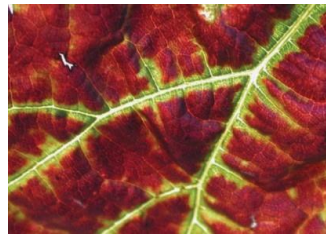
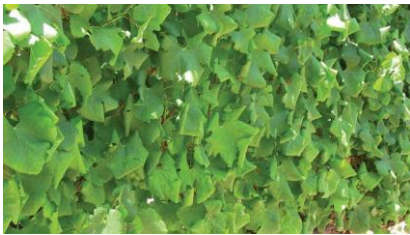




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LEAFROLL CONTROL STRATEGY

14. EXAMPLES OF LEAFROLL CONTROL.

In order to establish the efficacy of the strategies to control leafroll spread developed in the early 2000's and discussed in this series, a model site was established at Vergelegen Wine Estate in Somerset West, where these actions were implemented.

14.1 Control of leafroll was divided into three phases based on the estate's planned expansion of vineyards

- Phase one, establishment of new vineyards (mainly of red cultivars) on virgin soils. This included rehabilitation of the leafroll status of a few such vineyards which were established before the initiation of the project.
- Phase two, removal of the existing, highly leafroll-infected 15 to 20 year old red-cultivar vineyards, and replacement with new red-cultivar vineyards.
- Phase three, removal of highly infected 15 to 20 year old white-cultivar vineyards and replacement with new white-cultivar vineyards in which leafroll spread was controlled.

14.2 Control interventions conducted in phase one were

- Using only certified planting material from the South African Wine Grape Certification Scheme.
- Monitoring of mealybug levels with delta traps.
- Control of mealybug through treatment of vineyards with Imidachlorpid and winter application of Chlorpyrifos.

- Annual, autumn visual assessment of symptoms and ELISA tests for GLRaV-1,-2, and -3 (for the first few years of the vineyards). The ELISA tests were done to determine the efficiency of visual assessment of leafroll. These showed that visual assessment alone in red cultivars was sufficient for leafroll detection.
- Annual removal (roguing) of leafroll infected vines in early winter.
- Separating the implements used in these vineyards from those used in the, at that stage, highly leafroll infected vineyards of phase two.
- Retaining existing windbreaks of either Casuarina or Ulmus species

14.3 Phase two

During phase two all the above control strategies were applied, although at this stage some three-star material was available from the South African Wine Grape Certification Scheme, and was preferentially planted.

Furthermore phase two involved removal of the existing highly-leafroll infected vineyards. This was achieved by herbicide treatment of the old vineyards (subsequently shown to not have the desired effect of killing the old grapevine all the way to its roots), and removal of the old grapevines in total. A two growth season fallow period was used during which volunteer hosts were removed, followed by very deep soil preparation for the new vineyards to bring root remnants to the surface and have them dry out. Fortunately most of the vineyards of phase two were spatially adjoining and all these blocks were removed and replaced within three seasons of one another.



Figure 1: A typical red-cultivar vineyard in Autumn on Vergelegen. Note the absence of the typical red leaf symptoms of grapevine leafroll. (Image: G. Pietersen, ARC-PPRI)

Phase three involved the phased replacement of existing white cultivar vineyards. These vineyards were all spatially segregated but as a number of these vineyards were still producing good quality berries at reasonable yields, only those showing decline in quality or yield were removed. This is still an ongoing (2015) replacement. The same mealybug control, prevention of dispersal and fallow strategies employed in phase one and two were employed, except that old vineyards were not treated with herbicide prior to removal, but only with systemic insecticide. Furthermore, in order to identify infected grapevines for removal, ELISA tests were conducted annually on the grapevines. This was done by first testing a composite sample of all the grapevines in two bays (ten grapevines). Should such a sample test positive, the individual grapevines were tested to identify the infected one, which was then removed.

As a consequence of the above strategies, leafroll disease on Vergelegen is an extremely rare occurrence and it may be possible within a few years to consider the disease eradicated (three years without a single report) from the estate. In 2014 a total of 59 leafroll infected grapevines were observed amongst almost 210 000 grapevines in 64 red-cultivar vineyards with a combined area of 78 ha, all planted since 1998 and actively managed since 2003. This represented a 0.028 % infection. Thirteen vineyards have been without leafroll infected plants for two consecutive

seasons. Leafroll infection is not being controlled in the white cultivars with the same degree of success as in the red cultivars. This is likely due to the phased removal of white vineyards resulting in new vineyards being in close proximity to old, highly leafroll infected vineyards on both Vergelegen and neighboring farms, higher mealybug numbers due to proximity of infected neighboring estate vineyards and possibly due to a longer latent phase in white-berried cultivars. Nevertheless control was still very effective with a total of 142 infected grapevines detected by ELISA in 2014 amongst 91 061 grapevines planted since 2003 (0.16 % infection rate amongst new vineyards). The absolute numbers of infected grapevines were down from 247 infected grapevines detected in 2013. Since 2003 a cumulative 989 infected grapevines were identified in these new white-cultivar vineyards and rogued. This represents a cumulative 1 % of the grapevines planted since 2003 and must be considered a remarkable success. It is anticipated that the number of infected grapevines in the white cultivars will drop dramatically once older, highly infected vineyards in the proximity of these vineyards are removed.

Various minor variations on the leafroll spread interventions used at Vergelegen, based on personal preferences of vineyard managers and site-specific requirements, have been applied to the Foundation and a number of mother blocks used within the Wine Grape Certification Scheme with great success. These vineyards are spread throughout the wine grape production areas of South Africa and are located at a number of estates.

Amongst 335 foundation vineyard blocks, representing 572 000 grapevines monitored in 2015, 290 contained no leafroll infected grapevines. Within the remaining 45 foundation vineyards a total of 168 infected grapevines were observed in 2015, with the majority of these (n = 82) occurring in just three vineyards where clear deviations from the control strategy were performed.

In 119 commercial vineyards of various ages (2-16 years old) in various districts, utilized as mother blocks in the Wine Grape Certification Scheme, 38 had no leafroll infected grapevines in 2015 and none of the remaining vineyards exceeded a 1 % level of infected grapevines.

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