Australian Government

Australian Pesticides and Veterinary Medicines Authority

Public Release Summary

on the evaluation of the new active constituent acequinocyl in the product Kanemite Miticide

APVMA product number 88075

November 2020

ISSN 1443-1335 (electronic)

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This publication is available from the APVMA website.

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PREFACE

The Australian Pesticides and Veterinary Medicines Authority (APVMA) is the Australian Government regulator responsible for assessing and approving agricultural and veterinary chemical products prior to their sale and use in Australia. Before approving an active constituent and/or registering a product, the APVMA must be satisfied that the statutory criteria, including the safety, efficacy, trade and labelling criteria, have been met. The information and technical data required by the APVMA to assess the statutory criteria of new chemical products, and the methods of assessment, must be consistent with accepted scientific principles and processes. Details are outlined on the APVMA website.

The APVMA has a policy of encouraging transparency in its activities and seeking community involvement in decision making. Part of that process is the publication of Public Release Summaries for products containing new active constituents. This Public Release Summary is intended as a brief overview of the assessment that has been conducted by the APVMA and of the specialist advice received from advisory agencies, including other Australian Government agencies and State departments of primary industries. It has been deliberately presented in a manner that is likely to be informative to the widest possible audience to encourage public comment.

About this document

This Public Release Summary indicates that the APVMA is considering an application for registration of an agricultural or veterinary chemical. It provides a summary of the APVMA's assessment, which may include details of:

- the toxicology of both the active constituent and product
- the residues and trade assessment
- occupational exposure aspects
- environmental fate, toxicity, potential exposure and hazard
- efficacy and target crop or animal safety.

Comment is sought from interested stakeholders on the information contained within this document.

Making a submission

In accordance with sections 12 and 13 of the Agvet Code, the APVMA invites any person to submit a relevant written submission as to whether the application for registration of Kanemite Miticide should be granted. Submissions should relate only to matters that the APVMA is required, by legislation, to take into account in deciding whether to grant the application. These matters include aspects of public health, occupational health and safety, chemistry and manufacture, residues in food, environmental safety, trade, and efficacy and target crop or animal safety. Submissions should state the grounds on which they are based. Comments received that address issues outside the relevant matters cannot be considered by the APVMA.

Submissions must be received by the APVMA by close of business on 1 December 2020 and be directed to the contact listed below. All submissions to the APVMA will be acknowledged in writing via email or by post.

Relevant comments will be taken into account by the APVMA in deciding whether the product should be registered and in determining appropriate conditions of registration and product labelling.

When making a submission please include:

- contact name
- company or organisation name (if relevant)
- email or postal address (if available)
- the date you made the submission.

Please note: submissions will be published on the APVMA's website, unless you have asked for the submission to remain confidential, or if the APVMA chooses at its discretion not to publish any submissions received (refer to the public consultation coversheet).

Please lodge your submission using the public consultation coversheet, which provides options for how your submission will be published.

Note that all APVMA documents are subject to the access provisions of the *Freedom of Information Act 1982* and may be required to be released under that Act should a request for access be made.

Unless you request for your submission to remain confidential, the APVMA may release your submission to the applicant for comment.

Written submissions should be addressed to:

Executive Director, Registration Management

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Sydney NSW 2001

Phone: +61 2 6770 2300

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Further information

Further information can be obtained via the contact details provided above.

Copies of technical evaluation reports covering chemistry, efficacy and safety, toxicology, occupational health and safety aspects, residues in food and environmental aspects are available from the APVMA on request.

Further information on Public Release Summaries can be found on the APVMA website.

1 INTRODUCTION

This publication provides a summary of the data reviewed and an outline of the regulatory considerations for the proposed registration of Kanemite Miticide, and approval of the new active constituent, acequinocyl.

1.1 Applicant

Arysta Lifescience Australia Pty Ltd.

1.2 Purpose of application

Arysta Lifescience Australia Pty Ltd has applied to the APVMA for registration of the new product Kanemite Miticide, containing 156 g/L of the new active constituent acequinocyl, as a suspension concentrate (SC).

This publication provides a summary of the data reviewed and an outline of the regulatory considerations for the proposed registration of the product Kanemite Miticide, and approval of the new active constituent acequinocyl.

1.3 Proposed claims and use pattern

The proposed product Kanemite Miticide is intended for the control of two-spotted mite in pome and stone fruit.

1.4 Mode of action

Acequinocyl is a contact miticide for control of spider mites. It inhibits electron transfer at cytochrome-bc1 complex of mitochondria in target mites, thereby controlling of all immature life stages of mites. It may have indirect effects on adults of some target pest species. Acequinocyl can be applied in greenhouses and shade houses on container-grown ornamental, floral, foliage and nursery crops as well as on field-grown ornamentals and pome fruit using ground application equipment.

1.5 Overseas registrations

The product is currently registered in Canada, Europe and United States of America as Kanemite 15 SC and Shuttle 15 SC Miticide for control of mites in a variety of use situations.

2 CHEMISTRY AND MANUFACTURE

2.1 Active constituent

The active constituent acequinocyl is manufactured overseas. Details of the chemical name, structure, and physicochemical properties of acequinocyl are listed in Tables 1 and 2.

Acequinocyl is a light brown to yellow coloured crystal with a boiling point of 60°C. It is practically insoluble in water (6.7 µg/L at 20°C and pH 7), and very soluble in acetone, dichloroethane, ethyl acetate and xylene (> 250 g/L). It has a low vapour pressure of 1.69×10^{-6} Pa, suggesting that it is essentially non-volatile. Given a Henry's law constant of 3.9×10^{-5} Pa-m^3/mol at 20°C, there will be limited volatilisation from water. Acequinocyl is lipophilic and may have a potential for bioaccumulation. Neither the purified active ingredient nor the technical grade active ingredient are surface-active. There are no safety properties (for example flammability, explosive, and/or oxidizing) of concern regarding acequinocyl. Acequinocyl is expected to be stable for at least two years storage under normal conditions.

Table 1: Nomenclature and structural formula of the active constituent acequinocyl

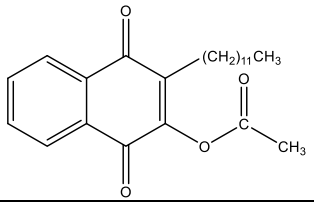
Common name (ISO):	Acequinocyl
IUPAC name:	3-dodecyl-1,4-dihydro-1,4-dioxo-2-naphthyl acetate
CAS registry number:	57960-19-7
Molecular formula:	$C_{24}H_{32}O_4$
Molecular weight:	384.5
Structural formula:	

Table 2: Key physicochemical properties of the active constituent acequinocyl

Physical form:	Solid
Colour:	Light brown flakes to yellow crystals
Odour:	Faint earthy odour
Melting point:	59.6°C
Boiling point:	The test substance decomposes at 200°C
Relative density	1.13 g/mL at 20°C
Stability:	At ambient temperature, acequinocyl was shown to be stable during storage for at least one year. At elevated temperatures, no changes in the active were observed after 2 weeks storage at 54ºC. No adverse reactions with iron, aluminium or aluminium oxide were observed following storage at 54ºC for 2 weeks, although acequinocyl was incompatible with iron (III) chloride. Technical acequinocyl is therefore expected to be stable on storage for at least 2 years under normal conditions.
Safety properties:	Not considered flammable. Not explosive. Not auto-flammable. Except for photo-degradation in water, the acequinocyl technical does not show any chemical incompatibility with oxidising and reducing agents and is essentially non-hazardous.
Solubility in water:	6.7 µg/L (pH 7.0) at 20ºC
Organic solvent solubility:	Acetone >250 g/L Ethyl acetate >250 g/L Heptane 36 g/L Dichloroethane >250 g/L Methanol 6 g/L Octanol 29.2 g/L
Dissociation constant (PK_a):	Does not have any dissociable moieties
PH:	pH 6.94 at a 1% dilution in pure water at 20ºC
Octanol/water partition coefficient (Log K_{ow}/K_{OW}):	log P_{ow} = >6.2, pH 7.0 at 20ºC
Vapour pressure:	1.69×10^{-6} Pa at 25ºC
Henry's law constant:	3.9×10^{-5} Pa m^3/mol at 20ºC

UV/VIS absorption spectra:	λ_{max}242 nm, neutral solution λ_{max}242 nm, acetic solution λ_{max}245 nm, basic solution
Hydrolysis in water:	Stable at pH 4 over 74 days. Half-life is 53 hours at pH 7 and 25°C. Half-life is 76 minutes at pH 9 and 25°C. Half-life is 19 days at pH 1.2 and 37°C in the absence of light.

2.2 Formulated product

The product Kanemite Miticide will be manufactured overseas. Tables 3 and 4 outline some key aspects of the formulation and physicochemical properties of the product.

Kanemite Miticide will be available in 1 L to 10 L HDPE (high density polyethylene) containers.

Table 3: Key aspects of the formulation of the product Kanemite Miticide

Distinguishing name:	Kanemite Miticide
Formulation type:	Suspension concentrate (SC)
Active constituent concentration/s:	156 g/L acequinocyl

Table 4: Physicochemical properties of the product Kanemite Miticide

Physical form:	Pale yellow viscous liquid
PH:	7.1 (1% aqueous dilution)
Relative density:	1.04 g/mL at 20ºC
Kinematic viscosity:	405.9 mPa^{-s} at 20ºC and 217 mPa^{-s} at 40ºC
Pourability:	Pour residue = 2.1%; rinsed residue = 0.18%
Persistent foaming:	20 mL foam after one minute
Suspensibility:	99% (50% dilution) and 94% (20% dilution)
Corrosion of metal:	No corrosion observed on aluminium and iron in direct contact with the formulation
Safety properties:	No flash point below boiling point. Not classified as a flammable liquid or an explosive and/or as an oxidising substance.
Storage stability:	There was sufficient data to conclude that the product is expected to remain within specifications for at least 2 years when stored under normal conditions

2.3 Recommendations

The APVMA has evaluated the chemistry of the active constituent acequinocyl and the associated product Kanemite Miticide including the manufacturing process, quality control procedures, physicochemical properties, spectra, stability, batch analysis results and analytical methods and found them to be acceptable. The available storage stability data indicate that the formulated product is expected to remain stable for at least 2 years when stored under normal conditions.

Based on a review of the chemistry and manufacturing details, the registration of Kanemite Miticide, and approval of the active constituent acequinocyl, are supported from a chemistry perspective.

3 TOXICOLOGICAL ASSESSMENT

The toxicology database submitted for acequinocyl is adequate to define the majority of toxic effects that may result from human exposure to acequinocyl.

3.1 Evaluation of toxicology

Chemical class

Acequinocyl belongs to the quinoline class of miticides and is a member of mode of action Group 20B. It works by binding to the Qo centre of Complex III in the mitochondria of the mite cells and inhibiting electron transfer. Acequinocyl is a known Vitamin K antagonist and is thought to disrupt blood coagulation. Acequinocyl is active against all motile life stages, as well as eggs.

Pharmacokinetics

Absorption of acequinocyl was rapid but limited. There was extensive biliary first pass elimination, however absorbed acequinocyl was extensively distributed. The highest concentrations were seen in the gastrointestinal tract and in the liver. There was no evidence of accumulation in any tissues. Excretion was mainly through the faeces, with a relatively small amount excreted via urine. Biliary excretion contributed up to 20% of the excreted radioactivity. Acequinocyl was extensively metabolised following absorption.

Acute toxicity (active constituent)

Acequinocyl was of low acute toxicity by the oral route in rats and mice and by the dermal route in rats. It was of moderate acute toxicity via the inhalation route in rats. It was a slight skin and eye irritant, and was not a skin sensitiser when tested by the Buehler method.

Acute toxicity (product)

Kanemite Miticide is of low acute oral toxicity to mice and rats and low acute toxicity by the dermal and inhalation routes in rats. It is slightly irritating to the eyes of rabbits, but is not irritating to the skin of rabbits or a skin sensitiser in guinea pigs (Buehler method).

Repeat-dose toxicity

In repeat-dose studies, the primary target was the coagulation system, characterised by increased prothrombin time, increased activated partial thromboplastin time, and internal haemorrhage. In short-term range-finding studies, haemorrhage was seen in mice (from 248 mg/kg bw/d) and rats (from 174 mg/kg bw/d), but not in dogs at up to 1000 mg/kg bw/d following oral dosing. Despite no supportive evidence in metabolism studies, males seem to show an increased sensitivity in a number of repeat-dose studies. Similar findings were noted in rats in a 90 day oral study from 120 mg/kg bw/d. In addition, effects on the eyes were seen, including intra-ocular haemorrhage, hypertrophy of the eyeball and retinal atrophy. A 90 day oral study in mice did not establish a no observed adverse effect level (NOAEL), with increased extra-medullary splenic haematopoiesis noted in females and hepatic lesions in males at 16 mg/kg bw/d. In

dogs, no NOAEL was established, with decreased body weight in males, and a dose related increase in platelets in females seen at the lowest dose tested of 40 mg/kg bw/d. Although clotting factors were not measured in some studies (for example, rat/rabbit developmental studies, mouse subchronic/chronic toxicity studies and 2 generation rat reproduction study), internal haemorrhages were noted. In a one year dog study, effects on coagulation parameters were noted, with a NOAEL of 5 mg/kg bw/day in males.

Following dermal dosing for 28 days, slight effects on coagulation were seen in male rats from 1000 mg/kg bw/d, with a NOAEL of 200 mg/kg bw/d determined.

Chronic toxicity and carcinogenicity

In an 80 week study in mice, effects were seen on the liver, including increased liver enzymes and histopathological changes, with a NOAEL of 2.7 mg/kg bw/d. In a 2 year rat study, hypertrophy of the eyeball was seen in both males and females, with increased clotting time, platelet effects and splenic congestion seen at higher doses. An overall NOAEL of 2.3 mg/kg bw/day was established.

There was no evidence of carcinogenicity.

Reproductive and developmental toxicity

In a 2 generation reproduction study in rats, there was no effect on measured reproduction parameters at doses up to 1500 ppm (111 mg/kg bw/d). Effects in parental animals and offspring were similar and consisted of haemorrhaging, leading to an increase in pup death. Some effects were only seen in offspring, such as swollen body parts and protruding eyes and occurred mainly after weaning. However, it was considered these are likely due to the increased dose levels achieved during this period and were not related to reproductive effects.

In developmental studies in rats and rabbits, maternal toxicity was seen, which led to premature sacrifice and was characterised by clinical signs and necropsy findings of internal haemorrhage (from 500 mg/kg bw/d in rats and at 120 mg/kg bw/d in rabbits). Early resorptions were noted in rabbits at this dose, whereas in rats resorptions only occurred at doses greater than that for maternal toxicity (750 mg/kg bw/d). There was no evidence of teratogenicity.

Overall, there is no evidence of increased susceptibility of rat or rabbit foetuses to in utero exposure to acequinocyl.

Genotoxicity

Acequinocyl was non-genotoxic in a range of *in vitro* and *in vivo* studies.

Neurotoxicity/immunotoxicity

No concerns relating to neurotoxicity were identified in standard toxicity studies.

Mode of action (toxicology)

Additional mechanistic studies investigated effects on blood coagulation following a single dose of up to 600 mg/kg bw. Coagulation was affected from doses of 20 mg/kg bw from 6 to 24 hours after dosing, however returned to normal levels after 48 hours. Young rats were affected slightly more than mature rats. Rhesus monkey receiving doses of up to 1000 mg/kg bw did not show effects on some blood coagulation parameters, and were considered to be less sensitive to these effects than rats.

Toxicity of metabolites and/or impurities

Studies on the toxicity of metabolites (AKM-18 and R1) did not demonstrate toxicity exceeding that of the parent compound.

3.2 Health-based guidance values and poisons scheduling

Poisons standard

Acequinocyl is included in Schedule 5 of the Standard for the Uniform Scheduling of Medicines and Poisons without any cut-off.

Health-based guidance values

Acceptable daily intake

An acceptable daily intake (ADI) for acequinocyl is established at 0.023 mg/kg bw/d based on a NOAEL of 2.3 mg/kg bw/d in a 2 year dietary rat study based on hypertrophy of the eyeball in males and applying a 100-fold uncertainty factor (UF) to incorporate differences in toxicodynamics and toxicokinetics between and within species.

Acute reference dose

The acute reference dose (ARfD) for acequinocyl is established at 0.08 mg/kg bw based on a NOAEL of 8 mg/kg bw in rat mechanistic studies investigating effects on blood coagulation, for prolonged prothrombin time (PT) and activated partial thromboplastin time (APTT) values. In the absence of any chemical-specific data to adjust the UF for extrapolation from laboratory animals to humans or take account of differences in human responses, a default 100 fold UF is applied to the NOAEL.

3.3 Recommendations

There are no objections on human health grounds to the registration of Kanemite Miticide, a suspension concentrate (SC) containing 156 g/L acequinocyl.

4 RESIDUES ASSESSMENT

Metabolism, analytical methodology, residue trial data, fate in storage, and trade aspects have been considered for acequinocyl.

4.1 Metabolism

The applicant has provided details of acequinocyl metabolism studies conducted in plants (apples, eggplant and oranges) and animals (lactating goat). A [phenyl-^{14}C (U)] label was used in each study while an additional (dodecyl-1-^{14}C) label was used in the apple and eggplant studies.

For the (phenyl-^{14}C (U)) labelled experiments in apples, eggplants and oranges, at the proposed harvest withholding period of 14 days, parent acequinocyl was the predominant component representing 48%, 51% and 36% of total fruit radioactivity respectively in apples, eggplant and oranges. Metabolite R1 (2-dodecyl-3-hydroxy-1,4-naphthoquinone) represented 2.3%, 4.3% and <0.1% of total fruit radioactivity respectively in apples, eggplant and oranges.

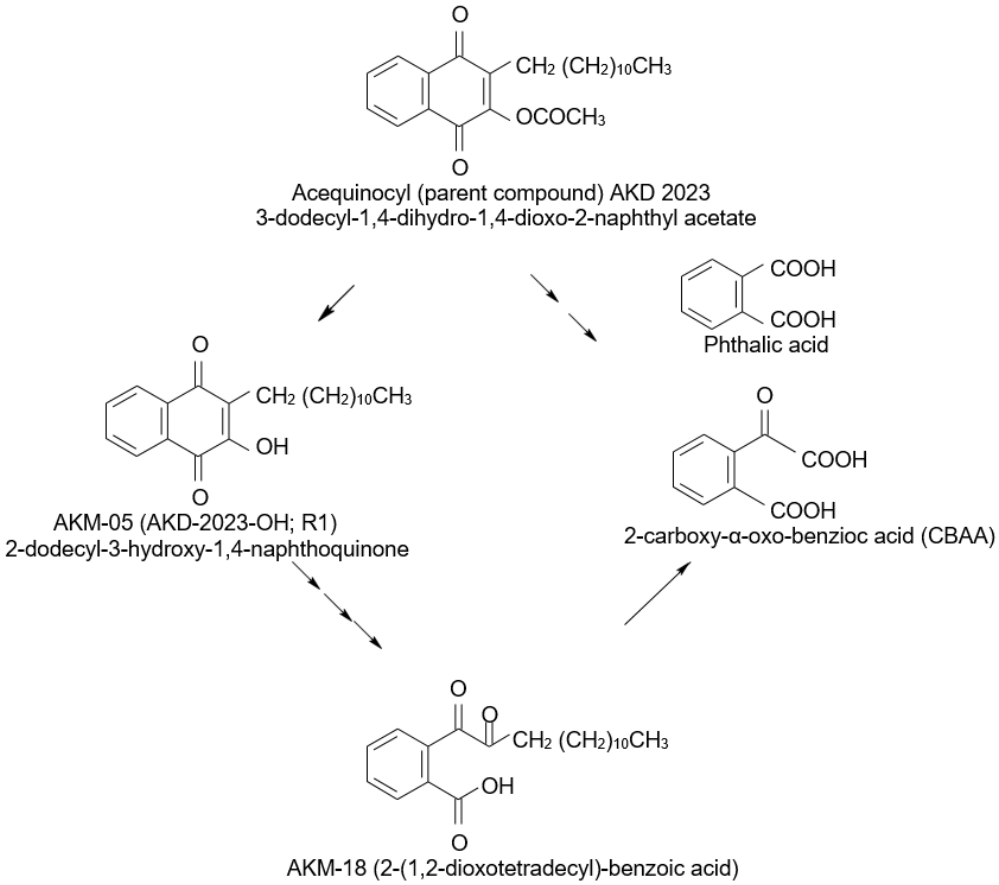
For the (dodecyl-1-^{14}C) labelled experiments in apples and eggplants, at the proposed harvest withholding period of 14 days, parent acequinocyl was the predominant component representing 57% and 55% of total fruit radioactivity respectively in apples and eggplants. Metabolite R1 represented 1.7% and 10% of total fruit radioactivity respectively in apples and eggplant.

For both labels, the percentage of total radioactive residue (TRR) contributed to parent acequinocyl were highest at 0 days after treatment and generally reduced as the post-harvest interval (PHI) increased to 14, 21 and 30 days.

In plants, the metabolism of acequinocyl proceeded by the same route in apples, eggplant and oranges. The metabolic pathway for acequinocyl is largely based on:

- loss of the acetyloxy moiety of the parent compound either to form 2-dodecyl-3-hydroxy-1,4-naphthoquinone (R1) or cleavage to form 2-carboxy-α-oxo-benzioc acid (CBAA) and phthalic acid
- 2-dodecyl-3-hydroxy-1,4-naphthoquinone (R1) is further metabolised through numerous steps involving hydroxylation and cleavage to form 2-(1,2- dioxotetradecyl) benzoic acid (AKM-18) which can also be metabolised to CBAA and phthalic acid.

Figure 1: Proposed metabolic pathway in plants



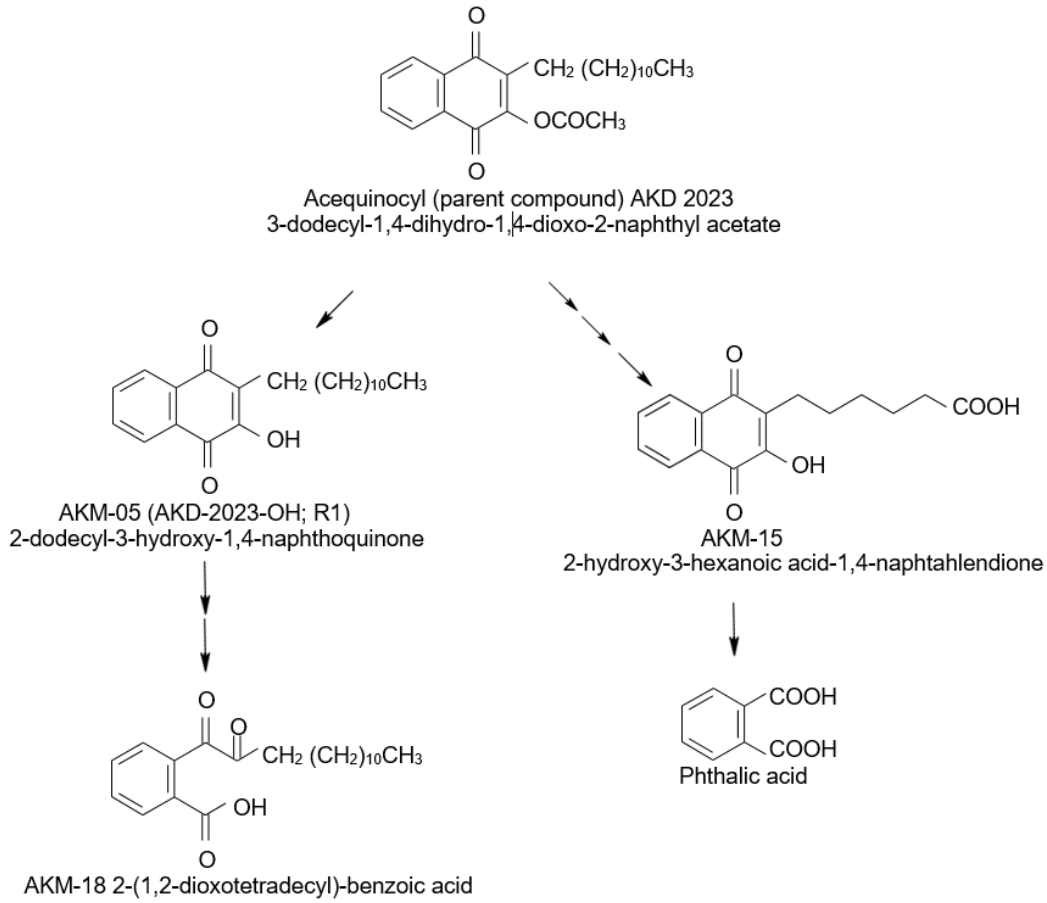
A lactating goat was administered with 5 consecutive daily oral doses of (^{14}C-phenyl) AKD 2023 at a nominal dose level of 10 ppm/day. The total recovery of radioactivity was 85.7% of the total administered dose. At least 11% of the dose was absorbed by the goat with 9.9% being excreted in the urine within 24 hours of the final dose. 64% of the total administered dose was excreted in faeces. Concentrations of radioactivity in tissues were highest in liver (0.14 ppm) and kidney (0.10 ppm). Subcutaneous, peri renal and omental fat contained 0.02 ppm each. Foreleg and rump muscle contained 0.006 and 0.008 ppm respectively. Milk contained concentrations up to 0.003 ppm in samples collected approximately 6 hours after dose administration. These concentrations indicate a low transfer of acequinocyl and its metabolites into tissue and milk.

Acequinocyl (parent) was present in all tissue extracts accounting for 22% of the TRR in fat, 1.5% TRR in liver and 10% TRR in kidney. R1 (2-dodecyl-3-hydroxy-1,4-naphthoquinone) accounted for 22% in fat, 8.4% in liver and <0.001 ppm in kidney. In both liver and kidney, the major components identified were relatively polar metabolites, 31% TRR in liver and 56% TRR in kidney. Subsequent analysis of the polar material revealed the major component in liver to be chromatographically similar to AKM-15 (2- hydroxy-3-hexanoic acid-1,4-naphthalenedione, 9.0% tissue radioactivity) and in the kidney one of the major components (accounting for 6.2% radioactivity) was shown to be chromatographically similar to AKM-18 (2-(1,2-dioxotetradecyl)-benzoic acid).

In a lactating goat, the metabolic pathway for acequinocyl is largely based on:

- loss of the acetyloxy moiety of the parent compound to form 2-dodecyl-3-hydroxy-1,4-naphthoquinone (R1) and partial cleavage of the dodecyl chain to form 2- hydroxy-3-hexanoic acid-1,4-naphthalenedione (AKM-15)
- followed by opening and degradation of the quinone ring to form 2-(1,2- dioxotetradecyl) benzoic acid (AKM-18) and phthalic acid.

Figure 2: The proposed mechanism for biotransformation in livestock



4.2 Analytical methods and storage stability

Analytical methods for commodities of plant origin

In the Australian pome fruit and stone fruit trials provided in support of this application, residues of acequinocyl and its metabolite acequinocyl-OH (R1) were extracted with acetonitrile with 1% acetic acid. After shaking and cooling the extract was centrifuged and added to a dispersive solid-phase extraction (dSPE) tube containing primary and secondary amine and magnesium sulphate. After further shaking and centrifuging the extract was diluted in methanol: formic acid: EDTA and analysed by liquid chromatography with tandem mass spectrometry. The limit of quantification (LOQ) was 0.01 mg/kg and the limit of detection

(LOD) was 0.008 mg/kg for each analyte. Average recoveries from fortified control samples were within acceptable limits.

In the apple trials, conducted in the United States of America, residues of acequinocyl and acequinocyl-OH were extracted from apples, apple juice and wet pomace with acetonitrile/water. An aliquot of the resulting acetonitrile phase was extracted with hexane. For apples and apple juice, the hexane extract was concentrated and cleaned up by silica solid phase extraction (SPE) followed by HPLC analysis. For wet pomace, the hexane extract underwent an acetonitrile/hexane partition to remove fats, oils, and other preferentially hexane-soluble co-extractives coupled with multiple extractions. The acetonitrile extract was then cleaned up by silica solid phase extraction (SPE) followed by HPLC analysis. The limit of quantification (LOQ) was 0.01 ppm for each analyte. Average recoveries from fortified control samples were within acceptable limits.

Analytical methods for commodities of animal origin

Animal commodities (milk and tissue samples) were analysed for acequinocyl and acequinocyl-OH (R1) extracted 3 times with hexane in the presence of anhydrous sodium sulfate. The combined hexane extract was partitioned in hexane: acetonitrile solvent to remove a large amount of fats and oils present. Using hexane: acetonitrile coupled with multiple extractions, the analytes were induced to move into the acetonitrile phase. Samples were purified by gel permeation chromatography followed by silica solid phase extraction (SPE). The purified extract was concentrated and then submitted to HPLC analysis. The LOQ for all matrices for both analytes was 0.01 ppm. Average recoveries from fortified control samples were within acceptable limits.

Storage stability

The freezer storage stability of acequinocyl and acequinocyl-OH (R1) was determined in apple and apple processed fractions, wet pomace and juice. Residues of acequinocyl and acequinocyl-OH were found to be stable for up to 154 days for apple fruit and 151 days for wet pomace and apple juice.

4.3 Residue definition

Commodities of plant origin

For plants, parent acequinocyl accounted for 36% to 57% TRR in fruit at the proposed harvest withholding period of 14 days, Although acequinocyl-OH was not observed at 10% TRR or above (<0.1% to 4.3% TRR in fruit at 14 days after treatment) in the metabolism studies with exception of in eggplant (10% TRR) for the (dodecyl-1-^{14}C) label, it is considered appropriate for inclusion in the residue definition for plant commodities because it was frequently observed at finite levels in the residue studies provided for stone and pome fruits.

The residue definition as the sum of acequinocyl and its metabolite 2-dodecyl-3-hydroxy-1,4-naphthoquinone, expressed as acequinocyl is recommended for commodities of plant origin. The definition is suitable for both enforcement and risk assessment and is consistent with the residue definition established in many overseas countries such as the USA and Japan.

Commodities of animal origin

For animals, parent acequinocyl contributed >10% TRR in kidney and fat and although its metabolite acequinocyl-OH is a minor metabolite in liver and kidney, it should be considered for risk assessment and enforcement purposes because it is observed in fat at 22% of tissue radioactivity.

The residue definition as the sum of acequinocyl and its metabolite 2-dodecyl-3-hydroxy-1,4-naphthoquinone, expressed as acequinocyl is recommended for commodities of animal origin. The definition is suitable for both enforcement and risk assessment.

4.4 Residues in food and animal feeds

The proposed use on pome fruits (apples and pears) and stone fruits (including apricots, cherries, nectarines, peaches and plums) involves a single foliar application per season applied to the point of run-off by tractor-mounted or tractor-drawn airblast sprayers at a concentration of 170 mL product/100 L (26.5 g ai/100 L). The proposed harvest withholding period (WHP) for pome fruits and stone fruits is 14 days.

Pome fruits

The Australian dataset consisting of 5 apple and 4 pear trials, when scaled to the proposed concentration of 26.5 g ai/100L, residues of total acequinocyl would be expected to be 0.05, 0.06, 0.09 (2), 0.11, 0.15, 0.19, 0.20 and 0.44 mg/kg. The OECD MRL calculator estimates an MRL of 0.7 mg/kg based on the Australian dataset.

The combined dataset of Australian and US trials (when scaled to the proposed concentration of 26.5 g ai/100L) suitable for MRL estimation for pome fruits is, in rank order, 0.02 (2), 0.04, 0.05 (2), 0.06 (3), 0.07, 0.08, 0.09 (3), 0.11 (2), 0.15 (2), 0.17, 0.19, 0.20 and 0.44 mg/kg (n=21). The STMR was 0.09 mg/kg. The OECD MRL calculator estimates an MRL of 0.5 mg/kg noting the HR of 0.44 mg/kg was in an Australian apple trial.

An acequinocyl MRL of 0.7 mg/kg for FP 0009 pome fruits is considered appropriate for the proposed use in conjunction with a harvest withholding period of 14 days.

In a processing trial conducted in the United States of America on apples residues of acequinocyl were observed to concentrate in wet apple pomace. Multiplying the processing factor for wet apple pomace, 3.6, by the HR for apples (0.44 mg/kg), yields a HR-P value of 1.6 mg/kg for wet apple pomace. Assuming a dry matter content of 40%, from the OECD feed calculator, an acequinocyl MRL of 5 mg/kg is considered appropriate for AB 0226 Apple pomace, dry.

Stone fruits

Twenty four Australian trials including 2 apricot, 4 cherry, 4 nectarine, 6 peach and 8 plum trials, were considered for MRL estimation in stone fruits. The dataset suitable for MRL estimation in apricots is in rank order, 0.03 and 0.10 mg/kg.

The dataset suitable for MRL estimation in nectarines is in rank order, 0.02, 0.03, 0.04 and 0.09 mg/kg (n=4, STMR = 0.04 mg/kg).

The dataset suitable for MRL estimation in plums is in rank order, <0.02 (3), 0.03, 0.04, 0.05 (2) and 0.08 mg/kg (n=8, STMR = 0.04 mg/kg).

The dataset suitable for MRL estimation in peaches is in rank order, <0.02, 0.03, 0.07 (2), 0.20 and 0.51 mg/kg (n=6, STMR = 0.07 mg/kg).

The dataset suitable for MRL estimation in cherries is in rank order, 0.10, 0.16 (2) and 0.36 mg/kg (n=4, STMR = 0.16 mg/kg).

The combined dataset suitable for MRL estimation to stone fruits is, in rank order, <0.02 (4), 0.02, 0.03 (4), 0.04 (2), 0.05 (2), 0.07 (2), 0.08, 0.09, 0.10 (2), 0.16 (2), 0.20, 0.36 and 0.51 mg/kg (n=24). The STMR was 0.05 mg/kg. The OECD MRL calculator estimates an MRL of 0.6 mg/kg. An acequinocyl MRL of 0.7 mg/kg for FS 0012 Stone fruits is considered appropriate for the proposed use in conjunction with a harvest withholding period of 14 days.

In a processing trial conducted in Australia on peaches residues of acequinocyl were observed to concentrate in dried peaches. Multiplying the processing factor for dried peaches, 1.7, by the HR observed in stone fruits (peaches, 0.51 mg/kg), yields a HR-P value of 0.86 mg/kg. It is recommended that acequinocyl MRLs at 1 mg/kg for DF 0240 apricots, dried, DF 0247 peach, dried and DF 0014 prunes, dried be established.

4.5 Crop rotation

Studies on the residues in rotational crops were not submitted. As pome fruits and stone fruits are perennial, and it is accepted that fields used for these crops are not normally planted as part of a rotation with food/feed crops, no rotational cropping studies are considered necessary at this time.

4.6 Residues in animal commodities

The OECD feed calculator indicates that apple pomace can form up to 20% of the diet for beef cattle and 10% of the diet for dairy cattle in Australia. The estimated maximum dietary burdens of acequinocyl for beef and dairy cattle resulting from the proposed use is calculated to be 0.28 ppm and 0.14 ppm respectively.

An animal transfer study for acequinocyl conducted on lactating cows has been provided.

From the animal transfer study and the estimated maximum dietary burden resulting from the proposed use on apples, detectable residues of acequinocyl are not expected to occur in animal commodities. It is therefore appropriate to establish animal commodity MRLs at LOQ of 0.02 mg/kg.

The following acequinocyl animal commodity MRLs are recommended:

- *0.02 mg/kg for MO 0105 Edible offal (mammalian).

- *0.02 mg/kg for MM 0095 Meat (mammalian) (in the fat).
- *0.02 mg/kg for ML0106 Milks.

An animal transfer study for poultry was not provided. As the proposed use does not involve significant poultry feeds no poultry MRLs will be established at this time.

4.7 Spray drift

In the animal feeding study, dosing with acequinocyl at 5 ppm gave a maximum total acequinocyl residues in fat 0.04 mg/kg. Based on the highest total acequinocyl residues observed in fat the estimated feeding level resulting in total acequinocyl residues below the LOQ of 0.02 mg/kg is 2.7 ppm.

If a Regulatory Acceptable Level of 2.7 ppm is used in the APVMA spray drift risk assessment tool, the following label statements are recommended for the protection of international trade.

The product will be applied by tractor mounted or tractor drawn airblast sprayers at a concentration of 170 mL product/100 L and a spray volume of no less than 1,000 L/ha. For spray drift estimation the default maximum spray volume of 1500 L/ha has been used as per the Spray Drift Risk Assessment Manual July 2019[1].

DO NOT apply by a boom sprayer.

DO NOT apply by a vertical sprayer unless the following requirements, OR the conditions provided in a relevant output of the spray drift management tool (website URL to be confirmed), 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 ‘Mandatory buffer zones’ section of the following table titled ‘Buffer zones for vertical sprayers’) are observed.

Mandatory buffer zones are required for livestock areas for the proposed use on pome fruits and stone fruits.

For the 3 target canopy types the livestock buffer zones are:

- 2 metres tall and smaller, maximum dilute water rate of 1500 L/ha – not required
- taller than 2 metres (not fully-foliated), maximum dilute water rate of 1500 L/ha – 10 metres
- taller than 2 metres (fully-foliated), maximum dilute water rate of 1500 L/ha – not required.

[1] Spray drift risk assessment manual July 2019, apvma.gov.au/sites/default/files/publication/51826-spray_drift_risk_assessment_manual.pdf

4.8 Dietary risk assessment

The chronic dietary exposure to acequinocyl is estimated by the National Estimated Daily Intake (NEDI) calculation encompassing all registered/temporary uses of the chemical and the mean daily dietary consumption data derived primarily from the 2011 to 2012 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 acequinocyl is equivalent to <20% of the ADI. It is concluded that the chronic dietary exposure to acequinocyl is acceptable.

The acute dietary exposure is estimated by the National Estimated Short Term Intake (NESTI) calculation. The NESTI calculations are made in accordance with the deterministic method used by the JMPR with 97.5th percentile food consumption data derived primarily from the 2011 to 2012 National Nutritional and Physical Activity Survey. NESTI calculations are conservative estimates of short-term exposure (24 hour period) to chemical residues in food. The highest acute dietary intake was estimated at <35% of the ARfD. It is concluded that the acute dietary exposure is acceptable.

4.9 Recommendations

The following amendments are required to be made to the APVMA MRL Standard (Table 5).

Table 5: Amendments to the APVMA MRL Standard

Amendments to Table 1			
Compound		**Food**	**MRL (mg/kg)**
ADD:			
Acequinocyl			
DF	0240	Apricots, dried	1
MO	0105	Edible offal (mammalian)	*0.02
MM	0095	Meat (mammalian) [in the fat]	*0.02
ML	0106	Milks	*0.02
DF	0247	Peach, dried	1
FP	0009	Pome fruits	0.7
DF	0014	Prunes	1
FS	0012	Stone fruits	0.7

Amendments to Table 3	
Compound	**Residue**
ADD:	
Acequinocyl	Sum of acequinocyl and its metabolite 2-dodecyl-3-hydroxy-1,4-naphthoquinone, expressed as acequinocyl

Amendments to Table 4			
Compound		**Animal feed commodity**	**MRL (mg/kg)**
ADD:			
Acequinocyl			
AB	0226	Apple pomace, dry	5

5 ASSESSMENT OF OVERSEAS TRADE ASPECTS OF RESIDUES IN FOOD

5.1 Commodities exported and main destinations

Pome fruits and stone fruits are considered major export commodities[2], as are commodities of animal origin, such as meat, offal and dairy products, which may be derived from livestock fed feeds produced from treated apples. Residues in these commodities resulting from the use of Kanemite Miticide may have the potential to unduly prejudice trade.

Australian exported 4.4 kilotonnes of apples worth $10.6 million, 9.2 kilotonnes of pears worth $16.4 million, 15.6 kilotonnes of nectarines/peaches worth $61.6 million, 6.8 kilotonnes of plums worth $25.0 million, 5.0 kilotonnes of cherries worth $79.5 million and 0.6 kilotonnes of apricots worth $2.4 million during 2018 to 2019[3]. Major export destinations are summarised in Table 6.

Table 6: Total exports of Australian pome fruits and stone fruits and destinations in 2018–19

Commodity	Major destinations
Apples	Papua New Guinea (1032t), Italy (5211t), Hong Kong (493t), Indonesia (396t) and The Netherlands (334t)
Pears	New Zealand (2428t), Indonesia (1597t), Canada (1424t), Singapore (1297t) and Fiji (602t)
Apricots	Saudi Arabia (164t), Kuwait (85t), Oman (55t), United Arab Emirates (52t) and Singapore (42t)
Cherries	China (1593t), Hong Kong (915t), Vietnam (598t), Singapore (587t), and Taiwan (313t)
Nectarines/peaches	China (6707t), Singapore (1596t), Saudi Arabia (1778t) and The United Arab Emirates (1652t)
Plums	China (2604t), Hong Kong (1515t), Indonesia (999t), Singapore (964t) and Malaysia (346t)

The significant export markets for Australian beef, sheep, pig meat, and offals are listed in the APVMA Regulatory Guidelines – Data Guidelines: Agricultural – Overseas trade (Part 5B).

[2] APVMA Regulatory Guidelines – Data Guidelines: Agricultural - Overseas trade (Part 5B), apvma.gov.au/node/1017

[3] Australian Horticulture Statistics Handbook 2018/2019, horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/grower-resources/ha18002-assets/australian-horticulture-statistics-handbook/

5.2 Overseas registrations and approved label instructions

The applicant indicated that acequinocyl is registered for use in Canada on pome fruits, in the United States of America on pome fruits and cherries, in a number of European countries on pome fruits, and in Germany on cherries and plums.

5.3 Comparison of Australian MRLs with Codex and international MRLs

The Codex Alimentarius Commission (Codex) is responsible for establishing Codex Maximum Residue Limits (CXLs) for pesticides. CXLs are primarily intended to facilitate international trade, and accommodate differences in Good Agricultural Practice (GAP) employed by various countries. Some countries may accept Codex CXLs when importing foods. Acequinocyl has not been considered by Codex.

The following relevant international MRLs have been established for acequinocyl.

Table 7: Proposed Australian and current international MRLs for acequinocyl

Country	Residue definition	Commodity	MRL (mg/kg)
Australia (proposed)	Sum of acequinocyl and its metabolite 2-dodecyl-3-hydroxy-1,4-naphthoquinone, expressed as acequinocyl	Pome fruits	0.7
		Stone fruits	0.7
		Edible offal (mammalian)	*0.02
		Meat (mammalian)[in the fat]	*0.02
		Milks	*0.02
European Union	Acequinocyl	Apples	0.1
		Pears	0.1
		Apricots	*0.01
		Cherries	0.1
		Peaches	0.04
		Plums	0.02
		Edible offal (mammalian)	*0.01 (bovine liver and kidney)
		Meat (mammalian)[in the fat]	*0.01 (in muscle and fat)
		Milks	*0.01
United States of America	Sum of acequinocyl [2-(acetyloxy)-3-dodecyl-1,4-naphthalenedione] and its metabolite, 2-dodecyl-3-hydroxy-1,4-naphthoquinone, calculated as the stoichiometric equivalent of acequinocyl	Pome fruits	0.40
		Cherry	1.0
Canada	(acetyloxy)-3-dodecyl-1,4-naphthalenedione, including the	Apples	0.3
		Pears	0.3

Country	Residue definition	Commodity	MRL (mg/kg)
	metabolite 2-dodecyl-3-hydroxy-1,4-naphthalenedione	Edible offal (mammalian)	0.02 (by products of cattle, goats and sheep)
		Meat (mammalian)[in the fat]	0.02 (meat of cattle, goats and sheep)
		Milks	0.02
Japan	Sum of the parent compound acequinocyl and hydroxyl acequinocyl (3-Dodecyl-2-hydroxy-1,4-naphthoquinone), calculated as acequinocyl	Apple	0.7
		Pear	1
		Cherry	2
		Nectarine	1
		Peach	0.1
		Plum	0.7
		Edible offal (mammalian)	0.02 (liver)
		Meat (mammalian)[in the fat]	0.02 (cattle, fat)
Hong Kong	Sum of acequinocyl and 2-dodecyl-3-hydroxy-1,4-naphthoquinone, expressed as acequinocyl	Pome fruits	0.4
Republic of Korea	–	Apple	0.5
		Pear	0.3
		Apricot	2.0
		Cherry	0.5
		Peach	2.0
		Plum	0.5
Taiwan	–	Apple	0.5
		Pear	0.5
		Apricot	0.5
		Cherry	0.5
		Nectarine	0.5
		Peach	0.5
		Plum	0.5

5.4 Potential risk to trade

Export of treated produce containing finite (measurable) residues of acequinocyl may pose a risk to Australian trade in situations where (i) no residue tolerance (import tolerance) is established in the importing country or (ii) where residues in Australian produce are likely to exceed a residue tolerance (import tolerance) established in the importing country.

The APVMA is proposing to establish MRLs for FP 0009 Pome fruits and FS 0012 Stone fruits at 0.7 mg/kg. Codex CXLs have not been established for acequinocyl.

The proposed Australian MRL for pome fruits at 0.7 mg/kg are higher than international MRLs/tolerances established in all markets except Japan. The established MRLs for apples and pears vary between 0.3 and 0.5 mg/kg in the US, Canada, Hong Kong, Taiwan and Korea and it is noted that the HR for apples from the Australian trials was 0.44 mg/kg. The EU MRL for apples and pears is 0.1 mg/kg.

The proposed Australian MRL for stone fruits at 0.7 mg/kg is higher than international MRLs established in Taiwan at 0.5 mg/kg for apricot, cherry, nectarine, peach and plum, Korea at 0.5 mg/kg for cherry and plum and the EU at 0.01*, 0.1, 0.04, 0.02 mg/kg for apricots, cherries, peaches and plum respectively. It is also noted that MRLs/tolerances are not established for stone fruits in Hong Kong, Canada or the US with the exception of cherries where the US has a tolerance established at 1.0 mg/kg.

No finite residues of acequinocyl are expected in animal commodities from the proposed use.

The applicant has proposed the following trade advice statements to mitigate the potential risk to trade in treated pome fruits and stone fruits:

> *Export of treated produce: MRLS or import tolerances for Acequinocyl may not be established in all markets. If you are using Kanemite Miticide on pome and stone fruit for export, please check with Arysta LifeScience Australia Pty Ltd for the latest information.*
>
> *Export trade advice – treated crops: Treated crop commodities destined for export may require extra time between application and harvest to be accepted in some export markets. Before you use this product, you are advised to contact Arysta LifeScience Australia Pty Ltd and/or your industry body about any potential trade issues and their management.*
>
> *Export trade advice – livestock: Consumption by livestock of any materials previously treated with this product may produce residues in the animal that might not be acceptable in some export markets. Before you use this product, you are advised to contact Arysta LifeScience Australia Pty Ltd and/or the relevant livestock industry body about any potential trade issues and their management. You should also be prepared to inform other livestock producers who intend using the material as stockfeed of its chemical exposure history.*

Industry stakeholders are invited to comment on the potential risk to international trade associated with the proposed use on pome fruit and stone fruit and the industry's ability to manage the potential risk to international trade.

6 WORK HEALTH AND SAFETY ASSESSMENT

6.1 Health hazards

Kanemite Miticide is of low acute oral toxicity to mice and rats and low acute toxicity by the dermal and inhalation routes in rats. It is slightly irritating to the eyes of rabbits, but is not irritating to the skin of rabbits or a skin sensitiser in guinea pigs (Buehler method).

6.2 Occupational exposure

Exposure during use

Kanemite Miticide is proposed for the control of two-spotted mite in pome and stone fruit, and will be applied at a rate of 1.7 mL/L (0.265 g ai/L), at a rate of no less than 1,000 ml per hectare. A maximum application rate of 663 g ai per hectare is expected. The product will be applied once per season by tractor-mounted airblast equipment. Workers will be exposed by dermal and inhalation routes. A dermal NOAEL of 200 mg/kg bw/day was selected as appropriate for dermal exposure during use, and an oral NOAEL of 5 mg/kg bw/day was selected as appropriate for inhalation exposure. An acceptable margin of exposure was achieved when mixer/loaders and applicators using an open cab tractor wear standard protective clothing (long pants and long-sleeved shirt or overalls).

Exposure during re-entry or rehandling

Workers undertaking typical agricultural activities may have exposure to foliar dislodgeable pesticide residues in treated crops. A dermal NOAEL of 200 mg/kg bw/day was considered suitable to assess these effects. Exposure resulting from a variety of exposures was acceptable on the day of treatment, and no re-entry interval is required for the use of Kanemite Miticide in pome or stone fruits.

6.3 Public exposure

The product is intended for professional use only, and is not intended for application to areas accessible to the general public. Adherence to good agricultural practice will minimise potential risks.

6.4 Recommendations

The following first aid instructions, safety directions and precautionary (warning) statements are recommended for the product label.

First aid instructions

If poisoning occurs, contact a doctor or Poisons Information Centre. Phone Australia 131126; New Zealand 0800 764 766.

Safety directions

May irritate eyes. Avoid contact with eyes. When opening the container, preparing spray and using the prepared spray, wear cotton overalls buttoned to the neck and wrist (or equivalent clothing). Wash hands after use. After each day’s use, wash contaminated clothing.

Precautionary (warning) statements

Do not allow entry into treated areas until spray has dried. If prior entry is necessary wear cotton overalls buttoned to the neck and wrist (or equivalent clothing). Clothing must be laundered after each day's use.

7 ENVIRONMENTAL ASSESSMENT

7.1 Fate and behaviour in the environment

Soil

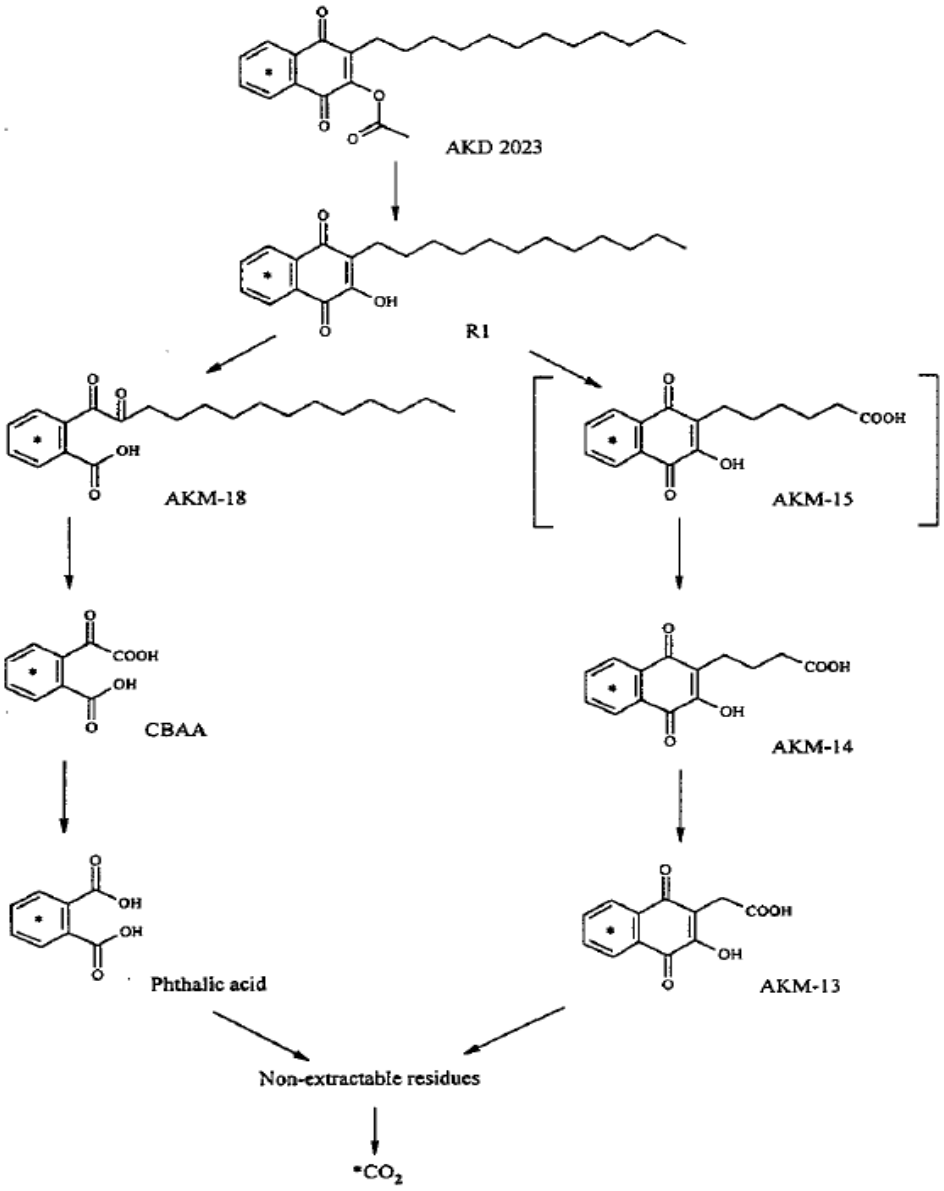
Under laboratory conditions at 20°C, acequinocyl exhibited very low to low persistence in 4 aerobic soils (DT_{50} 1.1 to 2.7 days, geomean 1.9 days) and an anaerobic soil (DT_{50} 1.8 days). The major metabolites detected in soils are R1[4] (max 34%) and AKM-18[5] (max 22%) formed by hydrolysis of parent molecule due to microbial action (Figure 3). Under laboratory conditions, metabolite R1 had low persistence in four aerobic soils (DT_{50} 2.0 to 49 days, geomean 8.8 days), while metabolite AKM-18 also exhibited low persistence (DT_{50} 3.5 days).

Based on batch equilibrium studies in four soils from Europe and Japan (volcanic soil), acequinocyl is considered as strongly adsorbed or immobile in soil with K_{oc} 35,200 to 12,3000 ml/g (mean 58,000 ml/g). Soil sorption of acequinocyl is not pH dependent but correlated to soil organic carbon content. Metabolite R1 is also considered strongly adsorbed or immobile in soil with Kf_{oc} 9,000 to 230,000 ml/g (mean 100,667 mL/g, 1/n 0.86). Available data also indicate metabolite AKM-18 is also strongly sorbed to soil.

Field dissipation studies were conducted in 3 sites in North America. Acequinocyl exhibited very low persistence (DT_{50} 2.2 to 6.2 days, geomean 3.4 days). Consequently, metabolite R1 was already observed on the day of application, which similarly dissipated rapidly (DT_{50} 2.9 to 7.2 days, geomean 4.1 days). Metabolite AKM-18 was only incidentally found within the first 15 to 72 hours. Metabolite R1 was not detected (LOQ 0.01 mg/kg). No residues were found below 15 cm. Based on results for field dissipation and soil sorption, acequinocyl and its metabolites (R1 and AKM-18) are not expected to readily leach from soil into ground water.

[4] 2-dodecyl-3-hydroxy-1,4-naphtalenedione
[5] 2-(1',2'-dioxotetradecyl) benzoic acid

Figure 3: Acequinocyl – Proposed degradation pathway in soil under aerobic conditions



Water

Acequinocyl hydrolysis rapidly, increasing in the order of pH 4 < pH 7 < pH 9 (DT_{50} values of 74, 2.2, and 0.045 days, respectively at 25°C). Major degradation products were R1 (respective maxima of 23%, 55% and 49% at pH 4, 7, and 9) and AKM-18 (respective maxima of 11%, 17% and 15% at pH 4, 7, and 9). Photolysis is expected to significantly enhance degradation of acequinocyl near the water surface (DT_{50} <15 minutes in sterile and natural waters buffered to pH 5). Major photoproducts were phthalic acid[6] (max 13%) and AKM-08[7] (max 13%).

[6] Benzene-1,2-dicarboxylic acid
[7] 2-hydroxy-3-(-oxyheptyl)-1,4-naphthoquinone

In 2 aerobic water/sediment systems under dark laboratory conditions, acequinocyl dissipated rapidly from the water with up to 25% partitioning to sediment. Overall, acequinocyl had very low persistence in the systems with water phase DT_{50} <0.75 days and whole system DT_{50} ranging 0.42 to 0.47 days (geomean 0.44 days). Major metabolites in the aquatic systems were AKM-18 (max 20%, 19% of which was in the sediment phase), R1 (max 12% in water, 2.8% in sediment) and CBAA[8] (max 11% all of which was in the water phase). The proposed degradation pathway of acequinocyl in aquatic systems is similar to that in soil.

Air

Based on its low vapour pressure (1.7×10^{-6} Pa at 25°C) and low water solubility (6.7×10^{-6} g/L at 25°C), acequinocyl is not expected to volatilise from soil or water surfaces. Based on the predicted rapid rate of photochemical oxidative degradation (DT_{50} 1.2 hours), acequinocyl is not expected to be found in any significant concentration in the air or be subject to long range transport.

7.2 Effects and associated risks to non-target species

Terrestrial vertebrates

Acequinocyl has low toxicity to mammals (LD_{50} >5000 mg ac/kg bw/d, 2 species tested) and birds (LD_{50} >1,942 mg ac/kg bw/d, 2 species tested). In reproductive toxicity testing, clinical and haemorrhagic effects on mammalian pups were observed after weaning at doses as low as 56 mg ac/kg bw/d (NOAEL 6.9 mg ac/kg bw/d, Rattus norvegicus), and reduced body weight and egg production in birds was observed at doses as low as 39 mg ac/kg bw/d (NOEL 7.5 mg ac/kg bw/d, Anas platyrhynchos).

Risks to birds were determined to be acceptable for realistic worst-case scenarios of direct dietary exposure to over-sprayed food items within the treatment area. Risks to wild mammals were determined to be acceptable when considering the species and dietary items that were likely to be present at the time of application. No protection statements are required for terrestrial vertebrates.

The log K_{ow} >6.2 for acequinocyl indicates a potential for bioaccumulation. A food chain assessment indicates that any accumulated residues in fish and earthworm will not reach levels harmful to predators under the proposed conditions of use. In addition, based on toxicokinetics data, biomagnification is not expected along the food chain.

Aquatic species

Acequinocyl and its representative SC formulation are considered to have moderate toxicity to sensitive fish (lowest LC_{50} 65 mg ac/L, *Oncorhynchus mykiss*), high toxicity to aquatic invertebrates (lowest EC_{50} 0.00059 mg ac/L, *Crassostrea virginica*; EC_{50} 0.0023 mg ac/L, *Daphnia magna*), and low toxicity to sediment dwellers (lowest LC_{50} >86 mg ac/L, *Chironomus riparius*) and algae (ErC_{50} >7.7 mg ac/L, *Raphidocelis subcapitata*) at the limits of water solubility under the conditions of the test. Following long-term exposure to acequinocyl, reduced survival of fish larvae was observed at concentrations as low as 2.3 mg ac/L (NOAEC 1.1 mg ac/L, *Oncorhynchus mykiss*) and reduced growth was observed in aquatic invertebrates at

[8] (2-(carboxycarbonyl)benzoic acid)

concentrations as low as 0.0018 mg ac/L (NOEC 0.00098 mg ac/L, *Daphnia magna*). In a higher tier chronic test with a mixed-age population of *Daphnia magna* in a water/sediment system, reduced population growth was observed at 0.10 mg ac/L (NOEC 0.020 mg ac/L). Due the high toxicity of acequinocyl to aquatic invertebrates, a protection statement is required on the label to identify the hazard.

Risks to fish, sediment dwellers and algae were determined to be acceptable for the worst-case scenario of direct overspray of aquatic habitat. Spray drift risks to aquatic invertebrates were determined to be acceptable provided buffer zones of 45 to 110 metres are observed, depending on the type of target canopy and dilute water rate. Runoff risks to aquatic invertebrates were also determined to be acceptable provided the product is not applied when a runoff event can be expected soon after application (i.e. due to storms or irrigation). Standard runoff restraints are advised to mitigate this risk.

Bees and other non-target arthropods

Acequinocyl has low toxicity to bees by contact exposure (LD_{50} >100 µg ac/bee, *Apis mellifera*) and oral exposure (LD_{50} >100 µg ac/bee, *Apis mellifera*). No mortality or behavioural effects were observed following exposure to the technical product at the highest dose tested (NOEL 100 µg ac/bee); however, increased mortality was observed following acute oral and contact exposure to the SC formulation at 13 and 54 µg ac/bee, respectively (NOEL 6.7 and 27 µg ac/bee, respectively).

Pome and stone fruit are attractive crops to bees and other insect pollinators. While acequinocyl does not have systemic activity, spray application is to be directed at foliage, flowers and fruit. Therefore, it is considered possible for bees and other insect pollinators to be exposed when foraging for pollen and nectar in over-sprayed blooming crops. Acceptable risks could be concluded for acute exposure of bees; however, effects on long-term survival and longevity could not be ruled out based on the available data. In the absence of chronic data on bees to refine the assessment, application during the blooming period is not recommended.

A representative SC formulation of acequinocyl was not toxic to the indicator species for predatory arthropods (LR_{50} >624 g ac/ha, *Typhlodromus pyri*) and parasitic arthropods (LR_{50} >1050 g ac/ha*, Aphidius rhopalosiphi*) in Tier 1 (glass plate) laboratory tests. Testing on additional species of predatory mites had variable effects: no effects were observed in *Amblyseius andersoni* in glass plate tests (ER_{50} >300 g ac/ha), while *Phytoseiulus persimilis* exposed to fresh-dried residues on a natural (leaf) substrate was very sensitive in a 2000 study (ER_{50} <300 g ac/ha) but demonstrated low sensitivity in a subsequent 2001 study (ER_{50} >300 g ac/ha). In additional tests on inert (sand) substrate, there were no adverse effects on ground dwelling predatory species such as ground beetles (ER_{50} >1050 g ac/ha, *Poecilus cupreus*) or spiders (ER_{50} >1050 g ac/ha, *Pardosa* sp). Testing on additional species of parasitic arthropods on glass plates similarly had no adverse effects (ER_{50} >1050 g ac/ha, *Aleochara bilineata*).

Risks to beneficial (predatory and parasitic) arthropods were determined to be acceptable for the realistic worst-case scenario of direct contact exposure to fresh-dried residues within the treatment area. The product can be considered compatible with integrated pest management (IPM) programs utilising beneficial arthropods. No protection statements are required for beneficial arthropods.

Soil organisms

Acequinocyl has low toxicity to soil macro-organisms such as earthworms (LC_{50corr} >500 mg ac/kg dry soil, *Eisenia foetida*), and the formulation does not enhance its toxicity. Reduced body weight of earthworms was observed at 1000 mg ac/kg dry soil following acute exposure ($NOEC_{corr}$ 250 mg ac/kg dry soil). Acequinocyl does not adversely affect soil microbial processes such as nitrogen transformation at exaggerated soil concentrations (NOEC 7.0 mg ac/kg dry soil).

Risks to soil organisms were determined to be acceptable for the worst-case scenario of direct contact exposure to acequinocyl residues incorporated into the top 5 cm of soil within the treatment area without interception. No protection statements are required for soil organisms.

Non-target terrestrial plants

A representative SC formulation of acequinocyl had low toxicity to 10 crop species following both pre-emergent exposure (seedling emergence test) and post-emergent exposure (vegetative vigour test). The ER_{25} and ER_{50} values were all greater than 15,000 g ac/ha, which is considerably greater than the proposed rate. Therefore, acequinocyl is not considered to be phytotoxic at field-relevant rates and risks were considered to be acceptable without further assessment. No protection statements are required for non-target terrestrial plants.

7.3 Recommendations

Based on assessment of the environmental data, it was determined that the proposed use of Kanemite Miticide is not, or would not be, likely to have an unintended effect that is harmful to animals, plants or things or to the environment following use in accordance with label instructions. Buffer zones of 45 to 110 metres are advised for the protection of natural aquatic areas, depending on the type of target canopy and dilute water rate. Standard runoff restraints are also advised to avoid a runoff event occurring soon after application (i.e. due to storms or irrigation). For the protection of bees and other insect pollinators, application while the crop is in bloom is not advised.

8 EFFICACY AND SAFETY ASSESSMENT

8.1 Proposed product use pattern

Kanemite Miticide is a contact miticide intended to be used in Australia for the control of two-spotted mite (Tetranychus urticae) in commercial pome and stone fruit orchards.

The product is to be applied at a rate of 170 ml/100 L (0.265 g ai/L) to the point of run-off as soon as mites appear. Application will be by tractor-mounted or tractor-drawn airblast sprayers, calibrated so that no less than 1,000 L of water is applied per hectare, to achieve complete coverage of crop foliage to ensure adequate mite control. No more than one application will be applied per growing season.

8.2 Efficacy and target crop/animal safety

Efficacy

The applicant presented data from seventeen Australian field trials conducted in commercial pome and stone fruit orchards during 2017 and 2018. The product was tested at rates of 115 to 230 ml/100 L, including the proposed label rate of 170 ml/100 L. Efficacy was compared alongside industry standard miticides, applied at the label rate, and an untreated control. Treatments were applied using a backpack sprayer in apples (3), pears (3), peaches (5), nectarines (4) and plums (2) in Victoria (11), New South Wales (1), South Australia (3) and Western Australia (2). A randomised complete block trial design was used with 4 to 6 replicates and one or 2 trees as an individual plot. Efficacy was assessed on natural two-spotted mite infestations and treatments were applied at the first sign of mites. Numbers of mite eggs, nymphs and adults were counted on 20 to 25 randomly selected leaves/plot before spraying and at varying intervals after spraying (usually -1, 1, 3, 7, 14 and 21 days after application). Mean mite infestations per treatment were calculated and was also expressed as percentage of leaves infested. All data was analysed using appropriate statistical tests.

Trial results demonstrated that Kanemite Miticide, applied at the proposed label rate (170 ml/100 L), provided effective control of all growth stages of two-spotted spider mites (eggs, nymphs and adults). Kanemite Miticide performed at statistically equivalent or better levels than the bifenazate industry standard and resulted in commercially acceptable levels of mite control. Some trials suffered from low and variable populations of two-spotted spider mites in the controls, particularly towards the end of the assessment period.

In the first 4 trials, conducted in Victoria (3) and South Australia (1) in 2017, 4 rates of Kanemite Miticide (150 ml, 170 ml, 200 ml and 230 ml/100 L) were compared with bifenazate industry standard (applied at label rate) on apples, nectarines and pears that were infested with two-spotted mites. These trials found that, in general, Kanemite Miticide at all rates provided good control of all mite growth stages (eggs, nymphs, and adults) with often complete control of all stages of the mites being achieved from 2 to 3 days after application (DAA) onwards.

In the next series of trials (10) conducted in 2018 in Victoria (8) and South Australia (2) Kanemite Miticide was applied at 115 ml, 150 ml, 170 ml and 230 ml/100 L. In South Australia, in nectarines and peach trees, all rates of Kanemite Miticide and the industry standard (bifenazate) gave statistically equivalent and

commercially acceptable levels of control towards the end (14 and 21 DAA) of the trial period. There was some variability in the results from earlier assessments of incidence and control of mites in the nectarine trials. This was manifested by the lower rates of Kanemite Miticide (115 ml and 150 ml/100 L) giving equivalent or better control of mites than the higher rates. It is likely these outlier responses were due to the low mite numbers present in the crop.

In 6 of the trials conducted in Victoria, no mites were detected from 1 to 3 DAA onwards in any of the treatments applied. However, in one trial (apples, Shepparton East) no mite eggs, nymphs or adults were found in the untreated control from 7 DAA onwards and in two other trials (nectarines and plums, Shepparton East) no mites were found in the untreated control in the final assessment at 28 DAA. In 2 other trials there were low numbers of mite presence (eggs, nymphs, and adults) found in some treatments in the latter period (14, 21, and 28 DAA) of the trial, but these only occurred at the lower rates (115 ml and 150 ml/100 L) of the Kanemite Miticide and bifenazate treatments. Kanemite Miticide applied at 170 ml/100 L gave almost complete control of all forms of mite presence (eggs, nymphs and adults) in all these trials.

In 2018, 2 trials were conducted in Western Australia and one in NSW where various rates of Kanemite Miticide (115 ml, 150 ml, 170 ml and 230 ml/100 L) were applied to peaches, plums, and apple trees to control two-spotted mites that were present in the foliage. In the Western Australian trials, virtually no mites were detected in any of the Kanemite Miticide treatments from 7 DAA onwards, although some of this was due to a general decline in mites in the crop. In both trials there was a mite presence in the untreated control at 14 DAA, but this was not significantly different from the treated plots. In NSW, commercially acceptable level of control (96.5%) was achieved by Kanemite Miticide when applied in apples at the proposed label rate at 13 DAA. This was statistically equivalent to the bifenazate treatment which gave 97% control at the same assessment date.

When present, numbers of beneficial mite predators were also counted on leaves sampled during the trial. This included *Stethorus* (a predatory beetle) and *Typhlodromus occidentalis* (a predatory mite). In most trials, predator numbers steadily increased in untreated controls as two-spotted mite populations increased. Statistically lower numbers of predators were often encountered in treated trees. However, it was concluded that this was more likely to be due to the removal of their prey (two-spotted mites) rather than a direct effect of Kanemite Miticide. To further address the toxicity of acequinocyl on mite predators, the applicant also submitted 2 laboratory studies conducted in Switzerland in 1998 and 2001. In these trials, protonymphs of a predatory mite (*T. pyri*) were subjected to 2 rates of acequinocyl. In 1998, the rate of acequinocyl used was close to the recommended label rate (300 g a.i./ha.) while in 2001 the rate used was 624 g a.i. to represent a worst case scenario. In both trials, the response of predatory mites to acequinocyl was compared alongside an untreated control (water only) and a toxic industry standard (parathion or dimethoate). Results from these trials indicated that mortality of *T. pyri* and the number of eggs laid by females after exposure to acequinocyl, was not significantly different from the untreated controls. In contrast, exposure of predatory mites to both toxic industry standards resulted in significant mortality and severely reduced fecundity. Additional laboratory studies, to determine the effect of acequinocyl on two other species of predatory mites (*Amblyseius andersoni* and *Phytoseiulus persimilis*), were considered in the Environmental assessment (see 7.2). While variable results were obtained for *P. persimilis*, risks to beneficial (predatory and parasitic) arthropods were determined to be acceptable for the realistic worst-case scenario of direct contact exposure to fresh-dried residues within the treatment area. Consequently, the product can be considered compatible with integrated pest management (IPM) programs utilising beneficial arthropods.

Crop safety

Detailed assessments of crop safety/phytotoxicity were made in all 17 efficacy trials which included several different major cultivars of pome and stone fruits. Visual assessment of phytotoxicity on foliage and fruit were made using a 0% to 100% scale (where 0 = no visible symptoms and 100 = complete plant scorching and death) at regular intervals throughout the trial (usually 1, 3, 7, 14, 21, 28 DAA). No visible symptoms of phytotoxicity or other crop damage (0%) was observed at any time during the trial in any of the treatments applied. These data demonstrate acceptable crop safety.

Resistance management

A resistance management strategy (RMS) has been developed for the control of two-spotted mites in pome fruit which advocates the rotation of currently registered miticides with a different mode of action (MoA) (CropLife Australia 2020). Acequinocyl is classed by the International Resistance Action Committee (IRAC) as a Group 20B insecticide with a MoA as a mitochondrial complex III electron transport inhibitor (IRAC 2020). Bifenazate is currently registered in Australia for the control of two-spotted mites in pome and stone fruits and belongs to the same MoA class as acequinocyl but in a different sub-group (20D). Sub-groups represent distinct classes of insecticidal agents that are believed to have the same MoA but are different enough in structure or mode of interaction with the target protein that the chance of selection for either metabolic or target-site cross-resistance is reduced compared to closely related insecticidal agents. As the cross-resistance potential between sub-groups is higher than that between different groups, consecutive rotation of sub-groups should be avoided (IRAC 2020). Label recommendation for Resistance Management is for only one application of Kanemite Miticide per season.

8.3 Recommendations

Trial data support that Kanemite Miticide will provide acceptable control against two-spotted spider mites in pome and stone fruit orchards when used as directed. Acceptable crop safety is expected when the product is used as directed. The directions for use are appropriate and consistent with miticide use in commercial agriculture in Australia.

There are no objections on efficacy or target-crop safety grounds to the registration of the product Kanemite Miticide containing 156 g/L acequinocyl.

9 LABELLING REQUIREMENTS

KEEP OUT OF REACH OF CHILDREN
READ SAFETY DIRECTIONS BEFORE OPENING OR USING

Kanemite® Miticide

ACTIVE CONSTITUENT: 156 g/L ACEQUINOCYL

GROUP 20B INSECTICIDE

For the control of Two-spotted Mite in Pome Fruit and Stone Fruit, as indicated in the Directions for Use Table

Contents: 1L, 5L, 10 L

Arysta LifeScience Australia Pty Ltd

Level 3, 70 Hindmarsh Square Adelaide SA 5000

Tel: (08) 8112 0900 Fax: (08) 8112 0999

DIRECTIONS FOR USE

RESTRAINTS

DO NOT use if rainfall is expected before spray has dried as reduced efficacy may result.
DO NOT apply if heavy rains or storms are forecast within 3 days.
DO NOT irrigate to the point of runoff for at least 3 days after application.

SPRAY DRIFT RESTRAINTS

Specific definitions for terms used in this section of the label can be found at apvma.gov.au/spraydrift.

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 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 three and 20* kilometres per hour at the application site during the time of application.

DO NOT apply by aircraft.

DO NOT apply by a boom sprayer.

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 two hours before sunset and persist until one to two hours after sunrise.

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 ‘Mandatory buffer zones’ section of the following table titled ‘Buffer zones for vertical sprayers’) are observed.

Buffer zones for vertical sprayers

Type of target canopy and dilute water rate	Mandatory downwind buffer zones for:	
	Natural aquatic areas	Livestock areas
2 metres tall and smaller, maximum dilute water rate of 1500 L/ha	45 metres	Not required
taller than 2 metres (not fully-foliated), maximum dilute water rate of 1500 L/ha	85 metres	10 metres

taller than 2 metres (fully-foliated), maximum dilute water rate of 1500 L/ha	80 metres		Not required

Crop	Pest	Rate	WHP	Critical Comments
Pome fruit (Apples & Pears) Stone fruit (including Nectarines, Peaches, Plums, Apricots & Cherries)	Two-spotted mite (*Tetranychus urticae*)	Dilute spraying 170 mL/ 100 L (26.5 g ai/100 L)	Harvest: 14 days	*Kanemite should be applied to the point of run-off as soon as mites appear.* *Equipment should be calibrated so that no less than 1000 L of water is applied per hectare.* *Complete coverage of all foliage is essential.* *Only one application should be made per season.*

NOT TO BE USED FOR ANY PURPOSE, OR IN ANY MANNER, CONTRARY TO THIS LABEL UNLESS AUTHORISED UNDER APPROPRIATE LEGISLATION

WITHHOLDING PERIOD:

POME FRUIT: DO NOT HARVEST FOR 14 DAYS AFTER APPLICATION

STONE FRUIT: DO NOT HARVEST FOR 14 DAYS AFTER APPLICATION

GRAZING: DO NOT graze any treated area or cut for stockfood

Export of treated produce: MRLS or import tolerances for Acequinocyl may not be established in all markets. If you are using Kanemite Miticide on pome and stone fruit for export, please check with Arysta LifeScience Australia Pty Ltd for the latest information.

Export trade advice – treated crops: Treated crop commodities destined for export may require extra time between application and harvest to be accepted in some export markets. Before you use this product, you are advised to contact Arysta LifeScience Australia Pty Ltd and/or your industry body about any potential trade issues and their management.

Export trade advice—livestock: Consumption by livestock of any materials previously treated with this product may produce residues in the animal that might not be acceptable in some export markets. Before you use this product, you are advised to contact Arysta LifeScience Australia Pty Ltd and/or the relevant livestock industry body about any potential trade issues and their management. You should also be prepared to inform other livestock producers who intend using the material as stockfeed of its chemical exposure history.

GENERAL INSTRUCTIONS:

Kanemite Miticide is a selective miticide for the control of Two-spotted Mite in Pome Fruit and Stone Fruit. When applied to the foliage as directed, Kanemite Miticide provides knockdown through contact activity and good residual control.

Due to its unique chemistry, mode of action and selective nature, Kanemite is relatively inactive against beneficial/predaceous mites and insects and therefore is compatible with IPM and resistance management programs.

Crop Monitoring:
Effective control depends upon regular crop monitoring. Check trees regularly (every 3-5 days) during the season.

Mixing Instructions:
Measure the required amount of Kanemite, add to partly filled spray tank under agitation, and then add the remainder of the water.

Use a sprayer designed to apply high volumes of spray solution up to the point of run-off and matched to the crop being sprayed. Set up and operate the sprayer to achieve even coverage throughout the crop canopy. Apply sufficient spray solution (Kanemite + water) to cover the crop to the point of run-off. Avoid excessive run-off. The required amount of spray solution (Kanemite + water) will change as the crop grows. The required water volume may be determined by applying different test volumes, using different settings on the sprayer, from industry guidelines or expert advice.

It is recommended that solutions of Kanemite mixed with water be used promptly, to prevent degradation of the product.

Application:
This product is a contact miticide and therefore it is important to achieve complete coverage of the crop to ensure mite control.

Resistance Management:
Pome & stone fruit: Only one application should be applied per season.

Insecticide Resistance Warning:

GROUP 20B INSECTICIDE

For insecticide resistance management Kanemite® Miticide is a Group 20B insecticide. Some naturally occurring insect biotypes resistant to Kanemite Miticide and other Group 20B insecticides may exist through normal genetic variability in any insect population. The resistant individuals can eventually dominate the insect population if Kanemite Miticide or other Group 20B insecticides are used repeatedly. The effectiveness of Kanemite Miticide on resistant individuals could be significantly reduced. Since occurrence of resistant individuals is difficult to detect prior to use, Arysta LifeScience Australia Pty Ltd accepts no liability for any losses that may result from the failure of Kanemite Miticide to control resistant insects.

PRECAUTION:

Re-entry Period:

Do not allow entry into treated areas until spray has dried. If prior entry is necessary wear cotton overalls buttoned to the neck and wrist (or equivalent clothing). Clothing must be laundered after each day's use.

PROTECTION OF HONEY BEES AND OTHER INSECT POLLINATORS

Harmful to bees. DO NOT apply to crops from the onset of flowering until flowering is complete. Before spraying, notify beekeepers to move hives to a safe location with an untreated source of nectar and pollen, if there is potential for managed hives to be affected by the spray.

PROTECTION OF WILDLIFE, FISH, CRUSTACEANS AND ENVIRONMENT

Very toxic to aquatic life. DO NOT contaminate wetlands or watercourses with this product or used containers.

STORAGE AND DISPOSAL

1L containers: Store in the closed, original container in a dry, cool, well-ventilated area out of direct sunlight. Triple-rinse containers before disposal. Add rinsings to spray tank. Do not dispose of undiluted chemicals on site. If recycling, replace cap and return clean containers to recycler or designated collection point.
If not recycling, break, crush or puncture and deliver empty packaging to an approved waste management facility. If an approved waste management facility is not available, bury the empty packaging 500 mm below the surface in a disposal pit specifically marked and set up for this purpose, clear of waterways, desirable vegetation and tree roots, in compliance with relevant local, state or territory government regulations. Do not burn empty containers or product.

5L and 10 L containers: Store in the closed, original container in a dry, cool, well-ventilated area out of direct sunlight. This container can be recycled if it is clean, dry, free of visible residues and has the drumMUSTER logo visible. Tripe-rinse container for disposal. Dispose of rinsate by adding it to the spray tank. Do not dispose of undiluted chemical on site. Wash outside of the container and the cap. Store cleaned container in a sheltered place with cap removed. It will then be acceptable for recycling at any drumMUSTER collection or similar container management program site. The cap should not be replaced, but may be taken separately.

SAFETY DIRECTIONS

May irritate eyes. Avoid contact with eyes. When opening the container, preparing spray and using the prepared spray, 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.

FIRST AID

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

MATERIAL SAFETY DATA SHEET

Additional information is listed in the Material Safety Data Sheet.

Conditions of Sale:

Arysta LifeScience Australia Pty Ltd will not accept any responsibility whatsoever and howsoever arising and whether for consequential loss or otherwise in connection with the supply or use of these goods other than responsibility for the merchantable quality of the goods and such responsibilities mandatorily imposed by Statutes applicable to the sale or supply of these goods. To the extent allowed by such Statutes the liability of Arysta LifeScience Australia Pty Ltd is limited to the replacement of the goods or (at the option of Arysta LifeScience Australia Pty Ltd) the refund of the price paid and is conditional upon a claim being made in writing and where possible sufficient part of the goods to enable proper examination being returned to Arysta LifeScience Australia Pty Ltd within thirty days of delivery.

UN No. 3082	**ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.** **(CONTAINS ACEQUINOCYL)** **MARINE POLLUTANT**
In an Emergency Dial **000** Police or Fire Brigade	SPECIALIST ADVICE IN EMERGENCY ONLY **1800 033 111** ALL HOURS – AUSTRALIA WIDE
P.G. III	**HAZCHEM**

(DG labelling: Class 9 diamond + Marine pollutant diamond)

®Kanemite is a registered trademark of Arysta LifeScience

BN

DOM

APVMA APPROVAL No. 88076/xxxxxx

24 Hour Emergency Response Service

Australia

1800 033 111

International

+61 3 9663 2130

ABBREVIATIONS

ac	active constituent
ADI	acceptable daily intake (for humans)
ai	active ingredient
ARfD	acute reference dose
APTT	Activated Partial Thromboplastin Time (a functional measure of the time taken for clotting to occur)
bw	bodyweight
CODEX	Codex Alimentarius Commission
CXL	Codex Maximum Residue Limits
d	day
DAT	Days After Treatment
DT_{50}	Time taken for 50% of the concentration to dissipate
EA	Environment Australia
EC_{50}	concentration at which 50% of the test population are immobilised
E_rC_{50}	concentration at which the rate of growth of 50% of the test population is impacted
EDTA	Ethylenediaminetetraacetic acid
EI	Export Interval
EGI	Export Grazing Interval
ESI	Export Slaughter Interval
EU	European Union
F_0	original parent generation
g	gram
GAP	Good Agricultural Practice
h	hour
ha	hectare
HDPE	High density polyethylene

HPLC	High Pressure Liquid Chromatography *or* High Performance Liquid Chromatography
HR	Highest Residue
HR-P	Highest residue in a processed commodity
IPM	Integrated Pest Management
in utero	happening before birth
in vitro	outside the living body and in an artificial environment
in vivo	inside the living body of a plant or animal
ISO	International Organization for Standardization
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
kg	kilogram
K_{FOC}	Organic carbon normalized Freundlich adsorption coefficient
K_{OC}	Organic carbon partitioning coefficient
L	Litre
LC_{50}	concentration that kills 50% of the test population of organisms
LD_{50}	dosage of chemical that kills 50% of the test population of organisms
LOD	Limit of Detection—level at which residues can be detected
Log K_{OW}	Log to base 10 of octanol water partitioning co-efficient, synonym P_{OW}
LOQ	Limit of Quantitation—level at which residues can be quantified
mg	milligram
mL	millilitre
mol	Moles; amount of substance
mPA	megapascal
MRL	Maximum Residue Limit
MSDS	Material Safety Data Sheet
NEDI	National Estimated Daily Intake
NESTI	National Estimated Short Term Intake
ng	nanogram

nm	nanometre
NEDI	National Estimated Daily Intake
NESTI	National Estimated Short Term Intake
NOEC/NOEL	No Observable Effect Concentration/Level
NOAEL	No Observed Adverse Effect Level
OECD	Organisation for Economic Co-operation and Development
OC	Organic Carbon
OM	Organic Matter
Pa	Pascal
pH	Potential of hydrogen
PHI	Post-Harvest Interval
PK_A	Dissociation constant
P_{OW}	Octanol/water partition coefficient; See also Log K_{OW}
PPE	Personal Protective Equipment
ppm	parts per million
PT	Prothrombin Time (a blood test that measures how long it takes for blood to clot)
RAL	Regulatory Acceptable Level
s	second
SC	Suspension Concentrate
SD RAT	Spray Drift Risk Assessment Tool
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
STMR	Supervised trial median residue
TRR	Total radioactive residue
UF	Uncertainty Factor
µg	microgram
WHO	World Health Organization
WHP	Withholding Period

GLOSSARY

Active constituent	The substance that is primarily responsible for the effect produced by a chemical product
Acute	Having rapid onset and of short duration
Carcinogenicity	The ability to cause cancer
Chronic	Of long duration
Codex MRL	Internationally published standard maximum residue limit
Desorption	Removal of a material from or through a surface
Efficacy	Production of the desired effect
Formulation	A combination of both active and inactive constituents to form the end use product
Genotoxicity	The ability to damage genetic material
Geomean	Geometric mean or average which indicates the central tendency or typical value of a set of numbers by using the product of their values
Henry's law constant	A gas law that states that the amount of dissolved gas in a liquid is proportional to its partial pressure above the liquid
Hydrophobic	Repels water
IUPAC name	International Union of Pure and Applied Chemistry naming scheme for organic compounds
Leaching	Removal of a compound by use of a solvent
Metabolism	The chemical processes that maintain living organisms
Photodegradation	Breakdown of chemicals due to the action of light
Photolysis	Breakdown of chemicals due to the action of light
Subcutaneous	Under the skin
Toxicokinetics	The study of the movement of toxins through the body
Toxicology	The study of the nature and effects of poisons

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