AWRI Abridged report prepared for:

NSW Primary Industries

31 December 2014

Contract # RFT DTIRIS 13/39

“Provision of a Skills Development Program for the NSW Wine Grape Industry”

Task 1.a. Survey of Pests and Disease Incidence and Severity

This report is an abridged version of the final survey report and describes the pests and diseases that were reported by a majority of survey respondents. A copy of the full report can be obtained by contacting Greg Dunn gregory.dunn@dpi.nsw.gov.au.

Photographs used throughout this report were taken from the pest and disease leaflet produced by the Australian Wine Research Institute as part of the delivery of the New South Wales Department of Primary Industries Viticulture Skills Development Program. All images, unless the source is otherwise labelled, were provided by Dr Richard Hamilton. An electronic version of the pest and disease leaflet can be accessed from the AWRI website here.
Executive summary:

The aim of this survey was to support the long term sustainability of the New South Wales grape and wine sector by assisting with the identification of areas for further research and development and to guide NSW DPI in providing appropriate and tailored resources to support the business practices of grape and wine producers in NSW. This detailed survey captured information about the pests and diseases that have occurred in NSW vineyards in the past 5-10 years in addition to the experiences of winegrape growers in recent seasons with regard to their management of vineyard pests and diseases. The survey was open for two and a half months and received 95 responses from 11 regions.

Powdery mildew, downy mildew and Botrytis attracted the highest reported incidence for diseases across NSW (76%, 83% and 87% of respondents respectively) and the varieties that were the most affected by these diseases were Chardonnay and Shiraz (representing 21% and 24% of NSW vineyard area respectively). Trunk diseases were reported by less than one third of survey respondents. Light brown apple moth was reported by 80% of respondents and birds by 100% and affecting up to 100% of vineyard area.

Most survey respondents reported that they applied agrochemicals to the vineyard 5-10 times in 2013-14 however, there were reports of up to 20 sprays applied in the past 5 seasons. Most respondents appeared to have a high level of knowledge of the spray equipment and water rates being used however, most reported that they only calibrate their spray equipment once per season.

More than half of respondents reported that they sought expert advice in 2013-14, a high proportion of those who sought external advice received it from chemical retailers and suppliers. Online resources are being well utilised for guidance on pest and disease issues indicating good awareness of the range of providers available. Pest and disease management, including spray application and resistance management, is considered to be a topic with high potential for training in NSW. Training in this area will increase the confidence of growers to choose and apply chemicals more effectively and also provide the potential for economic savings.
1. Survey structure and demographics:

The online survey attracted a total of 95 responses received from the largest NSW wine companies including Casella, Treasury Wine Estates, DeBortoli, Bartters, and McWilliams and from all of the major production areas of NSW (Figure 1). It is therefore assumed that the majority of vineyard area in NSW is represented in the responses. However, it is also acknowledged that the responses may be biased toward pest and disease management practices employed by large companies. There were a significant number of responses from the Hunter Valley (approximately 30%). This indicates the significance of the impact of pest and diseases in this region and also the level of engagement of growers in this region on the topic of pest and disease management. The varieties that were reported to be most affected by pests and diseases were Chardonnay and Shiraz. These two varieties represent 43% of the total NSW vineyard area (ABS 2012).

![Figure 1. Number of survey respondents by region.](image-url)
2. Key diseases:

a. Downy and powdery mildew:

A large proportion of the respondents reported that they had observed downy mildew (DM) (Figure 2) (83%) and powdery mildew (PM) (Figure 3) (76%) in their vineyards. The two varieties reported to have been most affected by these diseases were Shiraz and Chardonnay. Most respondents reported that in the past 5-10 years the incidence of DM was infrequent (1 in 5 years) however, this varied depending on variety. PM was most frequently reported to occur in Chardonnay and Shiraz 1 in every 10 years. The severity of DM in Shiraz and Chardonnay was typically 1-5% and PM was less than 10%. The chemical used most often for curative control of DM was phosphoric acid and metalaxyl, while the preventatives were Captan, copper and mancozeb. The chemicals used to prevent PM were predominately sulfur (88%) which was used more than once. Of all the other chemicals spiroxamine (Prosper), penconazole (Topas), pyraclostrobin (Cabrio), and quinoxyfen (Legend) were used once during the season. Some respondents reported on the repeated use of demethylation inhibitors (DMIs) (penconazole & myclobutanil) during the season.

![Figure 2. Downy mildew on upper (left) and lower (right) grapevine leaves](image1)

![Figure 3. Powdery mildew symptoms on a grapevine leaf (left) and bunch (right)](image2)

b. Botrytis:

A high proportion (87%) of respondents reported having observed Botrytis (Figure 4) in their vineyard, most reported that they are affected by this disease 1 in 10 years. Shiraz and Chardonnay were the two most affected varieties. The typical severity reported was 10% or less, although in Chardonnay 20% severity was more commonly reported (Hunter Valley predominately). In the 2013-14 season, most respondents reported only 1% of vineyard affected, with the exception of 2 vineyards in Orange which had 50% severity in Chardonnay. Chemicals used once included (in order of highest to lowest) cyprodinil + fludioxonil, iprodione, pyrimethanil and chloranthonil. Captan was reported as being used more than once by 15 respondents.

Botrytis is obviously a significant concern in NSW and several activities are either recently completed or are ongoing to address this issue. Included in the Vine Health field days which were conducted in Mudgee, Canberra, Murray Valley and the Riverina in September 2014, were a summary of previous work investigating the use of organic Botrytis controls completed by Richard Hilder as part of the GWRDC Regional trials in the Hunter Valley and also a presentation on Botrytis and other bunch rots given by Dr Trevor Wicks. Further work is currently underway in...
Mudgee and Orange which is extending the work investigating alternative methods of Botrytis control. This work is expected to be complete in June 2015.

Figure 4. Botrytis infection in a grape bunch

c. Non-Botrytis bunch rots:

Half of all the survey respondents answered ‘yes’ to having experienced non-Botrytis bunch rots (e.g. alternaria, cladosporium, black mould, blue mould, bitter rot, sour rot, rhizopus rot, botryosphaeria and ripe rot) in their vineyards, the varieties identified as being most affected were Chardonnay, Semillon and Shiraz. Most respondents reported seeing non-Botrytis bunch rots within 1 to 5 or 10 years. Non-Botrytis bunch rots were reported more frequently (1 in 3 years) in the Hunter Valley. Severity of these diseases was variable over the past 5-10 years with mostly 1-3% severity reported. However, 50% of the vineyard was affected in Semillon, Chardonnay and Shiraz from the Hunter Valley during that period. In the 2013-14 season, most respondents reported seeing 1% of vineyards affected.

The response to non-Botrytis bunch rots is as expected and the recommendations made above with regard to the existing extension activities around Botrytis management are also applicable here.

Figure 5. Examples of non-Botrytis bunch rots bitter rot (Greeneria uvicola) (left) and sour rot – Complexes associated with Aspergillus and Rhizopus rots (right). Images sourced from http://archive.agric.wa.gov.au/

d. Eutypa and other trunk diseases:

Only 28% of respondents reported Eutypa in their vineyards (from a total of 79) (Figure 6). Most reported only 1% of vineyard being affected and both Shiraz and Chardonnay being the most affected varieties. The reports of Eutypa incidence were from across NSW (no specific references to region).

Less than one third of all respondents reported other trunk diseases (e.g. Esca, Botryosphaeria dieback) in their vineyard. Of those respondents most reported 1% of their vineyard exhibited symptoms in 2013-14.
respondents reported that 50% of their vineyard had symptoms (Hunter Valley) and a single respondent in Mudgee reported 100% symptomatic vines.

Information about trunk diseases was presented as part of the Vine Health field days in September 2014 and a demonstration site for the renewal of vines affected with trunk diseases is being implemented in the Riverina as part of the delivery of the AGWA Regional program. Trunk diseases are currently a major focus of grape and wine producers in Victoria with numerous workshops and field walks held in 2014. The survey result was unexpected and it is possible that either growers are not familiar with the symptoms of trunk diseases or that the severity of trunk diseases are not significantly severe to warrant reporting. It further indicates that more dissemination activities are required to alert growers if in fact the incidence of trunk diseases is less in NSW compared to the other states.

Figure 6. A grapevine infected with the trunk disease Eutypa (left) (image: http://www.winesandvines.com/template.cfm?section=features&content=48286) and symptoms of Botryosphaeria dieback in a grapevine trunk (right) (image: http://www.csu.edu.au)

e. Light Brown Apple Moth:

Approximately 80% of respondents reported having seen Light brown apple moth (LBAM) in their vineyards. Most respondents reported having seen LBAM every year in their vineyard with Chardonnay, Semillon and Shiraz being the preferred varieties of LBAM. The typical severity reported varied greatly but the majority of respondents reported 1% of their vineyard area was affected.

In 2013-14, LBAM severity was considered to have affected 1% of vineyard area. Chardonnay and Shiraz were the worst affected. The chemicals used to control LBAM in 2013-14 included methoxyfenozide, which was used once, in addition to repeated applications of Bacillus thuringiensis (Bt) which was the preferred product.

The results of the survey were expected. There is little scope for improvement specific to the control of LBAM since control is achieved as a curative measure despite control being critical because of its association with Botrytis spread and infection.

Figure 7. Light brown apple moth (LBAM) left to right: adult, late season egg mass, late instar caterpillar and larvae.
f. **Mites:**

More than half of all respondents reported mites in their vineyards, the most common frequency reported was 1 in every 5 years. Chardonnay and Shiraz were the two varieties identified as being the most affected. Severity varied across the respondents with 1-10% of vineyard affected in the past 5-10 years. However, in 2013-14 it was reported that 1% of the vineyard area was affected. Sulfur was the chemical of choice for the control of mites.

Approximately 20% of respondents indicated they had seen two-spotted mites in their vineyards (all from the Hunter Valley), predominately every year with up to 20% of vineyard (Chardonnay and Semillon) affected. In 2013-14 two-spotted mites were estimated to affect 1% of vineyard area. The most common form of control was sulfur applied more than once during the season.

**g. Vine Moth:**

A majority of respondents (86%) reported vine moth in their vineyards, generally on an annual basis with approximately 1% of the vineyard area affected. In 2013-14 the severity of vine moth damage was considered to be 1%. However, there were some reports of 100% of the vineyard area being affected. BT was the most common form of insecticide used in 2013-14 for control of vine moth, followed by indoxacarb.

Despite there being a high number of responses to vine moth, it is not considered a major threat to grape production in NSW.

**h. Mealy Bug:**

Approximately one quarter of respondents observed mealy bug in their vineyard and large variability of responses with regards to its frequency. Chardonnay was the variety most affected, predominately in the Hunter Valley and Riverina. The severity of mealy bug damage was considered to be 1% of vineyard area in the past 5-10 years as well as in 2013-14. Four respondents reported using some form of chemical control, with two respondents reporting the use of buprofezin and two having used chlothianidin.

![Mealy Bug Image](http://www.winetitles.com/diagnosis/details.asp?view=143)

**Figure 8. Long tailed mealy bug. Image: http://www.winetitles.com/diagnosis/details.asp?view=143**

**i. Grapevine scale:**

Approximately half of respondents reported grapevine scale in their vineyards. A uniform distribution of respondents reported that their vineyards were affected by the pest, with Shiraz being the most affected variety. Severity levels of scale damage were considered <5% in the majority of responses, with the same figure reported for the 2013-14 season. Petroleum oil was the chemical used most for control, with those that used it doing so more than once.
j. **Snails:**

Around half of the respondents reported snails in their vineyards. The frequency of their occurrence was highly variable across responses. Chardonnay, Semillon and Shiraz were reported as being most affected by snails. The severity of snails varied between 1% and 10% (Hunter Valley) of vineyard area affected. Most respondents indicated that in 2013-14, 1% of vineyard area was affected. Snail bait (metaldehyde) was the most common control used for snails.

k. **Bird Damage:**

Close to 100% of respondents indicated that their vineyards had been affected by bird damage. Birds are seen as an annual problem with Chardonnay, Semillon and Shiraz being worst affected. The typical severity was reported as 1-3% and in 2013-14 slightly higher at 1-5% with some vineyards reporting 50% (Hunter) and 100% (Hilltops).

l. **Other Pests and Diseases:**

Respondents were asked to list other pests and diseases that were of concern that were not previously reported.

Ranked according to the frequency of responses:
- Kangaroos
- Phomopsis
- Katydids
- Fruit tree borer
- Feral Deer/cattle/pigs
- Virus
- Others included Agrobacterium, borers, earwigs, flying fox, hares, rabbits, nematodes

Respondents to this question thought 15% of crop losses could be attributed to this list of pests and diseases. There is an opportunity to incorporate these additional pests and diseases into an update of the pest and disease leaflet delivered as part of the NSW SDP in 2014 (access [here](#)).
3. Agrochemical use:

The majority of all respondents reported that they had sprayed 5-10 times in 2013-14 (Figure 9). Others who responded higher than this (12-14) came from the Hunter Valley and New England regions. In the five years prior to last season, respondents reported up to 20 sprays per season, with a higher proportion of respondents reporting more than six applications per season (Figure 10). This skew in the data is a result of a greater number of responses from the Hunter Valley.

![Figure 9. The number of agrochemical sprays applied in 2013-14.](image1)

![Figure 10. The number of agrochemical sprays applied in the past 5-10 years.](image2)

a. Spray technology:

The majority of respondents reported the use of either air blast or quantum mist sprayers (Figure 11) and the most commonly reported spray nozzles were hollow cones followed by air shear and solid cone (Figure 12).
Figure 11. Types of spray units used by survey respondents.

Figure 12. Responses to the question: What type of spray nozzle do you use?

Most respondents are using concentrate spraying (Figure 13). The majority of respondents indicated that as season progresses they adjust water rates accordingly for canopy size (Figure 14). The peak at 600-900L/ha indicates a large proportion of respondents using concentrate spraying (confirmed in Figure 13). A high proportion of survey respondents reported that they were unable to spray for between 1-6 days or up to 14 days in 2013-14 growing season.

Figure 13. The proportion of survey respondents using dilute or concentrate spraying.
b. Monitoring sprays and sourcing information:

Most respondents (83%) indicated they did monitor their spray coverage. The most common method used was using a visual inspection (Figure 15). Calibration of spray equipment was most commonly done once per season. Approximately 10% of respondents indicated they had used a mobile phone app to assist with spray calibration and 63% of respondents indicated they would be interested in using an app with calibration capabilities.

Most survey respondents indicated that they assessed the effectiveness of their spray program using a visual observation of presence or absence of pests and diseases. A few respondents indicated that they undertook pest and disease monitoring and two respondents reported that they compare the disease severity in their own vineyards to what is occurring within their region.

The majority of respondents consult the AWRI ‘Dog book’ (available for download here) to assist with resistance management, followed by product labels (50%) and websites (Error! Reference source not found.). Expert advice was sought by approximately 60% of respondents in 2013-14. External advice was sought by growers from a range of sources including a high proportion of growers seeking advice from chemical retailers and suppliers (Figure 16).

Online information on pests and diseases was sought predominantly from the AWRI website followed closely by NSW based websites and AGWA (Table 1). Approximately 60% of respondents reported that they use the NSW
Grapevine management guide and 80% of respondents indicated they used the paper copy of the dog book in 2013-14.

Figure 16. Sources of external advice sought by NSW grape and wine producers in 2013-14.

Table 1. Sources of online information consulted by grape and wine producers.

<table>
<thead>
<tr>
<th>Source</th>
<th>% respondents</th>
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</thead>
<tbody>
<tr>
<td>The Australian Wine Research Institute</td>
<td>69%</td>
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<tr>
<td>NSW Department of Primary Industries</td>
<td>33%</td>
</tr>
<tr>
<td>Australian Grape and Wine Authority (formerly GWRDC)</td>
<td>33%</td>
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<tr>
<td>National Wine and Grape Industry Centre</td>
<td>21%</td>
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<tr>
<td>South Australian Research and Development Institute</td>
<td>12%</td>
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<tr>
<td>Elders</td>
<td>10%</td>
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<tr>
<td>Landmark</td>
<td>9%</td>
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<tr>
<td>Department of Agriculture and Food Western Australia</td>
<td>7%</td>
</tr>
<tr>
<td>Victorian Department of Environment and Primary Industries</td>
<td>2%</td>
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When asked for suggestions for other ways to receive up to date pest and disease information, the most common response was by email, followed by a mobile phone app, phone alerts and keeping consultants up to date. Other suggestions included newsletters in the mail, re-instate a collateral manager at CESAR, and the AWRI website to have a disease specific section for the most up to date research.

Other comments received included the following:

- More regional research to make more relevant
- Information about compatibility of mixing chemicals, potential for App (this was requested numerous times)
- More information on chemical MRL’s and trade restrictions
- A service using aerial mapping to ID problem areas in vineyards
- Lack of websites such as ‘pest genie’
More information on insecticides and what affect they have on beneficials in vineyards

Botrytis, effective cheap organic options

4. Conclusions
The results of this survey confirm that grapevine diseases currently affecting NSW vineyards are powdery mildew, downy mildew, Botrytis and other bunch rots. The current pests of concern include light brown apple moth and birds. Grape and wine producers have a high level of knowledge of the equipment and methods used for spraying however, some of the practices reported, including a lack of ongoing equipment calibration, highlight a requirement for additional resources to support more efficient pest and disease control.

References