FACT SHEET

&VINE
Managing the challenge

MODULE 14

Rootstocks as a management strategy for adverse vineyard conditions

AUTHOR:
Catherine Cox - Phylloxera and Grape Industry Board of South Australia

These updates are supported by the Australian Government through the Irrigation Industries Workshop Programme - Wine Industry Project in partnership with the Department of Agriculture, Fisheries and Forestry and the Grape and Wine Research and Development Corporation.

Australian Government
Grape and Wine Research and Development Corporation

Australian Government
Department of Agriculture, Fisheries and Forestry

Rootstocks as a management strategy for adverse vineyard conditions

Introduction

This Fact Sheet consolidates current knowledge around the key rootstocks used in Australian Viticulture in terms of tolerance to drought, salinity and lime.

The aim of this module is to briefly summarise the pros and cons of each rootstock and showcase the existing industry resources that can be used to aid in the selection of rootstocks in the key growing regions within the Murray Darling Basin.

For more information and training contact your local Innovator's Network member or go to http://waterandvine.gwrdc.com.au.

1 Introduction to rootstocks

Grapevine rootstocks are derived from American Vitis species that co-exist with phylloxera. More commonly, rootstock species are combined for certain advantageous features.

The main rootstocks used in viticulture are native American species (Vitis rupestris, Vitis riparia, Vitis berlandieri and Vitis champini). Each of these rootstocks and their hybrid species is native to a unique set of environmental conditions and habitats.

As a result, each American Vitis species is able to respond differently under certain environmental conditions; for example, saline or water stressed conditions.

Parents	Common names
V. riparia X V. rupestris	101-14 Schwarzmann 3309C
V. berlandieri X V. riparia	5C Teleki 5BB Kober SO4 420A V. champini
V. berlandieri X V. rupestris	1103 Paulsen 140 Ruggeri 110 Richter 99 Richter
V. champini	Ramsey

2 Understanding different rootstock characteristics

V. riparia x V. rupestris

These rootstocks offer low-moderate vigour to the scion, and in certain situations hasten ripening. They do not tolerate drought conditions. These characteristics make them particularly suited to cool climate viticulture. These rootstocks perform best on soils that dry out slowly and have moderate-high water holding capacities. They impart low vigour to the scion and hence are suitable to high fertility sites and growing conditions.

V. berlandieri x V. riparia

These rootstocks offer moderate-high vigour to the scion depending on the soil type. They are moderately sensitive to drought conditions, but may hasten ripening and improve setting. They are best suited to cool climate viticulture, but with appropriate site selection and management can produce quality outcomes in warmer regions. These rootstocks perform best in free-draining soils of moderate depth and fertility. They are not suited to sites where soils readily dry out nor where water may be restricted.

V. berlandieri x V. rupestris

These rootstocks offer moderate-high vigour to the scion, are drought tolerant and have moderate-high tolerance of nematodes and salty soils. They have a long vegetative cycle, are best adapted to warm-hot regions. These rootstocks are suited to a wide range of soil types of low to moderate depth and fertility. The characteristics of this group make them suitable for drought and salt induced environments. Due to these characteristics they are unsuitable for deep fertile soils or poorly drained soils as this would inevitably produce excess vigour.

3 Drought tolerance

Rootstocks supply the grafted vine with a root system. The root system as a result of the choice of rootstock affects the vertical depth and horizontal spread of the roots along with the root density.

These genetic differences also influence the drought tolerance of a grafted vine. For example, a rootstock's ability to cope with dry conditions may be attributed to an ability to explore large volumes of soil with thick root systems.

Drought tolerance is scion and site specific and definitive drought tolerance is therefore hard to classify. However, as a general rule, rootstocks with a greater proportion of fine roots with a diameter <2mm will be more prone to drought and lower in vigour than a rootstock with thicker more plunging root systems (Soar and Loveys 2005).

Classification of drought tolerance	Rootstock
Susceptible	3309C, Schwarzmann, 101-14
Moderately susceptible	5BB Kober, 5C Teleki SO4
Tolerant	1103 Paulsen, 110 Richter, 99 Richter
Highly tolerant	Ramsey, 140 Ruggeri

4 Salt tolerance

Excess salinity affects own rooted vines reducing yields, growth and bunch numbers and berry weights (Whiting 2004). The rising salinity levels of soils and irrigation waters will restrict root growth, performance and wine quality of own rooted vines when levels above 1.8dS/m in soil are reached.

Certain rootstocks reduce the uptake of salts including sodium and chloride. The following table has been adapted from a report by Tee and Burrows (2004) defining salt tolerance of the various rootstocks.

Classification of salt tolerance	Grapevine	Approximate threshold soil saturation paste salinity (dS/m)
Sensitive	Own roots, 3309C, 1202C, K51-40	1.8
Moderately sensitive	5BB Kober, 5C Teleki, 110 Richter, 99 Richter, K51-32	2.5
Moderately tolerant	140 Ruggeri, Schwarzmann, 101-14, Ramsey (M5489, M6262, M5512)	3.3
Tolerant	1103 Paulsen	5.6

5 Nematode resistance

The protection of vines from damage caused by nematodes is one of the main reasons for rootstock use in Australia. Resistance of a rootstock to nematodes is largely achieved by tolerance and is generally confined to one nematode species or a group of closely related species (Whiting 2004). Outlined below is a table of nematode resistance.

6 Information resources to assist with rootstock selection

There are now a number of Australian publications that can help in the choice of a rootstock for your vineyard situation and include the following texts and websites:

The Phylloxera and Grape Industry Board website www.phylloxera.com.au

The Yalumba nursery website www.yalumbanursery.com

Cirami, R. (1999) Guide to the selection of phylloxera resistant rootstock. (Phylloxera and Grape Industry Board of South Australia).

Dry, N. (2007) Grapevine rootstocks: Selection and management for South Australian vineyards. (Phylloxera and Grape Industry Board of South Australia).

May, P. (1994) Using Grapevine Rootstocks: The Australian Perspective. (Winetitles: Adelaide).

Whiting, J (2004). Rootstocks. In Viticulture Volume 1: Resources. Eds. Dry, P.R. and Coombe, B.G. (Winetitles: Adelaide).

Whiting, J. (2003) Selection of Grapevine Rootstocks and Clones for Greater Victoria. (Department of Primary Industries: Victoria).

Krstic, M. and Hannah, R. (2003) Matching Scion and Rootstock combinations in Sunraysia. Final Report to GWRDC. Project No. RT02/19-3 (Dept. Primary Industries: Mildura).