Australian Government
Australian Quarantine and Inspection Service

Pesticide risk profile for the feeding of grape pomace/marc to cattle and sheep

Dugald MacLachlan
Chemical Residues
Residues and Food Safety
AQIS
July 2003
January 2006
Last reviewed: June 2020

Disclaimer

The views expressed in this publication are not necessarily the views of the Commonwealth. This publication is made available on the understanding that the Commonwealth is not thereby engaged in rendering professional advice. Before relying on material in this publication, users should independently verify the accuracy, currency, completeness and relevance of the information for their purposes and obtain any appropriate professional advice. References to non-Commonwealth organisations do not constitute endorsement by the Commonwealth of those organisations or any associated product or service.

The Australian Government Department of Agriculture, Fisheries and Forestry seek to publish its work to the highest professional standards. However, it cannot accept responsibility for any consequences arising from the use of information herein. Readers should rely on their own skills and use their own judgement in responding to or applying any information for analysis to particular issues or circumstances.

Acknowledgements

The cooperation of Croplife and its members as well as the comments of members of the SAFEMEAT Stock feed Working Group are gratefully acknowledged. The Chemistry and Residue Evaluation Section of the APVMA deserves special thanks for their efforts in tracing data and reviewing the assessments.

Abbreviations

ai	active ingredient
APVMA	Australian Pesticide and Veterinary Medicines Authority
bw	body weight
DM	dry matter
ECRP	Existing Chemical Review Program
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
g	gram
GAP	good agricultural practice
ha	hectare
HAFT	Highest average field trial
JMPR	Joint Meeting on Pesticide Residues
kg	kilogram
LOD	Limit of detection for the analytical method, sometimes also used for limit of determination which is the same as LOQ
LOQ	limit of analytical quantitation
mbyp	meat by products
mg	milligram = 0.001 grams
MRL	maximum residue limit
N	Negligible residue (when next to US MRL)
PAFC	primary animal feed commodity
PHI	pre-harvest interval
P_{ow}	octanol water partition coefficient
ppm	parts per million = mg/kg
PSD	Pesticide Safety Directorate
TF	transfer factor = concentration in animal tissue or milk divided by concentration in feed
TRR	total radioactive residue
US EPA	United States of America Environmental Protection Agency
WHP	withholding period
*	before MRL indicates that the residue is at or about the LOQ, *i.e.* should be less than the LOQ.

Table of contents

Potential for violative residues in cattle and sheep fed grape pomace/marc

For by-products to be useful as animal feeds, they must not present safety or health problems to the animals nor present a risk of contaminating the animal product to be sold. In the production and utilization of by-products, all parties must take care to prevent contamination with pesticides, mycotoxins, and other materials that could be dangerous to the animals or contaminate the animal product.

A relatively abundant potential source of animal feed in Australia is grape pomace and marc. The following details the potential risk that the feeding of such waste to animals poses to Australian export trade in red meat.

The juice of the grapes is fermented into wine. After the juice has been pressed out of the berries, the residue - grape pomace or winery pomace - is about 10% by weight of the total grape input. If the grapes are stripped from the stalks before processing, the residue consists of about 40% seeds and 60% skin and pulp. Winery waste pressed with the stalks is composed of about 30% stalks, 30% seeds and 40% skin and pulp.

It is reported to be easy to make silage of winery pomace as the initial acidity is already high. The pomace may also be separated into skin and seeds by loosening the pulp from the seeds in a breaker, after which a vibrating sieve separates the seed from the skin. Both fractions can be dried; the marc (skin and pulp) can be ground in a mill and bagged; and the dried seeds are removed from the dust and stored in silos.

The seeds contain 8-22% edible oil and can be either pressed or extracted with solvents. The seed oilcake has no feed value as it is not only too fibrous but also contains tannic acid; however, it has been used overseas as a carrier for molasses in cattle feed.

Overseas, winery pomace from stalked grapes has been reported to be fed to dairy cows in amounts up to 6.5 kg a day and is often supplemented with concentrates and legume hay. At this level of inclusion the milk yield tends to drop and the butterfat content increases. Larger amounts cause inflammation of the mucosa in the digestive system. Grape marc has a lower fibre content than pomace. Digestibility is reported to be increased by soaking the marc in hot (90 °C) water for about twenty minutes to remove the tartrates.

Chemical residues in animal feeds may be transferred to the tissues of livestock on feeding. While it is unlikely that the chemical residues present in meat and offal arising from feeding feeds represent a concern regarding food safety they can result in disruption to trade where the relevant Australian and overseas market standards differ.

The observation of chemical product withholding periods does not guarantee that the chemical residues in the feed are such that when fed to livestock, the residues in meat and offal will meet export market requirements.

The aim of the current report is to profile the risk of violative residues in export meat and edible offal posed by the presence of pesticide residues in grape pomace/marc fed to cattle and sheep.

Assessment of currently registered chemicals that may be used on grape crops

Estimates of residues in livestock tissues and milk are usually made on the basis of the propensity of a chemical to transfer to tissues and milk combined with anticipated animal dietary exposure. Most experiments in the area of transfer of pesticide residues to animal tissues and milk following ingestion have been designed based on the requirements of regulators. The relevant studies required are livestock metabolism studies (lactating goat or dairy cow) and animal transfer (feeding) studies.

The feeding studies are used to determine transfer factors (TF) that are defined as the ratio of the pesticide residue in the tissue or commodity of interest (fat, muscle, liver, kidney or milk) to the residue in the diet (expressed on a dry matter intake basis).

In utilizing transfer factors derived from feeding or metabolism studies for risk assessment management purposes, the user needs to be aware of the limitations and assumptions used. The TF derived is dependent on the duration of the feeding or dosing, the concentration in the feed or dose level, the nature of the feed (if added to the feed), lactational status, bodyweight, age, sex and breed of the animal studied. For chemicals administered as a mixture, the presence of other chemicals may alter the metabolism and/or rate of excretion by induction of the various routes of decontamination. The duration of a feeding study required for the steady state concentration to be reached in tissue or milk is a function of the elimination half-life. Residue definitions set by different regulators are not always the same and residue definition is a factor that should also be taken into account when utilizing TF for managing residue risks and trade. Care must be taken in extrapolating TFs from goat metabolism studies to all ruminants as is demonstrated by endosulfan, for which the residue definition is the sum of α-endosulfan, β-endosulfan and endosulfan sulphate, where only low levels of residues are found in goats but significant transfer to tissues occurs for cattle[1,2].

The transfer factors utilised here were calculated from residues reported in the scientific literature using the highest individual animal tissue divided by the nominal feed level. If the highest residue was not reported the average residue divided by the nominal feed level were used instead. In the case of milk the average residue was divided by the nominal feed level.

For the purposes of profiling risk conservative estimates of animal dietary burden (intake) are required. The APVMA "*Stockfeed Guideline Document 1 Primary Feed Commodities As A Proportion of Livestock Diets"* (Version 1.1 March 2002)[3] lists the maximum proportion of grape pomace included in animal feed as 20% and however, 30% was used in the current evaluation. Estimates of residues in grape pomace were obtained from scaling of literature studies, MRLs or based on conservative assumptions. The dietary burden is then the residue in crop × maximum proportion in the diet. To overcome errors that may result from differences in moisture contents of feed items it is accepted practice to calculate dietary burdens for a ration on a dry matter basis. Wet grape marc is reported to typically contain 50% dry matter[4] and this was used where necessary to correct the dietary intakes.

---

[1] Indraningsih, McSweeney, C.S. & Ladds, P.W. (1993) Residues of endosulfan in the tissues of lactating goats. *Aust. Vet. J.,* **70**, 59-62.

[2] Reregistration Eligibility Decision for Endosulfan Case No. 0014 EPA 738-R-02-013 November 2002 Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division. http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg)

[3] http://www.apvma.gov.au/residues/Stockfeed_Guideline_1.pdf

[4] DPI NSW Agnote DAI-21, Alternative roughage feeds (2 December 2002) sixth edition.

The estimated residue in animal commodities is:
Residue = TF × dietary burden [ppm DM basis]

Unless stated otherwise, the following assumptions have been used in the risk assessment:

- The grapes are harvested at maturity and that the pomace/marc is derived on processing.
- The crop has been treated at the maximum rate and with the shortest interval between application and harvest permitted by the product label[5]
- The maximum rate of incorporation in the ration/diet is 30%.
- That residue transfer for cattle is greater than for sheep and therefore that the assessment of residues in cattle also covers sheep.

The potential for violative residues in animals is assessed against the Australian, Codex and US tolerances as listed in February 2010[6]. Other markets may have different standards however, for the bulk of Australian meat exports it is assumed that if the lower of these tolerances (or the LOQ of the analytical method if no Codex or US tolerance exists) can be met, the feeding of grape pomace/marc will not pose an unacceptable risk.

Appendix 1 provides the details of a risk assessment for each of the compounds registered in Australia for use on grapes.

Most of the compounds registered for use on apples also have registrations in other crops that are major animal feed commodities. Indeed, for most compounds listed in appendix 1 the major route of exposure for animals to the chemical is expected to be through feeding of these other crops (*e.g.* pasture, cereal waste etc).

The conclusion of the analysis is the risk of residue violations in meat and edible offal posed by the feeding of grape pomace/marc derived from grapes treated with currently registered products is low for the majority of chemicals. Based on the available information, the following pesticides are identified as requiring further investigation and/or the development of additional risk management strategies:

Pesticide	Tissue	Residue (mg/kg)		Decline information located	
		Estimated[1]	Target[2]	Crop	Animal
Dicofol	Fat	0.75	0.01	Yes but no decline	No
Fenhexamid	Liver	0.56	0.05	Yes	No
Quinoxyfen	Fat	0.135	0.01	Yes	No

[1]residue in tissue estimated using assumptions outlined above
[2]target residue = lowest of Australian, Codex and US MRL or in absence of these the LOQ (often assumed to be 0.01 mg/kg)

Adequate data were not located to enable an assessment to be made for the following compounds: iprodione, procymidone, prothiofos and pyridaben.

[5] In general, only one or two product labels were selected per pesticide. There is a possibility that the maximum permitted rate may be higher than identified.
[6] MRLs and approved use patterns change with time. The assessments include the most recent decisions of the Codex Alimentarius Commission (32nd Session, July 2009) with regard to Codex MRLs, US tolerances as listed in the Code of Federal Regulations at February 2010 and MRLs as they appear in Table 1 of the APVMA *MRL Standard* as at February 2010.

The current assessment has only identified pesticides of concern and not considered industry based QA programs that address the potential for residues in animal feeds to transfer to animals and mitigate risks; The National Vendor Declaration (NVD) form for traded livestock and the Commodity Vendor Declaration (CVD) and By-product Vendor Declaration (BVD) forms which are used for traded livestock feedstuffs.

Appendix 1

2,2-DPA (2,2-dichloropropionic acid also known as dalapon)
- is a systemic herbicide used for the control of annual and perennial grasses and rushes. It is registered on a variety of crops including potential animal feeds sunflower, maize, soybean and pastures. The application rates are 1.5-3.7 kg ai/ha for the crops mentioned above and up to 7.4 kg ai/ha for grape vines. Application to grapes is to vines at least 4 years old with no more than 7.4 kg ai/ha/year. Apply as an application between rows. No harvest WHP is required.
All crops have the following grazing restraint:
DO NOT graze or cut for stock food for 6 weeks after application

There are no Codex or USA MRLs for 2,2-DPA in animal tissues. The critical Australian MRL is 0.2 mg/kg for meat (mammalian) and *0.1 mg/kg for milks. Significant residues are not expected in grapes at harvest, the relevant MRL is *0.1 mg/kg. Dalapon and all of its known breakdown products dissolve easily in water. They are readily washed from cells and tissues. Because dalapon is insoluble in organic solvents and lipids, it does not build up in animal tissues[7,8].

Note: the US EPA revoked tolerance for grapes was 3 ppm. Utilising the US EPA revoked tolerances a conservative TF of 0.01 is estimated for meat and offal and 0.006 for milk. Assuming residues occur at the US revoked tolerance for grapes, anticipated maximum residues in tissues are $0.3 \times 3 \times 0.01 = 0.009$ mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Amitrole
-is a herbicide used to control weeds in a variety of situations. The application rate for grapes is 0.275 kg ai/ha as a directed spray.
Do not apply later than 56 days before harvest

There are Australian but no Codex or US MRLs for amitrole in animal commodities. The Australian MRLs, including milk, have all been set at *0.01 mg/kg. The Australian MRL for grapes is *0.01 mg/kg.

The JMPR have stated[9] that "*There do not appear to be any grounds for assuming that livestock grazing on plant materials growing on land that had been treated with amitrole for the control of weeds would absorb or retain significant amounts of amitrole or its metabolites*".

It is anticipated that animal product residues will be below typical method LOQs.

Azinphos-methyl
- is an acaricide used for the control of codling moth, scale, beetles and aphids in grapes. The application rate is up to 49 g ai/hL.
The harvest WHP is 14 days.

---

[7] Kuhnert M, Freytag B, Freytag HH, Fuchs V. (1992) [The tolerance and residue accumulation of sodium-2,2-dichloropropionate (Dalapon) administered over 90 days to dairy cows] *Dtsch Tierarztl Wochenschr*. 99 (4), 148-51. German.
[8] Fertig, S. N.; Schreiber, M. M. (1961). Effects Of Herbicide Ingestion. Effect of dalapon ingestion on performance of dairy cattle and levels of residue in the milk. *J. Ag. Food Chem*. 9:369
[9] 1974 JMPR. Evaluations of some pesticide residues in food. FAO/AGP/1974/M/11; WHO Pesticide Residues Series No. 4, 1975

There are Australian but no Codex or US MRLs for azinphos-methyl in animal tissues. The Australian MRLs have all been set at *0.05 mg/kg (meat, edible offal, milk). The Australian MRL for grapes is 2 mg/kg. The JMPR report that residues in grape marc are reduced from those in the grapes.

Residues in the tissues and milk of cattle fed at levels ranging from 11 to 77 ppm in the diet for 28 days were all <0.01 mg/kg[10].

It is anticipated that animal product residues will be below typical method LOQs.

Azoxystrobin
-is a strobulurin fungicide used for control of powdery mildew, downy mildew and bunch rot on grapes. Application is at 25 g ai/hL.
The harvest WHP is 14 days

There are Australian and US but no Codex MRLs for animal commodities. The Australian MRLs for animal tissues have been set at *0.01 mg/kg while the milk MRL is 0.005 mg/kg. The US MRLs for animal commodities are set at 0.03, 0.01 and 0.07 mg/kg for cattle fat, meat and meat by-products respectively and 0.006 mg/kg for milk. An Australian MRL has been set for grapes at 2 mg/kg and grape pomace dry at 15 ppm. The US MRL for grapes is 1 mg/kg.

Residues in tissues of lactating cows were ≤0.01 mg/kg after feeding at levels up to 25 ppm in the diet for 28 days[11].

It is anticipated that animal product residues will be below typical method LOQs.

Benalaxyl
- is a phenylamide fungicide used for the control of downy mildew and various other fungal diseases.

There are no Australian, Codex or US MRLs for benalaxyl in animal commodities. Benalaxyl is not registered in the US. There are EU MRLs for animal tissues, all set at *0.5 mg/kg. The Australian MRL for grapes is 0.5 mg/kg.

The JMPR reported that ^{14}C residues in tissues of goats dosed at the equivalent of 50 ppm in the diet for 7 days with ^{14}C-benalaxyl were <0.1 mg equiv./kg in muscle, 0.4 mg equiv./kg in kidney and 1 mg equiv./kg in liver[12]. At the likely exposure from feeding grape pomace to animals there is no reasonable expectation of residues above likely LOQs of enforcement analytical methods.

It is anticipated that animal product residues will be below typical method LOQs.

Bifenthrin

[10] Interim Reregistration Eligibility Decision for Azinphos-Methyl Case No. 0235 Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division.
http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg
[11] APVMA Animal Residue Data Sheet – Azoxystrobin (October 2002)
http://www.apvma.gov.au/residues/stockfeed.shtml
[12] 1986 JMPR Pesticide Residues in Food - 1986 Evaluations, Part I Residues FAO Plant Production and Protection Paper 78. FAO and WHO 1986

- is a synthetic pyrethroid insecticide used for the control of various insects in crops. It is registered on grapes for control of fig longicorn. The application rate is up to 100 g ai/hL at late dormancy after pruning but before bud burst. Bifenthrin residues decline with typical half-lives of 26 and 7 days for soil and foliage respectively.
No harvest WHP required

There are Australian, Codex and USA MRLs for bifenthrin in animal tissues. The relevant MRLs for cattle fat are 2, 0.5 and 1 mg/kg for Australia, Codex and the USA respectively. The MRLs for milk are 0.5 mg/kg, *0.05 mg/kg (cattle milk) and 1 mg/kg (milk fat, 0.1 mg/kg for whole milk). The Australian MRL for grapes is *0.01 mg/kg. There are also MRLs for fodder and forage of pulses at 1 and 5 ppm respectively.

It is anticipated that animal product residues will be below typical method LOQs.

Boscalid
-is an oxathiin fungicide used for control of bunch rot in grapevines. Application is at up to 60 g ai/100L.
The harvest WHP is 28 days.
DO NOT treat vineyards that will or may be grazed by livestock.
ESI: DO NOT feed treated produce to livestock for 7 days before slaughter.

Codex MRLs for boscalid (recommended 2009) are meat (fat) 0.7 mg/kg, edible offal 0.2 mg/gk and milks 0.1 mg/kg (milk fat 2 mg/kg). The Australian MRLs are 0.05 mg/kg for edible offal mammalian, 0.1 mg/kg for meat [mammalian][in the fat] and *0.02 mg/kg for milks. The US MRLs are 0.35 mg/kg for meat by-products, 0.3 mg/kg for fat and 0.1 mg/kg for milk (residue definition boscalid + glucuronide conjugate). The MRL for grapes is 4 mg/kg, dried grapes 15 mg/kg and grape pomace (dry) 25 ppm.

In a cow transfer study, fourteen dairy cows were fed 0, 0.05, 0.164 and 0.655 mg/kg bw of boscalid once daily for 28 days[13]. The highest residues of boscalid were noted to be present in the cream, kidney, fat and liver of cows dosed at 0.655 mg/kg bw at levels of 0.381, 0.318, 0.292 and 0.182 mg/kg respectively. Residues of 0.096 mg/kg were detected in whole milk on day 18 of the study. No residues were detected in skim milk. Residues of 0.058 mg/kg were detected in the muscle of the cow after feeding for 28 days.

Depuration data were given for a single cow, sacrificed 7 days following dosing at 0.655 mg/kg bw in the feed. The data show that quantifiable residues were not detected in the milk, muscle, liver, kidney and fat of the cow. Boscalid is rapidly depleted from the cow after removing the animal from dosing for 7 days.

Health Canada[14] indicated the above dose rates (mg/kg bw) were equivalent to feeding at 1.8, 5.9 and 20 ppm in the diet giving rise to estimated transfer factors of 0.019 for cream, 0.016 for kidney, 0.015 for liver, 0.009 for fat and 0.003 for muscle. Feeding at 30% of the diet is expected to give rise to residues of boscalid of 0.3× 25 × 0.016 = 0.13 mg/kg in kidney and 0.3×25×0.009 = 0.07 mg/kg for fat.

Residues in cream would be 0.14 mg/kg and in whole milk 0.04 mg/kg.

[13] Public Release Summary on Evaluation of the new active BOSCALID in the product FILAN FUNGICIDE, Australian Pesticides and Veterinary Medicines Authority, April 2004, Canberra, Australia
[14] Health Canada, PMRA Regulatory Note REG2004-02 Boscalid/BAS 510, 30 January 2004

Livestock residues are not anticipated to exceed international and/or domestic market standards.

Buprofezin
is an insecticide used for the control of mealybugs in grapes. The application rate is 26.4 g ai/hL. The harvest WHP is 56 days for table grapes and not required for wine grapes (Do not use after 80% cap fall).
Do not allow livestock to graze grasses or weeds under treated trees

There are Australian, Codex and US MRLs for buprofezin in animal commodities. The Australian and Codex MRLs for edible offal and meat (fat) are all *0.05 mg/kg and for milk *0.01 mg/kg. The US MRL for cattle tissue are all set at 0.05 and milk is at 0.01 mg/kg . The Australian MRL for grapes is 0.3 mg/kg.

Residues of buprofezin were not detected in the tissues of cows following dosing at rates equivalent to feeding levels of 5, 15 and 50 ppm in the diet[15]. The method LOQ was 0.05 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Captan
- is a fungicide used for the control of various diseases in crops. It is registered on grapes for control of black spot, downy mildew, leaf blight etc. The application rate is up to 100 g ai/hL.
The harvest WHP is 7 days
Do not use treated produce for stock food within 7 days of treatment

There are Australian and USA but no Codex MRLs for captan in animal tissues. The relevant MRLs for edible offal and meat in Australia are *0.05 mg/kg and the US are set at 0.05 mg/kg. The Australian MRL for milk is *0.01 mg/kg. The Australian MRL for grapes is 10 mg/kg while the US MRL is 25 mg/kg. There is an Australian MRL for grape pomace (dry) at 10 ppm and dried grapes at 15 mg/kg.

JMPR has reported that feeding at rates of up to 100 ppm in the diet did not lead to detectable residues of captan in tissues or milk[16].

It is anticipated that animal product residues will be below typical method LOQs.

Carbaryl
- is a carbamate insecticide used for the control of various insects in crops. It is registered on grapes for control of heliothis, codling moth, blister mites etc. The application rate is up to 100 g ai/hL. The harvest WHP is 3 days.

Carbaryl residues decline with typical half-lives of 10 and 7 days for soil and foliage respectively.

There are Australian, Codex and USA MRLs for carbaryl in animal tissues. The Australian and Codex residue definition is carbaryl for both plant and animal commodities. The Australian MRLs for edible offal and meat are 0.2 mg/kg while that for milk is 0.05 mg/kg. The Codex MRL for

[15] 1999 JMPR - Pesticide Residues in Food - 1999 Evaluations, Part I Residues FAO Plant Production and Protection Paper 157. FAO and WHO 2000
[16] 2000 JMPR Pesticide Residues in Food - 2000 Evaluations – Part I, FAO Plant Production and Protection Paper 165. FAO 2001 http://www.fao.org/ag/AGP/AGPP/Pesticid/Default.htm

kidney is 3 mg/kg and liver 1 mg/kg while the MRL for meat is 0.05 mg/kg. The Codex milk MRL is 0.05 mg/kg. The Australian MRL for grapes is 5 mg/kg while the US one is 10 mg/kg.

The USA residue definition is the sum of carbaryl and 1-napthol expressed as carbaryl for plant commodities, the sum of carbaryl, 1-napthol, 5,6-dihydrodihydroxycarbaryl and 5,6-dihydrodihydroxynapthol expressed as carbaryl for animal tissues. The US tolerance for cattle kidney and liver is 1 mg/kg and that for milk 0.3 mg/kg.

No data was located for residues of carbaryl in grape pomace. However, it is considered unlikely that residues in pomace dried would exceed 100 ppm when prepared from grapes with maximum residues of 5 ppm (concentration factor of 20). The TF for kidney is 0.007 for the Australian/Codex residue definition and 0.012 for the US residue definition[17] giving rise to anticipated maximum residues in kidney from feeding grape pomace at 30% of the diet of 0.3×0.007×100 = 0.21 mg/kg and 0.3×0.012×100 = 0.36 mg/kg respectively for the Australian/Codex and USA residue definitions.
The TF for milk is 0.0002 for the Australian/Codex residue definition and 0.002 for the US residue definition giving rise to anticipated maximum residues in milk from feeding pomace at 30% of the diet of 0.3×0.0002×100 = 0.006 mg/kg and 0.3×0.002×100 = 0.06 mg/kg respectively for the Australian/Codex and USA residue definitions.

Livestock residues are not anticipated to exceed international and/or domestic market standards.

Carbendazim
- is a systemic fungicide used for the control of grey mould in grapes. It is registered at an application rate of 50 g ai/100L.
The harvest WHP is 1 day.

There are Australian and Codex but no USA MRLs for carbendazim. The relevant MRL for cattle meat is 0.2 mg/kg for Australia. MRLs for milk are all *0.1 to 0.1 mg/kg. There is an Australian MRL for grapes at 3 mg/kg.

In studies in which dairy cows were fed either carbendazim or benomyl at levels of 2, 10, or 50 ppm in the diet for 28 days, no carbendazim residues were found in samples of lean muscle, liver, kidney or fat although in the carbendazim feeding study low-level residues of 5-HBC were observed in the liver (0.01 mg/kg) and kidneys (0.06 mg/kg) of cows in the group receiving 50 ppm carbendazim[18]. However, residues of this compound were also apparent in a kidney sample in the control group. One week after the end of treatment with the test material no residues were detectable in any tissue sample.

It is anticipated that animal product residues will be below typical method LOQs.

Carfentrazone-ethyl
-is a herbicide used to control a variety of weeds in grapes. The application rate is 18 g ai/ha.
No WHP is required when used as directed.

[17] 2002 JMPR. Pesticide Residues in Food - 2002 Evaluations – Part I: Residues Volume 1, FAO Plant Production and Protection Paper 175/1. FAO and WHO 2003 http://www.fao.org/ag/AGP/AGPP/Pesticid/Default.htm
[18] 1998 JMPR - Pesticide Residues in Food - 1998 Evaluations, Part I Residues FAO Plant Production and Protection Paper 152/1. FAO and WHO 1999.

There are Australian and US but no Codex MRLs for animal commodities. The Australian MRLs have all been set at *0.05 mg/kg. The US MRLs are 0.1 for meat and meat by-products and 0.05 mg/kg for milk. The Australian MRL for grapes is *0.05 mg/kg.

The APVMA reported[19] feeding studies. Lactating cows were fed at levels equivalent to 1, 3 and 10 ppm in the diet for 28 consecutive days. No detectable residues (<0.005 ppm) of carfentrazone-ethyl, carfentrazone or F8426-propionic acid were found in any of the milk samples taken, except for low concentrations of carfentrazone (0.005 – 0.008 ppm) in three isolated samples from the 10 ppm dose group. No detectable residues (<0.01 ppm) of carfentrazone-ethyl, carfentrazone or F8426-propionic acid were found in any of the tissue or cream samples with the exception of kidney samples where trace amounts of carfentrazone (0.012 – 0.013 ppm) were found in samples from the 10 ppm dose group. There were no detectable residues of carfentrazone in kidney from cows fed clean feed for 7 days after dosing for 28 days, indicating that this residue was readily cleared from the kidney and excreted from the animal over a relatively short period of time.

It is anticipated that animal product residues will be below typical method LOQs.

Chlorantraniliprole
- is an insecticide. It is used on apples for the control of light brown apple moth and grapevine moth. The application rate is 3.15 g ai/hL.
The harvest WHP is 8 weeks.
Do not graze or cut for stock food.

There are Australian, Codex and US MRLs for chlorantraniliprole. The relevant Australian MRLs for meat (fat), edible offal and milk are all *0.01 mg/kg. The US MRLs are 0.3 mg/kg for fat and liver, 0.2 for cattle mbyp (=offal) except liver, 0.05 mg/kg for meat and milk. The Codex MRLs are all *0.01 mg/kg (meat (fat), offal and milk).

The Australian MRL for grapes is 0.3 mg/kg and for grape pomace (dry) 2 ppm.

The 2008 JMPR reported a feeding study where dairy cows were dosed with chlorantraniliprole for 28 days at the equivalent of 1, 3, 10 and 50 ppm in the diet. Average residues of chlorantraniliprole in milk for the 3 ppm dose group were < 0.01 (3) mg/kg. Chlorantraniliprole residues in liver and fat were higher than in other tissues. Average residues for tissues for the 3 ppm dosing level (3 animals per dose group) were all < 0.01 mg/kg for liver, fat, kidney and muscle. A transfer factor of <0.01/3 = <0.003 for fat when fed at 3 ppm in the diet was reported[20]. Applying this TF to the Australian MRL for pomace fed at 30% of the diet gives a fat residue of 0.003 mg/kg (0.3×3×0.003).
A transfer factor of 0.003 for milk when fed at 3 ppm in the diet was reported. Applying this TF to the Australian MRL for pomace fed at 30% of the diet gives a milk residue of 0.002 mg/kg (0.3×2×0.003).

It is anticipated that animal product residues will be below typical method LOQs.

Chlormequat chloride
-is a plant growth regulator applied around cap fall. The application rate is up to 30.8 g ai/hL.

[19] Public Release Summary on Evaluation of the new active CARFENTRAZONE-ETHYL in the product AFFINITY 400 DF HERBICIDE National Registration Authority for Agricultural and Veterinary Chemicals April 2000 Canberra Australia http://www.apvma.gov.au/publications/prscar.pdf)
[20] US EPA memorandum dated 12 February 1998, Chlorfenapyr - 129093: Health Effects Division Risk Characterization for Use of the Chemical Chlorfenapyr (Alert, EPA File Symbol 5905-GAI) in/on Citrus (6F04623). Case: 287132. Barcode: D221320 from George Kramer, Marion Copley, Susie Chun, Julianna Cruz to Ann Sibold/Marion Johnson, http://www.epa.gov/opprd001/chlorfenapyr/memohed2.pdf

No WHP is required when used as directed.

There are Australian and Codex but no US MRLs for animal tissues. The Australian MRLs are 0.5 mg/kg for edible offal and milks and 0.2 mg/kg for meat. The Codex MRLs are 0.5 mg/kg for kidney of cattle, goats, pigs and sheep and milk, 0.1 mg/kg for liver of cattle, goats, pigs and sheep and 0.2 mg/kg for meat of cattle pigs and sheep. The Australian MRL for grapes is 0.75 mg/kg.

Residues in tissues of dairy cows fed at 12 ppm in the diet for 28 days were <0.05 mg/kg for muscle and fat and 0.06-0.3 mg/kg for liver and kidney[21]. It is considered unlikely that residues of chlormequat in grape pomace/marc would exceed 2 ppm. Residues in whole milk were a maximum of 0.04 mg/kg for cows fed at the equivalent of 12 ppm in the diet.

It is anticipated that animal product residues will be below typical method LOQs.

Chlorothalonil
- is a systemic fungicide used for the control of downy mildew and black spot in grapes. It is registered at an application rate of 151 g ai/100L.
The harvest WHP is 7 (table) or 14 (wine) days.

There are Australian and US but no Codex MRLs for chlorothalonil. The Australian residue definition is the sum of chlorothalonil and 4-hydroxy-2,5,6-trichloroisophthalonitrile metabolite expressed as chlorothalonil. The Australian MRLs are 7 mg/kg for edible offal, 2 mg/kg for meat in the fat and 0.05 mg/kg for milk. The US residue definition for animal commodities is 4-hydroxy-2,5,6-trichloroisophthalonitrile. The relevant MRLs for cattle commodities are 0.1, 0.5, 0.05 and 0.03 mg/kg for fat, kidney, meat by-products (except kidney) and meat respectively and 0.1 mg/kg for milk. There is an Australian MRL for grapes at 10 mg/kg.

The TF for kidney (target tissue, US def) is 0.09[22]. Assuming residues of chlorothalonil do not concentrate in pomace or marc, anticipated residues in kidney would be 0.3×10×0.09 = 0.27 mg/kg if fed at 30% of the diet, below the US MRL. Other countries would be expected to utilise parent compound in any monitoring and no residues of parent compound are expected in animal tissues from feeding grape pomace.
The TF for milk (US def) is 0.03. Assuming residues of chlorothalonil do not concentrate in pomace or marc, anticipated residues in milk would be 0.3×10×0.03 = 0.09 mg/kg if fed at 30% of the diet, below the US MRL.

Chlorothalonil can contain up to 100 mg/kg hexachlorobenzene (HCB)[23], an application rate of 1.5 kg ai/ha corresponds to a potential application of HCB at 0.15 g/ha. Estimates of the potential for transfer of HCB residues are given below:
(a) Uptake from soil. Noting the half-life for HCB in soil is 3-6 years. Uptake of HCB by various crops was such that the ratio of soil to crop residues ranges from 0.03 – 2.4 for aerial parts. The contribution from previous years applications (assumed 12 years of additions 1 spray per year at the maximum rate = 0.15 g HCB/ha = 1.8 g HCB/ha), distributed in the top 20 cm soil with density 1

[21] 2000 JMPR. Pesticide Residues in Food - 2000 Evaluations – Part I, FAO Plant Production and Protection Paper 165. FAO and WHO 2001
[22] Pesticide Residues in Food - 1997 evaluations, FAO Plant Production and Protection Paper 146. FAO and WHO 1998 http://www.fao.org/ag/AGP/AGPP/Pesticid/Default.htm
[23] Australian Pesticides And Veterinary Medicines Authority, Minimum Compositional Standards (MCS) for Active Constituents as of 30 January 2004, http://www.apvma.gov.au/tgac/mincompstandards.pdf

g/mL would be 1800 mg/2000000 kg = 0.0009 ppm. Assuming a ratio of 0.1 for crop to soil, residues in aerial plant parts would account for no more than 0.00009 mg/kg.
The TF for fat and milk fat are assumed to be 8 and 8.4 respectively. Feeding grape marc with HCB residues of 0.00009 ppm at 30% of the diet would give rise to residues of 0.3×0.00009×8 = 0.00022 mg/kg in fat and 0.3×0.00009×8.4 = 0.00023 mg/kg in milk fat.
(b) Foliar residues. If assume chlorothalonil residues in fruit at day 0 from application of a pesticide at 1 kg ai/ha are 10 ppm and scale for application rate, HCB residues are expected to be 0.0015 ppm for grapes. Residues are expected to concentrate on producing grape marc and using an arbritary concentration factor of 10 would give a residue in marc of 0.015 ppm.
Residues in cattle fat and milk fat from feeding grape marc with residues of 0.015 ppm at 30% of the diet would be 0.3×0.015×8 = 0.036 mg/kg for fat and 0.3×0.015×8.4 = 0.038 mg/kg in milk fat.

Livestock residues are not anticipated to exceed international and/or domestic market standards.

Chlorpyrifos
- is an organophosphate insecticide used for the control of various insects in crops. It is registered on grapes for the control of light brown apple moth, grapevine moth and grapevine scale. The application rate is up to 25 g ai/hL.
The harvest WHP is 14 days.

The grazing WHP is 28 days. The label states that the Meat Research Corporation (MLA) determined that an Export Animal Feed Interval was not required.

There are Australian, Codex and USA MRLs for chlorpyrifos in animal tissues. The Australian and Codex residue definition is chlorpyrifos while the USA definition includes the metabolite TCP. The MRLs for cattle fat are T0.5, 1 and 0.3 mg/kg for Australia, Codex and the USA respectively. The MRLs for milk are T0.2 [milk in the fat] mg/kg, 0.02 mg/kg and 0.01 mg/kg (0.25 mg/kg for milk fat). There is an Australian MRL for grapes of T1 mg/kg. The US MRL for grapes is 0.01 mg/kg (regional tolerance).

The 2000 JMPR reported processing factors for grape pomace of 2.6 for production of white wine and 5.2 for red wine. The maximum transfer factor for feeding cattle at 10 ppm in the diet was 0.016 for cattle fat[24]. Residues from feeding grape pomace with residues of 5.2 ppm at 30% of the diet would be 0.3×5.2×0.016 = 0.02 mg/kg, below the Australian, Codex and USA MRLs for fat. Anticipated residues for milk would be 0.3×5.2×0.0007 = 0.001 mg/kg.

Livestock residues are not anticipated to exceed international and/or domestic market standards.

Clothianidin
- is an insecticide. It is used on apples for the control of long tailed mealybug. The application rate is 20 g ai/hL.
The harvest WHP is 6 weeks.

There are Australian and US but no Codex MRLs for clothianidin. The relevant Australian MRLs for meat (fat) and edible offal are *0.02 mg/kg and milk *0.01 mg/kg. The US MRLs are not set for for fat, mbyp (=offal) and meat and 0.01 mg/kg for milk. NOTE:, clothianidin is a major metabolite of thiamethoxam, and tolerances for the combined residues of thiamethoxam and its metabolite clothianidin have been established under 40 CFR part 180.565 for both plant and livestock commodities. US thiamethoxam tolerances in meat, offal and milk are 0.02, 0.04 and 0.02 mg/kg respectively.

[24] 2000 JMPR. Pesticide Residues in Food - 2000 Evaluations – Part I, FAO Plant Production and Protection Paper 165. FAO and WHO 2001 http://www.fao.org/ag/AGP/AGPP/Pesticid/Default.htm

The Australian MRL for grapes, excluding wine grapes, is 3 mg/kg and wine grapes *0.02 mg/kg.

At the highest dose level, 2.6 ppm feed, residues of clothianidin could be quantified in milk, ranging from < 0.01 ppm to 0.012 ppm. No quantifiable residues above the LOQ (0.01–0.02 ppm) of any analyte (TI-435, TZG, TZU and ATMG-pyruvate) were found in tissues.

It is anticipated that animal product residues will be below typical method LOQs.

Cyanamide
is a plant growth regulator used to regulate bud burst. It is applied at 2.6 kg ai/hL to dormant vines.

The Australian MRL for grapes is *0.05 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Cyprodinil
-is a fungicide that is used in grapes for the control of gray mould. The application rate is 30 g ai/hL.
The harvest WHP is 28 days

There are Australian and Codex but no US MRLs for cyprodinil in animal tissues. The Australian MRLs have all been set at *0.01 mg/kg. The Codex MRLs are *0.01 mg/kg for tissues and *0.0004 mg/kg for milk. The Australian grape MRL is 2 mg/kg. The US MRL for grapes is also 2 mg/kg. Residues in grape pomace (dry) are not expected to exceed 10 ppm. If fed at 30%, non-detectable residues would be expected in animal commodities and milk[25].

It is anticipated that animal product residues will be below typical method LOQs.

Diazinon
- is an organophosphate insecticide used for the control of various insects in crops. It is registered on grapes for the control of mealy bug and plague locust. The application rate is up to 52 g ai/hL. The harvest WHP is 14 days.
Do not harvest, graze or cut for stock food crops or pastures for 14 days after application

There are Australian, Codex and USA MRLs for diazinon in animal tissues. The MRLs for cattle fat are 0.7 mg/kg for Australia, 2 for Codex and 0.5 for the US. For milk the MRLs are 0.5 [in the fat], 0.02 F mg/kg and not specified. There is an Australian MRL for grapes at T2 mg/kg. The US MRL for grapes is 0.75 mg/kg (expire on 10/9/2010).

In a study reported by the 1993 JMPR residues of diazinon in dried grape pomace were 6× those of the grapes. The TF for diazinon in animal fat is 0.001[26]. Anticipated residues in cattle fat from feeding grape pomace at 30% of the diet are 0.3×12×0.001 = 0.004 mg/kg, below the relevant international MRLs. No residues were detected in milk of cows dosed at the equivalent of 120 ppm in the diet.

It is anticipated that animal product residues will be below typical method LOQs.

[25] 2004 JMPR. Pesticide Residues in Food - 2004 Evaluations – Part I, FAO Plant Production and Protection Paper (in press). FAO and WHO 2005
[26] 1996 JMPR - Pesticide Residues in Food - 1996 Evaluations, Part I: Residues FAO Plant Production and Protection Paper 142. FAO and WHO 1997

Dichlobenil
- is a selective herbicides used for the control of certain annual grasses and broad-leafed weeds in grapes. It is applied to grass/weeds in the orchard. The application rate is up to 6 kg ai/ha (band 2 m wide × 5 km).
No harvest WHP required.
Do not graze livestock on treated areas

There are no Australian, Codex or USA MRLs for dichlobenil in animal commodities. The Australian MRLs are 0.1 mg/kg for citrus fruit, pome fruit, stone fruit, grapes and tomatoes (US grape 0.15 mg/kg). No detectable residues are expected to result from the feeding of grape pomace (wet) to animals[27].

It is anticipated that animal product residues will be below typical method LOQs.

Dicofol
- is an organochlorine miticide used for the control of various pests in a variety of crops. In grapes it is used for the control of mites. The application rate is up to 36 g ai/hL.
The harvest WHP is 28 days.
Do not graze or cut for stock food.

There are no Australian or USA MRLs for animal commodities. The Australian and Codex residue definitions differ. The Australian residue definition is the sum of dicofol + 2,2,2-trichloro-1-(4-chlorophenyl)-1-(2-chlorophenyl)ethanol calculated as dicofol while the Codex residue definition for animal commodities is the sum of dicofol + 2,2-dichloro-1,1-bis(4-chlorophenyl)ethanol (p,p'-FW152) calculated as dicofol. There is a Codex MRL of 3 for cattle fat, 0.1 mg/kg for milk (F) and 1 mg/kg for cattle edible offal. The EU MRLs are 0.5 mg/kg for cattle and sheep meat, *0.05 mg/kg for cattle and sheep edible offal and 0.02 mg/kg for milk. There is an Australian MRL for grapes which has been set at 5 mg/kg (fruits other than strawberries). No data available at APVMA; adopted Codex MRL in 1986.

Residues in soil and foliage decline with typical half-lives of 16- 60 days and >6 months respectively.

The TF for fat for the Australian and Codex residue definitions are 0.05-0.1 for Australia and 0.3-0.5 for the Codex residue definition[28]. If it is assumed that residues do not concentrate in pomace the anticipated residues in fat are 0.3×5×0.5 = 0.75 mg/kg for the Codex and 0.3×5×0.1 = 0.15 for the Australian residue definition. Note it was assumed that pomace was fed at 30%. Residues above LOQ are expected if pomace derived from dicofol treated grapes is fed to animals.
Anticipated residues in milk (TFs 0.003-0.006 and 0.02-0.04 respectively.) are 0.3×5×0.04 = 0.06 mg/kg for the Codex and 0.3×5×0.006 = 0.009 for the Australian residue definition.

Dicofol can contain up to 1000 mg/kg DDT and related compounds[29], an application rate of 0.36 kg ai/ha (1000 L spray/ha) corresponds to a potential application of DDT at 0.36 g/ha. The TF for fat

[27] Reregistration Eligibility Decision Dichlobenil List A Case 0263, Environmental Protection Agency Office of Pesticide Programs, Special Review and Reregistration Division, EPA-738-R-98-003 October 1998
[28] Pesticide Residues in Food - 1994 Evaluations, Part I Residues FAO Plant Production and Protection Paper 78. FAO and WHO 1995
[29] Australian Pesticides And Veterinary Medicines Authority, Minimum Compositional Standards (MCS) for Active Constituents as of 30 January 2004, http://www.apvma.gov.au/tgac/mincompstandards.pdf

and milk fat are estimated to be 1.8 and 2.1 respectively. If residues DDT are present at the same ratio to dicofol as in the technical active ingredient and do not concentrate at more than 10× in marc, the anticipated residues are 0.3×5/1000×1.8 = 0.0027 mg/kg in subcutaneous fat and 0.3×5/1000×2.1 = 0.0031 mg/kg in milk fat.

Livestock residues (dicofol) may exceed international and/or domestic market standards.

Dimethoate
- is an organophosphate insecticide used for the control of various insects in crops. It is registered on grapes for the control of fruit fly. The application rate is up to 30 g ai/hL.
The harvest WHP is 7 days.

There are Australian, Codex and and USA MRLs for dimethoate in animal tissues. The Australian and Codex MRLs for animal commodities have been set at *0.05 mg/kg . The US MRLs for cattle meat byproducts and milk are set at 0.02 and 0.002 mg/kg. There are Australian MRLs of 5 mg/kg for fruits (includes grapes).
A metabolism study with lactating goats dosed orally with dimethoate at a rate equivalent to feeding at 30 ppm in the diet suggests that residues are not expected in animal tissues[30].

It is anticipated that animal product residues will be below typical method LOQs.

Dimethomorph
-is a fungicide. It is used on *grapevines* at application rates of 18 g ai/hL.
The harvest WHP is 4 weeks.

There are Australian but no Codex or US MRLs for dimethomorph in animal commodities. The Australian MRLs have all been set at *0.01 mg/kg. The Australian MRL for grapes is 2 mg/kg.

The UK PSD reported a feeding study[31]. Three groups of lactating dairy cows were administered dimethomorph (48/52 E/Z) orally, twice daily at feeding levels equivalent to 50, 150 or 500 mg/cow/day for 4-5 weeks. Residues of dimethomorph, VII (Z67), VIII (Z69) and XIII (CUR 7117) were all below 0.01, 0.02, 0.02 and 0.01 mg/kg respectively except for cow 14 from the highest dose group on day 45 of the study when residue levels were determined to be 0.03, 0.03 and 0.02 respectively for metabolites VII, VIII and XI.

It is anticipated that animal product residues will be below typical method LOQs.

Diquat
- is a herbicide used for the control of weeds in various crops. It is applied to grapes at an application rate of up to 0.3 kg ai/ha (30 g ai/hL).

The Australian and Codex MRLs for diquat in meat (mammalian) are the same at *0.05 mg/kg. The US MRL for meat is 0.05 mg/kg. The MRLs for milk are *0.01 mg/kg, *0.01 mg/kg and 0.02 mg/kg respectively. Residues in soil and foliage decline with typical half-lives of *ca.* 1000 and 30 days respectively. The MRL for grapes is *0.05 mg/kg. No residues were detected in tissues of

[30] 1998 JMPR - Pesticide Residues in Food - 1998 Evaluations, Part I Residues FAO Plant Production and Protection Paper 152/1. FAO and WHO 1999
[31] Evaluation of fully approved or provisionally approved products. Issue 99: Evaluation on dimethopmorph, April 1994, Department of Environment Food and Rural Affairs, Pesticide Safety Directorate. UK

cows fed diquat for 28 days at 100 ppm in the diet and slaughtered on the last day of dosing (LOD 0.01 mg/kg)[32]. Residues in pomace (dried) would be expected to be less than 100 ppm.

It is anticipated that animal product residues will be below typical method LOQs.

Dithianon
-is a fungicide that is used in grapes for the control of fungal black spot, downy mildew and cane and leaf spot. The application rate is 52.5 g ai/hL.
Do not harvest for 21 days after application

There are no Australian, US or Codex MRLs for dithianon in animal tissues. The Australian grape MRL is 2 mg/kg (fruits).

In a goat metabolism study the concentrations of radioactivity in milk, muscle and fat were less than 0.003 and 0.03 mg equiv./kg for animals dosed orally at *ca.* 3 and 30 ppm respectively in the feed for 5 days[33]. The levels in liver (0.02 and 0.17 mg equiv./kg) and kidneys (0.06 and 0.49 mg equiv./kg) were higher. No information was available on the proportion of the radioactivity that was due to dithianon *per se*.

Using the radioactive residues in fat as a basis for a TF, residues in fat are anticipated to be 0.3×2×0.001 = 0.0006 mg/kg if fed at 30% of the diet, less than likely LOQs of regulatory methods.

It is anticipated that animal product residues will be below typical method LOQs.

Diuron
- is a herbicide used for the control of weeds in crop. It is applied to bare ground in spring and autumn with an instruction to not allow spray or drift to contact fruit of grape foliage. The application rate is up to 1.75 -3.5 kg ai/ha.
No harvest or grazing WHP is required.

There are no Codex MRLs for diuron. The US and Australian residue definitions differ with the Australian definition including a metabolite in addition to the parent compound. The relevant US MRL for animal tissues is 1 mg/kg for cattle mbyp while the Australian MRL for edible offal of cattle is 3 mg/kg (the higher value probably reflecting the inclusion of the metabolite in the residue definition). The Australian MRL for milk is 0.1 mg/kg. Residues in soil and foliage decline with typical half-lives of 90 and 30 days respectively. Australia has a primary animal feed commodity MRL of 50 mg/kg while the MRL for grapes (fruits) is 0.5 mg/kg. The USA MRL for grapes is 0.5 mg/kg. It is considered unlikely that residues in pomace would exceed 10 ppm, much less than the Australian primary animal feed commodity MRL.

NOTE: US MRLs have been established for animal feed items (including alfalfa forage and hay at 2 ppm and citrus pulp dry at 4 ppm) as well as for animal commodities. If the US MRLs are used to estimate the dietary burden using the US EPA Guideline, a dietary burden of ca. 4.8 ppm is estimated. An anticipated TF is the 1 ppm (animal commodity tolerances) ÷ 4.8 ppm (dietary burden) = 0.2 (crude estimate). Using the estimated TF and the MRL, anticipated residues in tissues are 0.3×0.5×0.2 = 0.03 mg/kg.

[32] Reregistration Eligibility Decision, Diquat Dibromide, List A, Case 0288, EPA 738-R-95-016 July 1995 Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division. http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg
[33] Pesticide Residues in Food – 1992 evaluations. Part II. Toxicology. WHO, WHO/PCS/93.34, Geneva, 1993

It is anticipated that animal product residues will be below typical method LOQs.

Emamectin benzoate
- is a macrocyclic lactone insecticide used for the control of light brown apple moth and grapevine moth on grapes. The application rate is up to 0.66 g ai/hL.
Do not apply after bunch closure.
The harvest WHP is 8 weeks.
DO NOT graze or cut for treated areas stock food for 8 weeks after application.

There are Australian and US but no Codex MRLs for emamectin benzoate in animal tissues. The Australian MRLs are 0.01 mg/kg for edible offal, *0.002 mg/kg for meat and *0.0005 mg/kg for milk. The US residue definition is the sum of emamectin (MAB1a + MAB1b isomers) and the associated 8,9-Z isomers (8,9-ZB1a + 8,9-ZB1b). The USA MRL for fat is 0.01 mg/kg, meat 0.003 mg/kg, meat by-products (except liver) 0.02 mg/kg, liver 0.05 mg/kg and milk 0.003 mg/kg. The Australian grape MRL is *0.002 mg/kg.

A transfer factor of 0.3 for liver when fed at 0.1 ppm in the diet has been estimated[34]. Applying this TF to the MRL for grapes and feeding at 30% of the diet gives a liver residue of 0.0006 mg/kg (0.002×0.3). Grape marc produced from grapes treated with emamectin and fed to animals should not pose a threat to trade.
Anticipated residues in milk are (TF = 0.003) 0.002×0.003 = 0.000006 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Esfenvalerate
is a synthetic pyrethroid insecticide used to control garden weevil (permit) on grape vines. The application rate is 1.5 g ai/hL
The harvest WHP is 28 days.

There are Australian, Codex and USA MRLs for fenvalerate or esfenvalerate in animal tissues. The relevant MRLs for cattle fat are 1 (meat mammalian [in the fat]), 1 and 1.5 mg/kg for Australia, Codex and the USA respectively. The relevant MRLs for milk are 0.2 mg/kg, 0.1 F mg/kg and 0.3 mg/kg (7 mg/kg for milk fat) for Australia, Codex and the USA respectively. The Australian MRL for grapes is *0.05 mg/kg.

As significant residues are not expected on grapes and it is assumed no or only negligible residues will be present in derived pomace and marc, the risk of residues of esfenvalerate in animal tissues from feeding of pomace/marc is considered to be very low.

It is anticipated that animal product residues will be below typical method LOQs.

Ethephon
- is a plant growth regulator. It is applied to aid mechanical harvesting. The application rate is up to 91 g ai/hL.
The harvest WHP is 7 days

[34] APVMA Animal Residue Data Sheet – Emamectin, October 2002

The Codex and Australian MRLs for ethephon in edible offal *0.2 and 0.2 mg/kg, respectively. The Codex and Australian milk MRLs are *0.05 and 0.1 mg/kg. The US tolerance for offal is 1, meat and fat 0.02 and milk is 0.01 mg/kg. Residues in soil and foliage decline with typical half-lives of 10 and 5 days respectively. Australia has a primary animal feed commodity MRL of 10 mg/kg. The MRL for grapes is 10 mg/kg.

In a study where dairy cows were fed at up to 150 ppm in the diet for 28 days, residues in tissues were <0.1 mg/kg for muscle, <0.2 mg/kg for fat, liver and kidney and <0.12 mg/kg in milk[35].

It is anticipated that animal product residues will be below typical method LOQs.

Etoxazole

-is an oxazoline miticide used for control of two spotted mite on table grapes. The application rate is 3.85 g ai/hL.
The harvest WHP is 21 days.
Do not graze treated area or cut for stockfeed.

There are Australian and US but no Codex MRLs for etoxazole in animal commodities. The Australian MRLs are *0.01 mg/kg for edible offal and milks and *0.02 mg/kg for mammalian fat. The US MRLs are 0.02 mg/kg for cattle fat, 0.01 mg/kg for liver and milk fat. The MRL for grapes is 0.1 mg/kg and for grape pomace, dry 1 ppm.

The APVMA reported a study where dairy cattle were fed etoxazole for 28 consecutive days at rates equivalent to 1.2, 3.6 and 11.4 ppm in the diet[36]. Residues of etoxazole in milk were <LOQ/<LOD in all samples from the two lowest dose groups. The highest residue in milk from the high dose group was observed after 6 days dosing, indicating residues plateau quickly. Etoxazole showed a low potential for transfer to tissues with transfer factors in the range <0.004 to 0.013. Residues in the 1.2 ppm dose group were <0.005 mg/kg in muscle, milk, kidney and liver with a maximum residue in fat of 0.015 mg/kg.

Feeding grape pomace (dry) at 30% of the diet would give rise to anticipated maximum residues in fat (TF = 0.0125) of $0.3 \times 0.0125 \times 1 = 0.00375$ mg/kg, less than the limit of detection for this tissue. No residues are anticipated in other tissues.

It is anticipated that animal product residues will be below typical method LOQs.

Fenamiphos

is an organophosphate insecticide and nematicide. It is used on grapes for control of soil borne parasitic nematodes. Application is at 12 kg ai/ha in late September
No WHP required.

There is no US MRL for fenamiphos in animal tissues. The relevant Australian and Codex MRLs for fenamiphos in animal tissues are *0.05 and *0.01 mg/kg, respectively. The Australian and Codex MRLs for milk are *0.005 mg/kg. The Australian MRL for grapes is *0.05 mg/kg. In a dairy cattle feeding study, residues in tissues of cattle fed at the equivalent of 20 ppm in the diet were ≤0.01 mg/kg[37].

[35] 1994 JMPR - Pesticide Residues in Food - 1994 Evaluations, Part I Residues FAO Plant Production and Protection Paper 78. FAO and WHO 1995
[36] Public Release Summary on Evaluation of the new active ETOXAZOLE in the product Paramite Selective Miticide, APVMA May 2004, Canberra, Australia.
[37] 1999 JMPR - Pesticide Residues in Food - 1999 Evaluations, Part I Residues FAO Plant Production and Protection Paper 157. FAO and WHO 2000

It is anticipated that animal product residues will be below typical method LOQs.

Fenarimol

- is an fungicide used for the control of powdery mildew on grapes. The application rate is up to 2.4 g ai/hL

The harvest WHP is 14 days

There are Codex and US but no Australian MRLs for fenarimol in animal tissues. The Codex MRLs are 0.05 mg/kg for cattle liver and *0.02 mg/kg for cattle kidney and meat. The relevant USA MRLs for fenarimol in animal tissues are 0.01 mg/kg except meat by-products which is 0.05 mg/kg . The US MRL for grapes is 0.2 mg/kg and the MRL for grape pomace (wet and dry) is 2 ppm. The Australian MRL for grapes is 0.1 mg/kg. The JMPR PF for dry grape pomace is 15. Applying this PF to the Australian MRL gives an estimated maximum pomace residue of 0.1×15 = 1.5 ppm.

In a goat metabolism study where goats were dosed with fenarimol at the equivalent of 10 ppm in the diet for 5 days, no residues of fenarimol (parent compound) were detected in liver and kidney[38]. Radioactive residues in fat and muscle were 0.01-0.03 mg equiv/kg. Assuming inclusion at 30% of the diet, anticipated residues in fat would less than 0.001 mg/kg. The anticipated residue is less than likely regulatory method LOQs.

In a feeding study in cattle and pigs, animals were fed at levels up to 1 ppm. Residues in tissues only were below 0.01 mg/kg[39].

It is anticipated that animal product residues will be below typical method LOQs.

Fenhexamid

is a fungicide used to control bunch rot in grapes. Application is at 50 g ai/hL.

The harvest WHP is 21 days.

Do not allow livestock to graze vineyard for 14 days after application.

There are Australian and Codex but no US MRLs for fenhexamid in animal tissues. The Australian MRLs for animal commodities are 2, *0.05 and *0.01 for edible offal, meat (fat) and milk respectively. The Codex MRL for animal tissues is *0.05 while milk is *0.01 F mg/kg. The Australian MRL for grapes is 10 mg/kg and for grape pomace (wet weight basis) 50 ppm. The US MRL for grapes is 4 mg/kg, for raisins 6 mg/kg.

A goat metabolism of ^{14}C-fenhexamid in a lactating goat fed at a level equivalent to 133 ppm gave total radioactive residues (TRR) of 0.05-0.21 mg equiv./kg in milk (no free parent but 71% glucuronide conjugate), 4.7 mg equiv./kg in liver (54% parent compound), 3.3 mg equiv./kg in kidney, 0.04 mg equiv./kg in muscle, and 0.09 mg equiv./kg in fat. Based on the goat metabolism study and feeding pomace at a maximum of 30% in the diet the anticipated residues in fat would be 0.3×50×2×0.0007 = 0.02 mg/kg. Residues of fenhexamid in liver were 2.5 mg/kg giving a TF of 0.019. Anticipated residues in liver would be 0.3×50×2(to dry mass)×0.019 = 0.56 mg/kg.

[38] 1995 JMPR - Pesticide Residues in Food - 1995 Evaluations, Part I Residues FAO Plant Production and Protection Paper 137. FAO and WHO 1996

[39] 1995 JMPR - Pesticide Residues in Food - 1995 Evaluations, Part I Residues FAO Plant Production and Protection Paper 137. FAO and WHO 1996

Livestock residues may exceed international and/or domestic market standards.

Fenitrothion
-is an OP insecticide used to control plague locust in various crops. The application rate is up to 400 g ai/ha.
No harvest WHP required.

There are Australian and Codex but no US MRLs for fenitrothion in animal tissues. The relevant Australian and Codex MRLs for cattle fat are the same at *0.05 mg/kg. The Australian MRL for milks is *0.05 [in the fat] mg/kg and the Codex MRL is *0.01 mg/kg. The Australian MRL for grapes is 1 mg/kg (fruits).

Residues in tissues were <0.05 mg/kg in a 28 day lactating cow feeding study conducted at a feeding level equivalent to 100 ppm in the feed[40].

It is anticipated that animal product residues will be below typical method LOQs.

Fenthion
- is an organophosphate insecticide used for the control of various insects and nematodes. It is registered on grapes for the control of fruit fly. The application rate is up to 41.25 g ai/hL.
The harvest WHP is 7 days.

There are Australian and US (due to expire 1/4/06) but no Codex MRLs for fenthion in animal tissues. The relevant Australian and USA MRLs for fenthion in animal tissues are 1 mg/kg in Australia and 0.1 mg/kg in the US. The relevant milk MRLs are T0.2 and 0.01 mg/kg respectively. The Australian MRL for grapes is 2 mg/kg.

Residues in tissues of lactating dairy cows fed at a nominal feed level of 7.6 ppm were all <0.05 mg/kg[41]. The TF for milk is 0.002.

It is anticipated that animal product residues will be below typical method LOQs.

Fipronil
- is a phenylpyrazole insecticide. Application to wine *grapevines* is for control of fig longicorn and is at an application rate of 20 g ai/hL. The timing of application is to dormant vines prior to budburst.
WHP is not required when used as directed.
DO NOT feed trash or by-products resulting from treated grapevines to livestock.

The relevant Australian, Codex and US tolerances for fipronil in animal fat are 0.1, 0.5 (cattle meat in the fat) and 0.4 mg/kg respectively while the milk MRLs are 0.01, 0.02 mg/kg while the US MRL is 1.5 mg/kg for milk fat (representing 0.05 mg/kg in whole milk). The Australian MRL for wine grapes is *0.01 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

[40] The NRA Review of Fenitrothion Interim Report Volume 2, June 1999, Existing Chemicals Review Program National Registration Authority for Agricultural and Veterinary Chemicals – Residues Assessment
[41] 2000 JMPR. Pesticide Residues in Food - 2000 Evaluations – Part I, FAO Plant Production and Protection Paper 165. FAO and WHO 2001

Fluazifop-p
- is a selective post-emergent herbicide used for the control of certain grasses in crops such as canola, cotton, sunflower, legumes and pastures. The application rate for grapes is up to 0.212 kg ai/ha. In one Australian trial, residues in grapes at 28 days after application at 10× were <0.05 mg/kg parent only. No data for pomace.
The harvest WHP is 28 days

There are Australian and USA but no Codex animal tissue MRLs for fluazifop. The relevant Australian MRLs are *0.05 for edible offal and meat and 0.1 for milk. The US tolerances for animal commodities have all been set at 0.05 mg/kg (fluazifop-butyl). The Australian MRL relevant to grapes is 0.2 mg/kg (berries and other small fruit).

The TFs for kidney and fat are 0.01 and 0.005 respectively (12 ppm feeding level)[42]. Feeding grape pomace with residues at the MRL for grapes at 30% of the diet is estimated to give maximum residues in kidney of 0.3×0.2×0.1 = 0.006 mg/kg, below likely regulatory methods (assumed to be 0.01 mg/kg).

It is anticipated that animal product residues will be below typical method LOQs.

Fluazinam
-application is to dormant vines for control Phomopsis cane and leaf blight, a nil residue situation.

The Australian MRL for wine grapes is *0.01 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Fludioxonil
-is a fungicide used for the control of grey mould in grapes. It is applied as a foliar spray at an application rate of 20 g ai/hL.
The harvest WHP is 28 days

There are Australian but no Codex or US MRLs for animal tissues. The Australian MRLs have been set at *0.05 for edible offal and *0.01 mg/kg for meat and milk. The Australian MRL for grapes is 2 mg/kg. The US MRL for grapes is 1 mg/kg.

No residues were observed above the analytical LOQ of 0.01 mg/kg (meat) and 0.05 mg/kg (liver and kidney) in an animal transfer study conducted in dairy cattle. Lactating cows were treated with fludioxonil in gelatine capsules equivalent to 0.55, 1.6 and 5.5 ppm in feed for 28-30 consecutive days[43].

It is anticipated that animal product residues will be below typical method LOQs.

Flusilazole
- is a fungicide used for the control of powdery mildew on grapes. The application rate is up to 2 g ai/hL.

[42] UK PSD Evaluation of fully approved or provisionally approved products. Issue No. 10 Evaluation on: Fluazifop-P-butyl, October 1988

[43] Public Release Summary on Evaluation of the new active Fludioxinil in the product Maxim 100 FS Fungicide Seed Treatment National Registration Authority for Agricultural and Veterinary Chemicals April 2000 Canberra Australia

The harvest WHP is 14 days

There are Codex but no Australian or US MRLs for flusilazole in animal tissues. The Codex MRLs are 1 mg/kg for cattle meat (fat) and 0.05 mg/kg for milk (fat). The Australian MRL for grapes is 0.5 mg/kg.

The TF for liver, fat and cream are 0.015, 0.0012 and 0.001 respectively[44]. Assuming residues do not concentrate in wet pomace/marc, anticipated residues in liver are $0.3 \times 0.5 \times 0.015 \div 0.5 = 0.0045$ mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Forchlorfenuron

- is a plant growth regulator used to increase berry size. The application rate is up to 1 g ai/hL at 4-6 mm berry size.

A harvest WHP is not required.

There are Codex but no Australian or US MRLs for forchlorfenuron in animal tissues. The Australian MRL for grapes is *0.01 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Glufosinate ammonium

-is a non-selective foliar herbicide used for the control of broadleaf weeds and grasses in crops such as cotton, maize, sorghum and winter cereals as well as pastures. It is applied as a shielded spray to grapes. The application rate is up to 1 kg ai/ha.

No harvest WHP required

Do not graze or cut treated areas for stock food for 8 weeks after application

The Australian MRLs are 5 mg/kg for offal, 0.1 mg/kg for meat and *0.05 mg/kg for milk. The Codex MRLs are *0.1 mg/kg for edible offal, *0.05 mg/kg for meat and *0.02 mg/kg for milks. The relevant USA MRL is 6 mg/kg for cattle mbyp while the MRLs for meat and fat are 0.15 and 0.4 mg/kg respectively. The US MRL for milk is 0.02 mg/kg. There is an MRL for mixed pasture of 15 mg/kg while the grape MRL is 0.1 mg/kg (Berries and other small fruit). The US MRL for grapes is 0.05 mg/kg.

The JMPR have reported that residues were <0.01 mg/kg in edible offal and meat of cattle fed at the equivalent of 27 ppm in the diet[45].

It is anticipated that animal product residues will be below typical method LOQs.

Glyphosate

-is a non-selective foliar herbicide used for the control of broadleaf weeds and grasses in crops such as cotton, maize, sorghum and winter cereals as well as pastures. It is applied as a shielded spray to grapes. The application rate is up to 0.36 kg ai/ha for late season application to weeds (grapes not treated, shielded spray).

No harvest or grazing WHPs are required.

---

[44] 1986 JMPR - Pesticide Residues in Food - 1986 Evaluations, Part I Residues FAO Plant Production

[45] Pesticide Residues in Food - 1998 Evaluations, Part I Residues FAO Plant Production and Protection Paper 152/1. FAO and WHO 1999

The relevant Australian and Codex MRLs are the same at 2 mg/kg for cattle offal. MRL for milk is *0.1 and *0.05 mg/kg for milk. The relevant USA MRL is 5 mg/kg for cattle meat byproducts. The primary animal feed commodity MRL for glyphosate is 150 mg/kg, the grapes MRL is *0.05 mg/kg (Berries and other small fruit). The US MRL for grapes is 0.2 mg/kg.

Residues in cattle, pig and poultry meat, eggs and milk were determined after the animals were fed with a diet containing 100 ppm glyphosate and aminoglyphosate acid[46]. The highest residues were in pig liver and kidney (up to 0.16 and 0.91 mg/kg, respectively) and cattle kidney (up to 1.4 mg/kg). TF cattle kidney = 0.014

Livestock residues are not anticipated to exceed international and/or domestic market standards.

Haloxyfop-R
- is a selective post-emergent herbicide used for the control of certain grasses in crops such as grain legumes, oilseeds (including cotton) and legume pastures. The application rate for grapes is up to 416 g ai/ha as a directed spray.
No harvest WHP required

There are Australian but no USA or Codex animal tissue MRLs for haloxyfop. The relevant Australian MRLs are 0.5 mg/kg for edible offal, 0.02 mg/kg for meat (fat) and 0.02 mg/kg for milk. The Australian MRL relevant to grapes is *0.05 mg/kg (Berries and other small fruit).

It is anticipated that animal product residues will be below typical method LOQs.

Hexaconazole
-is a fungicide used for the control of powdery mildew in grapes. It is applied as a foliar spray at an application rate of 1.5 g ai/hL.
The harvest WHP is 21 days.
Do not feed produce from treated areas or by-products from treated crops to animals, including poultry

There are no Australian, Codex or US MRLs for animal tissues. The Australian MRL for grapes is 0.05 mg/kg.

In a goat metabolism study where lactating goats were dosed for 4 consecutive days with ^{14}C-hexaconazole, at a rate of about 15 ppm in the diet, the mean radioactive residues in the meat, fat, liver and kidney, calculated as hexaconazole, were 0.035, 0.025, 0.47 and 0.31 mg/kg respectively[47]. No hexaconazole was found in either meat or milk. Based on the goat metabolism study it is considered unlikely that residues above regulatory method LOQs would be detected in animal tissues from the feeding of pomace derived from hexaconazole treated grapes.

It is anticipated that animal product residues will be below typical method LOQs.

Indoxacarb

[46] 1986 JMPR Pesticide Residues in Food - 1986 Evaluations, Part I Residues FAO Plant Production and Protection Paper 78. FAO and WHO 1986
[47] 1990 JMPR. Pesticide Residues in Food - 1990 Evaluations, Part I Residues FAO Plant Production and Protection Paper 103/1. FAO and WHO 1990 http://www.fao.org/ag/AGP/AGPP/Pesticid/Default.htm

- is a oxadiazine insecticide. Application to grapes is for control of light brown apple moth and is at an application rate of 6.8 g ai/hL.
The harvest WHP is 8 weeks (63 days).
Do not allow livestock to graze crops or waste that has been treated

There are Australian, Codex and US MRLs for indoxacarb in animal tissues. The relevant Australian, Codex and US tolerances for indoxacarb in cattle fat are 1, 1 and 1.5 mg/kg respectively and for milk 0.05, 2 F and 0.15 (4 mg/kg for milkfat) mg/kg. The Australian MRL for grapes is 0.5 mg/kg and 3 ppm for grape pomace (dry). The TF for fat is 0.03[48]. Anticipated residues in fat of animals fed pomace at 30% of the diet are 0.3×3×0.03 = 0.027 mg/kg. The depletion half-life for cattle tissues is estimated to be <4 days. The TF for milk is 0.002. Anticipated residues in milk of animals fed pomace at 30% of the diet are 0.3×3×0.002 = 0.002 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Iprodione
- is a systemic fungicide used for the control of grey moulds in grapes. It is registered on grapes at an application rate of 50 g ai/100L.
The harvest WHP is 7 days
Do not feed treated produce or by-products to food producing animals, including poultry

There are Australian and US MRLs but no Codex MRLs for iprodione in animal tissues. The Australian MRLs have all been set at *0.1 mg/kg. The US MRLs are 3 mg/kg for cattle liver and kidney and 0.5 mg/kg for cattle fat, meat and meat by-products (except liver and kidney) and milk. The US residue definition is the sum of iprodione + isomer (RP-30228) + metabolite (RP-32490) + metabolite (RP-36114). There is an Australian MRL for grapes at 20 mg/kg. The US MRL for grapes is 60 ppm.

Iprodione residues in trials on grapes ranged from 5.9 to 14 mg/kg at 7/8days after application at the Australian maximum use-pattern. No data were located for pomace.

Total iprodione residues in liver were 0.66 mg/kg at the 50 ppm feed level. The TF for fat and milk (US residue definition) are 0.03 and 0.007 respectively (at 15 ppm feeding level)[49]. Assuming residues in grape pomace are the same as in grapes and feeding pomace at 30% of the diet the anticipated total iprodione residues in fat are 0.3×20×0.03 = 0.2 mg/kg. Anticipated residues in milk are 0.3×20×0.007 = 0.042 mg/kg. If parent compound is monitored in tissues in other countries, as in Australia, residues in tissues are expected to be below the method LOQ.

Insufficient data were located to provide confident opinion on livestock residue risks.

Maldison (malathion)
- is an organophosphate insecticide used for the control of various insects and nematodes. It is registered on grapes for the control of mealy bugs, vine moth and grapevine scale. The application rate is up to 100 g ai/hL.
The harvest WHP is 3 days.

[48] Indoxacarb; Notice of Filing a Pesticide Petition to Establish a Tolerance for a Certain Pesticide Chemical in or on Food, Federal Register: March 17, 2004 (Volume 69, Number 52) Page 12664-12670
[49] 1994 JMPR - Pesticide Residues in Food - 1994 Evaluations, Part I Residues FAO Plant Production and Protection Paper 78. FAO and WHO 1995

There are Australian and US but no Codex MRLs malathion in animal tissues. The relevant Australian and USA MRLs for malathion in animal tissues are 1 mg/kg in Australia and 4 mg/kg in the US. The Australian MRL for milk is 1 [in the fat] mg/kg while the US MRL is 0.5 mg/kg for milk fat (from application to dairy cows). The MRL for grapes is 8 mg/kg in Australia and the US.

No residues of malathion were detected in tissues in a goat metabolism study conducted at a nominal feeding level of 115 ppm[50].

It is anticipated that animal product residues will be below typical method LOQs.

Mancozeb
- is a dithiocarbamate fungicide used on a variety of crops. It is used on grapes for the control of downy mildew, black spot and dead arm at an application rate of 150 g ai/hl.
The harvest WHP is 14 days

There are Australian, Codex and US MRLs for mancozeb in animal commodities. The Australian MRL for edible offal is 2 mg/kg while the Codex MRL is 0.1 mg/kg, both as CS_2. The USA residue definition is zinc ethylenebisdithiocarbamate and the MRL 0.5 mg/kg for liver and kidney. The Australian and Codex MRLs for milk are *0.2 mg/kg and *0.05 mg/kg respectively.

The Australian PAFC MRL is 50 ppm and the grapes MRL T10 mg/kg. Residues in grape pomace (dry) would be expected to be less than 50 ppm. The target tissue is liver. The TF for liver (45 ppm feeding study) was 0.003[51] giving an anticipated maximum residue from the feeding of grape pomace (dry) at 30% of the diet of $0.3\times<50\times0.003 = <0.05$ mg/kg, less than the relevant international MRLs. The TF for milk was <0.008.

It is anticipated that animal product residues will be below typical method LOQs.

Metalaxyl
- is a fungicide used on a variety of crops. It is used on grapes for the control of downy mildew at an application rate of 22.5 g ai/hl.
The harvest WHP is 7 days

There are Australian and US but no Codex MRLs for metalaxyl in animal commodities. The Australian and Codex residue definition is parent compound. The Australian MRLs for edible offal and meat are *0.05 mg/kg while the MRL for milk is *0.01 mg/kg. The US residue definition is the sum of metalaxyl and its metabolites containing the 2,6-dimethylaniline moiety, and N-(2-hydroxymethyl-6-methylphenyl)-N-(methoxyacetyl)-alanine methyl ester, each expressed as metalaxyl equivalents. The USA MRLs are 0.4 mg/kg for fat, liver and kidney and 0.05 mg/kg for meat and meat by-products and 0.02 mg/kg for milk. The Australian grape MRL is 1 mg/kg while the US MRL is 2 mg/kg.

In a lactating goat metabolism study conducted at a dose level equivalent of feeding at 7 ppm, radioactive residues in tissues, expressed in metalaxyl equivalents, were all <0.06 mg/kg[52].

[50] 1999 JMPR - Pesticide Residues in Food - 1999 Evaluations, Part I Residues FAO Plant Production and Protection Paper 157. FAO and WHO 2000
[51] 1993 JMPR - Pesticide Residues in Food - 1993 Evaluations, Part I Residues FAO Plant Production and Protection Paper 124. FAO and WHO 1994
[52] 1982 JMPR Pesticide Residues in Food - 1982 Evaluations, FAO Plant Production and Protection Paper 49. FAO and WHO 1983

It is anticipated that animal product residues will be below typical method LOQs.

Methidathion
- is an organophosphate insecticide used for the control grapevine scale, light brown apple moth grapevine moth etc in grapes. The application rate is up to 50 g ai/hL. Methidathion residues decline with typical half-lives of 7 and 3 days for soil and foliage respectively.
The harvest WHP is 14 days

There are Australian and Codex but no USA MRLs for methidathion in animal tissues. The Australian (Codex) and USA residue definitions differ: methidathion (Australia, Codex), sum of methidathion, its oxygen analogue, the sulfoxide and the sulfone (USA). The Australian and Codex that apply to animal tissues are 0.5 and *0.02 mg/kg respectively. The corresponding milk MRLs are 0.5 [in the fat] and 0.001 mg/kg. The Australian MRL for grapes is 0.5 mg/kg.

No residues of methidathion were observed in tissues of cows fed at up to 50 ppm in the diet when measured by the Australian or USA residue definitions[53].

It is anticipated that animal product residues will be below typical method LOQs.

Methomyl
- is a carbamate insecticide used for the control of light brown apple moth and vine moth in grapes. The application rate is up to 33.75 g ai/hL. Methomyl residues decline with typical half-lives of 7 and 4 days for soil and foliage respectively.
The harvest WHP is 7 days.

There are Australian and Codex but no USA MRLs for methomyl (as thiodicarb) in animal tissues. The MRLs have all been set at the LOQ. The Australian MRL for grapes is 2 mg/kg.

No residues of methomyl/thiodicarb were observed in tissues (<0.01 mg/kg) of cows fed at up to 86 ppm in the diet when measured by the Australian or USA residue definitions[54].

It is anticipated that animal product residues will be below typical method LOQs.

Methoxyfenozide
- is an insecticide used for the control of light brown apple moth in grapevines. The application rate is up to 6 g ai/hL.
The harvest WHP is 21 days

There are Australian, Codex and USA MRLs for methoxyfenozide in animal tissues. The Australian MRLs have all been set at the LOQ (*0.01 mg/kg). The Codex MRLs are 0.05 mg/kg for fat, 0.02 mg/kg for edible offal and 0.01 mg/kg for milk. The US tolerances are 0.5 mg/kg for fat, 0.02 mg/kg for meat and 0.1 mg/kg for milk. The Australian MRL for grapes is 2 mg/kg.

Based on available cattle feeding studies, there is no expectation of residues in animal tissues when fed at a maximum of 22 ppm in the diet

[53] Methidathion Reregistration Eligibility Decision Residue Chemistry Considerations Shaughnessy No. 100301; Case No. 0034 Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division
[54] 2001 JMPR Pesticide Residues in Food - 2001 Evaluations – Part I, FAO Plant Production and Protection Paper 171. FAO and WHO 2002

It is anticipated that animal product residues will be below typical method LOQs.

Metiram
- is a dithiocarbamate fungicide used on a variety of crops. It is used on grapes for the control of black spot and downy mildew at an application rate of 140 g ai/hl.
The harvest WHP is 14 days

There are Australian and Codex but no US MRLs for metiram in animal commodities. The Australian MRL for edible offal is 2 mg/kg while the Codex MRL is 0.1 mg/kg, both as CS_2. The Australian PAFC MRL is 50 ppm and the grapes MRL T10 mg/kg. Residues in grape pomace (dry) would be expected to be less than 50 ppm. The target tissue is liver. The TF for liver (1000 ppm feeding study for metiram) was 0.01[55] giving an anticipated maximum residue from the feeding of pomace (dry) at 30% of the diet of 0.3×<50×0.01 = <0.15 mg/kg, less than the relevant international MRLs. The TF for milk was 0.0002. No detectable residues are expected in milk from feeding grape pomace to dairy cattle.

It is anticipated that animal product residues will be below typical method LOQs.

Myclobutanil
-is a fungicide used for the control of powdery mildew in grapes. It is applied as a foliar spray at an application rate of 3.125 g ai/hL.
The harvest WHP is 14 days

There are Codex and US but no Australian MRLs for myclobutanil in animal tissues. The Australian and Codex residue definition is mycolbutanil *per se*. The Codex MRLs are all *0.01 mg/kg for cattle milk, edible offal and meat. The US residue definition is the sum of myclobutanil alpha-butyl-alpha-(4-chlorophenyl)-*1*H-1,2,4-triazole-1-propanenitrile and its alcohol metabolite (alpha-(3-hydroxybutyl)-alpha-(4-chlorophenyl)-*1*H-1,2,4-triazole-1-propanenitrile (free and bound). The relevant cattle MRLs are liver 1 mg/kg, fat 0.05 mg/kg, meat 0.1 mg/kg, and meat by-products (except liver) and milk 0.2 mg/kg. The Australian MRL for grapes is 1 mg/kg.

Livestock metabolism studies indicate that if residues of myclobutanil and its metabolites do not exceed 3 ppm in total livestock diet then residues in all livestock tissues and products, including milk and eggs, will not exceed 0.1 ppm[56].

Residue data from the feeding of animals with myclobutanil at 30 ppm may result in significant residues in milk (0.258 ppm), cattle tissues such as kidney (0.182 ppm) and liver (0.965 ppm), and chicken eggs (0.122 ppm) (all US residue definition).

The TF for myclobutanil in liver is 0.032 (feeding at 30 ppm in the diet, US residue definition) resulting in an anticipated maximum residue from feeding grape marc at 30% of the diet of 1×5×0.032 = 0.15 mg/kg, less than the relevant US MRL.

The UK PSD reported a study where two lactating dairy cows received myclobutanol doses at the equivalent of 10 ppm in the diet for 5 days. Residue in milk plateaued by day 2 of dosing and reached a maximum of 0.04 mg/kg. Total radioactive residues in liver were 0.42 and kidney 0.11 mg/kg.

[55] Evaluation of fully approved or provisionally approved products. Issue 36: Evaluation on ethylenebisdithiocarbamtes (2), April 1991, Department of Environment Food and Rural Affairs, Pesticide Safety Directorate. UK
[56] PMRA Decision Document E93-01, June 1993, Health Canada.

Livestock residues are not anticipated to exceed international and/or domestic market standards.

Napropamide
is a herbicide used to control certain grass weeds in broad acre crops, tomatoes and grapes. The application rate is 2.25 kg ai/ha.
No WHP required.

There are no Australian, Codex or US MRLs for animal tissues. The Australian MRL for grapes is *0.1 mg/kg (berries and other small fruit).

It is anticipated that animal product residues will be below typical method LOQs.

Norflurazon
-is a fluorinated pyridazinone herbicide used for the pre-emergent control of annual grasses and broadleaf weeds in cotton, citrus, grapes and stone fruit etc. It is applied to grapes at an application rate of up to 2 kg ai/ha as a shielded spray.
No harvest or grazing WHPs are required.

There are no Australian or Codex MRLs for norflurazon in animal tissues. The Australian (parent) and US (parent + metabolite) residue definitions differ. The relevant US MRLs for animal tissues are 0.5 mg/kg for cattle liver and 0.1 mg/kg for other tissues and milk. The MRL for grapes is 0.1 mg/kg. The US MRL for grapes is 0.1 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Oryzalin
- is a dinitroaniline herbicide used for the control of weeds in various crops. The application rate is up to 4.8 kg ai/ha as a directed spray (WA).
There is no harvest WHP.
Do not graze treated weeds

There are no Australian, US or Codex MRLs for oryzalin animal commodities. The Australian MRL for grapes is 0.1 mg/kg.

The US EPA reported in their assessment on oryzalin[57] that there is "No reasonable expectation of finite residues in animal commodities".

It is anticipated that animal product residues will be below typical method LOQs.

Oxadixyl
- is a fungicide used on a variety of crops. It is used on grapes for the control of downy mildew at an application rate of 20 g ai/hl or 0.2 kg ai/ha.
The harvest WHP is 3 days

There are no Australian, Codex or US MRLs for oxadixyl in animal tissues. The Australian MRL for grapes is 2 mg/kg.

[57] Reregistration Eligibility Decision Oryzalin List A Case 0186, Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division

The log P_{ow} for oxadixyl is 0.74 suggesting little propensity for bioaccumulation. Using empirical relationship between log P_{ow} and maximum TF the following maximum TFs are estimated: 0.023 for offal, 0.02 for fat and 0.01 for milk. Oxadixyl is water soluble and would not be expected to concentrate in grape pomace. Worst case estimates for residues in offal are 0.3×0.023×2 = 0.014 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Oxyfluorfen
- is a diphenyl ether herbicide used for the control of weeds in various crops. The application rate is up to 18 g ai/ha.
There is no harvest WHP.
Do not graze treated weeds

There are Australian and US but no Codex MRLs for oxyfluorfen in animal commodities. The Australian MRLs have all been set at *0.01 and the US ones at 0.01 mg/kg. The Australian and US MRL for grapes are the same at 0.05 mg/kg. The TF for fat is 0.035 and for milk is 0.003[58].

It is anticipated that animal product residues will be below typical method LOQs.

Paraquat
- is a herbicide used for the control of weeds in various crops. The application rate is up to4 L/ha as a directed spray = 500 g ai/ha or 50 g ai/hL. (NOTE diquat = 300 g ai/ha or 30 g ai/hL)

The Australian and Codex MRLs for paraquat in kidney are 0.5 and 0.05 mg/kg respectively while *0.01 and 0.005 mg/kg for milk respectively. The US MRL for kidney is 0.5 mg/kg and for milk 0.01 mg/kg. Residues in soil and foliage decline with typical half-lives of *ca.* 1000 and 30 days respectively. The MRL for grapes is *0.05 mg/kg in both Australia and the US. For residues in kidney to be less than the US MRL of 0.3 mg/kg, cattle would have to fed at less than ca. 80 ppm in the diet. Noting the application rates and that the MRL for grapes is *0.05 mg/kg, it is considered unlikely that residues in pomace (dried) would exceed 80 ppm.

It is anticipated that animal product residues will be below typical method LOQs.

Parathion-methyl
- is an organophosphate insecticide used for the control of various insects in crops. It is registered on grapes for the control of mealy bug. The application rate is up to 32.5 g ai/hL.
The harvest WHP is 14 days.
Do not graze or cut for stock food for 14 days after application

There are Australian but no Codex or US MRLs for parathion methyl in animal commodities. The Australian MRLs for animal commodities have been set at *0.01 mg/kg. There are Australian MRLs of T0.5 mg/kg for grapes and T25 ppm for legume animal feeds.

A metabolism study with lactating goats dosed orally with parathion methyl at the equivalent of 6.25 ppm in the diet suggests that residues of parathion methyl are not expected in animal tissues[59].

[58] Reregistration Eligibility Decision (RED) Oxyfluorfen List A Case 2490, Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division
[59] 2000 JMPR. Pesticide Residues in Food - 2000 Evaluations – Part I, FAO Plant Production and Protection Paper 165. FAO and WHO 2001

It is anticipated that animal product residues will be below typical method LOQs.

Penconazole
-is a fungicide used for the control of powdery mildew in grapes. It is applied as a foliar spray at an application rate of 1.25 g ai/hL.
The harvest WHP is 14 days

There are Codex but no Australian or US MRLs for penconazole in animal tissues. The Codex MRLs are *0.05 mg/kg for cattle meat and edible offal and *0.01 mg/kg for cattle milk. The Australian MRL for grapes is 0.1 mg/kg. Milk, muscle and fat residues (radioactivity) in a goat metabolism study where lactating goats were orally dosed at a rate equivalent to 5 ppm in the feed were <0.017 mg equiv./kg[60].

It is anticipated that animal product residues will be below typical method LOQs.

Pendimethalin
-is a selective herbicide used for the control of annual ryegrass and certain broadleaf weeds in cotton, cereals etc. It is applied at an application rate of up to 3.96 kg ai/ha as a directed spray.
No harvest or grazing WHPs are required.

There are Australian but no Codex or US MRLs for pendimethalin in animal tissues. The Australian MRL for animal commodities all have been set at *0.01 mg/kg. Residues decline in soil and foliage with typical half-lives of 90 and 50 days respectively. The Australian MRL for grapes is *0.05 mg/kg (Berries and other small fruit). The US EPA notes that animal metabolism studies in goats conducted at exaggerated feeding levels indicate that there is no reasonable expectation for residues of pendimethalin in tissues[61].

It is anticipated that animal product residues will be below typical method LOQs.

Procymidone
is a fungicide used on grapes for control of grey mould. Application is at 37.5 g ai/hL.
The harvest WHP is 5 days.

There are Australian but no Codex or US MRLs for procymidone in animal tissues. The Australian MRLs are T0.2 mg/kg for fat, T0.05 mg/kg for offal and T0.02 mg/kg for milk.

Residues in mature grapes from Australian trials were 1.1 and 1 mg/kg at 3 to 5 DAT. The Australian MRL for wine grapes is 2 mg/kg. The US MRL for wine grapes is 5 mg/kg. There are animal feed MRLs of 5 ppm for canola and lentil forage.

The 1981 JMPR reported trials on processing grapes to wine. Processing factors for must were 0.59, 0.75, 0.86, 0.89 and 0.95 indicating a slight reduction in residues during production of pomace or must. The Australian animal commodity MRLs were based on a dietary burden of 10 ppm (APVMA gazette, APVMA Gazette, 13th July 2004 procymidone/lentils). Residues on feeding must at 30% of the diet are expected to be less than typical limits of quatification.

[60] 1992 JMPR - Pesticide Residues in Food – 1992 evaluations. Part II. Toxicology. WHO, WHO/PCS/93.34, Geneva, 1993
[61] Reregistration Eligibility Decision Pendimethalin List A Case 0187, Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division

It is anticipated that animal product residues will be below typical method LOQs.

Propineb
- is a propylenethiourea fungicide used on a variety of crops. It is used on grapes for the control of downy mildew at an application rate of 140 g ai/hl or 1.4 kg ai/ha.
The harvest WHP is 3 days

There are Australian and Codex but no US MRLs for propineb in animal commodities. The Australian MRL for edible offal is 2 mg/kg while the Codex MRL is 0.1 mg/kg, both as CS_2. The Australian PAFC MRL is 50 ppm and the grape MRL T10 mg/kg. Residues in grape pomace (dried) would be expected to be less than 50 ppm. The target tissue is liver. The TF for liver (45 ppm feeding study with mancozeb) was 0.003[62] giving an anticipated maximum residue from the feeding of pomace at 30% of the diet of $0.3\times<50\times0.003 = <0.05$ mg/kg, less than the relevant international MRLs.

It is anticipated that animal product residues will be below typical method LOQs.

Prothiofos
is an organophosphate insecticide used on grapes for the control of long tailed mealy bugs. The application rate is 50 g ai/hL.
The harvest WHP is 8 weeks (63 days).

There are no Australian, Codex or US MRLs for prothiofos in animal tissues. The Australian MRL for grapes is 2 mg/kg. No processing data (i.e. grape pomace) or animal transfer data were located.

Prothiofos has a log P_{ow} of 5.7 indicating that residues may accumulate in fat. In a rat metabolism study, results obtained with a single dosing of prothiofos-oxon indicated that the oxygen analog formed from prothiofos *in vivo* was rapidly degraded through cleavage of the P---S bond and the liberation of 2,4-dichlorophenol. Consistent with related organophosphorous pesticides, no residues are expected above the LOQ.

It is anticipated that animal product residues will be below typical method LOQs.

Pyraclostrobin
-is a stroblurin fungicide used for the control of powdery and downy mildew in grapes. Application is at up to 10 g ai/hL.
The WHP is 21 days for harvest.

There are Australian, US and Codex MRLs for pyraclostrobin in animal commodities. The Australian MRLs are *0.05 mg/kg for animal commodities except milk for which the MRL is *0.01 mg/kg. The Codex MRLs for edible offal, meat (fat) and milk are *0.05, 0.5 and 0.03 mg/kg respectively. The US MRLs are 1.5 mg/kg for liver, 0.2 mg/kg for other meat by-products, 0.1 mg/kg for meat, fat and milk. The MRL for grapes is 2 mg/kg and dried grapes 5 mg/kg. The MRL for grape pomace dry is 10 mg/kg.

[62] 1993 JMPR - Pesticide Residues in Food - 1993 Evaluations, Part I Residues FAO Plant Production and Protection Paper 124. FAO and WHO 1994

The APVMA PRS noted[63]:
Lactating dairy cows were fed pyraclostrobin in the diet for 28 consecutive days at levels equivalent to 8.8, 27.2 and 89.6 ppm in the diet. Residues of the parent compound were <LOQ (<0.01 or <0.05 mg/kg) in whole milk, skim milk, muscle, fat, kidney and liver of cows from all dose groups. Finite residues of the parent compound (0.016-0.044 mg/kg) were only observed in cream of cows dosed at the 89.6 ppm level. Total residues of pyraclostrobin and metabolites convertible to the chlorophenylpyrazole and 2-hydroxychloropyrazole analytical targets were <LOQ (<0.1 mg/kg) in muscle and fat at all feed levels. Finite residues were observed in liver at all dose levels and kidney at the highest dose level only. Total residues in liver were <0.1-0.32 mg/kg, 0.46-0.61 mg/kg and 2.1-2.8 mg/kg for the 8.8 ppm, 27.2 ppm and 89.6 ppm dose groups respectively. Total residues in kidney were 0.37-0.40 mg/kg for the 89.6 ppm dose group and <0.1 mg/kg for the lower dose groups. In the highest dose group the total residues in milk plateaued within 7 days of dosing. Total residues in milk were all <LOQ (<0.02 mg/kg) for the 8.8 ppm dose group. Total residues in milk peaked at 0.024 mg/kg and 0.18 mg/kg for the 27.2 ppm and 89.6 ppm dose groups respectively. Total residues in cream were 0.021-0.33 mg/kg, <0.02-0.056 mg/kg and 0.13-0.26 mg/kg for the 8.8 ppm, 27.2 ppm and 89.6 ppm dose groups respectively. In skim milk finite residues were only observed in the 89.6 ppm dose group at 0.039-0.10 mg/kg. The results of the dairy cow transfer study are in contrast to those observed in the goat metabolism study, particularly in relation residues observed in fat. The residues of parent compound are compared in the following table:

Study	^{14}C label position	Dose, ppm in feed (mg/kg bw)	Pyraclostrobin in fat, mg equiv./kg or mg/kg
Goat	Chlorophenyl	12.23 (0.95)	0.069
	Chlorophenyl	78.13 (2.72)	0.819
	Tolyl	12.19 (0.7)	0.061
	Tolyl	69.86 (1.37)	0.318
Cow	-	8.8 (0.22)	<0.05
	-	27.2 (0.67)	<0.05
	-	89.6 (2.40)	<0.05

The goat study indicates significant fat solubility of the parent compound, however, residues >0.05 mg/kg were not reported in cow fat, even at the highest dose level. The goat metabolism study is therefore used as a conservative estimate of potential residues in mammalian fat.

Sample	Observed HR, mg/kg	Study feed level, ppm	Expected residue **1**, mg/kg, from stated dietary exposure	
			0.28 ppm in diet **2**	4.65 ppm in diet **3**
Liver	0.32	8.8	<0.1	0.17
Kidney	<0.1	8.8	<0.1	<0.1
Milk	<0.02	8.8	<0.02	<0.02
Cream	0.033	8.8	<0.02	<0.02
Muscle	<0.1	8.8	<0.1	<0.1
Fat	0.819	78.1	<0.05	<0.05

1. Estimated residue in fat is for parent compound only based on goat metabolism study. Residues in other tissues are based on the cow transfer study and are expressed as pyraclostrobin following analysis by the common moiety method.
2. Assumes grape pomace containing pyraclostrobin at the STMR consumed at 20% of the diet
3. Assumes grape pomace containing pyraclostrobin at the HR consumed at 50% of the diet

No residues are expected in animal tissues or milk from animals exposed to levels in the diet from feeding pomace derived from grapes harvested from treated vines.

It is anticipated that animal product residues will be below typical method LOQs.

[63] Public Release Summary on Evaluation of the new active PYRACLOSTROBIN in the product CABRIO FUNGICIDE Australian Pesticides and Veterinary Medicines Authority September 2003 Canberra Australia

Pyridaben

- is an acaricide used for the control of bunch mites in grapes. The application rate is up to 20 g ai/hL.

The harvest WHP is 14 days.

There are US but no Australian or Codex MRLs for pyridaben in animal commodities. The US residue definition for animal tissues includes two metabolite and is pyridaben and (2-tert-butyl-5-(4-(1-carboxy-1-methylethyl)benzylthio)-4-chloropyridazin-3(2H)-one] and (2-tert-butyl-5-[4(-1,1-dimethyl-2-hypdroxyethyl)benzylthio-4-chloropyridazinn-3(2H)-one). The MRLs for cattle commodities have all been set at 0.05 mg/k except fat which is 1 mg/kg.

There is an Australian MRL of 5 mg/kg for grapes (same residue definition as US for plants, i.e. parent compound). The US MRL for grapes is 1.5 mg/kg.

EFSA reported a feeding study where lactating Holstein cows were administered pridaben for 29 days at doses equivalent to 2.5, 7.5 and 25 ppm in the diet. Cows were sacrificed 5 hours after the last dose. No residues of pyridaben, PB-7 or PB-9 were detected in whole milk (<0.01 mg/kg) or in kidney and muscle (<0.05 mg/kg). Maximum residues (mg/kg) in liver and fat were:

Dose (ppm)	Liver			Fat		
	Pyridaben	PB-7	PB-9	Pyridaben	PB-7	PB-9
2.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
7.5	<0.05	0.05	<0.05	<0.05	<0.05	<0.05
25	<0.05	0.15	<0.05	0.07	<0.05	<0.05

Livestock residues are not anticipated to exceed international and/or domestic market standards.

Pyrimethanil

-is a fungicide used for the control of grey mould in grapes. It is applied as a foliar spray at an application rate of 0.8 kg ai/ha.
The harvest WHP is 7 days.
Do not feed trash or by-products resulting from treated grapes to livestock

There are Australian, US and Codex MRLs for pyrimethanil in animal commodities. The Australian MRLs for animal commodities are *0.05 mg/kg for tissues and *0.01 mg/kg for milks. The US MRL for cattle kidney is 2.5 and other tissues is 0.01 mg/kg. The Codex MRL for edible offal and milk is 0.1 while meat (fat) is *0.05 mg/kg. The Australian MRL for grapes is 5 mg/kg. The US tolerance for wine grapes is 5 mg/kg (import tolerance). The Australian MRL for grape pomace (dry) is 40 ppm.

Residues in grapes treated at the Australian label rate (and 7 day WHP) ranged from 0.8 to 4.1 mg/kg (mean = 2.0 mg/kg; STMR = 1.7 mg/kg). Processing factors for whole fruit to wet pomace and dry pomace were calculated to be 2.3 and 7.4, respectively. Therefore, pyrimethanil residues in dry grape pomace are estimated at *ca.* 35 mg/kg [5 mg/kg × 7.4 (PF)].

In a 1993 lactating dairy cow metabolism study, a cow received 7 daily doses of anilino-labelled ^{14}C-pyrimethanil at a dose rate equivalent to 10 ppm with sacrifice 24 hours after the last dose[64]. TRR residues in milk (as parent) reached a plateau after 2 days of 0.05-0.06 mg/L (highest 0.069 mg/L at day 5). The metabolite SN 614276 represented 64% of the TRR in milk. TRR in tissues

[64] Evaluation of fully approved or provisionally approved products: Issue No. 138 pyrimethanil September 1995

were 0.017 for muscle, 0.036 for fat, 0.25 for kidney and 0.36 mg equiv/kg for liver. Two major metabolites were identified in kidney: SN 614276 (46% TRR) and SN 614800 (7% TRR). For muscle and fat, 53 and 77% respectively of the TRR was organo-extractable. For liver 73% of the TRR remained un-extracted. Feeding liver to rats did not result in detectable ^{14}C residues and it was concluded that liver residues were unlikely to be bio-available. Pyrimethanil undergoes extensive metabolism and it is not expected that feeding of grape pomace will give rise to detectable residues of parent compound.

It is anticipated that animal product residues will be below typical method LOQs.

Quinoxyfen
- is a fungicide used for the control of powdery mildew in grapevines. The application rate is up to 5 g ai/hL.
The harvest WHP is 14 days

There are Australian and Codex but no USA MRLs (registered) for quinoxyfen in animal tissues. The Australian MRLs are 0.1 mg/kg for meat (fat), *0.01 mg/kg for offal and 0.01 mg/kg for milk. The Codex MRLs are 0.2 mg/kg for meat (fat), *0.01 mg/kg for edible offal and 0.01 mg/kg for milk (0.2 mg/kg for milk fat). The Australian MRL for grapes is 0.5 mg/kg and for grape pomace (dry) 5 ppm. The half-life for residues in grapes is approximately 19 days.

The 2006 JMPR reported a feeding study where lactating dairy cows were dosed at the equivalent of 20 ppm in the feed for 28 days. Mean residues in animals sacrificed 16 hours after the last dose were 0.12 mg/kg in liver, 0.19 mg/kg in kidney, 0.11 mg/kg in muscle, 1.4 mg/kg in subcutaneous fat and 2.2 in peritoneal fat. Mean residues in milk were 0.16 mg/kg. The TF for fat is 0.09 and for milk 0.008. Feeding pomace at 30% of the diet is expected to arise in residues of $0.3\times5\times0.09 = 0.135$ mg/kg in fat. Anticipated residues in milk are $0.3\times5\times0.008 = 0.012$ mg/kg.

Livestock residues may exceed international and/or domestic market standards.

Quizalofop ethyl
is a herbicide used as a spot spray in grapes to control weeds at an application rate of 26 g ai/hL.
No WHP required when used as directed

There are Australian and US but no Codex MRLs for animal commodities. The Australian MRL for meat (mammalian) has been set at *0.02 mg/kg and for edible offal (mammalian) 0.2 mg/kg. The US MRLs are 0.05 mg/kg for fat and meat by-products and 0.02 mg/kg for meat. The US MRL for milk is 0.01 mg/kg and for milk fat 0.25 mg/kg. The US residue definition is the sum of quizalofop-ethyl, quizalofop- methyl and quizalofop expressed as quizalofop ethyl. There is an Australian MRL for grapes of *0.02 mg/kg.

NOTE based on the APVMA Stockfeed Sheet, A MFL of 10 ppm was used in setting the MRL of 0.2 mg/kg for edible offal. A conservative TF for offal would be the MRL ÷ MFL = 0.2/10 = 0.02.

It is anticipated that animal product residues will be below typical method LOQs.

Simazine
- is a triazine herbicide and is used for the control of grass and broadleaf weeds in crops including grapes. It is applied to bare ground as a directed spray at up to 3.5 kg ai/ha

No harvest or grazing/feeding WHPs required.

There are Australian and US but no Codex MRLS for animal commodities. The Australian MRLs have all been set at *0.05 mg/kg except milk which is at *0.02 mg/kg. The US MRLs are 0.03 mg/kg for animal commodity MRLs.
The Australian MRL for grapes is *0.1 mg/kg while the US MRL is 0.2 mg/kg.

In a ruminant feeding study[65], dairy cows were dosed with simazine at levels equivalent to 0.5, 2.5, and 5 ppm in the diet for 28 consecutive days. The combined residues of simazine, G-28279, and G-28273 in milk throughout the dosing period were <0.03 ppm (<0.01 ppm for each analyte) in milk from cows dosed at 0.5 ppm; 0.03 ppm (G-28273 was detected at 0.01 ppm) from cows dosed at 2.5 ppm; and 0.03-0.05 ppm (G-28273 detected at 0.01-0.04 ppm) from cows dosed at 5 ppm. The combined residues of simazine, G-28279 and G-28273 were <0.03 ppm (each at <0.01 ppm) in samples of meat, kidney, liver, and fat from cows in each dose group, with the exception of one cow dosed at 5 ppm and sacrificed on Day 21 which had residues of G-28273 at 0.01 ppm in tenderloin and kidney samples.

It is anticipated that animal product residues will be below typical method LOQs.

Spinosad
- is an antibiotic insecticide used for the control of light brown apple moth in grapes. The application rate is up to 4.8 g ai/hL.
The harvest WHP is 14 days.
Do not allow livestock to graze orchards or vineyards for 14 days after application.

There are Australian, Codex and USA MRLs for spinosad in animal commodities. The Australian and US MRLs applicable to cattle meat (fat) are 2 and 50 mg/kg respectively. The respective milk MRLs are T0.1 and 7 (85 mg/kg for whole milk fat) mg/kg. The Codex MRL is 3 mg/kg for cattle fat and 2 mg/kg for fat of other mammals and 1 mg/kg for cattle milk (5 m/kg for milk fat). There are Australian MRLs of 0.5 mg/kg for grapes and 1 mg/kg for grape pomace (dry).

The TF for cattle fat is 0.5-0.6[66] giving an anticipated maximum residue in cattle fat from feeding of grape pomace at 30% of the diet of $0.3\times1\times0.6 = 0.18$ mg/kg.
The TF for cattle milk is 0.05 giving an anticipated maximum residue in cattle milk from feeding of grape pomace at 30% of the diet of $0.3\times1\times0.05 = 0.015$ mg/kg.

Livestock residues are not anticipated to exceed international and/or domestic market standards.

Spiroxamine
-is a morpholine fungicide used for the control of powdery mildew mould in grapes. It is applied as a foliar spray at an application rate of 30 g ai/hL.
The harvest WHP is 28 days.

There are Australian but no Codex or US MRLs for animal tissues. The Australian MRLs are 0.5 and 0.05 mg/kg for edible offal and meat and milk, respectively. The Australian MRL for grapes is 2 mg/kg and 10 mg/kg for grape pomace.

[65] DATE: 26 May 2005 SUBJECT: SIMAZINE: Residue Chemistry Chapter for the RED, Revised for Errors; PC Code 080807; DP Barcode D316474 FROM: David Soderberg, TO: Diane Sherman
[66] 2001 JMPR Pesticide Residues in Food - 2001 Evaluations – Part I, FAO Plant Production and Protection Paper 171. FAO and WHO 2002

In the cattle feeding study where cattle were dosed with spiroxamine at the equivalent of 2, 6 and 20 ppm in feed, residues of spiroxamine in the muscle and fat were detected at or below the LOQ for animals fed at 2 and 6 ppm in the feed[67]. Feeding grape pomace at 30% of the diet is not expected to result in tissue residues above regulatory LOQs.

It is anticipated that animal product residues will be below typical method LOQs.

Tau-fluvalinate

-is a synthetic pyrethroid insecticide used on grapes for the control of plague thrips. Application is at 4.8 g ai/hL.
Do not harvest for 95 days after application.
Do not apply later than full flowering.

There are no Australian, Codex or US MRLs for animal tissues. The Australian MRL for table grapes is 0.05 mg/kg.

As tau-fluvalinate is applied during flowering (as per registered label), residue levels in fruit are expected to be <LOQ (<0.05 mg/kg) at mature harvest.

The mean TF for fluvalinate in fat is 0.05[68] (feeding at 4.8 ppm in the diet). Feeding grape pomace at 30% of the diet would not be expected to lead to residues in fat greater than 0.3×0.05×0.05 = 0.00075 mg/kg.
The mean TF for fluvalinate in milk is 0.02 (feeding at 4.8 ppm in the diet) resulting in an anticipated maximum residue from feeding grape pomace at 30% of the diet of 0.3×0.05×0.02 = 0.0003 mg/kg, less than the relevant Australian, proposed Codex and US MRLs and likely regulatory method LOQ (assumed 0.01 mg/kg).

It is anticipated that animal product residues will be below typical method LOQs.

Tebuconazole
-is a DMI fungicide used for the control of Powdery mildew in grapevines. The application rate is up to 12.9 g ai/hL.
The harvest WHPs is 8 weeks (56 days).

There are Australian, Codex and US MRLs for tebuconazole in animal tissues. The Australian and Codex residue definition is tebuconazole while the USA residue definition is the sum of tebuconazole and its 1-(4- chlorophenyl)-4,4-dimethyl-3-(*1*H-1,2,4-triazole-1-yl-methyl)-pentane-3,5-diol metabolite. The Australian MRLs 0.5 mg/kg for edible offal mammalian, 0.1 mg/kg for meat (mammalian) and 0.05 mg/kg for milk. The Codex MRLs are *0.05 mg/kg for both cattle meat and cattle edible offal and *0.01 mg/kg for milk. The US MRLs are 0.2 mg/kg for meat byp and 0.1 mg/kg for milk.

[67] Public Release Summary on Evaluation of the new active SPIROXAMINE in the product PROSPER 500 EC FUNGICIDE National Registration Authority for Agricultural and Veterinary Chemicals October 2001 Canberra Australia
[68] Evaluation of fully approved or provisionally approved products. Issue 162: Evaluation on Tau-fluvalinate, March 1997, Department of Environment Food and Rural Affairs, Pesticide Safety Directorate. UK

The Australian MRL for grapes is 2 mg/kg and dried grapes 5 ppm. There is a PAFC MRL of 50 ppm.

Residues of tebuconazole were not detected (<0.05 mg/kg) in muscle and fat of dairy cattle dosed at the equivalent of 250 ppm in the diet for 28 days[69]. The residues in liver were 0.2 mg/kg. The TF for liver is 0.0008.

It is anticipated that animal product residues will be below typical method LOQs.

Tebufenozide
- is an insecticide. Application to grapes is for control of light brown apple moth and is at an application rate of 6 g ai/hL.
The harvest WHP is 21 days.
Do not graze any treated area or cut for stock food

There are Australian and US MRLs but no Codex MRL for tebufenozide in animal tissues. The Australian residue definition is parent compound. The animal tissue MRLs have all been set at *0.02 mg/kg while the milk MRL is *0.01 mg/kg.

The US residue definition for animal commodities is the sum of tebufenozide and its metabolites benzoic acid, 3,5-di-methyl-1-(1,1-dimethylethyl)-2-((4-carboxymethyl)benzoyl)hydrazide), benzoic acid, 3-hydroxymethyl,5-meth-yl-1-(1,1-dimethylethyl)-2-(4-ethylbenzoyl)hydrazide, the stearic acid conjugate of benzoic acid, 3-hydroxymethyl,5-methyl-1-(1,1-dimethylethyl)-2-(4-ethylbenzoyl)hydrazide and benzoic acid, 3-hydroxymethyl-5-methyl-1-(1,1-dimethylethyl)-2-(4-(1-hydroxy-ethyl)benzoyl)hydrazide.
The US MRLs are 0.1 mg/kg for fat, 0.08 mg/kg for meat and meat by-products and 0.04 mg/kg for milk.

The Australian MRL for grapes is 2 mg/kg and 10 ppm for grape pomace (dry) while the USA MRL for grapes is 3 mg/kg.

In a lactating cow feeding study, animals were dosed at levels equivalent to 6, 18 or 60 ppm in the feed for 28 consecutive days[70]. The TFs for fat are 0.003 and 0.005 for the Australian and US reside definitions respectively (18 ppm feeding level). Using the TF for the US residue definition and assuming feeding of pomace at no more than 30% of the diet, anticipated residues in fat are $0.3\times10\times0.005 = 0.015$ mg/kg, less than typical regulatory method LOQs for animal tissues (0.02 mg/kg).
The TFs for milk are 0.0003 and 0.001 for the Australian and US reside definitions respectively (18 ppm feeding level). Using the TF for the US residue definition and assuming feeding of pomace at no more than 30% of the diet, anticipated residues in fat are $0.3\times10\times0.001 = 0.003$ mg/kg, less than typical regulatory method LOQs for milk (0.01 mg/kg).

It is anticipated that animal product residues will be below typical method LOQs.

Tetraconazole

[69] 1994 JMPR - Pesticide Residues in Food - 1994 Evaluations, Part I Residues FAO Plant Production and Protection Paper 78. FAO and WHO 1995
[70] 2001 JMPR Pesticide Residues in Food - 2001 Evaluations – Part I, FAO Plant Production and Protection Paper 171. FAO and WHO 2002

-is a fungicide used for the control of Powdery mildew in grapevines. The application rate is up to 1.2 g ai/hL.
The harvest WHPs is 14 days.

There are Australian and US but no Codex MRLs for tetraconazole in animal tissues. The Australian MRLs 0.2 mg/kg for edible offal, *0.01 mg/kg for meat (fat) and *0.01 mg/kg for milk. The US MRLs are 0.2 mg/kg for fat, 0.2 mg/kg for liver, 0.01 mg/kg for other meat byp, 0.01 mg/kg for meat and 0.01 mg/kg for milk (0.25 mg/kg for milk fat).

The Australian MRL for grapes is 0.5 mg/kg and grape pomace (dry) is 2 ppm.

EFSA reported a feeding study were lactating dairy cows were does at 7, 21 and 70 mg ai/day (approximately 0.35, 1 and 3.5 ppm in the diet) for 28 days. Mean residues in milk at the highest dose level were 0.029 mg/kg. Maximum residues (mg/kg) in tissues were:

Dose level (ppm)	Muscle	Liver	Kidney	Subcutaneous fat	Peritoneal fat
0.35	<0.003	0.371	0.007	0.026	0.029
1	0.006	0.662	0.039	0.033	0.069
3.5	0.015	1.64	0.067	0.16	0.20
3.5 (7 d depuration)	0.10	0.24	0.006	0.20	0.099
3.5 (14 d depuration)	<0.003	0.022	<0.003	<0.003	<0.003

Transfer factors for liver, fat and milk are 1.1, 0.08 and 0.008 respectively. Anticipated residues in liver, fat and milk on feeding at 30% of the diet are 0.3×1.1×2 = 0.66 mg/kg for liver, 0.05 mg/kg for fat and 0.005 mg/kg for milk.

Livestock residues may exceed international and/or domestic market standards.

Thiram
- is a dithiocarbamate fungicide used on a variety of crops. It is used on grapes for the control of black spot at an application rate of 120 g ai/hl.
The harvest WHP is 7 days
Do not feed grass clipping from treated areas or treated seed to poultry or animals

There are Australian and Codex but no US MRLs for thiram in animal commodities. The Australian MRL for edible offal is 2 mg/kg while the Codex MRL is 0.5 mg/kg, both as CS_2.
The Australian PAFC MRL is 50 ppm and the grape MRL T10 mg/kg. Residues in grape pomace (dry) would be expected to be less than 50 ppm. The target tissue is liver. The TF for liver (45 ppm feeding study for mancozeb) was 0.003[71] giving an anticipated maximum residue from the feeding of grape pomace (dry) at 30% of the diet of 0.3×<50×0.003 = <0.05 mg/kg, less than the relevant international MRLs.

It is anticipated that animal product residues will be below typical method LOQs.

Triadimefon
-is a fungicide used for the control of powdery mildew mould in grapes. It is applied as a foliar spray at an application rate of 2.5 g ai/hL.
The harvest WHP is 14 days.

[71] 1993 JMPR - Pesticide Residues in Food - 1993 Evaluations, Part I Residues FAO Plant Production and Protection Paper 124. FAO and WHO 1994

There are Australian, Codex and US MRLs for animal tissues. The Australian/Codex residue definition is the sum of triadimefon and triadimenol. The MRLs are *0.05 mg/kg for edible offal and meat. The Australian and Codex MRLs for milk are *0.1 and *0.01 mg/kg respectively. The US residue definition is the sum of triadimefon and its metabolites containing chlorophenoxy and triazole moieties.
The Australian MRL for grapes is 1 mg/kg and 10 mg/kg for primary animal feed commodities. The US MRL (expire on 25/7/2010) for grapes is 1 mg/kg and grape pomace (wet and dry) 4 ppm.

In a lactating cow feeding studies were carried out with 1:1 mixture of triadimefon and triadimenol and at dose levels equivalent to feeding at 625, 1875 and 6250 ppm, fat contained residues up to 0.029 mg/kg at the 6250 mg/kg level and 0.016 ppm at the 1875 ppm dose level, whereas the residue level in the fat was less than 0.01 mg/kg at the 625 mg/kg feeding level[72].

It is anticipated that animal product residues will be below typical method LOQs.

Triadimenol
-is a fungicide used for the control of powdery mildew mould in grapes. It is applied as a foliar spray at an application rate of 2.5 g ai/hL.
The harvest WHP is 7 days.

There are Australian, Codex and US MRLs for animal tissues. The Australian/Codex residue definition is the sum of triadimefon and triadimenol. The MRLs are *0.01 mg/kg for edible offal and meat. The US residue definition is the sum triadimenol and its metabolites containing the chlorophenoxy moiety. The Australian MRL for grapes is 0.5 mg/kg and 0.5 mg/kg for forage of cereal grains.

See triadimefon above.

It is anticipated that animal product residues will be below typical method LOQs.

Trichlorfon
- is an organophosphate insecticide used for the control of various insects in crops. It is registered on grapes for the control of grapevine moth. The application rate is up to 125 g ai/hL.
The harvest WHP is 2 days.

There are no Codex MRLs for trichlorfon in animal tissues. The Australian MRL for cattle fat is 0.1 mg/kg and 0.5 mg/kg for the US tolerance. The Australian MRL for milks is *0.05 mg/kg while no milk MRL has been set in the US. The Australian MRL for grapes (fruits) is 0.1 mg/kg. Residues decline in soil and foliage with typical half-lives of 10 and 3 days respectively. Following peroral uptake of the trichlorfon (12.5 and 20 ppm in feed), no trichlorfon residues were detected (<0.1 ppm) in any of the examined tissues and organs (brain, heart, kidney, steak, fat) after a four week feeding period[73]. Residues in grape pomace are expected to be less than 20 ppm.

It is anticipated that animal product residues will be below typical method LOQs.

[72] 1983 JMPR Pesticide Residues in Food - 1983 Evaluations, FAO Plant Production and Protection Paper 61. FAO and WHO 1985
[73] 1971 JMPR. Evaluations of some pesticide residues in food. AGP/1971/M/9/1; WHO Pesticide Residues Series No. 1, 1972

Trifloxystrobin

-is a fungicide used for the control of powdery mildew in grapes. It is applied as a foliar spray at an application rate of 7.5 g ai/hL.
The harvest WHP is 5 weeks (35 days) for wine grapes and 10 weeks (70 days) for table grapes.
Do not allow stock to graze in any treated area

There are Australian, US and Codex MRLs for trifloxystrobin. The Australian and US MRLs for animal tissues have been set at *0.05 and 0.05 mg/kg respectively. The Codex MRLs for cattle kidney is *0.04, liver and meat 0.05, while milk is *0.02 mg/kg. The Australian and US MRLs for milk are *0.02 and 0.02 mg/kg respectively. The Australian MRL for grapes is 0.5 mg/kg and for grape pomace (dry) 3 mg/kg. The US MRL for grapes is 2 mg/kg.

Lactating cows dosed orally for 28 consecutive days with trifloxystrobin at levels equivalent to 2, 6 and 20 ppm in the diet had residues in tissues that were <0.02 mg/kg[74]. The exception was fat of cows fed at 20 ppm in the diet which had residues on 0.06 mg/kg. Anticipated residues in fat from feeding grape pomace at 30% of the diet are 0.3×3×0.003 = 0.0027 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

Trifluralin

- is a selective herbicide of the dinitroaniline class and is used for the control of grass and broadleaf weeds in crops including grapes. It is applied to grapes as a shielded or directed spray to bare ground. The application rate is up to 1.1 kg ai/ha.
No harvest or grazing/feeding WHPs required.

There are no Codex or US MRLs for trifluralin in animal tissues. There are no Codex or US MRLs for trifluralin in animal tissues. The Australian MRL for meat (mammalian) and milk are *0.05 mg/kg. The Australian MRL for grapes is *0.05 mg/kg. The US MRL for grapes is 0.05 mg/kg. The US EPA evaluation of trifluralin states that based on a goat metabolism study where animals were fed at exaggerated rates there is no expectation of finite residues of trifluralin in animal tissues[75]. Residues decline in soil and foliage with typical half-lives of 60 and 3 days respectively.

It is anticipated that animal product residues will be below typical method LOQs.

Zineb

- is a dithiocarbamate fungicide used on a variety of crops. It is used on grapes for the control of downy mildew at an application rate of 140 g ai/hL
The harvest WHP is 7 days

There are Australian and Codex but no US MRLs for zineb in animal commodities. The Australian MRL for edible offal is 2 mg/kg while the Codex MRL is 0.1 mg/kg, both as CS_2. The Australian PAFC MRL is 50 ppm and the grape MRL T10 mg/kg. Residues in grape pomace would be expected to be less than 50 ppm. The target tissue is liver. The TF for liver (45 ppm feeding study

[74] Public Release Summary on Evaluation of the new active TRIFLOXYSTROBIN in the product FLINT FUNGICIDE National Registration Authority for Agricultural and Veterinary Chemicals September 2000 Canberra Australia
[75] Reregistration Eligibility Decision, Trifluralin, List A Case 0179, Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division EPA 738-R-95-040, April 1996

with mancozeb) was 0.003[76] giving an anticipated maximum residue from the feeding of pomace at 30% of the diet of 0.3×<50×0.003 = <0.05 mg/kg, less than the relevant international MRLs.

It is anticipated that animal product residues will be below typical method LOQs.

Ziram
- is a dithiocarbamate fungicide used on a variety of crops. It is used on grapes for the control of black spot at an application rate of 114 g ai/hL
The harvest WHP is 7 days

There are Australian and Codex but no US MRLs for ziram in animal commodities. The Australian MRL for edible offal is 2 mg/kg while the Codex MRL is 0.1 mg/kg, both as CS_2. The Australian PAFC MRL is 50 ppm and the grapes MRL T10 mg/kg. Residues in grape pomace would be expected to be less than 50 ppm. The target tissue is liver. The TF for liver (45 ppm feeding study with mancozeb) was 0.003[77] giving an anticipated maximum residue from the feeding of grape pomace at 30% of the diet of 0.3×<50×0.003 = <0.05 mg/kg, less than the relevant international MRLs.

The US residue definition is ziram (zinc dimethyldithiocarbamate), calculated as zinc ethylenebisdithiocarbamate. The US MRL for grapes is 7 mg/kg.

It is anticipated that animal product residues will be below typical method LOQs.

[76] 1993 JMPR - Pesticide Residues in Food - 1993 Evaluations, Part I Residues FAO Plant Production and Protection Paper 124. FAO and WHO 1994
[77] 1993 JMPR - Pesticide Residues in Food - 1993 Evaluations, Part I Residues FAO Plant Production and Protection Paper 124. FAO and WHO 1994