

## **Rootstock resistance to root-knot nematodes (RKN)**

*Project undertaken as part of the PGIBSA Rootstock Project, in collaboration with Greg Walker from SARDI.*

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### **Background**

1103 Paulsen has been widely recommended as an alternative to Ramsey in the warm-hot regions of South Australia, mainly because of its excellent drought and salt tolerance. To date, 2,684.33 hectares of 1103 Paulsen have been planted in South Australia.

Recent anecdotal reports have been received that 1103 Paulsen is under-performing in some sites, with the likely cause being rootknot nematodes. This is contrary to the current rating on the nematode resistance of 1103 Paulsen, which assumes at least moderate resistance to rootknot nematodes (Dry 2007).

Rootknot nematodes (*Meloidogyne* spp) are highly damaging to the grapevine (both own roots or susceptible rootstocks) on which it is able to feed and reproduce. They are the most widespread and economically-important plant parasitic nematodes of grapevines in South Australia (Walker 1997).

Plant growth response is a good indicator of grapevine susceptibility (Loubser and Meyer 1987). Symptoms of nematode infestation include poor shoot growth; severe infestation may result in vine death. Above-ground symptoms may be confused with nutritional deficiency or water stress (Nicol and van Heeswicjk 1997). Damage to a susceptible grapevine occurs through a loss of roots and impaired root function, which in turn limits the vine's capability to manage water and nutrient uptake - restricting vine growth and increasing the opportunity for fungal infections (Nichol and van Heeswicjk 1997).

Control methods for nematode-infested sites include planting with nematode-resistant rootstocks and increased water and nutrient inputs. However, the current drought situation means this may not be a viable management strategy available to growers. Therefore, planting with the right resistant rootstock(s) is the only long-term solution.

There are four main species of rootknot nematodes associated with grapevines: *Meloidogyne incognita*, *M. javanica*, *M. arenaria*, and *M. hapla*. It is possible that the resistance/tolerance of 1103 Paulsen to rootknot nematodes is species-specific. Previous studies have identified that different pathotypes or biotypes of rootknot nematode exist in the United States (Loubser and Meyer 1987, Cain et al. 1984, cited in Walker 1997, Walker unpublished data). Further to this, the degree of resistance of 1103 Paulsen may be modified by field conditions e.g. soil fertility and irrigation practices, previous cropping history, clonal differences in rootstocks or variation in virulence of nematode species (Loubser and Meyer 1987, Andrew Walker pers comm). This may explain why 1103 Paulsen has been growing well in some South Australian situations where rootknot nematode is present, but poorly in others.

### **Previous anecdotal findings**

The previous Rootstock Project Manager, Nick Dry, identified three RKN populations on 1103 Paulsen in sites sampled within the Riverland. The results from tests of the soil and roots of the samples indicated that the symptoms of poor vine health and decline were a result of the high RKN populations (Dry 2007 unpublished).

These preliminary findings suggest that 1103 Paulsen is susceptible to some species of RKN, mainly *M. javanica* and *M. arenaria*. The final report confirmed identification of the two RKN species in four Riverland vineyards, where it was apparent that these cases were isolated and populations atypical. However, recommendations in the final report suggest that these atypical populations may affect more vineyards in the Riverland in the future.

### **Research plan**

In order to establish the cause of the vine decline observed in 1103 Paulsen, more sites need to be identified where this pattern is occurring, and the populations of nematodes at those sites characterised to see if they are an unusually aggressive population, compared with populations found at sites where resistance does not appear to be breaking down.

In addition, it is important to assess whether this apparent breakdown in resistance is restricted to 1103 Paulsen, or whether other rootstocks with similar (eg 140 Ruggeri) or dissimilar (eg 101-14) parentage are also affected when exposed to the same conditions.

To date the Board has identified 18 growers from the regions of McLaren Vale, Langhorne Creek, Padthaway and the Riverland with incidences of vine decline on 1103 Paulsen. All sites have been tested for nematodes. Further work to characterise the rootknot nematode populations is currently being undertaken to determine their aggressiveness and resistance-breaking properties.

Experiments are proposed to evaluate the “resistance breaking” populations to see whether, when inoculated, they exhibit higher rates of population growth compared with standard populations, and if these alternative populations are more damaging to vine growth than the standard populations.

### **Current research**

A trial has commenced, where nematode-infested soil from sites identified as associated with vine decline (see above) is inoculated onto potted vines of different rootstock varieties (all grafted to Shiraz). Rootstocks being assessed are:

- 1103 Paulsen *V. Berlandieri x V. rupestris*
- 110 Richter *V. Berlandieri x V. rupestris*
- 140 Ruggeri *V. Berlandieri x V. rupestris*
- 101-14 *V. riparia x V. rupestris*
- 5C Teleki *V.berlandieri x V.riparia*
- Ramsey *V. champini*

Data collected will be:

- Nematode densities (in roots and soil using separate extraction methods)
- Vine growth in greenhouse including root fresh weight, shoot dry weight



Figure 1. Nematode infested 1103 Paulsen planting in the Riverland showing symptoms of poor growth and vine decline. Vines were replanted to 1103 Paulsen in 2002 and have failed to properly establish.

#### References:

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