IPM – What Benchmarks Do We Have?

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Benchmarking involves comparing your performance against ‘best practice.’ This may involve:
• assessing where your business is in relation to ‘best practice’
• comparing your practices with the rest of the industry
• comparing your practices to industry changes over time

Hurford and Vast (1997)

**Benchmarking in agriculture**

The development of benchmarks is not straightforward in any agricultural system. Unlike the controllable processes of a manufacturing operation, the changing environment faced in crop production makes comparing performance a complicated task. Attempts to define ‘best practice’ in agriculture have used overall targets or outcomes: e.g. yield, quality, maximum residue levels (MRLs), risk, environmental considerations and/or costs, and their potential impact on economic, social, natural resource and environmental factors. In agriculture it is difficult to identify measurable benchmarks which accurately reflect these criteria (McGuckian 1996). The dynamic and complex system that includes the physical environment (such as weather, soil, water), the grapevine and the biological environment (including the people) means ‘best results’ are relative. Table 1 shows the variation in chemical costs (including application) for vineyards between growers and between seasons (Grinter 1997).

Table 1. Total chemical plus spray application costs in three different vineyards in Australia over three seasons.

<table>
<thead>
<tr>
<th>Region/grower</th>
<th>1992/93</th>
<th>1993/94</th>
<th>1994/95</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$464.11</td>
<td>$164.73</td>
<td>$179.17</td>
</tr>
<tr>
<td>B</td>
<td>$164.52</td>
<td>$69.64</td>
<td>$122.09</td>
</tr>
<tr>
<td>C</td>
<td>$176.11</td>
<td>$98.55</td>
<td>$177.42</td>
</tr>
</tbody>
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Grinter (1997)

**The integrated pest management (IPM) approach**

It is also difficult to relate outcomes in a dynamic system back to specific inputs. Using an integrated pest management (IPM) approach, even measuring inputs (e.g. number of spray applications) can be misleading as the need to spray is site, variety, region and season specific. An IPM approach is based on knowledge of the pest, monitoring and responding to a changing environment, so one year may require one spray and the following year four sprays. Both may be best practice IPM. Specific objectives or performance indicators for benchmarks will also be quite different for target markets, such as dried fruit, wine grapes or table grapes.

In order to benchmark any type of pest management in vineyards against defined outcomes, the outcomes must be measurable, reasonably easy to calculate and meaningful to pest managers. Since IPM in vineyards introduces even more variability than a routine pest control program, benchmarking will have to be approached differently.

Although outcomes and inputs are subject to inherent seasonal and site variability, there is potential for benchmarking the processes of IPM rather than the numbers. The variation between seasons and between sites can also be put into a broader, more meaningful context. There is potential to develop a better understanding of patterns between numbers over time, and how they relate within and between vineyards and seasons. An on-going approach to benchmarking rather than a one-off event will contribute to better management of pest and disease in a dynamic vineyard environment.

**The processes of IPM**

The concept of IPM grew out of the realisation in the 1960s and 1970s that chemicals in agriculture are just one potential player in the bigger scheme of things. The development of insecticide resistance and the growing awareness of the impact of agricultural chemicals on the environment changed the more comfortable perception that pest management in agriculture would become increasingly straightforward.

As the broader impact of chemicals became apparent, an ecological approach developed that changed the focus of scientific research from the specific to the bigger picture. Ecology put the pest into a broader context that encompassed an understanding of its impact on the crop, its natural enemies, its life cycle and when and how it was most vulnerable to disruption. Watching, measuring and learning about the pest became valuable tools for more effective and environmentally sustainable use of chemicals. This integrated pest management approach has helped develop a different view of pest management in agriculture. In a world-wide assessment of IPM, it was found that when an IPM system is used, pest management costs are usually lower, net returns greater and risk the same or lower than with conventional pest control methods (Parigi 1995).

**IPM in viticulture**

Although many growers may still be using routine fortnightly sprays to gain results in viticulture, the demands of export markets and environmental considerations will have an impact on the requirements of wine grapegrowers—a best practice result as defined by the market. Benchmarking can help clarify the basic concepts of IPM in viticulture, and identify areas where current pest management practices can be changed to help meet both economic and market objectives.

Through the training program for the IPM Viticulture: Research to Practice™ workshops over the past year, a team of researchers and educators have brought together much of the information that has been developed for management of pests in Australian viticulture into an IPM package. We have been working with growers to develop and validate IPM methods that improve pest management for vineyards. With standardised, repeatable processes as a framework, we found it is possible to identify parameters for best practice pest management in viticulture. In contrast to the variability inherent in the best result numbers, the best practice processes involved in IPM at most levels, between seasons, between regions, between pests are the same.
These processes of IPM lend themselves well to the benchmarking process. They include:

- correct identification of the pest
- pest and weather monitoring/forecasting
- using thresholds for decision-making
- effective spray application
- records/documentation
- harvest assessment
- ongoing education/training

IPM programs based on these processes have been developed for the key viticulture pests in Australia including: lightbrown apple moth, downy mildew, powdery mildew, phomopsis and botrytis. An example of some of the processes of IPM are illustrated with lightbrown apple moth as follows:

Identification

Lightbrown apple moth is the only caterpillar pest that is of economic importance in mature grapevines. Identification is therefore not an important issue for ongoing IPM programs.

Monitoring

In the past pheromone or port wine traps were used to monitor lightbrown apple moth flights and sprays were applied accordingly. Recent work has shown that moth trapping can be misleading, e.g. large moth flights did not result in eggs being laid in the vines. More consistent, accurate management of lightbrown apple moth is obtained by monitoring egg masses. It gives a clear option of ‘No eggs, don’t spray.’ If there are no eggs in the vines, searching for egg masses can be discouraging for beginners, but with a bit of experience, it can be a very effective method for reducing sprays and reducing the risk. It gives us confidence that we know what is happening. Egg hatch is monitored for improved timing of sprays. No matter what control measure is used, getting the timing right will markedly improve its efficacy.

Thresholds for decision-making

Treatment thresholds are used to assess whether it is more economic to apply control measures or not. Although treatment thresholds are notoriously difficult to develop and vary depending on the market requirements, they are very helpful as a guide. With LBA M, we have found that three egg masses per 1000 leaves (50 leaves per panel over 20 panels) has provided a useful indicator for treatment. This threshold was developed in the Yarra Valley trials where botrytis is a major concern. Growers in regions less susceptible to botrytis who developed in the Yarra Valley trials where botrytis is a major concern. Thresholds may vary depending on thresholds.

Effective spray application

Calibration of equipment, vine row volume and aiming the spray at the appropriate target can have a major impact on the efficacy of sprays. LBA M damage is only a problem when it occurs in the bunches. Berry coverage can be checked using fluorescent dyes and water sensitive papers. LBA M larvae can be monitored before and after sprays to make sure they were controlled effectively.

Records/documentation

Recording monitoring results and sprays is necessary for assessing efficacy of treatments and MRLs. Historical records can help understand pest cycles and predict the most efficient monitoring times. Field notes can document over time the areas where there are LBA M hot spots.

Harvest assessment

A n essential part of IPM is relating the results back to the decisions made. Disease incidence at harvest can be correlated with treatments, thresholds, efficacy of sprays, etc. Although outcomes may not directly reflect IPM inputs, it can help provide a longer term perspective on the need for sprays, planning, etc.

Education/training of pest management staff

Keeping up with the latest methods has helped growers understand and practice effective egg monitoring, develop relevant thresholds, and assess the potential for alternate treatments such as Trichogramma wasps, Bacillus thuringiensis (Bt), etc. As market demands put more pressure on pest management systems, keeping up-to-date is an essential aspect of best practice IPM.

Although the dynamic nature of the vineyard makes comparing performance more difficult, the potential for developing and benchmarking an IPM approach to pest management in any region and any vineyard is a viable one. The knowledge-based approach of IPM helps take the risk out of pest management.

IPM is a relatively new approach to pest management in vineyards. As growers become more experienced and confident using IPM processes, we expect improved economic returns in the short term and a better understanding of its potential for meeting the demands of a changing market-place, the potential for resistance management and environmentally sustainable viticulture practices. IPM itself is a dynamic process, between growers, researchers, chemical companies, and others in the industry. It continues to change and grow in light of new observations, evidence and experiences. Although it is apparent that dealing with a changing environment can make benchmarking more difficult, it is apparent that there are many opportunities for the development of benchmarking as a method to incorporate and improve current IPM systems in vineyards.

References


