Designing a Model Agrochemical Residue Control Program

RUSSELL JOHNSTONE
The Australian Wine Research Institute/CSIRO Division of Horticulture

Introduction
Ten times more Australian wine was exported in 1992/93 than as recently as 1985/86 and wine exported from Australia is now 25% of all wine produced in Australia. This rapid internationalization of the Australian wine industry means that Australian wine will be examined for the presence of substances that may be used as technical or non-tariff trade barriers.

A agrochemical residues are part of a suite of potential contaminants, including lead, chloride, sodium, biogenic amines, and malvidin diglucoside, which may have an effect on the exportability of Australian wine. In a world where consumption in most wine-consuming nations is decreasing or at best static, someone is losing market share, and this may increase the temptation for these barriers to be raised.

Wines have been excluded from markets because unwanted agrochemical residues were detected. For example, some European wines have been prohibited from sale in the USA when found to contain a residue of the fungicide procymidine.

Consumer confidence in the use of agrochemicals is also at a low ebb. Judging by press reports the situation here in Australia is similar to that of the United States, where it was recently reported in a Pennsylvania survey that trust that farmers used pesticides safely decreased from 84% to 62% between 1965 and 1984.

Our large international customers, such as those United Kingdom supermarkets subject to the United Kingdom Food Safety Act (1990), are at pains to ensure that the foodstuffs they purchase to sell as own-label produced, or buyer’s own brands, contain no unwanted surprises, including agrochemical residues. Successful defence of a prosecution under this act includes being able to demonstrate ‘due diligence’ in the purchase of such foodstuff. One of these supermarkets expressly asks of potential suppliers: what are the agrochemicals which were applied in the vineyard from which you source the grapes to be made into wine; what are the UK, European Community, and Australian maximum residue limits for those agrochemicals; what is the analysis for those agrochemicals; and what is the name and address of the laboratory which conducted that analysis.

The continuing successful export and domestic sales of Australian wine may in part hinge on managing the agrochemical composition of our wines. How is this best done?

Definitions
Before proceeding, some definitions will be useful.

A agrochemicals are best defined as ‘any chemical used in agriculture excluding fertilizers. This includes fungicides, insecticides, herbicides, nematicides, bird repellents, plant growth substances and fruit drying agents.’

The registration is the legal permission for a registered product to be used according to the label directions.

A tolerance or maximum residue limit (MRL) may be defined as the maximum residue of a substance legally permitted in a foodstuff.

The Australian Wine Research Institute’s A Agrochemicals Grid
A wine may be excluded from a market because it contains the residue of an agrochemical for which there is neither a maximum residue limit nor a registration. These circumstances existed when procymidine became an issue in wine in the United States. It is therefore important to know if the agrochemicals proposed to be used in the vineyard have MRLs or are registered in the country to which it is intended that the wine be exported.

For the last three years The Australian Wine Research Institute has produced a summary of this information, in our major wine markets, for those agrochemicals which are registered for use in Australian viticulture. The latest version has been published in the form of an A4 booklet.

A Agrochemical specification for winegrowers and vineyard managers
The information in the agrochemicals grid is just one of the parameters to be considered when making decisions about which agrochemicals may be used and when they may be applied in the growing season. Other parameters to be considered are: which pests and diseases are present, cost, efficacy, compatibility within mixtures of agrochemicals, phytotoxicity, the possibility of creating populations of resistant pests or diseases and the potential for the destruction of beneficial organisms.

Assuming that all of the above parameters are well understood and that the export destination for the wine is known, venturing considering exporting wine or intending to make wine to sell in bulk at a later stage may then use the grid to

Table 1. Example entry for iprodione or Rovral® from the 1993 version of the agrochemicals grid published by The Australian Wine Research Institute

<table>
<thead>
<tr>
<th>Agrochemical</th>
<th>Registered Products</th>
<th>Australia</th>
<th>Canada</th>
<th>Codex</th>
<th>Denmark</th>
<th>Japan</th>
<th>Netherlands</th>
<th>NZ</th>
<th>Singapore</th>
<th>Sweden</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fungicides</td>
<td></td>
<td>MRL (mg/kg)</td>
<td>MRL (mg/kg)</td>
<td>MRL (mg/kg)</td>
<td>MRL (mg/kg)</td>
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</tr>
<tr>
<td>Iprodione</td>
<td>Rovral</td>
<td>20.00</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>a</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>10.00</td>
<td>60.00</td>
</tr>
</tbody>
</table>

1. Codex A limentarius
narrow down the list of agrochemicals that may be selected. In the case of corporate vineyard managers a program may be constructed from all the information known.

To ensure that private contract winegrowers meet the requirements of wineries with respect to agrochemical residue, a specification may be drawn up as to which agrochemicals the purchaser of the grapes deems acceptable. This specification will provide information for each agrochemical: the registered product name, disease or pest to be targeted and the last date the agrochemical may be applied or withholding period. How is this withholding period arrived at?

The setting of an export withholding period for an agrochemical

There are several categories of agrochemical to consider when setting the withholding period. Some desirable agrochemicals will have few MRLs or registrations in markets to which a Australian wine is exported. A sub-group of these agrochemicals exists for which there is little knowledge of the rate at which their residue on grapes decays and the effect of the winemaking, processing and maturation regime on the final concentration of that residue. These agrochemicals are best applied before fruit set. This recommendation may be made on the assumption that when there is little of the grape present, any residues which may last from fruit set until harvest will be considerably diluted by the sheer volume increase which will occur as the berry grows. If there is some knowledge of the pattern of decay of an agrochemical, an arbitrary withholding period may be struck. It is assumed that that by observing this withholding period that there will be no detectable residue in the final wine.

Just what is meant by non-detectable residues? This appears to be governed by the capabilities of the chemists and the equipment used in the detection of residues. In some export destinations, for example the Netherlands, the limit of detection is specified and is generally between 10 and 50 µg/kg depending on the agrochemical being considered.

A guide to private contract winegrowers is an example of how increasingly for much of agricultural output, the producer may no longer consider that their responsibilities cease at the farm gate. It is important, however, that an atmosphere is created in which the grower can communicate to the intending purchaser of his grapes any problems that are being experienced with controlling disease in the vineyard as harvest approaches. If there are problems of this nature in the vineyard, then the grower must be encouraged to contact the winery to obtain advice about alternative agrochemicals and to make sure the winemaker is aware that an agrochemical that may not have been specified has been used. In this way the winemaker may take the appropriate action when the grapes are received. For example the wine made may be kept separate or a calculation made of what proportion that particular batch of grapes will make to a blend and estimating the likelihood of the residue being a problem in that blend.

Spray diary

It is critical to the success of this exercise that winegrowers be encouraged to keep good records of their agrochemical applications. Providing them with a spray diary to record this information will help to ensure this is done. The information recorded may include date, variety or block identification, registered product used, water or carrier/ha used, product/100 L or product/ha, growth stage, and any comments, for example rainfall, wind and temperature. The completed spray diaries may then be returned to the winery at harvest. Some agricultural enterprises refuse to take delivery of the harvested produce unless accompanied by a statutory declaration of what, how much and when agrochemicals have been applied. The information in the spray diaries may then be collated and used to assist in the detection of batches of grapes that may not meet the specification laid out for the grower at the commencement of the growing season. The successful return of spray diaries will obviously require either a good working relationship with the grower or some form of financial feedback as an incentive.

Monitoring the success of the program

There are two issues to be considered when instituting a quality assurance program to monitor agrochemical residues in wine. First, identification of those batches of grapes that fail to meet specification so that remedial action may be taken in the winery and the above feedback given to the errant winegrower; second, the monitoring of finished wines that are to be exported.

Grapes

Random sampling of incoming loads of grapes may be necessary as a means of monitoring the winegrowers' compliance with the specifications for the application of agrochemicals issued by wineries. There are several logistical problems with this strategy. These include ensuring that the sample is representative of the vineyard harvested, the storage of large quantities of frozen grapes for later analysis, finding laboratories capable of analysing these grapes, and of course the cost.

Wine

Wine is more convenient to analyse than grapes, therefore less expensive, and is more likely to be representative of the vineyard from which the grapes were drawn. If batching of grapes has occurred then the analysis of wines may not be that helpful for a traceback of errant winegrowers. The final barrier to wines with unwanted agrochemicals escaping onto export markets is the analysis of wines. Because agrochemical residues may be reduced by winemaking techniques, including processing aids, maturation regime used, and time, it is most appropriate to analyse wines prior to final blending. The information gained may then be used to aid blending decisions and to help determine the destination of the wine.

Summary

The maintenance of Australia's export success may depend in part on managing the agrochemical composition of our wine.