

Evaluating and demonstrating new disease resistant varieties for warm irrigated areas

Bruno Holzapfel¹, Mark Thomas² and Ian Dry²

¹NSW Department of Primary Industries,
Wagga Wagga Agricultural Institute, Private Mail Bag,
Wagga Wagga NSW 2650

²CSIRO Agriculture & Food, Waite Campus Laboratory,
Private Bag 2, Glen Osmond, SA 5064

Breeding new grapevine cultivars with high resistance to fungal pathogens presents an opportunity to substantially reduce the use of plant protection agents, and therefore lower production costs and reduce the impact that viticulture has on the environment.

Resistance can be achieved by:

- crossing suitable parent cultivars
- screening for desired disease resistance and other beneficial traits.

The superior selections are then evaluated for their wine-making potential under field conditions for several years before release.

Selecting which varieties to pursue

As part of a previous project supported by Wine Australia, 1200 new varieties from the CSIRO breeding program, which show strong resistance to powdery mildew and reduced susceptibility to downy mildew, were evaluated under field conditions. Based on disease resistance and other physiological traits, 20 white selections with a range of potential wine quality attributes were identified. These vines represent the first generation of mildew-resistant vines produced using marker-assisted selection in Australia.



Figure 31. Plantings of the new disease-resistant varieties in the experimental vineyard at the NWGIC in the 2013–14 growing season.

The first large-scale trial planting of these varieties in NSW was undertaken in the experimental vineyard at the National Wine and Grape Industry Centre (NWGIC) in cooperation with McWilliams Wines in the Riverina during the 2013–14 growing season (Figure 31). This initial planting consisted of 20 white selections that have demonstrated superior plant performance at the Barossa site and produced diverse wine flavours identified as interesting by commercial winemakers during sensory evaluation. Red selections required further evaluation at the Barossa site at that time and consequentially were planted in the 2015–16 season next to the white varieties. Both selections were trained and managed similarly (see Figure 31) and the red varieties now have an established trunk and cordon after the second season.

White varieties

In winter, after the first season of sprawling in the white varieties (2013–14), all vines were pruned to three buds and pruning weights were assessed. These varied considerably by three-fold.

In the second season (2014–15), two shoots were left to grow from these buds to mid spring, and then the best shoot was selected for the trunk and was cut just above above the cordon wire. The total shoot length was measured before these changes, with the growth between varieties varying by about 30%. From the two upper buds and/or laterals the bilateral cordon developed, all vines had reached the appropriate cordon length or more by the end of second season. The training included debudding, fixing the trunk on stacks and the shoots for the cordon on the wires. The vines were sprayed against mites in spring with wettable sulfur and received fertiliser applications. Weed control was managed during the season with herbicide sprays in the vine row and the mid row, and frequent mowing. At the end of this season, the pruning weights were determined and showed four-fold differences across the 20 varieties.

In the third growing season (2015–16), the same vineyard management program was undertaken in relation to weed and mite control, but fertiliser application was increased. The longer shoots that were hanging into the rows were shortened in late spring. Basic berry and juice parameters were determined at harvest together with yield and yield components, with the bunch and berry size showing visual variation (Figure 32). There were considerable differences between the white variety yields and pruning weights, taken in winter, showing more than two- and four-fold differences respectively (Figure 33).



Figure 32. Bunches before harvest in third growing season (2015–16) from the new disease-resistant grape varieties in the experimental vineyard at the NWGIC.

In the past season (2016–17), the the white varieties' performance was further evaluated and two wines were made from each of the 20 varieties. These have been bottled and will be assessed over the next few months for their sensory attributes.

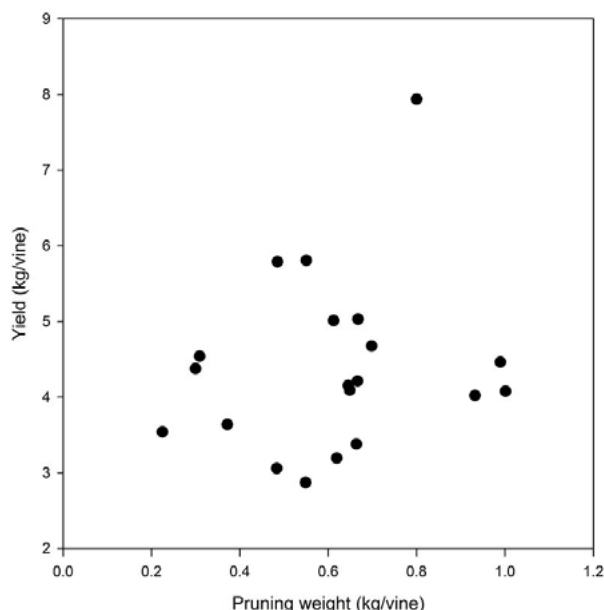


Figure 33. Range of yield and pruning weight levels of 20 new disease-resistant white varieties grown at the NWGIC experimental vineyard, three years after planting.

Next steps

It is anticipated that these white and red disease-resistant varieties will be further assessed over the next few growing seasons to ensure a meaningful evaluation of vine performance and wine characteristics. In particular, a NSW cool-region program will start soon to assess the disease resistance of the new red and white varieties.