

**SUGGESTED ROOTSTOCKS
For
NEW ZEALAND VINEYARDS**

Report For:

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INTRODUCTION

Rootstock choice can be one of the more important influential factors contributing to yield and quality, as well as ensuring peace of mind in resisting the ravages of the root sucking aphid *Phylloxera* in a vineyard enterprise. A wide range of rootstock types are available in New Zealand, thanks to an export programme by MAF viticulture personnel over the past 20 years.

Now that *Phylloxera* is widespread in New Zealand, growers can no longer consider planting or replanting vineyards without grafted vines on a suitably resistant stock. Most stocks available in New Zealand are adequately resistant or tolerant of *Phylloxera* and that becomes a minor issue in the decision to go to stock. What becomes a much more important consideration are the other attributes that stocks have and how best to choose the right stock or stocks for a particular site.

In France, and other major grape producing countries of Europe they have widely experimented with rootstock varieties since 1900. Many of these stocks were bred by European plant breeders in response to the *Phylloxera* outbreak in Europe at that time and include names such as Millardet, Courderc, Richter, Paullsen, Ruggeri, Foex and Teleki. As a result, the experiences of Europe have led them to narrowing the stock choice down to 20 or less, suggested for specific soil types, scion variety, climate, soil lime content and other factors. In New Zealand we are not so lucky, due primarily to a checkered history of rootstock evaluation (or lack of it) and inadequate records.

Romeo Braggatto, our first Government viticulturist in the early 1900's suggested that *Rupestris* St. George (du Lot) and Movvedre x *Rupestris* "1202" could be suitable. Later he suggested "3309" and "101-14" were good for soils other than "poor" ones. No records of any trial work done by Braggatto and others is available to prove or otherwise these "recommendations".

Today we still have very limited rootstock data for all grape regions of New Zealand or none at all. Work which MAF carried out during the 1970's and 80's has not continued and the only data that has been gathered is held mostly by private individuals and companies.

The first and most important step in understanding rootstocks is to study their parents which are mainly the Native American species of *Vitis*, and occasionally *Vitis vinifera*. Knowing the characteristics of three of these species provides a good base for understanding most commercial rootstocks as follows:

- **Vitis Berlandieri**

A native of Texas, *Berlandieri* has a long vegetative cycle and is one of the latest maturing. It has good resistance to *Phylloxera* and very good resistance to lime induced chlorosis.

This is important in Europe where vineyards are grown on soils with high lime (chalk) content but is less of a consideration here. Pure *Berlandieri* vines are very difficult to root. Hybridisation with other species was necessary to develop lime tolerance, which would root well enough for commercial propagation. *Vitis vinifera* vines which include all our major fruiting varieties, also have a naturally high lime tolerance. Many important commercial stocks are *Berlandieri* crosses, including S04, 5BB, 99 Richter, 1103 Paullsen.

- **Vitis riparia**

It is widely distributed east of the Rockies into Canada and it is good for cool climates such as New Zealand. It is the earliest maturing of the native species, has excellent cold resistance, prefers rich humid soils and is often found along riverbanks. *Riparia* roots and grafts very easily and has excellent resistance to *Phylloxera*. *Riparia* basically contributes quality, not quantity, to its progeny because of its low vigour and early maturity. Because vigour is a problem in many New Zealand vineyards, today's thinking is to aim for rootstocks that have *Vitis riparia* blood.

Riparia Gloire de Montpellier is the only pure riparia rootstock used today. It is used where low vigour and early ripening are desired. Riparia-Berlandieri crosses are quite vigorous, although less so than Berlandieri-rupestris crosses.

- **Vitis rupestris**

A mid western USA species. *Vitis rupestris* behaves more like a self supporting bush than a clinging vine. With its strongly vertical root system, rupestris seeks water and minerals in deep soils.

Like Berlandieri, rupestris has a long vegetative cycle with late maturity. Therefore, rupestris and Berlandieri-rupestris rootstocks are suited to warm climates. Rupestris roots and grafts easily. By far the most cultivated pure rupestris stock is Rupestris St. George (du Lot) but is losing ground to Berlandieri-rupestris crosses 11OR, 99R especially in dry areas.

When contemplating rootstock qualities it also pays to remember the following:-

- a) **Vigour and “DeVigourating” Rootstocks**

This is not always a virtue and as many of New Zealand’s vineyards are sited on deep fertile soils with resultant high vigour, stocks that impart vigour can seriously aggravate the situation.

Excess vigour can cause poor fruit set, delay ripening and lead through excess shoot growth to increased bunch rot - problems which are key ones for the New Zealand wine and grape industry. It is also important to remember that there is no such thing as a “devigourating rootstock”. It is simply that some stocks impart more or less vigour on some soils and sites than in others. It is a combination of the soils and climate which influence the performance of a particular rootstock on a particular site. It is therefore important to evaluate a range of rootstocks on any particular site. To some extent disease such as Virus may also influence rootstock vigour as well.

- b) **Effect on Maturity**

This is very important. Some *Vitis riparia* stocks, because of their inherent shorter vegetation cycle, may but not always, impart earlier maturity to the scion which is a significant advantage in New Zealand’s variable climate.

- c) **Rooting and Grafting**

It is often stated that rootstock varieties are chosen by nurseries and not by researchers. It is true that nurseries need to operate profitably and consumers lean towards bargains. However, as local experience with rootstocks grows, so does the demand change and it is notable that in the past 5 years or more, most nurseries are stocking a wide range of rootstock types to meet that demand.

SOIL CONDITIONS

- **Wet**

Some rootstocks are not happy in wet soils. Generally, stocks recommended for warmer climates (*Rupestris* and family) do not like humid soils. Similarly, many suitable stocks for cooler, rainier areas are *Riparia* relatives. By wetness we do not mean waterlogged soils with high water tables which should be drained regardless of rootstock choice.

- Drought

This is slightly trickier. You could think that St. George would be very drought resistant following the comments on wet soils, yet the Europeans rate St. George poorly for drought. Droughty soils in New Zealand add further complexities in and consideration in New Zealand. Currently we feel that droughty soils exist in the stony areas of Hawkes Bay and Marlborough, and this may be where drought tolerant stocks could be best suited. However, most of these 'droughty' areas are associated around river systems with a water table in them, and although we may see good drought tolerance responses in the early years of vineyard establishment, this may radically change once deep layers of moisture are exploited by the rooting system of the stock.

- Heavy Clay

While heavy soils with high clay are often associated with poor drainage they can, when drained adequately, impart low vigour and stocks tolerant to heavy clay are available for these sites.

NEMATODES

This has not been an issue in New Zealand to date, although it is a problem in some overseas countries. This is despite an extensive search for Nematodes in New Zealand vineyards. In case the situation does change, we have on hand a range of Nematode tolerant stocks, such as Ramsey, Schwarzmann and 1103 Paullsen.

PHYLLOXERA

Almost all stocks available in New Zealand adequately tolerate or resist Phylloxera.

However, there has been concern that rootstocks that have *Vitis vinifera* parentage in them can break down and succumb to the pest. This has happened recently in California for instance where ARG1 (A.X.R. - Aramon Rupestris Ganzin No. 1), which is a *vinifera* x *rupestris* hybrid has succumbed to a new strain (Biotype 2) of Phylloxera, and led to widespread removals and replanting at great cost. Other *vinifera* rootstocks in New Zealand include "1202" Courderc, a stock that had widely used in Auckland and Te Kauwhata for many years. Although Phylloxera will populate ARG1 roots, it has not at this point in time succumbed to Phylloxera and has in fact, yielded well in trials to date with good maturity in New Zealand. "1202" likewise has not been observed with Phylloxera populating the roots, but is less popular now because of its high vigour.

VIRUS DISEASES

The Leafroll Virus Type III is endemic in New Zealand and can spread rapidly, particularly in the more humid northern vineyards from Gisborne to the Far North.

Although virus spread by vectors such as Mealy bug in vineyards, are well recorded, the propagation of infected rootstocks still remains a major cause of Leafroll spread. Rootstocks are symptomless carriers of Leafroll and other viruses, and all nurseries must ensure that they propagate from known Leafroll free sources if they are to sell healthy grafted vines with confidence to their grower customers.

A Certification system is underway in New Zealand with widespread testing now carried out by all nurseries. However, purchasers of grafted vines should check with their nursery supplier or the New Zealand Vine Improvement Group to ensure Leafroll free material is being supplied.

NEW BREEDING PROGRAMMES - ARMILLARIA REPLANT PROBLEM

Although breeding programmes world-wide to find new rootstocks are not as extensive as in the days of the Phylloxera epidemic in Europe in the 1800's, the discovery of Biotype 2 Phylloxera strain in California has now prompted a major breeding programme there.

As well as attempting to attain more insight into the cause of the rootstock breakdown to new Phylloxera strains, the programme at UCD is attempting to evaluate resistance to the Oak Root Fungus (*Armillaria* species), which rots wood and dead roots in the soil but which may attack living roots of any new vine planted in the site.

Although it has rarely occurred in vines in New Zealand to date, *Armillaria* fungus may become an increasing problem, as our national vineyard area ages and replanting occurs in a site for the third or more times. The UCD programme may provide the necessary armoury to resist or tolerate *Armillaria* in the future.

THE "UNIVERSAL" ROOTSTOCK

As you can see from the previous statements, rootstock choice is not simple and the statements and comments made only serve as a guide to choosing for your particular site and climate. There is no single answer for all situations and in light of the fact that rootstock experiences are so limited in New Zealand, it pays to keep an open mind and try a range of stocks after considering the information in the previous pages.

Therefore, the "Top 15" described in this publication is one that will be fluid and dynamic, changing as further experience comes forward in the years to come. There is no such thing as a "universal" rootstock, and with the mix of soil types present in many New Zealand vineyard sites, it may be that a variety of stocks will be chosen for any one area, let alone throughout the many regions growing grapes at this point in time.

"TOP 15" ROOTSTOCKS FOR GRAPEVINES IN NEW ZEALAND:

a) Riparia Gloire de Montpellier:

- The most widely planted pure riparia stock world-wide.
- Excellent Phylloxera tolerance.
- Low-moderate vigour imparted to the scion.
- Assists in earlier ripening and better grape quality.
- Prefers fresh, humid soils that are not waterlogged. Does not tolerate droughty soils.
- Roots and grafts readily in the field but has proven to be more difficult to bench graft successfully.

Probably the most popular rootstock in New Zealand. Although more difficult to graft Riparia Gloire performs well in a range of soils and tends to produce higher quality versus other more vigorous stocks. Best wood source available is Clove BDX695 (Bordeaux) TK06518.

b) 101-14 : Millardet et de Grasset:

A riparia x rupestris cross. More vigorous than Riparia Gloire but less vigorous than 3309. Although the literature suggests it prefers fresh clay but not waterlogged soils, it has been noted that 101-14 will sometimes succumb to "Black Foot" disease on heavy, drained silts and clays. "Black Foot" is a fungal disease caused by *Cylindrocarpum destructans*. Until more research is carried out on this disease, growers should avoid planting 101-14 on heavy soils. The most common wood sources used are TK06212 (Stellenbosch 2/3/25) and TK06559 (Bordeaux).

c) 3309 : Couderc:

A riparia x rupestris hybrid. More vigorous than 101-14 or Riparia Gloire. Along with Riparia Gloire, this stock is performing well in New Zealand and producing higher quality versus more vigorous stocks.

- Grafts and roots well.
- Is not a good performer in droughty soil situations.
- Good Phylloxera resistance.
- Poor performer in heavy wet soils and may suffer root diseases such as Phytophthora in these situations.
- Sensitive to acid soils
- Widely used in the Eastern USA.
- Best wood sources are TK06091 (Geisenheim 9-2).

d) 3306 : Couderc:

Riparia x rupestris hybrid with same origins as 3309.

- Less vigorous than 3309.
- Low wood yields for propagation have made it unpopular with nurserymen.
- Advances maturity.
- Good Phylloxera resistance.
- Roots and grafts readily - perhaps a little easier than 3309 although some nurseryman have had variable results with bench grafting.
- Encouraging results observed in New Zealand to date, advancing ripeness.
- Best wood sources are TK06504 (Nuriootpa).

e) 420A : Millardet et de Grasset:

A Berlandieri x riparia hybrid.

- Low vigour, hastens maturity.
- Good Phylloxera resistance.
- Prefers moist, deep soils
- Not tolerant of drought.
- Does not root and bench graft particularly easily.
- Best wood sources are TK06502 (Nuriootpa) and TK06582 (UCD).

This stock has excellent potential on a wide range of soils due to its ability to impart moderate vigour and good quality. However, supply is limited due to its poor grafting attributes.

f) Schwarzmann:

A riparia x rupestris hybrid.

- Moderate vigour.
- High yielder in stock trials at Gisborne, Hawkes Bay and Te Kauwhata.
- Strikes and grafts readily, although for some reason is more difficult to bench graft.
- Resistance to Nematodes and Phylloxera.
- Best performance on moist deep soils but also performed well on clay at Te Kauwhata.
- Drought prone.
- Best wood sources are TK06320 and TK05051.

g) SO4:

Berlandieri x riparia hybrid.

- Moderate vigour although has been very vigorous on deep fertile silts in New Zealand.
- Good yields in New Zealand trials and only superseded by Schwarzmann and ARG1, where Chardonnay was the scion (Gisborne, Hawkes Bay).
- Roots and grafts fairly readily.
- Grows better in heavy soils than 3309, 101-14 or Riparia Gloire.
- Subject to Magnesium deficiency and “Shanking” (Bunch stem Necrosis).
- One of the most widely used stocks in New Zealand previously but is no longer considered as a choice to achieve high quality, particularly for red wine varieties.
- Best wood sources are TK05002, TK05318, TK05394 and TK06602.
- Does not tolerate drought.

h) 5BB Kober:

Berlandieri x riparia hybrid.

- Most vigorous of all the Berlandieri x riparia stocks and not suitable for vigorous scions, e.g. Merlot, Cabernet, Cabernet Franc, Syrah.
- Roots and grafts well.
- Tolerates heavy clay soils and fresh humid silts but has poor drought tolerance.
- High Phylloxera resistance.
- Sensitive to Magnesium deficiency and Bunch Stem Necrosis.
- Best on heavier soils - may be excessively vigorous with maturity delays on fertile sites and should not be utilised for red wine varieties in particular.
- Best wood sources are TK06104 (Geiseheim 13-46-13), TK05325 and TK05048.

i) 5C Teleki:

Berlandieri x riparia hybrid.

- Similar aptitudes to 5BB but can be earlier maturing than other Berlandieri x riparia hybrid stocks.
- Has yielded well in fertile, deep heavier soil sites in Hawkes Bay and Gisborne.
- High Phylloxera tolerance.
- Grafts and roots well.
- Not especially drought tolerant.
- Magnesium sensitive and subject to Bunch Stem Necrosis.
- Best wood sources are TK06089 (Geisenheim)

j) 125AA (Kober):

Berlandieri x riparia hybrid.

- Moderate to high vigour but not as vigorous as 5BB.
- Highest yielder in stock trials with Mueller Thurgau in Gisborne.
- Magnesium and Bunch Stem Necrosis sensitive.
- Performs best on deep, heavier soil types.
- Similar performance to S04 or 5C.
- Roots and grafts readily.
- Good Phylloxera tolerance.
- Best wood sources are TK06105 (Geisenheim 4) and TK06092 (Geisenheim 3).

k) ARGI (Aramon Rupestris Ganzin No. 1):

Vinifera x rupestris hybrid.

- Moderate to high vigour but very productive.
- Has also produced good ripeness.
- Roots and grafts with ease.
- Tolerates clay and deep, fresh soils.
- Moderate drought tolerance.
- Phylloxera tolerance is moderate (Phylloxera can be detected on roots) but so far has not debilitated the stock in New Zealand.
- A very productive old stock in New Zealand.
- Plant with caution and mark blocks in case replanting becomes a necessity in the future.
- Best wood sources are TK05007 (UCD) and TK05317.

l) 1202 Couderc:

Vinifera x rupestris hybrid.

- A very old stock in New Zealand. Most Auckland vineyards previously grafted to this stock but it has lost popularity because it is too vigorous.
- Can delay maturity.
- Tolerates heavy clay as well as suited to fresh, deep soils.
- Can have poorer set and yield on deep fertile soil types.
- Grafts and roots readily.
- Good Phylloxera tolerance in New Zealand, although rated poorly overseas.
- Best wood sources are T05047 (Davis), T05319 (Rua 1) and TK05395 (Rua 2). A number of wood sources in the past have been infected with Leafroll Virus Type III.

m) “Drought Tolerant”, Dry Country” Rootstocks:

A series of these were recently introduced into New Zealand for possible use on gravel soils in various districts, and where irrigation is not possible or limited. They include 99 Richter, 110 Richter, 140 Ruggeri and 1103 Paullsen - all Berlandieri x rupestris.

- All are vigorous and are likely to delay maturity in New Zealand, although it has been claimed that 140 Ru will “advance maturity” in cooler soils of North Italy.
- They graft and root fairly readily and are used in hotter climates on shallow limestone and rocky soils.
- They do not tolerate we soils.
- Suggested only for limited evaluation in gravel soils without irrigation resources.
- Best Wood sources ar06513 (Paullsen), TK06514 (Richter 110), TK06515 (Richter 99), TK06516 (140 Ruggeri).

n) Fercal:

- A relatively new rootstock type available commercially in New Zealand.
- A cross of V. Berlandieri x Colombard No. 1 x 333 EM (Ecole de Montpellier).
- High resistance to Phylloxera and Nematodes.
- Susceptible to Magnesium deficiency and therefore may be susceptible to Bunch Stem Necrosis.
- Suited to limestone areas. The stock is popular in France on lime soils such as Cognac, Champagne, Sancerre.
- Requires evaluation on a range of soils and sites.

o) Gravesac (TK06615):

- A relatively new stock available commercially in New Zealand.
- A cross of 161-49 Couderc x 3309 Couderc.
- Used in sandy, gravely, acid soils.
- Excellent resistance to Phylloxera.
- Requires evaluation on a range of soils and sites in New Zealand.

p) 34EM Ecole de Montpellier (TK06509):

- A Berlandieri x rupestris cross.
- High resistance to Phylloxera, similar to 3309, 3306, Riparia Gloire.
- Possibly slightly less vigorous than 420A.
- Suits moist, deep soils and is drought sensitive.
- Reputed to have the general qualities of 420A including greater difficulty in propagation.
- Suited to a wide range of soils according to Australian data with low drought tolerance.
- Worthy of evaluation on a range of sites in New Zealand. Available in limited quantities from the New Zealand Vine Improvement Group.

q) 8B Teleki (TK06579):

- A cross of Berlandieri and Riparia.
- Not an important stock in France.
- More drought tolerant than 5BB.
- Grafts well and is vigorous.
- Probably best suited to droughty situations where irrigation is limited or not available.
- Evaluate in these situations along with 140 Ruggen, 1103 Paullsen, Richter, etc.