Australian Government

Australian Pesticides and Veterinary Medicines Authority

Procymidone

Final Review Technical Report

October 2022

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Preface

The Australian Pesticides and Veterinary Medicines Authority (APVMA) is an independent statutory authority with responsibility for the regulation of agricultural and veterinary chemicals in Australia. Its statutory powers are provided in the Agvet Codes scheduled to the *Agricultural and Veterinary Chemicals Code Act 1994*.

The APVMA has legislated powers to reconsider the approval of an active constituent, registration of a chemical product or approval of a label at any time after it has been registered. The reconsideration process is outlined in sections 29 to 34 of Part 2, Division 4 of the Agvet Codes.

A reconsideration may be initiated when new research or evidence has raised concerns about the use or safety of a particular chemical, a product containing that chemical, or its label. The scope of each reconsideration can cover a range of areas including human health (toxicology, public health, work health and safety), the environment (environmental fate and ecotoxicology), residues and trade, chemistry, efficacy or target crop or animal safety. However, the scope of each reconsideration is determined on a case-by-case basis reflecting the specific issues raised by the new research or evidence.

The reconsideration process includes a call for data from a variety of sources, a scientific evaluation of that data and, following public consultation, a regulatory decision about the ongoing use of the chemical or product. The data required by the APVMA must be generated according to scientific principles. The APVMA conducts scientific and evidence-based risk analysis with respect to the matters of concern by analysing all the relevant information and data available.

About this document

This Technical Report is intended to provide an overview of the assessments that have been conducted by the APVMA. It has been deliberately presented in a manner that is likely to be informative to the widest possible audience, thereby encouraging public comment.

This document contains a summary of the assessment reports generated in the course of the chemical review of an active ingredient, including the registered product and approved labels. The document provides a summary of the APVMA's assessment, which includes details of:

- the chemistry of the active constituent
- the toxicology of both the active constituent and product
- the residues and trade assessment
- occupational exposure aspects
- environmental fate, toxicity, potential exposure and hazard.

Introduction

Procymidone is a systemic dicarboximide fungicide that has been registered for use in Australia since 1968. Procymidone is used in horticulture, turf, ornamentals, canola and pulses for the control of various fungal diseases.

The APVMA began its reconsideration of procymidone active constituent approvals, product registrations and associated label approvals in 2004 because of toxicological, occupational health and safety, residue and trade concerns. The adequacy of instructions and warnings on product labels was also considered.

Registrations of products containing procymidone were suspended in 2004 as the labels and use patterns did not meet the safety criteria. Instructions for use to address the safety concerns were issued for the duration of the suspension. Holders voluntarily varied their labels to include the amended instructions for use, or requested cancellation of their registrations, and as a result, the suspensions were revoked in 2005.

Purpose of review

The scope of the reconsideration includes the following aspects of active constituent approvals, product registrations and label approvals for procymidone:

- Toxicology, including potential for birth defects or impairment of human fertility due to anti-androgenic effects
- Occupational health and safety (OHS):
  - Risks arising from exposure during handling and application
  - Re-entry exposure risks
  - Determination of appropriate personal protective clothing requirements
- Residues and trade:
  - Residues in treated produce arising from application in accordance with label instructions
  - Establish appropriate maximum residue limits (MRLs) to underpin the assessment of dietary and trade risk for all commodities on which procymidone is used
  - Determination of dietary exposure resulting from the consumption of produce treated with procymidone

The APVMA has also considered information pertaining to chemistry (impurities of toxicological concern) and environmental safety (spray drift).

Product claims and use patterns

Procymidone is currently registered in Australia for the control of certain fungal diseases on food crops, including canola, pulse crops (faba beans, navy beans, lentils, and lupins), stone fruit, grapes (wine grapes only), onions, garlic and potatoes. Procymidone is also registered in Australia for the control of certain fungal diseases on ornamentals and turf grass.

Procymidone is also used under permit for the control of certain fungal diseases in mustard (oilseed cultivars) and peppers. The permit uses were not included under this reconsideration but will be reviewed on the renewal of the permit.

Mode of action

Procymidone is a systemic fungicide with protective and curative action. It belongs to the dichlorophenyl dicarboximide class of fungicide. It is rapidly absorbed by foliage with translocation to leaves and flowers. It inhibits germination of fungal spores and growth of fungal mycelium by affecting mitogen-activated protein (MAP) kinase and histidine kinase in osmotic signal transduction pathways. Procymidone is used against various fungal diseases including grey mould, blossom blight, and rots on grapevines, stone fruits, beans, onions, ornamentals and turf grass.

Procymidone can act as an androgen antagonist, and competitively inhibits the binding of androgens to their receptors, thereby preventing androgen function of the reproductive systems. It is in Schedule 7 of the SUSMP and therefore defined as a 'Dangerous Poison'.

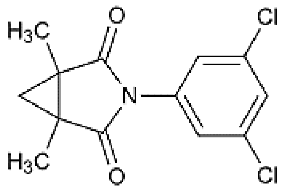
Submissions received during consultation

3 submissions were received during the consultation period following publication of the APVMA's proposed regulatory decisions on the reconsideration of procymidone on 9 May 2022. The submissions have been published on the APVMA's website and are summarised in Appendix B.

Chemistry

Active constituent

Table 1: Nomenclature and structural formula of the active constituent procymidone[1]

Common name (ISO):	Procymidone
IUPAC name:	3-(3,5-dichlorophenyl)-1,5-dimethyl-3-azabicyclo[3.1.0]hexane-2,4-dione
CAS registry number:	32809-16-8
Molecular formula:	C13H11Cl2NO2
Molecular weight:	284.1 gmol-1
Structural formula:	

[1] British Crop Production Council, *The Pesticide Manual 18th edition*, 2016.

Table 2: Key physicochemical properties of the active constituent procymidone[2]

Appearance:	Colourless crystalline powder (PAI, 99.5% purity) Off-white to light brownish crystalline solid (TGAI)
Melting point:	163 to 164.5°C
Boiling point:	Decomposes at 360°C before boiling point of 478°C
Solubility in water:	2.46 mg/L at 20°C 3.07 mg/L at 30°C
Solubility in organic solvents (20 to 25°C):	Acetone: 180 g/L Acetonitrile: 101 g/L Benzene: 86 g/L Chloroform: 216 g/L Cyclohexanone: 148 g/L Ethyl acetate: 115 g/L Methanol: 16 g/L Toluene: 66 g/L
n-Octanol/water partition coefficient (25°C):	Log P_{ow}= 3.30 (pH 6.0)
Vapour pressure:	2.3×10^{-5} Pa at 25°C 1.29×10^{-4} Pa at 35°C 5.4×10^{-4} Pa at 45°C
Dissociation constant (20°C):	No pKa value at pH 2.0 to 12.0, decomposition occurs at pH >8.0
Stability:	Stable for at least 2 years storage under normal conditions
Henry's law constant (20°C):	2.65×10^{-3} Pa.m^{3}mol^{-1}
Hydrolysis (DT_{50}, 30°C):	DT_{50} at pH 2 is 120.4 days DT_{50} at pH 7 is 3.8 days DT_{50} at pH 9 is 1.9 days
Photolysis:	Aqueous photolysis (DT_{50}) is 8 days under sunlight

Procymidone is a colourless crystalline powered solid that melts at 163 to 164.5°C, and further heating leads to decomposition at temperature above 360°C. It is practically insoluble in water (2.4 mg/L at 20°C) but is highly soluble in organic solvents. The octanol-water partition coefficient (Log P_{ow}= 3.3, pH 6.0) suggests that moderate bioaccumulation could occur, but the bioaccumulation factor is low. The vapour pressure

[2] Food and Agriculture Organization of the United Nations, *FAO specifications and evaluations for plant protection products – procymidone*, FAO website, 2001.

(2.3×10-5 Pa) and the Henry's law constant (2.65×10-3 Pa-m3/mol) indicate that volatilisation is not a significant route of dissipation. Procymidone is stable to photolysis in acidic solution but hydrolysed rapidly at pH 7.0 and pH 9.0. Degradation follows first-order kinetics with an estimated half-life of 8 days under sunlight conditions.

There is currently one active approval for procymidone (see Table 3).

Table 3: Current active approvals for procymidone

Approval number	Approval holder
50862	Sumitomo Chemical Australia Pty Ltd

The current APVMA active constituent standard for procymidone specifies a minimum purity of 985 g/kg for the technical material[3]. This minimum purity of 985 g/kg is the same as that specified in the FAO specification for procymidone technical material[4].

Toxicologically significant impurities

Noting the general list of impurities and classes of impurities of toxicological concern[5], the aniline derivative, 3,5-dichloroaniline is a potential impurity in technical procymidone. The FAO/WHO Joint Meeting on Pesticide Specifications (JMPS) assessment in 2001 did not identify any impurities as toxicologically relevant for the technical procymidone4. The APVMA considers that a maximum limit of 1 g/kg for 3,5-dichloroaniline is appropriate from a toxicological perspective. Therefore, a maximum limit of 1 g/kg for 3,5-dichloroaniline has been included in the APVMA Standard for procymidone.

On the basis of the information considered under this review, the currently approved source of procymidone active constituent will comply with this limit. No other changes to the APVMA standard for procymidone active constituent are considered necessary to ensure continued satisfaction with respect to the safety criteria for procymidone active constituent approvals.

An amended active constituent standard for procymidone has been established under section 6E of the Agvet Code.

Formulated products

There are currently 19 registered products containing procymidone across 3 product formulation types. They are 500 g/L of procymidone as suspension concentrate (SC) or flowable concentrate for seed treatment

[3] Australian Pesticides and Veterinary Medicines Authority (APVMA), 2022, *APVMA standards for active constituents for use in agricultural chemical products*, APVMA website, 8 March 2022.

[4] Food and Agriculture Organization of the United Nations (FAO), *FAO specifications and evaluations for plant protection products –procymidone*, FAO website, 2001.

[5] Australian Pesticides and Veterinary Medicines Authority (APVMA), 2015, *General list of impurities and classes of impurities of toxicological concern for agricultural active constituents*, APVMA website, 6 December 2018.

(FS), and 800 g/kg of procymidone as water dispersible granule (WG) (see Table 4). There are no co-formulated products, all products currently registered contain only procymidone as the active constituent.

Of the registered products, 16 products have approved uses for seed treatment, 15 are registered for use on onion seeds and 3 are registered for use on lupin seed (products #53963, 54455 and 67183). Under regulation 8AB(1) of the Agvet Code Regulations, Safety Criteria – chemical products; for a product that is to be applied to seeds to be stored before sowing the APVMA must have regard to whether the product contains sufficient pigment or dye to colour the seed to enable the seed to be readily distinguished from seed to which the product has not been applied. This consideration is included under the 'Treated seed' section below.

Table 4: Currently registered agricultural products containing procymidone

Registration number	Holder	Product name
Suspension concentrate (SC) formulation containing 500 g/L procymidone		
50883	Sumitomo Chemical Australia Pty Ltd	Sumitomo Sumisclex 500 Fungicide#
53963	Sumitomo Chemical Australia Pty Ltd	Sumitomo Sumisclex Broadacre Fungicide#
54455	Adama Australia Pty Ltd	Spiral Aquaflo Fungicide#
59268	Nutrien Ag Solutions Limited	Genfarm Proflex 500 Fungicide#
63494	Accensi Pty Ltd	Accensi Procymidone 500 Fungicide#
65892	Titan Ag Pty Ltd	Titan Procymidone 500 Fungicide#
67536	4 Farmers Australia Pty Ltd	4farmers Procymidone 500 Fungicide#
69208	Titan Ag Pty Ltd	Apparent Procymidone 500 Fungicide#
69322	Farmalinx Pty Ltd	Farmalinx Metapris 500 SCFungicide#
80001	Shandong Rainbow International Co Ltd	Proclex 500 Fungicide#
83139	Nutrien Ag Solutions Limited	Prodone 500sc Fungicide#
84082	Conquest Crop Protection Pty Ltd	Conquest Concydone 500 SC Fungicide#
84896	Oz Crop Pty Ltd	Ozcrop Procymidone 500 SC Fungicide#
85344	Axichem Pty Ltd	AC Palatial 500 Fungicide#
85546	Sumitomo Chemical Australia Pty Ltd	Sporex Fungicide#
Flowable concentrate for seed treatment (FS) formulation containing 500 g/L procymidone		
67183	4Farmers Australia Pty Ltd	4Farmers Procymidone 500 FS Seed Dressing#

Registration number	Holder	Product name
Water dispersible granule (WG) formulation containing 800 g/kg procymidone		
70284	Imtrade Australia Pty Ltd	Imtrade Nosclex 800 WG Fungicide
84695	Imtrade Australia Pty Ltd	Imtrade Procymidone 800 WG Fungicide
87227	Imtrade Australia Pty Ltd	IA Nosclex 800 WG Fungicide (previously Kelpie Procym 800 WG Fungicide)

[#]Products that include directions for use as a seed treatment

The APVMA does not currently have any standards for procymidone formulated products. It is noted that the FAO specification[6] includes specifications for procymidone wettable powder (WP), suspension concentrate (SC) and water dispersible granules (WG) formulations. The APVMA considers that the active constituent standard, including the proposed modification to include a limit for 3,5-dichloroaniline will by itself provide sufficient control of the safety, efficacy and trade criteria for both the active and the product, noting that toxicologically significant impurities including 3,5-dichloroaniline are unlikely to increase in concentration during storage of the products. Therefore, the only source of 3,5-dichloroaniline in formulated products is expected to be the technical active constituents and adoption of specifications for procymidone products as an APVMA standard under section 6E is not required in order to ensure continued satisfaction with respect to the safety, efficacy and trade criteria of product registrations for procymidone.

Recommendations

After assessment of the chemistry of procymidone and products containing procymidone, the APVMA has concluded:

- the current minimum purity of the technical procymidone 985 g/kg remains appropriate
- the APVMA standard for procymidone active constituent should be amended to include a maximum limit of 1 g/kg for 3, 5-dichloroaniline
- a new standard for procymidone active constituent is to be established under section 6E of the Agvet Code
- the current APVMA active approval complies with the proposed standard.

[6] Food and Agriculture Organization of the United Nations (FAO), *FAO specifications and evaluations for plant protection products – procymidone*, FAO website, 2001.

Toxicology

Toxicological properties

In October 2017, the APVMA finalised and published the procymidone human health risk (including toxicology and work health safety) assessment report focusing on the toxicological potential for birth defects or impairment of human fertility, and work health and safety risks arising from exposure during handling, application and re-entry for recommending appropriate safety directions.

Following completion of this report, further consideration has been given to the relevance to humans of the anti-androgenic effects in rats, which had previously been identified as the critical endpoint in establishing the acceptable daily intake (ADI) and the acute reference dose (ARfD). Additional data on the acute toxicity of procymidone, including acute neurotoxicity, has recently been submitted and assessed.

Anti-androgenic effects

Recent studies have indicated that while the toxicodynamic sensitivity of the androgen-sensitive tissues of different laboratory species is approximately the same, the rat is more sensitive to the anti-androgenic effects of procymidone and its mammalian metabolites compared with primates (including humans) and other laboratory species due to interspecies dispositional differences. The key anti-androgenic metabolite of procymidone is hydroxyprocymidone. In rats, hydroxyprocymidone is glucuronidated and excreted predominantly in bile. This results in a higher degree of enterohepatic circulation of hydroxyprocymidone and a resulting higher systemic exposure to this metabolite in rats compared with other species. In other species hydroxyprocymidone is predominantly, and rapidly, excreted in urine, resulting in a lower systemic exposure compared with the rat (Abe *et al*, 2018). Because of this interspecies difference, the rat is no longer considered the most appropriate model for the assessment of the hazard and risk of anti-androgenic effects in humans. Supporting this conclusion are the findings that neither monkeys nor rabbits showed developmental effects associated with anti-androgenic activity following dosing at up to 1000 mg/kg bw/day in rabbits and 125 mg/kg bw/day in monkeys (studies previously reported).

Based on this conclusion, the full procymidone toxicology database, as published in the previous toxicology assessment report, was re-examined in order to determine the appropriate end points for the establishment of health-based guidance values, as shown in in Table 5.

Table 5: Toxicology summary

Study	Key effects	Points of departure	Reference
Repeat dose toxicology studies			
5-week dietary rat	Hepatic enlargement at 471 mg/kg bw/day	NOEL*132 mg/kg bw/d	Singh *et al*, 1981
13-week dietary mouse	Hepatotoxicity at 100 mg/kg bw/day	NOEL 20 mg/kg bw/d	Weir and Keller, 1984

Study	Key effects	Points of departure	Reference
6-month dietary dog	Clinical pathology evidence of hepatorenal toxicity at 500 mg/kg bw/d	NOAEL** 100 mg/kg bw/d	Nakashima *et al*, 1984
18-month dietary mouse	Hepatotoxicity and atrophy of the testicular seminiferous tubules at 15 mg/kg bw/d	NOAEL 4.5 mg/kg bw/d	Hagiwara *et al*, 1981
2-year dietary mouse	Hepatotoxicity at the next highest dose	NOAEL 15 mg/kg bw/d	Filler and Parker, 1988
2-year dietary rat	Hepatoxicity and testicular toxicity at the next highest dose	NOAEL 15 mg/kg b/d	Keller and Cardy, 1986
52-week oral capsule study dog	Lower absolute lymphocyte counts and higher total and β-globulin levels at 500 mg/kg bw/d	NOEL 100 mg/kg bw/d	Dalgard and Machotka, 1992
2-year dietary dog	No adverse effects noted	NOEL ≥130 mg/kg bw/d	Kadota 1981a, Tatematsu *et al*, 1979
Reproductive toxicology studies			
One generation reproduction study dietary – rat	Evidence of developmental anti-androgen effects at 37 mg/kg bw/d	Parental NOAEL 37 mg/kg bw/d Developmental NOAEL 12 mg/kg bw/d	Hodge, 1991
2 generation reproduction study dietary – rat	Parental seminal vesiculitis (spermatocystitis) at 12.5 mg/kg bw/d. Evidence of developmental anti-androgenic effects and effects on body weight at 25 mg/kg bw/d[7]	Parental NOAEL 2.5 mg/kg bw/d Developmental NOAEL 12.5 mg/kg bw/d	Milburn, 1991, Wickramaratne, unspecified data
Developmental toxicology studies			
Gavage – rat	Maternal – reduced maternal bodyweight gain at the next highest dose Foetal – anti-androgenic effects at the next highest dose	Maternal NOAEL – 12.5 mg/kg bw/d Foetal NOAEL – 3.5 mg/kg bw/d	Hoberman, 1992
Gavage – rat	Maternal – no adverse effects at high dose Foetal – anti-androgenic effects at high dose	Maternal NOEL ≥200 mg/kg bw/d Foetal LOAEL 25 mg/kg bw/d	Ostby *et al*, 1999

[7] The increased incidence of spermatocystitis in parental males is likely secondary to anti-androgenic effects.

Study	Key effects	Points of departure	Reference
Gavage – rabbit	No adverse effects at the highest dose[8]	Maternal NOEL ≥100 mg/kg bw/d Foetal NOEL ≥100 mg/kg bw/d	IBT – Sumitomo, 1975
Gavage – rabbit	No adverse effects at the highest dose[9]	Maternal NOEL ≥1000 mg/kg bw/d Foetal NOEL ≥1000 mg/kg bw/d	Wickramaratne, 1988
Gavage – primate	No adverse effects at highest dose	Maternal NOAEL ≥125 mg/kg bw/d Foetal NOAEL ≥125 mg/kg bw/d	Fukunishi, 2003b

* NOEL = no observed effect level

** NOAEL = no observed adverse effect level

Acute toxicity

Additional acute toxicity studies were submitted by holders following the publication of the APVMA toxicology assessment in 2017. These studies indicate that procymidone was of low acute oral, dermal and inhalation toxicity and was not a skin irritant; however, was a slight eye irritant. Acute neurotoxicity studies indicated treatment-related effects on neurofunction were observed at 200 mg/kg bw, however were not associated with neurostructural changes. A NOAEL was established for acute neurotoxicity at 30 mg/kg bw/day (Motomura, 2015).

Impurities of toxicological concern

3,5-dichloroaniline has been identified as an impurity in procymidone active constituents. The toxicological effects of this impurity have been previously considered during approval of sources of the technical grade active constituent. An additional study on 3,5-dichloroaniline has been provided (Katsumata, 2013). Key identified effects were methaemoglobinaemia at low doses, with effects on the spleen and bone marrow at the next higher dose. A NOAEL was established in this study at 1 mg/kg bw/day. A maximum level of 1 g/kg, which has been included in the APVMA standard for procymidone, is considered adequately protective taking into consideration the requirement for protection of sensitive sub-populations from these effects.

[8] Test method requires some maternotoxicity at the highest dose unless the limit dose is used.

[9] Limit dose study.

Health-based guidance values and poisons scheduling

Acceptable daily intake

The acceptable daily intake (ADI) for procymidone will be revised from 0.03 mg/kg bw/day to 0.05 mg/kg bw/day. The ADI was previously based on a no observed adverse effect level (NOAEL) of 2.5 mg/kg bw/day in a one generation rat reproduction study based on increased parental testes weight and reduced epididymides and prostate weights at the next higher dose with an uncertainty factor of 10 for intra-species and 10 for interspecies differences applied. The establishment of the ADI at 0.05 mg/kg bw/day is based on a NOAEL of 4.5 mg/kg bw/day in an 18-month repeat dose dietary study in mice where hepatoxicity and atrophy of testicular seminiferous tubules were observed at the next higher dose and applying an uncertainty factor of 10 for intra-species and 10 for interspecies differences.

Acute reference dose

The acute reference dose (ARfD) for procymidone will be revised. The ARfD, for women of childbearing age, was 0.1 mg/kg bw based on a NOAEL of 12.5 mg/kg bw in a rat developmental toxicity study, based on an increased incidence of hypospadias at the next higher dose. An uncertainty factor of 10 for intra-species and 10 for interspecies variation has been applied previously.

It has now been determined that no ARfD is required for procymidone, on the basis that anti-androgenic effects on development are unlikely to occur following a single exposure incident, and the observed effects in the acute neurotoxicity study do not require the establishment of an ARfD.

Poisons scheduling

Procymidone is included in Schedule 7 of the Standard for the Uniform Scheduling of Medicines and Poisons. In 2004, reassessment of scheduling concluded that inclusion of procymidone in Schedule 7 remained appropriate, based on the evidence that procymidone promoted anti-androgenic effects in vitro in human cell lines. The Schedule 7 listing of procymidone remains appropriate.

Recommendations

The APVMA has assessed the toxicological hazards of procymidone, particularly related to anti-androgenic effects, and concludes that the active constituents and registration of products containing procymidone would not be:

- an undue health hazard to the safety of people exposed to it during its handling or people using anything containing its residues
- likely to have an effect that is harmful to human beings, and considered the following to be appropriate:
    - The ADI for procymidone should be revised to 0.05 milligrams of procymidone per kilogram body weight per day based on a no observed adverse effect level of 4.5 mg of procymidone per kilogram body weight per day for hepatotoxicity and atrophy of the testicular seminiferous tubules occurring at higher doses in

an 18-month dietary exposure study in mice toxicity/carcinogenicity study. The ADI incorporates a 100-fold uncertainty factor to account for inter- and intra-species differences

- The ARfD for procymidone should be considered unnecessary because anti-androgenic effects on development are unlikely to occur following a single exposure incident
- Procymidone should remain in Schedule 7 of the Standard for the Uniform Scheduling of Medicines and Poisons.

Occupational health and safety

Consideration of occupational health and safety risks

In October 2017, the APVMA finalised the procymidone human health risk (including toxicology and work health safety) assessment report. The 2017 human health report focused on the toxicological potential for birth defects or impairment of human fertility, and work health and safety risks arising from exposure during handling, application and re-entry in order to ensure label safety directions are appropriate.

In this further review, the full range of uses of procymidone have been reconsidered utilising revised endpoints based on the reconsideration of the toxicology of procymidone. Updated methodologies for exposure monitoring have been used where appropriate.

Application methods

Procymidone products are applied to a range of crops using the application methods and use rates listed in Table 6 below.

Table 6: Maximum use rates and standard work rates for procymidone application

Application method	Rate per hectare (kg ac/hectare) or concentration (g/L)	Hectares treated or volume used per day	Estimated quantity per day (kg procymidone)
Aerial	0.5	1 200	600
Groundboom (turfgrass)	5	20	100
Airblast	0.75	30	25
Low pressure handwand	5 g/L	151 L	0.755
High pressure handwand	5 g/L	3 785 L	3.79
Backpack	5 g/L	151 L	0.755

Exposure during use

For assessment of exposure during use, the current assessment has utilised the US Environmental Protection Agency (EPA) Office of Pesticide Programs Occupational Handler Exposure Calculator (US EPA, 2020). The following assumptions have been used in the modelling of exposure during use (see Table 7).

Table 7: Assumptions used in modelling exposure during procymidone application

Factor	Value considered
Average worker bodyweight	80 kg
Point of departure	20 mg/kg bw/day (NOEL)
Dermal absorption factor	0.03 (3%)
Inhalation absorption factor	1 (100%, default)
Acceptable margin of exposure (MOE)	≥100

Procymidone products are either suspension concentrate or wettable granule formulations, which are diluted with water and applied as a spray, or flowable suspension used as seed treatments. Workers may be exposed to procymidone during use through dermal contact with the undiluted product or the spray mixture. In addition, exposure may occur via inhalation of spray mist. While procymidone is used on a variety of crop types, there are a limited number of applications per season. The majority of workers are likely to be exposed on a short-term basis, although there is some potential for aerial contract workers to be exposed on a longer-term basis.

In the APVMA's 2017 human health report, the NOAEL from a rat 3-generation reproduction study was selected as being most health-protective, based on concerns regarding reproductive/developmental effects of procymidone. This is the NOAEL upon which the ADI was previously based. Following a reconsideration of the toxicological database, and the determination that the rat is more sensitive to anti-androgenic effects than other laboratory animals and humans, the ADI has been revised and is now based on a NOAEL of 4.5 mg/kg bw/day from an 18-month mouse study. The need for an ARfD has also been revisited, and it has been determined to be not required, based on the consideration that the developmental effects are unlikely to result from a single exposure.

Based on the exposure patterns, a 28-day dermal repeat dose toxicity study is considered protective for the majority of uses. However, on a conservative basis, a NOAEL of 20 mg/kg bw/day from a 13-week mouse dietary study would be considered more protective for the seasonal use of this product (taking into account that some workers may spray in multiple sites or be engaged in contract spraying), and this more conservative value has been utilised.

The conservative dermal absorption factor of 0.03 (3%) used in the APVMA's 2017 human health report is considered appropriate for mixing/loading and application exposure.

Calculations were made on the quantities of procymidone handled daily, based on the maximum label rates and standard work rates set out in Table 6. Utilising these use patterns, exposure to procymidone during mixing, loading and application activities were modelled. Acceptable exposure is determined by calculating a suitable margin of exposure in comparison with the identified NOAEL of 20 mg/kg bw/day. As the NOAEL was obtained from an animal study, a margin of exposure of 100 is deemed to be acceptable (including a factor of 10 based on intraspecies variation and 10 based on interspecies variation). Following use of procymidone, the maximum exposures of 0.15 mg/kg bw/day were calculated for use via backpack spraying while wearing a single layer of clothing, but without gloves, giving a margin of exposure of 133. Exposure during all other mixing, loading and application scenarios were lower, indicating all uses of procymidone are acceptable without the requirement of additional personal protective equipment for systemic exposure.

Safety directions take into account both acute hazards and systemic hazards associated with the use of the product. A revised entry will be set out in the FAISD Handbook[10] which takes into account revised toxicity endpoints. Procymidone products have been identified as slight skin and eye irritants, with a number of products also showing skin sensitisation potential. Based on the acute hazards identified with procymidone products, hazard statements and appropriate personal protective equipment are recommended.

Exposure during re-entry

Assessment of exposure during re-entry has been carried out using the US EPA Post-Application Risk Assessment Calculator (US EPA, 2013). In the previous assessment, the majority of crop situations had a suitable margin of exposure for entry on the day of treatment, and these uses have not been re-assessed. However, certain activities following treatment of grapes, stone fruit, ornamentals and onions required a re-entry period and these have been re-assessed utilising a suitable NOAEL based on the reconsideration of the toxicology. A 28-day dermal study, with a NOAEL of 1,000 mg/kg bw/day, was considered to be suitably protective for exposure resulting from re-entry into treated crops. Following this re-assessment, entry into treated crops was acceptable on day zero.

Based on the acute hazards of procymidone, in particular eye and skin irritation, it is recommended that workers do not enter treated areas until the spray has dried. A restraint should be included on the label as follows:

> **Do not enter treated areas until spray has dried. If prior entry is necessary, wear cotton overalls buttoned to the neck and wrist and elbow-length chemical resistant gloves.**

Public exposure

The APVMA's 2017 human health report used current methodology and a more conservative point of departure compared with that recommended currently. In that assessment, exposures were determined to be acceptable and, accordingly, no recalculation has been undertaken. Exposure to members of the public, including children, resulting from the use of procymidone on turfgrass according to label directions is considered to be acceptable.

Spray drift was considered according to the APVMA's current spray drift risk assessment manual and a Regulatory Acceptable Level (RAL) for one to 2-year-olds of 8,364 g ac/ha was established. On this basis, no buffer zones for bystander exposure are required. Further information on spray drift is available in the 'Spray drift' section below.

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[10] Australian Pesticides and Veterinary Medicines Authority (APVMA), 2022, *FAISD Handbook*, APVMA website, 31 March 2022.

Treated seed

The risk posed by exposure to seeds treated with procymidone is considered acceptable. Label instructions for products with approved uses for seed treatment include specific instructions for the storage and use of treated seeds. Products for use on seeds used as food or feed (lupins) contain a pigment which ensures that seeds treated with the product are readily distinguishable from untreated seeds.

The risk posed by products where the only seed treatment is for non-food or feed seeds (onion seed), is considered acceptable without the inclusion of a dye, as the seed is not expected to enter the food chain. The likelihood of treated onion seed entering the food chain is further reduced based on the maximum 14-day storage period for treated onion seed.

Recommendations

The worker health and safety assessment concluded that the use of procymidone does not pose an unacceptable risk to human health provided the following are ensured:

- The following contemporary precaution statements should be included on the label:

  Precautions:

  DO NOT use treated seed for human consumption. Do not allow treated seed to contaminate grain or other seed intended for animal or human consumption.

  When treated seed is stored it should be kept apart from other grain and the bags or other containers should be clearly marked to indicate that the contents have been treated with this product. Bags or containers which have held treated seed are not to be used for any other purpose.

- The following first aid instructions should be included on the label:

  If poisoning occurs, contact a doctor or Poisons Information Centre. Phone Australia 131 126, New Zealand 0800 764 766.

- The following safety directions should be included on the label:

  May irritate the eyes and skin. Avoid contact with eyes and skin. When opening the container and preparing the product for use, wear cotton overalls buttoned to the neck and wrist (or equivalent clothing) and elbow length chemical resistant gloves. When using the product, wear cotton overalls buttoned to the neck and wrist (or equivalent clothing). Wash hands after use. After each day's use, wash gloves and contaminated clothing.

- The following re-entry statement should be included on the label:

  Do not enter treated areas until spray has dried. If prior entry is necessary, wear cotton overalls buttoned to the neck and wrist, elbow-length chemical resistant gloves and goggles.

- The warning statement that was previously included on the label *"WARNING – Contains procymidone which causes birth defects in laboratory animals. Women of childbearing age should avoid contact with procymidone"* is no longer required.

Residues and trade

Residues studies submitted to the APVMA as part of this chemical review that are relevant to the currently approved use patterns have been considered. A contemporary dietary exposure estimate has been undertaken based on the above ADI and ARfD recommendations, contemporary Australian food consumption data, relevant residues data and methodology aligned with World Health Organization (WHO) Guidelines.

Use patterns can only be supported where there are sufficient relevant residues data to set a MRL for a commodity and where there are no dietary exposure concerns.

Metabolism in plants

The metabolism of procymidone (14C-phenyl procymidone and 14C-carbonyl procymidone labels) was investigated in cucumber, kidney bean, lettuce, grapes and wine.

The metabolism of procymidone in plants is slow with the major component in all studied crops being parent procymidone. Although there were a variety of metabolic products detected at comparatively low levels, not all were characterised. In beans, cucumber and lettuce each metabolite was present at less than 1% of the applied radioactivity and in grapes less than 4% of the applied radioactivity.

Metabolism in animals

The metabolism of procymidone (14C-phenyl procymidone label) was investigated in lactating goats, laying hens and laboratory animals (rats).

The metabolism of procymidone was similar in goats, hens and rats. Procymidone is metabolised to many compounds with the major derivatives being hydroxymethyl procymidone and procymidone carboxylic acid. Glucuronidation of metabolites was also reported as was cleavage of the amide. The goat and hen studies found parent procymidone to be the predominant component in goat fat, muscle, milk and liver as well as in hen fat.

Analytical methods

The general process for the determination of procymidone in plants in the submitted studies involved blending in a water-miscible solvent followed by partitioning into hexane. Extracts were purified further using silica gel column chromatography. Quantification was achieved with gas chromatography (GC) equipped with a flame thermionic detector (FTD). The limit of quantification (LOQ) was reported to be 0.01 to 0.05 mg/kg.

The process for the determination of procymidone in animal tissues and milk involved macerating or homogenising with acetone. Procymidone was cleaned up by Florisil column chromatography. Quantification was achieved with GC equipped with an FTD. The LOQ was reported to be 0.01 mg/kg for milk and animal tissues.

Storage stability

Data were presented for stability of procymidone residues in grapes, wine, strawberries, tomato, cucumber, lettuce, shallots, beans, sunflower seed, sour cherry and eggplant. In each commodity, procymidone was demonstrated to be stable when stored at -20ºC for up to 12 months.

Residue definition

The data presented support the current residue definition as procymidone *per se*.

Residues in food and animal feeds

For each crop with a currently registered procymidone use, the submitted residue trials that are relevant to the current Australian GAP and have been considered in the APVMA risk assessment will be discussed below.

Canola

Four Australian residue trials that addressed the Australian GAP found procymidone residues of <0.01, <0.02, 0.21 and 0.30 mg/kg in seed. Six relevant European (France and the Netherlands) trials involved one application at 500 g ac/ha at BBCH 65 (50% flowering). Residues in canola seed were <0.02 mg/kg (n=6). The combined relevant dataset for canola seed including 4 Australian and 6 European trials found procymidone residues of <0.01, <0.02 (7), 0.21 and 0.30 mg/kg. The OECD MRL calculator[11] recommends an MRL of 0.5 mg/kg. Based on the available data, it is concluded that the MRL for SO 0495 Rape seed should be established at 0.5 mg/kg.

A processing factor of 4× was observed in crude oil in the Australian trials. Twelve European processing studies found a processing factor of 2.22 to 4.63× (mean= 3×) for procymidone residues following processing from canola seed to oil. Given the highest processing factor of 4.63× and a Highest Residue (HR) of 0.30 mg/kg in rape seed (RAC), the Highest Residue in a Processed commodity (HR-P) is calculated to be 1.39 mg/kg. Given the HR-P of 1.39 mg/kg, it is concluded that a rape seed oil, crude at 2 mg/kg is appropriate.

The Australian rape seed straw data found residue levels of <0.02, 0.34, 2.6 and 3.1 mg/kg in straw at harvest (PHI 61 to 81 days). An MRL for rape seed forage and fodder at 5 mg/kg is appropriate based on the available information.

The continued use of procymidone on canola is supported based on analysis of available residues data. The current harvest and grazing withholding periods of “Not required when used as directed” and “Do not graze or cut for stock feed for 9 weeks after application” are supported.

[11] Organisation for Economic Co-operation and Development (OECD), 2020, *OECD Maximum Residue Limit Calculator*, OECD website.

Faba beans

No procymidone residues data for faba beans were submitted. While residues data is available for other pulse crops such as dry bean and peas, lentils, navy beans and soybeans, the registered use pattern for faba beans differs significantly from the treatment regime employed in the trials. It is also noted that while there is a registered use for the pulse crop of lentils, faba beans and lentils are in different crop sub-groups[12].

There is insufficient relevant residues data to determine an appropriate MRL for the currently registered use of procymidone on faba beans and its forage and fodder. The continued use of procymidone on faba beans cannot be supported due to insufficient residues data. The current MRL for VD 0523 Broad bean (dry) [faba bean (dry)] at T10 mg/kg should be deleted.

Garlic

Submitted residues data found a pre-plant clove treatment at 5 g ac/kg garlic resulted in a residue level of 1.80 mg/kg in garlic bulbs, while the application rate of 10 g ac/kg garlic (2× the Australian rate) resulted in residues of 2.90 and 4.75 mg/kg at harvest (210 to 236 days after planting). A MRL for garlic at 5 mg/kg is appropriate based on the available information.

The continued use of procymidone on garlic is supported based on assessment of available residues data. The harvest withholding period for garlic of "Not required when used as directed" is recommended for all relevant labels.

Grapes (wine grapes only)

A plethora of grape data (predominantly non-GLP and from overseas) has been submitted for consideration, however few trials involved the application concentration of 37.5 g ac/100L or sampling at the current withholding period of 9 days. The available relevant data indicates that residues in grapes may peak later than 9 days following treatment.

The highest residue from a relevant trial was observed from a trial in which 4 applications at a concentration of 67 g ac/100L (1.8× the Australian rate) resulted in HRs of 4.8, 7.3 and 6.6 mg/kg at 8, 15 and 22 days after last application (DALA) respectively. The residue level of 7.3 mg/kg observed at 15 DALA represents the highest residue observed at or after the current withholding period of 9 days and when scaled for the proposed concentration of 37.5 g ac/100L is calculated to be 4.1 mg/kg. An MRL for wine-grapes at 5 mg/kg is appropriate based on the available information.

Numerous grape studies investigated processing to wine, juice and wet pomace. In wine, processing factors were 0.04 to 0.65× (n= 100), with a mean of 0.20×. In juice, processing factors were 0.06 to 1.18× (n= 24), with a mean of 0.39×. In wet pomace, processing factors were 0.4 to 4.6× (n= 36), with a mean of 1.6×. Considering the mean PF observed in wine of 0.20, the HR-P for wine made from grapes treated with the Australian use pattern is calculated to be 0.82 mg/kg. Given a grape HR of 4.1 mg/kg and the mean

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[12] Australian Pesticides and Veterinary Medicines Authority (APVMA), *APVMA crop group list for pulses*, accessed 15 October 2021.

processing factor for wet grape pomace is 1.6×, the HR-P for grape pomace (wet) is 6.6 mg/kg. Noting an average moisture content of 15% in wet pomace[13], a MRL of 50 mg/kg is considered acceptable for grape pomace (dry), which is an animal feed commodity.

The continued use of procymidone on grapes (wine grapes only) is supported based on assessment of the available residue data. The current harvest withholding period of 9 days is supported.

Lentils

Four Australian residue trials that addressed the Australian GAP found procymidone residues of 0.08, 0.10, 0.11 and 0.13 mg/kg in lentil seed and 1.81, 2.18, 2.71 and 3.22 mg/kg in straw (dry weight basis) at 21 days after the second application. The current MRLs for Lentil (dry) at 0.5 mg/kg, Lentil forage at 5 mg/kg and Lentil straw and fodder, dry at 5 mg/kg remain appropriate.

The continued use of procymidone on lentil is supported based on analysis of available residue data. The current harvest and grazing withholding periods of 21 days are supported.

Lupin (seed dressing use)

Residues data was not submitted for this seed treatment use pattern on lupins as part of this chemical review. The 2004 procymidone review scope report stated that "Seed dressing products are not considered in this report, as the likely impact on dietary exposure is minimal".

The current use of procymidone on lupins as a seed dressing was first considered by the Pesticides and Agricultural and Chemicals Committee (PACC) in February 1989. A MRL of *0.01 mg/kg for lupin seed was established based on residues data that demonstrated that residues were not expected in grain at harvest. A MRL was also established for lupin forage at 0.1 mg/kg for this use with a 13-week grazing withholding period.

Considering the previous MRL recommendations made by the PACC and that the minimum time between germination and commercial harvest in Australia is approximately 6 months, residues above the LOQ of 0.01 mg/kg should not occur in lupin grain as a result of this approved seed dressing use pattern. This is supported by monitoring data, which has not observed procymidone residues above 0.01 mg/kg in lupin grain over the last 5 years (to 2020–21)[14].

The current labels do not state a harvest withholding periods for lupins. A harvest withholding period of "Not Required when used as directed" is supported for this seed dressing use.

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[13] Organisation for Economic Co-operation and Development (OECD), *Guidance document on residues in livestock*, OECD website, 4 September 2013.

[14] Department of Agriculture, Fisheries and Forestry, *National Residue Survey results and publications*, DAFF website, accessed 1 December 2021.

The available information indicates that the current lupin forage MRL of 0.1 mg/kg and 13-week grazing withholding period remain appropriate. The expression of the MRL should be amended from ‘Lupin forage’ to ‘Lupin forage and fodder’ to provide coverage to fodder including stubble that may be grazed.

A harvest withholding period of “Not required when used as directed” should be associated with this use (labels are currently silent on a harvest withholding period for lupin).

Navy beans

Insufficient residues data relevant to the current Australian GAP is available for navy bean noting that the registered navy bean rate of 750 g ac/ha is significantly higher than the registered rate for lentils for which there is a registered use. Critically, no relevant trials address residues in forage and fodder. Navy bean forage and fodder is considered a significant animal feed and any use on navy beans should be accompanied with a grazing withholding period and a Table 4 MRL, which cannot be established without residues data.

The continued use of procymidone on navy beans cannot be supported due to insufficient residues data. The current MRL for VD 0526 Common bean (dry) [navy bean (dry)] at T10 mg/kg should be deleted.

Non-food uses

Uses on ornamental crops and turf are currently approved on product labels. A residues assessment for these crops is not required as ornamentals and turf are non-food producing.

The grazing withholding period statement “DO NOT graze treated turf or lawn; or feed turf or lawn clippings from any treated area to poultry or livestock” is required to be included on product labels that include the use on turf to prevent potential exposure to livestock from treated turf.

Onions

The submitted onion data found that the application of procymidone as a soil spray at the rate of 2 kg ac/ha at planting, which is equivalent to 2× the Australian soil spray rate or 1× the Australian in-furrow application rate, resulted in a residue level <0.07 mg/kg (n=1). The soil spray treatment at the rate of 2 kg ac/ha together with a seed treatment at the rate of 25 g ac/kg seed (2.5× the Australian rate) resulted in a residue level of 0.13 mg/kg. A MRL for onions at 0.2 mg/kg is appropriate based on the available information.

The continued use of procymidone on onions is supported based on assessment of available residue data. The current 4-week harvest withholding period is supported.

Potato

Four Japanese procymidone trials that involved 4 applications to potatoes resulted in residues of 0.02, 0.02, 0.05 and 0.08 mg/kg in potato tubers at 20±1 DALA. An MRL for potato at 0.2 mg/kg is appropriate based on the available information.

Continued use of procymidone on potatoes is supported provided the following amendments are made to relevant product labels:

- The harvest withholding period should be increased from 9 days to 21 days
- The restraint “DO NOT apply more than 4 applications per crop” should be added

Stone fruit

Relevant residues data were submitted for stone fruit that involved application concentrations of 30 to 50 g ac/100L (0.8 to 1.3× the approved concentration) and sampling at 7 or 9 days after the last application (see Table 8).

Table 8: Details of procymidone stone fruit residue data

Crop	Application Rate (g ac/100L)	DALA	Procymidone residue (mg/kg)
Cherries	50 (3 to 5 applications	7	1.1, 1.3, 1.3, 1.9, 3.3, 3.6
Nectarines	37.5 (3 applications)	9	0.14
Plums	50 (2 applications)	7	0.32, 0.37
Peaches	30 to 50 (2 to 7 applications)	9	0.39, 0.42, 0.57, 1.2

Residues in cherries are significantly higher than in the other stone fruits, and cherries are in a separate subgroup from the other stone fruits[15]. It is therefore appropriate to estimate a separate MRL for cherries. The OECD MRL calculator[11] above recommends an MRL of 7 mg/kg for cherries.

The combined relevant dataset for stone fruit (except cherries) is 0.14, 0.32, 0.37, 0.39, 0.42, 0.57 and 1.2 mg/kg (n=7). The OECD MRL calculator[11] above recommends an MRL of 2 mg/kg. A MRL of 2 mg/kg is considered appropriate for the use of procymidone on stone fruit (except cherries) with a 9-day withholding period.

Recommendations for stone fruit

It is recommended that the continued use of procymidone on stone fruit be supported from a residues perspective. The current harvest withholding period of 9 days is supported.

The MRL for FS 0012 Stone fruits at T10 mg/kg should be changed to 2 mg/kg for Stone fruits {except Cherries}.

An MRL for FS 0013 Cherries should be established at 7 mg/kg.

[15] Australian Pesticides and Veterinary Medicines Authority (APVMA), *APVMA crop group list for stone fruits*, accessed 15 October 2021.

Animal transfer studies and animal commodity MRLs

Forage and fodder of canola and lentils are significant animal feed commodities for grazing livestock. Canola seed and meal, lentil and lupin grain, grape pomace and cull potatoes can also be fed to livestock and poultry.

The estimated maximum feeding burden for procymidone to cattle and poultry based on the residues expected in animal feed commodities following treatment with the supported use patterns were calculated using the OECD feed calculator to be 11.4 mg/kg for beef cattle (driven by grape pomace, lentil forage and canola forage) and 0.1 mg/kg for poultry (driven by lentil seed).

Animal transfer studies with a depuration phase were not available for procymidone. A lactating goat metabolism study and a laying hen metabolism study were available for consideration. In the available lactating goat metabolism study, 2 ~50 kg lactating goats were administered 14C-procymidone for 5 consecutive days at dose levels of 61 and 124 mg/kg in the feed. For the feeding level of 61 mg/kg, parent procymidone residues were 0.111 mg/kg in liver, 0.041 mg/kg in kidney, 0.046 mg/kg in muscle (forequarter), 0.526 mg/kg in fat (renal) and 0.09 mg/kg in milk.

Based on the calculated maximum mammalian dietary burden, the established MRLs for mammalian edible offal at 0.05 mg/kg, meat [in the fat] at 0.2 mg/kg and milk at 0.02 mg/kg are considered appropriate to cover residues that may occur following feeding of animal feeds treated with the supported uses of procymidone; however, those MRLs which are currently temporary should be made permanent at the same levels.

Based on the poultry feeding burden associated with poultry feed commodities treated with the supported uses of procymidone and the results of the available laying hen metabolism study, finite levels of procymidone residues are not expected in poultry eggs or edible tissues. Permanent MRLs at *0.01 mg/kg are recommended.

Spray drift

An MRL of 0.01 mg/kg in mammalian fat (the target tissue) is considered to be the appropriate target MRL for the assessment of exposure to procymidone due to spray drift for livestock areas. The RAL for livestock areas was calculated to be 1.2 mg ac/kg, based on a residue of 0.53 mg/kg in fat after feeding at 61 mg/kg in dry feed (goat metabolism study with no depuration phase). For more information relating to spray drift, see the 'Spray drift' section below.

Dietary exposure

Chronic dietary exposure assessment

The chronic dietary exposure to procymidone is estimated by the National Estimated Daily Intake (NEDI) calculation, encompassing all approved label and permit uses of procymidone and the mean daily dietary consumption data derived primarily from the 2011–12 National Nutritional and Physical Activity Survey. The NEDI calculation is made in accordance with WHO Guidelines and is a conservative estimate of dietary exposure to chemical residues in food.

The NEDI for procymidone associated with supported use patterns is equivalent to <15% of the revised ADI of 0.05 mg/kg bw/day. The chronic dietary exposure to procymidone, based on use according to directions for use varied as recommended in this document is acceptable.

Acute dietary exposure assessment

An acute dietary exposure assessment for procymidone is no longer required as the contemporary APVMA toxicology assessment concluded that an ARfD for procymidone was unnecessary.

Residue-related aspects of trade

Canola, lentils, lupins, wine grapes (including wine) and stone fruit are considered to be major export commodities[16], as are commodities of animal origin, such as meat, offal and dairy products, which may be derived from livestock fed feeds produced from crops treated with uses of procymidone supported in this residues assessment.

For lupins, and all poultry commodities, finite residues are not expected from the current uses and MRLs at *0.01 g/kg are supported and therefore the risk to trade is considered low.

For canola, lentils, wine grapes (including wine) stone fruit and mammalian meat, offal and milk, a comparison with the supported Australian MRL with international MRLs is detailed below in Table 9.

Table 9: Comparison of recommended Australian and current international procymidone MRLs

Commodity	Procymidone MRLs (mg/kg)						
	Australia (proposed)	Codex	USA	EU	Japan	Korea	Taiwan
Grapes (wine grapes)	5	–	5	*0.01	–	2	(Others (vegetables and fruits *0.01)
Stone fruit (except cherries)	2	–	–	*0.01	–	–	(Others (vegetables and fruits *0.01)
Peach		–	–	*0.01	0.7	0.5	–
Nectarine		–	–		10	–	–
Apricot		–	–	*0.01	5	–	–
Plums		–	–	*0.01		–	–

[16] Australian Pesticides and Veterinary Medicines Authority, (APVMA), *Pesticides: Overseas trade (Part 5B)*, APVMA website, 20 July 2020.

Commodity	Procymidone MRLs (mg/kg)						
	Australia (proposed)	Codex	USA	EU	Japan	Korea	Taiwan
Japanese plum (including prune)		–	–		0.5	–	–
Mune plum		–	–		10	–	–
Cherry	7	–	–	*0.01	5	5	–
Canola (rape seed)	0.5	–	–	*0.02	2	–	–
Canola (rape seed) oil, crude	2	–	–	–	–	–	–
Lentils	0.5 (established)	–	–	*0.01	(2 – Other legumes, pulses)	–	2 (Peas and beans)
Meat [in the fat]	0.2	–	–	–	–	–	–
Fat		–	–	*0.01	–	–	–
Muscle/Meat		–	–	*0.01	–	–	–
Milks	0.02	–	–	*0.01	–	–	–
Edible offal	0.05	–	–		–	–	–
Kidney		–		*0.01	–	–	–
Liver		–		*0.01	–	–	–
Other offal		–	–	*0.01		–	–

The National Residues Survey (NRS) includes procymidone in its monitoring of cattle and sheep fat, canola, lentils and cherries. In the 3 years from 2017–18 to 2019–20, procymidone residues above the Limit or Reporting (LOR) of 0.02 mg/kg were not observed in cattle fat (3566 samples in total) or sheep fat (2252 samples in total). In the 3 years from 2018–19 to 2021–21 procymidone residues in canola seed above ½ the current MRL (therefore 0.5 mg/kg, equal to the recommended MRL) were not observed in 1,272 samples in total. Procymidone residues in lentil grain above half the current MRL (therefore 0.25 mg/kg), but less than the MRL, were observed in only one of 275 samples in total. The cherry monitoring program commenced in 2017–18 and procymidone residues in cherries above half the current MRL (therefore 5 mg/kg, lower than the recommended MRL of 7 mg/kg) were not observed in 45 samples in 2017–18 or 54 samples in 2018–19. Cherries were not sampled for the monitoring program in either 2019–20 or 2020–21.

The supported procymidone MRLs for canola, lentils, lupins, wine grapes and stone fruit are higher than some MRLs established by some major export markets. The use patterns and potential for residues however remain unchanged to those currently registered and it is noted that industry is currently managing risks associated with approved uses without a known trade incident.

Residue and trade conclusions

Amendments to the Agricultural and Veterinary Chemicals Code (MRL Standard) Instrument 2019

Tables 10 and 11 summarise the recommended MRL changes to Tables 1 and 4 of the APVMA MRL Standard.

Table 10: Recommended Amendments to Table 1 of the Agricultural and Veterinary Chemicals Code (MRL Standard) Instrument 2019

Code	Food	Current MRL (mg/kg)	MRL at review decision/start of the phase-out period (mg/kg)	MRL at the end of the phase-out period (mg/kg)
Procymidone				
VD 0523	Broad bean (dry) [faba bean (dry)]	T10	T10	MRL deleted [a]
FS 0013	Cherries	–	**7**	7
VD 0526	Common bean (dry) [navy bean (dry)]	T10	T10	MRL deleted [a]
MO 0105	Edible offal (mammalian)	T0.05	0.05	0.05
PE 0112	Eggs	T*0.01	*0.01	*0.01
VA 0381	Garlic	T5	5	5
VD 0533	Lentil (dry)	0.5	0.5	0.5
VD 0545	Lupin (dry)	T*0.01	*0.01	*0.01
MM 0095	Meat (mammalian) [in the fat]	T0.2	0.2	0.2
ML 0106	Milks	T0.02	0.02	0.02
VA 0385	Onion, bulb	T0.2	0.2	0.2
VO 0051	Peppers	T2	T2	T2
VR 0589	Potato	T0.1	0.2	0.2

Code	Food	Current MRL (mg/kg)	MRL at review decision/start of the phase-out period (mg/kg)	MRL at the end of the phase-out period (mg/kg)
PM 0110	Poultry meat [in the fat]	T0.1	*0.01	*0.01
PO 0111	Poultry, edible offal	T*0.01	*0.01	*0.01
SO 0495	Rape seed [canola]	T1	0.5	0.5
OC 0495	Rape seed [canola] oil, crude	T2	2	2
FS 0012	Stone fruits	T10	MRL deleted	MRL deleted
VD 0526	Stone fruits {except Cherries}	**–**	**2**	2
FB 1236	Wine-grapes	T2	5	5

[a] This reconsideration has recommended that the MRLs for Broad bean (dry) [faba bean (dry)] and Common bean (dry) [navy bean (dry)] at T10 mg/kg be deleted at the end of the phase-out period. If the APVMA receives an application to approve a use of procymidone on these crops prior to the end of the phase-out period, the need for an MRL for these crops will be reconsidered.

Table 11: Recommended Amendments to Table 4 of the Agricultural and Veterinary Chemicals Code (MRL Standard) Instrument 2019

Code		Feed	Current MRL (mg/kg)	MRL at review decision/start of the phase-out period (mg/kg)	MRL at the end of the phase-out period (mg/kg)
Procymidone					
AB	0269	Grape pomace, dry	–	50	50
		Lentil forage	5	5	5
		Lentil straw and fodder, dry	5	5	5
AL	0545	Lupin, forage	0.1	MRL deleted	–
		Lupin forage and fodder	–	0.1	0.1
		Rape seed [canola] fodder, dry	T5	MRL deleted	–
		Rape seed [canola] forage	T5	MRL deleted	–

Code	Feed	Current MRL (mg/kg)	MRL at review decision/start of the phase-out period (mg/kg)	MRL at the end of the phase-out period (mg/kg)
	Rape seed [canola] forage and fodder	–	5	5

Residues assessment outcomes for procymidone use patterns

The residues and trade assessment concluded that the supported use patterns of procymidone in Table 12 would not pose an undue hazard to the safety of people consuming anything containing its residues, after the necessary changes have been made. No use patterns on faba beans or navy beans can be supported because there are insufficient residues data to establish MRLs and undertake a robust dietary assessment.

Table 12: Summary of residue assessment outcomes for procymidone use patterns

Use pattern	Use supported	Outcomes of the residues assessment
Canola (rape seed)	Yes	No change required.
Faba beans	No	No residues data submitted for faba bean seed, forage or fodder
Garlic	Yes	For products that do not currently specify a harvest withholding period for garlic on their product label (e.g. 65892), a harvest withholding period of "*Not required when used as directed*" must be added for garlic. *(This change is not required for products (e.g. 50833) that do currently include this harvest withholding period on their label.)*
Lentils	Yes	No change required.
Lupin (seed dressing use)	Yes	A harvest withholding period of "*Not required when used as directed*" should be associated with this use. *(Labels are currently silent on a harvest withholding period for lupin.)*
Navy beans	No	Insufficient relevant residue data submitted for navy bean seed, no residues data submitted for navy bean forage or fodder.
Onions	Yes	No change required.
Ornamental (non-food)	Yes	No change required.
Potatoes	Yes	The harvest withholding period must be increased from 9 days to 21 days. The restraint "*DO NOT apply more than 4 applications per crop*" must be added.
Stone fruit	Yes	No change required.
Turf (non-food use)	Yes	The statement "*DO NOT graze treated turf or lawn; or feed turf or lawn clippings from any treated area to poultry or livestock*" must

Use pattern	Use supported	Outcomes of the residues assessment
		be included on product labels that include the use on turf as a grazing withholding period statement.
Wine grapes	Yes	No change required.

Environment

Environment was not included in the scope of this review. The APVMA has, however, assessed environmental data to inform a contemporary spray drift assessment and to determine appropriate disposal instructions for spent dips. The APVMA has also reviewed the labels against the current Agricultural Labelling Code.

Fate and behaviour

Procymidone is not readily biodegradable (Nagawawa & Kukichi 1976) and is not susceptible to photolysis in soil (Purser 1996). Procymidone is very persistent in acidic soils with mean DT^{50} values of 376 days under laboratory conditions (Purser 1999) and 343 days under field conditions (Benwell 1999). Procymidone is persistent in neutral or alkaline soils with mean DT^{50} values of 119 days under laboratory conditions (Purser 1999) and 105 days under field conditions (Benwell 1999). The major metabolite PCM-NH-COOH is not persistent (mean DT^{50} 12 days; Wimbush 2002).

Two lysimeter studies in Northern Germany indicate some potential for minor soil metabolites to reach ground water (Schnoder 2002). Following 2 applications of 750 g ac/ha/yr to peas and rainfall of 881 to 1,132 mm in each year, the total radioactive residues in the leachate was >0.1 µg/L annual average in all years. Procymidone and its major metabolite PCM-NH-COOH each did not exceed 0.1 µg/L annual average, with the exception of 0.23 µg/L PCM-NH-COOH in only one core in an extremely wet first year following the initial "flush".

Procymidone has low solubility in water (2.5 mg/L at 20°C; Betteley 1996). In water/ sediment systems, procymidone undergoes hydrolysis to its acid derivative PCM-NH-COOH (Lewis 1996, 2003). Procymidone may be significantly adsorbed to sediment rich in organic matter (max 44%) where it degrades slowly. The dissipation of procymidone in the total aquatic system follows biphasic kinetics, with a DT^{50} value of about one day for the first 2 days followed by DT^{50} >100 days thereafter. The quantum yield was 0.32 at 304 nm and the photolytic half-life in 1-metre deep water in central Europe in May was calculated to be 66 days (Bodsky 1997).

Procymidone is non-volatile (Henry's Law constant 2.6×10-3 Pa·m3/mol at 20 to 25°C; Betteley 1996) and is not expected to be transported long distances through the air based on its predicted rapid reaction with hydroxyl radicals (DT^{50} 9.2 hours for a 12-hour day; Betteley 1996).

Spray drift

A contemporary spray drift assessment was conducted to ensure any necessary protection statements and restraints align with current standards. RALs for natural aquatic areas, pollinator areas and vegetation areas based on endpoints which are summarised below. The resulting buffer zones for foliar applied use patterns for representative individual crops are summarised in the 'Spray drift' section below.

Natural aquatic areas

Following long-term exposure to procymidone, NOEC values were determined to be 0.48 mg ac/L for fish (Oncorhynchus mykiss; Sousa 1996), 0.99 mg ac/L for aquatic invertebrates (Daphnia magna; Putt 1996), and 0.12 mg ac/L for sediment dwelling organisms (Chironomus riparius; Putt 2003). An RAL of 120 µg ac/L based on the long-term sediment dweller NOEC was determined to be appropriate for the spray drift assessment. Due to the moderate toxicity of procymidone to aquatic species, the following protection statement is required on product labels:

> **Toxic to aquatic life. DO NOT contaminate wetlands or watercourses with this product or used containers.**

For products which include seed treatments, the protection statement should read as follows:

> **Toxic to aquatic life. DO NOT contaminate wetlands or watercourses with this product, used containers or bags which have held treated seed.**

Pollinator areas

Procymidone has low toxicity to bees (contact LD50 >100 µg ac/bee, Apis mellifera; Bell & Barrett 1996), which results in an RAL of 16667 g ac/ha17. Therefore, spray drift risks to bees are considered to be acceptable without further assessment. No protection statements are required for bees.

Vegetation areas

Due to the age of procymidone, data on its toxicity to non-target terrestrial plants were not required at the time of its initial registration. Procymidone is not known to have phytotoxic effects and spray drift risks are considered to be acceptable on the basis of a long history of safe use. No protection statements are required for non-target terrestrial plants.

Disposal statement for spent dip

Currently approved labels for procymidone products include directions for use as a pre-plant dip for onion and garlic planting material, but do not have corresponding instructions for disposal of unutilised or spent dip. The degradation of procymidone is slower in acidic soils compared to neutral and alkaline soils, i.e. mean soil DT^{50} values under field conditions is 105 d (neutral/alkaline soils) and 343 days (acidic soils) (Benwell 1999). Therefore, disposal of spent dip in a dedicated limed and bunded site is considered to be appropriate. Repeat applications of spent dips must not occur until 4 half-lives have passed[18]; therefore, a minimum interval of 420 days is required between applications at the same site.

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[17] RAL (g/ha)= contact LD^{50} in µg/bee× LOC 0.4/ExpE 2.4× 1000

[18] Australian Pesticides and Veterinary Medicines Authority (APVMA), *Environment (Part 7)*, APVMA website, 13 January 2016.

Accordingly the appropriate disposal statement for spent dip is:

> **Dispose of spent dip in an authorised dip disposal facility. If an authorised dip disposal facility is not available, the spent dip should be evenly spread over flat land not exceeding 20,000 L/ha. The disposal site must be dedicated, limed and adequately bunded (soil at least 15 cm high). DO NOT dispose unwanted spent dip in the same place for at least 420 days, as repeated depositions in one location may, over time, create a contaminated site. Unused or spent dips should be disposed of carefully to avoid contamination of wetlands or watercourses.**

Seed treatment products

For products which include seed treatments, the following protection statement is required:

> **DO NOT feed treated seed or otherwise expose to wild or domestic birds. Any spillages of treated seed must be cleaned up immediately, preferably by recovery and re-use. If disposal is required, ensure treated seed are thoroughly buried in compliance with relevant local, state or territory government regulations and not accessible to birds or other wildlife.**

The following storage and disposal statement is also required for products which include seed treatments:

> **Treated seed and containers of treated seed: When treated seed is stored it should be kept apart from other grain and the bags or containers should be clearly marked to indicate the contents have been treated with this product. DO NOT use treated seed for human consumption. Bags which have held treated seed are not to be used for any other purpose.**

Recommendations

This report recommends that the procymidone products meet the environmental safety criteria provided labels contain the above mentioned protection statement for wildlife and aquatic species, directions for disposal of spent dip and specify buffer zones sufficient to ensure that the RALs listed in the 'Spray drift' section below are not exceeded.

Spray drift

A spray drift assessment was conducted according to the APVMA's approach to spray drift management, which specifies regulatory acceptable levels resulting from spray drift in bystander areas, livestock areas, natural aquatic areas, pollinator areas and vegetation areas. RALs identified for each area were used in calculating the required mandatory no-spray buffer zones and are summarised in Table 13.

The spray drift assessments considered the use patterns of the currently registered procymidone products. The standard deposition curves in the Spray Drift Risk Assessment Tool (SDRAT) with a MEDIUM droplet size were considered appropriate for boom sprayer and aerial application equipment, with the exception of aerial application to canola for which a COARSE droplet size was assessed. The resultant mandatory no-spray buffer zones are indicated in Appendix A.

Table 13: Regulatory acceptable levels of procymidone resulting from spray drift

Area considered	Regulatory acceptable level
Bystander areas	8364 g ac/ha
Natural aquatic areas	120 µg ac/L
Pollinator areas	16667 g ac/ha
Vegetation areas	Not required
Livestock areas	1.2 mg ac/kg

FS 500 g/L procymidone products

Flowable suspensions for seed treatments do not require buffer zones.

SC 500 g/L procymidone products

The spray drift assessments considered the use patterns of the currently registered SC 500 g/L procymidone products listed in Table 4. Mandatory downwind buffer zones are not required for seed or pre-plant clove treatment, transplant dipping, backpack/knapsack, or low and high-pressure handwand applications. Mandatory downwind buffer zones were not determined for navy beans or faba beans use patterns, as they were not supported by the residues assessment.

WG 800 g/kg procymidone products

The spray drift assessments considered the use patterns of the currently registered WG 800 g/kg procymidone products listed in Table 4 above. Mandatory downwind buffer zones are not required for transplant dipping, backpack/knapsack, or low and high-pressure handwand applications. Mandatory downwind buffer zones were not determined for navy beans or faba beans use patterns, as they were not supported by the residues assessment.

Appendix

Appendix A – Spray drift restraints

General spray drift restraints

DO NOT allow bystanders to come into contact with the spray cloud.

DO NOT apply in a manner that may cause an unacceptable impact to native vegetation, agricultural crops, landscaped gardens and aquaculture production, or cause contamination of plant or livestock commodities, outside the application site from spray drift. The advisory buffer zones in the relevant buffer zone table/s below provide guidance but may not be sufficient in all situations. Wherever possible, correctly use application equipment designed to reduce spray drift and apply when the wind direction is away from these sensitive areas.

DO NOT apply unless the wind speed is between 3 and 20 kilometres per hour at the application site during the time of application.

DO NOT apply if there are hazardous surface temperature inversion conditions present at the application site during the time of application. Surface temperature inversion conditions exist most evenings one to 2 hours before sunset and persist until one to 2 hours after sunrise.

Additional spray drift restraints for SC 500 g/L procymidone products

Boom sprayers

DO NOT apply by a boom sprayer unless the following requirements are met:

- Spray droplets not smaller than a MEDIUM spray droplet size category
- Minimum distances between the application site and downwind sensitive areas (see the 'Mandatory buffer zones' section in Table 14) are observed

Table 14: Buffer zones for boom sprayers (SC 500 g/L procymidone)

Application rate	Boom height above the target canopy	Mandatory buffer zones				
		Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas (metres)	Vegetation areas (metres)	Livestock areas (metres)
Up to 10,000 mL/ha (5,000 g ac/ha)	0.5 m or lower	0	10	0	0	350
	1.0 m or lower	0	35	0	0	375
Up to 6500 mL/ha (3,250 g ac/ha)	0.5 m or lower	0	0	0	0	210
	1.0 m or lower	0	25	0	0	350
	0.5 m or lower	0	0	0	0	180

Application rate	Boom height above the target canopy	Mandatory buffer zones: Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas (metres)	Vegetation areas (metres)	Livestock areas (metres)
Up to 6000 mL/ha (3,000 g ac/ha)	1.0 m or lower	0	20	0	0	350
Up to 4000 mL/ha (2,000 g ac/ha)	0.5 m or lower	0	0	0	0	85
	1.0 m or lower	0	15	0	0	325
Up to 2000 mL/ha (1,000 g ac/ha)	0.5 m or lower	0	0	0	0	30
	1.0 m or lower	0	10	0	0	140
Up to 1000 mL/ha (500 g ac/ha)	0.5 m or lower	0	0	0	0	10
	1.0 m or lower	0	0	0	0	65
Up to 500 mL/ha (250 g ac/ha)	0.5 m or lower	0	0	0	0	0
	1.0 m or lower	0	0	0	0	30

Vertical sprayers

DO NOT apply by a vertical sprayer unless the following requirements are met:

- Spray is not directed above the target canopy
- The outside of the sprayer is turned off when turning at the end of rows and when spraying the outer row on each side of the application site
- For dilute water rates up to the maximum listed for each type of canopy specified, minimum distances between the application site and downwind sensitive areas (see the 'Mandatory buffer zones' section in Table 15) are observed

Table 15: Buffer zones for vertical sprayers (SC 500 g/L procymidone)

Type of target canopy and dilute water rate	Mandatory buffer zones: Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas	Vegetation areas (metres)	Livestock areas (metres)
2 metres tall and shorter, maximum dilute water rate of 1,000 L/ha	0	0	0	0	0
Taller than 2 metres (not fully foliated), maximum dilute water rate of 1,500 L/ha	0	0	0	0	20

Type of target canopy and dilute water rate	Mandatory buffer zones				
	Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas	Vegetation areas (metres)	Livestock areas (metres)
Taller than 2 metres (fully foliated), maximum dilute water rate of 1,500 L/ha	0	0	0	0	10

Aircraft

DO NOT apply by aircraft unless the following requirements are met:

- Spray droplets not smaller than a MEDIUM spray droplet size category for lentil application
- Spray droplets not smaller than a COARSE spray droplet size category for canola application
- For maximum release height above the target canopy of 3 metres or 25% of wingspan or 25% of rotor diameter, whichever is the greatest, minimum distances between the application site and downwind sensitive areas (see the ‘Mandatory buffer zones’ section in Tables 16 and 17) are observed

Table 16: Buffer zones for aircraft (MEDIUM spray droplet size SC 500 g/L procymidone)

Application rate	Type of aircraft	Mandatory buffer zones				
		Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas (metres)	Vegetation areas (metres)	Livestock areas (metres)
Up to 500 mL/ha (250 g ac/ha)	Fixed wing	0	0	0	0	230
	Helicopter	0	10	0	0	140

Table 17: Buffer zones for aircraft (Coarse spray droplet size SC 500 g/L procymidone)

Application rate	Type of aircraft	Mandatory buffer zones				
		Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas (metres)	Vegetation areas (metres)	Livestock areas (metres)
Up to 1000 mL/ha (500 g ac/ha)	Fixed wing	0	5	0	0	180
	Helicopter	0	15	0	0	110

Additional spray drift restraints for WG 800 g/kg procymidone labels

Boom sprayers

DO NOT apply by a boom sprayer unless the following requirements are met:

- Spray droplets not smaller than a MEDIUM spray droplet size category
- Minimum distances between the application site and downwind sensitive areas (see the 'Mandatory buffer zones' section in Table 18) are observed

Table 18: Buffer zones for boom sprayers (WG 800 g/L procymidone)

Application rate	Mandatory buffer zones					
	Boom height above the target canopy (metres)	Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas (metres)	Vegetation areas (metres)	Livestock areas (metres)
Up to 6,000 g/ha (4,800 g ac/ha)	0.5 m or lower	0	10	0	0	350
	1.0 m or lower	0	30	0	0	375
Up to 4,000 g/ha (3,200 g ac/ha)	0.5 m or lower	0	0	0	0	200
	1.0 m or lower	0	25	0	0	350
Up to 3,500 g/ha (2,800 g ac/ha)	0.5 m or lower	0	0	0	0	160
	1.0 m or lower	0	20	0	0	350
Up to 1,250 g/ha (1,000 g ac/ha)	0.5 m or lower	0	0	0	0	30
	1.0 m or lower	0	10	0	0	140
Up to 600 g/ha (480 g ac/ha)	0.5 m or lower	0	0	0	0	10
	1.0 m or lower	0	0	0	0	60
Up to 300 g/ha (240 g ac/ha)	0.5 m or lower	0	0	0	0	0
	1.0 m or lower	0	0	0	0	30

Vertical sprayers

DO NOT apply by a vertical sprayer unless the following requirements are met:

- Spray is not directed above the target canopy
- The outside of the sprayer is turned off when turning at the end of rows and when spraying the outer row on each side of the application site

- For dilute water rates up to the maximum listed for each type of canopy specified, minimum distances between the application site and downwind sensitive areas (see the ‘Mandatory buffer zones’ section in Table 19) are observed

Table 19: Buffer zones for vertical sprayers (WG 800 g/L procymidone)

Type of target canopy and dilute water rate	Mandatory buffer zones				
	Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas (metres)	Vegetation areas (metres)	Livestock areas (metres)
2 metres tall and shorter, maximum dilute water rate of 1000 L/ha	0	0	0	0	0
Taller than 2 metres (not fully foliated), maximum dilute water rate of 1500 L/ha	0	0	0	0	20
Taller than 2 metres (fully foliated), maximum dilute water rate of 1500 L/ha	0	0	0	0	10

Aircraft

DO NOT apply by aircraft unless the following requirements are met:

- Spray droplets not smaller than a MEDIUM spray droplet size category for lentil application
- Spray droplets not smaller than a COARSE spray droplet size category for canola application
- For maximum release height above the target canopy of 3 metres or 25% of wingspan or 25% of rotor diameter, whichever is the greatest, minimum distances between the application site and downwind sensitive areas (see the ‘Mandatory buffer zones’ section in Tables 20 and 21) are observed

Table 20: Buffer zones for aircraft (MEDIUM spray droplet size, WG 800 g/L procymidone)

Application rate	Type of aircraft	Mandatory buffer zones				
		Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas (metres)	Vegetation areas (metres)	Livestock areas (metres)
Up to 300 g/ha (240 g ac/ha)	Fixed wing	0	0	0	0	220
	Helicopter	0	10	0	0	140

Table 21: Buffer zones for aircraft (Coarse spray droplet size, WG 800 g/L procymidone)

Application rate	Type of aircraft	Mandatory buffer zones				
		Bystander areas (metres)	Natural aquatic areas (metres)	Pollinator areas (metres)	Vegetation areas (metres)	Livestock areas (metres)
Up to 600 g/ha (480 g ac/ha)	Fixed wing	0	5	0	0	180
	Helicopter	0	15	0	0	110

Appendix B – Public consultation

The APVMA received 3 submissions in response to the publication of the proposed regulatory decision. Details of the submissions are listed in Table 22 and the APVMA's response are summarised below.

Table 22: Submissions in response to the proposed regulatory decisions on the reconsideration of procymidone

Submitter	Comments
Grain Producers Australia (GPA)	Provided information regarding the necessity of the use of procymidone on faba beans.
Grains Research and Development Corporation (GRDC)	Support for retaining uses of procymidone on faba beans and navy beans. Signal intent to conduct residue trials on behalf of industry to allow affirmation of those uses.
Horticulture Innovation Australia Limited (Hort Innovation)	Requested clarification of spray-drift restraints, growth stages for application of procymidone, resistance management strategies and regions where use is permitted.

Grain Producers Australia (GPA) and the **Grains Research and Development Corporation (GRDC)** highlighted the importance of procymidone in control of fungal diseases on faba bean and navy beans, with limited effective alternatives. GPA objected to the reclassification of faba beans to a new crop subgroup which occurred during the reconsideration and the subsequent proposal to remove use of procymidone on faba beans. Both GRDC and GPA submissions noted the low risk presented by the use based on the absence of detections of procymidone above half the current MRL in monitoring carried out by the National Residues Survey over the last three years (https://www.agriculture.gov.au/agriculture-land/farm-food-drought/food/nrs/nrs-results-publications) and requested that the APVMA allow the current use patterns for procymidone on faba beans and navy beans to remain in place.

> **The APVMA noted the need for effective fungicides and the request to maintain the use patterns for procymidone on faba beans and navy beans. However, as outlined in the residues section of this document, there is no supporting data for faba beans (or other pulses) reflective of the current GAP (250 g ai/ha, 9-day WHP) and there is insufficient data for faba bean forage and fodder to establish faba bean forage or fodder MRLs or a Grazing Withholding Periods. Likewise, there is insufficient data for navy beans.**

Horticulture Innovation Australia Limited (Hort Innovation) commented on several matters in the proposed decisions, each is addressed separately below:

Hort Innovation noted that the definition of "livestock areas" in the spray-drift guidance material is those areas where livestock are grazing and queried whether there is, or should be, a re-entry period during which livestock should be excluded from the buffer zone area.

> **The APVMA noted that the potential need for re-entry periods for livestock to areas affected by spray-drift is not currently assessed when establishing RALs and is part of a broader spray drift policy question. The risk of residues above international MRLs in animal commodities where animals access pasture potentially affected by spray drift, following a spray drift event, is expected to be low for procymidone. As discussed in the Residue-related aspects of trade section of this RTR,**

procymidone residues above the Limit or Reporting (LOR) of 0.02 mg/kg were not observed in cattle or sheep fat in the 3 years of NRS monitoring data from 2017–18 to 2019–20. Export Slaughter Intervals have not been established for directly treated forages on current labels and are not proposed as a review outcome. It is noted that potential livestock exposure to procymidone residues is higher for directly treated forages such as canola or lentil forage with an MRL of 5 mg ac/kg than that associated with spray drift (the procymidone RAL for livestock areas was determined to be 1.2 mg ac/kg).

Hort Innovation recommended the inclusion of the BBCH crop growth stages in the critical comments for improved clarity of the application timings, with the example given for stone fruit "Apply at 10% blossom (BBCH 61), full bloom (BBCH 65), late petal fall (BBCH 69) and shuck fall (BBCH 72). DO NOT apply after shuck fall. If weather conditions particularly favour blossom blight use higher rate. NSW, SA, Qld, Tas and WA only. Where Monilinia laxa is known to occur apply an additional early spray at pink bud (BBCH 57)."

APVMA: When considering whether the instructions for use of the product are appropriate, the APVMA requires timing statements which allow accurate use of the product for all purposes indicated. The BBCH codes are an acceptable means of referencing crop growth stage, as are phenological event descriptions, such as bud break and petal fall, etc. Since addition of the BBCH stages is not required for the APVMA to remain satisfied that the current instructions for use meet the labelling criteria, no changes are required, however registrants may choose to update their labels to include the relevant BBCH stages.

The "DO NOT apply after shuck fall" instruction was applied to labels to address potential residue concerns at the outset of the reconsideration in 2004. These concerns have been addressed by the assessments outlined in this report, therefore this critical comment is no longer required.

Hort Innovation recommended inclusion of fungicide resistance management guidelines on the product labels with critical comments, in addition to the resistance management statement required by the Ag Labelling Code.

APVMA: Inclusion of resistance management information, beyond what is indicated in the Ag Labelling Code, is not required for the APVMA to be satisfied that the products meet the statutory criteria in the Agvet code. However, to support sustainable use of procymidone addition of the following information to the resistance warning "Specific resistance management strategies for dicarboximide fungicides can be found on the Croplife Australia website" is recommended.

Hort Innovation requested confirmation that the removal of the State and Territory based restrictions on some use patterns means that all use patterns are supported in all jurisdictions.

APVMA: State and Territory specific instructions for use of procymidone are derived from the historical registration of products in particular jurisdictions. As there are no instructions for use of procymidone products that require restriction to specific geographical regions it is considered acceptable for the previous State and Territory specific instruction to be replaced by instructions which apply to all states and territories.

Acronyms and abbreviations

Shortened term	Full term
ac	Active constituent
ADI	Acceptable daily intake (for humans)
ARfD	Acute reference dose
bw	Bodyweight
d	Day
DAF	Dermal absorption factor
DALA	Days after last application
FAO	Food and Agriculture Organization of the United Nations
FTD	flame thermionic detector
g	Gram
GAP	Good agricultural practice
GC	gas chromatography
GLP	Good laboratory practice
ha	Hectare
HR	Highest Residue
HR-P	Highest residue in a processed commodity
kg	Kilogram
L	Litre
LD_{50}	Lethal Dose^{50} – dosage of chemical that kills 50% of the test population of organisms
LOAEL	Lowest observed adverse effect level
LOQ	Limit of quantification
mg	Milligram
mL	Millilitre
MRL	Maximum residue limit
NEDI	National estimated daily intake

Shortened term	Full term
NOEC/NOEL	No observable effect concentration level
NOAEL	No observed adverse effect level
OECD	Organisation for economic co-operation and development
PHI	Post-harvest interval
PPE	Personal protective equipment
ppm	Parts per million
µg	Microgram

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