Book review

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Proceedings of the 2nd International Downy Mildews Symposium

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This book contains full-length papers presented at the Downy Mildews, 2nd International Symposium, a meeting that focused on evolution, taxonomy, biology, genetic variation, host resistance, population diversity, epidemiology, and chemical and biological control of downy mildew diseases and pathogens. The book carries on the tradition begun at the Downy Mildew Workshops during the 7th International Congress of Plant Pathology (ICPP) held in Edinburgh (UK) in 1998 and at the 8th International Congress of Plant Pathology held in Christchurch (New Zealand) in 2003. These sessions led to two previous volumes of Advances in Downy Mildew Research, Volumes 1 and 2, which were published by Kluver Academic Publishers in 2002 and 2004. All three workshops reflect the increasing international cooperation in downy mildew research.

The papers in this volume cover a wide range of topics, and I highlight some of these below.

Section 1. **Evolution and taxonomy**. One paper considers the use of electron microscopy in the search for characters which could help in finding, separating and uniting characters above and below the species level. Another paper presents the first molecular phylogeny for graminicolous downy mildews.

Section 2. **Biology and ecology**. Some of the subjects were the variability of conidia of *Peronospora alta*, germination and viability of *Plasmopara viticola* oospores and their quantification, development of *P. viticola* detection by single chain antibody fragments, and the occurrence of lettuce downy mildew in natural populations of prickly lettuce. The effect of *meta*-topolin on optical parameters of lettuce leaf discs infected by *Bremia lactucae* is described.

Section 3. **Genetic variation and molecular biology**. The development of a transformation system for downy mildew was discussed. Appropriate developmental stages for transformation and different transformation techniques with respect to specific requirements of the sunflower/*Plasmopara halstedii* pathosystem were tested. Proteomic analysis of *Peronospora viciae* conidiophores was presented as a novel method to analyse molecular aspects of host-pathogen interaction and to identify key marker and target proteins for detection and control.

The population structure of *Hyaloperonospora parasitica* on vegetable *Brassica* (*HgB*) was investigated with a view to improved deployment of cultivars of field crops. Molecular techniques to discern between pathogen populations have been developed for *HpB* using recent information about putative pathogenicity genes alongside neutral markers.

Section 4. **Pathogenicity and host resistance**. A contribution on the distribution of *Plasmopara halstedii* races from around the world is the first to compile a list of known races from the major sunflower producing countries. An overview of races and the development of molecular markers linked to major resistance genes was presented for Spinach downy mildew. The objectives were to initiate the development of a set of open-pollinated near isogenic lines using different sources of major genes for resistance, and to utilise these genetic resources to develop molecular markers linked to major

disease resistance loci. A report on the resistance in *Cucumis melo* germplasm to *Pseudoperonospora cubensis* pathotypes summarises results obtained by laboratory screening of 52 *C. melo* accessions by 8 isolates of *P. cubensis*. The isolates represent 8 different pathotypes with low, medium or high levels of pathogenicity. The majority of *C. melo* accessions was highly susceptible to most of the *P. cubensis* isolates. Relatively few accessions expressed incomplete resistance and only one accession was found to be highly resistant to some *P. cubensis* isolates. The results of a study of the variation of the response to *Bremia lactucae* in natural populations of *Lactuca saligna* showed a high level of resistance of all *L. saligna* accessions tested. This supports the previous assumption that most of the resistance in *L. saligna* is probably non-host to this pathogen. However, the resistance patterns of some accessions also indicate some race-specific interactions, which is in accordance with other recently published data on this *Lactuca* species. Studies in the pathosystem *Bremia lactucae*/*Lactuca sativa* indicated a role for nitric oxide both in the *L. sativa* response to challenge by *B. lactucae* and in the pathogen's metabolism during spore germination and hyphal growth. Pre-incubation with cytokinins delays chlorophyll degradation in *Lactuca* spp. and reduces *Bremia lactucae* sporulation. Increased resistance to downy mildew in leaf tissues treated with aromatic *m*-topolin and 6-(3-methoxybenzylamino) purine-9-β-D-ribofuranoside occurred throughout the 14 day period after inoculation.

Section 5. **Population diversity and epidemiology**. The epidemiology of *Peronospora farinosa* f.sp. *spinaciae* and evaluation of infections on spinach and growth of this host in the field were studied. It was possible to correlate crop developmental stages with the leaf area. This was important for developing a scoring system for spinach downy mildew which gives a value for the true level of infection after canopy closure. The influence of primary inoculum, frequency of infection and sporulation, and length of the spinach culture on the development of the epidemic and disease severity was confirmed. The virulence characteristics of *Bremia lactucae* populations present in Norway from 2001 to 2005 were determined. They were found to be diverse, but not considerably different from other European populations of *B. lactucae*.

Section 6. **Chemical and biological control**. Chemical inducers could activate a resistance response in *Helianthus annuus* to *Plasmopara halstedii*. Sunflower seedlings treated with dichloroisonicotinic acid and α-aminobutyric acid showed a significantly reduced appearance of systemic disease symptoms. The internal development of the fungus was also inhibited. These changes highly resembled the sequence of events that happen in *R*-gene mediated resistance expression on sunflower infected by *P. halstedii*. Czech isolates from 2005 and 2006 of *Phytophthora infestans* were analysed for mating type, response to systemic fungicides and mitochondrial DNA haplotype. All isolates appeared to be sensitive to metalaxyl, dimethomorph and propamocarb-hydrochloride. The sensitivity to fungicides in Czech populations of *Pseudoperonospora cubensis* on cucumber was determined. Most of the isolates were sensitive to all concentration of Aliette 80 WP. Previcur 607 was also effective as most isolates were controlled by the optimal concentration 0.4%. Ridomil Plus was ineffective as 96% of isoltes showed resistance to the optimal concentration 0.25%. Ridomil Gold MZ 68 WP appeared effective, but tolerant reactions were detected at lower concentrations. Only 32% of the isolates showed sensitivity to Curzate K, and only 26% to Acrobat MZ.

The Proceedings of the 2nd International Downy Mildew Symposium present the most recent information on research in this scientific field. The book is well arranged and contains many new findings on the downy mildews. It will be of benefit to research and extension scientists as well as to advanced students and postgraduates interested in this topic.

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