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Controlling apple diseases – 7th International Congress of Plant Pathology, Edinburgh August 1998

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NSW Agriculture

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FINAL REPORT

"Controlling apple diseases - 7th International Congress of Plant Pathology, Edinburgh, August 1998"

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NSW AGRICULTURE

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1. Project Details

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2. Industry Summary

In August 1998 I participated in the 7th International Congress of Plant Pathology, held in Edinburgh. The congress was attended by over 2000 delegates from all branches of the plant pathology discipline, from all parts of the world. Whilst in the United Kingdom I also visited researchers at the East Malling Research Station of Horticulture Research International, in Kent.

The Congress covered all aspects of plant pathology, with a strong emphasis on molecular biology. This is an emerging area of science which, in the not too distant future, will provide breakthroughs in plant disease resistance, in the development of fungicides with modes of action which are carefully designed, and will become a significant factor in the identification and classification of pathogens and other organisms. Molecular techniques will also be developed for use in detecting the presence of pathogens in epidemiological studies.

Approximately forty papers were presented which dealt directly with the diseases of pome fruits, and a further sixty which dealt with diseases of other crops where the information involved was applicable to pome fruit.

The principal issue in plant protection of pome fruit, as I see it, is the need to develop an 'assured produce' scheme along the lines of that established in the United Kingdom. This involves the documentation of the whole production process so that it can be demonstrated that apples and pears are grown in a responsible manner with reference both to consumer safety and to the environment. This scheme would be based on, amongst other things, integrated fruit production where the consequences of all actions and their inter-relationship are taken into account. The majority of this work could be based on existing knowledge, with research undertaken to fill any gaps.

There is a general trend seen as the need to reduce pesticide usage, however there does not appear to be an overall acceptable pesticide use measurement system. A reduction on the reliance on conventional fungicides will, in the long term, be reduced by the development of transgenic cultivars with resistance to disease. In the short term the potential undesirable effects of fungicide will be overcome by a switch to fungicides with wide spectrum of activity and high efficacy, low toxicity and environmental concerns, which are based on analogues of antifungal compounds from nature. In the medium term the development of 'specific acquired resistance inducers', which have no effect on the plant but assist the plant in resisting disease, will provide disease control with a reduced fungicide input.

Whilst the Congress was attended by scientists with various interests, the strong involvement in molecular technology, was to some extent, at the expense of interest in more traditional areas of epidemiology and practical disease control. It is of concern that whilst there is a trend developing worldwide for the discovery of many exciting areas of disease control, there may be a lack of scientists with the interest to take these developments into practical agricultural production.

3. Program

The program, which occupied five full days is attached. Both plenary sessions and concurrent symposia were held and this was supplemented with two very large sessions of posters. A copy of the Congress program is attached as Appendix 1.

4. Delegates Attending

The Congress was attended by over two thousand delegates from all over the world, representing a range of expertise and specialities within the discipline of plant pathology. Government departments, universities and commercial organisations were represented. A list is available if required.

5. Achievement of Expected Outcomes

Diseases continue to be a major factor in apple production. Growers are faced with the opposing problems of the need to obtain a high level of disease control and the pressure to reduce pesticide use.

The goals of my attendance at the congress and my brief visit to the East Malling Research Station in Kent were :

- to obtain information on current and developing approaches to apple and pear disease control
- to obtain information on strategies used in other crops which may be adapted to apple and pear diseases
- to obtain information on the incorporation of disease control into IPM systems
- to obtain information on systems to measure pesticide use.

These goals were achieved and are discussed in detail in the following sections. They form the basis of the recommendations included in the report.

In general terms there is a world-wide trend towards the reduction of pesticide use in agriculture and towards the development of systems to assure consumers that produce is wholesome. These goals will be assisted by the development of a new generation of fungicides based on analogues of fungicides found in nature, and by the development of compounds which induce resistance in the plant. In the longer term, molecular biology techniques will provide transgenic plants with resistance to disease. These techniques will also assist in the development of fungicides with modes of action which are tailored to act on very specific sites of the fungal metabolism and with few undesirable characteristics.

7.1 Congress Highlights - 7th International Congress of Plant Pathology, Edinburgh

The achievement of the goals of the project are reported in the following sections. The notation in brackets refers to the congress abstract number, which are available in the compact disc form provided.

a. Apple and pear diseases

Forty papers were presented on apple diseases, covering both field and post harvest problems.

1. apple scab

A model has been developed in New Zealand (2.1.11) to predict the daily release of *Venturia inaequalis* ascospores. Ascospores are the principal source of inoculum in New Zealand apple orchards for primary apple scab infection in the spring. Ascospores are released from pseudothecia which develop during the winter in fallen leaves, from early September till early December when either the supply of ascospores has been exhausted or the apple leaf litter has decayed. Rainfall during daylight hours is required for ascospore release. Apple growers need to know when ascospore release will occur in order to apply fungicides to prevent infection. This study used ascospore release data, previously collected, to determine a predictive model to give growers an advance warning of major ascospore release. Degree day accumulations associated with the cumulative ascospore release from 1% to 95% of the seasons total were around 800°Cdays. It was suggested that the daily ascospore numbers are determined by an underlying accumulation of degree days, modified by daily rainfall. A simulation model was developed where ascospores are released on days when 0.2 mm or more of daytime rain fell and otherwise un-released ascospore accumulated until the next rain. This model correctly identified when rain after several dry days caused a major ascospore release event.

In wind tunnel experiments in New York (6.50) earlier research was confirmed or extended by studying the effect of 1) light on ascospore discharge 2) protracted periods of dry weather upon spore maturation and release 3) low temperatures on infection of ascospores and conidia and 4) plant target size, target susceptibility, and air borne inoculum on the relative risk of infection (RRI). In the laboratory maximum ascospore release was detected from 1 hour after sunrise on rainy days. A higher than normal proportion of ascospores were released in the darkness under low relative humidity and towards the end of the primary inoculum season (petal fall). Low temperatures (less than 1°C) reduced the rate of release. Protracted dry periods with little or no rain delayed spore maturation and extended the season for ascospore release. Infections below 6°C occurred after a shorter time than previously reported. RRI (target size x target susceptibility x airborne inoculum dose) increased over 1000 fold between green tip and bloom, and dropped between bloom and petal fall. Because the three components of RRI are highly

correlated with tree growth stage, it is very likely that infection risk eventually can be predicted phenology alone.

In a paper on action thresholds for apple scab control (PAD) (3.1.3) it was shown that in the north eastern USA that scab can be managed effectively in an orchard with a with a low predicted potential ascospore dose with two to five fewer early season fungicide applications than were recommended. Shredding the leaves or treating them with urea in the autumn can reduce ascospore dose by 50-70 %. The scab-risk action threshold states that if the number of scabbed leaves on 600 extension shoots assessed in autumn is less than 50 (a low risk orchard), the first fungicide application can be delayed. If the PAD is 50-100 (a moderate risk orchard) a sanitation treatment will enable the first spray to be missed. Where the PAD is greater than 100 the grower is advised that the risk of scab is high and the recommended protective fungicide schedule should be followed.

In a study on the production of pseudothecia and asci of *Venturia inaequalis* (3.7.88) it was found that the production of asci occurred earlier in cv. Jonagold than in Mutsu or Macoun, although there was no difference in the production of asci per pseudothecium.

A study was undertaken to determine the strain type of *V. inaequalis* present in New Zealand, using molecular techniques (2.2.33). Although a high degree of variability was noted between isolates, all appeared to belong to the European strain designated as Race 1. Unlike the Northern Hemisphere situation, New Zealand has only one race and this race can be controlled with the existing *Malus* resistance genes *Vf* and *Vm*.

A basic factor in the determination of infection conditions for apple scab is leaf wetness. A variety of probes have been used to determine this parameter and a paper reporting on the efficiency of sensors was presented (3.2.2). It was found that cylindrical sensors were most effective in representing wetness when mounted outside the tree canopy, but flat plate sensors were more reliable when mounted in the tree canopy.

In a study (5.5.30) on the resistance of *Venturia inaequalis* to the DMI fungicides it was found that a return to a non-DMI schedule did not result in a loss of the resistant population. In the presence of DMI insensitive individuals of *V. inaequalis*, even at low frequency in the population, the current use recommendations for DMI fungicides could rapidly select for a resistant population in this multicyclic disease. It seems that once DMI resistance in *V. inaequalis* has been selected it may not be possible to safely return to DMIs for apple scab control.

2. fire blight

Ten papers were presented on fire blight (*Erwinia amylovora*).

A new fire blight risk assessment system (BIS - Billing's Integrated System) has been developed (3.1.17). Epidemic blossom blight is

associated with warm weather during bloom and flower wetting, and epidemic shoot blight with damaging storms. The BIS approach is broadly similar to that in other systems, but also identifies days associated with low disease incidence. The precision of BIS assessments of disease development rates is good in most cases but there are host related differences.

In attempts to determine the presence of endophytic *E. amylovora* (2.9.9), 20% of 30 Jonathan trees contained the bacteria in one or more symptomless side shoots. Endophytic bacteria were also recovered from unopened blossom buds of three out of nine trees. The bacterium remained latent for 10 months in neglected greenhouse trees.

In a study on the spread of fire blight (2.4.5) it was found that flowers remained free of the organism through full bloom but became blighted over the next 2-3 days. This occurred without rain and was associated with a significant increase in the population of muscoid insects. Washings of the insects yielded *E. amylovora*. Muscoids and syrphid flies are attracted to the ooze on overwintering cankers and their presence is correlated with the rapid colonisation of flowers with *E. amylovora* in the absence of rain.

Biological control of fire blight is being investigated in several locations. In New Zealand (3.5.4) an isolate of *Erwinia herbicola* is being investigated which appears to control *E. amylovora* by the production of an antibiotic. The organism was successfully spread to flowers using bees, by placing freeze dried bacteria at the exit to the hive. Further spread occurred from flower to flower, it is assumed, by insects. In the USA (2.4.1s) the ability of bees to spread antagonistic strains of *E. herbicola* and of *P. fluorescens* was studied. It was concluded that the rate of blossom colonisation was variable between seasons and bee foraging activity depended on the weather and on other competing flowering plants. Because biocontrol of fire blight requires that populations of antagonists be established on stigma before establishment of the pathogen, they concluded that the variability in establishment of the antagonist by bees is too great for this method to be used as an alternative to spraying of the antagonist.

Five papers dealt with molecular techniques to understand the host-pathogen relationships in the disease(1.6.18,1.6.5s,1.5.8,1.5.7) and attempts to produce transgenic apples resistant to the disease.

3. Nectria canker

Nectria canker caused by *N. galligena* is a problem in apples in the UK. The disease does not occur in Australia and is the subject of quarantine restrictions. It was shown (6.168) that a delay in planting after lifting from the nursery favours the occurrence of the disease. Three papers reported using molecular techniques in the study of the epidemiology of the disease.

A species specific PCR based detection assay has been developed to assay symptomless infection (3.3.50). The technique has been used to attempt to differentiate infection in the orchard which has come in the nursery trees from that which is the result of tree to tree spread (2.4.16) and to investigate whether host specificity occurs between isolates (3.7.25).

4. other field diseases

A study of apple replant disease in the USA (2.7.2) showed that *Cylindrocladium, Phytophthora, Pythium and Rhizoctonia* species became dominant over *Mucor, Penicillium and Ulocladium* as the length of time that the soil had been under apples increased.

The epidemiology of brown rot (*Monilinia fructigena*), which does not occur in Australia, was studied in the UK (3.7.52).Mummified fruit of apple and pear on the ground or remaining attached to the tree are important sources of overwintering inoculum. All primary infection was associated with damage caused by birds, insects or growth cracking. Inoculation of fruit on potted trees showed that wounding was essential for infection.

There was a notable lack of papers on virus disease in pome fruit and the two that were presented were concerned with molecular investigation of the make up of the viruses (3.7.49,1.11.72).

5. post harvest diseases

The papers presented dealt largely with various aspects of biological control of post harvest diseases. Work from Spain (5.2.50) established the efficacy of *Candida sake* strain CPA-1 and *Pseudomonas syringae* strain CPA-15 and showed that the combination of the two organisms was more effective than when used singly against *Penicillium expansum*. Susceptibility to rots and the amenability to biological control varied between orchards (5.2.51). *Ps. syringae* strain CPA-1 was also found to have potential for control of core rot of Starking Delicious apples.

Research work (3.1.10) with antagonistic *Ps. fluorescens* EPS288 showed that when used in combination with fungicide (imazalil plus folpet) the rate of fungicide could be reduced by 25 %, whilst maintaining the efficacy of the fungicide alone against *P. expansum* .

b. Disease control in other crops relevant to apples and pears

1.fungicides

In an overview paper (5.6.1s) it was pointed out that fungicides remain vital for effective disease control. At least nine new fungicide groups with novel modes of action have been developed over the past few years, which will have a significant impact over the next decade. Some of these discoveries have arisen through traditional random screening, others from natural products and others through the exploitation of systemic acquired resistance (SAR). This later group are functional analogues of salicylic acid, for example 'Bion'. It protects the plant against bacterial and fungal

infection when applied before infection whilst having no effect on the pathogen. Because of their unique mode of action they should have no risk of resistance.

Two papers were presented on the strobilurin analog fungicides (4.9.6 and 5.6.2s). The most developed appear to be kresoxim-methyl and azoxystrobin. Their synthesis was inspired by a group of natural products, the strobilurins, which were produced by several species of Basidiomycete fungi. They have a very broad spectrum of activity against fungal pathogens from four taxonomic groups, the Ascomycetes, Oomycetes, Deuteromycetes and Basidiomycetes.

They are not cross resistant to other site- specific fungicides and represents a new tool for the management of resistance. Azoxystrobin (4.9.6) has a benign environmental profile and is unique in combining an excellent spectrum of activity at low rates. It is rapidly degraded in the environment and does not accumulate in the food chain. It is compatible with IPM. Field trials have shown it to be effective against diseases in many commercially important crops including cereals, grapes, rice, banana, peanut, cucurbits and tomato. It is expected to have a wide range of registrations on a range of crops worldwide.

Paper 5.6.2s reports the activity of these fungicides in as well as the above, pome fruits, vegetables and turfgrass and stated that they are protective, curative and in some cases eradicative. Yield increases have also been reported above those due to disease control and the fungicides provide a 'greening ' effect to foliage.

Another promising line of disease control is through the use of 'specific acquired resistance inducers' (SAR). The compounds are non fungicidal analogues of salicylic acid, for example 'Bion" a Novartis product. These compounds protect against fungal, bacterial and viral infection by inducing resistance. They are broad spectrum, long lasting and have multiple modes of action. There is a lag time of 3 to 7 days between application and protection. The compounds have no direct effect on the pathogen.

2.epidemiology

A number of general papers were presented on epidemiology, relating weather and inoculum concentration to the occurrence of disease. It was pointed out (2.5.2s) that pathogen dispersal can often be a limiting phase in the development of plant disease and that weather (eg. wind and rain) play a vital role in the dispersal process. The physical aspects of dispersal were discussed in some detail. Pathogen survival (2.5.3s) is another key component in the life cycle of plant pathogens. Environmental conditions affect the survival till the next season. The role of water, temperature and radiation have been investigated and their importance varies with the pathogen. These factors may also have an indirect role through the influence of microbes detrimental to survival propagules. Microclimate based disease warning models for use in plant disease control in a range of crops have lead to the study of the effect of temperature and moisture on infection and disease (2.6.2s).

Three papers on the epidemiology of specific diseases were presented. In sweet cherry (2.5.3) it was found that the occurrence of blossom blight (*Monilinia laxa*) was influenced by inoculum density and environmental conditions. Most blossoms were found to have become infected at full bloom. The severity of disease increased with higher density of inoculum sources and longer wetness duration. The amount of inoculum sources within 1.5 metres accounted for most of the differences in infection rates. Only flower infection rates above 40 % caused fruit set below the carrying capacity of the tree, however, spur blight incidence increased sharply if blossom blight was greater than 20 %.

Observations were made on wetness in Brussels sprouts in relation to leaf spot infection (2.5.27). the leaf wetness of the upper and lower canopy differed depending on the type of wetness event. Dew caused the upper canopy to have longer wetness duration than the lower positions. Rainfall gave more uniform wetness duration. Wind speed affected the wetness duration and occasionally lead to large differences in wetness duration of the canopy. One wetness probe cannot accurately predict the wetness duration of the entire canopy. Flat and cylindrical wetness probes estimated leaf wetness to be different. Onset was estimated much more slowly with the cylindrical probe than the flat probe.

In California a disease monitoring system (3.1.26) was developed for prediction of *Botryosphaeria* blight in pistachio orchards. Estimating the amount of disease inoculum in buds in the dormant period was found to be highly correlated with the level of disease which developed later. Predicting the presence or absence and the severity of expected *Botryosphaeria* blight can help growers in the early detection of disease allowing the pruning out of blighted shoots, panicles and cankers which could reduce *Botryosphaeria* blight in pistachio orchards.

Also in California (3.1.6) an extensive weather station network with 500 stations has been used with a database of models of plant disease to influence disease control. A model validated in California has been used successfully for predicting *Botrytis cinerea* infection periods in grapes. This model was used for *Botrytis* in strawberries using modified thresholds, with a saving in fungicide use and no loss in marketable yield.

A study on leaf wetness sensor position and coating, on performance during dew periods (2.5.2), showed that unpainted sensors were more sensitive than painted to the angle of sensor deployment. Compass angle had no significant effect.

3.biological control

Papers were presented on disease control both in the field and in post harvest situations. A study in Canada (5.2.20) showed control of brown rot (*Monilinia fructicola*) by applications of a strain of *Pseudomonas syringae* in the field. In the USA in a study with cherries, whilst applications of *Cryptococcus infirmo-miniatus* reduced blue mould, and in combination with iprodione fungicide reduced brown rot, the combination was more effective than iprodione alone.

Australian work (5.2.15) on mango has shown that stem end rot infection occurs endophytically, accounting for the difficulty in controlling the disease. Fruit flies have been found to inoculate fruit with bacteria which rot the fruit and provide an essential food base for the developing larvae. These bacteria also inhibit fruit decaying pathogens and may provide a lead in the search for biological control agents.

Variable efficacy is seen as preventing the use of biological control organisms (5.2.61). Low levels of fungicide (10%) can enhance this activity but so can some food additives. In laboratory assays a combination of sodium bicarbonate and poly-D-arginine or poly-D-lysine was the most effective in providing both protective and curative activity against *P. expansum* and *B. cinerea* on apples, whereas sodium bicarbonate alone proved to be effective in inhibiting *P. digitatum* on citrus. The use of these materials to enhance the effectiveness of yeast antagonists is yet to be tested.

Vinegar (acetic acid) in the vapour form was found to eliminate spores of *M. fructicola* from stone fruit and *P. expansum* from apples, and also reduced rot of strawberries caused by *B. cinerea*. The type of vinegar used affected the efficacy of the treatment.

4.identification of pathogens

The use of molecular techniques to identify plant pathogens was the subject of several papers. A commercial company has developed ELISA technology in a format which permits this molecular technique to be used in the field for identification before symptoms are apparent (3.3.4s). No laboratory equipment is required and the tests are performed in minutes. PCR technology is also being developed for diagnostic use.

Five papers were presented on the identification of the brown rot fungi (*Monilinia spp*). The first of these (3.7.56) used morphology (growth rate and germ tube length) to identify *M. fructicola, M. laxa* and *M. fructigena,* whilst others used monoclonal antibodies (6.146), total protein profiles (3.3.71) and ELISA techniques (6.70). The fifth paper reported comparison of identifications based on polymerase chain reaction and morphology. All were useful in differentiating the three species.

c. Disease control in IPM systems

1. IPM

A paper (3.1.8) was presented on using ADEM to manage apple diseases. ADEM (Apple Disease East Malling) is a PC based system which forecasts the risk of apple scab, powdery mildew, *Nectria* fruit rot and canker and fire blight. It was found that the appearance of new scab or mildew lesions agreed closely with predictions given by ADEM and that the scab predictions were more accurate than those based on the Mills table. The use of a key stage strategy, (where fungicides are applied routinely at

key growth stages but at other times fungicide choice and spray intervals were managed according to scab warnings), resulted in similar or better disease control compared to the routine program, but fungicide use was reduced by 20-50 %. The incidence of disease was monitored at 7-14 day intervals to assist with decision making. The work demonstrated the potential for optimising fungicide use in apple orchards by using ADEM with a key stage strategy.

A related paper (5.1.8s) was presented on the LIFE (Less Intensive Farming and Environment) project at Long Ashton Research Station where an integrated approach was taken to cereal growing. The IPM program was developed to integrate and exploit the main components of crop husbandry practices which minimise the risk of disease becoming severe. Thus a carefully selected crop rotation with crops established using minimum tillage, combined with cultivar resistance, adjustments to sowing date and nitrogen application offers opportunities to decrease the incidence and the severity of attack of a range of arable crop diseases that limit production.

2. computers and modelling

Modelling describes a suite of ideas and methods that are particularly useful for investigating and describing large , complex objects such as pathosystems in a mathematical language. In all aspects of epidemiology it complements common sense, simple logic, observation and experiment (2.1.1s).
A number of papers were presented on the use of computers and models in disease epidemiology. One of these concerned the splash dispersal of plant pathogens within a crop. A mathematical model has been developed for dispersal of plant pathogens by rain splash (2.1.3s) which may be used to examine the effects of different crop characteristics on the spread of disease.

Indian scientists (4.3.7)have developed a computer program to permit the identification of post-harvest diseases of a range of fruits. In the USA software has been developed for use in association with automatic weather stations for a wide range of diseases of a number of crops. Included are apple scab, cedar apple rust, fire blight, apple blotch, and pear scab. A model has also been developed for predicting codling moth. Post infection fungicide sprays for apple scab were equally effective as calendar timed sprays and used less fungicide.

3. pest risk analysis

The issue of quarantine, whilst not necessarily related to day to day plant protection is a vital part of disease control. Four papers were presented on 'Crop Risk Analysis' (PRA), the process used to consider the risks of importation of pests and diseases along with produce.

An overview paper (4.6.1s) pointed out that within the present century the majority of countries have developed quarantine regulations that are applied to plants and plant products, but there has been no consistent criteria used for

these determinations. In 1994 the World Trade Organisation (WTO) completed an agreement which led to the development of 'pest risk analysis' as a basis for quarantine decisions. Such schemes guide the assessors through the essential questions that should be answered in order to reach an acceptable assessment of risk. They seek to determine whether and how probable it is that a particular pest could be transported by international trade and establish in a particular area and cause economic loss. The information to make these decisions is not always available (4.6/8s).Although WTO /FAO provide guidelines on PRA in many cases there is a lack of data available on which to make decisions. Risk assessments are felt by some to be too subjective and by others to be too technical. Consequently the PRA process is imperfect and no ideal format is possible.

Two specific papers on PRA were presented, one on karnel bunt in wheat (4.6.2s) and the second, of particular relevance to pome fruit was presented by Dr Bill Roberts (AQIS) on the risks of fire blight introduction to Australia. Both papers aroused some controversy, mainly along the lines that the restrictions arising from the PRAs were more than could be justified.

d. Measuring pesticide use

1. the "assured produce scheme"

A paper (4.9.6s) was presented on the United Kingdom's 'Assured Produce Scheme'. It was pointed out that both fresh produce growers and retailers share a common concern to assure consumers that current food production methods lead to good quality safe food. The National Farmer's Union joined with major retailers in the UK to reassure consumers that produce is grown in an environmentally sensitive manner., with emphasis on reducing the use of pesticides by promoting viable integrated crop management (ICM). The initiative, known as the 'NFU - Retailer ICM Partnership', sought to achieve this objective in three phases; firstly to establish a baseline of current best horticultural practice; secondly to independently verify that growers are reaching these standards and thirdly, to measurably lift these standards.
The first phase achieved the development of ICM protocols for 47 crops. These described best existing practice, highlighted integrated pest and disease and crop management techniques and are updated as required.
In October 1997 the partnership embarked on the second phase with the launch of the Assured Produce Scheme. The scheme combines self and independent assessment
which are both scored.

7.2 VISIT TO EAST MALLING RESEARCH STATION, KENT

On the Friday before the Congress I visited the East Malling Research Station of Horticulture Research International in Kent, about an hour train ride from London. East Malling has a long history of horticultural and plant pathology research . I spent

the day with two researchers, Dr Xiangming Xu and Dr Angela Berrie, who both work on diseases of deciduous fruits.
Dr Xu is an epidemiologist and disease modeller. He has been closely involved with the development of ADEM (Apple Diseases East Malling) a computer aid to disease management .The program uses weather data to provide information on apple scab , powdery mildew, *Nectria* canker and fire blight infection and suggests control options. The program is available commercially and a Windows version is currently being constructed. The use of the system is aimed at advisers since the growers claim that the cost of setting up these system is too high. The cost is 3000 Pounds . Dr Xu claims this is economical in terms of the savings in sprays, at 30 Pounds per hectare, which could be obtained. Dr Xu is aiming to set up a network of 10 to 20 weather stations to cover the whole of Kent to collect data and have automatic dissemination of recommendations to advisers and growers. Currently the average number of fungicide sprays applied to apples is 15. Using ADEM the rate of fungicide in these sprays could be reduced. There is interest in reducing the use of pesticides, which is being driven by the supermarket chains. Dr Xu has developed his own model for scab which measures temperature each 3 minutes and the potential for infection is judged on that data, rather than on the mean temperature for the day.
The model for both scab and mildew takes into account the susceptibility of the cultivar. With mildew it has also been possible to set a threshold for damage, which is not possible with scab, for instance cv. Golden delicious can tolerate 30 % infection whilst the figure for cv. Cox's Orange pippin is only 10 %.
Dr Xu did not plan to use the PAD concept for the assessment of scab potential based on the level of overwintering scab because under local conditions much of the inoculum is conidial and survives in the buds in the trees and therefore not considered when PAD estimates are made in the autumn. He said that PAD was not useful in several areas of Europe.

Dr Angela Berrie has interests in several areas of apple pathology. In the UK rots of fruit have been an ongoing problem, but the cause has changed over time. In the early 1970s better storage conditions and the use of the benzimidazole fungicides lead to less problems with *Gloeosporium* rots, but *Phytophthora* rots became more important. *Botrytis* is now the major concern with calyx infection in late stored fruit. *Botrytis* causes blossom infection which remains latent in the calyx and becomes expressed in late-stored fruit. Ultra-low oxygen storage exacerbated the problem. Rotting was related to site and some orchards yielded less rotted fruit than others. Factors involved include the inoculum level (*Nectria* canker and brown rot), low hanging fruit and herbicide strip size (*Phytophthora*). Weather, previous rot history and mineral composition of the fruit are also important. Mineral analyses are now becoming a common assessment when deciding on the storage life of fruit.
Discussions were had on integrated fruit production (IFP) which was introduced to the UK in 1992. IFP which covers all aspects of fruit production led to a lot of disagreement between growers and supermarkets. A European standard has now been established. Apples, pears, stone fruit and soft fruit as well as a range of other fruit and vegetables are covered. Two years ago the 'Assured Produce Scheme' was developed from protocols agreed to between growers, supermarkets and experts. The production of produce is recorded and grower records are audited by an independent body. If the orchard fails to pass the standard the produce will not be accepted by

supermarkets. The result is that growers need to make informed decisions and justify actions taken. In the UK fruit produced under the scheme is not labelled to differentiate it from non-certified produce, whereas in Europe it is. IFP can result in some savings of pesticides but not to any great degree. A large field trial is underway on the station to compare fruit growing using conventional methods with IFP. Under IFP, fungicides applied for apple scab control are applied 'strategically', that is in the period of greatest infection risk up until petal fall, involving a maximum of 5 sprays. Four to eight mildew sprays are applied, but at reduced rates based on disease pressure.

8. PRACTICAL APPLICATION OF MOLECULAR BIOLOGY TO DISEASE CONTROL

It was pointed out (session 4.9) that agrochemical companies are acquiring seed and biochemical companies. The use of genomic science permits the detection of specific functions in organisms and the selection of chemicals to affect these processes. Using these techniques it is possible to take into account the effect of chemicals on non target animals and plants. Transgenic crops which are herbicide tolerant and insect resistant are currently available for field crops. There are currently no transgenic plants with disease resistance available yet but these should appear in the next 4-5 years. The future is seen to be the use of transgenic plants and fungicides complementing each another. Eight to twelve years are required to develop a fungicide, whilst it takes 7-10 years to develop transgenics.

The role and features of transgenics have not been adequately explained to the public, with an overemphasis on the risks and not the benefits, while the risks from traditional breeding has been neglected. The strategy is to only use plant genes in plants. It was argued that the risks from the transgenics should be weighed against the risks from present practices such as the use of pesticides.

9. OVERVIEW

Four main areas of immediate relevance to the pome fruit industry were apparent from the congress and the discussions had with colleagues.

1. the general trend to attempt to reduce and monitor the use of pesticides, and the need to be able to demonstrate that the fruit is grown in a responsible manner which guarantees safety to the consumer and has minimal impact on the environment.

2. disease control is entering a new area with soon to be available fungicides based on analogues from nature, with low toxicity and low environmental impact

3. in the not too distant future disease control will be aided by the availability of compounds which, when applied as a spray, induce specific acquired resistance (SAR) in the plant

4. transgenic technology will speed up the availability of new (or old) varieties with resistance to disease

10. RECOMMENDATIONS

1. that a program to provide the necessary research to establish integrated fruit production be undertaken

2. that a program to provide the coordination of existing knowledge to establish an 'assured produce scheme' based on integrated fruit production be undertaken

3. that industry be encouraged to pursue the adoption of fungicides based on analogues of products from nature

4. that industry be encouraged to pursue the adoption of specific acquired resistance eliciting compounds as a means of disease control

11. Copies of the conference proceedings

The congress proceedings are provided as a compact disc, which is herewith submitted.

12. Acknowledgments

I thank the Horticultural Research and Development Corporation and the Australian Apple and Pear Growers Association for funding my attendance at the Congress, and NSW Agriculture for salary and facilities.

APPENDIX 1

Conference program

SCIENTIFIC PROGRAMME

The following programme is shown on a day by day basis detailing symposia, poster sessions, evening meetings and additional meetings for Monday 10 - Friday 14 August. Please see the programme summary on page 9. The speakers name only is noted against symposium papers, for full authorship, please consult Volume 1 of the Book of Abstracts.

Monday 10 August 1998

OPENING PLENARY SESSION

(All registered delegates and accompanying guests are invited to attend)

Time: 08.30-12.20	**Venue: Usher Hall (& EICC, Pentland Suite via video link)**
08.30	**WELCOME to the 7th International Congress of Plant Pathology and to Edinburgh:** - **David Ingram** (Congress President) - **Peter Scott** (Chairman, Organising Committee) - **Lord Sainsbury of Turville**(Congress Honorary President) - **John Graham** (Secretary, The Scottish Office, Agriculture, Environment and Fisheries Department) - **Richard Hamilton** (President, International Society for Plant Pathology)
08.50 [3.1PL]	**THE GLENN ANDERSON LECTURE:** **Eugene Terry** *(Formerly, Director- General, W. Africa Rice Development Association (WARDA), Ivory Coast, now Adviser, Agricultural Research and Extension, The World Bank, Washington DC, USA)* **Agricultural Sustainability, Plant Pathogens and Traditional Systems**
09.30 [3.2PL]	**Brian Staskawicz** *(Department of Plant Biology, University of California, Berkeley, USA)* **Molecular Biology of Disease Resistance: From Genetic Understanding to Control**
10.00	Break
10.30 [3.3PL]	**Janis Antonovics** *(Department of Botany, Duke University, N.Carolina, USA)* **Population Biology of Infectious Disease: Perspectives for Plant Pathology**
11.00 [3.4PL]	**Pierre Urech** *(European Crop Protection Association, Belgium)* **The Agrochemical Industry: Its Contribution to Crop Protection and Environmental Policy**
11.30 [3.5PL]	**THE BRITISH SOCIETY FOR PLANT PATHOLOGY PRESIDENTIAL ADDRESS:** **David Ingram** *(Regius Keeper, Royal Botanic Garden Edinburgh, UK)* **Plant Disease and Biodiversity**
12.00	**OPENING of the 7th INTERNATIONAL CONGRESS OF PLANT PATHOLOGY by the CONGRESS PATRON:** **Her Royal Highness THE PRINCESS ROYAL**
12.20 (approx)	Lunch

Symposia - Afternoon

Time: 14.00-17.30 **Venue: EICC, Pentland Suite**

1.1 GENE FOR GENE INTERACTIONS: MOLECULAR STRUCTURES AND FUNCTIONS

Organiser and Chair: **P.J.G.M. DeWit** (Agricultural University, Wageningen, The Netherlands)

14.00: [1.1.1S]	*Keynote:* **P.J.G.M. deWit** Gene-for-gene interactions: the role of avirulence genes in pathogenicity and race-specific resistance
14.40: [1.1.2S]	**B.J. Baker** (University of California, Berkeley, USA) Elucidation of the molecular-genetic and biochemical basis of *N*-mediated TMV resistance
15.00: [1.1.3S]	**Barbara Valent** (DuPont, Wilmington, USA) Functional analysis of the *Magnaporthe grisea* avirulence gene *AVR2-YAMO*
15.20:	Break
15.50: [1.1.4S]	**A. Collmer** (Cornell University, Ithaca, USA) New approaches to finding bacterial AVR proteins and assessing their role in promoting parasitism
16.10: [1.1.5S]	**A. Bogdanove** (Purdue University, USA) Pathogen recognition and signal transduction events involved in plant disease resistance
16.30: [1.1.6S]	**J.G. Ellis** (CSIRO, Canberra, Australia) Molecular analysis of gene-for-gene specificities of the alleles of the flax L gene for rust resistance
16.50: [1.1.7S]	**J. Jones** (Sainsbury Laboratory, Norwich, UK) Plant disease resistance genes: structure, function and evolution
17.10:	Discussion led by: **J. Jones**
17.30:	Close

Time: 14.00-17.30 **Venue: Usher Hall**

2.10 ECOLOGICAL BASIS OF BIOLOGICAL CONTROL

Organiser & Chair: **N.J. Fokkema**, (IPO-DLO, Wageningen, NL)

14.00: [2.10.1S]	*Keynote*: **J.M. Whipps** (Horticulture Research International, UK) Microbial interactions as a basis for biological control of fungal diseases
14.40: [2.10.2S]	*Keynote*: **S.E. Lindow** (University of California, Berkeley, USA) Bacterial interactions in the phyllosphere as a basis for biological control of bacterial diseases
15.20:	Break
15.50: [2.10.3S]	**J. Kohl** (IPO-DLO, Wageningen, The Netherlands) Biological control of *Botrytis* spp. by suppression of spore production
16.10: [2.10.4S]	**R. Belanger** (Laval University, Quebec, Canada) Biological control of powdery mildews
16.30: [2.10.5S]	**M. Aino** (Huogo Agricultural Institute, Japan) Use of endophytic bacteria in biological control

16.50: [2.10.6S] **J.N. Matthiessen** (CSIRO, Canberra, Australia)
Ecological basis and prospects for biofumigation

17.10: Discussion led by: **N.J. Fokkema**

17.30: Close

Time: 14.00-17.30 **Venue: EICC, Kilsyth**

3.6 DISEASE MANAGEMENT IN CHANGING RICE PRODUCTION SYSTEMS

Organiser & Chair: **T.W. Mew** (IRRI, The Philippines)

14.00: [3.6.1S] *Keynote:* **S. Savary** (IRRI, The Philippines)
Changing production situations in rice and implications for plant pathology

14.20: [3.6.2S] *Keynote*: **H. Kato** (Kwansei Gakuin University, Hyogo, Japan)
Emerging disease problems in intensive rice systems in Asia

14.40: [3.6.3S] *Keynote*: **L. Calvert** (CIAT, Cali, Colombia)
Emerging disease problems in intensive rice systems in Latin America

15.00: [3.6.4S] *Keynote*: **J.-L. Notteghem** (ENSAM, Montpellier, France)
Emerging disease problems in intensive rice systems in Africa

15.20: Break

15.50: [3.6.5S] **H. Leung** (IRRI, The Philippines)
Networking science: partnership of rice disease research

16.10: [3.6.6S] **P.S. Teng** (IRRI, The Philippines)
Sharing science and contemporary technology with rice farmers

16.30: [3.6.7S] **J.M. Bonman** (DuPont, Newark, USA)
Rice disease management: industry approaches and perspectives

16.50: Discussion led by: **T.W. Mew**

17.30 Close

Time: 14.00-17.30 **Venue: Caledonian Hotel, Castle Suite**

4.5 AGENDA 21, SUSTAINABILITY AND ENVIRONMENT: STRATEGIES FOR PLANT PATHOLOGY

Organiser & Chair: **Ariena van Bruggen** (University of California, Davis, USA)

14.00: [4.5.1S] *Keynote:* **N. van der Graaf** (FAO, Rome, Italy)
Population growth and hunger: actions by plant pathologists

14.40: [4.5.2S] **A.B. Filho** (University of Sao Paulo, Brazil)
Sustainable management in plantation crops: emphasis on coffee rust

15.00: [4.5.3S] **S.R. Gowen** (Kansas State University, USA)
Sustainable disease management in bananas

15.20: Break

15:50: [4.5.6S] **N. Neate** (CSIRO, Glen Osmond, Australia)
Sustainable disease management in low-rainfall cereal production systems

16.10: [4.5.4S] **J.M. Duniway** (University of California, Davis, USA)
Alternatives to methyl bromide for root disease management

16.30: [4.5.5S]	**Jan E. Leach** (Kansas State University, USA) Predicting durable resistance based on cost of pathogen adaptation
16.50:	Discussion led by: **Ariena van Bruggen**
17.30:	Close

Time: 14.00-17.30 **Venue: EICC, Tinto & Moorfoot**

5.5 NEW APPROACHES TOWARDS IDENTIFYING FUNGICIDE MODES OF ACTION AND RESISTANCE

Organiser:	**D.W. Hollomon** (IACR-Long Ashton, UK)
Chair:	**M.A. DeWaard** (IPO-DLO, Wageningen, NL)
14.00: [5.5.1S]	*Keynote:* **W. Koeller** (Cornell University, Geneva, USA) Mode of action of fungicides in real plant pathogens
14.40: [5.5.2S]	**Rafaella Carzaniga** (University of Milan, Italy) Microscopy: opening a window on fungicide mode of action
15.00: [5.5.3S]	**M. Riederer** (BASF, Germany) Simulation of the foliar uptake of semi-volatile fungicides
15.20:	Break
15.50: [5.5.4S]	*Keynote:* **Anne B. Orth** (Dow AgroSciences, USA) Molecular genetics of fungicide resistance
16.30: [5.5.5S]	**S.P. Heaney** (Zeneca, UK) Molecular biology and resistance management
16.50: [5.5.6S]	**S. Webb** (ADVANT, Turku, Finland) Time-resolved fluorometry: an overview of the chemistry and applications in screening and diagnostics
17.10:	Discussion led by: **D.W. Hollomon**
17.30:	Close

Special Evening Meeting

Time: 18.30-20.45 **Venue: EICC, Pentland Suite**

E1 GLOBAL FOOD SECURITY: The Role for Plant Pathology

A Public Discussion Forum

Organiser: **W. Clive James** *(Grand Cayman)*

THE ENORMITY OF THE PROBLEM

During the World Food Summit in Rome in 1996, Heads of States agreed to halve the number of hungry people by 2015. Today there are 800 million, almost all of them in developing countries of Asia, Africa and Latin America.

Hunger and poverty are inextricably linked and the solution does not rely on one factor, but on an interrelated complex of factors that includes population, technology, policy and social changes.

What are the facts about Global Food Security?
- World population is 5.8 billion
- 80% live in developing countries, where the population increases 1.9% per year

- More than 800 million people do not have adequate food
- 1.3 billion live on less then $1 a day
- 50% of poor people live in Asia, 25% in Africa, 12% in Latin America
- Most poor people live in areas where the land is marginal and ecosystems are fragile
- Global food production is 5 billion tons per annum

Why do diseases and pests of crops matter?
- Crop diseases, pests and weeds reduce production by at least one-third, despite the use of pesticides worth 32 billion dollars
- Crop diseases alone reduce production by more than 10%
- For example, potato blight, the disease that caused the Irish famine in 1845, is again becoming prevalent

What are the options for managing crop diseases to improve food security?
Five distinguished scientists will address different aspects of the issue:

Dr Clive JAMES *(Chairman, International Service for the Acquisition of Agribiotech Applications, Cayman Islands)*
Global food security (abstract 4.1GF)

Dr Noman BORLAUG (*Nobel Peace Laureate, Mexico)*
Food security, plant pathology and quarantine (abstract 4.2GF)

Dr Cyrus NDIRITU *(Director, Kenyan Agricultural Research Institute, Nairobi, Kenya)*
Human capital investment in plant pathology: a view from the South (abstract 4.3GF)

Dr Robert WILLIAMS *(Deputy Director General, CAB International)*
Public-private sector partnerships in plant pathology that will contribute to food security (abstract 4.4GF)

Dr Paul TENG *(International Rice Research Institute, Philippines)*
Practising plant pathology in changing agricutural systems (abstract 4.5GF)

These presentations will be followed by a general discussion to which all are invited to contribute.

Other Evening Meetings

The following evening meetings will take place on Monday 10 August. Please see page 51 for further details.

Time: 18.30-20.45	**Venue: EICC, Moorfoot** **Jerry Bartz** (USA; Chairman, ISPP Postharvest Disease Committee) E8 - Post-harvest Diseases: Current Critical Issues
Time: 18.30-20.45	**Venue: EICC, Harris 1** **Baruch Sneh** (Israel; Chairman, ISPP Committee on Rhizoctonia) E10 - Rhizoctonia 1

Time: 18.30-20.45 **Venue: EICC, Tinto**
John Lucas (UK)
E16 - New Perspectives on Cereal Eyespot

Time: 18.30-20.45 **Venue: EICC, Harris 2**
Ieuan Evans (Canada)
E35 - Plant Disease and Micronutrition

Tuesday 11 August 1998

Symposia - Morning

Time: 08.30-12.00 **Venue: EICC, Pentland Suite**

1.2 CELL SIGNALLING AND THE HYPERSENSITIVE REACTION

Organiser & Chair: **J. Dangl** (University of North Carolina, Chapel Hill, USA)

08.30: [1.2.1S] *Keynote:* **J. Dangl**
Interactions between loci controlling disease resistance and cell death in *Arabidopsis*

09.10: [1.2.2S] *Keynote:* **P. Schulz-Leifert** (Sainsbury Laboratory, Norwich, UK)
Identification of syntetic relationships of resistance gene homologue loci in cereal genomes

09.50: Break

10.20: [1.2.3S] **F. Ausubel** (Harvard Medical School, Boston, USA]
Characterization of *Arabidopsis eds* mutants

10.40: [1.2.4S] **R. Innes** (Indiana University, Bloomington, USA)
Genetic dissection of the *RPS5* disease resistance pathway in *Arabidopsis*

11.00: [1.2.5S] **D. Scheel** (Institute for Plant Biochemistry, Halle, Germany)
Receptor-mediated pathogen recognition and signal transduction in plant defence

11.20: [1.2.6S] **C. Lamb** (The Salk Institute, La Jolla, California, USA)
Nitric oxide as a signal with reactive oxygen intermediates in the activation of disease resistance mechanisms

11.40: Discussion led by: **I. R. Crute** (Horticulture Research International, UK)

12.00 Close

Time: 08.30-12.00 **Venue: Caledonian Hotel, Castle Suite**

3.1 THE BIOLOGICAL BASIS OF DISEASE CONTROL DECISION SUPPORT

Organiser & Chair: **N. D. Paveley** (ADAS, High Mowthorpe, UK)

08.30: [3.1.1S] *Keynote:* **N.D. Paveley**
Integration of epidemiology, crop protection and physiology as a biological basis for decision support

09.10: [3.1.2S] *Keynote:* **J.M.B. Secher** (Hardi International, Denmark)
Delivering biological understanding in an agricultural context

09.50: Break

10.20: [3.1.3S] **J. de Kraker** (Agricultural University, Wageningen, The Netherlands)
Exploring crop protection options from a farm and regional perspective: from end-of-pipe solutions to systems management

10.40: [3.1.4S] **Rebecca Nelson** (International Potato Center, Peru)
Improving farmers' disease management decisions through participatory research and training

11.00: [3.1.5S] **R. Sylvester-Bradley** (ADAS, Boxworth, UK)
Towards an absolute basis for assessment and prediction of foliar disease

11.20:	Discussion led by: **E. Bouma** (PAGV, The Netherlands)
12.00:	Lunch

Time: 08.30-12.00 **Venue: Stakis Edinburgh Grosvenor, Grosvenor Suite**

3.7 DISEASES OF WOODY PLANTS: BIOLOGY, MANAGEMENT AND CONTROL

Organiser & Chair: **J.N. Gibbs** (Forestry Commission, UK)

08.30: [3.7.1S]	*Keynote*: **J.N. Gibbs** Understanding and controlling diseases of woody plants: an historical perspective
08.50: [3.7.2S]	**K.B. Johnson** (Oregon State University, USA) Eastern Filbert Blight: living with an introduced pathogen on an introduced host
09.10: [3.7.3S]	**M. Holderness** (CABI Bioscience, UK) *Ganoderma* diseases of perennial crops
09.30: [3.7.4S]	**M.J. Wingfield** (University of Pretoria, South Africa) *Cryphonectria* canker of *Eucalyptus*
09.50:	Break
10.20: [3.7.5S]	**C. Gessler** (ETH, Zurich, Switzerland) Apple and scab: gene employment strategy for the two partners in nature - implications for control
10.40: [3.7.6S]	**K. Suzuki** (University of Tokyo, Japan) The pine wilt disease and its control in Japan
11.00: [3.7.7S]	**B.J. Van Der Kamp** (University of British Columbia, Canada) *Armillaria* and its control in British Columbia
11.20:	Discussion led by: **E. M. Hansen** (Oregon State University, USA)
12.00:	Lunch

Time: 08.30-12.00 **Venue: EICC, Tinto & Moorfoot**

4.1 BIODIVERSITY AND CONSERVATION OF ECONOMIC PLANTS FOR DISEASE RESISTANCE

Organiser & Chair: **J.M. Lenne** (Milnthorpe, Cumbria, UK)

08.30: [4.1.1S]	*Keynote:* **J.M. Lenne** Biodiversity and conservation of crop plants for disease resistance
09.10: [4.1.2S]	*Keynote:* **J.J. Burdon** (CSIRO, Canberra, Australia) Biodiversity and the conservation of wild relatives of crops for disease resistance
09.50:	Break
10.20: [4.1.3S]	**J.D. Taylor** (Horticulture Research International, UK) Biodiversity for disease resistance, and potential for *in situ* conservation of *Phaseolus vulgaris* landrace mixtures in the southern highlands of Tanzania
10.40: [4.1.4S]	**G.S. Gilbert** (University of California, Berekeley, USA) Importance of tree diseases to the biodiversity and conservation of forest ecosystems

11.00: [4.1.5S]	**Marlene Diekmann** (IPGRI, Aleppo, Syria) The role of germplasm health in the biodiversity conservation of economic plants
11.20:	Discussion led by: **R. Williams** (CAB International, UK)
12.00:	Lunch

Time: 08.30-12.00 **Venue: EICC, Kilsyth**

4.8 SEED HEALTH: IMPLICATIONS IN PLANT PROTECTION AND INTERNATIONAL MOVEMENT OF SEEDS

Organiser & Chair:	**D.C. McGee** (Iowa State University, USA)
08.30: [4.8.1S]	*Keynote:* **D.C. McGee** Challenges to plant pathology research in a changing global seed health system
09.10: [4.8.2S]	*Keynote:* **J. Sheppard** (Food Inspection Agency, Ottawa, Canada) Industry/government initiatives to improve national and international seed health systems
09.30: [4.8.3S]	*Keynote:* **H.S. Shetty** (University of Mysore, India) The future role of seed health in plant protection in developing countries
09.50:	Break
10.20: [4.8.4S]	**H.J. Hansen** (Danish Institute for Seed Pathology, Denmark) Seed-borne disease databases: necessary tools for definition of phytosanitary regulations
10.40: [4.8.5S]	**J. C. Reeves** (National Institute of Agricultural Botany, UK) The impact of DNA and immunological diagnostic technologies on the management of seedborne diseases
11.00: [4.8.6S]	**R.A.C. Jones** (W. Australia Dept. of Agriculture, Australia) Seed transmission of plant pathogens: critical knowledge in establishing risks of pathogen introductions
11.20:	Discussion led by: **H.J. Dubin** (CIMMYT, Colonia Juarez, Mexico)
12.00:	Lunch

Poster Sessions - Morning

Time: 08.30-12.30 **Venue: Sheraton Grand Hotel & Marquee**

Poster Session: 1. Genetically modified resistance and breeding

Topics included: 3.4, 5.3, 5.4

Poster Session: 2. Biological Control

Topics included: 2.7, 2.10, 3.5, 5.2

Poster Session: 3. Plant-nematode interactions

Topics included: 1.14

Poster Session: 4. Climate, sustainability and environment

Topics included: 4.2, 4.5

Symposia - Afternoon

Time: 14.00-17.30 **Venue: EICC, Tinto & Moorfoot**

2.2 POPULATION GENETICS: STRUCTURE AND DYNAMICS

Organiser & Chair: **Linda M. Kohn** (University of Toronto, Canada)

14.00: [2.2.1S] *Keynote*: **Linda M. Kohn**
How pathogen populations change: understanding the evidence

14.20: [2.2.2S] **J.B. Anderson** (University of Toronto, Canada)
Mutation and mitotic recombination in fungal plant pathogens

14.40: [2.2.3S] *Keynote:* **B.A. McDonald** (Texas A & M University, USA)
Immigration, selection and recombination in agricultural plant pathosystems

15.20: Break

15.50: [2.2.4S] **C. Damgaard** (NERI, Silkeborg, Denmark)
Fixation probabilities of resistance alleles in mixed mating host populations

16.10: [2.2.5S] **M.G. Milgroom** (Cornell University, Ithaca, USA)
Evolution of dsRNA viruses in fungal plant pathogen populations

16.30: [2.2.6S] **A. Drenth** (University of Queensland, Australia)
Elucidating the population structure of introduced plant pathogens

16.50: [2.2.7S] **Georgiana May** (University of Minnesota, USA)
The future is in the past: the impact of evolutionary history on current population dynamics in the *Ustilago maydis*/*Zea mays* pathosystem

17.10: Discussion led by: **Georgiana May**

17.30: Close

Time: 14.00-17.30 **Venue: Stakis Edinburgh Grosvenor, Grosvenor Suite**

2.4 DISPERSAL, MOVEMENT AND SPATIAL PROCESSES

Organiser & Chair: **K.B. Johnson** (Oregon State University, USA)

14.00: [2.4.1S] *Keynote*: **K.B. Johnson**
Significance of honeybees as vectors of biocontrol agents of floral plant pathogens

14.40: [2.4.2S] **J.B. Ristaino** (N. Carolina State University, USA)
Stopping epidemics in their tracks: The *Phytophthora* blight in bell pepper story

15.20: Break

15.50: [2.4.3S] **S. Savary** (International Rice Research Institute, The Philippines)
Effects of some environmental factors on rice sheath blight epidemiology

16.10: [2.4.4S] **G. Hughes** (University of Edinburgh, UK)
The spatio-temporal dynamics of Citrus Tristeza Virus disease spread

16.30: [2.4.5S] **M.W. Shaw** (University of Reading, UK)
The relation between the dispersal of pathogens and the spatial pattern of disease

16.50: Discussion led by: **G. Hughes**

17.30: Close

Time: 14.00-17.30 **Venue: Caledonian Hotel, Castle Suite**

3.2 THE TECHNOLOGICAL BASIS OF DISEASE CONTROL DECISION SUPPORT

Organiser & Chair: **P. Verrier** (IACR-Rothamsted, UK)

14.00: [3.2.1S] *Keynote:* **P. Verrier**
The making of a decision-support system

14.40: [3.2.2S] *Keynote:* **D.J. Parsons** (Silsoe Research Institute, UK)
A review of analytical techniques for decision support

15.20: Break

15.50: [3.2.3S] **N. Holst** (Danish Institute of Agricultural Science, Flakenberg, Denmark)
How to produce robust and flexible models using patterns of object-oriented design

16.10: [3.2.4S] **M.A. Semenov** (IACR-Long Ashton Research Station, UK)
Making the weather

16.30: [3.2.5S] **D. Morgan** (Central Science Laboratory, Sand Hutton, UK)
A spatio-temporal model and decision-support system for barley yellow dwarf virus

16.50: [3.2.6S] **Caroline Parker** (HUSAT, UK)
From user requirements to user interfaces: a practical approach

17.10: Discussion led by: **J.M.B. Secher** (Hardi International, Denmark)

17.30: Close

Time: 14.00-17.30 **Venue: EICC, Kilsyth**

4.7 PLANT DISEASE AND THE RESOURCE-POOR FARMER

Organiser & Chair: **J. M. Waller** (International Mycological Institute, UK)

14.00: [4.7.1S] *Keynote:* **J.M. Waller**
The agro-ecological perspective of resource-poor farming

14.40: [4.7.2S] *Keynote:* **P. Kenmore** (FAO, Rome Italy)
Biological options for pest control by resource-poor farmers

15.20: Break

15.50: [4.7.3S] **S.H. Shomari** (Naliendele, Tanzania)
Integrated cashew management in southern Tanzania: a new approach for research technology transfer to cashew farmers

16.10: [4.7.4S]	**R. Plowright** (CABI, UK) The farmer field school approach to the improvement of disease management by resource-poor farmers in tropical Asia
16.30: [4.7.5S]	**Ulrike Krauss** (CABI, Peru) Diseases of cocoa (*Erythroxylum coca*) and the role of extensionists in the Huallaga Valley of Peru
16.50: [4.7.6S]	**Hilary Warburton** (NRI, UK) Plant virus diseases: farmers' perceptions and coping strategies
17.10:	Discussion led by: **L. Mughogho** (ICRISAT Centre, Bulawayo, Zimbabwe)
17.30:	Close

Time: 14.00-17.30 **Venue: EICC, Pentland Suite**

5.3 GENETICALLY-ENGINEERED DISEASE RESISTANCE: 1. FOREIGN GENES

Organiser & Chair:	**T. Michael A. Wilson** (Scottish Crop Research Institute, UK)
14.00: [5.3.1S]	*Keynote:* **R.I. Hamilton** (British Colombia, Canada) An overview of pathogen-derived resistance
14.40: [5.3.2S]	**D. Gonsalves** (Cornell University, Ithaca, USA) Practical use of pathogen-derived resistance to control virus diseases: from cucurbits to papaya
15.00: [5.3.3S]	**D.J. Stahl** (Planta, Germany) Increased fungal resistance of transgenic plants by heterologous expression of bacteriophage T4 lysozyme gene
15.20:	Break
15.50: [5.3.4S]	**Angharad M.R. Gatehouse** (University of Durham, UK) Use of endogenous plant genes to engineer crops for resistance to insect pests
16.10: [5.3.5S]	**A. Mitra** (University of Nebraska, USA) A mammalian 2-5A system functions as an antiviral pathway in transgenic plants
16.30: [5.3.6S]	**H.J. Atkinson** (University of Leeds, UK) Genetically engineered resistance to nematodes
16.50: [5.3.7S]	**N. Tumer** (Rutgers University, USA) Broad-spectrum resistance to viral and fungal infection by expression of pokeweed antiviral protein
17.10:	Discussion led by: **J. Bol** (Leiden University, The Netherlands)
17.30:	Close

Poster Sessions - Afternoon

Time: 14.00-17.30 **Venue: Sheraton Grand Hotel & Marquee**

Poster Session: 5. Cell Biology and signalling

Topics included: 1.1, 1.2, 1.3, 1.4

Poster Session: 6. Diseases of woody plants

Topics included: 3.7

Additional Meetings for Invited Delegates

Time: 09.00-11.00 **Venue: EICC, Harris 1**
ISPP Special Interest Committee - Post-Harvest Disease
(Jerry Bartz)

Time: 09.00-11.00 **Venue: EICC, Harris 2**
ISPP Special Interest Committee - Rhizoctonia
(Baruch Sneh)

Time: 12.30-14.00 **Venue: EICC, Harris 1 & 2**
ISPP Executive Council & Special Interest Committee Chairs

Time: 16.00-18.00 **Venue: EICC, Harris 1**
ISPP Special Interest Committee - Epidemiology
(Roy Gaunt)

Time: 16.00-18.00 **Venue: EICC, Harris 2**
ISPP Special Interest Committee Meeting - Biological Control
(William Bruckart)

Time: 18.30-20.45 **Venue: Caledonian Hotel, Tummel & Rannoch Rooms**
Plant Pathology Editorial Board

Time: 18.30-20.45 **Venue: Sheraton, Glenkinchie**
GCTE (Harald Scherm)

Time: 19.30-21.00 **Venue: EICC, Kilsyth**
Chinese Society of Plant Pathology

Open Meeting for Delegates

Time: 18.30-20.45 **Venue: EICC, Moorfoot**
AAB Launch of Plant Virus Notebook

Evening Meetings

The following meetings will commence at 18.30 hours and finish at 20.45 hours. Please see page 51 for details.

Time: 18.30-20.45 **Venue: EICC, Tinto**
Bill Bruckart (USA; Chairman, ISPP Biological Control Committee) &
Simon Shamoun (Canada)
E7 - Beneficial Use of Plant Pathogens: Biological Control of Weeds

Time: 18.30-20.45 **Venue: Shaeraton Grand Hotel, Talisker**
George Lacy (USA)
E14 - Xanthomonads: Progress in Molecular Taxonomy

Time: 18.30-20.45	**Venue: EICC, Harris 1** **Tim O'Neill** (UK) E17 - Recent Developments in the Control of *Botrytis cinerea* in Horticultural Crops
Time: 18.30-20.45	**Venue: Sheraton Grand Hotel, Dalwhinnie** **Chrys Akem** E25 - Variability in *Ascochyta* Blights
Time: 18.30-20.45	**Venue: EICC, Sidlaw** **Nyckle J. Fokkema** (The Netherlands) E27 - Implementation of Biological Control of Plant Diseases
Time: 18.30-20.45	**Venue: EICC, Fintry** **Anupam Varma** (India) E28 - Impact of Sanitation and Phytosanitary Regulations
Time: 18.30-20.45	**Venue: EICC, Harris 2** **Simon Gowen** (UK) E31 - Will Microbial Agents in Integrated Control Strategies Provide an Alternative to Methyl Bromide for the Management of Nematodes?

Wednesday 12 August 1998

Symposia - Morning

Time: 0830-12.00 **Venue: EICC, Pentland & Sidlaw**

1.3 CELL BIOLOGY OF PLANT-PATHOGEN INTERACTIONS

Organiser & Chair: **Michele C. Heath** (University of Toronto, Canada)

08.30: [1.3.1S] *Keynote*: **Michele C. Heath**
The cell biology of plant-pathogen interactions

09.10: [1.3.2S] **W.R. Bushnell** (University of Minnesota, USA)
Over-expression of host response genes: effects on cellular responses to fungal pathogens

09.30: [1.3.3S] **E. Schmelzer** (Max-Planck Institute, Germany)
Cell biology of plant cell interactions with *Phytophthora* species

09.50: Break

10.20: [1.3.4S] **H. Kunoh** (Mie University, Japan)
Cellular aspects of the interactions of powdery mildew fungi with resistant and susceptible plants

10.40: [1.3.5S] **J.W. Mansfield** (Wye College, University of London, UK)
Interactions between plant cells and bacteria: evidence for suppression of localized resistance reactions

11.00: [1.3.6S] **S. Santa Cruz** (Scottish Crop Research Institute, UK)
Cell biology of Potato Virus X infection

11.20 [1.3.7S] **D Gilchrist** (University of California, Davis, USA)
Programmed cell death in plant-pathogen interactions

11.40: Discussion led by: **W.R. Bushnell**

12.00 Lunch

Time: 08.30-12.00 **Venue: Caledonian Hotel, Tummel & Rannoch**

1.14 PLANT NEMATODE INTERACTIONS: CHANGES IN PLANT GENE EXPRESSION AT NEMATODE FEEDING SITES

Organiser & Chair: **G.D.R. Gheysen** (Monsanto, Brussels, Belgium)

08.30: [1.14.1S] *Keynote*: **G.D.R. Gheysen**
Changes in plant gene expression at nematode feeding sites

09.10: [1.14.2S] **R. Hussey** (University of Georgia, USA)
Molecular analysis of nematode secretory proteins

09.30: [1.14.3S] **J. Helder** (Agricultural University, Wageningen, The Netherlands)
Functional analysis of potato cyst nematode secretions

09.50: Break

10.20: [1.14.4S] **Valerie Williamson** (University of California, Davis, USA)
Early changes in gene expression after infection of tomato with root-knot nematodes

10.40: [1.14.5S]	**D. Bird** (North Carolina State University, USA) Molecular and genetic dissection of nematode feeding sites
11.00: [1.14.6S]	**C. Opperman** (North Carolina State University, USA) Genetic analysis of *Heterodera glycines* parasitism
11.20: [1.14.7S]	**Carmen Fenoll** (Universidad Autonoma de Madrid, Spain) Transcriptional regulation and promoter elements in nematode feeding sites
11.40:	Discussion led by: **Carmen Fenoll**
12.00:	Lunch

Time: 08.30-12.00 **Venue: EICC, Lomond Suite**

2.3 PLANT - PATHOGEN INTERACTIONS IN NATIVE VEGETATION

Organiser & Chair:	**J.J. Burdon** (CSIRO, Canberra, Australia)
08.30: [2.3.1S]	*Keynote:* **J.J. Burdon** Patterns in the evolutionary dynamics of host-pathogen interactions
09.10: [2.3.2S]	**E. Hansen** (Oregon State University, USA) *Phellinus weirii*: conifer interactions in western North America
09.30: [2.3.3S]	**J. Stenlid** (Swedish University of Agricultural Sciences, Sweden) *Heterobasidion annosum* in Scandinavian forests
09.50:	Break
10.20: [2.3.4S]	**W. Van der Putten** (Netherlands Institute of Ecology) Nematode and soil fungi contribution to vegetation succession in coastal sand dunes
10.40: [2.3.5S]	**K. Clay** (Indiana University, USA) Effect of endophyte infection on grassland communities
11.00: [2.3.6S]	**Ulla Carlsson-Graner** (Unea University, Sweden) Change and selection in *Silene*:anther smut associations
11.20: [2.3.7S]	**D. Appel** (Texas A&M University, USA) Population biology of the oak wilt pathosystem in Texas
11.40:	Discussion led by: **J.J. Burdon**
12.00:	Lunch

Time: 08.30-12.00 **Venue: Caledonian Hotel, Castle Suite**

3.8 ECOLOGY, BIOLOGY AND CONTROL OF DISEASES IN SOILLESS CULTURE

Organiser & Chair:	**G.M. McPherson** (Horticulture Research International, UK)
08.30: [3.8.1S]	*Keynote:* **G.M. McPherson** Root diseases in hydroponics: their control by disinfection and evidence for suppression in closed systems
09.10: [3.8.2S]	*Keynote:* **M.E. Stanghellini** (University of California, Riverside, USA) Epidemiology of zoosporic pathogens in hydroponic systems: the role of biosurfactants in disease suppression
09.50:	Break

10.20: [3.8.3S] **T.C. Paulitz** (McGill University, Canada)
Evidence for induced systemic resistance as a mechanism for disease suppression in hydroponic systems

10.40: [3.8.4S] **P.H.M. Bakker** (Utrecht University, The Netherlands)
The potential role of siderophores in disease suppression in closed hydroponic systems

11.00: [3.8.5S] **J.M. Raaijmakers** (Agricultural University, Wageningen, The Netherlands)
Antibiotic production by rhizosphere bacteria and their potential role in closed hydroponic systems

11.20: [3.8.6S] **W. Wohanka** (Forschungsanstalt, Geisenheim, Germany)
The role of slow filtration for disease control in closed hydroponic systems

11.40: Discussion led by: **J.M. Deacon** (University of Edinburgh, UK)

12.00: Lunch

Time: 08.30-12.00 **Venue: Stakis Edinburgh Grosvenor, Grosvenor Suite**

4.2 CLIMATE CHANGE: POTENTIAL SCENARIOS FOR PLANT DISEASES AND AIR POLLUTANTS

Organiser & Chair: **S. Chakraborty** (University of Queensland, Australia)

08.30: [4.2.1S] *Keynote*: **S. Chakraborty**
Climate change and air pollution: potential impact on plant diseases

09.10: [4.2.2S] **H. Sandermann** (Institut f. Biochemische, Oberschleissheim, Germany)
Ozone and biotic disease interactions

09.30: [4.2.3S] **H. Scherm** (University of Georgia, USA)
Working on a global scale for global change impact assessment in plant pathology

09.50: Break

10.20: [4.2.4S] **P.S. Teng** (IRRI, The Phillippines)
Integrating disease models with crop and ecosystem models to assess the effects of climate and land-use changes on plant pathosystems

10.40: [4.2.5S] **R.C. Seem** (Cornell University, Geneva, USA)
Weather forecasts at the whole-plant level: implications for estimating disease risk with global climate models

11.00: [4.2.6S] **N.D. Paul** (University of Lancaster, UK)
Stratospheric ozone depletion, UV-B radiation and *Septoria tritici* infection of wheat

11.20: [4.2.7S] **A.V. Tiedemann** (University of Rostock, Germany)
Host-pathogen system in a changing atmosphere: case studies with fungal pathogens of wheat

11.40: Discussion led by: **R.C. Seem**

12.00: Lunch

Time: 08.30-12.00 **Venue: EICC, Fintry**

5.1 (Part 1) PREVENTING AND CONTROLLING DISEASE IN SYSTEMS INVOLVING LOW EXTERNAL COSTS

Organiser & Chair:	**M.S. Wolfe** (Fressingfield, UK)
08.30: [5.1.1S]	*Keynote:* **M.S. Wolfe** Sustainable, low cost disease prevention and control: the challenge for agriculture and society
09.10: [5.1.2S]	*Keynote:* **D.T. Thurston** (Cornell University, Ithaca, USA) An overview of methods used by traditional farmers in different environments to restrict plant disease without reliance on external or synthetic inputs
09.50:	Break
10.20: [5.1.3S]	**Martha E. Rosemeyer** (Universities of Costa Rica and Wisconsin) The development of mulch-based agriculture as a multi- functional practice to include restraint of unwanted organisms
10.40: [5.1.4S]	**H.A.J. Hoitink** (Ohio State University, USA) Opportunities for control of plant diseases with composts
11.00: [5.1.5S]	**R.A. Sikora** (Institut fur Planzenkrankheit, Bonn, Germany) Biological system management: strengthening the antagonistic potential in soil ecosystems for the control of complex disease syndromes caused by pathogens and nematodes
11.20: [5.1.6S]	**Ariena Van Bruggen** (University of California, Davis, USA) Root diseases caused by fungi and nematodes in conventional and alternative farming systems
11.40:	Discussion led by: **C.C. Mundt** (Oregon State University, USA)
12.00:	Lunch

Poster Session - Morning

Time: 08.30-12.30 **Venue: Sheraton Grand Hotel & Marquee**

Poster Session: 7. Biology and epidemiology

Topics included: 2.1, 2.4, 2.5, 2.6, 2.8, 2.9

Poster Session:8. Miscellaneous

Topic included: 6

Symposia - Afternoon

Time: 14.00-17.30 **Venue: Stakis Edinburgh Grosvenor, Grosvenor Suite**

1.5 GENE REGULATION IN PLANT PATHOGENIC BACTERIA

Organiser & Chair: **G. P. Salmond** (University of Cambridge, UK)

14.00: [1.5.1S] *Keynote:* **G.P. Salmond**
Gene regulation systems in bacterial pathogens

14.40: [1.5.2S] *Keynote:* **S.C. Winans** (Cornell University, Ithaca, USA)
Host-responsive gene expression by *Agrobacterium tumefaciens*

15.20 Break

15.50: [1.5.3S] **M. Schell** (University of Georgia, USA)
What's going on out there? Environmental sensing and control of virulence genes in *Ralstonia solanacearum*

16.10: [1.5.4S] **H-W Nasser** (CNRS, UMR, Villeurbanne France)
Complex regulatory network directing the synthesis of pectinases, the main virulence factors of *Erwinia chrysanthemi*

16.30: [1.5.5S] **S. Hutcheson** (University of Maryland, USA)
Characterization of the HRP regulon of *Pseudomonas syringae*

16.50: [1.5.6S] **A.K. Chatterjee** (University of Missouri, USA)
Transcriptional and post-transcriptional regulation of secreted proteins in *Erwinia carotovora* subsp. *carotovora*

17.10: Discussion led by: **A.K. Chatterjee**

17.30: Close

Time: 14.00-17.30 **Venue: EICC, Pentland**

1.8 MOLECULAR BIOLOGY OF FUNGAL PATHOGENICITY

Organiser & Chair: **Anne Osbourn** (Sainsbury Laboratory, Norwich, UK)

14.00: [1.8.1S] *Keynote:* **Anne Osbourn**
Molecular biology of fungal pathogenicity

14.20: [1.8.2S] **Sarah J. Gurr** (University of Oxford, UK)
The differentiation and development of infection structures in *Erysiphe graminis*

14.40: [1.8.4S] *Keynote:* **N.J. Talbot** (University of Exeter, UK)
Identification and characterization of pathogenicity genes from the rice blast fungus, *Magnaporthe grisea*

15.20: Break

15.50: [1.8.3S]	**B. Tyler** (University of California, Davis, USA) Construction and DNA-sequencing of a BAC contig spanning the *Phytophthora* genome
16.10: [1.8.5S]	**M.J. Daboussi** (Universite Paris-sud, France) *Fusarium oxysporum* transposons as tools for the isolation of fungal genes
16.30: [1.8.6S]	**J. Manners** (CSIRO, St Lucia, Australia) Disruption of the essential pathogenicity gene *CgDN3* of *Colletotrichum gloeosporiodes* results in a hypersensitive response in the host, *Stylosanthes guianensis*
16.50: [1.8.7S]	**Christine Struck** (University of Konstanz, Germany) Molecular and functional characterization of the haustorial H^+-ATPase of the biotrophic rust fungus *Uromyces fabae*
17.10:	Discussion led by: **N.J. Talbot**
17.30:	Close

Time: 14.00-17.30 **Venue: EICC, Sidlaw**

1.11 VIRAL PATHOGENICITY

Organiser & Chair:	**A.J. Maule** (John Innes Centre, Norwich, UK)
14.00: [1.11.1S]	*Keynote*: **A.J. Maule** Molecular responses of compatible hosts to virus infection
14.40: [1.11.2S]	*Keynote:* **K. Davis** (Ohio State University, USA) Molecular genetic studies of symptom development in *Arabidopsis* - geminivirus interactions
15.20:	Break
15.50: [1.11.3S]	**Margaret I. Boulton** (John Innes Centre, Norwich, UK) The molecular basis of maize streak virus pathogenicity
16.10: [1.11.4S]	**S.N. Covey** (John Innes Centre, Norwich, UK) Programmatic features of plant pararetroviral pathogenesis
16.30: [1.11.5S]	**S. Wolf** (The Hebrew University of Jerusalem, Rehovot, Israel) Cell-to-cell communication in the control over phloem transport: insight gained from viral movement proteins
16.50: [1.11.6S]	**Karin Herbers** (Institut f. Pflanzogenetik und Kulturpflanzenforschung, Gatersleben, Germany) Sugar-mediated resistance in transgenic plants
17.10:	Discussion led by: **J. Milner** (Glasgow University)
17.30:	Close

Time: 14.00-17.30 **Venue: Caledonian Hotel, Castle Suite**

2.5 THE EXTERNAL ENVIRONMENT AND PLANT-PATHOGEN INTERACTIONS

Organiser and Chair:	**D.R. Butler** (University of West Indies, Trinidad)
14.00: [2.5.1S]	*Keynote*: **D.R. Butler** Daily weather and plant diseases

14.40: [2.5.2S] **H.A. McCartney** (IACR-Rothamsted, UK)
The effect of environment on pathogen dispersal

15.00: [2.5.3S] **R. Bandyopadhyay** (ICRISAT, India)
The effect of environment on pathogen survival

15.20: Break

15.50: [2.5.4S] **P. Delfosse** (ICRISAT, India)
Virus diseases affected by environment: Indian peanut clump virus, a case study

16.10: [2.5.5S] **M.J. Jeger** (Agricultural University, Wageningen, The Netherlands)
Soil water potential effects on fungal pathogens and root diseases

16.30: [2.5.6S] **D.J. Bailey** (University of Cambridge, UK)
The role of soil physical conditions on pathozone dynamics and disease progress

16.50: Discussion led by: **L. Huber** (INRA, France), and **B.D.L. Fitt** (IACR-Rothamsted, UK)

17.30: Close

Time: 14.00-17.30 **Venue: EICC, Tinto & Moorfoot**

4.4 DISEASES WHICH DISRUPT NATURAL ECOSYSTEMS

Organiser & Chair: **Inez C. Tommerup**, (CSIRO, Perth, Australia)

14.00: [4.4.1S] **Inez C. Tommerup**
Phytophthora: an introduced hazard in forests, woodlands and woody heaths

14.20: [4.4.2S] **Margery Daughtrey** (Cornell University, Riverhead, USA)
Dogwood anthracnose: the serious impact of a disease on native trees of great ornamental value

14.40: [4.4.3S] **T.R. Gordon** (University of California, Davis, USA)
The potential for pitch canker to wreak havoc by altering ecological relationships in native ecosystems

15.00: [4.4.4S] **L. Ericson** (Umea University, Sweden)
Change in spatial distribution of selection pressures in the *Urtica-Carex-Puccinia caricis* interaction

15.20: Break

15.50: [4.4.5S] **B.B. Kinloch Jr.** (Institute of Forest Genetics, Berkeley, USA)
Genetic interactions of white pines and blister rust in western North America

16.10: [4.4.6S] **C.M. Brasier** (Forestry Commission, UK)
New genetics and new biocontrols for Dutch Elm disease and Chestnut blight

16.30: [4.4.7S] **K.M. Old** (CSIRO, Canberra, Australia)
Forest diseases, quarantine and the global village

16.50: Discussion led by: **C.M. Brasier**

17.30: Close

Time: 14.00-17.30 **Venue: EICC, Fintry**

5.1 (Part 2) PREVENTING AND CONTROLLING DISEASE IN SYSTEMS INVOLVING LOW EXTERNAL COSTS

Organiser & Chair: **M.S. Wolfe** (Fressingfield, UK)

14.00: [5.1.8S] *Keynote*: **R.A. Crowder** (Lincoln University, New Zealand)
Pest, disease and weed restraint in organic agriculture: is this the way forward?

14.40: [5.1.9S] **V.W.L Jordan** (IACR-Long Ashton, UK)
Integrated production: its importance and application for disease control

15.00: [5.1.10S] **G.A.Forbes** (International Potato Center, Quito, Ecuador)
Potato blight: a world problem

15.20: Break

15.50: [5.1.11S] **C. Akem** (ICARDA, Aleppo, Syria)
Using genetic diversity for disease resistance

16.10: [5.1.12S] **H.J.Dubin** (CIMMYT, Mexico)
Genetic and management tools for sustainable disease control in wheat cropping systems

16.30: [5.1.13S] **Maria Finckh** (ETH-Zurich, Switzerland)
Management of disease resistance at field, farm and regional levels

16.50: Discussion led by: **C.C. Mundt** (Oregon State University, USA)

17.30: Close

Additional Meetings for Invited Delegates

Time: 12.30-14.00 **Venue: EICC, Harris 1 & 2**
ISPP Executive Council

Time: 15.00-18.00 **Venue: Sheraton Hotel, Dalwhinnie**
ISM-MPI Board of Directors

Evening Meetings

The following evening meetings will take place on Wednesday 12 August 1998 commencing at 18.30 hours and finishing at 20.45 hours. Please see page 51 for further details.

Time: 18.30-20.45 **Venue: EICC, Fintry**
Gail Schumann (USA)
E4 -The Future of Plant Pathology Teaching Programs: Promise or

Time: 18.30-20.45 **Venue: EICC, Sidlaw**
Mark Holderness (UK) & **Tom Mew** (Philippines; Chairman, ISPP Seed Pathology Committee)
E6 - Lessons from Karnal Bunt for the Global Movement of Seed Peril?

Time: 18.30-20.45 **Venue: EICC, Harris 1**
Baruch Sneh (Israel; Chairman, ISPP Committee on Rhizoctonia)
E11 - Rhizoctonia 2

Time: 18.30-20.45 **Venue: EICC, Pentland**
CIP, Peru
E13 - GILB: Global Initiative on Late Blight

Time: 18.30-20.45 **Venue: EICC, Tinto**
Aled Dik & Albert Kerssies (The Netherlands) EICC, Tinto
E18 - Biology and Control of Powdery Mildews in Protected Crops

Time: 18.30-20.45 **Venue: EICC, Moorfoot**
Michele Perombelon (UK)
E21 - Soft Rot Erwinias

Time: 18.30-20.45 **Venue: EICC, Kilsyth**
Don J MacLean (Australia)
E24 - Pathogen Detection by Real-Time Fluorescence PCR

Time: 18.30-20.45 **Venue: EICC, Harris 2**
Luclana Corazze (Italy)
E26 - Monilinia of Stone and Pome Fruits

Time: 18.30-20.45 **Venue: Sheraton Hotel, Glenkinchie**
M J Wingfield (South Africa; Chairman, ISPP Committee on Forest Pathology)
E34 - Forest Pathology

Time: 18.30-20.45 **Venue: Sheraton Hotel, Talisker**
G Dixon (UK)
E33 - International Club Root Working Group

Time: 18.30-20.45 **Venue: Sheraton Hotel, Dalwhinnie**
Norm Schaad & Anne Vidaver (USA)
E32 - Use of Electronic Communication for Reporting New and Emerging Pathogens

Thursday 13 August 1998

Symposia - Morning

Time: 08.30-12.00 **Venue: EICC, Pentland & Sidlaw**

1.4 INTERCELLULAR SIGNALS AND SYSTEMIC ACQUIRED RESISTANCE

Organiser & Chair: **J.A. Ryals** (Paradigm Genetics Inc., USA)

08.30: [1.4.1S] *Keynote:* **J.A. Ryals**
Systemic acquired resistance signal transduction

09.10: [1.4.2S] *Keynote:* **J.-P. Metraux** (Universite de Fribourg, Switzerland)
Salicylic acid induction-deficient mutants in *Arabidopsis*

09.50: Break

10.20: [1.4.3S] **D. Klessig** (Rutgers University, New Jersey, USA)
Salicylic acid-mediated signal transduction in disease resistance

10.40: [1.4.4S] **I. Raskin** (Rutgers University, New Jersey, USA)
Biological role of precursors and metabolites of salicylic acid

11.00: [1.4.5S] **T.P. Delaney** (Cornell University, Ithaca, USA)
Genetic dissection of systemic acquired resistance and other forms of induced resistance

11.20: [1.4.6S] **Jennifer Smith-Becker** (University of California, Riverside, USA)
Tracing the path of the mobile signal of systemic acquired resistance in cucumber

11.40: Discussion led by: **J.-P. Metraux**

12.00: Lunch

Time: 08.30-12.00 **Venue: Stakis Edinburgh Grosvenor, Grosvenor Suite**

2.1 USES OF MODELS IN PLANT EPIDEMIOLOGY

Organiser & Chair: **M.W. Shaw** (University of Reading, UK)

8.30: [2.1.1S] *Keynote*: **M.W. Shaw**
The uses of models in epidemiology

9.10: [2.1.2S] **S. Gubbins** (University of Cambridge, UK)
Biological control of plant pathogens:population dynamics within and between seasons

9.30: [2.1.3S] **Annemarie Pielaat** (Agricultural University, Wageningen, The Netherlands)
Modelling splash dispersal of plant pathogens within a crop

9.50: Break

10.20 [2.1.4S] **J. Holt** (Natural Resources Institute, UK)
Multi-field models of rice tungro virus disease dynamics

10.40 [2.1.5S] **Hanne Ostergard** (Rosskilde, Denmark)
Use of multilocus selection models in barley powdery mildew for evaluating strategies of disease management

11.00	[2.1.6S]	**L.W. Timmer** (University of Florida, USA) Forecasting outbreaks of postbloom fruit drop of citrus caused by *Colletotrichum acutatum.*
11.20		Discussion led by: **L.W. Madden** (Ohio State University, USA)
12.00		Lunch

Time: 08.30-12.00 **Venue: Caledonian Hotel, Castle Suite**

2.9 ENDOPHYTISM IN PLANT PATHOLOGY

Organiser & Chair:	**O. Petrini (**Pharmaton S.A., Switzerland)
08.30: {2.9.1S]	**The British Mycological Society Lecture: O. Petrini** What are endophytes anyway?
09.10: [2.9.2S]	*Keynote:* **Lynn Boddy** (University of Wales, UK) and **I. Chapela** (University of California, Berkeley, USA) Endophytes: friends or foes?
09.50:	Break
10.20: [2.9.3S]	**G.C.M. Latch** (DSIR Plant Pathology, New Zealand) Grass endophytes as a model
10.40: [2.9.4S]	**C. Chanway** (University of British Columbia, Canada) Bacterial endophytes: ecological and practical implications
11.00: [2.9.5S]	**A. Vannini** (University of Tuscia, Italy) Endophytes and oak decline in Southern Europe: the role of *Hypoxylon mediterraneum*
11.20:	Discussion led by: **D. Lonsdale** (Forestry Commission, UK)
12.00:	Lunch

Time: 08.30-12.00 **Venue: EICC, Lomond Suite**

3.4 CONVENTIONAL AND ENHANCED BREEDING STRATEGIES FOR RESISTANCE TO PATHOGENS

Organiser & Chair:	**R. W. Michelmore** (University of California, Davis, USA)
08.30: [3.4.1S]	*Keynote:* **R.W. Michelmore** Genomic organization of resistance genes and exploiting germplasm resources
09.10: [3.4.2S]	**P.M. Hayes** (Oregon State University, USA) Durable stripe rust resistance in barley: oligogenic and polygenic resistance
09.30: [3.4.3S]	**E. Lagudah** (CSIRO, Canberra, Australia) Cyst nematode resistance genes in wheat
09.50:	Break
10.20: [3.4.4S]	**D. Pink** (Horticulture Research International, UK) Application of double haploid technology and DNA markers in breeding for clubroot resistance in *Brassica oleracea*
10.40: [3.4.5S]	**Molly Kyle Jahn** (Cornell University, Ithaca, USA) Strategies, tools and progress to date in breeding pepper and tomato for broad spectrum disease resistance

11.00: [3.4.6S]	**Dina A. St. Clair** (University of California, Davis, USA) Introgression of late blight and blackmold resistance genes in tomato
11.20: [3.4.7S]	**D. Baldwin** (Pioneer Hi-Bred International Inc., Iowa, USA) RNA transcript profiling for detecting early maize responses to a fungal pathogen and its toxin
11.40:	Discussion led by: **I.R. Crute** (Horticulture Research International, UK)
12.00:	Lunch

Time: 08.30-12.00 **Venue: EICC, Fintry**

4.3 INFORMATION TECHNOLOGY FOR PLANT PATHOLOGY

Organisers:	**P. R. Scott** (CAB International, UK) and **T. Stewart** (Massey University, New Zealand)
Chair:	**P.R. Scott**
08.30: [4.3.3S]	**T. Stewart** (Massey University, New Zealand) Information technology for plant pathologists: global communication, collaboration and training
08.50: [4.3.4S]	**S.S. M'Boob** (FAO, Dar es Salaam, Tanzania) The impact of information technology for crop protection in developing countries
09.10: [4.3.5S]	**Thorsten Kraska** (University of Bonn, Germany) Plant pathology and the Internet: a forward look
09.30: [4.3.6S]	**P.R. Scott** (CABI, UK) How can the new information technology help us gather, manage and disseminate information in plant pathology?
09.50:	Break
10.20: [4.3.1S]	*Keynote:* **Sir Robert May** (UK Office of Science and Technology) The life sciences and the information revolution
11.00: [4.3.2S]	*Keynote:* **P. Cochrane** (British Telecom Laboratories, Ipswich, UK) IT and life sciences: two disciplines undergoing revolution
11.40:	Discussion led by: **P.R.Scott** (CABI,UK)
12.00:	Lunch

Poster Sessions - Morning

Time: 08.30-12.30 **Venue: Sheraton Grand Hotel & Marquee**

Poster Session: 9. Biodiversity and ecology

Topics included: 2.2, 2.3, 4.1, 4.4

Symposia - Afternoon

Time: 14.00-17.30 **Venue: Caledonian Hotel, Castle Suite**

2.8 CROP PHYSIOLOGY, YIELD DETERMINANTS AND EPIDEMIC PROGRESS

Organiser & Chair: **M.J. Jeger** (Agricultural University, Wageningen, The Netherlands)

14.00: [2.8.1S] *Keynote*: **J. Farrar** (University of Wales, Bangor, UK)
Why the plant suffers: fungi, fluxes and the future

14.40: [2.8.2S] **Julie Scholes** (University of Sheffield, UK)
Sources and sinks: the impact of biotrophic fungal pathogens on host physiology and gene expression

15.00: [2.8.3S] **T. Yamada** (Okayama University, Japan)
Role of indoleacetic acid production in pathogens in the plant-microbe interaction

15.20: Break

15.50: [2.8.4S] **R. Rickman** (USDA, ARS, Adams, USA)
Simulation of wheat take-all (*Gaeumannomyces graminis* var. *tritici*) effects on the seasonal development of winter wheat (*Triticum aestivum* L.)

16.10: [2.8.5S] **E. Caswell-Chen** (University of California, Davis, USA)
Nematodes and plant physiology: nutrition, allometry and yield

16.30: [2.8.6S] **Rosie Bryson** (ADAS, Cambridge, UK)
Explaining the variation in yield response to disease control through estimates of radiation interception by crop canopies: an opportunity for remote sensing

16.50: [2.8.7S] **E. Hoffland** (Agricultural University, Wageningen, The Netherlands)
Resource availability, plant growth and disease resistance

17.10: Discussion led by: **R. Sylvester-Bradley** (ADAS, Cambridge, UK)

17.30: Close

Time: 14.00-17.30 **Venue: EICC, Lomond Suite**

3.3 THE STATUS OF MOLECULAR METHODS FOR PATHOGEN DETECTION, DIAGNOSIS AND ESTIMATION AND IN COMMERCIAL DETECTION TECHNOLOGY

Organiser & Chair: **A. Binder** (Novartis Agrobiotechnology, N. Carolina, USA)

14.00: [3.3.1S] *Keynote:* **Sally Miller** (Ohio State University, USA)
Impacts of molecular diagnostic technologies on plant disease management: past, present and future

14.40: [3.3.2S] **D.W. Parry** (Horticulture Research International, UK)
DNA diagnostics in cereals

15.00: [3.3.3S] **A. Drenth** (University of Queensland, Brisbane, Australia)
What are the ingredients of a successful DNA-based test for fungal plant pathogens?

15.20: Break

15.50: [3.3.4S] **J. Beck** (Novartis Crop Protection, N. Carolina, USA)
Novartis crop disease diagnostics

16.10: [3.3.5S]	**K. Davies** (IACR-Rothamsted, UK) Nematode diagnostics: in search of antigenic markers
16.30: [3.3.6S]	**S. De Boer** (Center of Animal and Plant Health, P.E.I., Canada) DNA and immunotechniques in bacteria and viruses
16.50: [3.3.7S]	**D. Howells** (Perkin Ellmer Biosystems, Warrington, UK) TAQMAN, a new technology for high throughput pathogen detection, quantitation and mutation screening
17.10:	Discussion led by: **A. Binder**
17.30:	Close

Time: 14.00-17.30 **Venue: EICC, Fintry**

3.5 MOLECULAR APPROACHES TO BIOLOGICAL CONTROL STRATEGIES

Organiser:	**Genevieve Defago** (ETH, Zurich, Switzerland)
Chair:	**I. Chet** (Hebrew University, Rehovot, Israel)
14.00: [3.5.1S]	*Keynote:* **Genevieve Defago** Molecular approach in biological control: potential and limitations
14.40: [3.5.2S]	**Linda S. Tomashow** (Washington State University, USA) Molecular approaches to improve the efficacy of bacterial biocontrol agents
15.00: [3.5.3S]	**M. Lorito** (University of Naples, Italy) Molecular approaches to improve the efficacy of fungal biocontrol agents
15.20:	Break
15.50: [3.5.4S]	**D. Rigling** (Forest, Snow & Landscape Research, Birmensdorf, Switzerland) Molecular approaches to improve the use of viruses as biocontrol agents of plant pathogenic fungi
16.10: [3.5.5S]	**Joyce Loper** (USDA, Corvallis, USA) Molecular approaches for elucidating the *in situ* activities of biological control agents and the nature of bacterial habitats in the rhizosphere
16.30: [3.5.6S]	**D.F. Jensen** (KVL University, Frederiksberg, Denmark) A molecular approach for studying autecology of fungal BCAs
16.50: [3.5.7S]	**D.C. Naseby** (University of Surrey, UK) Molecular tools to delineate the interactions between bacteria and fungi
17.10:	Discussion led by: **I. Chet**
17.30:	Close

Time: 14.00-17.30 **Venue: Stakis Edinburgh Grosvenor, Grosvenor Suite**

4.9 DISEASE CONTROL: GROWERS, CONSUMERS AND ENVIRONMENTAL PERSPECTIVES

Organiser & Chair:	**R.C. Shattock** (University of Wales, Bangor, UK)
14.00: [4.9.1S]	*Keynote:* **Vivienne Anthony** (Zeneca Agrochemicals, UK) Future changes in disease control: fungicides or biotechnology?
14.40: [4.9.2S]	*Keynote:* **J.R. Witcombe** (University of Wales, Bangor, UK) The impact of transgenic food crops and the environment: some issues for the developing world

15.20:	Break
15.50: [4.9.3S]	**E.C. Oerke** (University of Bonn, Germany) Impact of pests and crop protection on crop production
16.10: [4.9.4S]	**M.R. Thomas** (Central Science Laboratory, UK) A review of changes in fungicide use on winter wheat in England and Wales, 1970-96
16.30: [4.9.5S]	**T.J. Dixon** (Beesons Group Ltd., Norfolk, UK) Meeting potato market requirements
16.50: [4.9.6S]	**J.C. Wise** (National Farmers Union, UK) The UK's 'Assured Produce Scheme'
17.10:	Discussion led by: **M. Askew** (Central Science Laboratory, UK)
17.30:	Close

Time: 14.00-17.30 **Venue: EICC, Pentland & Sidlaw**

5.4 GENETICALLY-ENGINEERED DISEASE RESISTANCE: 2. MODIFIED NATURAL RESISTANCE

Organiser & Chair: **K. Hammond-Kosack** (Monsanto International, Belgium)

14.00: [5.4.1S]	*Keynote:* **K. Hammond-Kosack** Can we use race-specific R-genes to provide broad spectrum pathogen control?
14.40: [5.4.2S]	*Keynote:* **C. Rommens** (Monsanto Co., St Louis, USA) The engineering of plant disease resistance based on an understanding of disease resistance signalling pathways
15.20:	Break
15.50: [5.4.3S]	**M.H. Stuiver** (Zeneca-MOGEN, Leiden, The Netherlands) Infection-induced expression of the avirulence gene *Avr9* in transgenic CF9 tomato plants confers resistance to fungal pathogen attack
16.10: [5.4.4S]	**Xin Li** (Duke University, Durham, USA) Generation of broad-spectrum disease resistance by over-expression of an essential regulatory gene in systemic acquired resistance
16.30: [5.4.5S]	**Valerie Williamson** (University of California, Davis, USA) Nematode and aphid resistance in tomato
16.50: [5.4.6S]	**W. Broekaert** (Janssens Laboratory of Genetics, Leuven, Belgium) A jasmonate-dependent pathway in *Arabidopsis thaliana* is required for resistance against particular pathogens
17.10:	Discussion led by: **N. Keen** (University of California, Riverside, USA)
17.30:	Close

Poster Sessions - Afternoon

Time: 14.00-17.30

Venue: Sheraton Grand Hotel & Marquee

Poster Session: 10. Plant-bacterium interactions

Topics included: 1.5, 1.6, 1.7

Poster Session: 11. Plant-fungus interactions

Topics included: 1.8, 1.9, 1.10

Poster Session: 12. Plant-virus interactions

Topics included: 1.11, 1.12, 1.13

Additional Meetings for Invited Participants

Time: 09.00-11.00
Venue: EICC, Harris 2
Sclerotinia discussion group (John Steadman)

Time: 11.30-13.30
Venue: EICC, Harris 2
ISPP Special Interest Committee - Extension (Nigel Hardwick)

Time: 13.30-14.30
Venue: To be confirmed
ISPP Executive Committee

Time: 14.00-16.00
Venue: EICC, Harris 2
ISPP Special Interest Committee - Seed Pathology (Tom Mew)

Time: 14.30-15.30
Venue: To be confirmed
ISPP Council

Evening Meetings

The following meetings will commence at 18.30 hours and finish at 20.45 hours. Please note Evening Session E2 shall finish later at 22.00 hours - see page 51 for details.

Time: 18.30-20.45
Venue: EICC, Sidlaw
Richard Frederiksen (USA)
E15 - Sorghum Ergot

Time: 18.30-20.45
Venue: EICC, Fintry
Peter Spencer-Phillips (UK)
E5 - Downy Mildews

Time: 18.30-20.45
Venue: EICC, Tinto
Stevens M Brumbley (Australia)
E12 - Rattoon Stunting Disease of Sugarcane

Time: 18.30-20.45
Venue: EICC, Moorfoot
Anupam Varma (India)
E29 - Whitefly Transmitted Viruses

Time: 18.30-20.45
Venue: EICC, Kilsyth
James Brown (UK)
E22 - Resistance in Wheat to *Septoria tritici*

Thursday 13 August 1998

Time: 18.30-20.45

Venue: EICC, Harris 1
David Harris (UK)
E20 - Life after Methyl Bromide: Alternative approaches to Controlling Soil-Borne Fungal Diseases

Time: 18.30-20.45

Venue: EICC, Harris 2
Peter Mills (UK)
E19 - Advances in the Pathology of Cultivated Mushrooms

Time: 18.30-20.45

Venue: Sheraton Hotel, Glenkinchie
Jerry Bartz (USA; Chairman, ISPP Post-harvest Disease Committee)
E9 - Post-Harvest Diseases: Novel Control Methods

Time: 18.30-20.45

Venue: Sheraton Hotel, Talisker
Anne Marte Tronsmo (Norway)
E30 - Low-Temperature Diseases

Time: 18.30-20.45

Venue: Sheraton Hotel, Dalwhinnie
V Gunasekher (India)
E23 - Perspectives on Mulberry Diseases in the Tropics

Time: 18.30-22.00

Venue: Scottish Agricultural College, Edinburgh
Peter Scott (UK), **Terry Stewart** (New Zealand) & **Gareth Hughes** (UK)
E2 - Information Technology for Plant Pathology: A Hands-On Workshop

Time: 18.30-20.45

Venue: University of Edinburgh, Adam Ferguson Building, Room G.10
David Lonsdale (UK) & **Orlando Petrini** (Switzerland)
E3 - Endophytes
(sponsored by the British Mycological Society)

Friday 14 August 1998

Symposia - Morning

Time: 08.30-12.00 **Venue: EICC, Sidlaw**

1.7 BEHAVIOUR OF BACTERIA ON PLANT SURFACES

Organiser & Chair: **M. Romantschuk** (University of Helsinki, Finland)

08.30: [1.7.1S] *Keynote:* **M. Romantschuk**
Pathogenicity and the microenvironment

09.10: [1.7.2S] *Keynote:* **E. W. Nester** (University of Washington, USA)
Interaction of *Agrobacterium* and its gene products with host plants

09.50: Break

10.20: [1.7.3S] **Maria Brandl** (University of California, Berkeley, USA)
Ecological and molecular aspects of indole-3-acetic acid production in an epiphytic strain of *Erwinia herbicola*

10.40: [1.7.4S] **S.S. Hirano** (University of Wisconsin, USA)
Role(s) of pathogenicity-associated genes in interactions of populations of *Pseudomonas syringae* pv. *syringae* B728A with snap bean (*Phaseolus vulgaris*) plants in the field

11.00: [1.7.5S] **S. He** (Michigan State University, USA)
Plant-bacterial interface: *Pseudomonas syringae* extracellular proteins controlled by the hrp system

11.20: [1.7.6S] **Gail Preston** (University of Oxford, UK)
Isolating plant-induced genes from *Pseudomonas fluorescens*

11.40: Discussion led by: **S.E. Lindow** (University of California, Berkeley, USA)

12.00: Lunch

Time: 08.30-1200 **Venue: EICC, Pentland**

1.10 DEVELOPMENTAL BIOLOGY OF PLANT PATHOGENIC FUNGI]

Organiser & Chair: **Regine Kahmann** (University of Munich, Germany)

08.30: [1.10.1S] *Keynote:* **Regine Kahmann**
Developmental biology of plant-pathogenic fungi

08.50: [1.10.2S] **J. W. Kronstad** (University of British Columbia, Canada)
Signalling via CAMP is important for morphogenesis and virulence in *Ustilago maydis*

09.10: [1.10.3S] *Keynote:* **J. Hamer** (Purdue University, USA)
Signal transduction and morphogenesis during *Magnaporthe grisea* infection

09.30: [1.10.4S] **D. Nuss** (University of Maryland, USA)
Effects of G-protein alpha and beta subunit gene disruption and mutagenesis on complex fungal biological processes

09.50: Break

10.20: [5.6.3S]	**S. Koizumi** (Tohoku National Agricultural Experiment Station, Omagari-shi, Japan) New fungicide use on rice in Japan
10.40: [5.6.4S]	**N.R.X. Nazareno** (IAPAR, Brazil) New fungicide use on potatoes in Brazil
11.00: [5.6.5S]	**C. Maumene** (ITCF, France) New fungicides and their introduction in wheat and barley spray programs in France
11.20: [5.6.6S]	**D. Slawson** (Central Science Laboratory, UK) Regulatory challenges for new fungicides in the European Union
11.40:	Discussion led by: **P. Leroux** (INRA, France)
12.00:	Lunch

Poster Sessions - Morning

Time: 08.30-12.30 **Venue: Sheraton Grand Hotel & Marquee**

Poster Session: 13. Decision making

Topics included: 3.1, 3.2, 3.3, 4.6, 4.8

Poster Session: 14. Information technology (papers not part of IT workshop)

Topic included: 4.3

Symposia - Afternoon

Time: 14.00-17.30 **Venue: EICC, Sidlaw**

1.6 SECRETION SYSTEMS AND PATHOGENICITY GENES

Organiser & Chair:	**Ulla Bonas** (Martin Luther University, Halle-Wittenberg, Germany)
14.00: [1.6.1S]	*Keynote:* **Ulla Bonas** Protein trafficking in *Xanthomonas*-plant interactions
14.40: [1.6.2S]	*Keynote:* **L. Rahme** (Harvard Medical School, USA) *Arabidopsis thaliana* and *Pseudomonas aeruginosa*: a host-pathogen system to define molecular interactions required for bacterial pathogenicity
15.20: [1.6.3S]	Break
15.50: [1.6.4S]	**M. Arlat** (INRA-CNRS, France) The *Ralstonia solanacearum* HRP machinery
16.10: [1.6.5S]	**D.E. Foutts** (Cornell University, Ithaca, USA) Characterization of HRP and AVR genes on the flanks of the *Pseudomonas syringae* HRP cluster

16.30: [1.6.6S]	**J.F. Kim** (Cornell University, Ithaca, USA) Molecular analysis of the regions flanking the type III protein secretion operons on *Erwinia amylovora*: searching for genes encoding HRP-dependent pathogenicity, virulence and avirulence proteins
16.50: [1.6.7S]	**R. Jackson** (University of the West of England, Bristol, UK) A large native plasmid of *Pseudomonas syringae* pv. *phaseolicola* is associated with pathogenicity towards bean
17.10:	Discussion led by: **A. Collmer** (Cornell University, Ithaca, USA)
17.30:	Close

Time: 14.00-17.30 **Venue: EICC, Pentland**

1.9 SECONDARY METABOLITES AND RESISTANCE

Organiser & Chair:	**K. Hahlbrock** (Max-Planck Institute, Cologne, Germany)
14.00: [1.9.1S]	*Keynote:* **K. Hahlbrock** From pathogen recognition to secondary product accumulation
14.40: [1.9.2S]	*Keynote:* **Margaret Essenberg** (Oklahoma State University, USA) Secondary metabolite localization and activity: keydeterminants of a role in resistance
15.20:	Break
15.50: [1.9.3S]	**T. Graham** (Ohio State University, USA) Cell-to-cell and intrasignalling mechanisms programming the multiplex phenylpropanoid defence responses in soyabean
16.10: [1.9.4S]	**D. Strack** (Institut f. Pflanzenbiochemie, Weinberg, Germany) *Phytophthora infestans*-stimulated biosynthesis of hydroxycinnamic acid amides in *Solanum tuberosum* and cloning of a CDNA encoding tyramine hydroxycinnamoyltransferase (THT)
16.30: [1.9.5S]	**J. Chappell** (University of Kentucky, Lexington, USA) Diffusible signal(s) involved in cell-to-cell communication and localized defense responses in tobacco
16.50: [1.9.6S]	**R.A. Dixon** (Noble Foundation, Oklahoma, USA) Engineering metablic pathways for plant protection
17.10:	Discussion led by **R.A. Dixon**
17.30:	Close

Time: 14.00-17.30 **Venue: EICC, Fintry**

1.13 VIRUS-VECTOR INTERACTIONS

Organiser & Chair:	**T.P. Pirone** (University of Kentucky, USA)
14.00: [1.13.1S]	*Keynote:* **T.P. Pirone** Vector transmission of plant viruses: an overview with emphasis on noncirculative transmission by aphids
14.40: [1.13.2S]	**S. Blanc** (INRA-CNRS, France) A second helper protein is required for the aphid transmission of cauliflower mosaic virus

15.00: [1.13.3S] **S. Gray** (USDA, ARS, Ithaca, USA)
Molecular and cellular mechanisms regulating the movement of luteoviruses through aphid vectors

15.20 Break

15.50: [1.13.4S] **J. Van den Heuvel** (DLO, Wageningen, The Netherlands)
The role of *Buchnera* Groel in determining the persistent nature of plant viruses which are transmitted by aphids in a circulative, non-propagative manner

16.10: [1.13.5S] **J. Sherwood** (University of Georgia, USA)
Is the acquisition of tomato spotted wilt tospovirus by thrips a receptor-mediated event?

16.30: [1.13.6S] **S. MacFarlane** (Scottish Crop Research Institute, UK)
Molecular studies of the transmission of plant viruses by nematodes

16.50: [1.13.7S] **T. Tamada** (Okayama University, Japan)
Molecular and biological aspects of fungal transmission of viruses with rod-shaped particles

17.10: Discussion led by: **M. Mayo** (Scottish Crop Research Institute, UK)

17.30: Close

Time: 14.00-17.30 **Venue: EICC, Tinto & Moorfoot**

2.7 BIOTIC INTERACTIONS IN THE SOIL

Organiser & Chair: **C. Alabouvette** (INRA, Dijon, France)

14.00 [2.7.1S] **The Garrett Memorial Lecture - C. Alabouvette**
The significance of biotic interactions in the soil
(*Chair **D.S. Ingram**, President, British Society for Plant Pathology)*

14.40 [2.7.2S] *Keynote*:**T.C. Paulitz** (McGill University, Canada)
Population dynamics of biocontrol agents and pathogens in the soil and rhizosphere

15.20 Break

15.50 [2.7.3S] **C.M. Liddell** (New Mexico State University, Las Cruces, USA)
Interactions between abiotic and biotic factors in soil

16.10 [2.7.4S] **P. Lemanceau** (INRA, Dijon, France)
Effects of the plant on soil-borne microflora: application to the fluorescent pseudomonads

16.30 [2.7.5S] **D.M. Weller** (Washington State University, USA)
The role of antibiotics in microbial interactions in the soil

16.50 Discussion led by: **T.C. Paulitz**

17.30 Close

Time: 14.00-17.30 **Venue: EICC, Kilsyth**

4.6 EXOTIC PATHOGEN THREATS: RISK ASSESSMENT

Organiser & Chair: **I.M. Smith** (EPPO, France)

14.00: [4.6.1S] **D.M. McNamara** (EPPO, France)
Pest risk analysis: an essential element of plant quarantine

14.20: [4.6.2S]	**Claire Sansford** (Central Science Laboratory, UK) The application of scientific principles to pest risk analysis with special reference to Karnal Bunt
14.40: [4.6.3S]	**C. Magnusson** (Crop Research Institute, Norway) Pest risk analysis on *Bursaphelenchus xylophilus* for the European Union
15.00: [4.6.4S]	**W. Roberts** (Dept. of Primary Industry and Energy, Canberra, Australia) Pest risk analysis of the risk of introduction of fire blight disease via trade in apples
15.20:	Break
15.50: [4.6.5S]	**W.E. Fry** (Cornell University, Ithaca, USA) New strains of *Phytophthora infestans* from Mexico
16.10: [4.6.6S]	**Joan F. Webber** (Forestry Commission, UK) International threats posed by *Ophiostoma* and *Ceratocystis* species
16.30: [4.6.7S]	**H.C. Evans** (CABI Biosciences, UK) A lateral view of PRA: evaluating fungal pathogens as biocontrol agents of weeds
16.50: [4.6.8S]	**E.V. Podleckis** (APHIS, USDA, USA) Pest risk assessment in the future: research and information needs
17.10:	Discussion led by: **I.M. Smith**
17.30:	Close

Poster Sessions - Afternoon

Time: 14.00 - 17.30

Venue: Sheraton Grand Hotel & Marquee

Poster Session: 15. Disease management

Topics included: 3.6, 3.8, 4.7, 4.9, 5.1, 5.5, 5.6

Closing Ceremony

Time: 17.45-18.15

Venue: EICC, Pentland Suite

Closing Items

Jacob Eriksson Prize: Presentation on behalf of the Jacob Eriksson Prize Commission and the Swedish Academy of Science.

Handing over of the ISPP Flag

Address on behalf of the Australasian Plant Pathology Society, hosts of the 8th International Congress of Plant Pathology, to be held in Christchurch, New Zealand, in February 2003.

Closing of the 7th International Congress of Plant Pathology

Farewell Ceilidh

Time: 19.30-00.00

Venue: EICC, Cromdale & Lomond Suite

Please see page 72 for further details