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UNIVERSITY OF TORINO

ICPP 2008

9th INTERNATIONAL CONGRESS OF PLANT PATHOLOGY

August 24-29, 2008
Torino, Italy

Healthy and Safe Food for Everybody

BOOK OF ABSTRACTS

Edited by
A. Porta-Puglia and P. Gonthier

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cidence and severity of FCR and TA in wheat production in the Western Cape province.

38.51 GENETIC CHARACTERISATION OF *FUSARIUM OXYSPORUM* FROM NATURAL SOILS IN AUSTRALIA. **M.H. Laurence, B.A. Summerell, L.W. Burgess and E.C.Y. Liew.** *Royal Botanic Gardens Sydney, Botanic Gardens Trust, Mrs Macquaries Rd, Sydney, NSW 2000, Australia. Email: matthew.laurence@rbgsyd.nsw.gov.au*

Fusarium oxysporum is a ubiquitous fungal species complex that includes both non-pathogenic and pathogenic strains, the latter being responsible for disease in over one hundred cultivated plant species. The origin of many of these strains is poorly understood but recent studies on the cotton wilt pathogen, *F. oxysporum* f.sp. *vasinfectum* in Australia, indicate an indigenous origin from populations associated with native cotton relatives. Research to date has focused on isolates from agricultural environments but these are unlikely to represent the natural underlying diversity of the species complex in Australia, with anthropogenic distribution of pathogens and selection pressures that favour clonality. Given the broad host range of *F. oxysporum* and its potential threat to agriculture, there is a pressing need to characterise the native species complex. We have addressed this need by sampling isolates associated with native vegetation geographically isolated from cultivation throughout the continent. DNA fingerprints were obtained using various genetic markers to indicate the extent and distribution of genetic diversity. In addition the phylogenetic position and lineage composition of the native soil populations were investigated on the basis of DNA sequences of the β-tubulin, EF-1α, NIR, CAL and mtSSU rDNA regions. The evolutionary potential of native *F. oxysporum* populations in Australia is discussed.

38.52 DEVELOPMENT OF TECHNIQUES FOR ASSESSING SPORE VIABILITY OF *PLASMODIOPHORA BRASSICAE*. **M.C. Lewis, E. Clewes and R. Kennedy.** *University of Warwick, Warwick HRI, Wellesbourne, CV35 9EF, UK. Email: M.C.Lewis@warwick.ac.uk*

Clubroot of vegetable *Brassica*, caused by the pathogen *Plasmodiophora brassicae*, is an important problem within the UK due to the crops' high economic value and reduction in quality/yield that results from infection. Spores of *P. brassicae* can remain dormant in the soil for many years, and there are currently no reliable methods to accurately determine spore viability. DNA-based techniques can detect spores in soil, but the most robust test of viability to date is a traditional bait test. In this new project we investigate factors affecting the viability of *P. brassicae* spores, and develop methods for determining spore viability in soil.

38.53 OCCURRENCE OF RACES OF *PHYTOPHTHORA CLANDESTINA* – CAUSAL AGENT OF SUBTERRANEAN CLOVER ROOT ROT IN THE RAINFALL ZONES OF THE AGRICULTURAL BELT OF WESTERN AUSTRALIA. **H. Li, X. Ma, P.H. Nichols, M.P. You, M.J. Barbetti and K. Sivasithamparam.** *School of Plant Biology, Faculty of Natural and Agricultural Sciences, The University of Western Australia, Crawley, WA 6009, Australia. Email: xma@cyllene.uwa.edu.au*

Phytophthora clandestina is an important pathogen of annual pasture legumes across southern Australia, especially subterranean clover (*Trifolium subterraneum*) on which it is the most important root rot pathogen. *P. clandestina* had been found to only occur in Australia, with the majority of its distribution and most diversity of races found in the 700–1000 mm rainfall zones in the south-west of Western Australia. The most promising and economic approach to manage this disease is through host resistance. However, this appeared to break down and/or was lost over time, suggesting the rapid development of new races of the pathogen in response to field deployment of various host resistances. Our recent work, screening isolates of *P. clandestina* across subterranean clover host differentials to characterize races, identified 10 races with varying degrees of pathogenicity on the differential host plant cultivars. Races 173 and 177 were found to be widely distributed and were the most common in Western Australia, together constituting 80% of the isolates characterized. While resistance in subterranean clover against some races was easy to identify, it was less readily found against other races. One race in particular, race 177, was the most virulent of the races across the subterranean clover genotypes tested and no resistance to this race has been identified to date. Hence, studies were undertaken to locate sources of tolerance/resistance to race 177, among newly available subterranean clover germplasm.

38.54 *FUSARIUM* PATHOGENS OF CULTIVATED CROPS FROM NATURAL ECOSYSTEMS IN AUSTRALIA. **E.C.Y. Liew, A.R. Bentley, H.T. Phan, T. Petrovic, J.L. Walsh, B.A. Summerell and L.W. Burgess.** *Royal Botanic Gardens Sydney, Botanic Gardens Trust, DECC, Mrs Macquaries Rd, Sydney, NSW 2000, Australia. Email: edward.liew@rbgsyd.nsw.gov.au*

In Australia the majority of our agricultural crops are species and cultivars introduced into the continent. Until recently *Fusarium* species associated with various diseases of these crops were generally thought to have been introduced, concurrent with or subsequent to the host introduction. The cotton wilt pathogen, *F. oxysporum* f.sp. *vasinfectum*, however, has been shown to be genetically more closely affiliated with native populations and is believed to have a local origin. We have been investigating *Fusarium* endophytes in non-cultivated hosts, in both natural ecosystems and agricultural environments. The focus of our research has been on grasses (native and introduced) in natural ecosystems geographically isolated from the agricultural environment. A wide range of plant pathogenic species have been commonly isolated from these grasses. Some of these, e.g. *F. thapsinum* and *F. pseudograminearum*, were shown to differ little genetically from strains obtained from their respective cultivated hosts, sorghum and wheat. Furthermore, some were shown to be pathogenic on the cultivated host in the greenhouse. Implications of these findings and future research directions are discussed.

38.55 EFFECTS OF METALAXYL AND PHOSPHONATE ON *PHYTOPHTHORA* ROOT ROT OF WOLLEMI PINE. **E.C.Y. Liew, C.A. Offord, A. Pinaria, C. Pavich and B.A. Summerell.** *Royal Botanic Gardens Sydney, Botanic Gardens Trust, DECC, Mrs Macquaries Rd, Sydney, NSW 2000, Australia. Email: edward.liew@rbgsyd.nsw.gov.au*

The Wollemi pine (*Wollemia nobilis*) was first shown to be susceptible to *Phytophthora cinnamomi* in pot trials in 1999, and since then precautions have been taken to prevent the inadvertent introduction of the pathogen into the wild population within Wollemi National Park, Australia. However, in 2005 *P. cinnamomi* was detected in soil surveys following observations of disease symptoms at the site. On the basis of systematic transects, subsequent surveys established the precise location of the pathogen, which appeared to be confined to two areas within one of the Wollemi pine stands. Concurrent to the on-going monitoring of pathogen spread, there was an urgent need to establish control strategies for managing this problem. A study was initiated to investigate the effects of metalaxyl and potassium phosphonate on *Phytopthhora* root rot of Wollemi pine. Post-infection soil drenching of potassium phosphonate was shown to be effective in controlling this disease in a greenhouse trial. No phytotoxicity was observed on plants treated with phosphonate. However, neither foliar spray of phosphonate nor soil drenching with metalaxyl effectively controlled the disease. Implications of these results in relation to management strategies are discussed.

38.56 VANILLA STEM ROT PATHOGEN CAN SURVIVE AS AN ENDOPHYTE WITHIN HEALTHY VINES. **E.C.Y. Liew, A. Pinaria, F. Rondonuwu, J. Paath, D.T. Sembel and L.W. Burgess.** *Royal Botanic Gardens Sydney, Botanic Gardens Trust, DECC, Mrs Macquaries Rd, Sydney, NSW 2000, Australia. Email: edward.liew@rbgsyd.nsw.gov.au*

Vanilla is an important and popular cash crop offering high economic returns to smallholding farmers in North Sulawesi, Indonesia. However, vanilla production in this region is greatly constrained by *Fusarium* stem rot. Although the disease is most severe on the stems, it is also found on the leaves and roots. On the stem internode, small brown water-soaked spots or lesions initially appear, which enlarge and become necrotic, eventually girdling and shrivelling the stem. Etiological studies confirmed the causal agent to be *Fusarium oxysporum* f.sp. *vanillae*. Interestingly, although this is a soilborne vascular pathogen, disease lesions are often observed between healthy internodes in the absence of any apparent wounds, raising questions as to the pathogen's mode of entry. We showed in a greenhouse trial that *F. oxysporum* isolates obtained from healthy stems without any external or internal symptoms were pathogenic on vanilla vines, indicating the possibility of this pathogen surviving as an endophyte within healthy vines. This finding has significant implications on disease management as vanilla is vegetatively propagated and most planting material is obtained from existing farms with various levels of disease incidence.

38.57 *SPONGOSPORA SUBTERRANEA* DAMAGES POTATO PLANT GROWTH AND YIELD. **R.A. Lister, R.E. Falloon and D. Curtin.** *New Zealand Institute for Crop & Food Research Limited, PB 4704, Christchurch, New Zealand. Email: ListerR@crop.cri.nz*

Spongospora subterranea f.sp. *subterranea* causes powdery scab on potato tubers (*Solanum tuberosum*), which is the well recognised quality-limiting effect of this pathogen. Root infections by *S. subterranea* (zoosporangia and root galls) are common but rarely observed, and their significance has not been documented. We have completed several experiments indicating that this pathogen can adversely affect plant growth and yield parameters. A field trial, where powdery scab was severe, measured a mean total tuber yield increase of 28% due to soil-applied pesticides that effectively controlled the disease. A second field trial measured a 42% reduction in mean tuber yield following *S. subterranea* inoculation of uninfested soil. Several glasshouse experiments have tested whether inoculation with *S. subterranea* sporosori affected plant growth. Relative to uninoculated plants, inoculated plants yielded 21% less total dry matter, were 17% shorter and had 7% fewer leaves. Shoots from inoculated plants had reduced content of the elements P, K, S, Mn, Cu, and Zn, and increased amounts of N, Mg, and Na, and their roots were discoloured, indicating that the pathogen damaged roots and disrupted root membrane function. Cultivar resistance to powdery scab is generally assessed as low tuber infection. However, inoculation reduced total plant dry weight of cv. Iwa (very susceptible to powdery scab on tubers) by 27%, and of cv. Gladiator (resistant) by 28%. These results are strong evidence that *S. subterranea* has effects that could harm crop yields as well as quality, in cultivars that are resistant or susceptible to powdery scab on tubers.

38.58 UNDERESTANDING AND MANAGING EPIDEMICS CAUSED BY *PHYTOPHTHORA CAPSICI* IN CHILE-PEPPER. **J. Luna-Ruiz and O. Moreno-Rico.** *Universidad Autónoma de Aguascalientes, Av. Universidad 940, Cd. Universitaria, C.P. 20100, Aguascalientes, Ags., Mexico. Email: jjluna@correo.uaa.mx*

Phytophthora capsici causes severe infection of roots, crowns, stems, leaves and fruits of chile-pepper (*Capsicum annum* L.) in commercial fields worldwide including Mexico. Our objectives are to present (1) advances related to the understanding of epidemics caused by *P. capsici* in Central Mexico, and (2) some recommendations for integrated disease management based on experimental results. As no genetic resistance to *P. capsici* is currently available in commercial chile-pepper cultivars, the initial infection and development of epidemics seem to be caused by three main factors: (a) high concentration of initial inoculum (oospores) in soil, (b) presence of summer rains, and (c) frequent and prolonged crop flooding (excess soil moisture). Factors b and c have been well documented, but even where natural sexual recombination of *P. capsici* has been demonstrated, the role of oospores as the primary/initial inoculum for infection has not been proved in Central Mexico. Experimental results and field observations indicate that early transplanting (March 15-31) on raised mulching beds, followed by drip irrigation, reduce the impact of rain and disease risk. Good crop-plant nutrition and soil applications of beneficial microorganisms (*Trichoderma harzianum*, *Bacillus subtilis*, etc.) improve plant vigor, health and strength, therefore reducing the vulnerability of susceptible chile-peppers to *P. capsici*. Crop genetic resistance is a major component of integrated disease management. Screening traditional local varieties and landraces of chile-pepper against regional aggressive strains of *P. capsici* has led to identifying excellent levels of genetic resistance for crop improvement, a major component of integrated disease management and sustainable agriculture.

38.59 ROLE OF PLANT GROWTH-PROMOTING RHIZOBACTERIA IN THE SUPPRESSION OF SOIL-BORNE DISEASES OF TWO MEDICINAL CROPS, *COLEUS FORSKOHLII* AND *WITHANIA SOMNIFERA*. **S.B. Mallesh and S. Lingaraju.** *Department of Plant Pathology, U.A.S., Dharwad 580005, Karnataka, India. Email: lingaraju_s@rediffmail.com*

Fusarium chlamydosporium, *Ralstonia solanacearum* and *Meloidogyne incognita* were found to be the predominant pathogens affecting the medicinal crops, *Coleus forskohlii* and *Withania somnifera* in a survey done in Karnataka, southern India. We investigated the ability of 50 rhizobacterial strains isolated from healthy rhizoplanes and rhizospheres of these crops to suppress the activity *in vitro* of *F. chlamydosporium* or *R solanacearum*, using the dual culture technique. Cell-free filtrates of the same strains were tested for *M. incognita* juvenile mortality and inhibition of egg