

Disease-resistant grapevine cultivars in the Riverina

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Could the future of Riverina winegrape production include cultivars resistant to powdery mildew (*Erysiphe necator*) and downy mildew (*Plasmopora viticola*)? This is the question being asked through the Wine Australia Riverina Regional Program 2017–22.

Background

Since 2013, NSW DPI Senior Research Scientist, Dr Bruno Holzapfel, has evaluated 20 white and 20 red CSIRO-bred grapevine cultivars with resistance to powdery mildew and reduced susceptibility to downy mildew at the National Wine and Grape Industry Centre (NWGIC), Wagga Wagga. The 20 white disease-resistant cultivars are crosses of eight common selections and a parental line (BC5:3294-R23) derived from a back-crossing program involving the North American grape species *Muscadinia rotundifolia*, which contains genes with resistance to powdery mildew and downy mildew.

Apart from early-season sulfur sprays for mite control, the vines received no powdery or downy mildew preventative or curative sprays. This enabled pathogen level resistance evaluation as well as the suitability of these cultivars to a warm, inland irrigated region to be assessed.

The NWGIC vineyard planting consists of 2.25 m spacing between vines and 3 m between rows, with a planting density of 1,481 vines per hectare. The vines are spur-pruned on a bilateral cordon to approximately 20 spurs or 40 buds. Approximately 3 ML of irrigation water and 50 kg of nitrogen was applied per hectare during the 2016–17 and 2017–18 growing seasons. Monthly rainfall and average temperatures for these growing seasons are shown in Figure 40 and Figure 41.

Evaluation at the NWGIC

Despite strong disease pressure, especially for powdery mildew, no powdery or downy mildew development was observed on any of the cultivars. Grape quality and seasonal development were monitored every two weeks from veraison (EL 35) to ensure each selection was harvested at the pre-determined ripeness of 22 °Brix.

Yield and pruning weight (canopy size) varied between the two growing seasons (Table 11), possibly from exhausted internal reserves in the young vines after a larger crop the previous season. Pruning weight ranged from 0.5–2.0 kg per vine in 2016–17 to 0.4–1.5 kg per vine during 2017–18.

Cultivar 18 had the lowest pruning weight and increased bunch exposure in both seasons (Figure 42 and Figure 43) and this trend appears to be continuing. Final pruning weights will be determined during winter 2019.

Two ferments of each cultivar (approximately 50 kg) in each vintage were assessed after bottling for sensory attributes including tropical and floral aromas, citrus, stone fruit and mouthfeel, length of flavour, acidity and bitterness. Overall scores, based on a 100 point scale, were assessed by Riverina winemakers, with average values ranging from 83.5–87.4 (2016–17; Figure 44) and 82.9–91.7 (2017–18; Figure 45).

Balancing the viticulture, winemaking and sensory assessments (Table 11, Table 12, Figure 44 and Figure 45), the white cultivars selected for planting at the Griffith Research Station are 1, 2, 7, 16 and 18.

Table 11. Bunches per vine, bunch weight, berries per bunch and berry weights from the 2016–17 and 2017–18 harvests of disease-resistant cultivars selected for planting at the NSW DPI Griffith Research Station.

Cultivar	Bunches per vine		Bunch weight (g)		Berries per bunch		Berry weight (g)		Yield (tonnes per hectare)	
	2017	2018	2017	2018	2017	2018	2017	2018	2016–17	2017–18
1	118	62	121	109	97	70	1.25	1.60	21.00	10.00
2	90	75	187	173	105	75	1.78	2.31	24.92	18.96
7	73	41	276	280	133	100	2.08	2.79	29.84	17.00
16	88	54	147	138	131	98	1.12	1.40	19.16	11.04
18	105	72	75	88	95	89	0.79	0.99	11.66	9.38

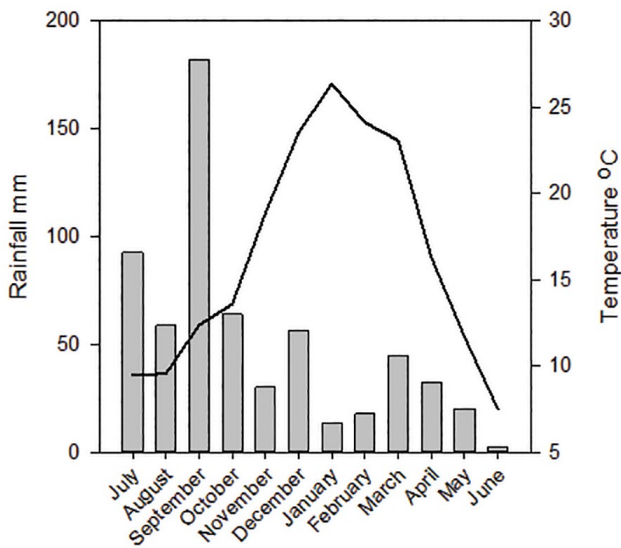


Figure 40. Monthly rainfall and average monthly temperatures in Wagga Wagga for the 2016–17 growing season. Source: Holzapfel et al. 2019.

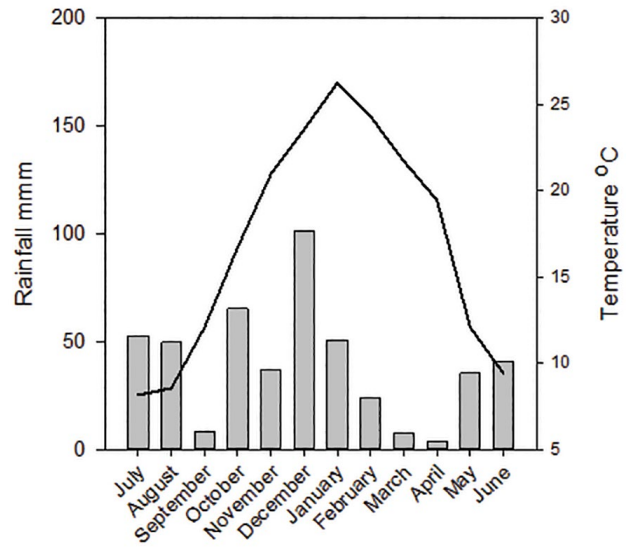


Figure 41. Monthly rainfall and average monthly temperatures in Wagga Wagga for the 2017–18 growing season. Source: Holzapfel et al. 2019.



Figure 42. Increased bunch exposure in Cultivar 18.



Figure 43. Canopy growth in Cultivar 18.

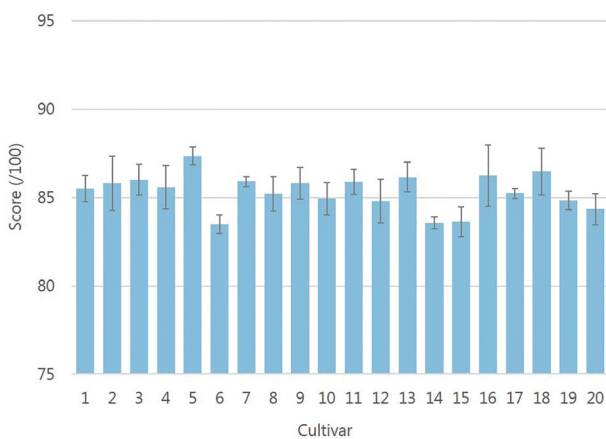


Figure 44. Overall wine scores of 20 white selections evaluated at the NWGIC during 2016–17. Bars represent standard error (n=5). Source: Holzapfel et al. 2019.

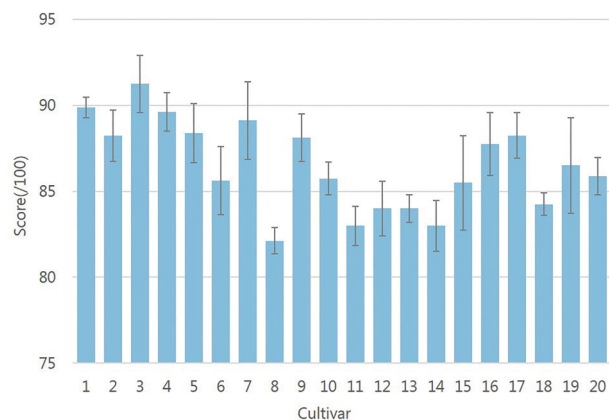


Figure 45. Overall wine scores of 20 white selections evaluated at the NWGIC during 2017–18. Bars represent standard error (n=5). Source: Holzapfel et al. 2019.

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Table 12. Total soluble solids (TSS), sugar per berry, juice pH and titratable acidity (TA) from the 2016–17 and 2017–18 harvests of disease-resistant cultivars selected for planting at the NSW DPI Griffith Research Station.

Cultivar	Total soluble solids (°Brix)		Sugar per berry (mg)		Juice pH		Titratable acidity (g/L)	
	2017	2018	2017	2018	2017	2018	2017	2018
1	21.3	21.5	266	343	3.43	3.31	4.61	7.16
2	21.7	22.5	385	520	3.65	3.54	3.65	3.97
7	21.5	22.2	446	621	3.40	3.45	4.21	4.19
16	21.5	22.6	241	317	3.44	3.17	4.49	5.88
18	21.1	21.8	166	215	3.17	3.07	6.87	6.30

NSW DPI Griffith Research Station planting

In spring 2018, as an initiative of the Riverina Regional Program 2017–22, a one-hectare demonstration vineyard (Figure 46) comprising white cultivars 1, 2, 7 (Figure 47 and Figure 48), 16 and 18 was developed. Approximately one-third of the block comprises the selections on their own roots, with one-third on Ramsey rootstock and the remaining third on Paulsen rootstock.

The disease-resistant cultivars and rootstocks were planted as callused cuttings. In winter 2019, the rootlings will be cut back to two buds and replacement vines planted where callused cuttings failed to establish in spring 2018. Field grafting the white selections onto Ramsey and Paulsen rootstock will occur in spring 2019.

Only 9 of 140 vines successfully established for cultivar 18. Coupled with decreased canopy growth and increased fruit exposure, this cultivar will be replanted in spring 2019 with a yet to be determined cultivar.

A further 0.5-hectare development of red disease-resistant cultivars is planned for spring 2019. Sensory results from the 2019 vintage will help determine the five most appropriate cultivars.

This initiative aims to give Riverina viticulturists and winemakers the ability to further assess market suitability of these cultivars for fast-tracking market adoption. The vineyard development will demonstrate and assess a number of viticulture and winemaking techniques. If you are interested in visiting the disease-resistant cultivar sites at the NWGIC or NSW DPI Griffith Research Station, or would like further information, please contact NSW DPI Development Officer, Adrian Englefield at adrian.inglefield@dpi.nsw.gov.au



Figure 46. NSW DPI Griffith Research Station disease-resistant cultivar vineyard block.



Figure 47. Cultivar 7 leaf.



Figure 48. Cultivar 7 bunch.

Reference

Holzapfel B, Rossouw G, Dry I and Thomas M. 2019. Productivity and wine assessment of new disease-resistant cultivars in Australia. *In press*.

Acknowledgements

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Riverina
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Integrated pest management in vineyards

New native predatory mite for grapevine mite pests

Doreen (*Typhlodromus doreenae*; Figure 49) is an Australian native predatory mite that feeds on rust mite, bud mite, blister mite and bunch mite in winegrapes (Figure 50), bryobia mite in almonds and pomefruit, and other eriophyid mites in a range of crops.

Field research between 1988 and 1994 showed this predator to be common in these crops throughout south-eastern Australia.



Figure 49. *Typhlodromus doreenae* feeding on grapevine rust mites.

With modern advancements in predator rearing, the Biological Services team says it is now possible for them to offer Doreen to commercial growers to promote healthier crops.

To learn more about Doreen or how integrated pest management can help reduce the risk of chemical resistance among crop pests, contact Biological Services on 08 8584 6977 or info@biologicalservices.com.au.



Figure 50. Grapevine rust mite damage.