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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.
- ROBYN, 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.
- (NICLOUD, 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

- TATCHELL, 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., TATCHELL, 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 *kc* 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 NO₃-N and NH₄-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 LaNbO₄ 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'skohozaistvennoj 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.