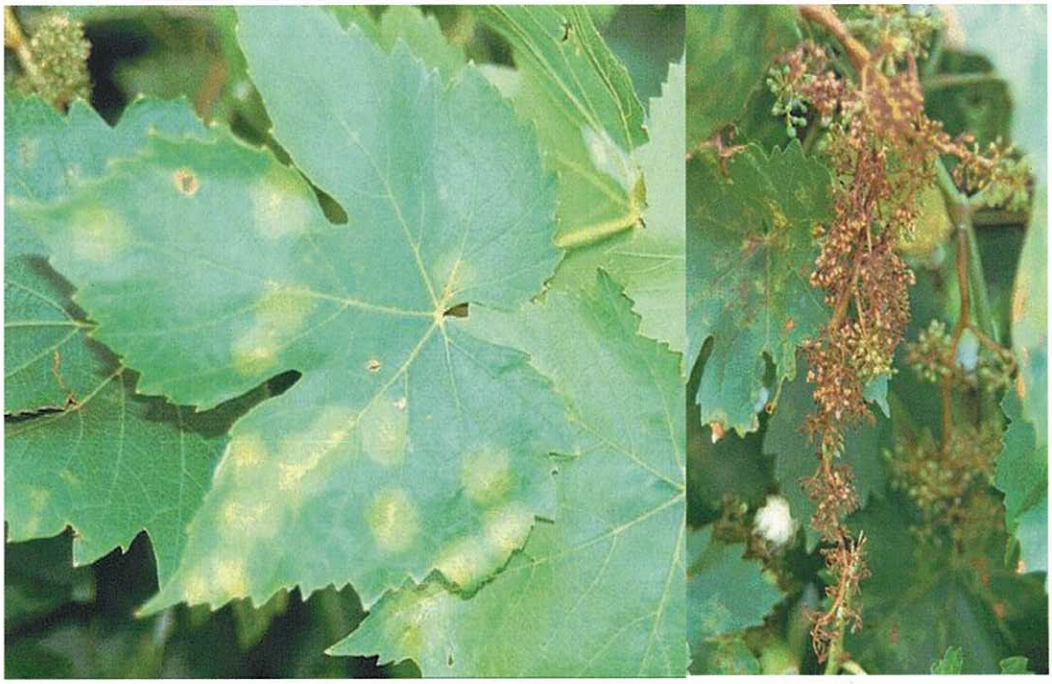
Reduced Chemical Usage and Improved Control of Grapevine Downy Mildew Using a Simulator of Disease.



FINAL REPORT to GWRDC

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Project Number: DAS 9GW; DAS 9

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Date: July 31 2000

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Executive Summary

Downy mildew is a widespread, destructive disease of grapevines especially in warm, wet conditions. It causes major crop loss that averaged (1996 figures) at around $23 m dollars per season (approximately 3% of Australian viticulture's production total). Significantly, a further $10m is spent annually trying to control the disease. However, some years in Australia are relatively dry and little or no disease develops while in stark contrast, wet seasons have led to district crop losses estimated at 10 – 15%. In these years, downy epidemics destroy complete crops in some vineyards. The present project was initiated on the premise that this crop loss can be avoided and that the number of sprays used to control downy mildew can be significantly reduced even in wet years.

Surveys have shown that in dry seasons, the average Australia grapegrower applied 4-6 protectant fungicide sprays each season. In wet seasons, this number increased to 6-8 (-12) sprays in the hope that these sprays would prevent downy from developing especially during the time around flowering when the developing bunches are most susceptible. The main reason these controls failed has been the lack of appropriate spray timing. Most outbreaks occur when the time between the last pre-infection (protectant) spray and the time of wetness that led to infection, was too great. On other occasions, at times of high disease risk, expensive post-infection (eradicant) sprays are applied too late to kill off an infection event. The result is unnecessary crop loss and unnecessary risk of residues in Australian wine when both can be avoided.

Prior to this project, a preliminary version of a simulator of downy mildew (DMODEL) had been produced in a collaborative project with funds from Australian Rural Credits and the Australian Dried Fruits Research and Development Council. Australian investigators were assisted by Dr Bob Seem from Cornell University, NY, USA. The computer-operated system modelled various stages in the life cycle of the disease including zoospore release, infection, incubation, oilspot survival, sporulation and spore mortality. A combination of scores for surviving spores and infection likelihood is used to predict the likely severity of each infection period. This system showed potential for use in Australia by providing growers with warnings of the date and time of downy mildew infection events. It relied upon access to weather data collected by electronic stations located in the vineyard and though it worked well, it was difficult and slow to use.

In an effort to improve spray timing, to increase the efficiency of disease control and to reduce the impact of downy mildew in Australian vineyards, the following objectives were pursued:

1. **Software development**: To complete a computer-based simulator of downy mildew epidemiology to improve control of the disease in Australian vineyards.
2. **Validation**: To continue validation of the simulator in vineyards of South Australia, New South Wales and Victoria, and
3. **Comparison**: To compare the prognoses of Environcaster®, a US built predictor of downy mildew on *Vitis labrusca*, and an Austrian predictor, KMS-P®, with the Loxton-built simulator.

Software development: During the course of the project, the simulator of downy mildew epidemiology was re-vamped. The software was converted to more versatile programming language and a number of sub-routines were modified to improve the accuracy of disease prognoses. Important structural changes were made to allow future modification of component models on various aspects of the downy mildew life cycle and for use of the model in different geographic regions. This change also allowed another important use *viz* to test the simulator under hypothetical situations and so to determine the relative influence of models within the simulator on disease predictions.

A further major improvement was the addition of a disease management advisory system. This new software provides growers with a recommendation on options for best management of disease given past disease progress and assessment of present risk of disease. To assist the user understand the implications

of each option, the consequences of each is also presented. This system was the first of its kind for use by grape growers anywhere.

The rewriting of the software enabled more rapid use of the system and included automatic processing and importantly, error checking procedures for weather data. The simulator was thus made easier and safer to use.

Validation: Weather data were collected from unsprayed vineyard sites in South Australia at Loxton (5 vineyards), Waikerie, Nuriootpa, and in Pt Macquarie, NSW. Difficulties in obtaining reliable data from sites outside the Riverland continued. Plans to obtain data from the Hunter Valley failed because the electronic weather stations were not well maintained.

During the dry seasons 1990/91 and '91/92, the simulator proved its value for typically dry Australian conditions by correctly predicting when disease risk was low and advising growers to withhold sprays. The season 1992/93 was very wet and was probably the worst for downy mildew in the history of Australian viticulture. Nine major infection events occurred in unsprayed vineyards. This resulted in some vineyards suffering total crop loss from downy mildew and unsubstantiated reports of district losses of 20-30%. The disease pressure and difficulties with managing downy (and powdery) mildew resulted in very high levels of enquiry to the project team. In excess of 1,140 enquiries were received at Loxton Centre, comprising 777 from growers, 229 from government agencies (in SA and interstate), and 135 from the press. The project team also addressed an additional 800 growers at special meetings to discuss the management of downy mildew in the Riverland, published 30 extension articles, presented 34 radio and 12 television reports and 9 newspaper articles. Under these circumstances, the simulator of downy mildew proved its ability to quickly and accurately describe infection periods in both the Sunraysia and Riverland districts. It predicted the date and severity of the appearance of oilspots and provided options for disease management for grapegrowers to improve the efficiency of downy mildew control. As a result, growers in the test vineyards were able to save on average 2 sprays per season. (These findings are to be reported more fully in a CRC(V) project on Strategic Management of Grapevine Diseases and Pests).

The critical need for reliable electronic weather data was emphasised and the advantage of a system in which the weather stations also contained the simulator for automatic on-site processing, was demonstrated. (An associated GWRDC project DAS 92/2, involved integration of this simulator in a low cost, robust weather station to enable application of the simulator in the vineyards of Australia. This work is reported in **GWRDC Project DAS 92/2).**

Comparison of overseas predictors: An Environcaster® (= Pestcaster®), a high cost downy mildew disease predictor from USA, was provided to the project for two seasons. Predictions of disease from this unit compared favourably with the timing of disease events in an unsprayed vineyard showing that this device was an accurate and reliable weather station/disease predictor, easy to operate and access. It is however, no longer being manufactured.

The DMODEL system has shown excellent potential for widespread use in Australia despite two deficiencies. These are a lack of biological information relating to predicting primary infection and the need for weather stations to provide appropriate weather data. In the future, we hope the use of site-specific weather forecast technology will allow the simulator to predict infection, several days before they take place in the vineyard. It is important that the simulator be thoroughly tested for use in a diversity of regions, especially in cool climates where wet conditions persist for long periods.

This project has confirmed the use of DMODEL as a tool for Australian grapegrowers to minimise chemical use while improving the level of control of downy mildew. Affirmation of this came when a subsequent project led to the initiation and development of AusVit™ a decision support tool that now provides disease and pest management advice to grapegrowers of Australia. The DMODEL simulator formed the basis of AusVit™ 's predictions of downy mildew and its use as a simulator within this expert system was the first ever, for commercial use in agriculture.

A completed simulator has potential as a decision-aid for Australian vineyard managers to confidently rationalise existing fungicide spray programs. Fewer sprays have been required to achieve more effective downy mildew control with less chemical hazard to the environment and to reduce the risk of pathogen tolerance to post-infection fungicides.

Project Details

Project Code:	DAS 9GW, DAS 9
Project Title:	Reduced chemical usage and improved downy mildew control using a computer simulator of disease.
GWRDC Priority Area:	Pest Management
Research Organisation:	Primary Industries South Australia
Name of Administrative Contact:	Research Funds Co-ordinator Primary Industries South Australia
Name of Project Coordinator:	Mr P.A. Magarey Plant Pathologist Loxton Centre PO Box 411, Loxton, SA, 5333 Phone: (08) 8595 9100 Fax: (08) 8595 9199
Names of Project Staff:	Mr P.A. Magarey, Plant Pathologist. Mr M. F. Wachtel, Plant Pathologist. Loxton Centre, Loxton, SA 5333. Dr. R.C. Seem, Associate Professor, Cornell University, Geneva, New York, USA.
Funding:	$113,184
Date Commenced:	July 1991
Date Completed:	June 1994

Related Projects:

- DAS 92/2 - Reliable, cheap weather stations as predictors for improved disease and pest control.
- Strategic Disease and Pest Management for AusVit™ (CRCV Program 2)
- Development of the AusVit™ Computer - based Decision Support System for Australian Viticulture (CRCV Program 4)

Technical Report

Objective

1. To complete a computer-based simulator of downy mildew epidemiology to improve control of the disease in Australian vineyards.
2. To continue validation of the simulator in vineyards of South Australia, New South Wales and Victoria, and
3. To compare the prognoses of Envirocaster®, a US built predictor of downy mildew on *V. labrusca*, and an Austrian predictor, KMS-P®, with prognoses from the Loxton-built simulator.

Progress 1991/92

Software

During the course of the project in 1991, DMODEL, the simulator of downy mildew epidemiology, was significantly re-vamped. The software was re-written to meet upgrade specifications including a conversion to the move versatile Turbo C programming language. A number of the sub-routines were modified to improve the accuracy of disease prognoses.

Important structural changes were made to the simulator to include the preparation of a system whereby future changes to the component models can be made with ease. In this way the models can be varied to suit any change in specifications that may become apparent with evaluation of the simulator in different geographical regions. Also the models can be varied to test their performance under hypothetical situations, to determine the influence component variables have on prognoses of disease events.

Another major improvement to the simulator was the addition of a disease management advisory system. This provides a disease management recommendation determined in relation to current disease prognoses and predictions of disease risk. Alternative courses of management action are listed as options for consideration by the vineyard manager and the consequences of electing any one of those options is now also presented. This system appears to be unique in international comparisons of similar predictors of downy mildew and offers excellent advice to grapegrowers.

The rewriting of DMODEL has enabled more rapid use of the system including automatic data handling and date bounds checking procedures. The latter component is essential to safeguard use of accurate date. Operation of the simulator is now possible in less time and by those with less computer knowledge.

Subsequent to the present project, development of this software led to the development of the computer-based decision support system **AusVit™.** This is reported elsewhere but is summarised in a number of publications that are cited in this report (see below).

Validation

Weather data were again regularly collected from unsprayed vineyard sites in South Australia at Loxton (5 vineyards), Waikerie, Nuriootpa, and in Pt Macquarie, NSW. Difficulties in obtaining reliable data from the latter two sites continued, and previous plans to obtain data from a vineyard in the Hunter Valley failed. A lack of staff to maintain and service the electronic weather stations at those locations caused this failure but this problem should be overcome by appropriate training of the personnel who use this computer-based system.

During the dry seasons 1990/91 and '91/92, the DMODEL simulator proved its value for typically dry Australian conditions by correctly predicting when disease risk was low and advising growers to withhold sprays.

Overseas predictors
Plans to purchase an Envirocaster® (=Pestcaster®), a high cost downy mildew disease predictor from USA, were negated following discussions with the manufacturer (as part of the project supervisor's Churchill Fellowship to USA). The company agreed to provide a test unit to Loxton Research Centre for two seasons, without cost. The capital equipment provision of $6,000 in the present project thus was returned to GWRDC.

This money was subsequently deferred to the a new project (**GWRDC DAS 92/2**) which led to construction and finally, commercial release of an Australian product, the ***Model T MetStation***. This exciting new technology is a low cost, intelligent weather station that functions successfully as a disease predictor. A report on this project is presented in **GWRDC Final Report for DAS 92/2.**

The Envirocaster® proved an accurate and reliable weather station unit that was easy to operate and access. Unfortunately, despite the swift delivery of Envirocaster® to Loxton and the excellent support service accompanying the unit, evaluation of its ability to predict downy mildew was prevented because the operational season date within the unit was not converted for the southern hemisphere growing season.

In addition, following discussions with a plant pathologist from Switzerland, and courtesy of an electronics manufacturer Anton Paar in Austria, and their Australian agent FSE, a second predictor of downy mildew was delivered for testing at Loxton for a two year period, again at no charge.

Both this unit, the KMS-P®, and Envirocaster® appeared to have potential for reliable use in Australian viticulture despite initially high capital costs ($6,000 and $15,000 respectively). Further evaluation of similar devices is still needed, though the ***Model T MetStation*** commercially available (in the year 2000) for $1,100, has superseded this need.

Summary 1991/92

Re-writing of the software for DMODEL, the downy mildew simulator, was completed most successfully. Only minor up-grades are now anticipated. The addition of important data checking routines and of disease management advice has contributed greatly to the useability of the simulator for grapegrowers. The system has shown excellent potential for widespread use in Australia despite two deficiencies. These are over-prediction of primary infection events in cool climate regions. This was not adequately tested because of dry seasons during the term of the present project. A second deficiency is the need for weather stations to provide appropriate weather data. At the time of the project, this came only from high-cost weather stations. It is important that the simulator be thoroughly tested for use in a greater diversity of regions and this was planned in 1992/93.

Progress 1992/93

The unprecedented wet season 1992/93 (probably the worst season for downy mildew in the history of Australia) provided excellent opportunity to evaluate the latest version simulator of downy mildew. It proved its ability to accurately describe infection periods (upon the processing of vineyard weather data), to predict the date and severity of the appearance of oilspots, and to provide disease management advice (and options) for grapegrowers to improve the efficiency of disease control and to reduce the use of chemicals in vineyards. Plant protectionists in with Agriculture Victoria, Mildura (David Madge, Bob Emmett and Roger Magarey) installed the simulator in Sunraysia and provided the first opportunity to field test its performance outside the Riverland. The uniformity of the weather pattern during 1992/93 in much of SE Australia assisted evaluation of the simulator in more than 20 vineyards of the Riverland and Sunraysia. The field tests of the strategies to control downy mildew in both Riverland and Sunraysia demonstrated successful control could be attained by use of the simulator, which provided advice of optimum dates of spraying. Contributors to poor spray programs were incorrect maintenance of weather stations (hence the provision of poor data) and poorly designed and adjusted spray machinery.

The weather pattern during 1992/93 induced nine infection events at Loxton in unsprayed vineyards (and a similar number in Mildura). The disease pressure resulted in some vineyards suffering total crop loss to downy mildew; unsubstantiated district losses of 20-30% were reported. The disease pressure and difficulties with managing downy (and powdery) mildew resulted in very high levels of enquiry to the project team at Loxton Research Centre during the growing season. In excess of 1,140 enquiries were received. These comprised 777 from grapegrowers, 229 from government agencies (in SA and interstate), and 135 enquiries from the press.

On average, there were 22 enquires/day made during the growing season (highest number was 125 enquires/day during rain and mid-flowering). The project team also addressed an additional 800 growers at special meetings to discuss the management of downy mildew in the Riverland, published 30 extension articles, presented 34 radio and 12 television reports and 9 newspaper articles.

The simulator is still not perfect in its ability to predict disease (it lacked and still lacks, biological information on primary infection) but from its evaluation during drier years (*ie.* prior to 1992/93) and during the wet season 1992/93, we confirmed its usefulness as a tool for Australian grapegrowers to minimise chemical use while improving the level of control of downy mildew.

The simulator required evaluation in an increased number of vineyards in SE Australia during 1993/94 in association with Co-operative Research Centre (Viticulture) activities in NSW, Vic and SA. An associated GWRDC project DAS 92/2, involved integration of this simulator in a low cost, robust weather station (as above) to enable application of the simulator in the vineyards of Australia.

The Envirocaster® disease predictor proved reliable and accurate in predictions of downy mildew infection events but slight modifications to the output displays will be required prior to its commercial release in Australia. In 2000, this is unlikely since the Envirocaster ® is no longer manufactured. Due to the extreme season activities, the KMS-P® was not tested.

Progress 1993/94

Downy mildew is a major disease of Australian vineyards, although in inland regions significant crop loss occurs only once or twice in 10 years. Many growers apply sprays at less than optimum times and in dry seasons, often in anticipation of disease which does not occur. Some of these sprays can be avoided with confidence and the timing of others can be improved by accurate provision of knowledge about the disease and its management. Wet seasons like 1992/93, arguably the worst that Australian viticulture has experienced, highlighted the need for reliable and timely information on downy mildew and its control.

A computer-based simulator of the epidemiology of downy mildew has been constructed and was evaluated with success during this particularly wet season. Known as DMODEL, the simulator comprises a series of models each of which describe a phase in the life cycle of the disease (Magarey et al. 1991). Briefly they are zoospore release, infection, incubation, oilspot survival, sporulation and spore mortality. A combination of surviving spores and infection likelihood are used to predict the likely severity of each infection period. All the parameters used by DMODEL have now been placed in an external file which allows them to be altered easily enabling 'what if' comparisons that may explain unusual predictions or observations, or to provide a better model of observed events. Several parameters within the model have been altered on the basis of field observations during its development phase, reducing the planned tendency for the model to over- rather than under-predict.

The pathogen requires specific microclimatic conditions for infection. These include temperature, relative humidity, leaf wetness, rainfall and light/dark. The simulator has been developed to process both detailed weather data from electronic dataloggers and epidemiological information, to provide vineyard managers with the date downy mildew oilspots will appear and the likely severity of disease.

Depending on the type of infection, (whether oilspots are present in the vineyard or not) and depending on the growth stage of the vines, the simulator also now recommends a course of action – for fungicide use or non-use – to be followed by the owner of the vineyard. Significantly, the consequences of the following or not following the recommendations are also detailed.

Verification and validation of the simulator has been undertaken in South Australia, New South Wales and Victoria during 1990-94. Tests of the accuracy of disease prognoses during these years have shown the simulator is encouragingly accurate. Infection events have been precisely predicted and recommended management actions were successfully evaluated in commercial vineyards.

Despite the progress to date, more basic data on primary infection processes are badly needed. This is a crucial requirement for widespread use of the disease prediction modules within AusVit ™ in Australian viticulture. This is especially true for cool climate viticulture. While the simulator has accurately predicted primary infection in recent years, the duration of rainfall needed for zoospore release and the duration of leaf wetness needed for infection have both on many occasions, greatly exceeded the minimum requirements set within the model. The model requires more intense evaluation, particularly in areas of higher and/or more frequent rainfall than that experienced at Loxton and Mildura.

It was planned in season 1994-95 to process, on a commercial basis, weather data collected from a network of automatic stations strategically placed throughout the region to provide a more regional advisory service on the need for fungicide use for downy mildew control. This work subsequently led to the implementation of Crop Watch SA – an industry-based commercially operated service for grapegrowers. It offers disease and pest risk information that is derived from use of DMODEL (based in AusVit™), which processes data from electronic weather stations (AWS).

Project Summary 1990-1994

A completed simulator was shown to have potential as a decision-aid for Australian vineyard managers to confidently rationalise existing fungicide spray programs. Fewer sprays were required to achieve more effective downy mildew control with less chemical hazard to the environment and with a reduced risk of pathogen tolerance to post-infection fungicides.

A large proportion of the bulk wine production of Australia occurs in the arid zone adjacent to the River Murray where total annual rainfall averages around 250 mm. Contrary to grower practice, in many seasons – probably seven out of ten – fungicide sprays are not needed to control downy mildew. Or if they are, their use is warranted only before flowering. The subsequent production of wines with low or non-detectable chemical residues presents a marketing opportunity for Australian wines in many overseas countries. The adoption of the control strategies contained within DMODEL, will further lower chemical residues in Australian wines. A large number of publications as presented to Australian Viticulture, discussed these issues and possibilities. These represent a report to industry of the present project and are listed below (Table 1). They are presented in hard copy in Appendix 1.

The advent of lower cost electronic technology offered potential to incorporate a reduced form of DMODEL into a robust electronic device that will continuously process vineyard weather data and predict infection periods of downy mildew. Such a low-cost, in-field disease predictor would have greater potential for use in Australian viticulture (Magarey *et al.* 1993). The subsequent success of this possibility in the form of the ***Model T MetStation,*** has been discussed above and is reported in the literature cited and presented below.

Another application of DMODEL was as a module in AusVit™, an expert system which has now been released for commercial use. Constructed as a practical management tool for most diseases and pests in Australian viticulture, it has great potential as an industry-wide decision support system (Travis et al. 1993). Improved use of available knowledge about downy mildew, linked with informed use of an effective array of fungicides for this and the other diseases and pests, can assist Australian grapegrowers apply fewer sprays to improve the level of disease control and produce a purer grape product.

This project has confirmed the use of DMODEL as a tool for Australian grapegrowers to minimise chemical use while improving the level of control of downy mildew. Affirmation of this came when a subsequent project led to the initiation, development and, in 1994, commercial release of AusVit™ a decision support tool that now provides disease and pest management advice to grapegrowers of

Australia. The DMODEL simulator formed the basis of AusVit™ 's predictions of downy mildew and its use as a simulator within this expert system was the first ever, for commercial use in agriculture.

The DMODEL system has shown excellent potential for widespread use in Australia (as incorporated into AusVit™, despite two deficiencies. These are a lack of biological information relating to predicting primary infection and the need for weather stations to provide appropriate weather data. In the future, we hope the use of site-specific weather forecast technology will allow the simulator to predict infection events, several days before they take place in the vineyard. It is important that the simulator be thoroughly tested for use in a diversity of regions, especially in cool climates where wet conditions persist for long periods.

A completed simulator has potential as a decision-aid for Australian vineyard managers to confidently rationalise existing fungicide spray programs. Fewer sprays have been required to achieve more effective downy mildew control with less chemical hazard to the environment and to reduce the risk of pathogen tolerance to post-infection fungicides.

A comprehensive listing of papers published, presentations given and meetings attended, follows. These collectively comprised, along with this report, the process of reporting the present project to Australian viticulture.

Acknowledgements

The development of the simulator has been assisted financially by the GWRDC and the Australian Dried Fruit Research and Development Council. The support, wisdom and enormous contribution of Malcolm Wachtel, formerly of PIRSA, Loxton Centre, was fundamental to success of this project. Also, in early phases of this project, the late Dr Phil Kable, NSW Dept of Agriculture, and Dr Bob Seem, Cornell University, NY, USA, Dr D.A. Maelzer, Peter Weir, Renmark, SA, and Stephen Wachtel, formerly of Loxton, SA, also assisted greatly. Subsequently many Australian colleagues, contributed. These included Dr Bob Emmett, David Madge and Roger Magarey, DNRE Mildura and Neville Herrmann, formerly of Charles Sturt University, Wagga Wagga, NSW. All these and many growers whose properties provided essential field data, and the encouragement of Peter Hayes, formerly Executive Director of GWRDC, were essential to the success of the project. The assistance of all these is gratefully acknowledged.

Communications arising from the project:

1. Summary of Publications re Downy Mildew

Table 1: Scientific, Technical and Extension Publications re Downy Mildew:
Numbered by Type and Year of Publication. Current to 30th June 2000.

Series	1.	2.	3.	4.	5, 12.	6, 9, 10.	
Year	Refereed Papers	Technical Conference Papers	Other Scientific Publications	Industry Conference Papers	Extension Publications	General Extension Publications	TOTAL Number
1977					1		1
1981			1		2		3
1982					1		1
1983		2			1		3
1984		1			4		5
1985	1	1		2	4		8
1986				1	1		2
1987		3	1	1	1	2	8
1988			1		3	1	5
1989		1	1		3	1	6
1990	2	4		1	2	1	10
1991	3	4	6		4	2	19
1992	1				4	8	13
1993		6	1		6	9	22
1994	2	8			1	4	15
1995		4				3	7
1996	1	2				3	6
1997	3	1	1			8	13
1998	2	9			2	3	16
1999	2	2				3	7
2000		1		1		1	3
TOTAL	**17**	**49**	**12**	**6**	**40**	**49**	**173**

2 Summary of Verbal Communications re Downy Mildew

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
as at 10/6/00

Date	Media	Location	Host	Subject	Duration	#
6/12/79	Radio	Renmark, SA	ABC Radio 5MV - Country Breakfast Session	Downy Mildew – Warning and control.	5 mins	-
10/10/80	Radio	Renmark, SA	ABC Radio 5MV - Country Breakfast Session	Downy mildew discussion/spray advice.	5 mins	-
19/2/81	Radio	Renmark, SA	ABC Radio 5MV - Country Breakfast Session,	1.) Downy Mildew Warning Service 2.) Rhine Riesling interstate survey	5 mins	40
9/9/81	Lecture	Research Centre, Loxton, SA	Sunraysia Riverland Coordination Committee – Vine Production Sub-Committee	The Rhine Riesling Problem & Downy Mildew Forecasting—Current Pathological Research in Viticulture in SA	20 mins	20
16/9/81	Lecture	Waite Research Institute Urrbrae, SA	University of Adelaide	Can we model Downy Mildew of Grapevines	75 mins	36
9/3/82	Lecture	Loxton Community Hotel, Loxton, SA	Loxton Agriculture Bureau	New spray chemicals.	1.5 hrs	15
14/12/82	Lecture	Research Centre, Loxton, SA	Loxton Agriculture Bureau	New development in controlling diseases of grapevines in the Riverland.	45 mins	25
23/3/83	Lecture	Hawker Conference Centre, Waite Agricultural Research Institute Adelaide, SA	SA Department of Agriculture and University of Adelaide	Grapevine downy mildew disease management system. P.A. Magarey and I.B. McLean.	10 mins	30
26/7/83	Lecture	Loxton Hotel, Loxton, SA	Loxton Irrigation Agricultural Bureau	Downy Mildew Strategies for 1983/84.	2 hrs	15
11/10/83	Lecture	Loxton Hotel, Loxton, SA	Loxton Irrigation Agricultural Bureau	A panel: 1.) Downy mildew 2.) Citrus growth and culture	2 hrs	35
17/10/83	Press Release	Loxton Regional Head Quarters, Loxton, SA	SA Department of Agriculture	Downy mildew infection alert Conditions for downy mildew	300 words, 500 words	-
18/10/83	Radio	Renmark, SA	ABC Radio 5MV - Breakfast Session	Downy Mildew infection alert.	5 mins	-
3/11/83	Radio	Renmark, SA	ABC Radio 5MV - Country Breakfast Session	Downy Mildew at present.	2 mins	10
4/11/83	Press Release	Loxton Regional Head Quarters, Loxton, SA	SA Department of Agriculture	Downy mildew spray alert	-	-

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
as at 10/6/00

Date	Media	Location	Host	Subject	Duration	#
4/11/83	Radio	Renmark, SA	ABC Radio 5MV - News	Downy mildew spray alert.	5 mins	-
4/11/83	Radio	Adelaide, SA	ABC State Radio News	Downy mildew spray alert.	5 mins	-
4/11/83	Radio	Berri, SA	Radio 5RM News	Downy mildew spray alert.	5 mins	-
4/11/83	Television	Loxton, SA	RTS 5A Community News	Downy mildew spray alert.	5 mins	-
5/11/83	Radio	Renmark, SA	ABC Radio 5MV News	Downy mildew spray alert.	5 mins	-
5/11/83	Radio	Adelaide, SA	ABC State Radio News	Downy mildew spray alert.	5 mins	-
7/11/83	Radio	Renmark, SA	ABC Radio 5MV News	Downy mildew spray alert.	5 mins	-
7/11/83	Radio	Adelaide, SA	ABC Radio News, Country Hour	Downy mildew spray alert.	5 mins	-
7/11/83	Television	Loxton, SA	ABC Channel 3 Regional News	Downy mildew spray alert.	2 mins	-
8/11/83	Radio	Renmark, SA	ABC Radio 5MV – Country Breakfast Session	Downy mildew update regarding secondary infection.	5 mins	-
8/11/83	Radio	Renmark, SA	ABC Radio 5MV News	Downy mildew spray alert.	2 mins	-
9/11/83	Press Release	Loxton Regional Head Quarters, Loxton, SA	SA Department of Agriculture	Downy mildew continues	-	-
9/11/83	Radio	Renmark, SA	ABC Radio 5MV – News	Downy mildew continues.	2 mins	-
9/11/83	Radio	Renmark, SA	Radio 5RM – News	Downy mildew continues.	2 mins	-
10/11/83	Radio	Renmark, SA	ABC Radio 5MV – News	Downy mildew continues.	2 mins	-
10/11/83	Radio	Renmark, SA	ABC Radio 5MV – Country Breakfast Session	Downy mildew continues.	5 mins	-
10/11/83	Radio	Renmark, SA	Radio 5RM – News	Downy mildew continues.	2 mins	-
10/11/83	Television	Loxton, SA	RTS 5A Regional News	Downy mildew alert	2 mins	
12/11/83	Radio	Adelaide, SA	ABC Radio News, Country Hour	Downy mildew alert.	3 mins	-
19/11/83	Radio	Renmark, SA	ABC Radio 5MV – News	Downy mildew alert	2 mins	-
23/11/83	Radio	Renmark, SA	ABC Radio 5MV – Country Breakfast Session	Downy mildew advice.	5 mins	-
7/12/83	Radio	Renmark, SA	ABC Radio 5MV – Country Breakfast Session	Downy mildew update	5 mins	-
7/12/83	Radio	Renmark, SA	Radio 5RM – News	Downy mildew update	2 mins	-
10/1/84	Press Release	Loxton Regional Head Quarters, Loxton, SA	SA Department of Agriculture	Downy mildew and brown rot spray alert	-	-
10/1/84	Radio	Renmark, SA	ABC Radio 5MV – News	Downy mildew alert.	2 mins	-
10/1/84	Television	Loxton, SA	RTS 5A Regional News	Downy mildew alert	2 mins	
11/1/84	Radio	Renmark, SA	ABC Radio 5MV – News	Downy mildew alert.	2 mins	-

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
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Date	Media	Location	Host	Subject	Duration	#
11/1/84	Radio	Adelaide, SA	ABC Radio State News	Downy mildew alert.	2 mins	-
10-11/1/84	Radio	Renmark, SA	Radio 5RM – News	Downy mildew alert	2 mins	-
12/1/84	Television	Loxton, SA	RTS 5A Regional News	Downy mildew alert	2 mins	
12/1/84	Television	Loxton, SA	ABC Channel 3 Regional News	Downy mildew alert	2 mins	
12/1/84	Television	Loxton, SA	RTS 5A Regional News	Downy mildew a threat	2 mins	
12-13/1/84	Radio	Renmark, SA	Radio 5RM – News	Downy mildew a threat	2 mins	-
17/1/84	Television	Loxton, SA	RTS 5A Regional News	Downy mildew management programme	2 mins	
18/1/84	Television	Loxton, SA	RTS 5A Regional News	Downy mildew spray advice	2 mins	
23/1/84	Lecture	Berri, SA	Berri Irrigation Agricultural Bureau	Downy Mildew Control in 1983/84	2 hrs	20
7/3/84	Lecture	Research Centre, Loxton, SA	University of Adelaide, Waite Research Institute, Student Tour,	Sampling for Grapevine Downy Mildew.	3 hrs	7
12/3/84	Lecture	Waite Agriculture Research Institute, Urrbrae, SA	SAGRIC,	Grapevine Downy Mildew Management System.	1 hr	5
19/3/84	Lecture	Waikerie, SA	Waikerie Irrigation Agricultural Bureau	Downy Mildew Control in 1983/84	2 hrs	-
19/3/84	Lecture	Waikerie, SA	Horticultural Agriculture Bureau	Downy Mildew Control in 1983/84.	2 hrs	20
7/6/84	Lecture	Mildura Country Club, Mildura, Vic.	Victorian Department of Agriculture Seminar 'Pest/Disease prediction and monitoring , Stuart Gage and Tom Neil.	A management system for grapevine Downy Mildew	40 mins	20
3/9/84	Lecture	Area School, Swan Reach, SA	Swan Reach – Nildottie Agricultural Bureau	Controlling downy mildew in 1984/85	2 hrs	9
17/9/84	Lecture	Adelaide, SA	Adelaide University, Waite Institute, Fourth Year Plant Pathology Students	A management system for grapevine downy mildew in Australia – In conception.	1 hr	8
28/11/84	Lecture	Research Centre, Loxton, SA	Barossa Grape Growers' Vine Selection Society	Downy mildew of grapevines – control and other information.	1 hr	110
6/3/85	Lecture	Research Centre, Loxton, SA	Adelaide University – Waite Institute, Student Tour Fourth Year Students	Downy mildew disease management system	1 hr	4
10/4/85	Lecture	Royal Exhibition Building, Melbourne, Vic	View Australia (150th Jubilee of Victoria) Conference	A disease management system for Australia Viticulture – an insight into tomorrow's technology	20 mins	80

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
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Date	Media	Location	Host	Subject	Duration	#
21/5/85	Lecture	Biological and Chemical Research Institute, Rydalmere, NSW.	New South Wales Department of Agriculture	A disease management system for viticulture	1 hr	20
23/5/85	Lecture	C.B Alexander Agriculture College Tocal, NSW.	New South Wales Department Agriculture Seminar	Downy mildew of grapevines and it's control	1 hr	40
29/5/85	Lecture	Mildura Government Offices, Mildura, Vic.	South Australian and Victorian Departments of Agriculture	Downy mildew disease management and related systems for monitoring weather and pest/disease	30 mins	6
30/5/85	Lecture	Mildura Country Club, Mildura, Vic.	Australian Society Viticulture and Oenology Seminar	Downy mildew of grapevines – How it behaves in the vineyard.	30 mins	110
31/5/85	Lecture	Government Offices, Mildura, Vic.	Sunraysia/Riverland Research Liaison Committee, Plant Protection sub-committee	Let's co-ordinate our use of electronic instruments to collect weather related data	30 mins	10
2/10/85	Lecture	Research Centre, Loxton, SA	Renmark Agricultural Bureau Field Day	Grapevine Downy Mildew Management Research Presented by M.F. Wachtel	1 hr	6
7/10/85	Lecture	Area School, Swan Reach, SA	Swan Reach/Nildottie Agriculture Bureau,	Information on grapevine downy mildew management	3 hrs	7
16/10/85	Lecture	Research Centre, Loxton, SA	Riverland Vine Improvement Committee	A disease management system for viticulture.	40 mins	90
16/10/85	Press Release	Loxton, SA	-	Possible downy mildew outbreak	150 words	-
17/10/85	Radio	Berri, SA	Radio 5RM News	Possible downy mildew outbreak	1 mins	-
17/10/85	Television	Loxton, SA	RTS 5A News	Possible downy mildew outbreak	2 mins	-
17/10/85	Radio	Renmark, SA	ABC Radio 5MV – Country Breakfast Session	Grapevine downy mildew information	3 mins	4
17/10/85	Radio	Renmark, SA	ABC Radio 5MV News	Downy mildew spray alert	1 mins	-
17/10/85	Radio	Adelaide, SA	ABC Radio 5CL Country Hour	Downy mildew spray alert	1 mins	-
24/10/85	Lecture	Urrbrae, SA	University of Adelaide, Waite Institute	Disease management system for viticulture, Fourth Year students	50 mins	7
28/10/85	Lecture	Berri, SA	Berri Agriculture Bureau,	Disease of stone-fruit and grapevines	50 mins	19
10/12/85	Lecture	Hawker Conference Room, Waite Institute, Urrbrae, SA	SAGRIC Northfield Research Labs, Seminar	A disease management system for Australian Viticulture	15 mins	55
13/5/86	Lecture	Renmark, SA	Department Technical and Further Education	Disease control strategies – J. Seekamp	1.5 hrs	4

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
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Date	Media	Location	Host	Subject	Duration	#
11/6/86	Lecture	Ringwood Cultural Centre, Ringwood, Vic	Dept. Agric &Rural Affairs, Victoria – Pest & Diseases of Grapevines Seminar	Managing Downy Mildew of Grapes	1 hr	180
6/10/86	Lecture	Waite Institute, Urrbrae, SA	University of Adelaide Plant Pathology Department Fourth Year students	Rationalisation of disease control tactics	1 hr	8
20/10/86	Lecture	Barmera Uniting Church Hall, Barmera, SA	Barmera Agricultural Bureau	Rationalising vineyards spray programmes regarding Ridomil with Marcus Chen (Ciba Geigy)	2 hrs	19
29/10/86	Lecture	Research Centre, Loxton, SA	Department Technical and Further Education	General plant pathology – disease identification	2 hrs	5
19/11/86	Lecture	Craneford (near Springton), SA	Adelaide Hills Viticultural Group - Mount Adam Vineyards - Seminar & Field Day	Grapevine diseases - Why spray at all?	30 mins	60
11/5/87	Lecture	Waite Institute, Urrbrae, SA	APPS National Conference	Practical agro-meteorology for agricultural scientists	20 mins	40
14/5/87	Lecture	Adelaide University, Adelaide, SA	Australasian Plant Pathology Society National Conference	Control of grapevine downy mildew with H_3PO_3 and other fungicides	30 mins	100
8/7/87	Lecture	Tocal, NSW	NSW Department of Agriculture Viticultural Seminar	Grapevine downy mildew and phosphorous acid	50 mins	100
10/7/87	Radio	Newcastle, NSW	ABC Newcastle Country Breakfast Session	H_3PO_3 and grapevine downy mildew	5 mins	
8/10/87	Radio	Renmark, SA	ABC 5 MV Riverland and Northern Mallee Rural Report	Early season disease control downy mildew and pest management grapevines	5 mins	
8/10/87	Television	Loxton, SA	RTS 5A News	Early season disease control, downy and powdery mildew management, downy mildew weather monitoring	5 mins	
9/10/87	Radio	Renmark, SA	ABC Radio 5MV - Country Breakfast Session	Downy mildew weather forcasts	5 mins	
16/10/87	Radio	Renmark, SA	ABC Radio 5MV - Country Breakfast Session	Downy mildew control and H_3PO_3	5 mins	
19/10/87	Lecture	Uniting Church Hall, Barmera, SA	Berri-Barmera Agricultural Bureau	Downy mildew, H_3PO_3 and disease control	1 hr	17

Table 2: Verbal Presentations Communications re Downy Mildew

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Date	Media	Location	Host	Subject	Duration	#
1/12/87	Television	Loxton, SA	RTS 5A North Mallee and Riverland Rural Reports	Downy mildew infection period	15 mins	
29/2/88	Lecture	Rothbury Estate Vineyard, Pokolbin, Hunter Valley	UIM Agrochemicals Field Day	H_3PO_3 and downy mildew	1 hr	65
9/3/88	Lecture	Research Centre, Loxton, SA	Adelaide University-4th Year Plant Pathology student tour	H_3PO_3 and grapevine mildew pre-infection test	3 hrs	6
22/8/88	Lecture	Department Technical and Further Education, Loxton, SA	Department Technical and Further Education - Horticultural Practice Certificate	Practical aspects of plant pathology	1.75 hr	5
16-17 /10/88	Audio Visual	Research Centre, Loxton, SA	SAGRIC, Open day	Grapevine Disease Management Diagnostic Services	10:30 am-5:00 pm both days	211 (on 16th) 94 (on 17th)
19/10/88	Radio	Renmark, SA	ABC 5MV,	Downy mildew monitoring/simulator	5 mins	-
20/10/88	Radio	Renmark, SA	ABC 5MV Country Hour	Leaf wetness recorder H_3PO_3 (new UIM) project	8 mins	-
26/10/88	Lecture	Research Centre, Loxton, SA	Riverland Vine Improvement Committee Distribution Day	Diseases of viticulture – current recommendations and research directions	15 mins	120
4/11/88	Radio	Adelaide, SA	ABC Country Hour	Downy mildew advice re rain	2 mins	-
4/11/88	Television	Loxton, SA	RTS 5A News	Downy mildew advice	2 mins	-
7/11/88	Radio	Renmark, SA	ABC 5MV Breakfast Session	Downy mildew situation	10 mins	-
17/11/88	Lecture	Sunraysia Horticultural Centre Mildura, Vic.	Dried Fruits, Grape & Wine Research Councils	Grapevine disease and pest management coordination group and DMODEL	45 mins	25
22/2/89	Lecture	Research Centre, Loxton, SA	Adelaide University 4th Year Student Tour	H_3PO_3 on *Penicillium. expansum* on pears	3 hrs	6
30/5/89	Radio	Renmark, SA	ABC Radio 5MV- Breakfast Session	Disease management systems with Bob Evans, Washington State, USA	5 mins	-
24-25/10/89	Lecture	CSIRO, Canberra, ACT	CSIRO Divsn. Entomology	Australian viticultural disease management system	30 mins	15
3/11/89	Television	Loxton, SA	RTS 5A NEWS	Mildew management phone service	2 mins	-
10/11/89	Lecture	Research Centre, Loxton, SA	Horticultural Field Crops of Australia Group Field Day	Welcome to LRC and disease management in grapevines	45 mins	35

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
as at 10/6/00

Date	Media	Location	Host	Subject	Duration	#
29/6/90	Lecture	Mildura, Vic	Australian Society of Viticulturalists and Oenologists Meeting with Roger Pearson	Disease management systems	45 mins	45
17/7/90	Lecture	John Curtin House Canberra, ACT	First Australian Disease and Pest Coordination Group Meeting	Downy Mildew	20 mins	20
27/7/90	Television	Loxton, SA	RTS 5A News	Churchill Fellowship Award	2 mins	-s
19/9/90	Lecture	Tocal, NSW	Hunter Valley Vineyard Association – Seminar	Managing Downy Mildew	1 hr	30
20/9/90	Lecture	Kassegrain, Pt Macquarie, NSW	Kassegrain Vineyards	Downy Mildew Simulator	1 hr	15
23/1/91	Television	Loxton, SA.	RTS 5A News	Downy mildew and powdery mildew after the rain	2 mins	-
25/1/91	Television	Loxton, SA.	RTS 5A News	D Model ex GWRC – simulator developments	2 mins	
18/3/91	Video	Research Centre, Loxton, SA	Incitec, Sharon Carter, (Camera Production), Ian Woolley and Kay W, TJW, RWE, PAM	Managing fungicide resistance.	15 mins	-
28/3/91	Television	Research Centre, Loxton, SA	Channel 10 News, Adelaide - for 2-5/4/91.	DMODEL and managing downy mildew	5 mins	-
3/5/91	Lecture	Ron George, New Residence, SA	Churchill Fellows of SA	DMODEL and managing grapevine diseases	40 mins	35
17/2/92	Lecture	Adelaide, SA	Bureau of Meteorology.	Downy and powdery prediction - weather driven management system.	1 hr	20
17/2/92	Lecture	Aspendale, Victoria	CSIRO Division Atmospheric Research - Workshop on Climate Change and Agriculture in SE Australia	Downy and powdery mildew climate controlled diseases - response to climate change	20 mins	25?
11/9/92	Lecture	Roseworthy Campus, University. of Adelaide, Roseworthy, SA.	Viticulture IV students – with David Gadoury and Peter Dry	Control strategies for downy and powdery mildew and AusVit demonstration	10	-
12/10/92	Lecture	Research Centre, Loxton, SA	Department of Agriculture, Loxton Research Centre – Seminar series	Reflections on Churchill Fellowship visit overseas.	50 mins	12

Table 2: Verbal Presentations Communications re Downy Mildew

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Date	Media	Location	Host	Subject	Duration	#
20/10/92	Lecture	Sunraysia Horticultural Centre, Irymple, Victoria.	Department of Food and Agriculture, Mildura, Vic. – Field Day	Downy and powdery mildew of grapes	2 hrs	160
21/10/92	Lecture	Research Centre, Loxton SA	Department of Agriculture SA – Vineyard Walk	Powdery / downy mildews and black spot	2 hrs	65
29/1/93	Lecture	Loxton Hotel, Loxton, SA	Rotary Club of Loxton	Downy mildew of grapes	30 mins	15
18/2/93	Lecture	Berri Hotel, Berri, SA	Women in Horticulture	Managing the diseases of grapes	1.5 hrs	8
23/2/93	Television	Loxton, SA	RTS 5A At Home	Downy mildew simulator	5 mins	-
1/3/93	Television	Loxton, SA	RTS 5A At Home	Chemicals in agriculture	5 mins	-
27/4/93	Lecture	Moorook Club, Moorook, SA	ADFA State Conference	Downy mildew of grapes	15 mins	28
2/6/93	Lecture	RHT, Barmera, SA	RHT/PISA Growers' Day	1. Grapevine diseases – downy and powdery mildew; 2. Stonefruit diseases	3 hrs 1 hr	160
11/6/93	Lecture	Roseworthy Campus, University. Of Adelaide, Roseworthy, SA.	Viticulture IV students	Modelling disease	1 hr	8
1/7/93	Lecture	Mt. Pleasant Research Station, Launceston, Tas.	Department of Primary Industry and Fisheries Tasmania – Grapevine Disease Workshop.	Biology and management of downy mildew	1 hr	30
10/8/93	Lecture	Horticultural. Centre, Lenswood, SA	Adelaide Hills Vine Improvement Society Inc. – Seminar	Powdery/downy mildew control strategies. Carry over between seasons	30 mins.	90
17/8/93	Lecture	Mildura, Vic	Sunraysia Technical and Further Education	Downy and powdery mildew management.	35 mins	11
17/8/93	Television	Loxton, SA	RTS 5A TV News	Downy and powdery mildew management strategies	5 mins	-
15/9/93	Lecture	Chateau Yaldara, Lyndoch, SA	Mildara Blass - Growers' Day on Integrated Pest/Disease Management	Downy and powdery mildew	60 mins	60
20/9/93	Lecture	Australian Wine Research Institute, Urrbrae, SA	GWRDC Workshop	Proposals for a low-cost disease predictor - Chairman	3 hrs	30
12/10/93	Lecture	Town Hall, Berri, SA	Town and Country Growers Mart, Berri, SA - Horticultural Growers' Night	Downy/Powdery Mildew review '92/93 and recommendations for '93/94.	40 mins	26

Table 2: Verbal Presentations Communications re Downy Mildew

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Date	Media	Location	Host	Subject	Duration	#
26/10/93	Lecture	Sunraysia Horticultural Centre, Irymple, Victoria.	Agriculture Victoria – Effective Disease and Pest Control - Field Day	Downy mildew and powdery mildew biology	15 mins x 6	160
29/10/93	Lecture	Richardson Theatre, Roseworthy Campus, University of Adelaide, Roseworthy, SA	Fourth Year Horticulture Course	Downy mildew simulator and mildew control strategies	2.5 hrs.	7
22/12/93	Radio	Berri, SA	5RM Agriculture report	Downy mildew	5 mins	
24/12/93	Radio	Adelaide, SA	ABC Radio Country Hour	Downy mildew alert for Barossa Valley, McLaren Vale, Clare	5 mins	
14/4/94	Lecture	Research Centre, Loxton, SA	ICMS, Primary Industries SA Information Day	Managing diseases of grapevines using softer controls	20 mins	32
17/10/94	Lecture	Chardonnay Lodge, Coonawarra, SA	Coonawarra Grapegrowers Association Seminar	Vineyard disease and pest management in Germany, Switzerland, Austria and Italy	20 mins	43
14/7/95	Lecture	Plant Research Centre, Urrbrae, SA	Australian Council of Viticulture Inc.: Grapevine Phytoplasma information meeting	An international perspective - Overview of the Australian experience with grapevine phytoplasma	40 mins	25
17/7/95	Lecture	Adelaide University, Waite Institute, Urrbrae, SA	Ninth Australian Wine Industry Technical Conference - Workshop Monitoring for Grapevine Diseases	Scouting and monitoring for grapevine diseases – A sampling procedure - with field demonstration	55 mins	28
26/9/95	Press Release	Research Centre, Loxton, SA	SARDI	CropWatch	30 mins	15
26/9/95	Lecture	Berri Estates Winery, Glossop, SA	Berri Horticultural Bureau	CropWatch release and automatic weather stations	1.5 hrs	20
18/10/95	Lecture	University Adelaide Waite Institute, Urrbrae, SA	3rd & 4th Year Crop Production Students	Grapevine pest & diseases identification and management workshop	1 hr	45
19/10/95	Lecture	Cowra, NSW	Cowra Vineyard's Association Field Day	Monitoring techniques – Field demonstration.	1.5 hrs	100
20/10/95	Lecture	Sunraysia Hort Centre, Irymple, Victoria	Agriculture Victoria, Mildura, Vic. – Field Day	Monitoring techniques / Field demonstration	3.5 hrs	150
27/10/95	Lecture	Penola SA	Powdery Mildew Roadshow 9. Vititech 95 Session 1	Grapevine pest & diseases identification and management workshop	40 min	65
27/10/95	Lecture	Penola SA	Powdery Mildew Roadshow 9. Vititech 95 Session 2	Grapevine pest & diseases identification and management workshop	40 min	40

Table 2: Verbal Presentations Communications re Downy Mildew

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Date	Media	Location	Host	Subject	Duration	#
27/10/95	Lecture	Penola SA	Powdery Mildew Roadshow 9. Vititech 95 Session 3	Grapevine pest & diseases identification and management workshop	40 min	25
27/10/95	Lecture	Penola SA	Powdery Mildew Roadshow 9. Vititech 95 Session 4	Grapevine pest & diseases identification and management workshop	40 min	5
31/10/95	Lecture	Omrah Vineyard, Mt Barker, WA	Powdery Mildew Roadshow 10 Western Australian Agriculture/GWRDC	Grapevine pest & diseases identification and management workshop - with Bob Emmett	2 hrs	36
1/11/95	Lecture	Amberley Estate Vineyards, Margaret River, WA	Powdery Mildew Roadshow 11 Western Australian Agriculture/GWRDC	Grapevine pest & diseases identification and management workshop - with Bob Emmett	5 hours approx	89
2/11/95	Lecture	Haughton Estate, Swan Valley, WA	Powdery Mildew Roadshow 12 Western Australian Agriculture/GWRDC	Grapevine pest & diseases identification and management workshop - with Bob Emmett	2 hrs	24
13/11/95	Lecture	Launceston TAFE, Launceston Tas	Powdery Mildew Roadshow 13 Tas DPIF/GWRDC	Grapevine pest & diseases identification and management workshop - with Bob Emmett	2 hours	58
14/11/95	Lecture	Newtown Research Labs, Hobart, Tas	Powdery Mildew Roadshow 14 Tas DPIF/GWRDC	Grapevine pest & diseases identification and management workshop - with Bob Emmett	2 hrs	47
6/12/95	Lecture	Ex-Servicemen's Club, Mirrool room 2, Griffith	Winegrape Marketing Board Grapevine - Disease Seminar	Downy mildew- Its spread and control	20 mins	35
6/12/95	Lecture	Ex-Servicemen's Club, Mirrool room 2, Griffith	Winegrape Marketing Board Grapevine - Disease Seminar	AusVit- Australian Viticultural Expert System	10 mins	35
28/2/96	Lecture	Savoy Club, Myrtleford, Vic.	Victoria Agriculture, Ovens Research Station - Disease Management Workshop	The mildews and how they spread	25 mins	64
28/2/96	Lecture	Savoy Club, Myrtleford, Vic.	Victoria Agriculture, Ovens Research Station - Disease Management Workshop	Using weather data to manage mildews	40 mins	64
28-29/5/96	Poster	Koorlong, Vic	ADFA, Gadget Field Day, Koorlong, Vic	Managing grapevine powdery mildew - poster	-	-
7/8/96	Lecture	Coromandel Valley, SA	Adelaide Hills Apple Growers	Demonstration of Model T Met thing	2.5 hrs	7
8/8/96	Lecture	Victorian Institute of Animal Science Attwood, Vic.	GWRDC Pest and Disease Management Project Review Meeting	Technology Transfer and Adoption, Status Reports	25 mins	56
?15/9/96?	Lecture	????	Mildara Blass Growers Day	Downy / powdery mildew	1 hr	60

Table 2: Verbal Presentations Communications re Downy Mildew

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Date	Media	Location	Host	Subject	Duration	#
10/12/96	Lecture	SHC Irymple	IPM Research to Practice Training Workshop	Downy Mildew	1.3 hrs	23
10/12/96	Lecture	SHC Irymple	IPM Research to Practice Training Workshop	Monitoring in the vineyard	1 hrs	23
12/12/96	Lecture	Loxton Club, Loxton, SA	IPM Research to Practice Training Workshop	Monitoring in the vineyard	30 mins	22
7/1/97	Lecture	Visitors' Centre, McLaren Vale, SA	IPM Research to Practice Training Workshop	Monitoring in the vineyard	30 mins	23
8/1/97	Lecture	Visitors' Centre, McLaren Vale, SA	IPM Research to Practice Training Workshop	Downy Mildew	60 mins	30
9/1/97	Lecture	Vine Inn, Nuriootpa, SA	IPM Research to Practice Training Workshop	Downy Mildew	45 mins	23
9/1/97	Lecture	Vine Inn, Nuriootpa, SA	IPM Research to Practice Training Workshop	Monitoring in the vineyard	45 mins	23
13/3/97	Lecture	CSIRO Conference Room, Merbein, Vic	Australian Vine Improvement Association - Seminar	Identification of vines affected by downy & powdery mildew, black spot, Phomopsis, Botrytis, AGY and rust mites.	7.5 hrs	37
18/6/97	Lecture	Loxton Hotel, Loxton, SA	Riverlink: PISA and Ag Vic. - Grapevine pest and disease review meeting	Technologies available to use with IPM	40 mins	160
22/7/97	Lecture	Clare Country Club, Clare, SA	Vivco IAMA annual vignerons' dinner	Managing the mildew diseases of grapevines	50 mins	100
29/8/97	Lecture	Masonic Hall, Robinvale, Vic	IPM Viticulture: Research to Practice Workshop	Downy Mildew	45 mins	27
29/8/97	Lecture	Masonic Hall, Robinvale, Vic	IPM Viticulture: Research to Practice Workshop	AusVit	30 mins	27
09/09/97	Lecture	Country Comfort Club, Mudgee, NSW	IPM Viticulture: Research to Practice Workshop	Downy Mildew	45 mins	28
11/09/97	Lecture	TAFE Conference Centre, Heddon St, Kurri Kurri, NSW	IPM Viticulture: Research to Practice Workshop	Downy Mildew	45 mins	31
3/10/97	Lecture	Salitage Wines, Vasse Highway, Pemberton, WA	IPM Viticulture: Research to Practice Workshop	Monitoring & Treatment thresholds	30 mins	30
3/10/97	Lecture	Salitage Wines, Vasse Highway, Pemberton, WA	IPM Viticulture: Research to Practice Workshop	Filed demonstration or monitoring	30 mins	30

Table 2: Verbal Presentations Communications re Downy Mildew

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Date	Media	Location	Host	Subject	Duration	#
6/10/97	Lecture	Colonial Motor Lodge, Wallcliffe Road , Margaret River, WA	IPM Viticulture: Research to Practice Workshop	Monitoring & treatment thresholds	30 mins	32
8/10/97	Lecture	Parade Hotel, 100 Stirling Street, Bunbury, WA	IPM Viticulture: Research to Practice Workshop	What is IPM? Pest by pest IPM.	15 mins	33
8/10/97	Lecture	Parade Hotel, 100 Stirling Street, Bunbury, WA	IPM Viticulture: Research to Practice Workshop	Monitoring & treatment thresholds	30 mins	33
18/11/97	Lecture	CSIRO, Merbein, Vic.	IPM Viticulture: Research to Practice Workshop	Downy Mildew	50 mins	20
19/11/97	Lecture	TAFE, Loxton	TAFE Farm Practice - Viticulture	Managing diseases and pests	1.5 hrs	30
19/11/97	Lecture	TAFE, Loxton	TAFE Farm Practice - Viticulture	Downy mildew and powdery mildew	1.3 hrs	38
20/11/97	Lecture	Research Centre, Loxton	IPM Viticulture: Research to Practice Workshop	Downy Mildew	45 mins	18
27/11/97	Lecture	Mount Benson Hall, Robe, SA	IPM Viticulture: Research to Practice Training Workshop	Downy Mildew	45 mins	17
27/11/97	Lecture	Mount Benson Hall, Robe, SA	IPM Viticulture: Research to Practice Training Workshop	AusVit	20 mins	17
30/3/98	Workshop	Mildura Function Centre, Mildura, Vic	DM/PM Workshop Roadshow 1 with RCS, JWT, Geo. Leavitt, Bala, Georg Hill, Doug Gubler, RWE	Grapevine Disease Management: International perspectives	3 hr	?
30/3/98	Workshop	Barmera Football Club, Barmera, SA	DM/PM Workshop Roadshow 2 with RCS, JWT, Geo. Leavitt, Bala, Georg Hill, Doug Gubler, RWE	Grapevine Disease Management: International perspectives	3 hr	?
31/3/98	Workshop	McLaren on the Lake, McLaren Vale, SA	DM/PM Workshop Roadshow 3 with RCS, JWT, Geo. Leavitt, Bala, Georg Hill, Doug Gubler, RWE	Grapevine Disease Management: International perspectives	3 hr	?
1/4/98	Workshop	Healseville RACV Counttry Club, Melbourne, Vic	DM/PM Workshop Roadshow 4 with RCS, JWT, Geo. Leavitt, Bala, Doug Gubler, RWE	Grapevine Disease Management: International perspectives	3 hr	220
1/4/98	Workshop	Broke Hall, Broke, NSW	DM/PM Workshop Roadshow 5 with RCS, JWT, Geo. Leavitt, Bala, Doug Gubler, RWE	Grapevine Disease Management: International perspectives	3 hr	?

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
as at 10/6/00

Date	Media	Location	Host	Subject	Duration	#
1/4/98	Workshop	Margaret River, WA	DM/PM Workshop Roadshow 6 with RCS, JWT, Geo. Leavitt, Bala, Doug Gubler, RWE	Grapevine Disease Management: International perspectives	3 hr	?
1/4/98	Workshop	Pemberton, WA	DM/PM Workshop Roadshow 7 with RCS, JWT, Geo. Leavitt, Bala, Doug Gubler, RWE	Grapevine Disease Management: International perspectives	3 hr	?
1/4/98	Workshop	Swan Valley, WA	DM/PM Workshop Roadshow 8 with RCS, JWT, Geo. Leavitt, Bala, Doug Gubler, RWE	Grapevine Disease Management: International perspectives	3 hr	?
31/7/98	Seminar	Kingaroy, Qld	CRC(V) & DPI, Qld	Managing the mildews	60 mins	120
31/8/98	Lecture	Agriculture WA, Albany, WA	IPM Viticulture: Research to Practice Training Workshop	Monitoring & treatment thresholds	40 mins	19
3/9/98	Lecture	Margaret River, WA	IPM Viticulture: Research to Practice Training Workshop	Monitoring and treatment thresholds	40 mins	21
15/10/98	Lecture	Swan Valley Athletics Club, Herne Hill, WA	Agriculture WA Seminar	Downy mildew outbreak and management	2.5 hrs	180
18/10/98	Lecture	Margaret River Cultural Centre, Margaret River, WA	Agriculture WA Seminar	Downy mildew outbreak and management	1.5 hrs	122
19/10/98	Lecture	Manjimup Town Hall Manjimup, WA	Agriculture WA Seminar	Downy mildew outbreak and management	2 hrs	98
19/10/98	Lecture	Swan Valley, Caversham Hall, Swan Valley, WA	Agriculture WA Seminar	Downy mildew outbreak and management	3 hrs	75
28/10/98	Lecture	Sports Club, Penola, SA	Vititec '98 Seminar	New weather forecast products	7 mins	230
2/11/98	Lecture	TAFE, Loxton, SA	TAFE Viticulture students	Control of grapevine diseases	60 mins	20
10/11/98	Radio	Renmark, SA	ABC 5MV Rural Report	Downy mildew alert	3 mins	-
10/11/98	Radio	Renmark, SA	ABC 5MV Riverland Regional News	Downy mildew alert	1 mins	-
10/11/98	All press	Adelaide, SA	Bureau of Meteorology	Downy mildew alert	1 mins	-
10/11/98	All press	Melbourne, Vic	Bureau of Meteorology	Downy mildew alert	1 mins	-
11/11/98	Radio	Adelaide, SA	5CK ABC Rural Report	Downy mildew alert	3 mins	-
11/11/98	Lecture	Research Centre, Loxton, SA	SE TAFE Viticulture students	Managing downy mildew and powdery mildew	40 mins	50
12/11/98	Television	Loxton, SA	RTS 5A News	Downy mildew alert	1 mins	-

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
as at 10/6/00

Date	Media	Location	Host	Subject	Duration	#
12/11/98	Radio	Renmark, SA	5MV ABC Rural Report	Downy mildew alert	1 mins	-
12/11/98	Television	Loxton, SA	RTS 5A News - Loxton	Downy mildew alert	1 mins	-
21/11/98	Lecture	Swan Valley Athletics Club, Herne Hill, WA	Agriculture WA Seminar	Downy mildew outbreak and management	1.5 hrs	70
23/11/98	Lecture	Loxton Club, Loxton, SA	IPM Viticulture: Research to Practice Training Workshop	Downy mildew	45 mins	24
23/11/98	Lecture	Loxton Club, Loxton, SA	IPM Viticulture: Research to Practice Training Workshop	Downy Mildew	45 mins	24
1/12/98	Lecture	Research Centre, Loxton, SA	Barossa TAFE – Viticulture. Kevin Mitchell	Controlling powdery and downy mildew	60 mins	9
9/12/98	Lecture	Southern Vales Tourist Centre, McLaren Vale, SA	IPM Viticulture: Research to Practice Training Workshop	Downy Mildew	45 mins	23
17/12/98	Radio	Renmark, SA	ABC 5MV Riverland and Mallee Rural Report	Controlling powdery and downy mildew	2 mins	-
11/1/99	Radio	Renmark, SA	ABC 5MV Riverland and Mallee Rural Report	Downy mildew in SA & WA	3 mins	-
15/1/99	Lecture	Naracoorte TAFE, Naracoorte, SA	IPM Viticulture: Research to Practice Training Workshop	Downy mildew	45 mins	24
5/2/99	Television	Loxton, SA	RTS 5A News	Season report re mildews	1 mins	-
12/2/99	Radio	Renmark, SA	ABC 5MV Riverland and Mallee Rural Report	Recent rains at harvest	7 mins.	-
30/3/99	Radio	Renmark, SA	ABC 5MV Riverland Local news	Downy mildew. and Botrytis at harvest	1 mins	-
31/3/99	Radio	Renmark, SA	ABC 5MV Riverland and Mallee Rural Report	Downy mildew and Botrytis at harvest	5 mins	-
31/3/99	Television	Loxton, SA	RTS 5A News	Downy mildew and Botrytis at harvest	2 mins	-
29/4/99	Lecture	Freycinet Inn, Margaret River, WA.	AVIA / WAVIA Vine Inspectors' Workshop	Foliage and virus diseases etc	1 day	18
21/6/99	Lecture	Bureau of Met, Kent Town, Adelaide	Australian Meteorological Society – SA Branch	How the weather influences the growing of quality grapes in Australia	1.5 hrs	18
12/10/99	Lecture	Research Centre, Loxton, SA	Loxton Agricultural Bureau-Irrigation Branch-Field Walk	Monitoring for grapevine diseases	3 hrs	30
3/11/99	Lecture	Hawthorn, SA	The Women's Place	Managing grapevine diseases with ecological safety	90 mins	42

Table 2: Verbal Presentations Communications re Downy Mildew

without a published paper output
as at 10/6/00

Date	Media	Location	Host	Subject	Duration	#
4/11/99	Radio	Renmark, SA	ABC 5MV - Riverland Rural Report with Kathy Parker	Downy mildew alert	5 mins	-
4/11/99	Television	Loxton, SA	5A TV News	Downy mildew alert	2 mins	-
5/11/99	Television	Loxton, SA	5A TV News	Downy mildew alert	2 mins	-
11/11/99	Television	Loxton, SA	5A TV News	Downy mildew alert	2 mins	-
16/11/99	Radio	Renmark, SA	5MV ABC - Riverland News	Downy mildew Field Day	5 mins	-
17/11/99	Lecture	Begarra Road, Renmark North, SA	Riverland IAMA, Field Walk	Downy Mildew Information Session	2.5 hrs	115
22/11/99	Radio	Adelaide, SA	ABC Country Hour	Downy mildew alert	5 mins	-
23/11/99	Television	Loxton, SA	5A TV News	Downy and powdery mildew	2 mins	-
30/11/99	Lecture	Barmera, SA	DiManno Seeds Growers Seminar	Managing downy mildew	1 hr	84
13/4/00	Lecture	PIRSA Vit. Station, Nuriootpa	2nd Source Area Inspectors' Workshop	Symptoms of Disease, Pest and Disorders in Australian Viticulture	50 mins	22
18/4/00	Television	Loxton, SA	WIN TV News	Harvest summary 1999/00	2 min	-
3/5/00	Radio	Bunbury, WA	ABC Radio Rural Report – Judith price	Downy mildew and CropWatch for WA?	10 min	-
4/5/00	Workshop	Margaret River, WA	Margaret River Wine Industry Association Workshop	Possibilities for CropWatch WA; and bunch rot control	3.5 hrs	15
5/5/00	Lecture	Margaret River, WA	Margaret River Wine Industry Association Field Day Seminar	Living with downy mildew in SA	40 min	250

3 Summary of Meetings re Downy Mildew

Table 3: Meetings re Downy Mildew Attended or Contributed to

without a published paper output
as at 10/6/00

Date	Type	Location	Host	Subject	Duration	#
23/3/83	Seminar	Hawker Conference Centre, Waite Agricultural Research Institute Adelaide,	SA Department of Agriculture and University of Adelaide	Integrated pest management for Australian deciduous fruits – New York and Michigan systems, options for Australia. P.A. Magarey and I.B. McLean.	1 day	-
11/5/87	Workshop	Waite Institute, Urrbrae, SA	APPS National Conference	Practical agro-meteorology for agricultural scientists	1 day	-
16-17 /10/88	Field Day	Loxton Research Centre, Loxton, SA	SAGRIC, Open day	Grapevine Disease Management, Audio Visual, Diagnostic Services, Crown Gall.	10:30 am-5:00 pm both days	211 (on 16th) 94 (on 17th)
24-25/10/89	Meeting	Black Mountain, Canberra, ACT	CSIRO Division Entomology	Australian viticultural disease management system	2 days	15
17/7/90	Meeting	John Curtin House Canberra, ACT	First Australian Disease and Pest Coordination Group Meeting	Grapevine Diseases and Pests	2 days	20
27/9/90	Meeting	Waikerie, SA	SA Dept of Agricultural- - Advisers Meeting	Downy mildew phone answer service	3 hrs	8s
27/8/92	Meeting	Loxton Research Centre, Loxton, SA	PISA Chemical Reseller's Meeting, with Bob Emmett, Roger Magarey, *et al*	Review of disease and pest spray strategies	4 hrs	50
28/8/92	Meeting	Loxton Research Centre, Loxton, SA	Sunraysia-Riverland Spray Schedules Revision Review Meeting.	Review of new spray schedules	5 hrs	30
20/11/92	Field Day	Sunraysia Horticultural Centre, Irymple, Vic.	AgVic., Pest and Disease Identification Field Day with RDM, RWE, LTB., GAB, AMM	Early identification of grape diseases and pests	3 hrs	170
20/9/93	Workshop	Australian Wine Research Institute, Urrbrae, SA	GWRDC Workshop	Proposals for a low-cost disease predictor - Chairman	3 hrs	30
30/8/95	Workshop	Picton, New Zealand	APPS Co-convenor with Bala	Leaf wetness: its influence on disease and its measurement	3 hr	~35
31/8 – 2/9/95	Workshop	Picton, New Zealand	APPS. Co-convenor with Bala	Grape Disease Management Workshop	3 days	39

Table 3: Meetings re Downy Mildew Attended or Contributed to

without a published paper output
as at 10/6/00

Date	Type	Location	Host	Subject	Duration	#
6/12/95	Seminar	Ex-Servicemen's Club, Mirrool room 2, Griffith, NSW	Winegrape Marketing Board Grapevine - Disease Seminar	Grapevine disease seminar	2.45 hrs	
15/1/96	Meeting	Research Centre, Lenswood, SA	SA Apple and Pear Growers' Association	Orchard 2000 with Matthew Laurenson	3 hr	~ 20
5/3/96	Meeting	Telstra phone link	CRC(V)	Review of progress with AusVit	2 hrs	~ 7
25/3/96	Meeting	Loxton Centre, Loxton, SA	Orlando Wyndham, Rowland Flat – Don Lester	KWV Australian tour – ex South Africa – Herman le Roux et al	1 hr	8
8/5/96	Meeting	CSIRO Merbein	? GWRDC	Update on current grape IPM research programs	102 mins	70
9-10/4/97	Lecture	SHC Irymple	IPM Research to Practice Training Workshop	Preparation of IPM Manual and Day 3 syllabus	2 days	~7
10/7/96	Seminar	Waite Institute, Urrbrae, SA	SARDI/ Bureau of Met	Ian Holton re forecasting weather and ?downy mildew	1 hr	45
10/7/96	Field walk	Nunkri, Coromandel Valley, SA	SARDI with GWRDC	Field test site for Model T MetStation with MDW	1.5 hr	4
7/8/96	Field walk	Nunkri, Coromandel Valley, SA	SARDI with GWRDC	Field test site for Model T MetStation with MDW and IPM Committee SA Apple Pear Growers Association	2 hrs	5
17/8/96	Meeting	Loxton, SA	SARDI Loxton	Discussions with Gottfreid Pessl re AWS	3 hrs	3
27/8/96	Meeting	Bureau of Meteorology, Melbourne, Vic	B of Met., Melbourne	Disease advisory service for Mildura viticulture with RWE, Bill MacH, Rob B.	2 hrs	~ 4
13/9/96	Field Day	Loxton Centre, Loxton, SA	PISA/SARDI	Field Day	1 day	?
20/9/96	Workshop	Loxton Centre, Loxton, SA	SARDI	Training course for monitoring grape diseases and pests	3 hrs	5
18/6/97	Meeting	Loxton Hotel, Loxton, SA	Riverlink Seminar: PISA and Ag Vic. - Grapevine pest and disease review meeting	Chairman, Session 4: New products for pest & disease control.	2 hrs	160
24/7/97	Meeting	Grand Hotel, Mildura, Vic.	CRC(V)	Commercial launch of AusVit	1 hr	~45
17/9/97	Lecture	Waite Institute, Urrbrae, SA	University of Adelaide, Waite Institute	Lecture re AusVit to Viticulture students – Peter Dry		
23/2/98	Meeting	B. of Met., Kent town, SA	CRC(V) &SARDI, Loxton, SA	Review of agricultural forecasts with Bob Seem	2 hrs	5
10/8/98	Meeting	Loxton Centre, Loxton, SA	SARDI, Loxton, SA	John Steenkamp, South Africa, re Viticultural expert systems	2 hrs	3

Table 3: Meetings re Downy Mildew Attended or Contributed to

without a published paper output
as at 10/6/00

Date	Type	Location	Host	Subject	Duration	#
14/8/98	Meeting	SHC, Mildura, Vic	CRC(V)	AWS networks – RWE, DGM, Steven Rogers and Brian Peardon	2.5 hrs	6
21/6/99	Meeting	Bureau of Meteorology – SA Office; Kentown	SARDI, Loxton, SA.	Opportunities for collaborative research and provision of advice to grapegrowers	2 hrs	~12
5/8/99	Meeting	Merbein	Riverlink Dried Grape Industry	R and D Planning Day	1 day	
25/1/00	Meeting	Plant Research Centre Waite Campus, Urrbrae, SA	Cooperative Research Centre for Viticulture Seminar – with Prof. Bob Seem, New York	Chairperson – Managing Grapevine Diseases Using Weather Data	1 hr	28
13/4/00	Workshop	Nuriootpa Vit Station	AVIA	2nd Source Area Inspectors' Workshop	7 hrs	22

Appendix 1: Publications List re Grapevine Downy Mildew - by Year 1977 – 2000.

Citations of papers directly from or benefited by the present project.

(* Numbers refer to type of publication and file numbers as per Table 1 above.)

1977

5.1 Wicks, T.J. and Magarey, P.A. (1977). Downy mildew fungicides detailed. Australian Grapegrower and Winemaker 14(160):p.68.

1981

3.7 Magarey, P.A. (1981). Grapevine Downy Mildew disease warning service. Australian Horticultural Research Newsletter No 54, August, 1981:108.

5.2 Wicks, T.J., Magarey, P.A. and Baker, B.T. (1981). What you should know about downy mildew - curse of the vineyard in Annual Technical Issue, Australian Grapegrower and Winemaker 18(205):12,14

12.1 Wicks, T.J. and Magarey, P.A. Downy Mildew of Grapevines. (1981). Agdex 241/633. Revised January 1981.

1982

5.3 Wicks, T.J., Magarey, P.A. and Baker, B.T. (1982). What you should know about downy mildew - curse of the vineyard in Annual Technical Issue, Australian Grapegrower and Winemaker 19(220):88-89.

1983

2.7 Magarey, P.A., Maelzer, D.A., Kable, P.F., Woods, P., Wicks, T.J. and Wallace, H.R. (1983). A management system for grapevine downy mildew in Australia - its conception. Paper presented. Abstract No. 292. Abstract of Papers, Fourth International Congress Plant Pathology. Melbourne, Aust., 17th - 24th August, 1983. 273 pp. (Oral)

2.8 Seem, R.C., Magarey, P.A., Wachtel, M.F. and McCloud, P.I. (1983). Sampling procedure for detecting downy mildew of grapes. Abstract No. 878. Abstract No. 878. Abstracts of Papers, Fourth International Congress Plant Pathology. Melbourne, Aust., 17th - 24th August, 1983. 273 pp. (Poster)

5.4 Magarey, P.A. (1983). Management system for downy mildew control. Australian Grapegrower and Winemaker 20(239):9-10.

1984

2.9 McLean, G.D., Magarey, P.A., Wachtel, M.F. and Dry, P.R. (1984). A climatic evaluation of the question: Could grapevine downy mildew develop in Western Australia? Advances in Viticulture and Oenology for Economic Gain. Proceedings of Fifth Australian Wine Industry Technical Conference, 29th November - 1st December, 1983, Perth, Western Australia, pp 249-260.

5.5 Magarey, P.A. (1984). Downy mildew can cause heavy losses. Australian Grapegrower and Winemaker 21(243):19.

5.6 Magarey, P.A. (1984). Downy mildew control in 1983/84. Australian Grapegrower and Winemaker 21(244):24, 27.

5.7 Steed, J.N. and Magarey, P.A. (1984). Guard against serious crop losses from downy mildew. Australian Grapegrower and Winemaker 21(250):20.

5.8 Steed, J.N. and Magarey, P.A. (1984). Instruments can provide useful guide to the need for downy mildew sprays. Australian Grapegrower and Winemaker 21(251):22.

1985

1.5 Seem, R.C., Magarey, P.A., McCloud, P.I. and Wachtel, M.F. (1985). A sampling procedure to detect grapevine downy mildew. Phytopathology 75(11):1252-1257.

2.10 Magarey, P.A., Weir, P.C. and Wicks, T.J. (1985). Grapevine downy mildew - how it behaves in the vineyard. Proceedings of Australian Society of Viticulturalists and Oenologists Seminar, 30th May, 1985, Mildura, Vic. Aust. pp 66-85. (Invited oral)

4.1 Magarey, P.A. (1985). Grapevine downy mildew - a description with guidelines for effective control. Proceedings of the Seventh Viticulture Seminar, NSW. Dept. Agric., May 21st - 23rd, Tocal, NSW. Aust. pp 134-147. (invited oral)

4.2 Magarey, P.A. (1985). A disease management system for viticulture - an insight into tomorrow's technology for disease control. Paper to VIEWCON 85 International Winemakers Technical Conference, April 10th - 11th, 1985, Melbourne, Aust. (invited oral)

5.9 Magarey, P.A. (1985). A disease management system for viticulture. The Victorian Vigneron 22:7-8.

5.10 Magarey, P.A. (1985). A disease management system for viticulture. An insight into tomorrow's technology for disease control. Annual Technical Issue, Australian Grapegrower and Winemaker 22(256):6-7.

5.11 Magarey, P.A. and Wicks, T.J. (1985). Grapevine downy mildew. Annual Technical Issue, Australian Grapegrower and Winemaker 22(256):8-11.

5.12 Magarey, P.A., Wicks, T.J. and Weir, P.C. (1985). Some new guidelines for the control of grapevine downy mildew. Annual Technical Issue, Australian Grapegrower and Winemaker 22(256):13-18.

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4.3 Magarey, P.A. (1986). Managing downy mildew of grapevines. Pests and Diseases of Grapevines. Seminar, June 11th, 1986, Vic. D. Ag. & R.A., Ringwood, Vic. Aust., pp 15-26. (invited oral)

5.13 Magarey, P.A. and Simes, R.T. (1986). Grapevine diseases - a quick guide. Downy mildew (*Plasmopara viticola*). Australian Grapegrower and Winemaker 23(274):25.

1987

2.13 Magarey, P.A. and Wachtel, M.F. (1987). Control of grapevine downy mildew with phosphorous acid. Abstract 59., p 45. Sixth Conference, Australian Plant Pathology Society, May 11-15th, Adelaide University, Adelaide, S.A., 115 pp. (Oral)

2.14 Magarey, P.A., Wachtel, M.F., Frensham, A.B. and McHenry, W. (1987). Strategic use of acylanilide and phosphonate fungicides against grapevine downy mildew. Abstract 61., p 46. Sixth Conference, Australian Plant Pathology Society, May 11-15th, Adelaide University, Adelaide, S.A., 115 pp. (Oral)

2.17 Magarey, P.A., Wachtel, M.F. and Frensham, A.B. (1987). Phosphorous acid controls grape downy mildew. American Phytopathological Society, Annual Meeting, August 2-6, Cincinnati, Ohio, USA. Poster No. 669. (Poster)

3.10 Magarey, P.A. (1987). Practical Agrometeorology For Agricultural Scientists, A Report on the Workshop, Australasian Plant Pathology Society, Waite Agricultural Research Institute, Adelaide, Sth Australia, May 11th, 1987.

4.4 Magarey, P.A. (1987). Grapevine downy mildew - new developments in control. pp. 207-221 in Eighth Viticultural Seminar, NSW Dept. Agric., July 7-9th, Tocal, NSW, Aust., 221 pp. (invited oral)

5.14 Magarey, P.A. (1987). A disease management system for viticulture. An insight into tomorrow's technology for disease control. Dried Fruit News NS 14(3):14-15.

9.2 Magarey, P.A. (1987). Latest developments in control of grapevine diseases. Australian Grapegrower and Winemaker 24(283):27

9.3 Magarey, P.A. (1987). Grapevine diseases : early season control is important. Australian Grapegrower and Winemaker 24(286):12-13.

1988

3.12 Magarey, P.A., Wachtel, M.F., Fresham, A.B. (1988). Phosphorous acid controls grape downy mildew. Temperate Downy Mildews Newsletter 5:18.

5.15 Magarey, P.A. (1988). Downy mildew events in 1987/88 - Riverland and Hunter Valley Australian Grapegrower and Winemaker 25(292):23.

5.16 Magarey, P.A. and Weir, P.C. (1988). A simulator for better management of downy mildew. Australian Grapegrower and Winemaker 25(292):47.

5.17 Magarey, P.A., Wicks, T.J. and Wachtel, M.F. (1988). Research continues on phosphorous acid as a downy mildew fungicide. Australian Grapegrower and Winemaker 25(293):21.

9.4 Wicks, T.J., Magarey, P.A., Emmett, R.W., Baker, G.J. and Baker, B.T. (1988). Practical management of grapevine diseases and pests. Australian Grapegrower and Winemaker 25(297):13-32.

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2.19 Magarey, P.A., Wicks, T.J. and Wachtel, M.F. (1989). Field evaluation of phosphorous acid for the control of grapevine downy mildew. Abstract 111, Seventh Australasian Plant Pathology Society Conference Brisbane, Qld 3-7th July 1989. p 113. (Oral)

3.13 Magarey, P.A. (1989). A simulator for better management of downy mildew in Australia. Agricultural Systems and Information Technology Newsletter (Bureau of Rural Resources) 1(3):4-5.

5.18 Magarey, P.A., Wicks, T.J. and Wachtel, M.F. (1989). Phosphorous acid as Foli-R-Fos 200(R) controls downy mildew. Annual Technical Issue, Australian Grapegrower and Winemaker 26(304):86-87.

5.19 Magarey, P.A., Wicks, T.J. and Wachtel, M.F. (1989). Field evaluation of phosphorous acid for the control of grapevine downy mildew. Australian Grapegrower and Winemaker 26(309):41.

5.20 Magarey, P.A., Wicks, T.J. and Wachtel, M.F. (1989). Foli-R-Fos 200(R) a new fungicide. Australian Grapegrower and Winemaker 26(309):42.

9.5 Wicks, T.J., Magarey, P.A., Emmett, R.W., Baker, G.J. and Baker, B.T. (1989). Practical management of grapevine diseases and pests - revised 1989 edition. Australian Grapegrower and Winemaker 26(309):19-37.

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1.17 Wicks, T.J., Magarey, P.A., de Boer, R.F. and Pegg, K.G. (1990). Evaluation of phosphonic acid as a fungicide in Australia. Brighton Crop Protection Conference - Pests & Diseases 3 A-2:97-102.

1.20 Magarey, P.A., Wicks, T.J. and Wachtel, M.F. (1990). Phosphonic (phosphorous) acid controls *Plasmopara viticola* of grapevines. Proc. APPS H3PO3 Workshop, Brisbane, 3rd July 1989. Australasian Plant Pathology 19(4):126-127.

2.21 Magarey, P.A. (1990). Systems for managing diseases and pests of grapevines. pp. 136-141 in Proc. Seventh Australian Wine Industry Technical Conference, Adelaide SA, 13-17th August 1989. Williams, P.J., Davidson, D.M. and Lee, T.H., Eds., Australian Wine Research Institute, Urrbrae, South Australia, 272 pp. (Invited oral)

2.22 Magarey, P.A., Wicks, T.J., Wachtel, M.F. and Frensham, A.B. (1990). Phosphorous acid (Foli-R-Fos 200(R)) - A new fungicide for grapevine downy mildew (*Plasmopara viticola*). pp. 227-228 in Proc. Seventh Australian Wine Industry Technical Conference, Adelaide, August 13-17th 1989. Williams, P.J., Davidson, D.M. and Lee, T.H., Eds., Australian Wine Research Institute, Urrbrae, South Australia. 272 pp. (poster paper).

2.24 Magarey, P.A., Wicks, T.J. and Wachtel, M.F. (1990). Developments in downy mildew management, ASVO Seminar on Grapevine Disease Management, Australian and New Zealand Wine Industry Journal. 5(3): 210-13. (Invited oral).

2.26 Kable, P.F., Magarey, P.A. and Emmett, R.W. (1990). Computerised disease management systems in viticulture. ASVO Seminar on Grapevine Disease Management. Australian and New Zealand Wine Industry Journal May 1990 : 5(3):221-23 & 238. (Invited oral).

4.5 Magarey, P.A. and Wachtel, M.F. (1990). Managing downy mildew pp 25-33 in 1990 Spring Vineyard Seminar, Hunter Valley Vineyard Association and NSW. Department of Agriculture & Fisheries, Richmond Grove, Pokolbin, NSW. 19 September, 1990. (invited oral)

5.21 Wicks, T.J., Magarey, P.A. and Wachtel, M.F. (1990). The spread of downy mildew in a vineyard. Australian Grapegrower and Winemaker 27(316):73-74.

5.21 Magarey, P.A., Wachtel, M.F. and Wicks, T.J. (1990). Downy Mildew - A major disease. Australian Grapegrower and Winemaker 27(321):19-23.

9.8 Roberts, W., Magarey, P.A. (1990). The collection and manipulation of environmental data from dataloggers. Australian Grapegrower and Winemaker. 27(321):50-51. September, 1990.

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