

Thank you for using eradoc, a platform to publish electronic copies of the Rothamsted Documents. Your requested document has been scanned from original documents. If you find this document is not readable, or you suspect there are some problems, please let us know and we will correct that.



ROTHAMSTED
RESEARCH

Rothamsted Experimental Station Report for 1987

[Full Table of Content](#)



Publications

Rothamsted Research

Rothamsted Research (1988) *Publications* ; Rothamsted Experimental Station Report For 1987, pp 133 - 159 - DOI: <https://doi.org/10.23637/ERADOC-1-28>

PUBLICATIONS

Publications are listed under Divisions and not under their constituent Departments. Interdivisional papers appear under all contributing Divisions.

BIOMATHEMATICS DIVISION

Programs and System Guides

- BROOKES, S. RESCU 128/87 A guide to using the graphics package UNIRAS.
DARBY, R.J. RESCU 123/87 Bar coded label printing program.
MITCHELL, C.S. RESCU 118/87 Device fault reporting.
MITCHELL, C.S. RESCU 124/87 Generating bar code labels using the INTERMEC 8620 thermal printer.
MITCHELL, C.S. RESCU 125/87 Wordstar patching guide.
PECK, D.J. RESCU 114/87 Operation manual for electroporation unit.
PECK, D.J. RESCU 116/87 Line tester for VAX 4 wire network.
PECK, D.J. RESCU 119/87 Rain detector with variable delay.
PECK, D.J. RESCU 122/87 User guide : RS232.
THOMAS, C.F. RESCU 117/87 Introduction to UNIX on the Sun workstation.
THOMAS, C.F. RESCU 121/87 JUSE—journal usage database.
VERRIER, P.J. RESCU 108/87 The RES local area network.
VERRIER, P.J. RESCU 109/87 Sun network configuration.
VERRIER, P.J. RESCU 110/87 The IBM PC and variants.
VERRIER, P.J. RESCU 111/87 PEP daily meteorological database.
VERRIER, P.J. RESCU 112/87 The image data tablet.
VERRIER, P.J. RESCU 113/87 UNIX, a brief look.
VERRIER, P.J. RESCU 120/87 Entomology Department aphid logging.
VERRIER, P.J. RESCU 126/87 Constant environment temperature monitoring system.
WILSON, E.C. RESCU 127/87 Tarehouse automation—Broom's Barn.

Books

- PAYNE, R.W., LANE, P.W., AINSLEY, A.E., BICKNELL, K.E., DIGBY, P.G.N., HARDING, S.A., LEECH, P.K., SIMPSON, H.R., TODD, A.R., VERRIER, P.J., WHITE, R.P., GOWER, J.C., (TUNNICLIFFE WILSON, G., PATERSON, L.J.) (1987) *Genstat 5 reference manual*. Oxford : Clarendon Press.
MEMBERS OF THE STATISTICS DEPARTMENT (1987) *Genstat: a general statistical program*. Oxford: Numerical Algorithms Group Ltd.
ROSS, G.J.S. (1987) *MLP 3.08 user manual*. Oxford : Numerical Algorithms Group Ltd.
SIMPSON, H.R. & (STALEWSKI, A.) (1987) *Genstat 5 implementation guide*. Oxford : Numerical Algorithms Group Ltd.

Research Papers

- AINSLEY, A.E., (PATERSON, L.J. & PATTERSON, H.D.) (1987) A method for predicting the efficiency of incomplete-block trials. *Biometrics* **43**, 55-59.
BAILEY, R.A. (1987) One-way blocks in two-way layouts. *Biometrika* **74**, 27-32.
BAILEY, R.A. (1987) Restricted randomization : a practical example. *Journal of the American Statistical Association* **82**, 712-719.
BAILEY, R.A. & (ROWLEY, C.A.) (1987) Valid randomization. *Proceedings of the Royal Society of London* **A410**, 105-124.

ROTHAMSTED REPORT FOR 1987, PART 1

- BOWDEN, J., SHERLOCK, P.L. & DIGBY, P.G.N. (1986) Studies of elemental composition of *Rhopalosiphum padi* (L.) (Hemiptera:Aphididae) from *Prunus padus* at different localities. *Bulletin of Entomological Research* **76**, 621-632.
- (BROOKS, D.) & CHURCH, B.M. (1987) Drill performance assessments : a changed approach. *British Sugar Beet Review* **55**, 50-51.
- FARNHAM, A.W., MURRAY, A.W.A., SAWICKI, R.M., DENHOLM, I. & WHITE, J.C. (1987) Characterization of the structure-activity relationship of *kdr* and two variants of *super-kdr* to pyrethroids in the housefly (*Musca domestica* L.) *Pesticide Science* **19**, 209-220.
- FITT, B.D.L., GREGORY, P.H., TODD, A.D., McARTNEY, H.A. & MacDONALD, O.C. (1987) Spore dispersal and plant disease gradients : a comparison between two empirical models. *Journal of Phytopathology* **118**, 227-242.
- GOWER, J.C. (1987) Statistics and agriculture. *Journal of the Royal Statistical Society* **A151**, 179-200.
- KERSHAW, C.D. (1987) A comparison of estimators of the ED50 in up-and-down experiments. *Journal of Statistical Computation and Simulation* **27**, 175-184.
- KERSHAW, C.D. (1987) Discrimination problems for satellite images. *International Journal of Remote Sensing* **8**, 1377-1383.
- (MARTIN, P.J.), RILEY, J. & (DABEK, A.J.) (1987) Clove tree yields in the islands of Zanzibar and Pemba. *Experimental Agriculture* **23**, 293-303.
- PERRY, J.N. (1987) Iterative improvement of a power transformation to stabilise variance. *Journal of the Royal Statistical Society* **C36**, 15-21.
- PERRY, J.N. (1987) Estimating guild sizes. *Nature* **325**, 202.
- (SOANE, B.D.) & KERSHAW, C.D. (1987) A survey of the incidence and control of soil over-compaction problems on Scottish farms. *Agricultural Engineer* **42**, 45-52.
- (SPEED, T.P.) & BAILEY, R.A. (1987) Factorial dispersion models. *International Statistical Review* **55**, 261-277.
- WALL, C. & PERRY, J.N. (1987) Range of action of moth sex-attractant sources. *Entomologia Experimentalis et Applicata* **44**, 5-14.
- WILLIAMS, I.H., MARTIN, A.P. & WHITE, R.P. (1987) The effect of insect pollination on plant development and seed production in winter oil-seed rape (*Brassica napus* L.) *Journal of Agricultural Science, Cambridge* **109**, 135-139.
- YATES, F. & DUTTON, S.J. (1987) A simple procedure for the analysis of experiments of mixtures of varieties or species of agronomic interest. *Journal of Agricultural Science* **110**, 13-24.

Paper in Rothamsted Report, Part 2

- ELSMERE, J.I. (1988) Use of fertilizers in England and Wales. *Rothamsted Experimental Station. Report for 1987*, 187-194.

General Papers

- AINSLEY, A.E., DIGBY, P.G.N., HARDING, S., LANE, P.W., PAYNE, R.W. & SIMPSON, H.R. (1987) Conversion from Genstat 4 to Genstat 5. *Genstat Newsletter* **19**, 5-39.
- BAILEY, R. (1987) Comment on What is an analysis of variance? by T.H. Speed. In: *The Annals of Statistics* **15**, 913-916.
- (CHALMERS, A.G.) & LEECH, P.K. (1987) Fertilizer use on farm crops in England and Wales 1986 (SS/CH/23) *Agricultural Development and Advisory Service, Rothamsted Experimental Station and Fertiliser Manufacturers' Association*. 41pp.
- (EDWARDS, S.A., ARMSBY, A.W.) & SPECHTER, H.H. (1987) Space allowances for growing pigs on fully-slatted floors. *Paper 106. Proceedings BSAP Winter Meeting, March, 1987*.

PUBLICATIONS

- (EDWARDS, S.A. LIGHTFOOT, A.L.) & SPECHTER, H.H. (1987) Effects of farrowing crate design and floor type on pig performance. *Farm Buildings and Engineering* **4**, 21-24.
- (FORD, M.G., REAY, R.C.), LANE, P.W. & (EL-JADD, L.) (1987) Factors affecting the performance of applications of cypermethrin for the control of *Spodoptera littoralis*. In: *Studies in pesticide transfer and performance. Aspects of Applied Biology* **14**, 217-232.
- GOWER, J.C. (1987) Introduction to ordination techniques. In: *Developments in numerical ecology* NATO Advanced Study Institute Series vol. G14. Eds. P. & L. Legendre. Berlin: Springer-Verlag, pp. 3-64.
- (LIGHTFOOT, A.L., MILLER, B.G.) & SPECHTER, H.H. (1987) The effects of pre-weaning diet on post-weaning health and performance of 3-week weaned pigs. *Paper 104. Proceedings BSAP Winter Meeting, March, 1987*.
- MEMBERS OF THE DEPARTMENT (1987) Conversion from Genstat 4 to Genstat 5. *Genstat Newsletter* **19**, 5-39.
- MURRAY, A.W.A. (1986) A program for routine analysis of cereal nitrogen response data. *Genstat Newsletter* **17**, 18-26.
- PERRY, J.N. (1987) Estimating guild sizes. *Nature* **325**, 202.
- PERRY, J.N. (1987) New families of frequency distributions that describe repeated animal samples. *Biometrics Bulletin* **14**, 12-13.
- PERRY, J.N. (1987) Scientific societies : adapt or die. *Assembly and Association* **2**, 24-29.
- (SYLVESTER-BRADLEY, R.), ADDISCOTT, T.M., (VAIDYANATHAN, L.V.), MURRAY, A.W.A. & WHITMORE, A.P. (1987) Nitrogen advice for cereals : present realities and future possibilities. *Proceedings of the Fertiliser Society* **263**, 1-36.

ROTHAMSTED REPORT FOR 1987, PART 1

CROP AND ENVIRONMENT PROTECTION DIVISION

Books

- (BROWN, R.H.) & KERRY, B.R. (1987) *Principles and practice of nematode control in crops*. Sydney : Academic Press.

Theses

- AIREY, W.J. (1986) *Some aspects of the feeding behaviour of slugs in the potato crop*. Ph.D. Thesis, University of London.
- FFRENCH-CONSTANT, R.H. (1987) *The ecological genetics of insecticide resistance in Myzus persicae*. Ph.D. Thesis, University of London.
- GOULDS, A. (1987) *Sharp eyespot disease of cereals*. Ph.D. Thesis, Victoria University of Manchester.
- MATTINSON-ROSE, A.D. (1986) *Classification of amycolate wall chemotype IV actinomycetes*. Ph.D. Thesis, University of Newcastle-upon-Tyne.
- ROWLAND, M.W. (1987) *Insecticide resistance, parasites and the circadian flight activity of mosquitoes*. Ph.D. Thesis, University of London.
- WALTON, M.P. (1987) *Application of gel-electrophoresis to the study of cereal aphid parasitoids*. Ph.D. Thesis, CNA.

Research Papers

- ADAMS, M.J., JONES, P. & SWABY, A.G. (1987) The effect of cultivar used as host for *Polymyxa graminis* on the multiplication and transmission of barley yellow mosaic virus (BaYMV) *Annals of Applied Biology* **110**, 321-327.
- ADAMS, M.J., READ, P.J., LAPWOOD, D.H., CAYLEY, G.R. & HIDE, G.A. (1987) The effect of irrigation on powdery scab and other tuber diseases of potatoes. *Annals of Applied Biology* **110**, 287-294.
- AJAYI, O. (1987) The effect of barley yellow dwarf virus on the amino acid composition of spring wheat. *Annals of Applied Biology* **108**, 145-149.
- ANTONIW, J.F. & WHITE, R.F. (1986) Changes with time in the distribution of virus and PR protein around single local lesions of TMV infected tobacco. *Plant Molecular Biology* **6**, 145-149.
- BATEMAN, G.L. (1987) Comparison of the effects on eyespot in wheat of fungicides applied to the foliage or shoot bases at different times. *Journal of Agricultural Science, Cambridge* **109**, 601-604.
- BLIGHT, M.M. & WADHAMS, L.J. (1987) Male-produced aggregation pheromone in pea and bean weevil, *Sitona lineatus*(L.) *Journal of Chemical Ecology* **13**, 733-739.
- BRIGGS, G.G. & HENDERSON, I.F. (1987) Some factors affecting the toxicity of poisons to the slug *Deroceras reticulatum* (Muller)(Pulmonata: Limacidae). *Crop Protection* **6**, 341-346.
- BRIGGS, G.G., RIGITANO, R.L.O. & BROMILOW, R.H. (1987) Physico-chemical factors affecting uptake by roots and translocation to shoots of weak acids in barley. *Pesticide Science* **19**, 101-112.
- BROBYN, P.J., WILDING, N. & CLARK, S.J. (1987) Laboratory observations on the effect of humidity on the persistence of infectivity of conidia of the aphid pathogen *Erynia neoaphidis*. *Annals of Applied Biology* **110**, 579-584.
- BROMILOW, R.H., RIGITANO, R.L.O., BRIGGS, G.G. & CHAMBERLAIN, K. (1987) Phloem translocation of non-ionised chemicals in *Ricinus communis*. *Pesticide Science* **19**, 85-99.
- BROOKES, C.P. & LOXDALE, H.D. (1987) Survey of enzyme variation in British populations of *Myzus persicae* (Sulzer) (Hemiptera: Aphididae) on crops and weed hosts. *Bulletin of Entomological Research* **77**, 83-89.

PUBLICATIONS

- BROWN, M.E. & HORNBY, D. (1987) Effects of nitrate and ammonium on wheat roots in gnotobiotic culture: amino acids, cortical cell death and take-all (caused by *Gaeumannomyces graminis* var. *tritici*). *Soil Biology and Biochemistry* **19**, 567-573.
- CARTER, N. (1987) Management of cereal aphid (Hemiptera:Aphididae) populations and their natural enemies in winter wheat by alternate strip spraying with a selective insecticide. *Bulletin of Entomological Research* **77**, 677-682.
- CAYLEY, G.R., GRIFFITHS, D.C., HULME, P.J., LEWTHWAITE, R.J. & PYE, B.J. (1987) Tracer techniques for the comparison of sprayer performance. *Crop Protection* **6**, 123-129.
- CAYLEY, G.R., GRIFFITHS, D.C., PYE, B.J., SMART, L.E., STEVENSON, J.H. & WALTERS, J.H.H. (1987) Effectiveness of different spraying systems in winter wheat and biological effects on target and non-target organisms. *Agriculture, Ecosystems and Environment* **19**, 211-221.
- CAYLEY, G.R., HIDE, G.A., LEWTHWAITE, R.J., PYE, B.J. & VOJVODIC, P.J. (1987) Methods of applying fungicide sprays to potato tubers and description and use of a prototype electrostatic sprayer. *Potato Research* **30**, 301-317.
- CLARKE, A.J. & HENNESSY, J. (1987) Hatching agents as stimulants of movement of *Globodera rostochiensis* juveniles. *Revue de Nématologie* **10**, 471-476.
- COSKUN, H., BATEMAN, G.L. & HOLLOMON, D.W. (1987) Changes in population structure of carbendazim-resistant eyespot in wheat and barley between spring and summer 1984. *Transactions of the British Mycological Society* **88**, 117-120.
- CRUMP, D.H. (1987) Effect of time sampling, method of isolation and age of nematode on the species of fungi isolated from females of *Heterodera schachtii* and *H. avenae*. *Revue de Nématologie* **10**, 369-374.
- CRUMP, D.H. & KERRY, B.R. (1986) Effects of some agrochemicals on the growth of two nematophagous fungi, *Verticillium chlamydosporium* and *Cylindrocarpon destructans*. *Nematologica* **32**, 363-366.
- CRUMP, D.H. & KERRY, B.R. (1987) Studies on the population dynamics and fungal parasitism of *Heterodera schachtii* in soil from a sugar-beet monoculture. *Crop Protection* **6**, 49-55.
- (CUERO R.G., SMITH, J.E.) & LACEY, J. (1987) Interaction of water activity, temperature and substrate on mycotoxin production by *Aspergillus flavus*, *Penicillium viridicatum* and *Fusarium graminearum* in irradiated grains. *Transactions of the British Mycological Society* **89**, 221-226.
- (CUERO, R.G., SMITH, J.E.) & LACEY, J. (1987) Stimulation by *Hyphopichia burtonii* and *Bacillus amyloliquefaciens* of aflatoxin production by *Aspergillus flavus* in irradiated maize and rice grains. *Applied and Environmental Microbiology* **53**, 1142-1146.
- DAWSON, G.W., GRIFFITHS, D.C., JANES, N.F., MUDD, A., PICKETT, J.A., WADHAMS, L.J. & WOODCOCK, C.M. (1987) Identification of an aphid sex pheromone. *Nature* **325**, 614-616.
- DAWSON, G.W., GRIFFITHS, D.C., PICKETT, J.A., WADHAMS, L.J. & WOODCOCK, C.M. (1987) Plant-derived synergists of the alarm pheromone from the turnip aphid, *Lipaphis (Hydaphis) erysimi* (Homoptera, Aphididae). *Journal of Chemical Ecology* **13**, 1663-1671.
- EDEN-GREEN, S.J. & (MARKHAM, P.G.) (1987) Multiplication and persistence of *Acholeplasma* spp. in leafhoppers. *Journal of Invertebrate Pathology* **49**, 235-241.
- ELLIOTT, M., FARNHAM, A.W., JANES, N.F., JOHNSON, D.M. & PULMAN, D.A. (1987) Synthesis and insecticidal activity of lipophilic amides. Part 1: Introductory survey, and discovery of an active synthetic compound. *Pesticide Science* **18**, 191-201.
- ELLIOTT, M., FARNHAM, A.W., JANES, N.F., JOHNSON, D.M. & PULMAN, D.A. (1987) Synthesis and insecticidal activity of lipophilic amides. Part 2: Effect of heteroatom replacements and of introducing methyl groups in the pentadiene system. *Pesticide Science* **18**, 203-209.
- ELLIOTT, M., FARNHAM, A.W., JANES, N.F., JOHNSON, D.M. & PULMAN, D.A. (1987)

ROTHAMSTED REPORT FOR 1987, PART 1

- Synthesis and insecticidal activity of lipophilic amides. Part 3: Influence of chain length and terminal group in *N*-(2-methylpropyl)-2,4-dienamides. *Pesticide Science* **18**, 211-221.
- ELLIOTT, M., FARNHAM, A.W., JANES, N.F., JOHNSON, D.M. & PULMAN, D.A. (1987) Synthesis and insecticidal activity of lipophilic amides. Part 4: The effect of substituents on the phenyl group of 6-phenylhexa-2,4-dienamides. *Pesticide Science* **18**, 223-228.
- ELLIOTT, M., FARNHAM, A.W., JANES, N.F., JOHNSON, D.M. & PULMAN, D.A. (1987) Synthesis and insecticidal activity of lipophilic amides. Part 5: Influence on activity of varying the substituent on nitrogen. *Pesticide Science* **18**, 229-238.
- ELLIOTT, M., FARNHAM, A.W., JANES, N.F., JOHNSON, D.M. & PULMAN, D.A. (1987) Synthesis and insecticidal activity of lipophilic amides. Part 6: 6-(Disubstituted-phenyl)hexa-2, 4-dienamides. *Pesticide Science* **18**, 239-244.
- EVANS, K. (1987) The interactions of potato cyst nematodes and *Verticillium dahliae* on early and maincrop potato cultivars. *Annals of Applied Biology* **110**, 329-339.
- FARNHAM, A.W., MURRAY, A.W.A., SAWICKI, R.M., DENHOLM, I. & WHITE, J.C. (1987) Characterization of the structure-activity relationship of *kdr* and two variants of *super-kdr* to pyrethroids in the housefly (*Musca domestica* L.) *Pesticide Science* **19**, 209-220.
- FFRENCH-CONSTANT, R.H. & DEVONSHIRE, A.L. (1987) A multiple homogenizer for rapid sample preparation in immunoassays and electrophoresis. *Biochemical Genetics* **25**, 493-499.
- FFRENCH-CONSTANT, R.H., DEVONSHIRE, A.L. & CLARK, S.J. (1987) Differential rate of selection for resistance by carbamate, organophosphorus and combined pyrethroid and organophosphorus insecticides in *Myzus persicae* (Sulzer) (Hemiptera: Aphididae). *Bulletin of Entomological Research* **77**, 227-238.
- FITT, B.D.L., CREIGHTON, N.F. & BATEMAN, G.L. (1987) Pathogenicity to wheat seedlings of wheat-type and rye-type isolates of *Pseudocercospora herpotrichoides*. *Transactions of the British Mycological Society* **88**, 149-155.
- FITT, B.D.L., GREGORY, P.H., TODD, A.D., McCARTNEY, H.A. & MacDONALD, O.C. (1987) Spore dispersal and plant disease gradients; a comparison between two empirical models. *Journal of Phytopathology* **118**, 227-242.
- (GOODFELLOW, M.), LACEY, J. & (TODD, C.) (1987) Numerical classification of thermophilic streptomycetes. *Journal of General Microbiology* **133**, 3135-3149.
- GUTTERIDGE, R.J., BATEMAN, G.L. & HORNBY, D. (1987) Comparison of the effects of spring applications of ammonium chloride and other nitrogen fertilizers on take-all in winter wheat. *Journal of Agricultural Science, Cambridge* **108**, 567-572.
- HAMON, N., BARDNER, R., (ALLEN-WILLIAMS, L. & LEE, J.B.) (1987) Flight periodicity and infestation size of *Sitona lineatus*. *Annals of Applied Biology* **111**, 271-284.
- HARRINGTON, R. (1987) Varying efficiency in a group of people sampling cabbage plants for aphids (Hemiptera: Aphididae). *Bulletin of Entomological Research* **77**, 497-501.
- HIDE, G.A. & CAYLEY, G.A. (1987) Effects of spraying mefluidide onto potato foliage. *Potato Research* **30**, 341-343.
- HIDE, G.A. & CAYLEY, G.R. (1987) Effects of delaying fungicide treatment and of curing and chlorpropham on the incidence of skin spot on stored potato tubers. *Annals of Applied Biology* **110**, 617-627.
- HOOPER, D.J. (1986) Observations on the curation of plant and soil nematodes. *Nematologica* **32**, 312-321.
- (LOTT, T.W., INGRAM, D.S.) & RAWLINSON, C.J. (1987) Studies of fungicide resistance in *Pyrenopeziza brassicae*, cause of light leaf spot disease of oilseed rape and other brassicas. *Transactions of the British Mycological Society* **88**, 515-523.
- IRVING, F. & KERRY, B.R. (1987) Variation between strains of the nematophagous fungus,

PUBLICATIONS

- Verticillium chlamydosporium* Goddard. II. Factors affecting parasitism of cyst nematode eggs. *Nematologica* **32**, 474-485.
- KERRY, B.R., IRVING, F. & HORNSEY, J.C. (1987) Variation between strains of the nematophagous fungus, *Verticillium chlamydosporium* Goddard. I. Factors affecting growth *in vitro*. *Nematologica* **32**, 461-473.
- LACEY, J. (1987) Nomenclature of *Saccharopolyspora erythraea* Labeda 1987 and *Streptomyces erythraeus* (Waksman 1923) Waksman and Henrici 1948, and proposals for the alternative epithet *Streptomyces labedae* sp. nov. *International Journal of Systematic Bacteriology* **37**, 458.
- LACEY, J. & LACEY, M.E. (1987) Micro-organisms in the air of cotton mills. *Annals of Occupational Hygiene* **31**, 1-19.
- LACEY, M.E., RAWLINSON, C.J. & McCARTNEY, H.A. (1987) First record of the natural occurrence in England of the teleomorph of *Pyrenopeziza brassicae* on oilseed rape. *Transactions of the British Mycological Society* **89**, 135-140.
- (LIU XUN, KONG JIE, ZHANG ZHONG-NING), PICKETT, J.A., (PAN YONCHENG & MENG XIAOYUN) (1987) Field attraction of the photosensitive propheromone to the diamondback moth, *Plutella xylostella* (L). *Sinozoologia* **5**, 15-19.
- (MAUCHAMP, B.) & PICKETT, J.A. (1987) Juvenile hormone-like activity of (*E*)-B-farnesene derivatives. *Agronomie* **7**, 523-529.
- (NICOU, S. DUMAS, E., GIANINAZZI, S.) & WHITE, R.F. (1987) Hypersensitive reaction in *Petunia*. I. Protein changes in the intercellular fluid from *P. axillaris* cv. (M' leaves inoculated with TMV. *Journal of Phytopathology* **119**, 122-130.
- PENNY, A., WIDDOWSON, F.V. & JENKYN, J.F. (1986) Results from experiments on winter barley measuring the effects of amount and timing of nitrogen and some other factors on the yield and nitrogen content of the grain. *Journal of Agricultural Science, Cambridge* **106**, 537-549.
- RICE, S.L., STONE, A.R. & (LEADBEATER, B.S.C.) (1987) Changes in cell structure in roots of resistant potatoes parasitized by potato cyst nematodes. 2. Potatoes with resistance derived from *Solanum vernei*. *Physiological and Molecular Plant Pathology* **31**, 1-14.
- RIGITANO, R.L.O., BROMILOW, R.H., BRIGGS, G.G. & CHAMBERLAIN, K. (1987) Phloem translocation of weak acids in *Ricinus communis*. *Pesticide Science* **19**, 113-133.
- RILEY, A.M. (1987) More on wing mounts. *Antenna* **11**, 90.
- ROBINSON, M.P., (ATKINSON, H.J.) & PERRY, R.N. (1987) The influence of soil moisture and storage time on the motility, infectivity and lipid utilization of second stage juveniles of the potato cyst nematodes *Globodera rostochiensis* and *G. pallida*. *Revue de Nématologie* **110**, 343-348.
- ROBINSON, M.P., (ATKINSON, H.J.) & PERRY, R.N. (1987) The influence of temperature on the hatching, activity and lipid utilization of second stage juveniles of the potato cyst nematodes *Globodera rostochiensis* and *G. pallida*. *Revue de Nématologie* **10**, 349-354.
- ROWLAND, M.W. & (HEMINGWAY, J.) (1987) Changes in malathion resistance with age in *Anopheles stephensi* from Pakistan. *Pesticide Biochemistry and Physiology* **28**, 239-247.
- SAWICKI, R.M. & DENHOLM, I. (1987) Management of resistance to pesticides in cotton pests. *Tropical Pest Management* **33**, 262-272.
- (STOREY, G.W.) & EVANS, K. (1987) Cellular responses of three susceptible cultivars of potato to invasion by the juveniles of *Globodera pallida*. *Revue de Nématologie* **10**, 113-115.
- (STOREY, G.W.) & EVANS, K. (1987) Interactions between *Globodera pallida* juveniles, *Verticillium dahliae* and three potato cultivars, with descriptions of associated histopathologies. *Plant Pathology* **36**, 192-200.

ROTHAMSTED REPORT FOR 1987, PART 1

- TACHELL, G.M. (1987) Agricultural viewdata services in Britain and the role of Rothamsted as an information provider. *Computers and Electronics in Agriculture* **2**, 163-170.
- (THEURI, J.M., BOCK, K.R.) & WOODS, R.D. (1987) Distribution, host range and some properties of a virus disease of sunflower in Kenya. *Tropical Pest Management* **33**, 202-207.
- WALL, C. & PERRY, J.N. (1987) Range of action of moth sex-attractant sources. *Entomologia Experimentalis et Applicata* **44**, 5-14.
- WALL, C., (BOURNOVILLE, R.), GREENWAY, A.R. & (EINHORN, J.) (1987) Efficacy and stability of sex attractant lures for *Cydia nigricana* (F.) and *Cydia medicaginis* (Kuzn.) *Crop Protection* **6**, 7-12.
- WALL, C., GARTHWAITE, D.G., (BLOOD SMYTH, J.A. & SHERWOOD, A.) (1987) The efficacy of sex-attractant monitoring for the pea moth, *Cydia nigricana*, in England, 1980-1985 *Annals of Applied Biology* **110**, 223-229.
- WHITE, R.F., (RYBICKI, E.P., VON WECHMAR, M.B., DECKER, J.L.) & ANTONIW, J.F. (1987) The detection of PR-1 type proteins in various plant species by immunoelectroblotting. *Journal of General Virology* **68**, 2043-2048.
- WHITEHEAD, A.G. & TITE, D.J. (1987) Chemical control of stem nematode, *Ditylenchus dipsaci*, in field beans (*Vicia faba*). *Annals of Applied Biology* **110**, 341-349.
- WHITEHEAD, A.G., FRASER, J.E. & NICHOLS, A.J.F. (1987) Variation in the development of stem nematodes, *Ditylenchus dipsaci*, in susceptible and resistant crop plants. *Annals of Applied Biology* **111**, 373-383.
- WHITEHEAD, A.G., FRASER, J.E., PETERS, C.G. & NICHOLS, A.J.F. (1987) Observations on the control of potato cyst-nematodes, *Globodera rostochiensis* and *G. pallida* in 35 English potato soils in pots by oxamyl and resistant potatoes. *Annals of Applied Biology* **111**, 597-605.
- WHITEHEAD, A.G., TITE, D.J., FRASER, J.E. & NICHOLS, A.J.F. (1987) Control of beet cyst-nematode, *Heterodera schachtii*, by aldicarb applied to the soil by a vertical band-reciprocating harrow technique or by rotary cultivation. *Annals of Applied Biology*, **110**, 127-133.
- WHITEHEAD, A.G., TITE, D.J., FRASER, J.E. & NICHOLS, A.J.F. (1987) Effects of potato genotype, oxamyl and the numbers of potato cyst-nematodes, *Globodera rostochiensis* and *G. pallida* on tuber yields and nematode increase. *Annals of Applied Biology* **111**, 161-172.
- WHITEHEAD, A.G. & (WESTERDIJK, C.E.) (1987) Observations on the distribution of potato cyst-nematodes *Globodera rostochiensis* and *G. pallida* on two fenland potato farms. *Annals of Applied Biology* **110**, 571-578.
- WILLIAMS, I.H. (1987) The pollination of lupins. *Bee World* **68**, 10-16.
- WILLIAMS, I.H., MARTIN, A.P. & (KELM, M.) (1987) The phenology of the emergence of brassica pod midge (*Dasineura brassicae* Winn.) and its infestation of winter oil-seed rape (*Brassica napus*.) *Journal of Agricultural Science, Cambridge* **108**, 579-589.
- WILLIAMS, I.H., MARTIN, A.P. & WHITE, R.P. (1987) The effect of insect pollination on plant development and seed production in winter oil-seed rape (*Brassica napus* L.). *Journal of Agricultural Science, Cambridge* **109**, 135-139.
- YEOMAN, D.P., LAPWOOD, D.H. & McEWEN, J. (1987) Effects of a range of fungicides used to control rust (*Uromyces viciae-fabae*) on spring-sown field beans (*Vicia faba*) in the UK. *Crop Protection* **6**, 90-94.

Paper in Rothamsted Report, Part 2

- WOIWOD, I.P., TACHELL, G.M., DUPUCH, M.J., MACAULAY, E.D.M., PARKER, S.J., RILEY, A.M. & TAYLOR, M.S. (1988) Rothamsted Insect Survey. Nineteenth annual summary. *Rothamsted Experimental Station. Report for 1987*, 195-229.

General Papers

- ANTONIWI, J.F. (1987) Molecular cloning of beet cryptic virus ds RNA. In: *Abstracts 7th International Congress of Virology, Edmonton, Canada, 1987*. **22**, S12.6.
- (BALE, J.S.), HARRINGTON, R. & (CLOUGH, M.S.) (1986) Effect of low temperature on the survival of the peach-potato aphid *Myzus persicae*. In: *Proceedings 3rd European Congress of Entomology, Amsterdam, 1986*. Amsterdam Nederlandse Entomologische Vereniging, pp.243-246.
- (BALE, J.S.), HARRINGTON, R., (KNIGHT, J.D. & CLOUGH, M.S.) (1987) Principles of the cold hardiness and overwintering survival of aphids. In: *Proceedings Crop Protection in Northern Britain 1987*, pp.97-104.
- BALL, B. (1987) The association between acute paralysis virus and *Varroa jacobsoni*. *Pcelar* **3**, 68-70.
- BARKER, I. (1987) Situation review of barley yellow dwarf in Britain. In: *Abstracts CIMMYT Workshop on Barley Yellow Dwarf, Udine, Italy, 1987*, A.5.
- BARKER, I. & TORRANCE, L. (1987) Direct testing of individual aphids for barley yellow dwarf virus by ELISA. In: *Abstracts CIMMYT Workshop on Barley Yellow Dwarf, Udine, Italy, 1987*, A.25.
- BATEMAN, G.L., FITT, B.D.L., KILBY, K. & (HOLLOMON, D.W.) (1987) Variation in eyespot populations a field study. In: *Genetics and plant pathogenesis*. Eds P.R. Day & G.J. Jellis. Oxford: Blackwells, pp.330-332.
- BROMILOW, R.H. (1987) Physico-chemical properties and pesticide placement. In: *Application to seeds and soil. British Crop Protection Monograph 8389* 295-308.
- BURROWS, P. (1987) A cloned DNA fragment specific to *G. pallida*. *Association of Applied Biologists' Meeting, London, 1987*, 16.
- BURROWS, P. & PERRY, R.N. (1987) In search of species and pathotype-specific DNA sequences of *Globodera rostochiensis* and *G. pallida*. In: *British Society for Parasitology Meeting, Edinburgh, 1987*, 53-54.
- CHAMBERLAIN, K., BRIGGS, G.G., BROMILOW, R.H., EVANS, A.A. & CHEN Q. FANG (1987) The influence of physico-chemical properties of pesticides on uptake and translocation following foliar application. In: *Studies of pesticide transfer and performance. Aspects of Applied Biology* **14** 293-304.
- COOK, R. & EVANS, K. (1987) Resistance and tolerance. In: *Principles and practice of nematode control in crops*. Eds R.H. Brown & B.R. Kerry. Sydney: Academic, pp. 179-231.
- CROOK, B., HIGGINS, S. & LACEY, J. (1987) Airborne Gram negative bacteria associated with the handling of domestic waste. In: *Advances in Aerobiology*. Eds G.Boehm & R.M. Leuschner. Basel: Birkhauser Verlag, pp.371-375.
- CROOK, B., (FORSTER, H.W. & PLATTS, B.) (1987) Measurement of aerosols generated in a sugar beet factory. In: *Aerosols—their generation, behaviour and applications. 1st Conference, Loughborough, 1987*. Loughborough: The Aerosol Society, pp.137-140.
- CRUMP, D.M. (1986) Techniques for isolating soil fungi which are naturally pathogenic to *H. schachtii*. *Association of Applied Biologists' Nematology Group Meeting, London, 1986*, Abstract 6.
- DENHOLM, I., SAWICKI, R.M. & FARNHAM, A.W. (1987) Laboratory simulation of selection for resistance. In: *Combating resistance to xenobiotics. Biological and chemical approaches*. Eds M.G. Ford, D.W. Hollomon, B.P.S. Khambay & R.M. Sawicki. Chichester: Ellis Horwood, pp. 138-149.
- DEVONSHIRE, A.L. (1987) Biochemical studies of organophosphorus and carbamate resistance in houseflies and aphids. In: *Combating resistance to xenobiotics: biological and chemical*

ROTHAMSTED REPORT FOR 1987, PART 1

- approaches. Eds M.G. Ford, D.W. Hollomon, B.P.S. Khambay & R.M. Sawicki. Chichester: Ellis Horwood, pp. 239-255.
- DEVONSHIRE, A.L. (1987) The role of biotechnology in limiting the impact of insecticide resistance. In: *Recent developments in AFRC biotechnology*. London: AFRC, pp. 16-17.
- EDEN-GREEN, S.J., (BALFAS, R. & JAMALIUS, B.) (1987) Transmission of xylem-limited bacteria causing Sumatra disease of cloves in Indonesia by tube-building cercopoids, *Hindola* spp. (Homoptera: Machaerotidae). *Proceedings 2nd International Workshop on Leafhoppers and Planthoppers of Economic Importance, Provo, Utah, 1986*. Eds M.R. Wilson & L.R. Nault. London: Commonwealth Institute of Entomology, pp. 101-107.
- EDEN-GREEN, S.J., (BALFAS, R., SUTARJO, T., SUSHIAHTI, N. & HASNAM, N.) (1987) Preliminary results on transmission of xylem-limited bacteria causing Sumatra disease of cloves by tube-building cercopoids, *Hindola* spp. (Homoptera: Machaerotidae). In: *Plant pathogenic bacteria. Proceedings 6th International Conference on Plant Pathogenic Bacteria, Maryland, 1985*. Ed. E.L. Civerolo, A. Collmer, R.E. Davis & A.G. Gillaspie. Dordrecht: Nijhoff, pp. 370-374.
- EDEN-GREEN, S.J., (SUPRIADI, V., HASNAM, N. & HUNT, P.) (1987) Serological relationship between the xylem-limited bacterium causing Sumatra disease of cloves and *Pseudomonas solanacearum*. In: *Plant pathogenic bacteria. Proceedings 6th International Conference on Plant Pathogenic Bacteria, Maryland, 1985*. Ed. E.L. Civerolo, A. Collmer, R.E. Davis & A.G. Gillaspie. Dordrecht : Nijhoff, pp. 357-363.
- ELLIOTT, M., FARNHAM, A.W., JANES, N.F., JOHNSON, D.M., KHAMBAY, B.P.S. & SAWICKI, R.M. (1987) Selectivity and resistance to non-ester pyrethroids and *N*-alkylamides in houseflies (*Musca domestica* L.). In: *Combating resistance to xenobiotics. Biological and chemical approaches*. Eds M.G. Ford, D.W. Hollomon, B.P.S. Khambay & R.M. Sawicki. Chichester: Ellis Horwood, pp. 306-313.
- EVANS, K. (1987) Comparison of row and broadcast treatments with oxamyl of winter oilseed rape infected by brassica cyst nematode. *Tests of Agrochemicals and Cultivars No.8 (Annals of Applied Biology 110, Supplement)*, pp. 20-21.
- FORDE, S.M.D. & PARKER, I. (1987) Strain differentiation of barley yellow dwarf virus isolates using specific monoclonal antibodies in immunosorbent electron microscopy (ISEM). In: *Abstracts CIMMYT Workshop on Barley Yellow Dwarf, Udine, Italy, 1987*, A.99.
- GRIFFITHS, D.C. & PICKETT, J.A. (1987) Novel chemicals and their formulation for aphid control. *Proceedings 14th International Symposium on Controlled Release of Bioactive Materials, Toronto, 1987*. Eds P.I. Lee & B.A. Leonhardt. Toronto: The Controlled Release Society, pp. 32-33.
- HARRINGTON, R. & TAYLOR, M.S. (1987) The Rothamsted Insect Survey and the problem of rapid aphid identification. In: *Population structure, genetics and taxonomy of aphids and thysanoptera*. Proceedings of international symposia, Smolenice, Czechoslovakia, 1985. Eds J. Holman, J. Pelikan, A.F.G. Dixon & L. Weismann. The Hague: SPB Academic Publishing, pp. 267-272.
- HIDE, G.A. (1987) Mist opportunities. *Potato World* **4**, 243-244.
- HIDE, G.A., READ, P.J., SANDISON, J.P. & HALL, S.M. (1987) Control of potato diseases with fungicides applied to seed tubers. *Tests of Agrochemicals and Cultivars No.8 (Annals of Applied Biology 110, Supplement)*, pp. 72-73.
- HIGGINS, S., CROOK, B. & LACEY, J. (1987) Airborne micro-organisms in refuse disposal facilities. In: *Aerosols—their generation, behaviour and applications. 1st Conference, Loughborough, 1987*. Loughborough: The Aerosol Society, pp. 141-144.
- JANES, N.F. (1987) Analysis of chiral pyrethroids, and the relationship between chirality and

PUBLICATIONS

- biological activity. (Abstract of paper presented at *Chirality in Chemical Crop Protection*, London, 1986). *Pesticide Science* **18**, 149-150.
- KERRY, B.R. (1987) An assessment of the role of parasites and predators in the regulation of cyst nematode populations. In: *Cyst nematodes. Proceedings NATO Advanced Study Institute on Cyst Nematodes, Martina Franca, Italy, 1985*. Eds C.E. Taylor & F. Lamberti. London: Plenum Press, pp. 433-450.
- KERRY, B.R. (1987) Biological control. *Principles and practice of nematode control in crops*. Eds R.H. Brown & B.R. Kerry. Sydney: Academic Press, pp. 233-263.
- KERRY, B.R., IRVING, F., BARBA, J. & de LEIJ, F. (1987) Variation between isolates of the nematophagous fungus, *Verticillium chlamydosporium*. *Association of Applied Biologists' Nematology Group Meeting, London, 1987*, Abstract 13..
- KHAMBAY, B.P.S. (1987) Chirality in pyrethroids—synthetic aspects (Abstract of paper presented at *Chirality in Chemical Crop Protection*, London, 1986.) *Pesticide Science* **18**, 150-151.
- LACEY, J. (1987) Airborne fungus spores in outdoor air. In: *Aerosols—their generation, behaviour and applications. 1st Conference, Loughborough, 1987*. Loughborough: The Aerosol Society, pp.125-128.
- LACEY, J. (1987) Airborne spores in the farm environment and respiratory disease. In: *Aerosols—their generation, behaviour and applications. 1st Conference, Loughborough, 1987*. Loughborough: The Aerosol Society, pp.117-120.
- LACEY, J. (1987) Exposure of farm workers to fungi and actinomycetes while harvesting cereal crops and handling stored grain. In: *Proceedings International Symposium on Work-related Respiratory Disorders among Farmers, Kuopio, Finland, 1985*. Eds E.O. Terho, K. Husman & T. Kauppinen. *European Journal of Respiratory Diseases, Supplement 154* **71**, 37-43.
- LACEY, J. (1986) Obituary—P.H. Gregory. *Indian Phytopathology* **39**, i-iii.
- LACEY, J., MAGAN, N., (CUERO, R.G. & SMITH, J.E.) (1987) The influence of water and temperature on moulding and mycotoxin production. In: *Proceedings 4th International Working Conference on Stored-Product Protection (formerly Stored-Product Entomology), Tel-Aviv, 1986*. Eds E. Donahaye & S. Navarro. Bet Dagan: Agricultural Research Organisation and The Volcani Center, pp. 63-76.
- LEWIS, T. (1987) Feeding of *Limothrips cerealium* (Hal.): the mouthparts, their action, and effects on plant tissue. In: *Population structure, genetics and taxonomy of aphids and thysanoptera*. Proceedings of an International Symposium, Smolenice, Czechoslovakia, 1985. Eds J. Holman, J. Pelikan, A.F.G. Dixon & L. Weismann. The Hague: SPB Publishing, pp. 439-447.
- LEWIS, T. (1987) Practice and progress in pest forecasting. In: *Rational pesticide use. Proceedings 9th Long Ashton Symposium*. Eds K.J. Brent & R.K. Atkin. Cambridge: Cambridge University Press, pp.285-299.
- LEWIS, T. (1987) Thrips—a microcosm of the Insecta or beyond the fringe(s). *Antenna* **11**, 92-99.
- LOXDALE, H.D. & BROOKES, C.P. (1987) Use of electrophoretic markers to study the spatial and temporal genetic structure of populations of a holocyclic aphid species—*Sitobion fragariae* (Walker) (Hemiptera: Aphididae). In: *Population structure, genetics and taxonomy of aphids and thysanoptera*. Proceedings of international symposia, Smolenice, Czechoslovakia, 1985. Eds J. Holman, J. Pelikan, A.F.G. Dixon & L. Weismann. The Hague : SPB Academic Publishing, pp. 100-110.
- MAGAN, N. & LACEY, J. (1987) The effect of two ammonium propionate formulations on growth *in vitro* of *Aspergillus* species from hay. In: *Stored product pest control*. Ed. T.J. Lawson. Thornton Heath : BCPC, p. 269.

ROTHAMSTED REPORT FOR 1987, PART 1

- MAGAN, N. & LACEY, J. (1987) The influence of water and temperature on germination and growth of fungi causing spoilage of grain. In: *Stored product pest control*. Ed. T.J. Lawson. Thornton Heath : BCPC, pp. 43-52.
- (MAKKOUK, K.M.), BARBER, I., (ASSAM, O., SKAF, J.) & FORDE, S.M.D. (1987) Serological variability among BYDV isolates from some countries of the Middle East and North Africa. In: *Proceedings 7th International Congress of Virology, Edmonton, 1987*, p. 180.
- McCARTNEY, H.A. & FITT, B.D.L. (1987) Spore dispersal gradients and disease development. In: *Populations of plant pathogens: their dynamics and genetics*. Eds M.S. Wolfe & C.E. Caten. Oxford: Blackwells, pp.109-118.
- NICHOLLS, P.H., EVANS, A.A. & WALKER, A. (1987) The behaviour of chlorsulfuron and metsulfuron in soils in relation to incidents of injury to sugar beet. *Proceedings British Crop Protection Conference—Weeds, Brighton, 1987*, 549-556.
- PERRY, R.N. (1986) A novel hatching bioassay for cyst nematodes. *Association of Applied Biologists' Nematology Group Meeting, London, 1986*, Abstract 3..
- PERRY, R.N. (1987) Physiology of hatching. In: *Cyst nematodes. Proceedings NATO Advanced Study Institute on Cyst Nematodes, Martina Franca, Italy, 1985*. Eds C.E. Taylor & F. Lamberti. London : Plenum Press, pp. 119-131.
- PERRY, R.N. & BEANE, J. (1987) The effect of various herbicides on hatch and invasion of *Globodera rostochiensis*. *Association of Applied Biologists' Nematology Group Meeting, London, 1987*, Abstract 8.
- PICKETT, J.A., DAWSON, G.W., GRIFFITHS, D.C., (HASSANALI, A.), MERRITT, L.A., MUDD, A., SMITH, M.C., WADHAMS, L.J., WOODCOCK, C.M. & ZHANG ZHONG-NING (1987) Development of plant-derived antifeedants for crop protection. In: *Pesticide science and biotechnology*. Eds R. Greenhalgh & T.R. Roberts. Oxford : Blackwells, pp. 125-128.
- PICKETT, J.A., DAWSON, G.W., (LAURENCE, B.R., PILE, M.M.), SMITH, M.C. & WADHAMS, L.J. (1987) Development of the oviposition attractant pheromone for control of *Culex* sp. mosquitoes. *Abstracts 6th International Congress Pesticide Chemistry, IUPAC, Ottawa, 1986*, 2C-07.
- PLUMB, R.T. (1987) Aphid trapping to forecast virus disease. *Span* **30**, 35-37.
- PLUMB, R.T. (1987) Rationalizing pesticide use in the United Kingdom for the control of barley yellow dwarf virus. *Barley Yellow Dwarf Newsletter* **1**, 13-16.
- PLUMB, R.T. (1987) The epidemiology of barley yellow dwarf in Europe. In: *Abstracts CIMMYT Workshop on Barley Yellow Dwarf, Udine, Italy, 1987*, A.29.
- POWELL, W. (1986) Biocontrol of cereal aphids in the United Kingdom by a range of natural enemies. In: *Biological control in the tropics*. Eds M.Y. Hussein & A.G. Ibrahim. Serdang : Penerbit Universiti Pertanian Malaysia, pp. 159-162.
- RAWLINSON, C.J. (1987) A team approach to oilseed rape research. *Span* **30**, 69-71.
- RAWLINSON, C.J. (1987) Factors limiting yield of winter oilseed rape. *Group Consultatif International de Recherche sur le Colza. Bulletin* **3**, 26-27.
- RAWLINSON, C.J. (1987) Multidisciplinary, multifactorial trials on winter oilseed rape: pest and disease factors limiting yield in 1984-85. *SROP/WPRS Bulletin* **10**, 48-56.
- RILEY, A.M. (1987) Butterfly records from the Isle of Wight, 1985. *Entomologist's Record and Journal of Variation* **99**, 224-225.
- RILEY, A.M. (1987) *Cleora conctaria* D & S. (Lep.: Geometridae), the Ringed Carpet in Dumfries-shire. *Entomologist's Record and Journal of Variation* **99**, 160.
- RILEY, A.M. (1987) *Chloroclystis chloerata* Mab. (the Sloe Pug) (Lep.: Geometridae) in Leicestershire. *Entomologist's Record and Journal of Variation* **99**, 260.
- RILEY, A.M. (1987) Early records of *Eupithecia tenuiata* Hubn. (Slender Pug) in Inverness-shire. *Entomologist's Record and Journal of Variation* **99**, 257.

PUBLICATIONS

- RILEY, A.M. (1987) *Eupithecia lariciata* Freyer (Lep.: Geometridae), the Larch Pug in Dumfries-shire. *Entomologist's Record and Journal of Variation* **99**, 152.
- RILEY, A.M. (1987) *Eupithecia virgaureata* Doubl. (Lep.: Geometridae), the Goldenrod Pug in Dumfries-shire. *Entomologist's Record and Journal of Variation* **99**, 184.
- RILEY, A.M. (1987) A further diagnostic feature for the separation of *Eilema lurideola* Zincken and *E. complana* L. (Lep.: Arctiidae). *Entomologist's Record and Journal of Variation* **99**, 28.
- RILEY, A.M. (1987) Further records of *Thaumetopoea processionea* L. (Oak Processionary Moth) (Lep.: Thaumetopoeidae) on Jersey. *Entomologist's Record and Journal of Variation* **99**, 225-226.
- RILEY, A.M. (1987) A guide to the separation of *Lampropteryx eclipopera* and *Electrophaes* species. (Lep.: Geometridae). *Entomologist's Record and Journal of Variation* **99**, 281-282.
- RILEY, A.M. (1987) *Lomographa cararia* (Hubn.) (Lep.: Geometridae) on Jersey—a new species to the Channel Islands and the British Isles. *Entomologist's Record and Journal of Variation* **99**, 65-66.
- RILEY, A.M. (1987) Pimpinel Pug (*Eupithecia pimpinellata* Hubn.) (Lep.: Geometridae) in Leicestershire. *Entomologist's Record and Journal of Variation* **99**, 68.
- RILEY, A.M. (1987) Pinion-spotted Pug (*Eupithecia insigniata* Hubn.) (Lep.: Geometridae) in Suffolk. *Entomologist's Record and Journal of Variation* **99**, 66.
- RILEY, A.M. (1987) White-spotted Pug (*Eupithecia tripunctaria* H.-S.) (Lep.: Geometridae) in Cardiganshire. *Entomologist's Record and Journal of Variation* **99**, 129.
- ROWLAND, M.W. (1987) Fitness of insecticide resistance. *Nature* **327**, 194.
- SAWICKI, R.M. (1987) Definition, detection and documentation of insecticide resistance. In: *Combating resistance to xenobiotics. Biological and chemical approaches*. Eds M.G. Ford, D.W. Hollomon, B.P.S. Khambay & R.M. Sawicki. Chichester : Ellis Horwood, pp. 105-117.
- (SMITH, J.E., CUERO, R.G.) & LACEY, J. (1987) The influence of pretreatment of maize seeds by irradiation or autoclaving on growth and aflatoxin production by *Aspergillus flavus*. In: *Stored product pest control*. Ed. T.J. Lawson. Thornton Heath : BCPC, pp.63-69.
- STONE, A.R. (1987) Genetic systems in plant pathogenic nematodes and their hosts. In: *Genetics and plant pathogenesis* Eds P.R. Day & G.J. Jellis. Oxford : Blackwells, pp. 101-109.
- STONE, A.R. (1987) Taxonomy and phylogeny of cyst nematodes. In: *Cyst nematodes. Proceedings NATO Advanced Study Institute on Cyst Nematodes, Martina Franca, Italy, 1985*. Eds C.E. Taylor & F. Lamberti. London : Plenum Press, pp. 1-21.
- (SUNDERLAND, K.D., HAWKES, C.), STEVENSON, J.H., (McBRIDE, T.), SMART, L.E., (SOPP, P.I.), POWELL, W., (CHAMBERS, R.J. & CARTER, O.C.R.) (1987) Accurate estimation of invertebrate density in cereals. *Bulletin SROP/OILB* **10**, 71-81.
- TATCHELL, G.M. & WOIWOD, I.P. (1986) The role of the Rothamsted Insect Survey in aphid monitoring and forecasting. *Proceedings Parasitica* **86**, 171.
- WADHAMS, L.J. (1987) GC analysis of chiral insect pheromones. (Abstract of paper presented at *Chirality in Chemical Crop Protection*, London, 1986.) *Pesticide Science* **18**, 152-153.
- WILDING, N. & (LATTEUR, G.) (1987) The Entomophthorales-problems relative to their mass production and their utilisation. *Mededelingen van de Faculteit Landbouwwetenschappen Rijksuniversiteit Gent* **52(2a)**, 159-164.
- WOIWOD, I.P. (1987) Assessing environmental change by monitoring moth populations. In: *Science, agriculture and the environment*. Ed. J. Hardcastle. London : AFRC, pp. 2-3.

ROTHAMSTED REPORT FOR 1987, PART 1

CROP SCIENCE DIVISION

Theses

- HENDERSON, J. (1987) *Protein deposition in developing barley endosperm*. Ph.D. Thesis, University of Durham.
- JOHNSON, R. (1987) *Properties and synthesis of ribulose-1,5-bisphosphate carboxylase large subunit binding protein in Hordeum vulgare*. Ph.D. Thesis, University of Warwick.
- TWELL, D. (1987) *Molecular analysis of the patatin gene family of potato (Solanum tuberosum L.)*. Ph.D. Thesis, University of London.

Research Papers

- (BELTON, P.S., DUCE, S.L.) & TATHAM, A.S. (1987) ^{13}C solution and solid state nuclear magnetic resonance study of wheat gluten. *International Journal of Biological Macromolecules* **9**, 357-362.
- BOYLE, F.A. & KEYS, A.J. (1987) The state of activation of ribulose-1,5-bisphosphate carboxylase in wheat leaves. *Photosynthesis Research* **11**, 97-108.
- (BREIMAN, A., ROTEM-ABARBANELL, D.), KARP, A. & (SHASHKIN, H.) (1987) Heritable somaclonal variation in wild barley (*Hordeum spontaneum*). *Theoretical and Applied Genetics* **74**, 104-122.
- BURGESS, S.R., FESTENSTEIN, G.N., (HAY, F.C.) & SHEWRY, P.R. (1987) The immunochemical relationships of prolamins of temperate meadow grasses and cereals. *Journal of Experimental Botany* **38**, 247-253.
- BYERS, M., McGRATH, S.P. & WEBSTER, R. (1987) A survey of the sulphur content of wheat grown in Britain. *Journal of the Science of Food and Agriculture* **38**, 151-160.
- (DE VRIES, S.E., JACOBSEN, E.), JONES, M.G.K., (LOONEN, A.E.H.M., TEMPELAAR, M.J., WIJBRANDI, J. & FEENSTRA, W.J.) (1987) Complementation studies of biochemically well-characterised nitrate reductase deficient mutants of *Nicotiana plumbaginifolia* by electrofusion. *Plant Science* **51**, 105-112.
- (DE VRIES, S.E., JACOBSEN, E.), JONES, M.G.K., (LOONEN, A.E.H.M., TEMPELAAR, M.J., WIJBRANDI, J. & FEENSTRA, W.J.) (1987) Somatic hybridization of amino acid analogue-resistant cell lines of potato (*Solanum tuberosum* L.) by electrofusion. *Theoretical and Applied Genetics* **73**, 451-458.
- (DUNN, R.), THOMAS, S.M., KEYS, A.J. & (LONG, S.P.) (1987) A comparison of the growth of the C_4 grass *Spartina anglica* with the C_3 grass *Lolium perenne* at different temperatures. *Journal of Experimental Botany* **38**, 433-441.
- FESTENSTEIN, G.N., (HAY, F.C.) & SHEWRY, P.R. (1987) Immunochemical relationships of the prolamins storage proteins of barley, wheat, rye and oats. *Biochimica et Biophysica Acta* **912**, 371-383.
- (FIELD, J.M.) & SHEWRY, P.R. (1987) Prolamin subunit interactions in hexaploid and octaploid Triticales and their wheat and rye parents. *Journal of Cereal Science* **6**, 199-210.
- (FIELD, J.M.), TATHAM, A.S. & SHEWRY, P.R. (1987) The structure of a high-M_r subunit of durum-wheat (*Triticum durum*) gluten. *Biochemical Journal* **247**, 215-221.
- FISH, N. KARP, A. & JONES, M.G.K. (1987) Improved isolation of dihaploid *Solanum tuberosum* protoplasts and the production of somatic hybrids between dihaploids, *S. tuberosum* and *S. brevidens*. *In Vitro Cellular and Developmental Biology* **23**, 575-580.
- KARP, A., STEELE, S.H., PARMAR, S., JONES, M.G.K., SHEWRY, P.R. & (BREIMAN, A.) (1987) Relative stability amongst barley plants regenerated from cultured immature embryos. *Genome* **29**, 405-412.
- KARP, A., WU, Q.S., STEELE, S.H. & JONES, M.G.K. (1987) Chromosome variation in

PUBLICATIONS

- dividing protoplasts and cell suspensions of wheat. *Theoretical and Applied Genetics* **74**, 140-146.
- KREIS, M., WILLIAMSON, M.S., BUXTON, B., PYWELL, J., (HEJGAARD, J. & SVENDSEN, I.) (1987) Primary structure and differential expression of beta-amylase in normal and mutant barleys. *European Journal of Biochemistry* **169**, 517-525.
- KRUGER, N.J. & (DENNIS, D.T.) (1987) Molecular properties of pyrophosphate : fructose 6-phosphate phosphotransferase from potato tuber. *Archives of Biochemistry and Biophysics* **256**, 273-279.
- LAWLOR, D.W., BOYLE, F.A., KENDALL, A.C. & KEYS, A.J. (1987) Nitrate nutrition and temperature effects on wheat : enzyme composition, nitrate and total amino acid content of leaves. *Journal of Experimental Botany* **38**, 378-392.
- LAWLOR, D.W., BOYLE, F.A., YOUNG, A.T., KENDALL, A.C. & KEYS, A.J. (1987) Nitrate nutrition and temperature effects on wheat : soluble components of leaves and carbon fluxes to amino acids and sucrose. *Journal of Experimental Botany* **38**, 1091-1103.
- LAWLOR, D.W., BOYLE, F.A., YOUNG, A.T., KEYS, A.J. & KENDALL, A.C. (1987) Nitrate nutrition and temperature effects on wheat : photosynthesis and photorespiration of leaves. *Journal of Experimental Botany* **38**, 393-408.
- LINDSEY, K. & JONES, M.G.K. (1987) The permeability of electroporated cells and protoplasts of sugar beet. *Planta* **172**, 346-355.
- LINDSEY, K. & JONES, M.G.K. (1987) Transient gene expression in electroporated protoplasts and intact cells of sugar beet. *Plant Molecular Biology* **10**, 43-52.
- LYONS, A., (RICHARDSON, M.), TATHAM, A.S. & SHEWRY, P.R. (1987) Characterization of homologous inhibitors of trypsin and alpha-amylase from seeds of rye (*Secale cereale* L.). *Biochimica et Biophysica Acta* **915**, 305-313.
- MADDOCK, S.E. (1987) Suspension and protoplast culture of hexaploid wheat. *Plant Cell Reports* **6**, 23-26.
- OOMS, G., BURRELL, M.M., KARP, A., (BEVAN, M. & HILLE, J.) (1987) Genetic transformation in two cultivars with T-DNA from disarmed *Agrobacterium*. *Theoretical and Applied Genetics* **73**, 744-750.
- PARRY, M.A.J., SCHMIDT, C.N.G., CORNELIUS, M.J., MILLARD, B.N., BURTON, S., GUTTERIDGE, S., (DYER, T.A.) & KEYS, A.J. (1987) Variations in properties of ribulose-1, 5-bisphosphate carboxylase from various species related to differences in amino acid sequences. *Journal of Experimental Botany* **38**, 1260-1271.
- PIERPOINT, W.S., TATHAM, A.S. & (PAPPIN, D.J.C.) (1987) Identification of the virus-induced protein of tobacco leaves that resembles the sweet-protein thaumatin. *Physiological and Molecular Pathology* **31**, 291-298.
- REA, P.A. & (SANDERS, D.) (1987) Tonoplast energization : two H⁺-pumps, one membrane. *Physiologia Plantarum* **71**, 131-141.
- REA, P.A., (GRIFFITH, C.J. & SANDERS, D.) (1987) Purification of the N,N (-dicyclohexyl-carbodiimide-binding) proteolipid of a higher plant tonoplast H⁺-ATPase. *Journal of Biological Chemistry* **262**, 14745-14752.
- REA, P.A., (GRIFFITH, C.J., MANOLSON, M.F. & SANDERS, D.) (1987) Irreversible inhibition of H⁺-ATPase of higher plant tonoplast by chaotropic anions : evidence for peripheral location of nucleotide-binding subunits. *Biochimica et Biophysica Acta* **904**, 1-12.
- (SERVAITES, J.C.), PARRY, M.A.J., GUTTERIDGE, S. & KEYS, A.J. (1986) Species variation in the predawn inhibition of ribulose-1, 5-bisphosphate carboxylase/oxygenase. *Plant Physiology* **82**, 1161-1163.
- SHEWRY, P.R., PARMAR, S. & (PAPPIN, D.J.C.) (1987) Characterization and genetic control of the prolamins of *Haynaldia villosa*: relationship to cultivated species of the Triticeae (rye, wheat and barley). *Biochemical Genetics* **25**, 309-325.

ROTHAMSTED REPORT FOR 1987, PART 1

- TATHAM, A.S., (FIELD, J.M.), SMITH, S.J. & SHEWRY, P.R. (1987) The conformations of wheat gluten proteins, II Aggregated gliadins and low molecular weight subunits of glutenin. *Journal of Cereal Science* **5**, 203-214.
- (TEMPELAAR, M.J., DUYST, A., DE VLAS, S.y., KROL, G.), SYMONDS, C. & JONES, M.G.K. (1987) Modulation and direction of the electrofusion response in plant protoplasts. *Plant Science* **48**, 99-100.
- TWELL, D. & OOMS, G. (1987) The 5' flanking DNA of a patatin gene directs tuber specific expression of a chimaeric gene in potato. *Plant Molecular Biology* **9**, 365-375.
- WALLSGROVE, R.M., TURNER, J.C., HALL, N.P., KENDALL, A.C. & BRIGHT, S.W.J. (1987) Barley mutants lacking glutamine synthetase—biochemical and genetic analysis. *Plant Physiology* **83**, 155-158.
- (WELLS, T.K.), HAMMOND, J.B.W. & (DICKERSON, A.G.) (1987) Trehalase and glycogen phosphorylase activities during periodic fruiting of *Agaricus bisporus*. *New Phytologist* **105**, 273-280.
- WILLIAMSON, M., FORDE, J., BUXTON, B. & KREIS, M. (1987) Nucleotide sequence of barley chymotrypsin inhibitor-2 (CI-2) and its expression in normal and high-lysine barley. *European Journal of Biochemistry* **165**, 99-106.

General Papers

- AUSTIN, R.B., FORD, M.A., MILLER, T.E., MORGAN, C.L. & PARRY, M.A.J. (1987) Variation in photosynthetic characteristics among *Triticum* species and attempts to exploit it in breeding. *Progress in photosynthesis research, Vol. 4*. Ed. J. Biggins. Dordrecht : Nijhoff, pp. 361-368.
- (BELTON, P.S., DUCE, S.L.) & TATHAM, A.S. (1987) Nuclear magnetic resonance studies of wheat gluten. In: *Cereals in a European context*. Ed. I.D. Morton. Chichester : Ellis Horwood, pp. 489-497.
- (BLUMWALD, E.), REA, P.A. & (POOLE, R.J.) (1987) Preparation of tonoplast vesicles : applications to H⁺-coupled secondary transport in plant vacuoles. *Methods in Enzymology* **148**, 193-198.
- BURRELL, M.M., HAMMOND, J.B.W. & KRUGER, N.J. (1987) Characterization of multiple forms of potato tuber phosphofructokinase. In: *Abstracts 14th International Botanic Congress, Berlin, 1987*, p. 67.
- BYERS, M., FRANKLIN, J. & SMITH, S.J. (1987) The nitrogen and sulphur nutrition of wheat and its effect on the composition and baking quality of the grain. In: *Cereal quality. Aspects of Applied Biology* **15**, 337-344.
- DeBOTH, M.T.J. & JONES, M.G.K. (1987) Electroporation of tobacco protoplasts as a model system to study plant gene expression. In: *Proceedings 7th International Protoplast Symposium, Wageningen, 1987*, p. 103.
- EADY, C., (WARREN, G.), LINDSEY, K. & JONES, M.G.K. (1987) Electrofusion and electroporation of sugar beet protoplasts. In: *Proceedings 7th International Protoplast Symposium, Wageningen, 1987*, p. 91.
- FISH, N. & JONES, M.G.K. (1987) Cultivating our wild relations. *Potato World* **4**, 22-23.
- FISH, N. & KARP, A. (1987) A study on the effect of different initial culture media on chromosome stability of *Solanum tuberosum* cv. Maris Bard protoplast derived regenerants. In: *Proceedings International Symposium on Genetic Manipulation in Plant Breeding*. Eds W. Horn, C.J. Jensen, W. Odenbach & O. Schieder. Berlin: Walter de Gruyter, pp. 601-605.
- FORDE, B.G., TURTON, J., OLIVER, J.E., DAY, H.M. & HOPLEY, A.P. (1987) Studies on the developmental regulation of glutamine synthetase genes in *Phaseolus vulgaris*. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 32.

PUBLICATIONS

- GALLOIS, P., MARRIS, C., FORDE, B.G. & KREIS, M. (1987) Seed-specific expression of a B-hordein gene in transgenic tobacco plants. *Plant Physiology* **83S**, 150.
- GUTTERIDGE, S., PARRY, M.A.J., KEYS, A.J., (SERVAITES, J. & FEENEY, J.) (1987) The structure of the naturally occurring inhibitor of rubisco that accumulates in the chloroplast in the dark is 2-carboxyarabinitol-1-phosphate. *Progress in photosynthesis research, Vol.3*. Ed. J. Biggins. Dordrecht : Nijhoff, pp. 395-398.
- HALL, N.P., KENDALL, A.C., TURNER, J.C. & WALLSGROVE, R.M. (1987) Selection screen for novel photorespiration mutants of barley. *Plant Physiology* **83S**, 64.
- HASEGAWA, H., TURNER, J.C., KENDALL, A.C. & WALLSGROVE, R.M. (1987) Selection strategies for isolation of nitrate uptake deficient mutants in barley. *Japanese Journal of Breeding* **37S**, 2.
- (JENNINGS, I.R.), REA, P.A. & (SANDERS, D.) (1987) A microcomputer-based system for the recording and analysis of fluorescence transients from membrane vesicles. In: *Plant vacuoles: their importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York: Plenum, pp. 57-62.
- JONES, M.G.K. (1987) The application of cell biological techniques to crop improvement. In: *World biotech report 1987 (Agriculture, economics and technology)*. Pinner : Online, pp. 45-54.
- JONES, M.G.K. (1987) Introduction and expression of foreign genes in cereals. In: *Cereal quality. Aspects of Applied Biology* **15**, 569-580..
- JONES, M.G.K. (1987) Use of protoplast fusion and somaclonal variation in potato breeding. In: *The production of new potato varieties : technological advances*. Eds G. J. Ellis & D.E. Richardson. Cambridge : Cambridge University Press, pp. 313-324.
- JONES, M.G.K. & FISH, N. (1987) Production and characterisation of somatic hybrids of potato (*Solanum* sp.). *Abstracts 14th International Botanical Congress, Berlin, 1987*, p. 167.
- JONES, H., SYMONDS, C.J. & JONES, M.G.K. (1987) Transient expression of genes electroporated into protoplasts of cultivated and wild potato. In: *Proceedings 7th International Protoplast Symposium, Wageningen, 1987*, p. 102.
- JONES, M.G.K. KARP, A., JONES, H., COOPER-BLAND, S., LINDSEY, K., WU, Q.S., LEE, B.T., DeBOTH, M.T.J. & FISH, N. (1987) Electrofusion and electroporation of crop plant protoplasts. In: *Genetic and cellular engineering of plants and microorganisms important for agriculture*. Abstracts CEC Meeting of Biotechnology Action Programme, Louvain, 1987. Eds D. de Nettanourt & E. Magnien. Louvain : CEC, pp. 97-98.
- KARP, A. & SHEWRY, P.R. (1987) Cell and molecular biology : what do they have in store for the grain trade? *Proceedings International Grain Forum, Amsterdam, 1986*, 129-148.
- KARP, A. (1987) Chromosome variation in regenerated plants. In: *Proceedings International Symposium on Genetic Manipulation in Plant Breeding*. Eds W. Horn, C.J. Jensen, W. Odenbach & O. Schieder. Berlin : Walter de Gruyter, pp. 547-554.
- KARP, A., JONES, M.G.K., FOULGER, D., OOMS, G. & BRIGHT, S.W.J. (1987) Potato protoplasts and tissue culture in crop improvement. In: *Biotechnology and genetic engineering reviews*. Ed. E. Russell. Wimbourne : Intercept, pp. 1-32.
- KARP, A., WU, Q.S. & JONES, M.G.K. (1987) Cytology of wheat suspensions and cultured protoplasts. *Annual Wheat Newsletter* **33**, 102.
- KENDALL, A.C., BRIGHT, S.W.J., HALL, N.P., KEYS, A.J., LEA, P.J., TURNER, J.C. & WALLSGROVE, R.M. (1987) Barley photorespiration mutants. *Progress in photosynthesis research, Vol.3*. Ed. J. Biggins. Dordrecht : Nijhoff, pp. 629-632.
- KEYS, A.J. (1987) Rubisco : its role in photorespiration. In: *Ribulose biphosphate carboxylase-oxygenase*. Eds R.J. Ellis & J.C. Gray. Cambridge : Cambridge University Press, pp. 21-32.
- KEYS, A.J., PARRY, M.A.J., PHILLIPS, A.L., HALL, N.P. & KENDALL, A.C. (1987) Properties

ROTHAMSTED REPORT FOR 1987, PART 1

- of Rubisco in relation to the control of photorespiration. *Progress in photosynthesis research, Vol.3*. Ed. J. Biggins. Dordrecht : Nijhoff, pp. 611-616.
- KREIS, M., FORDE, J., WILLIAMSON, M.S. & SHEWRY, P.R. (1987) Characterisation of proteins and genes determining barley feed quality. In: *Cereal quality. Aspects of Applied Biology 15*, 97-103.
- KREIS, M., WILLIAMSON, M.S., FORDE, J., CLARKE, J., BUXTON, B., PYWELL, J., MARRIS, C., GALLOIS, P. & SHEWRY, P.R. (1987) Structure and regulation of expression of seed proteins in barley. *Plant Physiology and Biochemistry* **25**, 291-302.
- LAWLOR, D.W., KEYS, A.J., KENDALL, A.C. & YOUNG, A.T. (1987) Regulation of nitrogen and carbon metabolism in wheat by nitrate supply and temperature. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 28.
- LAWLOR, D.W., KONTTURI, M., YOUNG, A.T., KEYS, A.J. & PARRY, M.A. (1987) Flag leaf photosynthesis does not increase in proportion to ribulose biphosphate carboxylase-oxygenase with large nitrate supply. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 17.
- LEE, B.T., DeBOTH, M.T.J., MURDOCH, K., TOPPING, J., WU, Q.S., STEELE, S.H., KREIS, M. & JONES, M.G.K. (1987) Studies on gene transfer into cereals. *Abstracts 14th International Botanical Congress, Berlin, 1987*, p. 182.
- LEE, B.T., MURDOCH, K., TOPPING, J., DeBOTH, M.T.J., WU, Q.S., KARP, A., STEELE, S., SYMONDS, C., KREIS, M. & JONES, M.G.K. (1987) Isolation, culture and morphogenesis from wheat protoplasts and study of expression of DNA constructs by direct gene transfer. In: *Proceedings 7th International Protoplast Symposium, Wageningen, 1987*, p. 24.
- MARQUEZ, A., AVILA, C., FORDE, B.G. & WALLSGROVE, R.M. (1987) Ferredoxin-glutamate synthase from barley leaves— purification and properties. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 35.
- (MORRIS, P.C., WEILER, E.M.), JONES, M.G.K. & (BOWLES, D.J.) (1987) Role of ABA in the regulation of gene expression during cereal embryogenesis. *Abstracts 14th International Botanical Congress, Berlin, 1987*, p. 135.
- OOMS, G. (1987) Controlling differentiation and endogenous growth regulator content by means of genetic transformations. In: *Advances in the chemical manipulation of plant tissue cultures. British Plant Growth Regulator Group Monograph 16*, 1-17..
- OOMS, G. (1987) Genetic manipulation in potato using *Agrobacterium*. In: *The production of new potato varieties : technological advances*. Eds G. J. Ellis & D.E. Richardson. Cambridge : Cambridge University Press, pp. 293-308.
- (POOLE, R.J., MANOLSON, M.F.) & REA, P.A. (1987) Plant vacuolar ATPases and pyrophosphatases. *Abstracts 14th International Botanical Congress, Berlin, 1987*, p. 21.
- REA, P.A., (BLUMWALD, E. & POOLE, R.J.) (1987) Tonoplast vesicles : a model system for the study of H⁺-coupled transport. In: *Models in plant physiology and biochemistry. Vol.3*. Eds. D.W. Newman & K.G. Wilson. Florida : CRC Press, pp. 20-25.
- REA, P.A., (GRIFFITH, C.J. & SANDERS, D.) (1987) A third-category and a fourth-category H⁺-phosphohydrolase at the tonoplast. In: *Plant vacuoles : their importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York : Plenum, pp. 157-171.
- REA, P.A., (GRIFFITH, C.J. & SANDERS, D.) (1987) Differential susceptibilities of tonoplast ATPase and PPase to irreversible inhibition by chaotropic anions. In: *Plant vacuoles : their importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York : Plenum, pp. 178-186.
- REA, P.A., (GRIFFITH, C.J. & SANDERS, D.) (1987) Structure/function partitioning of tonoplast H⁺-ATPase. *Plant Physiology* **83S**, 947.
- REA, P.A., LEIGH, R.A. & (SANDERS, D.) (1987) Wash-activated Na⁺/H⁺ exchange in tonoplast vesicles from *Beta vulgaris* storage root disks. In: *Plant vacuoles : their*

PUBLICATIONS

- importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York : Plenum, pp. 227-233.
- (SANDERS, D.) & REA, P.A. (1987) H⁺-coupled transport at the plasma membrane and tonoplast. In: *Plant membrane solute transport*. Eds M.J. Beilby, J.R. Smith & N.A. Walker. Canberra : Australian Academy, pp. 102-112.
- SHEWRY, P.R. (1987) Methods for the analysis of cereal prolamins. In: *Agriculture: protein evaluation in cereals and legumes*. Proceedings of a seminar in the CEC programme of coordination of agricultural research on plant productivity, Thessaloniki, 1985. Ed. V. Pattakou. Luxembourg : CEC, pp.5-19.
- SHEWRY, P.R. & KREIS, M. (1987) Biotechnology and improvement of feeds. *Proceedings of the Nutrition Society* **46**, 379-385.
- SHEWRY, P.R. & KREIS, M. (1987) Improving cereal feed quality by genetic engineering. *Milling* October, 36-37.
- SHEWRY, P.R. & PARMAR, S. (1987) The *HrdF* (*Hor 5*) locus encodes gamma-type hordeins. *Barley Genetics Newsletter* **17**, 32-34.
- SHEWRY, P.R. & TATHAM, A.S. (1987) Recent advances in our understanding of cereal seed protein structure and functionality. *Comments on Agricultural and Food Chemistry* **1**, 71-93.
- SHEWRY, P.R., (FIELD, J.M.) & TATHAM, A.S. (1987) The structure of cereal seed storage proteins. In: *Cereals in a European context*. Ed. I.D. Morton. Chichester : Ellis Horwood, pp. 421-437.
- SHEWRY, P.R., WILLIAMSON, M.S. & KREIS, M. (1987) Effects of mutant genes on the synthesis of storage components in developing barley endosperms. In: *Developmental mutants in higher plants*. Eds H. Thomas & D. Grierson. Cambridge : Cambridge University Press, pp.95-118.
- SHEWRY, P.R., KREIS, M., BURRELL, M.M. & MIFLIN, B.J. (1987) Improvement of the processing properties of British crops by genetic engineering. In: *Food biotechnology-1*. Eds R.D. King and P.S.J. Cheetham. London : Elsevier, pp.49-85.
- SHEWRY, P.R., PARMAR, S., WHITE, R.P. & FRANKLIN, J. (1987) Mapping and biochemical analysis of the *Hor 4* (*Hrd G*) locus encoding B hordein-like polypeptides. *Barley Genetics Newsletter* **17**, 87-89.
- SHEWRY, P.R., WILLIAMSON, M.S., BURGESS, J.R. & KREIS, M. (1987) Polymorphism of barley seed proteins and their genes as markers for linked characters on chromosome 5. *Abstracts 14th International Botanical Congress, Berlin, 1987*, p. 169.
- TATHAM, A.S., (FIELD, J.M.) & SHEWRY, P.R. (1987) Model studies of wheat gluten elasticity. In: *Cereal quality. Aspects of Applied Biology* **15**, 91-95.
- TWELL, D. & OOMS, G. (1987) Tuber-specific manipulation in potato. In: *Genetic and cellular engineering of plants and microorganisms important for agriculture*. Abstracts CEC Meeting of Biotechnology Action Programme, Louvain, 1987. Eds D. de Nettanourt & E.Magnien. Louvain : CEC, pp. 112-113.
- WALLSGROVE, R.M. (1987) The roles of glutamine synthetase and glutamate synthase in nitrogen metabolism of higher plants. In: *Inorganic nitrogen metabolism*. Eds W.R. Ullrich, P.J. Aparacio, P.J. Syrett & F. Castillo. Berlin : Springer Verlag, pp. 137-141.
- WALLSGROVE, R.M., KENDALL, A.C., HALL, N.P., TURNER, J. & BRIGHT, S.W.J. (1987) Biochemical and molecular genetics of nitrogen assimilation and re-assimilation in barley. *Journal of the Science of Food and Agriculture* **28**, 318-319.
- WILLIAMSON, M.S., FORDE, J., PETERSON, D. & KREIS, M. (1987) Expression of barley chymotrypsin inhibitor genes. *Plant Physiology* **83S**, 163.
- WU, Q.S., DeBOTH, M.T.J. & JONES, M.G.K. (1987) Dividing protoplasts of wheat and their use for introducing foreign genes. *Annual Wheat Newsletter* **33**, 102.

ROTHAMSTED REPORT FOR 1987, PART 1

SOILS AND CROP PRODUCTION DIVISION

Books

- (MONNIER, G.) & GOSS, M.J. (Eds) (1987) *Soil compaction and regeneration*. Rotterdam : A. A. Balkema.
- NEWMAN, A.C.D. (Ed.) (1987) *Chemistry of clays and clay minerals* Harlow : Longman Scientific & Technical; London : Mineralogical Society.
- (PEARCE, S.C., CLARKE, G.M.), DYKE, G.V. & (KEMPSON, R.E.) (1987) *A manual of crop experimentation*. London : Charles Griffin.
- PIRIE, N.W. (1987) *Leaf protein and its by-products in human and animal nutrition*. Cambridge : Cambridge University Press.

Theses

- PERRY, C.A. (1986) *Osmotic factors affecting sucrose storage and mobilisation in storage roots of Beta vulgaris L.* Ph.D. Thesis, University of Southampton.
- REYNOLDS, P.J. (1985) *The nature, origin and distribution of Quaternary brickearth soils in South Hampshire*. Ph.D. Thesis, University of London.
- SCOTT, G.J.T. (1987) *Analysis of crack pattern in clay soil*. Ph.D. Thesis, University of Reading.
- SNELLGROVE, R.C. (1987) *Effects of vesicular-arbuscular mycorrhizas on the carbon and phosphorus physiology of Allium species*. Ph.D. Thesis, CNA.

Research Papers

- ADDISCOTT, T.M. & WHITMORE, A.P. (1987) Computer simulation of changes in soil mineral nitrogen and crop nitrogen during autumn, winter and spring. *Journal of Agricultural Science, Cambridge* **109**, 141-157.
- AMIJEE, F. & STRIBLEY, D.P., (1987) Soluble carbohydrates of vesicular-arbuscular mycorrhizal fungi. *The Mycologist* **21**, 20-21.
- ARIAS, I., SAINZ, M.J., GRACE, C.A. & HAYMAN, D.S. (1987) Direct observation of vesicular-arbuscular mycorrhizal infection in fresh unstained roots. *Transactions of the British Mycological Society* **89**, 128-131.
- (AYLING, S.M.), BACON, E., CHRISTIAN, D.G. & GOSS, M.J. (1987) The growth and yield of winter wheat following ten years of continuous ploughing, shallow-tine cultivation or direct drilling on a non-calcareous clay soil. *Journal of Agricultural Science, Cambridge* **108**, 335-340.
- BROOKES, P.C. (1987) ATP and adenylate energy charge measurements in soil. *Journal of the Science of Food and Agriculture* **40**, 129-130.
- BROOKES, P.C. & McGRATH, S.P. (1987) Adenylate energy charge in metal-contaminated soil. *Soil Biology and Biochemistry* **19**, 219-220.
- BROOKES, P.C., NEWCOMBE, A.D. & JENKINSON, D.S. (1987) Adenylate energy charge measurements in soil. *Soil Biology and Biochemistry* **19**, 211-217.
- BROWN, G., WOOD, I.G. & NICHOLLS, L. (1987) Thermal and mechanical instabilities in the alignment of Bragg-Brentano parafocussing powder diffractometers. *Powder Diffraction* **2**, 7-21.
- BROWN, M.E. & HORNBY, D. (1987) Effects of nitrate and ammonium on wheat roots in gnotobiotic culture: amino acids, cortical cell death and take-all (caused by *Gaeumannomyces graminis* var. *tritici*). *Soil Biology and Biochemistry* **19**, 567-573.
- BYERS, M., McGRATH, S.P. & WEBSTER, R. (1987) A survey of the sulphur content of wheat grown in Britain. *Journal of the Science of Food and Agriculture* **38**, 151-160.

PUBLICATIONS

- CATT, J.A., BATEMAN, R.M., (WINTLE, A.G.) & MURPHY, C.P. (1987) The 'loess' section at Borden, Kent, SE England. *Journal of Quaternary Science* **2**, 141-147.
- CATT, J.A., (REYNOLDS, K.S. & REYNOLDS, P.J.) (1987) Long Slade Bottom, New Forest: prehistoric farming and colluvial history. In: *Wessex and the Isle of Wight. Field guide*. Ed. K.E. Barber. Cambridge : Quaternary Research Association, pp. 5-11.
- COOKE, G.W. (1987) Yield limiting factors and their correlation in the systems of agriculture. *Vestnik Sel'skokhozyaistvennoi Nauki (Moscow, USSR)* **2**, 123-130.
- DAY, W., LAWLOR, D.W. & DAY, A.T. (1987) The effect of drought on barley yield and water use in two contrasting years. *Irrigation Science* **8**, 115-130.
- (DE ARAMBARRI, P.) & TALIBUDEEN, O. (1987) Changes in the mineralogy of a cultivated marsh soil caused by simulated weathering. *Journal of Soil Science* **38**, 13-17.
- (EHLERS, W.), GOSS, M.J. & (BOONE, F.R.) (1986) Tillage effects on soil moisture, root development and crop water extraction. *Plant Research and Development* **25**, 92-110.
- ESTAUN, V., CALVET, C. & HAYMAN, D.S. (1987) Influence of plant genotype on mycorrhizal infection : response of three pea cultivars. *Plant and Soil* **103**, 295-299.
- EVANS, R. & CATT, J.A. (1987) Causes of crop patterns in eastern England. *Journal of Soil Science* **38**, 309-324.
- FITT, B.D.L., GREGORY, P.H., TODD, A.D., McARTNEY, H.A. & MacDONALD, O.C. (1987) Spore dispersal and plant disease gradients; a comparison between two empirical models. *Journal of Phytopathology* **118**, 227-242.
- (GIBBARD, P.L., WINTLE, A.G.) & CATT, J.A. (1987) Age and origin of clayey silt 'brickearth' in west London, England. *Journal of Quaternary Science* **2**, 3-9.
- GOSS, M.J., (DEXTER, A.R. & EVANS, M.) (1987) Mechanics of root elongation and the effects of 3,5-diiodo-4-hydroxybenzoic acid (DIHB). *Plant and Soil* **99**, 211-218.
- (JONES, H.), LEIGH, R.A., (TOMOS, A.D. & WYN JONES, R.G.) (1987) The effect of abscisic acid on cell turgor pressures, solute content and growth of wheat roots. *Planta* **170**, 257-262.
- (JONES, K.C., SYMON, C.J.) & JOHNSTON, A.E. (1987) Retrospective analysis of an archived soil collection. I. Metals. *The Science of the Total Environment* **61**, 131-144.
- (JONES, K.C., SYMON, C.J.) & JOHNSTON, A.E. (1987) Retrospective analysis of an archived soil collection. II. Cadmium. *The Science of the Total Environment* **67**, 75-89.
- (KIRBY, E.J.M., PORTER, J.R.) DAY, W., (ADAM, J.S., APPELYARD, M., AYLING, S., BAKER, C.K., BELFORD, R.K., BISCOE, P.V., CHAPMAN, A., FULLER, M.P., HAMPSON, J., HAY, R.K.M., MATTHEWS, S., THOMPSON, W.J.), WEIR, A.H., (WILLINGTON, V.B.A.) & WOOD, D.W. (1987) An analysis of primordium initiation in Avalon winter wheat crops with different sowing dates and at nine sites in England and Scotland. *Journal of Agricultural Science, Cambridge* **109**, 123-134.
- KOOMEN, I., GRACE, C.A. & HAYMAN, D.S. (1987) Effectiveness of single and multiple inocula on growth of clover and strawberry plants at two soil pHs. *Soil Biology and Soil Biochemistry* **19**, 539-544.
- (KUHLMANN, H.) & BARRACLOUGH, P.B. (1987) Comparison between the seminal and nodal root systems of winter wheat in their activity for N and K uptake. *Zeitschrift für Pflanzenernährung und Bodenkunde* **150**, 24-30.
- LACEY, J. & LACEY, M.E. (1987) Micro-organisms in the air of cotton mills. *Annals of Occupational Hygiene* **31**, 1-19.
- LACEY, M.E., RAWLINSON, C.J. & McARTNEY, H.A. (1987) First record of the natural occurrence in England of the teleomorph of *Pyrenopeziza brassicae* on oilseed rape. *Transactions of the British Mycological Society* **89**, 135-140.
- LAWLOR, D.W., BOYLE, F.A., KENDALL, A.C. & KEYS, A.J. (1987) Nitrate nutrition and

ROTHAMSTED REPORT FOR 1987, PART 1

- temperature effects on wheat : enzyme composition, nitrate and total amino acid content of leaves. *Journal of Experimental Botany* **38**, 378-392.
- LAWLOR, D.W., BOYLE, F.A., YOUNG, A.T., KENDALL, A.C. & KEYS, A.J. (1987) Nitrate nutrition and temperature effects on wheat : soluble components of leaves and carbon fluxes to amino acids and sucrose. *Journal of Experimental Botany* **38**, 1091-1103.
- LAWLOR, D.W., BOYLE, F.A., YOUNG, A.T., KEYS, A.J. & KENDALL, A.C. (1987) Nitrate nutrition and temperature effects on wheat : photosynthesis and photorespiration of leaves. *Journal of Experimental Botany* **38**, 393-408.
- McCARTNEY, H.A. (1987) Deposition of *Erysiphe graminis* conidia on a barley crop. II. Consequences for spore dispersal. *Journal of Phytopathology* **118**, 258-264.
- McCARTNEY, H.A. & (AYLOR, D.E.) (1987) Relative contributions of sedimentation and impaction to deposition of particles in a crop canopy. *Agricultural and Forest Meteorology* **40**, 343-358.
- McCARTNEY, H.A. BAINBRIDGE, A. (1987) Deposition of *Erysiphe graminis* conidia on a barley crop. I. Sedimentation and impaction. *Journal of Phytopathology* **118**, 243-257.
- MacDONALD, O.C. & McCARTNEY, H.A. (1987) Calculation of splash droplet trajectories. *Agricultural and Forest Meteorology* **39**, 95-110.
- McGRATH, S.P. (1987) Computerized quality control, statistics and regional mapping of the concentrations of trace and major elements in the soil of England and Wales. *Soil Use and Management* **3**, 31-38.
- McGRATH, S.P. (1987) Long-term studies of metal transfers following application of sewage sludge. In: *Pollutant transport and fate in ecosystems. British Ecological Society Special Publication 6*. Eds P.J. Coughtrey, M.H. Martin & M.H. Unsworth. Oxford : Blackwells, pp. 301-317.
- NORTH, P.F. (1987) Effect of contrasting tillage procedures on the emergence of onions in relation to measured physical properties of seed beds. *Journal of Agricultural Science, Cambridge* **108**, 671-680.
- NORTH, P.F. (1987) Retrieval of data stored in a neutron moisture meter using a portable microcomputer. *Computers and Electronics in Agriculture* **2**, 135-143.
- (OLIVER, M.A.) & WEBSTER, R. (1987) The elucidation of soil pattern in the Wyre Forest of the West Midlands, England. I. Multivariate distribution. *Journal of Soil Science* **38**, 279-291.
- (OLIVER, M.A.) & WEBSTER, R. (1987) The elucidation of soil pattern in the Wyre Forest of the West Midlands, England. II. Spatial distribution. *Journal of Soil Science* **38**, 293-307.
- PERRY, C.A., LEIGH, R.A., (TOMOS, A.D., WYSE, R.E. & HALL, J.L.) (1987) The regulation of turgor pressure during sucrose mobilisation and salt accumulation by excised storage-root tissue of red beet. *Planta* **170**, 353-361.
- PIPER, J. (1987) Interaction forces between soil particles : shear moduli of the <2 μ m size fraction. *Journal of Soil Science* **38**, 1-11.
- PIRIE, N.W. (1987) A pedal-assisted unit for making leaf juice. *Experimental Agriculture* **23**, 315-318.
- PIRIE, N.W. (1987) An economical unit for pressing juice from fibrous pulps. *Journal of Agricultural Engineering Research* **38**, 217-222.
- PIRIE, N.W. (1987) Some preliminary observations on treatments which increase and decrease the stability of beta-carotene in preserved, moist leaf protein. *Plant Foods for Human Nutrition* **36**, 263-272.
- POPE, A.J. & LEIGH, R.A. (1987) Some characteristics of anion transport at the tonoplast of oat roots, determined from the effects of anions on pyrophosphate-dependent proton transport. *Planta* **172**, 91-100.

PUBLICATIONS

- (PORTER, J.R., KIRBY, E.J.M.), DAY, W., (ADAM, J.S., APPELYARD, M., AYLING, S, BAKER, C.K., BEALE, P., BELFORD, R.K., BISCOE, P.V., CHAPMAN, A., FULLER, M.P., HAMPSON, J. HAY, R.K.M., HOUGH, M.N., MATTHEWS, S., THOMPSON, W.J.), WEIR, A.H., (WILLINGTON, V.B.A.) & WOOD, D.W. (1987) An analysis of morphological development stages in Avalon winter wheat crops with different sowing dates and at ten sites in England and Scotland. *Journal of Agricultural Science, Cambridge* **109**, 107-121.
- POWELSON, D.S., BROOKES, P.C. & (CHRISTENSEN, B.T.) (1987) Measurement of soil microbial biomass provides an early indication of changes in total soil organic matter due to straw incorporation. *Soil Biology and Biochemistry* **19**, 159-164.
- POWELSON, D.S., POULTON, P.R., PENNY, A. & HEWITT, M.V. (1987) Recovery of ¹⁵N-labelled urea applied to the foliage of winter wheat. *Journal of the Science of Food and Agriculture* **41**, 195-203.
- REYNOLDS, K.S. & CATT, J.A. (1987) Soils and vegetation history of abandoned enclosures in the New Forest, Hampshire, England. *Journal of Archaeological Science* **14**, 507-527.
- RODGERS, G.A. (1987) Biological nitrogen transformations in soil after repeated application of nitrification inhibitors. *Zentralblatt für Mikrobiologie* **142**, 343-348.
- RODGERS, G.A., PENNY, A., WIDDOWSON, F.V. & HEWITT, M.V. (1987) Tests of nitrification and of urease inhibitors, when applied with either solid or aqueous urea, on grass grown on a light sandy soil. *Journal of Agricultural Science, Cambridge* **108**, 109-117.
- SANDERS, J.R. & EL KHERBAWY, M.I. (1987) The effect of pH on zinc adsorption equilibria and exchangeable zinc pools in soils. *Environmental Pollution* **44**, 165-176.
- SANDERS, J.R. & ADAMS, T.McM. (1987) The effects of pH and soil type on concentrations of zinc, copper and nickel extracted by calcium chloride from sewage sludge-treated soils. *Environmental Pollution* **43**, 219-228.
- SANDERS, J.R., McGRATH, S.P. & ADAMS, T.McM. (1987) Zinc, copper and nickel concentrations in soil extracts and crops grown on four soils treated with metal-loaded sewage sludges. *Environmental Pollution* **44**, 193-210.
- SHEN SHAN-MIN, BROOKES, P.C. & JENKINSON, D.S. (1987) Soil respiration and the measurement of microbial biomass C by the fumigation technique in fresh and in air-dried soil. *Soil Biology and Biochemistry* **19**, 153-158.
- THORNE, G.N. & WOOD, D.W. (1987) Effects of radiation and temperature on tiller survival, grain number and grain yield in winter wheat. *Annals of Botany* **59**, 413-426.
- THORNE, G.N. & WOOD, D.W. (1987) The fate of carbon in dying tillers of winter wheat. *Journal of Agricultural Science, Cambridge* **108**, 515-522.
- TOWNER, G.D. (1987) Formulae for calculating water flow in macro-pores in soil. *International Agrophysics* **3**, 5-15.
- TOWNER, G.D. (1987) The mechanics of cracking of drying clay. *Journal of Agricultural Engineering Research* **36**, 115-124.
- TOWNER, G.D. (1987) The tensile stress generated in clay through drying. *Journal of Agricultural Engineering Research* **37**, 279-289.
- VANCE, E.D., BROOKES, P.C. & JENKINSON, D.S. (1987) An extraction method for measuring soil microbial biomass C. *Soil Biology and Biochemistry* **19**, 703-707.
- VANCE, E.D., BROOKES, P.C. & JENKINSON, D.S. (1987) Microbial biomass measurements in forest soils : determination of *k_c* values and tests of hypotheses to explain the failure of the chloroform fumigation-incubation method in acid soils. *Soil Biology and Biochemistry* **19**, 689-696.
- VANCE, E.D., BROOKES, P.C. & JENKINSON, D.S. (1987) Microbial biomass measurements in forest soils : the use of the chloroform-incubation method in strongly acid soils. *Soil Biology and Biochemistry* **19**, 697-702.

ROTHAMSTED REPORT FOR 1987, PART 1

- (WAGENET, R.J.) & ADDISCOTT, T.M. (1987) Estimating the variability of unsaturated soil hydraulic conductivity using simple equations. *Soil Science of America Journal* **51**, 42-47.
- WALKLATE, P.J. (1987) A random-walk model for dispersion of heavy particles in turbulent air flow. *Boundary-Layer Meteorology* **39**, 175-190.
- WEBSTER, R. & McBRATNEY, A.B. (1987) Mapping soil fertility at Broom's Barn by simple kriging. *Journal of the Science of Food and Agriculture* **38**, 97-115.
- WEIR, A.H. (1987) Some effects of soil type and weather on the yield variability of wheat. *Journal of the Science of Food and Agriculture* **37**, 675-676.
- WHITMORE, A.P. & ADDISCOTT, T.M. (1987) A function for describing nitrogen uptake, dry matter production and rooting by wheat crops. *Plant and Soil* **101**, 51-60.
- WHITMORE, A.P. & ADDISCOTT, T.M. (1987) Applications of computer modelling to predict mineral nitrogen in soil and nitrogen in crops. *Soil Use and Management* **3**, 38-43.
- WHITMORE, A.P., MILFORD, G.F.J. & ARMSTRONG, M.J. (1987) Evaluation of a nitrogen leaching/mineralization model for sugar beet. *Plant and Soil* **101**, 61-65.
- WIDDOWSON, F.V., PENNY, A., DARBY, R.J., BIRD, E. & HEWITT, M.V. (1987) Amounts of $\text{NO}_3\text{-N}$ and $\text{NH}_4\text{-N}$ in soil, from autumn to spring, under winter wheat and their relationship to soil type, sowing date, previous crop and N uptake at Rothamsted, Woburn and Saxmundham, 1979-85. *Journal of Agricultural Science, Cambridge* **108**, 73-95.
- WOOD, I.G. (1987) Temperature dependence of domain walls in LaNbO_4 and their relation to the spontaneous strain. *Phase Transitions* **9**, 269-279.
- WRIGHT, A.C. (1987) A model of the redistribution of disaggregated soil particles by rainsplash. *Earth Surface Processes and Landforms* **12**, 583-596.
- YEOMAN, D.P., LAPWOOD, D.H. & McEWEN, J. (1987) Effects of a range of fungicides used to control rust (*Uromyces viciae-fabae*) on spring-sown field beans (*Vicia faba*) in the UK. *Crop Protection* **6**, 90-94.
- YOUNGS, E.G. (1987) Estimating hydraulic conductivity values from ring infiltrometer measurements. *Journal of Soil Science* **38**, 623-632.
- YOUNGS, E.G. (1987) Seepage from channels and ponds with impervious boundary walls extending below floor level. *Journal of Hydrology* **92**, 193-205.

General Papers

- (ARMSTRONG, M.) & MILFORD, G.F.J. (1987) Correct timing of N fertiliser applications for the beet crop. *British Sugar Beet Review* **55**(1), 41-43.
- BARRACLOUGH, P.B. (1986) Nutrient fluxes in the rhizosphere of high-yielding grain crops. In: *Transaction 13th Congress International Society of Soil Science, Vol.V, Hamburg, 1986*. Hamburg : ISSS, pp. 217-224.
- BROWN, G. (1987) Structural chemistry of soil minerals: the way forward. In: *Future developments in soil science research*. Eds L.L. Boersma *et alia*. Madison, Wisconsin: Soil Science Society of America, pp. 519-528.
- CATT, J.A. (1987) Dimlington. In: *East Yorkshire—field guide*. Ed. S. Ellis. Cambridge : Quaternary Research Association, pp.82-98.
- CATT, J.A. (1987) Effects of the Devensian cold stage on soil characteristics and distribution in eastern England. In: *Periglacial processes and landforms in Britain and Ireland*. Ed. J. Boardman. Cambridge : Cambridge University Press, pp. 145-152.
- CATT, J.A. (1987) Paleosols in Quaternary research. *Episodes* **10**, 35-37.
- CATT, J.A. (1987) The Quaternary of East Yorkshire and adjacent areas. In: *East Yorkshire—field guide*. Ed. S. Ellis. Cambridge : Quaternary Research Association, pp.1-14.
- CATT, J.A. (1987) Sewerby. In: *East Yorkshire—field guide*. Ed. S. Ellis. Cambridge : Quaternary Research Association, pp.53-57.

- COOKE, G.W. (1987) Potassium in the agricultural systems of the humid tropics. An introduction to the Colloquium. In: *Proceedings 19th Colloquium International Potash Institute, Bangkok, 1985*. Worblaufen-Bern : International Potash Institute, pp.21-28.
- COOKE, G.W. (1987) The role and importance of potassium in the agricultural systems of the humid tropics: the way forward. In: *Proceedings 19th Colloquium International Potash Institute, Bangkok, 1985*. Worblaufen-Bern : International Potash Institute, pp. 369-405.
- COOKE, G.W. (1987) Yield limiting factors and their correlation in the systems of agriculture. *Vestnik Sel'skhozajstvennoj Nauki/VASHNIL* No.2, 124-130.
- GILLER, K.E., McGRATH, S.P. & BROOKES, P.C. (1987) Suppression of nitrogen fixation in clover on soil contaminated with heavy metals. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 68.
- GOULDING, K.W.T. (1986) Thermodynamics applied to potassium exchange in aluminosilicate minerals and soils. In: *Transaction 13th Congress International Society of Soil Science, vol.III, Hamburg, 1986*. Hamburg : ISSS, pp.1133-1143.
- HARPER, S.H.T. & JENKINSON, D.S. (1987) Decomposition of crop residues and organic matter in soil. *Journal of the Science of Food and Agriculture* **40**, 125-126.
- HEPPER, C.M. (1987) Gel electrophoresis for identification of VAM fungi. *Proceedings 7th North American Conference on Mycorrhiza, Gainesville, 1987*, pp. 308-310.
- HEPPER, C.M. (1987) VAM spore germination and hyphal growth *in vitro*—prospects for axenic culture. *Proceedings 7th North American Conference on Mycorrhiza, Gainesville, 1987*, pp. 172-174.
- (INUBUSHI, K), BROOKES, P.C. & JENKINSON, D.S. (1987) Effects of waterlogging on microbial biomass in soil. (Part I) Changes in ATP contents and AEC. In: *Abstracts 3rd Conference Japanese Society of Microbial Ecology, Kyoto, 1987*.
- JENKINSON, D.S. & POWLSON, D.S. (1987) Efficiency of use of spring-applied nitrogen in arable agriculture. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 6.
- JENKINSON, D.S. & POWLSON, D.S. (1987) This week's citation classic. *Current Contents* No.23, 18.
- JOHNSTON, A.E. (1987) Nitrogen—maximising benefits and minimising problems. In: *Arable crop nutrition and fertiliser use*. Proceedings of an RASE, ADAS, FMA Conference, Stoneleigh, 1987.
- JOHNSTON, A.E. (1987) Reducing nitrate pollution. In: *Science, agriculture and the environment*. Ed. J.Hardcastle. London : AFRC, pp. 8-9.
- JOHNSTON, A.E. (1987) Will Europe return to fallowing? *Span* **30**, 53-54.
- JOHNSTON, A.E., (SMITH, B. & PATTERSON, D.) (1987) Straw incorporation and its implications for crop protection and wildlife. In: *Science, agriculture and the environment*. Ed. J.Hardcastle. London : AFRC, pp. 14-15, 28.
- (KIRKBY, E.A.), ARMSTRONG, M.J. & MILFORD, G.F.J. (1987) The absorption and physiological roles of P and K in the sugar beet plant with reference to the functions of Na and Mg. *Proceedings 50th Winter Congress International Institute for Sugar Beet Research*. Brussels : IIRB, pp. 1-23.
- LAWLOR, D. (1987) Biomass production—overcoming limitations of low temperature. In: *Energy from biomass 1. Proceedings of the first contractors' meeting*. Eds G. Grassi & H. Zibetta. London : Elsevier, pp. 153-157.
- LAWLOR, D.W. & YOUNG, A.T. (1987) Measurement of photosynthesis and photorespiration in the field. In: *Progress in photosynthesis research Vol.3*. Ed. J Biggins. Dordrecht : Nijhoff, pp.665-668.
- LAWLOR, D.W., KEYS, A.J., KENDALL, A.C. & YOUNG, A.T. (1987) Regulation of nitrogen

ROTHAMSTED REPORT FOR 1987, PART 1

- and carbon metabolism in wheat by nitrate supply and temperature. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 28.
- LAWLOR, D.W., KONTTURI, M., YOUNG, A.T., KEYS, A.J. & PARRY, M.A. (1987) Flag leaf photosynthesis does not increase in proportion to ribulose biphosphate carboxylase-oxygenase with large nitrate supply. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 17.
- LEIGH, R.A. & JOHNSTON, A.E. (1987) The usefulness of expressing nitrogen concentrations in crops on the basis of tissue water. *Journal of the Science of Food and Agriculture* **38**, 317-318.
- LEIGH, R.A. & MILFORD, G.F.J. (1987) Some consequences of expressing total nitrogen concentrations in plants on the basis of tissue water. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 13.
- LEIGH, R.A. & POPE, A.J. (1987) Understanding tonoplast function : some emerging problems. In: *Plant vacuoles : their importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York : Plenum, pp. 101-110.
- McCARTNEY, H.A. & FITT, B.D.L. (1987) Spore dispersal gradients and disease development. In: *Populations of plant pathogens : their dynamics and genetics*. Eds M.S. Wolfe & C.E. Caten. Oxford : Blackwells, pp.109-118.
- McGRATH, S.P. (1987) Long-term effects of contaminants in soils. In: *Concerted action treatment and use of organic sludge and liquid agricultural wastes. COST 681. Report of the Community-Cost Concertation Committee on 1984-1985 activities. II. Scientific Report*. Brussels : CEC, pp. 74-78.
- McGRATH, S.P., BROOKES, P.C. & GILLER, K.E. (1987) Long-term biological effects of applying metal-contaminated sewage sludge to soil. In: *Heavy metals in the environment. Vol. 1*. Eds S.E. Lindberg & T.C. Hutchinson. Edinburgh : CEP, pp. 372-376.
- McGRATH, S.P., BROOKES, P.C. & GILLER, K.E. (1987) Long-term biological effects of metals after applications of sewage sludge. *Journal of the Science of Food and Agriculture* **40**, 320-322.
- McGRATH, S.P., CUNLIFFE, C.H. & POPE, A.J. (1987) Lead, zinc, cadmium, copper and nickel concentrations in the topsoils of England and Wales. In: *Proceedings 1st International Symposium on Geochemistry and Health, London, 1985*. Ed. I. Thornton. Middlesex : Science Reviews. pp. 52-58.
- McGRATH, S.P. & JOHNSTON, A.E. (1987) Le soufre en Grande-Bretagne. *Perspectives Agricoles* **111**, 45-47.
- McGRATH, S.P. & TILL, A.R. (1987) Uptake of sulphur following foliar applications of elemental sulphur. In: *International Symposium Elemental Sulphur in Agriculture. Vol. 1. Proceedings, Nice, 1987*, pp. 369-370.
- (MACNAB, F.), LAWLOR, D.W., (BAKER, N.R.) & YOUNG, A.T. (1987) Effects of nitrate nutrition on chloroplast composition and photosynthetic activities in wheat. In: *Progress in photosynthesis research Vol.2* Ed. J. Biggins. Dordrecht : Nijhoff, pp. 359-362.
- NEWMAN, A.C.D. (1987) Interaction of water with clay mineral surfaces. In: *Chemistry of clays and clay minerals*. Ed A.C.D. Newman. Harlow : Longman Scientific & Technical; London : Mineralogical Society, pp. 237-274.
- NEWMAN, A.C.D. & BROWN, G. (1987) Chemical constitution of clays. In: *Chemistry of clays and clay minerals* Ed A.C.D. Newman. Harlow : Longman Scientific & Technical; London : Mineralogical Society, pp. 1-128.
- PERRY, C.A., LEIGH, R.A., (TOMOS, A.D. & HALL, J.L.) (1987) Osmotic factors affecting the mobilisation of sucrose from vacuoles of red beet storage tissue. In: *Plant vacuoles: their importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York : Plenum, pp. 89-94.

PUBLICATIONS

- POPE, A.J. & LEIGH, R.A. (1987) The effects of anions on PPi-dependent proton transport in tonoplast vesicles from oat roots. In: *Plant vacuoles: their importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York : Plenum, pp. 199-204.
- POPE, A.J. & LEIGH, R.A. (1987) Is there a nitrate/H⁺ symport at the tonoplast? *Plant Physiology* **83S**, 112.
- POPE, A.J. & LEIGH, R.A. (1987) The transport of nitrate and other anions in isolated tonoplast vesicles from oat roots. In: *Meeting on Plant and Soil Nitrogen Metabolism, Sussex, 1987*. London : AFRC, 15.
- POWLSON, D.S. & JENKINSON, D.S. (1987) Non-fertilizer inputs of nitrogen to arable and grassland systems. In: *Advances in nitrogen cycling in agricultural ecosystems*. Proceedings International Symposium, Brisbane, 1987, pp. 59-60.
- REA, P.A., LEIGH, R.A. & (SANDERS, D.) (1987) Wash-activated Na⁺/H⁺ exchange in tonoplast vesicles from *Beta vulgaris* storage root disks. In: *Plant vacuoles : their importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York: Plenum, pp. 227-234.
- (ROSENDAHL, S.) & HEPPEL, C.M. (1987) Comparative studies of medium endophytes forming VA-mycorrhizae. *Proceedings 7th North American Conference on Mycorrhiza, Gainesville, 1987*, p. 319.
- (STOREY, R.) & LEIGH, R.A. (1987) Distribution of potassium between vacuole and cytoplasm in response to potassium deficiency. In: *Plant vacuoles : their importance in plant cell compartmentation and biotechnology*. Ed. B. Marin. New York : Plenum, pp. 95-98.
- STRIBLEY, D.P. (1987) Mineral nutrition. In: *Ecophysiology of VA mycorrhizal plants*. Ed. G.R. Safir. Boca Raton, Florida : CRC Press, pp. 59-70.
- (SYLVESTER-BRADLEY, R.), ADDISCOTT, T.M., (VAIDYANATHAN, L.V.), MURRAY, A.W.A. & WHITMORE, A.P. (1987) Nitrogen advice for cereals : present realities and future possibilities. *Proceedings of the Fertiliser Society* **263**, 1-36.
- VANCE, E.D. & BROOKES, P.C. (1987) Measurement of microbial biomass in soil. In: *Chemical analysis in environmental research*. Grange-over-Sands : ITE, pp.68-78.
- WITTY, J.F., (MINCHIN, J.F., SKOT, L. & SHEEHY, J.E.) (1986) Nitrogen fixation and oxygen in legume root nodules. *Oxford Surveys of Plant Molecular and Cell Biology* **3**, 275-314.
- YOUNGS, E.G. & (MAREI, S.M.) (1987) The influence of air access on the water movement down soil profiles with impeding layers. In: *Infiltration development and application. Pre-Conference Proceedings, Honolulu, 1987*. Ed. Yu-Si Fok. Honolulu : Water Resources Research Center, University of Hawaii, pp. 50-58.