

18-21 NOVEMBER 2002

BRIGHTON, UK

CONFERENCE PROCEEDINGS VOLUME 1

THE BCPC CONFERENCE

# Pests & Diseases 2002

Proceedings of an international conference held  
at the Brighton Hilton Metropole Hotel, UK  
18-21 November 2002



BRITISH  
CROP  
PROTECTION  
COUNCIL

# CONTENTS

Page

|  |        |
|--|--------|
| The British Crop Protection Council Members .....  | XVIII  |
| The British Crop Protection Council .....          | XIX    |
| The BCPC Conference 2002 Programme Committee ..... | XX     |
| Author Index .....                                 | XXII   |
| Abbreviations .....                                | XXVIII |

## VOLUME 1

|                  |         |      |
|------------------|---------|------|
| <b>SESSION 1</b> | Session | Page |
|------------------|---------|------|

### THE TWENTY-NINTH BAWDEN MEMORIAL LECTURE

|   |     |   |
|---|-----|---|
| Risks and benefits of biological and chemical plant protection strategies – food safety aspects |     |   |
| J Schlundt .....  | 1-1 | 3 |

### SESSION 2A

#### NEW COMPOUNDS AND USES FOR PEST MANAGEMENT

|   |      |    |
|---|------|----|
| Insect neuropeptide fusion proteins – a new generation of orally active insect control agents   |      |    |
| J P Edwards, E C Fitches, N Audsley and J A Gatehouse .....   | 2A-1 | 25 |
| Pyridalyl: a novel insecticidal agent for controlling lepidopterous pests   |      |    |
| S Saito, S Isayama, N Sakamoto, K Umeda and K Kasamatsu .....   | 2A-2 | 33 |
| BSN 2060: a novel compound for whitefly and spider mite control   |      |    |
| R Nauen, T Bretschneider, E Brück, A Elbert <i>et al.</i> .....   | 2A-3 | 39 |
| Field and laboratory studies on the effects of a neem-based plant extract on the feeding activity of the large pine weevil, <i>Hylobius abietis</i>                               |      |    |
| J R M Thacker, W Bryan, C McGinley, S Heritage and R H C Strang .....   | 2A-4 | 45 |
| Clothianidin: a novel broad-spectrum neonicotinoid insecticide  |      |    |
| Y Ohkawara, A Akayama, K Matsuda and W Andersch .....   | 2A-5 | 51 |
| Control of corn rootworms ( <i>Diabrotica</i> spp.) and of secondary pests of corn ( <i>Zea mays</i> ) using seed treatments of clothianidin                                      |      |    |
| M Schwarz, D Christie, W Andersch, K Kemper <i>et al.</i> .....   | 2A-6 | 59 |
| Spirodiclofen: a broad-spectrum acaricide with insecticidal properties: efficacy on <i>Psylla pyri</i> and scales <i>Lepidosaphes ulmi</i> and <i>Quadraspidiotus perniciosus</i> |      |    |
| L De Maeyer, D Peeters, J M Wijsmuller, A Cantoni <i>et al.</i> .....   | 2A-7 | 65 |

### SESSION 2B

#### DISCUSSION FORUM

|   |    |    |
|---|----|----|
| Is field pathology and diagnosis a dying art? Does it matter? |    |    |
| Discussion Forum – no written paper presented .....           | 2B | 75 |

### SESSION 3A

#### ADVANCES IN BIOLOGICAL CONTROL

|  |      |    |
|--|------|----|
| Initial testing of potential fungal biological control agents<br>for potato cyst nematodes<br>S D Atkins, I M Clark, B R Kerry and D Sosnowska.....  | 3A-1 | 79 |
| Antifungal activity of <i>Pseudomonas oryzihabitans</i> , a bacterium<br>symbiotically associated with <i>Steinernema abbasi</i> , towards<br><i>Fusarium oxysporum</i> and <i>Rhizoctonia solani</i><br>I K Vagelas, S R Gowen, M Wood, K G Davies and F T Gravani..... | 3A-2 | 85 |
| Possibilities and constraints of agro-ecosystem diversification<br>as a pest management strategy: a simulation approach<br>R P J Potting, J N Perry and W Powell .....   | 3A-3 | 91 |
| Alien pests – opportunities and risks for biological control<br>S Cheek and R J C Cannon .....   | 3A-4 | 97 |

### SESSION 3B

#### MANAGEMENT OF FUNGALLY-TRANSMITTED VIRUSES OF ARABLE CROPS

|  |      |     |
|--|------|-----|
| The mosaic viruses of winter barley: problems and prospects<br>M J Adams.....  | 3B-1 | 105 |
| The development of sugar-beet rhizomania disease and<br>its control in the UK<br>M J C Asher.....  | 3B-2 | 113 |
| Assessment of the resistance of UK winter wheat varieties to<br>the diseases caused by soil-borne wheat mosaic virus and<br>wheat spindle streak mosaic virus<br>G Budge, G R G Clover, C M Henry, C Ratti <i>et al.</i> ..... | 3B-3 | 121 |
| Potential for chemical control of <i>Spongospora subterranea</i> , cause<br>of powdery scab of potatoes and vector of potato mop-top virus<br>S J Wale .....   | 3B-4 | 129 |

### SESSION 3C

#### NEONICOTINOID INSECTICIDES – CURRENT STATUS AND FUTURE PROSPECTS

|   |      |     |
|---|------|-----|
| Neonicotinoid insecticides – retrospective consideration and prospects<br>P Jeschke, M Schindler and M E Beck .....   | 3C-1 | 137 |
| Cyanotropanes: novel chemistry interacting at the insect<br>nicotinic acetylcholine receptor<br>R J Lind, D T Greenhow, J Blythe, J Goodchild <i>et al.</i> ..... | 3C-2 | 145 |
| Neonicotinoid pharmacokinetics<br>R Greenwood, M G Ford and A Scarr .....   | 3C-3 | 153 |
| Incidence and management of insect resistance to neonicotinoids<br>I Denholm, G Devine, S Foster, K Gorman and R Nauen.....                                       | 3C-4 | 161 |

#### POSTER SESSION 4A

##### ADVANCES IN PEST AND DISEASE MANAGEMENT IN TROPICAL AND SUB-TROPICAL CROPS

- Management of *Pythium aphanidermatum* in greenhouse cucumber production in the Sultanate of Oman  
M L Deadman, A M Al Saadi, I Al Mahmuli, Y M Al Maqbali *et al.* .....4A-1 ..... 171
- The effects of cultivation practices and pre-treatment of tubers with sodium hypochlorite on the incidence of blackleg, *Erwinia carotovora*, and tuber moth, *Phthorimea opercullela*, in potato production in the Sultanate of Oman  
M L Deadman, I A Khan, K Al Habsi, A M Al Saadi and J R M Thacker .....4A-2..... 177
- Monitoring of Thysanoptera in tropical crops in S Tomé e Príncipe  
C Mateus, I Paquete, R Oliveira and A Mexia .....4A-3 ..... 183
- Augmentation of parasitoids in conjunction with pheromones to manage cotton bollworms  
B Fatima, N Ahmad, M Ashraf and N Suleman .....4A-4..... 189

#### POSTER SESSION 4B

##### PEST AND DISEASE MANAGEMENT IN HORTICULTURAL CROPS

- Aspects of the epidemiology of *Botrytis cinerea* on covered pot-grown ornamentals  
S E Barnes, M W Shaw and T R Pettitt .....4B-1 ..... 197
- Integration of different fungicide groups in spray programs for the control of powdery mildew in grapevines  
T J Wicks, C J Hitch and B H Hall .....4B-2 ..... 203
- Comparison of strategies for timing protective and curative fungicides for control of onion downy mildew (*Peronospora destructor*) in New Zealand  
P J Wright, R W Chynoweth, R M Beresford and W R Henshall .....4B-3 ..... 207
- Integrated approaches to control of grey mould (*Botrytis cinerea*) in greenhouse crops of container-grown ornamentals  
T M O'Neill, T R Pettitt, M P McQuilken and P J C Hamer .....4B-4 ..... 213
- The effect of rain splash on the development of rose blackspot and implications for a disease control strategy  
A Ali and A M Hall .....4B-5..... 219
- Effect of leaf wetness duration and temperature on the development of leaf spot (*Septoria apiicola*) on celery  
K R Green, T M O'Neill and D Wilson .....4B-6 ..... 225
- Assessment of the impact of water treatments on potential indicators of microbial suppression of root disease in hydroponic tomatoes  
T R Pettitt, J M Whipps, G M Petch, S R Kenny *et al.* .....4B-7 ..... 231

|   |       |     |
|---|-------|-----|
| Spinosad: a natural insecticide with novel mode of action for control of pests in UK field vegetable crops<br>A Leader and R Dutton.....                            | 4B-8  | 237 |
| A pheromone monitoring system for pea midge ( <i>Contarinia pisi</i> ) in vining peas<br>A J Biddle, R L Ward and Y Hilbur.....                                     | 4B-9  | 243 |
| Efficacy of spinosad in controlling some pests from the family Tortricidae<br>R W Olszak and Z Pluciennik .....   | 4B-10 | 249 |
| An evaluation of the efficacy of aldicarb and alternative nematicides against plant parasitic nematodes in carrots<br>S A Ellis, S Hockland and J Blood-Smyth ..... | 4B-11 | 255 |

#### POSTER SESSION 4C

##### MEASURING THE FATE AND EFFECTS OF PESTICIDES IN THE ENVIRONMENT

|  |      |     |
|--|------|-----|
| Does triticonazole affect microbial activity?<br>E Börjesson and L Johnsson .....  | 4C-1 | 263 |
| The fate and uptake of the fungicide carbendazim into organisms in soil microcosms<br>L A Burrows, C A Edwards and T Knacker and B Förster .....                       | 4C-2 | 267 |
| Influence of organic amendments on soil sorption of the fungicides metalaxyl and tricyclazole<br>L Cox, M C Fernandes, M C Hermosín, J Cornejo and A G Osman.....      | 4C-3 | 273 |
| Effects of azoxystrobin on soil microorganisms under laboratory conditions<br>V A Kalinin and K V Bykov.....   | 4C-4 | 279 |
| Comparison of soil sorption measurement techniques for a <sup>14</sup> C anthranilate fungicide<br>A Kennedy, R M W Wilkins and E Lopez-Capel.....                     | 4C-5 | 285 |
| Fate of the dicarboximide fungicide procymidone in alkaline greenhouse soils from Almeria (Spain) and Albenga (Italy)<br>E Lopez-Capel, A Kennedy and R M Wilkins..... | 4C-6 | 291 |
| Field studies to determine the effects of the fungicides mancozeb and dinocap on predatory mites in orchards and vineyards in Europe<br>M Miles and E Green.....       | 4C-7 | 297 |
| Persistence and mobility of aldicarb in a simulated red clay soil profile<br>T Vrahimi-Hadjilouca and R M Wilkins.....   | 4C-8 | 303 |

#### POSTER SESSION 4D

##### ADVANCES IN BIOLOGICAL CONTROL

|  |      |     |
|--|------|-----|
| Mass production of <i>Trichogramma chilonis</i> : an economical and advanced technique<br>B Fatima, M Ashraf, N Ahmad and N Suleman..... | 4D-1 | 311 |
|--|------|-----|

|  |            |     |
|--|------------|-----|
| <i>Bemisia argentifolii</i> parasitoids on poinsettia<br>K Hudák and B Péntes .....  | 4D-2 ..... | 317 |
| Field evaluation of genetically modified <i>Helicoverpa armigera</i><br>nucleopolyhedrovirus in cotton bollworm control<br>X Sun, H Wang, X Chen, Z Hu, C Peng et al.....      | 4D-3.....  | 323 |
| The role of parasitoids in decreasing the number of<br>diamond back moth ( <i>Plutella xylostella</i> ) in horticultural crops<br>K Wiech and J Kalmuk .....                   | 4D-4 ..... | 329 |
| Development of a biopesticide for the coconut mite in India<br>P Sreerama Kumar .....  | 4D-5.....  | 335 |
| Putative biological control agents of <i>Microdochium nivale</i><br>isolated from compost<br>J A R Pratt, A H Cobb and A A Keeling .....                                       | 4D-6 ..... | 341 |
| Controlling infection of cereal grain by toxigenic<br><i>Fusarium</i> species using fungal competitors<br>W A J M Dawson, G L Bateman, J Köhl, B H de Haas <i>et al.</i> ..... | 4D-7.....  | 347 |

## **EVENING DISCUSSION**

### **CROP PROTECTION RESEARCH. WHO DECIDES? WHO BENEFITS?**

|  |          |     |
|--|----------|-----|
| Crop protection research. Who decides? Who benefits?<br>S Morse, W Buhler and D Gibbon ..... | ED ..... | 355 |
|--|----------|-----|

## **SESSION 5A**

### **NEW COMPOUNDS, FORMULATIONS AND USES FOR DISEASE MANAGEMENT**

|  |            |     |
|--|------------|-----|
| HEC5725: a novel leaf systemic strobilurin fungicide<br>S Dutzmann, A Mauler-Machnik, F Kerz-Möhlendick,<br>J Applegate and U Heinemann..... | 5A-1 ..... | 365 |
| New in-furrow fungicides for seedling disease control in cotton<br>M A Newman .....  | 5A-2 ..... | 371 |
| Ethaboxam: a new oomycete fungicide<br>D S Kim, Y S Lee, S J Chun, W B Choi <i>et al.</i> .....  | 5A-3.....  | 377 |
| Disease control with a yeast elicitor in conjunction with fungicides<br>N Tosun .....  | 5A-4 ..... | 383 |
| JAU 6476 - A new dimension DMI fungicide<br>A Mauler-Machnik, H-J Rosslénbroich, S Dutzmann,<br>J Applegate and M Jautelat .....             | 5A-5.....  | 389 |

## **SESSION 5B**

### **DISCUSSION FORUM**

|  |          |     |
|--|----------|-----|
| Managed approaches to pest control: barriers and constraints<br>Discussion Forum – no written paper presented..... | 5B ..... | 397 |
|--|----------|-----|

## **SESSION 6A**

### **DETECTION AND ENUMERATION OF PLANT PATHOGENIC INOCULUM**

|  |            |     |
|--|------------|-----|
| Recent advances in the detection of airborne inoculum of plant pathogens using molecular methods<br>H A McCartney.....   | 6A-1 ..... | 401 |
| Quantification of airborne inoculum using antibody based systems<br>A J Wakeham and R Kennedy.....   | 6A-2 ..... | 409 |
| Use of flow cytometry in the detection of plant pathogenic spores<br>G W Griffith, J P Day and D B Kell.....   | 6A-3 ..... | 417 |
| Sensors for early warning of post-harvest spoilage in potato tubers<br>B J P de Lacy Costello, R J Ewen, H E Gunson, N M Ratcliffe<br>and P T N Spencer-Phillips ..... | 6A-4 ..... | 425 |

## **SESSION 6B**

### **ADVANCES IN FORMULATION AND APPLICATION TECHNOLOGY**

|   |            |     |
|---|------------|-----|
| Development of a new deltamethrin formulation for Europe<br>W T Lankford, E S Bardsley, Gaëlle Baur, J-P Trijau and M Henriet .....   | 6B-1.....  | 435 |
| Acylated lignin: a matrix for controlled release formulations of pesticides<br>J Zhao and R M Wilkins.....  | 6B-2.....  | 441 |
| Current status of application technology for greenhouses across Europe and associated occupational exposure to pesticides<br>C R Glass, A J Gilbert, J J Mathers and R J Lewis <i>et al.</i> .....  | 6B-3 ..... | 447 |
| Measurements of spray deposits on and off target surfaces within and beyond the treatment zone: the need for an embracing International Standard to measure and account all potential losses from container to target surfaces<br>W A Taylor and P G Andersen ..... | 6B-4.....  | 453 |

## **SESSION 6C**

### **INTEGRATED CROP MANAGEMENT IN FIELD VEGETABLES**

|  |            |     |
|--|------------|-----|
| What impact is ICM having on pest and disease management in field vegetables?<br>W E Parker .....            | 6C-1.....  | 463 |
| Crop protection in integrated production of field vegetables in Sweden: the status of IPM<br>B Jönsson ..... | 6C-2 ..... | 471 |
| ICM – what does it offer – profits, markets, environment, social benefits?<br>C J Drummond.....              | 6C-3 ..... | 479 |
| Slugs in vegetable crops: can control methods meet the needs of growers and consumers?<br>G R Port.....      | 6C-4 ..... | 485 |

## VOLUME 2

### SESSION 7A

#### OPTIMISING THE USE OF SEED TREATMENT PESTICIDES

|  |            |     |
|--|------------|-----|
| Seed treatment: uses and benefits<br>M C Hare.....   | 7A-1.....  | 493 |
| Meeting the requirements for modern seed treatment application<br>A Wainwright, A C Rollett and A B Cheer .....                      | 7A-2 ..... | 499 |
| The effects of surfactant and water volume on the coverage<br>of the seed surface by a seed treatment formulation<br>S J Maude ..... | 7A-3 ..... | 507 |
| Variety as a factor in the response of winter wheat to<br>siltthiofam seed treatment<br>R A Bayles, B A S Napier and D Leaper .....  | 7A-4 ..... | 515 |

### SESSION 7B

#### PEST AND DISEASE MANAGEMENT IN ORGANIC FARMING

|   |            |     |
|---|------------|-----|
| Organic agriculture and GM crops: is co-existence possible?<br>D Atkinson, C A Watson, B Pearce, L Woodward <i>et al.</i> .....   | 7B-1.....  | 523 |
| The role of functional biodiversity in managing pests and<br>diseases in organic production systems<br>M S Wolfe .....  | 7B-2 ..... | 531 |
| Development of a systems approach for the management of<br>late blight ( <i>Phytophthora infestans</i> ) in organic potato production:<br>an update on the EU-Blight MOP project<br>S L Phillips, C Leifert, J Santos, P Juntharathap <i>et al.</i> ..... | 7B-3 ..... | 539 |
| Developing improved strategies for pest and disease management<br>in organic vegetable production systems in the UK<br>G Davies, P Sumption, M Crockatt, P Gladders <i>et al.</i> .....   | 7B-4.....  | 547 |

### SESSION 7C

#### OILSEEDS – IMPROVING MANAGEMENT OF PESTS AND DISEASES

|   |            |     |
|---|------------|-----|
| A review of pest and disease problems in winter oilseed rape<br>in England and Wales<br>J A Turner, S J Elcock, K F A Walters, D M Wright and P Gladders .....  | 7C-1.....  | 555 |
| New perspectives on the epidemiology and management of<br>phoma stem canker of winter oilseed rape in England<br>J S West, Y-J Huang, J M Steed, P K Leech <i>et al.</i> .....  | 7C-2 ..... | 563 |
| Turnip rape ( <i>Brassica rapa</i> ) as a trap crop to protect oilseed rape<br>( <i>Brassica napus</i> ) from infestation by insect pests: potential and<br>mechanisms of action<br>S M Cook, L E Smart, R J P Potting, E Bartlet <i>et al.</i> ..... | 7C-3.....  | 569 |



|   |           |     |
|---|-----------|-----|
| Efficacy of single and two-way fungicide seed treatments for the control of metalaxyl-resistant strains of <i>Plasmopara halstedii</i> (sunflower downy mildew)<br>T J Gulya..... | 7C-4..... | 575 |
|---|-----------|-----|

**POSTER SESSION 8A**

**PEST AND DISEASE MANAGEMENT IN ARABLE CROPS**

|  |             |     |
|--|-------------|-----|
| The effects of fungicides on <i>Fusarium graminearum</i> growth and its consequences to green leaf retention, yield and seedling emergence<br>E G Korpetsis and E A Skorda .....                                   | 8A-1 .....  | 583 |
| Chemical control of eyespot and other stem-base pathogens in an early drilled first winter wheat crop<br>R V Ray, S G Edwards and P Jenkinson .....  | 8A-2 .....  | 589 |
| Control of potato late blight ( <i>Phytophthora infestans</i> ) with a fenamidone-based product in the UK<br>E S Bardsley, A Seitz and R T Mercer.....   | 8A-3 .....  | 595 |
| Inoculum sources of the toxigenic ear-blight pathogen, <i>Fusarium culmorum</i> , in wheat<br>G L Bateman .....  | 8A-4 .....  | 601 |
| Development of leaf blotch ( <i>Rhynchosporium secalis</i> ) epidemics on barley<br>D F Henman, H Davis and B D L Fitt.....  | 8A-5.....   | 605 |
| Why do cereal diseases occur where they do?<br>M C Taylor .....  | 8A-6.....   | 611 |
| Disease and canopy control in oilseed rape using triazole fungicides<br>A E Coules, G D Lunn and S Rossall.....  | 8A-7.....   | 617 |
| HEC 5725 – chemodynamic behaviour of a new leaf systemic strobilurin fungicide<br>I Haeuser-Hahn, U Heinemann, P Baur and A Suty-Heinze .....  | 8A-8 .....  | 623 |
| Effects of light leaf spot ( <i>Pyrenopeziza brassicae</i> ) infection on winter survival and yield of oilseed rape ( <i>Brassica napus</i> )<br>A Baierl, N Evans, J M Steed, B D L Fitt and K G Sutherland ..... | 8A-9.....   | 629 |
| Pest and disease management constraints under climate change<br>D Harris and J E Hossell .....   | 8A-10 ..... | 635 |
| MASTER – Management Strategies for European Rape Pests – a new EU Project<br>I Williams, W Büchs, H Hokkanen, I Menzler-Hokkanen <i>et al.</i> .....   | 8A-11.....  | 641 |
| The effect of clothianidin on aphids and virus yellows in sugar beet<br>A M Dewar, L A Haylock, B H Garner, P Baker and R J N Sands .....  | 8A-12 ..... | 647 |
| The effects of insecticide seed treatments on beneficial insects in sugar beet<br>P A Baker, L A Haylock, B H Garner, R J N Sands and A M Dewar.....   | 8A-13 ..... | 653 |

|  |            |     |
|--|------------|-----|
| Spatial pattern in the distribution of pests and yield in an oilseed rape crop: implications for ICM<br>A W Ferguson, J N Perry, I H Williams, S J Clark <i>et al.</i> .....                     | 8A-14..... | 659 |
| The use of baited and unbaited sticky traps to monitor the orange blossom midge, <i>Sitodoplosis mosellana</i> and its parasitoid, <i>Macroglenes penetrans</i><br>J N Oakley and L E Smart..... | 8A-15..... | 665 |
| Observations on integrated population management strategies for wheat bulb fly<br>J E B Young, G A Talbot and P Strachan .....   | 8A-16..... | 671 |
| Protecting oilseed rape from slug damage using metaldehyde, methiocarb and imidacloprid seed dressings<br>L C Simms, M J Wilson, D M Glen and D B Green.....                                     | 8A-17..... | 679 |
| Semiochemicals for the control of cereal pests<br>T J Bruce, J L Martin, B J Pye, L E Smart and L J Wadhams .....  | 8A-18..... | 685 |
| Clothianidin – a new chloronicotinyl seed treatment for use on sugar beet and cereals: field trial experiences from Northern Europe<br>R H Meredith, P J Heatherington and D B Morris .....      | 8A-19..... | 691 |

#### POSTER SESSION 8B

##### PEST AND DISEASE MANAGEMENT IN ORGANIC FARMING

|  |           |     |
|--|-----------|-----|
| Health status of spring barley cultivated under organic, integrated and conventional farming conditions<br>A Baturo .....  | 8B-1..... | 699 |
| Management of plant parasitic nematode populations by use of vermicomposts<br>N Q Arancon, C A Edwards, S S Lee and E Yardim .....   | 8B-2..... | 705 |
| Suppression of the plant diseases, <i>Pythium</i> (damping-off), <i>Rhizoctonia</i> (root rot) and <i>Verticillium</i> (wilt) by vermicomposts<br>H Chaoui, C A Edwards, A Brickner, S S Lee and N Q Arancon ..... | 8B-3..... | 711 |
| The effect of organic amendments on stem canker and black scurf ( <i>Rhizoctonia solani</i> ) of potatoes<br>G Davies, O Woolley, P Gladders, M Wolfe and R Haward.....  | 8B-4..... | 717 |

#### POSTER SESSION 8C

##### POST-GRADUATE STUDENT POSTERS

|  |           |     |
|--|-----------|-----|
| Behaviour-modifying chemicals of the damson-hop aphid, <i>Phorodon humuli</i> (Schrank)<br>T W Pope .....  | 8C-1..... | 725 |
| Maturation of ascospores of A-group and B-group <i>Leptosphaeria maculans</i> (stem canker) on winter oilseed rape debris<br>Y J Huang, B D L Fitt and A M Hall..... | 8C-2..... | 729 |

|   |            |     |
|---|------------|-----|
| Alternatives to methyl bromide method for the management of<br>root-knot nematodes ( <i>Meloidogyne spp.</i> ) in greenhouse-grown tomato<br>G Neophytou, N Ioannou and D J Wright .....                              | 8C-3.....  | 733 |
| Variety mixtures and the blighted organic potato<br>S L Phillips .....  | 8C-4.....  | 737 |
| Insect growth regulators inhibit acetylcholinesterase activity<br>in B-biotype <i>Bemisia tabaci</i><br>E L A Cottage and R V Gunning .....   | 8C-5.....  | 741 |
| Behavioural consequences of pyrethroid resistance in the<br>peach-potato aphid, <i>Myzus persicae</i><br>I G Eleftherianos, S P Foster, M S Williamson and I Denholm.....   | 8C-6.....  | 745 |
| Symbiotic bacteria from entomopathogenic nematodes acting<br>as biological agents against fungal pathogens of tomato seedlings<br>A V Kapsalis, S R Gowen and F T Gravanis .....                                      | 8C-7.....  | 749 |
| Studies on population dynamics of <i>Bacillus subtilis</i> and<br><i>Fusarium oxysporum</i> f.sp. <i>lentis</i> , the causal organism of<br>lentil vascular wilt<br>S A El-Hassan and S R Gowen.....                  | 8C-8.....  | 753 |
| Differences between <i>Rhizoctonia solani</i> isolates from potato crops<br>J W Woodhall and P Jenkinson.....   | 8C-9.....  | 757 |
| Effect of mycelial inoculum level and cultivar susceptibility on<br><i>Rhizoctonia solani</i> development on potato stems and seed tubers<br>P Kyritsis and S J Wale.....   | 8C-10..... | 761 |
| Inhibition of common cereal pathogenic fungi by clove oil<br>and eucalyptus oil<br>E M Byron and A M Hall .....   | 8C-11..... | 765 |
| Biocontrol of canker on oilseed rape by reduction and<br>inhibition of initial inoculum<br>M S Maksymiak and A M Hall .....   | 8C-12..... | 769 |
| Impact of spectral cladding materials on the behaviour of glasshouse<br>whitefly <i>Trialeturodes vaporariorum</i> and <i>Encarsia formosa</i> ,<br>its hymenopteran parasitoid<br>D Doukas .....                     | 8C-13..... | 773 |
| The effect of granular nematicides on the development of<br><i>Rhizoctonia solani</i> diseases and their interaction with<br><i>Globodera rostochiensis</i> on potato<br>M A Back, P P J Haydock and P Jenkinson..... | 8C-14..... | 777 |
| A malathion-specific esterase in a highly resistant strain of<br>the red flour beetle <i>Tribolium castaneum</i><br>A Rauf and R M Wilkins.....   | 8C-15..... | 781 |

## POSTER SESSION 8D

### RESISTANCE OF PESTS AND PATHOGENS TO PESTICIDES

|  |             |     |
|--|-------------|-----|
| Insecticide resistance in Egyptian strains of <i>Bemisia tabaci</i><br>H El Kady, I Denholm and G J Devine .....   | 8D-1.....   | 787 |
| Chlorfenapyr resistance in <i>Helicoverpa armigera</i> in Australia<br>R V Gunning and G D Moores .....  | 8D-2 .....  | 793 |
| Use of novel substrates to characterise esteratic cleavage<br>of pyrethroids<br>G D Moores, P Jewess, A L Boyes, N Javed and R V Gunning .....   | 8D-3.....   | 799 |
| The effect of dose rate of imidacloprid and clothianidin on<br>insecticide-resistant clones of <i>Myzus persicae</i><br>L A Haylock, A M Dewar, B H Garner, R J N Sands <i>et al.</i> .....  | 8D-4.....   | 805 |
| Resistance to carbamate, organophosphate and pyrethroid<br>insecticides in the potato aphid ( <i>Macrosiphum euphorbiae</i> )<br>S P Foster, B Hackett, N Mason, G D Moores <i>et al.</i> .....  | 8D-5.....   | 811 |
| Resistance to insecticides in the currant-lettuce aphid,<br><i>Nasonovia ribisnigri</i> : laboratory and field evidence<br>M D Barber, G D Moores, I Denholm, N B Kift and G M Tatchell.....   | 8D-6 .....  | 817 |
| PCR-based method for detecting mutation allele frequencies for<br>QoI resistance in <i>Plasmopara viticola</i><br>C Sirven, E Gonzalez, E Bufflier, M-P Latorse and R Beffa .....  | 8D-7 .....  | 823 |
| Interrelation between alternative respiration and target site<br>mutations in resistance to QoI fungicides<br>C Avila-Adame and W Köller.....  | 8D-8.....   | 829 |
| Sensitivity of European isolates of <i>Phytophthora infestans</i> to<br>famoxadone and cymoxanil<br>T Barchietto and J L Genet .....   | 8D-9 .....  | 835 |
| Shift in sensitivity of <i>Alternaria solani</i> (potato early blight)<br>to strobilurin fungicides<br>J S Pasche, C M Wharam and N C Gudmestad .....  | 8D-10.....  | 841 |
| Mefenoxam resistance in the North American population of<br><i>Phytophthora erythroseptica</i> : spatial distribution and frequency<br>of resistance in soil and recombinant populations<br>R J Taylor, B Salas, G A Secor, V V Rivera <i>et al.</i> ..... | 8D-11 ..... | 847 |
| Activity of zoxamide against European isolates of<br><i>Phytophthora infestans</i><br>L R Cooke, D J Carlisle and R D McCall .....   | 8D-12 ..... | 853 |
| Effect of dose rate and mixture on selection for reduced<br>sensitivity to triazole fungicides in <i>Mycosphaerella graminicola</i><br>V J Mavroidis and M W Shaw .....  | 8D-13.....  | 859 |

## POSTER SESSION 8E

### ADVANCES IN FORMULATION AND APPLICATION TECHNOLOGY

- Technical advances in fumigant application for soil disinfestations  
M L Gullino, A Minuto, A Garibaldi and H A Ajwa .....8E-1..... 867
- Novel pesticides for slug and snail control in horticulture  
I Schüder, G Port and J Bennison .....8E-2..... 873
- A comparison of a direct injection sprayer with a conventional one  
A G Hodgekiss .....8E-3..... 879

## SESSION 9A

### FORECASTING, MODELLING AND RISK ASSESSMENT AS PART OF DECISION MAKING PROCESSES FOR PEST AND DISEASE MANAGEMENT

- The application of decision theory in pest and disease management  
G Hughes .....9A-1..... 887
- Disease management decisions – making decisions that matter  
J Yuen .....9A-2..... 889
- Towards an early warning system for winter wheat disease severity  
S Pietravalle, F van den Bosch, M W Shaw and S R Parker .....9A-3..... 897
- Oilseed rape and cereal diseases – how are farmers responding  
to their control?  
N V Hardwick, J A Turner, J E Slough, S J Elcock *et al.* .....9A-4..... 903
- International developments in pest risk analysis for phytosanitary  
decision making: a review of methodologies for pest risk assessment  
L Zhu, R Black and J Holt .....9A-5..... 911

## SESSION 9B

### INTERACTIONS BETWEEN PEST AND DISEASE CONTROL AND CROP PHYSIOLOGY

- Improving and exploiting self-defence against wheat diseases  
S R Parker, N D Paveley, M J Foulkes, D J Lovell *et al.* .....9B-1..... 919
- The influence of crop physiology on the development and  
impact of summer aphid infestations on wheat  
J N Oakley .....9B-2..... 925
- Effects of light leaf spot (*Pyrenopeziza brassicae*) infection on  
canopy size and yield of oilseed rape (*Brassica napus*)  
G D Lunn, J M Steed, A Baierl, N Evans *et al.* .....9B-3..... 933
- Anti-oxidative and anti-senescence effects of the strobilurin  
pyraclostrobin in plants: a new strategy to cope with  
environmental stress in cereals  
T Jabs, J Pffirman, S Schäfer, Y X Wu and A v Tiedemann .....9B-4..... 941

## **SESSION 9C**

### **BIODIVERSITY IN ARABLE ECOSYSTEMS**

|   |            |     |
|---|------------|-----|
| Biodiversity in different farming systems<br>A R Leake .....  | 9C-1 ..... | 949 |
| Biodiversity in British agro-ecosystems: the changing regional landscape context<br>S Petit, D C Howard, S M Smart and L G Firbank .....      | 9C-2 ..... | 957 |
| Indirect effects of pesticides on breeding yellowhammers<br><i>Emberiza citrinella</i><br>A J Morris, R B Bradbury and J D Wilson .....       | 9C-3 ..... | 965 |
| Increasing the Government's Farmland Bird Index through conservation management at the farm scale: a ten-year demonstration<br>C Stoate ..... | 9C-4 ..... | 971 |

## **SESSION 10A**

### **GLOBAL ASPECTS FOR THE SAFE USE OF CROP PROTECTION AGENTS**

|   |             |      |
|---|-------------|------|
| Pesticides in the third world – changing role and a need for new thinking<br>J F Cooper and H M Dobson .....  | 10A-1 ..... | 979  |
| The importance of product specifications to ensure availability of safe, high quality crop protection and public health products in world markets<br>T S Woods .....          | 10A-2 ..... | 987  |
| Implementation of FAO Guidelines on Minimum Requirements for Pesticide Application Equipment: a case study in Cameroon<br>G Matthews, T Wiles, H Dobson and T Friedrich ..... | 10A-3 ..... | 995  |
| Safe and effective use of crop protection products in developing countries<br>J Frei .....  | 10A-4 ..... | 1003 |

## **SESSION 10B**

### **THE POTENTIAL ROLE OF TRANSGENIC CROPS IN SUSTAINABLE AND DURABLE PEST AND DISEASE MANAGEMENT**

|  |             |      |
|--|-------------|------|
| Transgenic crops: can European consumers benefit from eating them and will they want to?<br>J Wesseler ..... | 10B-1 ..... | 1013 |
| Transgenic crops and integrated pest management<br>A H Hilbeck .....   | 10B-2 ..... | 1021 |
| Transgenic papaya: a case for worldwide control of papaya ringspot virus<br>D Gonsalves .....                | 10B-3 ..... | 1029 |
| Adaptive resistance management in <i>Bt</i> maize<br>D A Andow .....   | 10B-4 ..... | 1035 |