

Australian Vine Improvement Association Inc.

Study Tour of Germany, France, Canada and the United States of America

October 2004



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Grape and Wine
Research and
Development Corporation



*Victorian & Murray Valley
Vine Improvement Association Inc.*



Know-how for Horticulture™

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**Study Tour of Germany, France,
Canada and the United States of
America**

October 2004

Submitted by

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Abstract

The Australian Vine Improvement Association Inc. in association with Horticulture Australia Ltd, the Grape and Wine Research and Development Corporation and the Victorian and Murray Valley Vine Improvement Association Inc. undertook a study tour of Germany, France, Canada and the United States of America during October 2004.

The tour provided the opportunity for the Australian Vine Improvement Association Inc. to re-establish links with grape breeders and suppliers of high health vine material. It also provided the opportunity to negotiate contracts to distribute new varieties and clones.

Technologies used for vine improvement were also thoroughly investigated, to determine if there is potential for adoption by vine improvement associations in Australia. One aspect of this is rootstock trellising, which is used extensively in Germany. Investigation revealed that although trellising is important and necessary in Germany it may not be the most appropriated method of rootstock production in Australian conditions.

Information gathered from the tour has provided vine improvement associations and nurserymen with an insight into vine improvement activities in various countries and how they produce and distribute material of a high health status.

Introduction

The primary objective of the Australian Vine Improvement Association (AVIA) is to facilitate the importation of new grape and rootstock varieties from breeders in Europe and the United States. Material imported by AVIA is rapidly multiplied and then distributed to the state vine improvement associations, who are members of AVIA. To ensure that AVIA remains at the forefront of the importation of new varieties that are of a high health status, a study tour was initiated with financial assistance from Horticulture Australia and the Grape and Wine Research and Development Corporation.

The tour comprised of visits to four countries, these were Germany, France, Canada and the United States. In Germany the Institute for Grape Breeding and Grafting located at Geisenheim was toured for its reputation as a breeder of grape and rootstock varieties. In France the Etablissement National Technique pour l'Amelioration de la Viticulture (ENTAV), which is located at Espiguette, Montpellier was visited for its world-renowned reputation as a breeder of new clones. The prospect of securing a licence for AVIA to distribute ENTAV trade marked clones within Australia was also investigated. Canada, which although not a significant player on the world stage in viticulture was chosen as a site of interest due to its outstanding facilities at the Centre of Plant Health located at Sidney, British Colombia. These facilities enable Canada to be at the forefront of vine improvement and of considerable value as a source of new varieties of high health status.

In the United States the tour included visits to Foundation Plants Services (FPS), the United States Department of Agriculture (USDA) and the Californian Table Grape Commission. Foundation Plant Services located at Davis California was of considerable interest due to it being the primary source of grapevine varieties and rootstocks imported by AVIA. The USDA ARS Laboratory located at Parlier, California, is the major breeder of new table and dried fruit varieties in the USA, was an important visit to learn more about the potential new varieties being bred by Dr David Ramming and his team. The final part of the tour involved a visit to the Californian Table Grape Commission, which is located at Fresno. Here, discussions were held to try to obtain the rights to distribute the new tablegrape varieties Princess and Summer Royal, which are now subject to provisional plant breeders rights in Australia.

Objectives

1. To build on the existing relationship with grape breeders and suppliers of high health vine material in Germany, France, Canada and the United States of America.
2. To establish agreements with ENTAV and The Californian Table Grape Commission for distribution of new varieties and clones.
3. To look closely at rootstock trellising techniques and their potential application in Australia.
4. To investigate new varieties/clones which may have potential in Australia.
5. To investigate the potential for technology adoption in the area of vine improvement.
6. To cement current agreements with Foundation Plant Services, Davis, California and the Centre for Plant Health, Sidney, Canada.

Preparations

The study tour was initiated by the Australian Vine Improvement Association to reaffirm its commitment to members it's desire to be at the forefront of importation of new varieties and clones. The tour was also designed to reassure overseas contacts that AVIA continues to play a significant role in vine improvement within Australia.

The itinerary was organised by Mr George Kerridge (Executive Officer; AVIA), and Mr Michael Pullen (Executive Officer; Victorian and Murray Valley Vine Improvement Association).

Funding for Mr George Kerridge was jointly provided by Horticulture Australia and the Australian Vine Improvement Association. Mr Kym Ludvigsen was jointly funded by Horticulture Australia and the Victorian and Murray Valley Vine Improvement Association (VAMVVIA). Mr Julian Connellan was jointly funded by Horticulture Australia and the Grape and Wine Research and Development Corporation.

Tour Overview

Geisenheim, Germany Institute For Grape Breeding and Grafting Prof. Dr Ernst Ruhl, Director

At the Institute for Grape Breeding and Grafting (hereafter known as “the Institute”) the focus is on breeding new wine grape varieties with an attempt to breed into these varieties powdery mildew resistance. Considerable effort is also being put towards the selection of new clones from traditional varieties and developing new rootstocks. Dr Ruhl said the most promising red wine grape the Institute currently has is Dunkelfelder. The facility also provides vinifera and rootstocks cuttings to nurseries for the establishment of source areas.

Rootstocks grown at Geisenheim are trellised due to the cool, wet conditions in Germany, which predispose sprawled rootstocks to anthracnose. In Dr Ruhl’s experience, to grow one hectare of trellised rootstocks for a season it requires fifty days of labor to train the rootstocks appropriately. Trellised rootstocks generally produce around 100 useable cuttings per vine with a planting density of around 2000 vines per hectare. Per hectare this equates to around 200,000 cuttings.



Fig.1 George Kerridge inspecting a typical trellis system.



Fig. 2 Trellis system preferred by the Institute.

All vines at the Institute are grown on Borner due to the presence of phylloxera, which is endemic across Germany. Dr Ruhl suggested that Borner (*V.riparia* x *V.cinerea*) could potentially be quite a useful rootsock in Victoria’s high country due to it’s deep root system and resistance to phylloxera.

In Germany approximately 30 million grafts are conducted annually which produces around 20 million plants. Of these 5% to 10% of vines are shipped outside Germany to other members of the European Union (EU). Being part of the EU provides free access to other countries, which are EU members allowing movement of materials and labour across borders. To transport material out of Germany the material requires a “Plant Passport” which requires the material be free of any quarantinable diseases and checked for viruses.

Currently, Hot Water Treatment is not part of the certification program used by the institute, as there is some suspicion as to its validity. Its difficulty to incorporate into grafting procedures is also used by nurseries as another reason for not using the treatment. According to Dr Ruhl the prevalence of conditions such as Crown gall only seems to arise once every 15 to 20 years when it’s a particularly cold year. Other diseases such as Flavescence dorée are not a problem in Germany.

Plant health in Germany is regulated by legislation, which is set down by the state. In Germany it is against the law to propagate and distribute material without being a registered nursery. Nurseries also have to propagate from certified material. Certified material originates from material produced by the Institute and others like it. In all there are 200 hectares of grapevine varieties and 200 hectares of rootstocks, which are certified by the Institute.

The German certification system consists of four categories, these are Pre-base, Base, Certified and Uncertified. Pre-base material is what is known as elite material in Australia, this material is tested by Enzyme-linked immunosorbent assay (ELISA) once every 3-5 years. Generally there are around 10-15 vines of these, which are also visually inspected once annually. The ELISA tests are used to detect Grapevine leafroll associated viruses, Grapevine fanleaf virus and the Arabis mosaic virus. They also have the capability to test for the Raspberry ringspot virus and the Tomato black ring virus. One generation down from this is the base material, which is the multiplication stage, at this stage there can be up to 50 vines. Material from these vines is taken by the Institute staff and given to one of two nurseries to graft and supply to growers. When material is taken from base blocks an ELISA test is conducted on a composite sample of off cuts from 30 to 50 sticks. Once the material is grafted by the nursery and given to growers it becomes certified material. From this stage on the Institute has no direct contact with the grower.

Annually, blocks with certified vines are inspected by Certification Officers who work for the EU, these blocks are also inspected by the Institute staff. On completion of inspection by the officers, a block, if it is deemed acceptable to take cuttings from, is added to a list as a source area for that particular variety. At the conclusion of the inspections by the EU officers a list is generated with all available source areas. This list is then published for nurseries. From here nurseries can approach a grower directly to take the cuttings and agree on a price. Once cuttings are taken they are inspected by the certification officers for quality parameters and the total number taken. This information is then provided to the Institute who charge the nursery a royalty for each cutting taken. Cuttings are cut into 1.2m lengths, from this a grower receives around 50 cents. The Institute receives around 20 to 30 cents per cuttings as a royalty.

Currently, considerable effort at the institute is spent on selecting new clones from existing varieties. At present the institute staff are looking closely at two new Pinot Noir clones. One of the clones has loose berries, is earlier ripening and has lower acid levels, whilst the other has small berries. Either or both of these clones may possibly be of interest in Southern Victoria once they are released.



Fig.3 Traditional harvesting techniques still used in Germany.

**E.N.T.A.V. Le Grau du Roi. Espiguette, Montpellier.
Jean-Michel Boursiquot, Director**

ENTAV is a non-government body, which distributes all the selected grapevine varieties and clones in France. The facility is located very close to the coastline so that the vines could originally be grown on their own roots in the sandy soil. However in recent years all the vines in the vineyard have been grafted onto the rootstock SO4 due to the prevalence of nematodes. The vineyard consists of 16 hectares of base material for the production of source areas. Currently ENTAV has between 25-30 different rootstock's, however this collection does not include Ramsey or Dog Ridge.



Fig.4 Serge Grennan (ENTAV) shows George Kerridge and Kym Ludvigsen some Gamay growing in the sandy soils.

Like Giesenheim, clonal selection is a very important part of the work carried out at this facility. For clonal selection to occur the material is observed in the vineyard for two years and cuttings are then taken. Cuttings are hot water treated for 45 minutes at 50⁰ C for control of Petri disease and Flavescence dorée. This material is then tested for the presence of Grapevine fanleaf virus (GFLV), Grapevine leafroll associated viruses (GLRaV), Grapevine fleck virus (GFkV), Grapevine virus A (GVA), Grapevine virus B (GVB), Rupestris stem pitting associated virus (RSPaV), Grapevine vein mosaic virus and Grapevine vein necrosis. The testing procedure used for these viruses generally takes three years and includes woody grafting for detection of GFLV and GFkV. They use ELISA for detecting GLRaV, GVA, GFLV and GFkV. Green grafting is used to detect GVA, GVB and RSPaV. At this stage ENTAV is only beginning to use PCR for the detection of GLRaV and RSPaV.



Fig.5 Green grafting used to detect Grapevine virus B.

Each year ENTAV produces two to three clones for release. Material produced by ENTAV is provided to 15 nurseries for multiplication and release to growers. These are classified as certified vines. Annually ENTAV produces 300,000 vines to provide nurseries with base material for the establishment of mother blocks. There are currently 4000 hectares of certified source areas in France. Source areas are tested for the presence of GFLV by ELISA once every 5 to 6 years.



Fig.6 Some of the 300,000 vines destined for nurseries.

Currently, ENTAV has three new Chardonnay and two new Viognier clones ready for release to French growers. ENTAV intends to keep this material in France for the next five years before it will release these to parties in other countries who have contracts with ENTAV.

To date ENTAV has a contract with only one nursery in Australia, it was the intention of AVIA to attempt to secure another contract, however at this stage ENTAV will wait for another two to three years before it will licence another body in Australia.

Centre for Plant Health, Sidney, B.C., Canada
Dr Bill Lanterman, Director
Ray Johnson, Research Officer

The Centre for Plant Health (CPH) is a government research institute which receives its funding from the Canadian federal government. The role of this facility is to maintain a repository of nuclear level, virus tested clones of grapevine and tree fruit varieties. Currently the facility holds around 100 grapevine clones. The CPH is also an import quarantine facility handling imported tree fruits, small fruits and grapevines.

Material imported to the facility from countries such as France is routinely hot water treated at 50⁰C for 45 minutes for control of phytoplasma and agrobacterium. Depending upon the country of origin, grapevine material may only be fumigated to kill any potential insect vectors. Material produced by the Centre for Plant Health is not hot water treated before being distributed to nurseries or growers.

Imported material found to contain virus is either put through a virus eradication program using heat therapy or destroyed. Several techniques are used by CPH for virus detection. These are ELISA, PCR, bioassay onto herbaceous and woody indicators and visual examination. Currently CPH is working towards gaining accreditation for its PCR tests.



Fig.7 Vines in indicator block expressing symptoms of Grapevine Fleck virus.

The two major grape growing areas in Canada are southern Ontario and British Columbia. These areas tend to be more mild than other parts of the country. The largest of the two areas, southern Ontario has 15,000 hectares under production. Here, temperatures can fall as low as -20⁰ C making frost fans essential pieces of equipment. In British Columbia the production area is located in a valley where conditions are warm and dry. Temperatures in this area can reach 40⁰C in summer. Wine quality in this region is said to be quite good.

Foundation Plant Services, University of California, Davis
Dr Deborah Golino, Director
Cheryl Covert, Sales and Distribution Manager

Foundation Plant Services (FPS) is a non government agency with links to the University of California, Davis and the United States Department of Agriculture (USDA). The current facility was built with the assistance of a grant of 1.5 million dollars (US) from the USDA and the donation of a parcel of land by the University of California, Davis. The major source of income for this organisation is from user fees.

The FPS currently holds in-excess of 1600 selections of more than 600 grapevine varieties, which includes table, dried, wine and rootstock varieties. Testings of these varieties is a legislative requirement with all Foundation-level (registered) material undergoing field and herbaceous indexing and ELISA testing prior to being planted. Once planted, these vines are subject to ELISA tests once every five years. To achieve this, one fifth of the varieties are tested annually. All source blocks are visually inspected in Spring and Autumn. Government inspectors also conduct inspections of source blocks. Due to the presence of phylloxera all vines are grown on the rootstock 3309 Courderc.

The FPS now offers an identification testing service using DNA technology. The facility now has the DNA of over 700 grapevine and rootstock varieties, which can be used to screen against an unknown to determine its identity.

Currently, FPS grows the majority of its rootsocks on trellis, however this system has been found to be low yielding and labour intensive.



Fig.8 Autumn Royal very late in the season.

USDA ARS Laboratory, Parlier, California
Dr David Ramming
Grape Breeder

Dr Ramming has been involved in the production of seedless tablegrape and dried fruit varieties for more than 30 years. Currently Dr Ramming and his team produce 40,000 cultures of seedless x seedless crosses annually. Generally around 5000 of these will become viable plants, which are screened and selected for further development should they display favourable characteristics.

Once a potential new variety has been identified, the vine is multiplied into 25 vines. From here the 25 vines are planted in a plot, which is divided into five replicates of five vines. Cultural practices such as pruning, GA application and girdling are trialed. Storage trials are also undertaken. Grower based trials are not used by the USDA due to the potential for loss of material.

The development of a new variety generally takes around 12 years. Currently all new crosses are discarded if they have a seed trace, however this policy was not in force when Autumn Royal was undergoing development.



Fig.9 New seedless x seedless crosses recently transferred from tissue culture media to a peatmoss and perlite based media.

At present, Dr Ramming is looking at developing dried fruit vines, which dry on the vine naturally without cutting any canes. Other areas in which he and his team are focusing is the breeding of vines resistant to mildews and Pierce's disease. The breeding of resistance to mildews and Pierce's disease is taking place using traditional breeding techniques. In the mid 1990's the first transgenic grapes were produced. Out of this program a transgenic rootstock with resistance to Grapevine fanleaf virus was produced. This rootstock is still undergoing evaluation.

Californian Table Grape Commission. Fresno, California
Ross Jones, Vice President, Research

There are currently two new tablegrape varieties in Australia, which are subject to provisional Plant Breeders Rights (PBR). These varieties are Princess and Summer Royal, which were released from quarantine in late 2002. These varieties were purchased from Foundation Plant Services and were listed as freely available varieties.

In order to obtain the rights to distribute these varieties through regional vine improvement groups, which are members of AVIA, it was thought that a delegation should be sent to meet with Mr Ross Jones. A case was put forth to the Californian Table Grape Commission to allow AVIA to distribute these varieties and any new tablegrape varieties which may be subject to PBR.

The Californian Table Grape Commission is looking for an organisation that is able to propagate, market and police newly imported table grape varieties, which are subject to PBR. AVIA currently awaits a response from the Commission in regards to this matter.



Fig.10 Princess which is currently subject to provisional Plant Breeders Rights in Australia.

Conclusion

The tour was invaluable for the three members who each gained valuable experiences and established key international contacts. Although a contract with ENTAV was not forthcoming, the experience gained from visiting the site and talking to Jean-Michel Borsiquot made the trip to Montpellier worthwhile. AVIA still awaits a response from the Californian Table Grape Commission for the rights to distribute Princess and Summer Royal.

The tour also highlighted that the technology available for vine improvement in Australia through the CSIRO and/or state government departments is equal to that of any of the institutions visited during the tour. The tour also demonstrated for Julian Connellan (Research and Development Officer VAMVVIA) that the virus testing protocols developed for source area establishment and maintenance of VAMVVIA plantings are as stringent as those used by any of the toured countries. It has also highlighted that serious consideration should be given before attempting to undertake trellising of rootstocks on a large scale given the associated costs and the reasons why it is used in countries such as Germany.

Acknowledgments

The three participants would like to thank Horticulture Australia, the Australian Vine Improvement Association, the Grape and Wine Research and Development Corporation and the Victorian and Murray Valley Vine Improvement Association for the opportunity to tour the four countries. Additional thanks to Michael Pullen, who committed his time and effort in obtaining funding for this tour.

The experiences gained and the linkages made with viticultural researchers will return dividends for many years to come.

References

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4. Weber E. and Galino D. Laboratory (2002) Laboratory testing for grapevine diseases Practical Winery and Vineyard.

Attachment 1

Travel Itinerary:

Monday 4 th October	Depart Melbourne fly to Frankfurt, Germany.
Tuesday 5 th October	Institute for Grape Breeding and Grafting, Geisenheim.
Wednesday 6 th October	Institute for Grape Breeding and Grafting, Geisenheim.
Thursday 7 th October	Fly Frankfurt to Montpellier.
Friday 8 th October	E.N.T.A.V Le Grau du Roi, Espiguette, Montpellier.
Saturday 9 th October	Train to Paris.
Monday 11 th October	Fly Paris to Victoria Canada.
Tuesday 12 th October	Centre for Plant Health, Sidney, B.C.
Wednesday 13 th October	Fly Victoria to Sacramento, USA.
Thursday 14 th October	Drive Sacramento to Foundation Plant Services, Davis.
Friday 15 th October	Drive Sacramento to NapaValley.
Saturday 16 th October	Drive Sacramento to Fresno.
Monday 18 th October	Drive Fresno to USDA ARS Laboratory, Parlier, California.
Tuesday 19 th October	Califronian Table Grape Commission, Fresno, California.
Wednesday 20 th October	Fly Fresno to Mildura.

Attachment 2

Contact List

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