Remove:

DO NOT use high pressure handheld equipment to apply FORUM Fungicide.

DO NOT use backpack sprayers to apply FORUM Fungicide.

References

Information Considered in the Chemistry Assessment

PMRA Document Number	Reference
1796084	1997. Dimethomorph pH, DACO: 2.16
1796087	1995. DME-SOF-1 Dimethomorph Spectral Database REPORT AMENDMENT 2, DACO: 2.14.12
2337728	2013. Product identity and composition of Acrobat Fungicide Technical [Dimethomorph (BAS 550 F) (EPA Reg.No. 241-382)]. DACO: 2.11.1, 2.11.2.
2337730	2013. Product identity and composition of Acrobat Fungicide Technical [Dimethomorph (BAS 550 F) (EPA Reg. No. 241-382)], DACO: 2.11.1, 2.11.2
2337739	2007. Characterization of five batches Dimethomorph (BAS 550 F TGAI). DACO: 2.13.3
2337741	2013. Characterization of Five Batches of BAS 550. DACO: 2.13.3
2795315	2015. Analytical characterization of five representative batches of Dimethomorph TGAI (BAS 550 F). DACO: 2.13.3, 2.13.4 CBI
2795317	2016. 2nd Amendment - Analytical characterization of five representative batches of Dimethomorph TGAI (BAS 550 F). DACO: 2.13.3, 2.13.4 CBI
2795320	2017. Analysis of five representative batches of Dimethomorph TGAI (BAS 550 F). DACO: 2.13.3, 2.13.4 CBI

Information Considered for the Toxicological Risk Assessment

A. Studies/Information Submitted by Registrant

PMRA document number	Reference
1161435	1985. Acute oral toxicity to rats of ZTH 236 Z50.(DK-411-004;151AA-421-004;851074D/ CMK5/AC) (Dimethomorph). DACO: 4.2.1
1161436	1986. CME 151: Acute oral toxicity test in mice. (DK-411-012;151AE-421-008;3651;235257) (Dimethomorph) DACO: 4.2.1
1161437	1987. CME 151/E-isomer: Acute toxicity study in rats after oral administration.(DK-411-009;151AG-421-010;T13053,CME151LOG11/0001.0.0;4/73/87). (Dimethomorph) DACO: 4.2.1
1161438	1987. CME 151/Z-ISOMER: Acute toxicity study in rats after oral administration.(DK-411-008;151AG-421-009;T13054,TOXLOG9190587/0001.0.0;4 /62/87). (Dimethomorph) DACO: 4.2.1
1161439	1985. Acute toxicity study in rats after epicutaneous administration. EMD ZTH 236 Z 50. (DK-412-001;151AB-422-001;T12853,TOXLOG4180785;4/70/85). (Dimethomorph). DACO: 4.2.2

1162746	1985. Acute Toxicity Study In Rats After Epicutaneous Administration. Emd Zth 236 Z 50. (DK-412-001;151ab-422-001;T12853,TOXLOG4180785;4/70/85). (Dimethomorph) *Note- Last Pages Of The Original Study In Pckg#95406 Batch#24 Were Unreadable-(Pages 162 & 163)- 2 Higher Quality Replacements Pages. DACO: 4.2.2
1161440	1989. CME 151 Technical material: acute dermal toxicity, skin and eye irritancy.(DK-412-002;SBGR.89.143;4260).(Dimethomorph) DACO: 4.2.2, 4.2.4, 4.2.5
1161442	1986. ZTH 236 Z50 Acute inhalation toxicity study in rats 4-hour exposure.(DK-413-001; 151AA-423-001;CMK10/86464).(Dimethomorph) DACO: 4.2.3
1161443	1985. Primary skin and eye irritation test in rabbits. EMD ZTH 236 Z 50.(DK-415-001;151AB-465-001;T12854;TOXLOG10/10220785/0001.0.0;4/75/85) (Dimethomorph). DACO: 4.2.4, 4.2.5
1161444	1985. Skin-sensitization study in guinea pigs using the maximization test according to Magnusson. EMD ZTH 236 Z 50.(DK-416-001;151AB-467-001;T12852; UALOG4100785;4/68/85).(Dimethomorph) DACO: 4.2.6
1161446	1989. CME 151 Technical material: skin sensitisation potential-guinea pigs.(DK-416-002;4260; SBGR.89.184).(Dimethomorph) DACO: 4.2.6
1161447	1991. Summaries: (dimethomorph). DACO: 4.2
1161454	1986. CME 151: 6 week dietary dose range finding study in mice.(DK-420-003;151AE-431-003;3653;435067).(Dimethomorph) DACO: 4.3.1
1161455	1990. SAG 151: 52 week dietary toxicity study in dogs.(DK-427-003;5533;636876). (Dimethomorph) DACO: 4.3.1
1161456	1991. SAG 151: 104 week dietary toxicity study in rats.(DK-427-004;5788;435140). (Dimethomorph) DACO: 4.4.1
1161458	1990. SAG 151: Two generation oral (dietary administration) reproduction toxicity study in the rat (two litters in the F_1 generation).(DK-430-001;460-022;763-460-022). (Dimethomorph) (Cont'd On Roll#1419) DACO: 4.5.1
1161467	1990. (cont'd from roll#1418) SAG 151: Two Generation Oral (Dietary Administration) reproduction toxicity study in the rat (two litters in the F1 generation).(DK-430-001;460-022;763-460-022).(Dimethomorph).DACO: 4.5.1
1161457	1990. Summaries: (Dimethomorph). DACO: 4.1
1161459	1986. CME 151: 4 week dietary dose range finding study in rats.(DK-420-002;151AE-431-002;3649;435025).(Dimethomorph) DACO: 4.3.1
1161460	1985. ZTH 236 Z 50 preliminary assessment of toxicity to rats by dietary admixture for 4 weeks (Final Report).(DK-420-005;151AA-432-002;CMK6/851056).(Dimethomorph) DACO: 4.3.1
1161461	1991. SAG 151 E ISOMER: A 28 day oral toxicity study in rats.(DK-470-015;4578; SBGR.90.106). (Dimethomorph) DACO: 4.3.1
1161462	1991. SAG 151 Z ISOMER: A 28 day oral toxicity study in rats.(DK-470-016;4580; SBGR.90.107). (Dimethomorph) DACO: 4.3.1
1161463	1987. CME 151 toxicity to rats by dietary admixture for 13 weeks with a 4-week withdrawal period (Final Report). (DK-425-001;151AA-433-001;CMK7/8624). (Dimethomorph) DACO: 4.3.1
1161464	1986. CME 151: dietary maximum tolerated dose study in dogs.(DK-420-001;151AE-431-001;3592;635228).(Dimethomorph) DACO: 4.3.1

1161465	1987. CME 151: 13 week dietary toxicity study in dogs.(DK-425-002;151AE-433-002;3722; IRI635212). (Dimethomorph) DACO: 4.3.1
1161466	1987. CME 151: histopathological examination of ileum sections taken from the rat (IRI Project NO.435025) and mouse (IRI Project NO.435067) dose range finding studies.(DK-420-004;151AE-432-003;3770;IRI435596).(Dimethomorph) DACO: 4.3.1
1161468	1987. CME151-Z50: chromosome aberrations in cells of Chinese hamster cell line V79.(DK-435-006;151AE-457-007;LMP275;MB160786;AH230287;AB79RK/F). (Dimethomorph) DACO: 4.5.4
1161469	1986. CME151-Z50: cell transformation assay with Syrian hamster embryo (she) cells.(DK-435-005;151AE-457-006;LMP180D;MB200886;MB030986; TRANSRE;ROT43). (Dimethomorph) DACO: 4.5.4
1161470	1989. Mouse micronucleus test on CME 151 technical material.(DK-435-009; SLL169/89932) (Dimethomorph) DACO: 4.5.4
1161471	1986. CME 151-Z50: unscheduled DNA synthesis in hapatocytes of male rats *in vitro* (UDS Test).(DK-435-002;151AE-457-003;LMP180A;AT030786; MB100786;UDSRE). (Dimethomorph) DACO: 4.5.4
1161472	1990. SAG 151: 104 week dietary carcinogenicity study in mice.(DK-428-004;5816; IRI435088) (Dimethomorph). DACO: 4.4.2
1161473	1990.104-Week Dietary Oncogenicity Study In Mice With Sag 151- Pathology Report. Pathology Supplement.(DK-428-003;Eplno.104-005;Iri435088).(Dimethomorph) (cont'd on roll#1420). DACO: 4.4.2
1161482	1990. (Cont'd From Roll#1419) 104-Week Dietary Oncogenicity Study In Mice With Sag 151- Pathology Report. Pathology Supplement.(DK-428-003;Eplno.104-005;IRI435088).(Dimethomorph). DACO: 4.4.2
1161474	1989. SAG 151: oral (gavage) teratogenicity study in the rat.(DK-432-002;460/23;764-460/23).(Dimethomorph) DACO: 4.5.2
1161475	1987. CME 151: preliminary oral (gavage) embryotoxicity study in the rabbit. Final report.(DK-432-003;460/12;694-460/12;151AE-451-002).(Dimethomorph) DACO: 4.5.2
1161476	1989. SAG 151: oral (gavage) teratogenicity study in the rabbit. Final report.(DK-432-004; 460/24;765-460/24;151AE-451-007).(Dimethomorph) DACO: 4.5.2
1161478	1988. Bacterial mutagenicity studies with CME-151.(DK-435-010;SBGR.88.241;50670769; 4059;AJB/WS4/232). (Dimethomorph). DACO: 4.5.4
1161479	1991. Bacterial mutagenicity studies with CME-151. Addendum TO SBGR.88.241. (DK-435-011;SBGR.88.241;4059).(Dimethomorph). DACO: 4.5.4
1161480	1987. CME151-Z50: detection of gene mutations in somatic mammalian cells in culture: HGPRT-Test With V79 Cells.(DK-435-003;151AE-457-004;LMP180B;K1010886 ;MB191286;HGPRT-RE).(Dimethomorph). DACO: 4.5.4
1161481	1986. CME151-Z50: chromosome aberrations in cells of Chinese hamster cell line V79. (DK-435-004;151AE-457-005;LMP180C;MB160786;MB140886; AB79RK/F). (Dimethomorph). DACO: 4.5.4
1161504	1990. The biokinetics and metabolism of 14c-dimethomorph in the rat.(DK-440-001; CUB1/87; SHGR.90.006). DACO: 4.5.9 (Reported as DACO: 6.4)

1161507	1990. 14C-dimethomorph (CME 151): absorption, distribution, metabolism and excretion after bile cannulation and single oral administration to the rat.(DK-440-002;255172). DACO: 4.5.9 (reported as DACO: 6.4)
1163731	1991. Summaries - metabolism investigation on the nature of metabolites occurring in rats– Dr. W. Ost (1991) (Dimethomorph). DACO: 4.5.9
1162900	1991. SAG 151 104 week dietary carcinogenicity study in rats (DK-428-005;435140;5806) (Dimethomorph Technical). DACO: 4.4.1, 4.4.2
2361498	2010. BAS 550 F (Dimethomorph) - Repeated-dose 28-day dermal toxicity study in Wistar rats Conducted by Experimental Toxicology and Ecology Laboratory. DACO: 4.4.2
2361502	2010. BAS 550 F Dimethomorph) - Immunotoxicity Study in Male Wistar Rats - Administration via the Diet for 4 Weeks. Experimental Toxicology and Ecology Laboratory. DACO: 4.5.15
2361503	2011. BAS 550 F (Dimethomorph) - Acute Oral Neurotoxicity Study in Wistar Rats - Administration via Gavage. Experimental Toxicology and Ecology BASF SE. DACO: 4.5.12
2361508	2004. BAS 550 F - Subchronic Neurotoxicity Study in Wistar Rats; Administration in the Diet for 3 Months. Experimental Toxicology and Ecology BASF Aktiengesellschaft. DACO: 4.5.13

Information Considered in the Dietary Assessment

A. Studies/Information Submitted by Registrant

PMRA document number	Reference
788072	1998. Method for the Determination of Residues of Dimethomorph (CME 151) in Potatoes, Tomatoes, Grapes (Including Grape Waste Material, Raisins, Fruit Juice, Wine). DACO: 7.2.3
788073	1993. Analysis of Dimethomorph by Multi-Residue Methods in FDA Pesticide Analytical Manual Volume I. DACO: 7.2.4
788074	1991. Confirmatory Validation of an Analytical Method for the Determination of the Residues of Dimethomorph in Plant Material (FAMS 002-02). DACO: 7.2.4
788075	1991. First Amendment to Report No 307822: Confirmatory Validation of an Analytical Method for the Determination of the Residues of Dimethomorph in Plant Material (FAMS 002-02). DACO: 7.2.4
1067407	1997. CL 336379 (dimethomorph): Independent Laboratory Validation of GC and GC/MS Confirmatory Method M 2639 for the Determination of CL 336379 residues in Potato Tubers, Washed Unpeeled Potato, Potato Chops, Wet Peel, Granules, Frying Oil and Potato Fish Water. DACO: 7.2.3
1161483	1991. 14C-Dimethomorph (CME 151)(Morpholine Ring Label)- Metabolism And Translocation In Potato Plants- Supplemental Data. Supplemental Report To Report SHGR.89.070. DACO: 6.3
1161484	1987. Macroautoradiographic Studies On The Translocation Behaviour Of 14C-Labelled CME 151 After Leaf Application In Wine. (Dimethomorph). DACO: 6.3

1161485	1990. ^{14}C-Dimethomorph (CME 151): Absorption, Distribution, Metabolism And Excretion After Repeated Oral Administration To Laying Hens.(DK-440-003;214740) (Dimethomorph). DACO: 6.4
1161486	1991. ^{14}C-Dimethomorph (CME 151): Absorption, Distribution, Metabolism And Excretion After Repeated Oral Administration To Laying Hens. First Amendment To Report DK-440-003.(DK-440-007;214740).(Dimethomorph). DACO: 6.4
1161487	Summaries: Dimethomorph. DACO: 7.1
1161488	1990. ^{14}C-Dimethomorph (CME 151)-Confined Accumulation Study On Rotational Crops (DK-640-008;CUB2/87;SHGR.90.004). DACO: 7.4.2
1161489	1991. Dimethomorph: Determination Of CME 151 Residues And Metabolites In Milk.(DK-705-002;CUA90/661;SHGR.91.005). DACO: 7.5
1161490	1991. Dimethomorph: Determination Of CME 151 Residues And Metabolites In Processed Milk.(DK-705-001;CUA90/662;SHGR.91.006). DACO: 7.5
1161491	1991. CME 151 (Dimethomorph) Technical: Residues In Milk And Tissues Of Dairy Cows. Volume I,II,III.(DK-705-007;CMK61/91644). DACO: 7.5
1161493	1990. Summaries: Dimethomorph. DACO: 6.1
1161504	1990. The Biokinetics And Metabolism Of 14c-Dimethomorph In The Rat.(DK-440-001; CUB1/87;SHGR.90.006). DACO: 6.4
1161507	1990. ^{14}C-Dimethomorph (CME 151): Absorption, Distribution, Metabolism And Excretion After Bile Cannulation And Single Oral Administration To The Rat.(DK-440-002;255172). DACO: 6.4
1161508	1990. ^{14}C-Dimethomorph (CME 151): Absorption, Distribution, Metabolism And Excretion After Repeated Oral Administration To Lactating Goats.(DK-440-005;213928). DACO: 6.4
1161509	1991. ^{14}C-Dimethomorph (CME 151): Absorption, Distribution, Metabolism And Excretion After Repeated Oral Administration To Lactating Goats. First Amendment To Report. (22 PAGES).(DK-440-008;213928). DACO: 6.4
1161510	1990. 14C-Dimethomorph (CME 151)(Chlorophenyl Ring Label)- Metabolism And Translocation In Potato Plants. DACO: 6.3
1161511	1991. 14C-Dimethomorph (CME 151)(Chlorophenyl Ring Label)- Metabolism And Translocation In Potato Plants- Supplemental Data. Supplemental Report To RepORT SHGR.89.071. DACO: 6.3
1161512	1990. 14C-Dimethomorph (CME 151)(Morpholine Ring Label)- Metabolism And Translocation In Potato Plants. DACO: 6.3
1161680	1995. Summaries: Acrobat Fungicide. Dimethomorph/Mancozeb. Submitted: October (Acrobat MZ Fungicide). DACO: 7.1
1161681	1992. Dimethomorph: Determination Of Residues In Potatoes Grown In The UK IN 1990 After Treatment With 75 G/KG Wettable Powder, SY50588, OR 90 G/KG Wettable Powder, SY50586, OR 500 G/KG Wettable Powder, SY50574, Under Field Conditions.(DK-724-016;DK-724-016;SHGR.92.033;CUA91/723; SUKF90449;SUKF90450). DACO: 7.4.2
1161682	1992. Dimethomorph: Storage Stability At <= -18'C In Potato.(DK-326-004;SHGR.92.001; CU89/626).(Acrobat MZ Fungicide) DACO: 7.3
1162862	1995. Residue Summaries - Forum 50WP, FAMS 002-02, Method For The Determination Of Residues Of Dimethomorph (CME 151) In Potatoes, Tomatoes, Grapes (Including Grape Waste Material, Raisins, Fruit Juice, Wine). DACO: 7.1

1162863	1989. Method For The Determination Of Residues Of Dimethomorph (CME 151) In Potatoes, Tomatoes, Grapes (Including Grape Waste Material, Raisins, Fruit Juice, Wine)(FAMS 002-02;DK-244-002)(01.02.1989)(Forum 50WP). DACO: 7.21
1162864	1993. Dimethomorph: Determination Of Residues In Potatoes Grown In France In 1990 After Treatment With 500 G/KG Wettable Powder, SY 50574, Under Field Condition (CUA91/719;SHGR.92.030;RSF 9071;SFRF90271;SFRF90465; SFRF90510;DK-724-018)(Forum 50WP). DACO: 7.42
1162865	1989. Residue Analysis Of CME 151 (Dimethomorph) In The Potato (*Solanum tuberosum* L.) 1985-1988: A Review(SHGR.89.001;DK-724-001)(Forum 50WP). DACO: 7.4.2
1163683	1991. Dimethomorph: Determination Of CME 151 Residues And Metabolites In Bovine Tissues - Supplemental Data - (SHGR.91.032;663;CUA 90/663;Supplement To SHGR.91.007). DACO: 7.5
1163684	1991. Dimethomorph: Detemination Of CME 151 Residues And Metabolites In Milk - Supplemental Data - (SHGR.91.030;DK-705-004;CUA 90/661;661). DACO: 7.5
1163685	1991. Dimethomorph: Determination Of CME 151 Residues And Metabolites In Processed Milk - Supplemental Data - (CUA 90/662;662;DU-705-005;SHGR.91.031). DACO: 7.5
1163731	1991. Summaries - Metabolism - (Dimethomorph).. DACO: 6.1
1163742	1991. 14C-Dimethomorph (CME 151): Investigation On The Nature Ofmetabolites Occuring In Rats (DK-440-006;SKGR.91.010;CUB 91/2)(Dimethomorph). DACO: 6.4
1163753	1992. Dimethomorph (CME 151)(Chlorophenyl Ring-14C) Metabolism: The Nature Of The Residue In Potato Tubers (Supplemental Report To SHGR.89.071). DACO: 6.3
1163762	1991. Summaries - Residues Studies – Dimethomorph. DACO: 7.1
1163763	1991. Dimethomorph: Determination Of CME 151 Residues And Metabolites In Bovine Tissues (CUA90/663;663;DK-705-003;SHGR.91.007). DACO: 7.5
1163934	1994. ^{14}C-Dimethomorph: Additional Investigations On The Nature Of Metabolites Occurring In Rats.(CFS1994-076;DK-440-010;CUB91/5). DACO: 6.4
1166297	1991. Summary: Analytical Mathods For Determinating Pesticide Redisue. DACO: 6.1, 7.1
1166298	1991. Method For Determining Dimethomorph (CME 151) And Metabolites Z67 And Z69 In Bovine Meat, Kidney, Liver And Fat. (FAMS 023-01). (DK-245-007;151AX-523-005). (MARCH 5, 1991). DACO: 7.2.1
1166299	1991. Confirmatory Validation Of An Analytical Method For The Determination Of The Residues Of Dimethomorph And Its Metabolites In Cattle Organs/Tissues (Method Fams 023-01). (DK-245-010;308913) (November 4, 1991). DACO: 7.2.1
1166300	1990. ^{14}C-Dimethomorph (CME 151) - Metabolism And Translocation In Vines. Project SHGR.89.072. (DK-640-005;CUB3/87) (April 20, 1990). DACO: 6.3
1166301	1991. Confirmatory Validation Of An Analytical Method For The Determination Of The Residues Of Dimethomorph And Its Metabolites In Milk (FAMS 024-01). (DK-245-011;308902) (November 14, 1991). DACO: 6.3
1167443	1996. Dimethomorph Residues In Potato Harvest Tubers (1995). R.Macdonald, Cyanamid Crop Protection. February 1 1996.(Acrobat MZ). DACO: 7.4.2

1170571	1991. Method For Determining Residues Of Dimethomorph (CME 151) And Its Metabolites Z67, Z69 And CUR 7117 IN Milk And Milk Products.(FAMS024-01;DK-245-008).(Acrobat MZ). DACO: 7.2.1
1174819	1998. Final Report: Crop Residue Study: CL336,379 Residues In Potatoes After Multiple Applications Of Acrobat MZ (90/600) WP Fungicide. M.CENNI. Study Completion Date: February 27,1998.(RES97-057;OPPTS860.1500;DM96CN02;ABC Report Number 44089;LAB NO.516;964100). DACO: 7.4.2
1174820	1998. Final Report: Crop Residue Study: CL336,379 Residues In Potatoes After Multiple Applications Of Acrobat MZ (90/600) WP Fungicide. M.Cenni. Study Completion Date: February 27,1998.(RES97-058;OPPTS860.1500;DM96CN03;ABC Report Number 43640;Lab No.517;964091). DACO: 7.4.2
1174872	1998. Summaries: Acrobat MZ (RES96-114;RES97-057;RES97-058). DACO: 7.1
1174873	1998. Final Report: Crop Residue Study: CL336,379 Residues In Potatoes After Multiple Applications Of Acrobat MZ (90/600) WP Fungicide. M.Cenni. Study Completion Date: January 26,1998.(RES96-114;OPPTS860.1500;DM96CN01;ABC Report Number 43629;LAB NO.518;964099). DACO: 7.4.2
1175001	1991. Method For Determining Residues Of Dimethomorph (CME 151) And Its Metabolites Z67, Z69 AND CUR 7117 In Milk And Milk Products. 08.02.1991.(FAMS024-01;DK-245-008).(Acrobat MZ). DACO: 7.2.1
1870800	2010. Final residue report - Dimethomorph: Magnitude of the Residue on Cantaloupe. DACO: 7.4.1
1870804	2010. Final residue report - Dimethomorph: Magnitude of the Residue on Cucumber. DACO: 7.4.1
1870805	2010. Final residue report - Dimethomorph: Magnitude of the Residue on Squash. DACO: 7.4.1
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1871705	2008. Study on the residue behaviour of BAS 650 F and BAS 550 F in tomato after three applications of BAS 651 00 F under greenhouse conditions in Northern and Southern France, Germany, Greece, Italy, Spain and United Kingdom, 2007. DACO: 7.4.1
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1161595	1987. The Acute Oral Toxicity (LD50) Of CME151 To The Mallard Duck.(DK-505-003;151AE-441-001;CMK15/86919).(Dimethomorph). DACO: 9.6.2.1
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1161685	1991. Summaries: Dimethomorph. (Acrobat MZ Fungicide). DACO: 9.5.1
1161686	1991. Dimethomorph: CME151/Mancozeb 90/600 G KG-1 WP (SY50579), Acute Toxicity To *Oncorhynchus Mykiss* And *Daphnia Magna*. (DK-560-001; 4901; SBGR.90.250). (Acrobat MZ Fungicide). DACO: 9.3.1, 9.5.2.1
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1161689	1992. Dimethomorph: Acute Toxicity Of Dimethomorph/Mancozeb 75/667 G/KG WP (SY50588 R) To *Oncorhynchus Mykiss*, Daphnia Magna And *Selenastrum Capricornutum*.(DK-560-005;5640;SBGR.92.177).(Acrobat MZ Fungicide). DACO: 9.3.1, 9.5.2.1, 9.8.2

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1161691	1991. Summaries: Dimethomorph. (Acrobat MZ Fungicide). DACO: 9.2.1
1161692	1991. Dimethomorph (CME 151): A Field Study Of Effects On The Beneficial Arthropod Fauna Of Potatoes.(DK-549-003;4336;SBGR.90.036).(Acrobat MZ Fungicide). DACO: 9.2.5
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1871629	2009. BAS 651 00 F - Acute toxicity in the bobwhite quail (*Colinus virginianus*) after single oral administration (LD50). DACO: 9.6.4, IIIA 10.1.6
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1871634	2007. BAS 651 00 F - Determination of the acute effect on the swimming ability of the water flea *Daphnia magna* Straus. DACO: 9.3.2, 9.3.5, IIIA 10.2.2.2
1871635	2008. BAS 651 00 F - Determination of the inhibitory effect on the cell multiplication of the unicellular green algae *Pseudokirchneriella subcapitata* Korshikov. DACO: 9.8.2, 9.8.3, 9.8.6, IIIA 10.2.2.3
1871636	2008. BAS 651 00 F - Determination of the inhibitory effect on the cell multiplication of the unicellular green algae *Pseudokirchneriella subcapitata* Korshikov. DACO: 9.8.2, 9.8.3, 9.8.6, IIIA 10.2.2.3
1871637	2006. Assessment of side effects of BAS 651 00 F to the honey bee, *Apis mellifera* L. in the laboratory. DACO: 9.2.8, IIIA 10.4.2.1, IIIA 10.4.2.2
1871638	2006. Assessment of side effects of BAS 651 00 F to the honey bee, *Apis mellifera* L. in the laboratory. DACO: 9.2.8, IIIA 10.4.2.1, IIIA 10.4.2.2
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PMRA Document Number	Reference
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1871642	2007. Effect of BAS 651 00 F on the parasitic wasp (*Aphidius rhopalosiphi*) in a laboratory trial. DACO: 9.2.8, IIIA 10.5.1
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1871647	2008. Acute toxicity of BAS 651 00 F on earthworms (*Eisenia fetida*) in artificial soil with 5% peat (Including amendment no. 1). DACO: 9.2.8, IIIA 10.6.2
1871648	2008. Acute toxicity of BAS 651 00 F on earthworms (*Eisenia fetida*) in artificial soil with 5% peat (Including amendment no. 1). DACO: 9.2.8, IIIA 10.6.2
1871649	2007. Sublethal toxicity of BAS 651 00 F to the earthworm *Eisenia fetida* in artificial soil with 5% peat. DACO: 9.2.8, IIIA 10.6.3
1871650	2007. Sublethal toxicity of BAS 651 00 F to the earthworm *Eisenia fetida* in artificial soil with 5% peat. DACO: 9.2.8, IIIA 10.6.3
1871651	2007. Effects of BAS 651 00 F on the reproduction of the collembolans *Folsomia candida* in artificial soil with 5% peat. DACO: 9.2.8, IIIA 10.6.6
1871652	2007. Effects of BAS 651 00 F on the reproduction of the collembolans *Folsomia candida* in artificial soil with 5% peat. DACO: 9.2.8, IIIA 10.6.6
1871657	2009. BAS 651 00 F: A toxicity test to determine the effects of the test substance on vegetative vigor of ten species of plants. DACO: 9.8.6, IIIA 10.8.1.2
1871658	2009. BAS 651 00 F: A toxicity test to determine the effects of the test substance on vegetative vigor of ten species of plant. DACO: 9.8.6, IIIA 10.8.1.2
1871659	2009. BAS 651 00 F: A toxicity test to determine the effects of the test substance on seedling emergence of ten species of plants. DACO: 9.8.6, IIIA 10.8.1.3
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1888446	2001. Effect of BAS 550 01 F on the Growth of *Lemna gibba*. DACO: 9.8.5, IIA 8.6

B. Additional Information Considered

i) Unpublished Information

PMRA Document Number	Reference
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1560632	2003. Pesticide Sampling Program for selected municipal drinking water supplies in New Brunswick, Canada. Tables 4-6: results by municipality and QA/QC samples. DACO: 8.6
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2818406	2016. e-Pesticide Manual. DACO: 12.5
2876402	1979. The use and significance of pesticides in the environment. DACO: 8.2.3; 8.3.3
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iii) Published Foreign reviews

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2818405	2017. The PPDB, A to Z list of pesticide active ingredients. DACO: 12.5
2818406	2016. e-Pesticide Manual. DACO: 12.5
2946573	2000. Assessing Soil Contamination; a reference manual. Appendix 2, parameters of pesticides that influence processes in the soil. DACO: 8.2.3
2946575	2014. Guidance for addressing unextracted pesticide residues in laboratory studies. Environmental Fate and Effects Division (7507P), Office of Pesticide Programs. September 12, 2014. DACO: 12.5

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