What practices in the vineyard lead to the consistent production of medal-winning wines?



FINAL REPORT FOR INCUBATOR PROJECT

Project number: **UA1801**

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Research organisation: **THE UNIVERSITY OF ADELAIDE**

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Photo courtesy Barossa Grape & Wine Association

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Abstract

Twelve years of wine judging results from the Barossa Wine Show were analysed to discover those Shiraz and Riesling wines consistently winning medals. An email survey was deployed to ascertain the viticultural practices used to grow the fruit to produce these wines. The viticulturists for the 15 Riesling and 17 Shiraz wines were contacted. Due to a variety of reasons, there were difficulties in obtaining responses. Other approaches to improve the data collection for this type of study are discussed. In general, the responses to the survey showed that medal winning wines were made from grapes from single cordon, spur pruned vines with approximately 40 buds left at pruning.

Executive summary

Results show that in general fruit produced for consistent medal winning wines is more likely to be from spur pruned vines, trained to a single cordon and with fewer than 40 buds per vine at pruning. This vineyards will have good vineyard floor management – with no bare soils for either Shiraz or Riesling as well as relatively low volumes of water use.

Survey response collection was challenging particularly for Shiraz wines. Busyness, inconsistent ownership, blend variations, and confidentiality all contributed to the low response rate. A recommendation is to document vineyard practices centrally as part of the wine show entrance, based on the elements covered by this report. This practice would make it possible for growers and wine makers to analyse the practices over time, which provide for "higher" quality wine.

The wine show system holds elements of self-selection (not all wines are entered) and variability in judging quality. To better understand which vineyard practices lead to better quality wines another approach could be to start from the vineyard perspective. Blocks of Shiraz or Riesling from the Barossa Valley and Eden Valley could be assessed for the vineyard practices they use and then this information could be linked back to a wine. Wine writers could then link the wine back to any show results or features. In this way, a greater cross section of the Barossa could be analysed and more holistic data produced.

The Waite Research Institute contributed financially to the project and is engaged to develop the extension materials to be presented to the Regional Partner. Additionally, Torbreck's Nigel Blieschke provided input on the survey development and Nicki Robins, from the Barossa Wine Association, has edited and contributed to drafts of all the work arising from this project as well as providing show results and contact information.

Aims and background

Gold medals and well-known regions, particularly those associated with high quality reputations, increase consumer intent for purchasing a wine (Lockshin *et al.* 2006). An increase in gold medals will certainly also drive an increase in recognisable regionality and reinforce its links to wine quality. Adoption of practices in production that consistently lead to gold medal winning wines will improve both the marketability of the region and its products, improving financial stability.

It is argued, that vinification is the main driver of wine quality and in fact, the presence of some oak compounds is a well-known consumer and expert mark of quality (Gambetta *et al.*, 2017). However, only wines made from quality grapes are selected for oak treatment, therefore the original grape quality at the winery door will drive all further downstream vinification decisions.

Grape composition is also an important driver of flavour and aroma in a final wine. Management practices are able to alter the concentration of enzymes and compounds that act as precursors to many esters affecting wine volatile compounds (Boss *et al.*, 2018) which also effect quality. The practices investigated by this research included pruning, trellising, nutrition, soil health, pest and disease management, mid-row and under-vine management, irrigation timing and amount, canopy management and harvest management, all of which are practices that make for sustainable viticulture (van Leeuwen *et al*., 2009). Management techniques can have a significant influence on vine health and grape quality (González-Barreiro *et al.*, 2015): Do any of these techniques link specifically to a noticeable improvement in the performance of a wine at a wine show?

Materials and methods

Show data

Catalogues of results from 21 Barossa Wine Shows were made available. These were from 1985, 1990, 1997, 1998, 1999, 2000, 2002, 2003, 2004, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017 and 2018. The results from the Riesling categories (current vintage, two year old, museum) and Shiraz (1 year old, 2 year old, 3 plus year old and museum) were analysed for consistent winners. It was decided to focus on the results from the previous 12 years (2007 – 2018) as there were continuous records available.

Over the course of this 12 year period there were instances of wineries changing names, wines themselves renamed or rebranded, and wineries and brands being bought by other

companies. The data has been normalised as best as possible in an attempt to amalgamate this information.

'Consistent' was defined as a wine which had won a medal in at least three consecutive vintages and at least one of them was a gold. Consecutive vintages should help to highlight the consistent performers. This method selected 15 Riesling wines and 17 Shiraz wines.

A survey was constructed (see Appendix A) to gather a range of information on the viticultural practices of the selected wines. The Riesling wines received a 60% response rate and the Shiraz 25%.

Results and discussion

Show data

Riesling

The Riesling wines entered in the Barossa wine show between 2007-2018 were submitted in three classes – Current vintage (Class 1), One year old (Class 2) and a mixed class that had two or more years old wines (Class 3). To be a consistent medal winner wines needed to win at least three medals therefore any winery that had entered less than three times was removed from the list. On average more than half the entrants in the wine show were awarded a medal (See Figure 1A, 1C, 1E). Of the three Riesling classes, Class 1 was one where an entrant was least likely to be awarded a medal with between 50-60% of entrants between 2007 and 2011 awarded no medal. From 2012 – 2017 this dropped below half to as low as 30 % in 2012 and 2013 aligning with anecdotally good vintages in the Eden Valley (Figure 1B). For Class 2 an entrant was more likely to be awarded a Bronze medal with on average 40% of all entrants falling into this category (Figure 1C). In Class 3 almost half of all entrants were awarded a gold medal (Figure 1E) however this category is considerably smaller (Table 1) and is mostly populated by the same few wines.

Shiraz

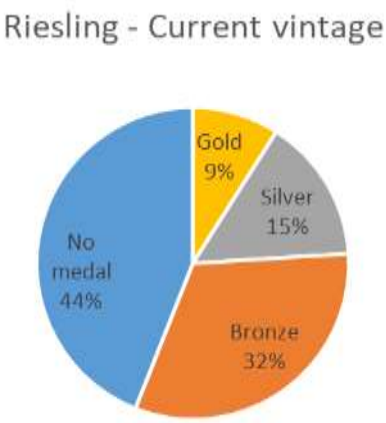
The Shiraz classes are one year old (Class 9), two years old (Class 10) and three or more years old (Class 11). Class 10 is the most popular class in the Barossa Wine Show with on average 104 entrants in any given year (Table 1). This ranges from a low of 40 in 2007 to 166 entrants in 2018. Unlike the Riesling categories in which as age increases the likelihood of no

medal decreases, in the Shiraz categories an entrant becomes more likely to not be awarded a medal. Of the average 81 entrants in Class 11 – 49 % were not awarded a medal (Figure 2E).

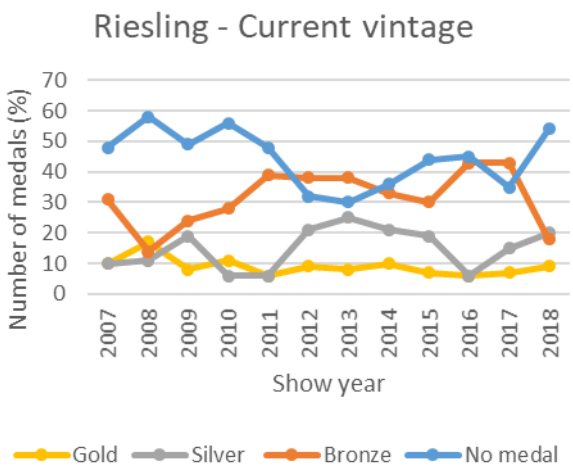
Table 1. Average number of entrants in each of the Barossa Wine Show Classes analysed.

Class		***Average number of entrants***
1	Current vintage Riesling	42
2	1 year old Riesling	34
3	2 + year old Riesling	7
9	1 year old Shiraz	38
10	2 year old Shiraz	104
11	3 + year old Shiraz	81

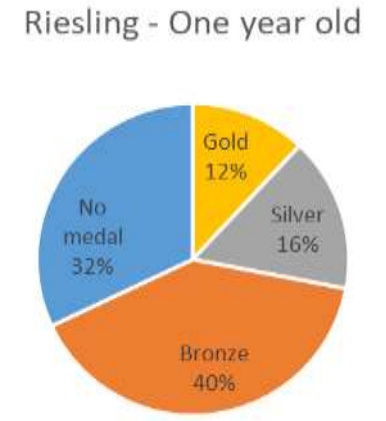
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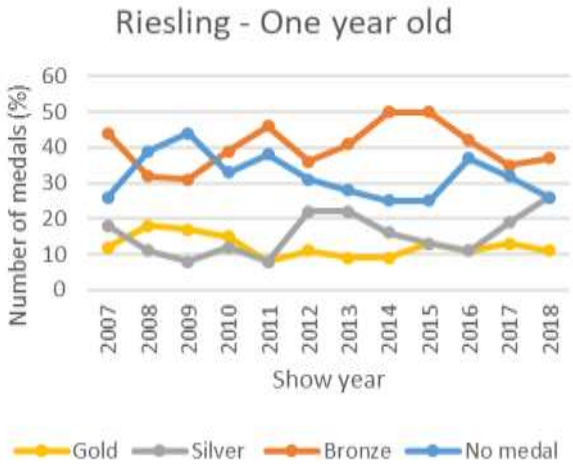
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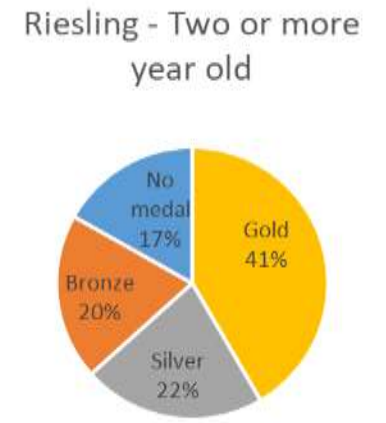
C



D



E



F

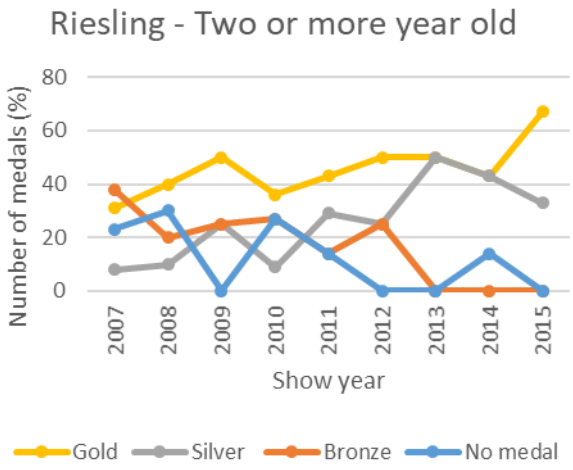
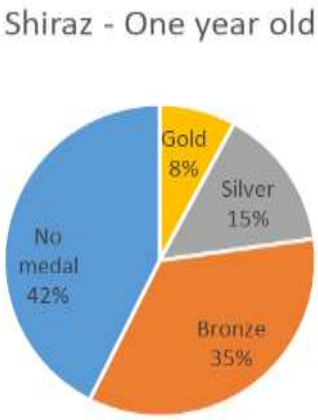


Figure 1. Riesling results from the Barossa Wine Show from each of the three classes. The graphs on the left represent the average number of medals awarded for the twelve years surveyed (A, C, E). The graphs on the right break down the percentage of each medal awarded in each year (B, D, F).

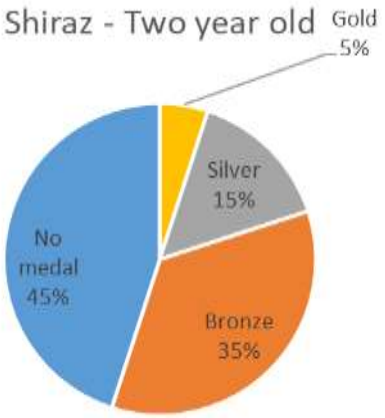
A



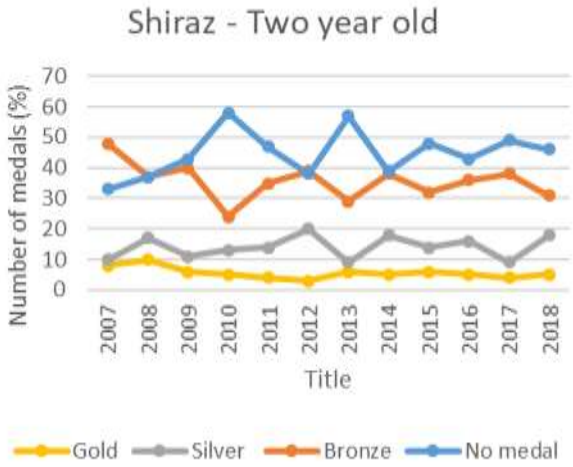
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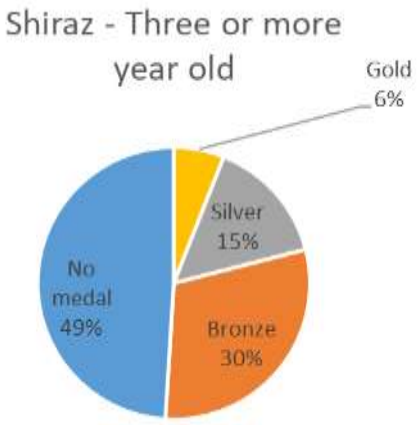
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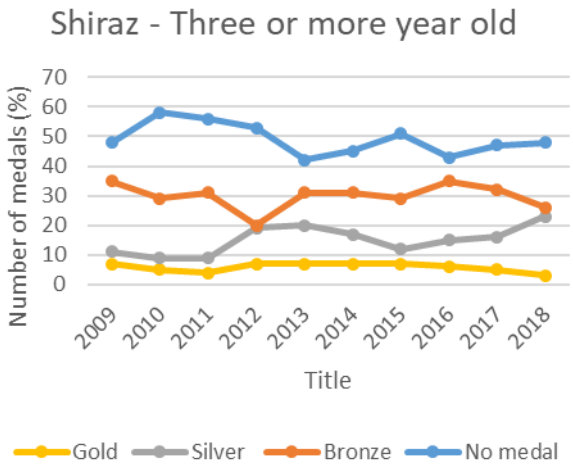


Figure 2. Shiraz results from the Barossa Wine Show from each of the three classes. The graphs on the left represent the average number of medals awarded for the twelve years surveyed (A, C, E). The graphs on the right break down the percentage of each medal awarded in each year (B, D, F).

Viticultural practices

Riesling

The results of the survey showed a range of practices responsible for the consistent medal winners (Table 2). The responses to the questions varied considerably. The majority of these vineyards were spur pruned with single wire cordons. The mid-row management for all of the blocks was a permanent sward with half of the blocks also using straw mulch. In the Eden Valley approximately 35 % of vineyards use mulch (Nordestgaard, 2019). The majority of Riesling vines were on own roots. Bud number varied from 30 -44 with the most common response being 40. The Vineyards were all located in the Eden valley and seemed to cluster along two main ridges (Figure 3).

Table 2. Viticultural practices of Riesling consistent medal winners

Question	*Range of response*
Planting year	1964-2002
Clone/Rootstock	Own roots (70%)
Vines/ha	1200-2222
Bud number	30-44 (40 by 64%)
Harvest Method	50% Hand/Machine
Type of viticulture	Conventional (14% Biodynamic)
Trellis	65% Single wire
Pruning	80 % Spur
Mid-row management	100% Permanent sward
Undervine management	50% Straw mulch
Frequency of irrigation	As required – weekly – 7hrs/week
Amount	0.5-1.5 ML/ha

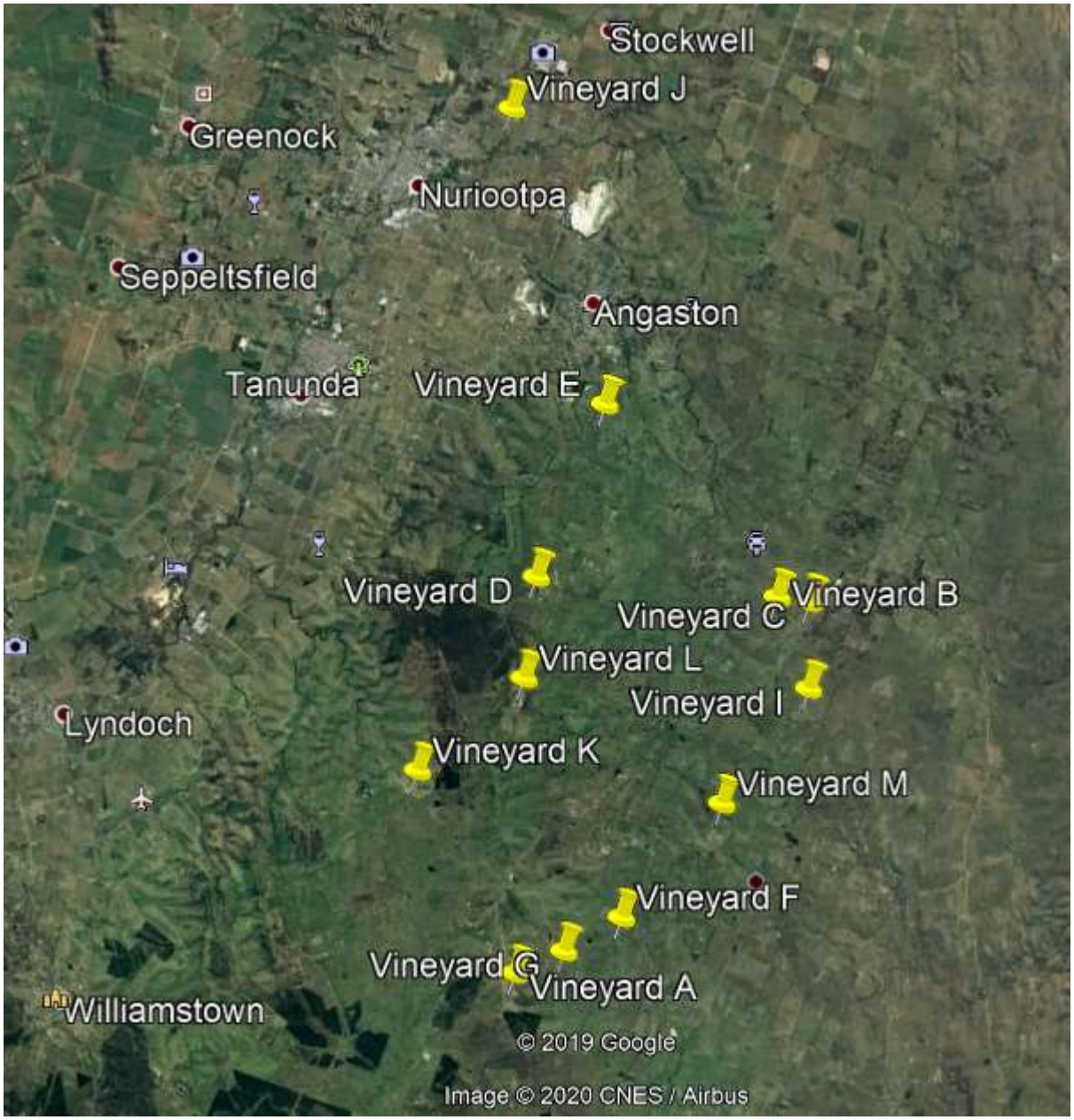


Figure 3. Locations of surveyed Riesling vineyards

Shiraz

The results of the survey showed a range of practices responsible for the consistent medal winners (Table 3). As with Riesling, these vineyards were spur pruned with single wire cordons. The mid-row management for all of the blocks was a permanent sward/cover crop with half of the blocks surveyed adding mulch. This is compared to approximately 25 % of vineyards in the Barossa adding mulch (Nordestgaard, 2019). Irrigation volumes were low with the average irrigation for the Barossa region being over 1 ML/ha (Nordestgaard, 2019). Bud number varied from 28-40 with the most common response being 40. Due to the low

response rate to the Shiraz survey the locations have not been plotted as no real trends can be elucidated from the data.

Table 3. Viticultural practices of Shiraz consistent medal winners

Question	*Range of response*
Planting year	1963-2001
Clone	1654 (50%)
Rootstock	Own roots
Vines/ha	1298-1851
Bud number	28-40
Harvest Method	Machine
Type of viticulture	Conventional
Trellis	Single wire
Pruning	Spur
Mid-row management	Cover crop/sward
Undervine management	50% Straw mulch
Frequency of irrigation	Varied response
Amount	0.2-0.5 ML/ha

Discussion

In order to more clearly find a consistent practice for winning wines, the wines that did not ever score a medal at the Barossa Wine Show were analysed. As with the analysed medal winners, the wine had to have entered at least three shows and have not been awarded a medal in more than half of their showings. Unfortunately, these wineries declined to participate in the project.

In an attempt to address this, a winery that entered multiple wines in the wine show where one was classified as a consistent winner and the other not ('non-consistent') was approached for vineyard management information on both Shiraz and Riesling. In this case the survey responses of the 'non-consistent' wines still fitted the parameters of Table 2 and 3. Even though the wine was not considered 'consistent' by this projects definition ie won three consecutive medals, one of which must be a gold, it had still been awarded medals at the show and was still therefore a quality product.

Although rigorous, the Australian wine show system is far from fallible, yet significant improvements are continuously occurring (Jordan, Robinson and Bulleid, 2015). No two judges will ever perceive each wine in exactly the same way. Further, if the context or judging environment of a given wine is different this will impact judges perceptions, likely leading to different outcomes (Bastian *et al.*, 2019). There is variation in the show data that suggest that even though a wine is not necessarily a gold medal winner it may very well still be a quality wine made from premium fruit. Table 4 highlights the results of Peter Lehman Wigan Riesling at the Barossa Wine Show and compares these results to results from other capital city wine shows. The variation in these results for the 2013 Wigan Riesling is clear. For example the wine won a Gold and a trophy at the Barossa wine show but no medal in Sydney, and only Bronze at the Adelaide and Melbourne shows. The Wigan Riesling was been selected for this exercise at it is the most awarded Riesling at the Barossa wine show, and had also consistently won a trophy in the provenance section, implying a consistent product. This variation in awards also suggests that although a wine needed to have won a gold medal to be considered in this project, it is possible, through variation in judging, that a wine which had won Bronze medals is of equal quality to a gold medal winner elsewhere. A study of Australian capital city wine shows, found that disagreements between judges were usually focused on which medal to award, not whether or not to award a medal (Allen and Germov, 2011). Interestingly, this study also found that Riesling medal winners showed the lowest consistency and Shiraz the highest. This was despite Riesling traditionally being a much smaller category. The authors, Allen and Germov, suggested that the quality specifications for the Riesling variety was ambiguous. The results from the Barossa show indicate the opposite, with Riesling having consistent medal winners and Shiraz results more varied. As the Barossa show is a regional show the ambiguity may have been reduced because the judges only taste Eden Valley Riesling.

The show system also has an element of bias. Not all wines are entered in the show. For example, Torbreck Vitners produce the most expensive wine (Shiraz) in the Barossa Valley (The Laird - $750) but do not participate in the show process. Additionally, if a wine is not awarded a medal after a few shows then that wine is generally not entered in subsequent shows, minimising the number of wines that never win a medal.

Riesling is expected to be more representative of the vineyard, as it is generally made with minimal wine-making influence. This lack of wine-making influence may also be

demonstrated by the lack of variation in medals awarded at the show. Interestingly, the Shiraz fruit from a vineyard that made a 'consistent' wine was also sourced to produce another wine show entrant that was not considered 'consistent' in good quality, possibly highlighting these wine-making impacts. On average at the wine show, there were two and half times more Shiraz entrants than Riesling entrants, however there were only two more Shiraz wines selected by this project. This lack of consistent medal winners amongst Shiraz could be the result of varied wine making influences, more entrants, or a change in style preferences throughout the years.

Table 4. Peter Lehman Wigan Riesling comparable performance at the Barossa wine show compared with Australian Capital City Shows. ('DNE'- Did not enter, '-' no records available)

Year	***Barossa***	***Adelaide***	***Sydney***	***Melbourne***
2018	Gold	Bronze	No medal	Gold
2017	DNE	DNE	Silver	No medal
2016	Silver	Bronze	Gold	Gold
2015	DNE	Gold	No medal	Gold
2014	Gold	Gold	-	Silver
2013	Trophy	Bronze	-	Bronze

Conclusion and recommendations

Collecting responses to the survey was challenging. In many cases, producers were simply too busy to participate or, commonly in the wines that did not produce 'consistent' winners, the grapes came from a different grower every vintage. In some cases, wineries had been sold and the new owners had no records of past vintages. In one case, the vineyard owner had passed away. In other cases wines made by larger companies, were produced from blends of different vineyards in most years (particularly with Shiraz) and therefore it was impossible to get an indication of consistency. It was unfortunate for this study that so few Shiraz winners and non-winners responded to the survey and therefore didn't allow for recommendation on vineyard practice improvements. It is possible that using an incentive to get responses may have helped.

Additionally, as discussed above, it is possible that the show system, both contains an element of bias due to self-selectivity of entries for a variety of reasons, as well as inherent

variability across judges and shows. Not all wines participate in the Barossa Wine Show. To better understand which vineyard practices lead to higher quality wines it may have been better to approach this from the vineyard perspective. This could be achieved by surveying a selection of producers with blocks of Shiraz/Riesling from the Barossa Valley and Eden Valley to determine their vineyard practices and then linking this information back to any show results and/or features by wine writers. In this way a greater cross section of the Barossa could be analysed and perhaps more holistic data produced, assuming adequate survey responses. Along these lines if viticulturists provided documentation to the Wine Show on vineyard practices for each block based on questions, seasonally it would be possible to quickly build up a robust data set centrally to analyse practices over time to work out which provided them with "higher" quality wine.

This result does show that in general fruit that is produced for consistent medal winning wines is more likely to be spur pruned, single cordon, have good floor management practices and have fewer than 40 buds.

Extension

Findings from this project have been effectively communicated in two presentations to the regional partner. The aims and method of the project was initially presented to the Barossa Viti Tech Group in order to gain feedback and insight on the directions the project would take. The final results were presented to the same group for feedback prior to consolidating the data for this report. The survey was also communicated to the group and feedback was sought.

This project was also presented to the international research community in a Poster session at GiESCO see Appendix B.

The final goal of this project is to produce a matrix highlighting the results. This is currently being designed in collaboration with the Regional Partner.

Researcher benefit and feedback

The principal researcher of this project was Dr. Alice Betteridge. As a budding early career researcher this project has given her the opportunity to meet, collaborate and build positive

working partnerships with the local industry paving the way for future collaborations and research opportunities.

This project has also allowed Alice to begin to develop her career as a post-doctoral scientist, gaining experience in applying for funding, managing a project, working with and managing the needs of industry representatives and performing independent research.

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Appendices

Appendix 1. Viticultural practices survey emailed to growers

Unless otherwise requested please answer in the response column.
If your practices have varied from vintage to vintage please respond in the appropriate column

		Vintage									
	Response	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Wine:											
Block:											
Contact Name:											
Site Address:											
Latitude:											
Longitude:											
Planting Year:											
Clone/Rootstock:											
Vine Spacing:											
Row Spacing:											
Vine Density(vines/ha):											
Bud Number:											
Row Orientation:											
Previously did this fruit go towards the production of a wine other than that listed? What/When											
Please answer for each vintage											
Harvest Method											
Yield (tonne/ha)											
Harvest Date											
Bx											
pH											
TA											
Conventional/Organic/Biodyanamic											
Trellsing Type:											
Summer canopy management technique:											
Summer Canopy Management Application Time:											
Summer Canopy Management Frequency:											
Pruning Method:											
Pest Control:											
Frequency:											
Mid-row Management:											
Undervine Management:											
Fertiliser/Compost/Mulch:											
Weed Control:											
Frequency of Irrigation:											
Amount of Irrigation(ML/ha):											
Type of Water:											
Other comments:											
Soil Type:											
pH:											
Salinity:											
Organic Matter Content											
Soil Infiltration:											
Available Water Holding Capacity(mm):											
I will find out this information											
Elevation (m):											
Mean Annual Rainfall(mm):											
Growing Season Rainfall:											
Mean January Temperature(°C):											
Growing Degree Days:											
Growing Season Mean Temperature (°C):											

Appendix 2. Poster and abstract presented at the 21st G*i*ESCO meeting in Thessaloniki, Greece.

What practices in the vineyard lead to the production of wines that consistently win medals?

THE UNIVERSITY of ADELAIDE



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Background

- High quality wines start in the vineyard however little is known about the role vineyard management practices play in this quality outcome.
- Gold medals and well-known regionality increase consumer preference for purchasing a wine (Lockshin et al. 2006).
- This study aims to identify vineyard practices associated with the consistent production of high-quality wine-styles as defined by consistently earning medals at the Barossa Wine Show.

Shiraz

Most predominant planting in the Barossa Valley and is found in all sub-regions.



120 wineries
453 entries
From across sub-regions of the Barossa Valley
↓
Consistent winners
9 wineries
109 entrants
10 wines

Wine Show Results

12 years of results (2007-2018) from the Class 1 Riesling (current vintage) and Class 1 Shiraz (1 year old) categories at the Barossa wine show were analysed

"Consistent" was then defined as a wine that was awarded a medal for at least three successive vintages one of which was a Gold medal. These were wines selected to complete the survey.

Riesling

Eden Valley – minimum 400 m above sea level, cooler climate, highest rainfall of all the sub-regions.



103 wineries
505 entries
All from the Eden Valley
↓
Consistent winners
11 wineries
128 entrants
15 wines





Subset of Riesling Vineyards

Specific location does not appear to play a role in Gold medal winning wines.

Survey

Growers were then asked to respond to a survey to gather information on their viticulture practices including pruning, trellising, nutrition, soil health, pest and disease management, mid-row and under-vine management, irrigation, canopy management and harvest management.

Is mulch the difference?

Respondents to date have indicated that mulch may be an indicator of vineyard quality. Studies have shown that mulch helps decrease water requirements (DeVetter et al. 2015) particularly important in a dry climate like Barossa.

Conclusion

A matrix, linking vineyard practices and wine medals will be created and deployed to the wine industry. Growers in Barossa will then be able to make more informed management decisions to produce grapes that lead to consistent quality wines.

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WHAT PRACTICES IN THE VINEYARD LEAD TO THE PRODUCTION OF WINES THAT CONSISTENTLY WIN MEDALS?

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Context and purpose of the study -High quality wines start in the vineyard however little is known about the role vineyard management practices play in this quality outcome.

Gold medals and well-known regionality increase consumer preference for purchasing a wine. An increase in the former will certainly also drive an increase in the latter and therefore practices in production that consistently lead to gold medal winning wines will improve both the marketability of the region and its products. It is argued that vinification is the main driver of wine quality and in fact, the presence of some oak compounds is a well-known consumer and expert mark of quality. However, only select wines are vinified in oak and therefore the original grape quality at the winery door must in fact drive all further downstream vinification decisions.

Grape composition is also an important driver of flavour and aroma in a final wine. Management practices are able to alter berry chemistry as well as the concentration of enzymes and compounds that act as precursor to many esters affecting wine volatile compounds.

This study aims to identify vineyard practices associated with the consistent production of high-quality wine-styles as defined by consistently earning medals at the Barossa Wine Show.

Materials and methods – Twenty years of results from the Riesling and Shiraz categories from the Barossa wine show were analysed for consistent award winning wines. Consistent was defined as a wine that was awarded a medal for at least three successive vintages one of each was a Gold medal. Growers were then asked to respond to a survey to gather information on their viticulture practices including pruning, trellising, nutrition, soil health, pest and disease management, mid-row and under-vine management, irrigation, canopy management and harvest management. This data will be analysed for commonalities.

Results - Shiraz and Riesling wines that have consistently earned medals over a period of 20 years at the Barossa Wine Show have been identified. Growers are being surveyed and their specific vineyard management practices recorded. The analysis of these responses will be presented and aims to identify commonalities in vineyard management. A matrix, linking vineyard practices and wine medals will be created and deployed to the wine industry. Growers in the Barossa Valley will then be able to make more informed management decisions to produce grapes that leads to consistent quality wines. Findings from this study will also create opportunities to validate the matrix in other regions.

Keywords:
Viticultural practices, medal winning wines.