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



# Report for 1974 - Part 1



Full Table of Content

## **Index**

### **Rothamsted Research**

Rothamsted Research (1975) *Index*; Report For 1974 - Part 1, pp 317 - 329 - DOI: https://doi.org/10.23637/ERADOC-1-131

### SUBJECT INDEX

The General Report by the Director (pp. 9-16) has not been indexed.

```
AC 64475', as aphicide for sugar beet, 54
'AC 92100'
as insecticide for wheat bulb fly, 147
for pests in sugar beet, 49, 54
Acephate, aphid resistance to, 146
Acetylcholinesterase, from resistant houseflies, 144
Acid sulphate soils, 191, 199, 273
Aerial photography
for plant-disease surveys, 217
for soil survey, 275
Aerial pollution, effect on plant growth, 33
Agricultural Development and Advisory Service, 147,
185, 230, 235, 277, 288, 289, 290
Agropyron repens (Couchgrass)
aminotriazole to control, 122, 126
effect of N fertiliser on, 41
fallows to control, 123
herbicide for, 38, 122, 123, 126
in poor patches in rye grass, 233
on Broadbalk, 122
wheat bulb fly on, 108
wheat infestation by, 41
Agrostis gigantea (common bent grass), 38, 41, 182,
223
Air-drying of soils, effects on release of nutrients, 197
Air turbulence within wheat 207
     'AC 64475', as aphicide for sugar beet, 54 'AC 92100'
       Air-drying of soils, effects on release of nutrients, 197
Air turbulence within wheat, 207
         Aldicarb
                   ldicarb
analysis of, 158
as aphicide, 46, 52–55, 66, 159
as nematicide, 46, 57, 66, 160, 183, 184, 187, 188, 236
effect on potato yield, 183, 184
effect on soil, 159
effect on virus disease in grass, 232
for pests in sugar beet, 46–49, 50, 52–56, 66
residual effects on beans, 236
toxicity to mample, 46
      residual effects on beans, 256 toxicity to mammals, 46
Alkali metals, 165
Alopecurus myosuroides (black grass) effect of fertilisers on, 39, 42 germination of, 38, 39, 42 herbicides for control of, 38, 122 on Broadbalk, 38, 122
      on Broadback, 38, 122
Aluminium
crops which accumulate, 77
effect on tropical legumes, 88
exchangeable in acid soils, 87
P and K uptake by plants and, 77, 87
toxicity to plants, 77
Amides in nitrogen mobility, 19
   Amides in nitrogen mobility, 19
Amino acids
biosynthesis of, 19
commercial production of, 23
effect of sulphur and nitrogen fertilisers on, 22
in grass, 77, 84, 85
in wheat protein, 22
non-protein in plants, 20, 77
P deficiency and accumulation of, 77
transport of, 21
2-aminobutane, as fungicide for potato, 240
Aminotriazole, as herbicide, 39, 122, 123, 126, 223
Ammonia gas, adsorption of, by soil, 79
Ammonium nitrate, 78, 85
Ammonium sulphate, 78, 84
Anagallis arvensis (scarlet pimpernel), 38, 39
Animal Diseases Research Institute, Compton, 188
Aphanomyces cochlioides, on sugarbeet, 51
Aphicides
         Aphicides

'AC 64475', 54

aldicarb, 46, 52–55, 66, 159
```

```
Aphicides (contd.)
             phicides (contd.)
aphid resistance to, 55, 146
demeton-S-methyl, 52–56, 146, 235
dimethoate, 55, 146
disulfoton, 70, 147
for beans, 70, 124, 127, 235
for sugar beet, 52–56, 123, 128, 145
formothion, 55
menazon, 54, 220, 232
'Metasystox', 123, 124, 125, 127, 128, 235
methomyl, 56
omethoate, 55
                omethoate, 55
permethrin ('NRDC 143'), 55
phosphamidon, 55
                 pirimicarb, 52-56, 146
propoxur, 56
See also Insecticides; Pesticides
             See also Insecticides; Pesticides sphids artificial diets for, 151 biological control of, by wasps, 151 caught in traps, 52, 220 Entomorphihora infection, 106, 107 esterase activity of, 146 Euonymus europaeus as host of, 52, 106, 152 fungus diseases of, 106, 107 identification by chromatography, 107 invasion of Britain from Europe by, 103 membrane feeding of, 213 migration of, 104, 220 on apple trees, 105 on beans, 52, 70, 106, 107, 124, 127, 234 on cereals, 104, 106, 220 on grass, 107 on potato, 104, 125, 241 on rape, 237 on sugar beet, 51–56, 123, 128, 135, 143, 145 overwintering, 52 parasitic fungi for controlling, 104 population of species in 1974, 105
    Aphids
                 population of species in 1974, 105
predators of, 56, 104, 106, 107, 151
resistance to insecticides, 46, 55, 135, 143, 145
                resistance to insecticides, 46, 33, 133, 143, 143
sampling stations, 104
spindle bushes as hosts, 52, 106, 152
spray warnings for, 52, 147
suction sampling of, 107
virus transmission by, 51–56, 104, 212, 232, 234, 236,
241
virus transmission by, 51-56, 104, 212, 232, 234, 236, 241

weekly bulletins on, 104

Aphids, specific names of

Acyrthosiphon pisum, 107, 152, 236

Aphis evonymi, 152

Aphis fabae, 52, 53, 54, 55, 56, 104, 105, 106, 107, 124, 146, 147, 152, 236

Aphis gossypii, 215

Aulacorthum solani, 104, 105

Brevicoryne brassicae, 105, 152, 237

Macrosiphum avenae, = Sitobion avenae

Macrosiphum avenae, 104, 105, 212, 241

Megoura viciae, 105, 152

Metopolophium dirhodum, 105, 106

Metopolophium festucae, 104, 105

Myzus persicae, 52, 53, 54, 55, 56, 104, 105, 128, 135, 143, 145, 146, 152, 212, 213, 215, 241

Pemphigus spp., 104, 105

Phorodon humuli, 105, 152

Rhopalosiphum insertum, 105, 106

Rhopalosiphum padi, 105, 106, 215, 220, 232

Sitobion fragariae, 105, 106
```

Arthropods in sugar beet, 46	Benzimidazoles (contd.)
Aspergillus spp., on stored cereals, 215 Asulam, microbial degradation of, in soil, 254	as nematicide, 187
Atmospheric pollution, effect on cereal growth, 33	synthesis of, 158 Benzoylprop-ethyl, 113
Auxins in sugar beet, 37	Berkshire, soil survey in, 265
Avon,	Betaine in sugar beet, 37
soil survey in, 266	'Betanal E' (phenmedipham), 67, 123
soil variability in, 276	BHC
Azotobacter spp., in Rothamsted Rhizobium Collec- tion, 245	as insecticide for wheat bulb fly, 147, 148 for pests in sugar beet, 48, 49
Azotobacter paspali, 250	poisoning of honey bees by, 147
<i>( - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - </i>	residual effect of, on beans, 237
Barley	seed treatment with, 158
defoliation experiments with, 217	Bioallethrin, solubility of, 141
effect of sulphur dioxide on, 33	Biodeterioration, 215
Erysiphe graminis (powdery mildew) on, 124, 127, 136, 156, 157, 212, 217, 220, 221, 222	Bioresmethrin, 139, 143, 145
frequency of beet and barley, 67	Blackgrass. See Alopecurus myosuroides Boron
fungicides for, 69, 76, 79, 136, 156, 157	amounts removed by crops, 88
N fertiliser for, 31, 76, 78, 79, 124, 277, 287	effect on wheat yields, 63
nematode-resistant, 178	in organic manures, 88
nematodes in, 57, 178, 182	Botrytis cinerea, on rape, 237
Puccinia hordei (brown rust) on, 76, 79, 124, 127, 222	Boulder clay soils, 191, 194
Rhynchosporium infection on, 212, 222, 230 root growth of, 31	Boxworth Experimental Husbandry Farm, 230 Brazil
senescence, effect of mildew on, 217	mycorrhiza and phosphate in soils of, 251
Ustilago nuda (smut) on, 157	tests with insecticides in, 150
variety trial, 277	Bridgets Experimental Husbandry Farm, 185
yields, 124, 159, 220, 230, 277	British Solomon Islands Protectorate, virus diseases in
See also Cereals; Erysiphe graminis; Take-all	plants in, 214
BAS 3000 F', as fungicide on wheat seed, 223	British Sugar Corporation, 59, 60, 136, 146 Broadbalk
BAS 3170 F' See Benodanil	beans on, 81, 122
'Bayer 6660', as fungicide for sugar beet, 56	effect of farmyard manure and N fertilisers on, 81
Beans	farmyard-manure plots on, 80
aphids on, 52, 70, 106, 107, 124, 127, 234	magnesium fertiliser for, 122
effect of aphicides on yield, 236	N uptake by wheat on, 80, 81
fungus disease of, 132	nematodes on, 182, 185
germination, effect of seed heating on, 184 N fertiliser for, 131	potatoes on, 122 take-all on, 224
nematodes on, 124, 131, 173, 182, 183, 236	weeds on, 38, 122
residual effect of nematicides on, 237	wheat on, 76, 80, 81, 122, 185, 224
Rhizobium leguminosorum on, 245	wheat yields and N contents of grain on, 81
seed heating for nematode control, 184	Broadbalk Wilderness, nitrogenase activity in soils, 249
sensescence, effect of aldicarb on, 236	Broom's Barn Farm
simazine for, 70, 123, 124, 127 soil fumigation for, 131	cropping, 69
'Subject Day on Field Beans', 211	livestock, 71 soil analyses, changes in, 69
virus diseases of, 124, 234–236	weather (1973–74), 45, 308
virus-free seed, 236	Buckinghamshire, soil survey in, 265
wilting of, 236	Butyl catechol, as soil-applied fungicide, 154
yields, 67, 70, 124, 127, 131	
Bee Advisory Service, 146 Bees. See Honeybees	Calcium nitrate
Beet, red, common scab (Streptomyces spp.) on, 238	movement in soil, 78
Beetles	sprays for wheat, 76, 78, 80 Cambridgeshire, soil survey in, 260
as predators of aphids, 56	Captafol, as fungicide, 51, 215, 221
caught in traps, 109	Carbendazim, as fungicide, 157, 215, 234
effect of soil cultivation on, 112	effect on soil, 159, 240
In sugar cane, 4/	Carbofuran
for pests in sugar beet, 48, 49	as nematicide, 54, 187
microencapsulation of, 147	for pests in sugar beet, 48, 49, 54 Carbon dioxide
used in insecticidal baits, 150	effect on carbohydrate metabolism of wheat, 27
Benodanil ('BAS 3170 F')	uptake by plants, 206
as fungicide for barley, 69, 76, 79, 80	Carbophenothion, as insecticide, 147, 150
interaction with N fertiliser, 79	Cardiganshire, trace elements in soils of, 272
Benomyl	Cell walls, enzymes degrading, 18
as nematicide, 183, 187 effect on clover rot, 234	Cereals
effect on soil, 159	aphids on, 104, 106, 220 Aspergillus spp. on, 215
extraction from potato tubers, 240	browning root rot of, 229
for barley, 69, 157, 159, 215	copper as seed dressings, 63
for brassicas, 237	Cultivation for Cereals experiment, 230
for potatoes, 183, 239	direct drilling for, 112
for sugar beet, 56 movement of, in soil, 240	effect of aerial pollution on, 33
Benzimidazoles	effect of copper, magnesium and boron on, 63
adsorption of, by potatoes and soil, 240	effect of cultivation on disease in, 230 effect of fumigation and N on, 68
as fungicide for cereals, 157	effect of sulphur and fluoride on, 33
318	The state of the s
210	

Cockroach (Periplaneta americana), insecticides for, 142, 151 Cereals (contd.) ereals (contd.)

Erysiphe graminis (mildew) on, 123, 124, 127, 136, 156, 157, 212, 217, 223

eyespot on, 223
fertilisers for, 25-29, 67, 68, 223
foot and root diseases, 230
fungicides for, 70, 154-158, 220-223

Fusarium spp. on, 26, 154, 155, 156, 215, 230
Gaeumannomyces graminis on, 18, 223, 226-229, 250
Gaeumannomyces-Phialophora complex on, 18, 212, 226-229 Codling moth, caught in traps, 148 Collembola in sugar beet, 47, 48 Colocasia esculenta (taro), virus disease in, 214 Computer programs omputer programs
bibliographic information retrieval, 99
cocoa-pod diseases, 100
coded soil data, 99, 274
evaporation and heat flux calculations, 207
field experiments on interference, 133
for maps of potential cropland, 277
for micrometeorology, 207
for molecular structures, 169 Intensive Cereals experiment at Woburn, 83 mercury for seed treatment, 123, 127, 154–156, 158, 223 for micrometeorology, 207
for molecular structures, 169
Multijob, 95, 97
nematode-competition simulation, 178
Numerical Algorithms Group, 98
pore space in thin sections of soil, 274
PRINT, 97
rates of flow of radioactive substances in plants,
99
Rothamsted Editor Program (PEDIT) 97 mercury for seed treatment, 123, 127, 154–156, 158, 223
moulds in, during storage, 215
nematodes in, 57, 173, 178, 182, 185
nutrient uptake by diseased roots, 218
P deficiency and Pythium root infection, 229
Pentcillium spp. on, 215, 216
Phialophora radicicola on, 18, 212, 226–229
protein synthesis in seeds, 21, 22
Phytium infection of roots, 229
Septoria nodorum on, 154, 155, 223
sharp eyespot on, 223
soil-borne fungus on seeds, 154
straw chopper for stubble, 125
stubble cultivations, 66
stubble spraying with insecticides, 123
subsoil fertilising for, 68, 132
take-all on, 18, 123, 212, 223–229, 230, 250
virus diseases in, 214, 220
yields and soil type, 277
See also Barley; Erysiphe graminis; Maize; Oats;
Take-all; Wheat
'CGA 12223', as insecticide for wheat bulb fly, 147
Chalky boulder clay, 272
Charcoal, for controlling wheat bulb fly, 148
Chemical Liaison Unit, 158
Chemical Reference plots, 159
Cheshire soil survey in, 258 Rothamsted Editor Program (REDIT), 97 Rothamsted General Survey Program, 99 spore-dispersal simulation, 207 taxonomic information retrieval, 99 wheat gene data, 99 See also Statistical Programming Computers
Bath University Computing Centre, 99
CDC 6400, 99 distribution of work by agricultural institutes, 96 Edinburgh Regional Computing Centre, 93, 99, 275 equipment, 94
Honeywell systems, 98, 100
IBM 370/158, 99, 275
ICL 4, 93, 94, 95, 98, 100, 101, 274
Manchester Regional Computing Centre, 99
monitoring assessment of computer activity, 98
project costing, 100
Openational Insign Applysor, 216, 274 Chemical Liaison Unit, 158
Chemical Reference plots, 159
Cheshire, soil survey in, 258
Chickweed in grass, 125, 128
Chloraniformethan, as fungicide on barley, 221
Chlorfenvinphos, as insecticide, 147, 148, 150, 159
Chlorflurecol methyl, effect on sugar beet, 59
Chlormequat chloride (CCC) project costing, 100
Quantimet Image Analyser, 216, 274
telecommunications, 100
See also Computer programs; Statistical analysis;
Statistical programming
Convolvulus arvensis (Bindweed), herbicide for, 38
Copper, as seed dressing for cereals, 63
Cornwall Chlormequat chloride (CCC)
effect on bolting in sugar beet, 35
effect on moulds in cereals, 215
effect on starch in wheat grains, 32
sprays for cereals, 70
Chloroform, soil fumigation with, 197
Chlorophyll in plants, 23, 28
Chloropicrin, 184, 185, 187, 188
Chlorpyrifos
for pests in sugar beet, 48 soil survey in, 267 soil survey in, 267
trace elements in soil, 272
Cotton, analysis of trials on, 259
Couchgrass. See Agropyron repens
Coumatetralyl, for control of wood mice, 50
Cover loam, 272, 277
Cowpea, (Vigna unguiculata), 246, 247, 248
Crop physiology, 25
Crotoxyphos, used in insecticidal baits, 150, 151
Crown ethers for pests in sugar beet, 48 used in insecticidal baits, 150 Chlorthiamid, residual effect of, 40 Crotoxyphos, used in insecticidal baits, 130, 151
Crown ethers
conformational energies of, 16
crystal structure of, 168
Crystal X-ray analysis, 169
Cultivation, effect on diseases and yield of cereals, 230
Cultivation for Cereals experiment, 230
Cumbria, soil survey in, 258
'Curb' (aluminium ammonium phosphate), for control of wood mice, 50
Cutworms, virus infection of, 111
Cyanopenphos, insecticide for wheat bulb fly, 147 Chlortoluron,
chromatography of, 160
effect of repeated application of, in soil, 159
effect on soil microflora, 253
measurement of residues in soil, 160
Chrysanthemate, dihalo analogues of, 137
Cirsium arvense (creeping thistle), 39, 123
Cismethrin, solubility of, 141
Clay minerals
in English soil clays, 192
interstratified, diffraction patterns of, 192
of Nigerian soils, 195
See also Soil clays; Soil mineralogy
Clay soils, 194, 195, 196
Clover Chlortoluron, Cutworms, virus infection of, 111
Cyanopenphos, insecticide for wheat bulb fly, 147
Cylindrocarpon spp.
competition with mycorrhiza, 252
nematode infection by, 186
on bean roots, 132
Cypendazole, as fungicide for cereals, 157
Cytokinins, in sugar beet, 37 clover
breeding for increased N fixation in, 246
effect of aldicarb on yield, 232
effect of benomyl on, 234
root-hair infection, 248, 249
Sclerotinia trifoliorum on, 234
yields, 234
Clwyd 4-D, 254 Daminozide, control of common scab in potatoes by, 153 Daxomet as nematicide, 187, 188 soil survey in, 268 trace elements in soils of, 272 soil sterilisation with, 131, 187 319

'D-D'	Erysiphe cruciferarum, on rape, 237
for Docking disorder in sugar beet, 57, 186	Erysiphe graminis (mildew)
soil fumigation with, 67, 186 DDT, toxicity of, to housefly and mustard beetle, 139,	isolates insensitive to ethirimol, 221 on cereals, 123, 124, 127, 136, 156, 157, 212, 217,
143	220, 221
Demeton-S-methyl ('Metasystox'), as aphicide, 52-56,	spore dispersal, 221
123, 124, 125, 127, 128, 146, 235	Essex, soil survey in, 265
Derbyshire, soil survey in, 261 Devon, soil survey in, 267	Ethephon ('Ethrel') effect on sugar beet, 35, 59 Ethionine
'Dexon' See fenaminosulf	effect on potato scab, 153
Diazinon, effect on lettuce-root aphids, 158	Ethirimol ('Milstem'), for barley, 69, 70, 124, 127,
Dichlofenthion, used in insecticidal baits, 150, 151	136, 156, 158, 220, 221
Dichloropropene mixtures, as nematicides, 186, 187 Dieldrin	Ethyl mercuric chloride, as fungicide for cereal seed,
as insecticide for wheat bulb fly, 147, 148, 158	Ethyl mercuric phosphate steep for sugar beet, 51
for controlling wood mice, 50	Euonymus europaeus (spindle bush), as host for aphids,
toxicity to housefly and mustard beetle, 139	52, 106, 152, 174
with mercury as wheat-seed dressing, 123	Eyespot (Cercosporella herpotrichoides), effect of
Diethyl phosphates, as nematicides, 187 Diethyl phosphorothioates, as nematicides, 187	fungicides on, 223
Dimethoate	Farmyard manure, 76, 80, 81, 86, 88
as aphicide for sugar beet, 55	Fenaminosulf ('Dexon')
as pesticide on grassland, 111	as fungicide for sugar beet, 51
resistance of housefly to, 143, 144, 145, 146	residual effects of, on beans, 236
Dimetilan, used in insecticidal baits, 150 Dioxathion, 150	Fenitrothion, for weevil control in beans, 235
Disulfoton	Fertiliser Manufacturers Association, 290
as aphicide for beans, 70	Fertilisers Fertilisers
microencapsulation of, 147	applied to subsoil, 68, 132
Ditalimfos, as fungicide for wheat seeds, 223 Drainage water, silicon in, 88	effect on crop quality, 76
Dry valley soils, 272	slow-release, 76 Survey of Fertiliser Practice, 289
'DS 15647', as insecticide for sugar beet, 49, 54	See also Names of individual fertilisers
Dyfed, soil survey in, 269	Field experiments
'Dyfonate' (fonofos), for pests in sugar beet, 48, 49	design for measuring interference, 133, 221
Earthworms, 112, 113, 158	methods for, 130
East Malling Research Station, 97, 98, 100	serially balanced designs, 133 Flour Milling and Baking Research Association, 133
Electronmicroscopy	Fluoride in atmosphere, effect on barley, 33
epoxy resin used in, 175	Fonofos ('Dyfonate'), for pests in sugar beet, 48, 49
of nitrifying bacteria, 253	Forest clearance in tropics, effect on nutrient reserves
of viruses, 111, 116, 232 scanning, of nematodes, 175, 176, 182	in soil, 197
transmission, 175	formalin, as nematicide, 236 for fungal pathogens of nematodes, 186
See also Scanning electron microscopy	Formothion
Endogone spp., 251, 252	as aphicide for sugar beet, 55
Endosulfan as acaricide, 212, 232	as fungicide, 158
as fungicide, 158	Fospirate, used in insecticidal baits, 150 Fosters Field, effect of crop sequences on take-all on,
residues in grass, 233	225, 226
Entomophthora spp.	Frost heave in soils, 271
aphid infection by, 106, 107	Fungi
Entomophthora-like fungus on nematodes, 185 on wheat bulb fly, 108	cell-wall degrading enzymes and, 18
Enzymes	Gaeumannomyces-Phialophora complex on cereals, 18, 212, 226
acetylcholinesterase, 144	spore dispersal, 207, 221, 222
acetylthiocholine, 144	spore traps, 221, 222
ammonia utilised by, 19	Fungicides
asparagine synthetase, 19 aspartate kinase, 20	adsorption of, by potatoes and soil, 240 as haulm sprays for potatoes, 153
carboxyesterase, 146	bioassay methods for mode of action, 136, 156
cell-wall degrading, 18	downward translocation in plants, 136
cellulase, 18	effect on leaf senescence, 56
diaminopimelate decarboxylase, 20	factors influencing effectiveness, 157
dihydrodipicolinate synthase, 19 extraction from rice blast fungus, 20	for barley, 69, 76, 79, 136, 156, 157
from houseflies, 144	for moulds in stored cereals, 215 for potatoes, 153, 154
glutamine synthetase, 18	for sugar beet, 51, 56
glutamine-α-oxyglutamate aminotransferase, 19	organomercury, 154
homoserine kinase, 20	persistence in soil, 240
in nitrogen metabolism of plants, 18, 28 in wheat, 28	radiolabelled, 157
of amino-acid biosynthesis, 19	seed treatment with, 154, 157, 158 soil-applied for potato scab, 154
photosynthesis and, 28	systemic, 136, 156, 157
polygalacturonase, 18	uptake and translocation of, 157
protein content of wheat and, 28	Fungus diseases
ribulose biphosphate carboxylase and oxygenase, 28 saccharopine dehydrogenase, 20	air-dispersed, experiments on, 221
Equisetum arvense (horsetail), 38, 40, 41, 122	in aphids, 106, 107 in bean roots, 132
Erwinia spp. on potato, 238, 240	in brassicas, 237
320	2 calculus 2 2000 70 2880 2 to 0.000 7 Per

Fungus diseases (contd.)
in cereals, 26, 70, 123, 124, 127, 136, 154-157, 215-230
in grass, 233
in hay, 216
in potatoes, 123, 125, 127, 136, 153, 184
in stored cereals, 215
in sugar beet, 51, 56, 58
spore traps, 221, 222
See also Erysiphe; Eyespot; Take-all
Fusarium spp. Herbicides (contd.) benzoylprop-ethyl, 113 chlortoluron, 159, 160, 253 chlorthiamid, 40 chlorthiamid, 40
disulfoton, 70, 147
DNOC, 128
effect on algal crust on soil, 253
effect on soil fauna, 113
linuron/paraquat, 39, 125
MCPA/dicamba/mecoprop, 38, 66, 70
mecoprop, 125 MCPA/dicamba/mecoprop, 38, 66, 70 mecoprop, 125 microbial degradation of, 253, 254 1-naphthol, 253 paraquat, 66, 123, 126, 182 phenmedipham ('Betanal'), 67, 123 phenoxyacetic acid, 245 pyrazone ('Pyramin'), 67, 71 residual effects of, 40 simazine, 70, 123, 124, 127 2,4,5-T, 128 sulphanilamide, 254 terbutryne, 38, 122 Herefordshire, soil survey in, 263 Highfield, effect of crop sequences on take-all, 225 Honeybees (Apis mellifera) Fusarium spp.
effect of N fertiliser on, in cereals, 26, 215 in bean roots, 132 in grass, 233 on cereals, 26, 154, 155, 156, 215 on potatoes, 242 Gaeumannomyces graminis var. tritici interactions with host nutrition, 223 pathogenic isolates of, 228 Phialophora radicicola and, 18, 212, 226-229 survival of virus-infected isolates in soil, 229 two pathogenic strains of, 250 viruses in 228 two pathogenic strains of, 250 viruses in, 228 See also Take-all
Gentamicin, for inhibiting virus multiplication, 212
Gibberellins, 33, 35, 36, 38, 153
Gloucestershire, soil survey in, 267
Glycollate pathway in wheat, 31
Grass Honeybees (Apis mellifera) drone rearing, 114 footprint substance, 114 granulation of honey, 114 hybrid onion seed produced by, 115 poisoning of, by pesticides, 146, 158 pollination by, 114 swarming, 113 virus diseases of, 115 winter food, ivy honey as, 114 age of sward and virus disease, 232
amino-acid content of, 77, 84, 85
aphids on, 106, 232
chemical control of pathogens, 232
composition of, 83–85
dipterous stem borers in, 111
effect of cutting and rolling on virus transmission,
231
effect of levs on arable crops, 85 Hoosfield barley on, 122, 185, 228 Exhaustion Land, 85 effect of cutting and rolling on virus transmission, 231
effect of leys on arable crops, 85
effect of leys on take-all in cereals, 224
effect of pesticides on, 110, 232, 233
effect of soil acidity on composition of, 83
effect of sulphur-coated urea on, 78
effect on cereals in rotations, 82, 85
Helminthosporium spp. on, 231, 233
invertebrates in, 110
irrigation for, 70
K deficiency in, 77, 83
liming for, 77, 84
N content of, 83, 84
N fertilisers for, 78, 85, 110, 125, 128
P deficiency in, 77, 83
P fertilisers for, 85
protein content of, 77, 84, 85
virus diseases of, 212, 214, 231, 232
weeds in, 40, 125, 128
yields, 84
Grassland Research Institute, Hurley, 97, 98, 100, 100, 111, 232
Growth substances and growth regulators fungal pathogens of nematodes on, 185 weeds on, 39, 123
Housefly (Musca domestica)
acetylcholinesterase from, nervous system of, 143, 151 resistance to insecticides, 143–145 toxicity of synthetic pyrethroids to, 139 Hydrodynamic dispersion of water and salts, 203 Image analysis, for plant pathological problems, 216 Indoleacetic acid, in sugar beet, 37 Insect traps aphids caught in, 52 Coccinella spp. caught in, 52 codling moths caught in, 148 codling moths caught in, 148
emergence traps, 109
light traps, 112, 148, 288
pheromone traps, 109, 148
pitfall traps, 47, 109, 112
pygmy beetles caught in, 47
sticky traps, 47, 52, 109
suction traps, 47, 104, 109
water traps, 108, 109
Insecticides
aphid resistance to, 145
as slurries, 51, 150
bees damaged by, 146, 158
bioresmethrin, 139, 141, 142, 143, 145
chrysanthemate, dihalo analogues of, 137
cismethrin, 141 Growth substances and growth regulators auxins, 37
betaine, 37
chloroflurecol methyl, 59
chlormequat chloride, 32, 35, 70, 215
cytokinins, 37
effect on sugar beet, 35–37
effect on sugar beet, 35–37 endogenous gibberellins, 33, 35 ethephon ('Ethrel'), 35, 59 for controlling common scab in potato, 137 gibberellin-like compounds, 36 gibberellins, 32, 33, 35, 36, 153 Cismethrin, 141
Congress of Pesticide Chemistry, Helsinki, 136
DDT, 139, 143
dieldrin, 50, 123, 139, 147, 148, 158 dieldrin, 50, 123, 139, 147, 148, 158 effects on nervous systems of insects, 141 for leaf-cutting ants, 149, 150 for sugar beet, 48–49, 52–56 fungicidal properties of, 151 in baits, 149, 150 insect resistance to, 136, 143–146 knockdown, 141, 142 mammalian metabolism of, 141 microenansulation of, 147 Hay, prevention of moulding in, 159, 216 Hay, prevention of moulding in, 159, 216
Heavy metals in soils, sewage sludge and, 191, 198
Helminthosporium spp.
on grass, 231, 233
on potatoes, 241
Herbicides
aminotriazole, 39, 122, 123, 126
asulam, 254 asulam, 254 microencapsulation of, 147

Insecticides (contd.)	Light penetration within a crop, 207 Lime
'NRDC 161', 136, 137, 139, 140, 141, 142, 169 parathion, 139, 145	effect on composition of grass, 77, 84
permethrin ('NRDC 143'), 55, 136, 137, 140, 141,	effect on sewage-sludge treated soil, 191, 198
147, 150	Lincolnshire, soil survey in, 261
persistence trials, 150 phenoxybenzyl alcohol, 140	Linuron/paraquat sprays for potatoes, 39, 125, 127 Livestock
predicting time of application, 110	Advisory Bulletin on Feeding Stuffs, 289
pyrethrin I, 142	cross-bred cattle, 289
pyrethroids, synthetic, 136–145, 147 radiosynthesis of, 140	cross-breeding of pigs, 289 on Broom's Barn Farm, 71
relative toxicities of, 139	on Rothamsted Farm, 125
repellency trials, 150	on Woburn Farm, 128
solubility of, 141	winter-calving dairy experiments, 289
systemic, resistance to, 136, 146	Locust (Schistocerca gregaria), neuroanatomy of nervous systems, 143
toxicity to mammals, 137 used in rotation to delay resistance, 145	Long Hoos Field
X-ray examination of, 140	effect of pesticides on soil microflora of, 253
See also Aphicides; Pesticides; and names of	nitrogenase activity in, 249
individual insecticides	Lucerne ( <i>Urophlyctis alfalfae</i> ), crown wart disease of, 234
Insects nervous systems of, 141	234
neuroanatomical techniques, 151	'M & B 19985', used as insecticidal bait, 150
phenology of, in wheat field, 109	Magnesium
pheromone-trap catches, 109, 148	chlorophyll in plants and, 23
poison baits for, 149, 150 rearing of, 152	effect on wheat, 63 for sugar beet, 60
resistance to insecticides, 136, 143-146	forms of fertiliser, 60, 63, 122, 126
Rothamsted Insect Survey, 103, 104, 288	Maize
soil-inhabiting, 147	nematode reproduction in roots, 182
species diversity, indices of, 288 staining techniques for, 151	photorespiration in, 29 Malaoxon, housefly resistance to, 144
See also Insect traps; Moths; and names of indi-	Malathion, for weevil control in beans, 235
vidual insects	Malaysia, acid sulphate soils in, 199
International Institute of Tropical Agriculture, 191,	Maneb, as fungicide for sugar beet, 51
195, 246 Irrigation	Manganese, as foliar spray for sugar beet, 62 Mangrove swamp soils, acidity of, 199
carbon dioxide uptake and, 206	Market Garden experiment, Woburn, 191, 198
effect on nematodes, 181, 188	MCPA/dicamba/mecoprop, 38, 66, 70
effect on stomatal resistance in plants, 205, 207	Mecarbam, used in insecticidal baits, 150
equipment for measurement, 202	Mecoprop, 125 Medicago lupulina (black medick), 38
for fodder crops, 70 for kale, 205	Menazon, as aphicide, 54, 220, 232
for potatoes, 181, 205, 238, 239	Mercury, as seed treatment for cereals, 123, 127, 134,
for sugar beet, 34, 59, 63	158, 223
for wheat, 205	Mercury/dieldrin dressings for wheat seed, 123, 127 Mesophyll resistance in plants, 206, 207
leaching of salts from soil after, 204 mist irrigation, 34, 35	Metal residues in crops and soil, 191, 198
time of application, 64	'Metasystox' (demeton-S-methyl), as pesticide, 52-56,
Isofenphos, 49, 54, 148	123, 124, 127, 128, 146, 235
Isonicotinyl hydrazide, 30	Methiocarb, for pests in sugar beet, 48, 49 Methomyl, as pesticide, 56, 235
Isopropyl paraoxon, housefly resistance to, 144	Methyl bromide, 183, 184, 187, 188
Kale, irrigation for, 205	Methyl isothiocyanate, as nematicide, 187
Kaolinite in soil clays, 192, 194, 195	Methyl paraoxon, housefly resistance to, 144
Kent, soil survey in, 266	Mica in soil clays, 192, 194, 195
Kenya, virus disease in plants, 215 'Kitazin P', as fungicide for wheat seed, 223	Mice, damage to sugar beet by, 50, 51 Micrometeorology, 207
Kituzii I , us lungioldo loi whout sood, 225	Microscopy
Lancashire, soil survey in, 259	dark-field microscopy, 253
Leaching of salts from soil, 203	electron microscopy, 111, 116, 232, 253 scanning electronmicroscopy, 175, 176, 182
Leaf-cutting ants, 149–150 Leatherjackets in soil, 111	Millipedes (Blaniulus guttulatus)
Leghaemoglobin, 248	aggregation of, 47
Legumes	effect of cultivation on, 112
breeding for increased N fixation in, 246	'Milstem' (ethirimol), 69, 70, 124, 127, 136, 156, 158,
effect of added N on growth, 246 effect of temperature on, 247	220, 221
effect of waterlogging on, 247	Mineralogy. See Soil mineralogy
inoculation with Rhizobium spp., 245-247	Minor elements in soils, 196, 271
new introductions in humid tropics, 246	Mirex, used in insecticidal baits, 150, 151
nodulation in, 245–250, 251 symbiosis in, 247	Mites predators of aphids, 56
tropical, effect of heat stress on, 247	predators of Collembola, 48
tropical, strain tests of, 246	virus transmission by, 212, 231
See also Clover, Cowpeas, Lucerne	Mobile shelter for irrigation and tillage experiments,
Letcombe Laboratory, 65, 112, 218, 230	Moths
Ley Arable experiment, Rothamsted, 123 Ley Arable experiment, Woburn, 184	codling moth, 148
Leys. See Grass	flight and mating, 109
322	

Moths (contd.) Nematodes (contd.) round cyst, 174, 180 scanning electronmicroscopy of, 175, 176, 182 seed heating for control of, 184 seed-borne by beans, 183, 184 soil fumigation for, 67, 131, 183, 184, 185, 186, 187 pea moths caught in traps, 104, 109 rearing on artificial diets, 110 spray-warning system, 104

Musca domestica. See Housefly

Mustard beetle, toxicity of synthetic pyrethroids to, Mycorrhiza, 251 soil-moisture content and, 57 soil-moisture content and, 57 spermatogenesis, 175 stem nematode, 55, 173, 183, 188 stylet action of, 179 stubbyroot, 186 subcrystalline layer of, 176 taxonomy, 174 type specimens of, 174 ultrastructure of, 175 vermiform, 180, 183 virus transmission by, 174 1-Naphthol, microbial metabolism of, 253
National Institute for Research in Dairying, 97
National Institute of Agricultural Botany, 184, 277
National Institute of Agricultural Engineering, 59, 97, 98, 100, 230
National Vegetable Research Station, 59, 97, 100
'NC 5936', as fungicide on wheat, 223
Nematicides type specimens of, 174
ultrastructure of, 175
vermiform, 180, 183
virus transmission by, 174
whipworm and, 188
Nematodes, specific names of
Aphelenchoides spp., 174, 175, 180
Aphelenchoides blastophthorus, 174, 176, 179
Aphelenchoides rutgersi, 174
Aphelenchoides sacchari, 174
Ditylenchus spp., 174, 180
Ditylenchus dipsaci, 55, 131, 179, 183, 184, 188, 236
Globodera spp., 175, 176
Heterodera spp., 68, 174, 175, 176, 186
Heterodera avenae, 174, 178, 187
Heterodera acuciferae, 179
Heterodera goettingiana, 187
Heterodera goettingiana, 187
Heterodera rostochiensis, 127, 174, 177, 179, 180, 182, 184, 187
Heterodera schachtii, 186, 187
Heterodera schachtii, 186, 187
Hexatylus viviparus, 179
Longidorus attenuatus, 174
Longidorus elongatus, 57, 174
Longidorus elongatus, 57, 174
Longidorus leptocephalus, 57, 185
Meloidogyne spp., 175
Neotylenchus spp., 68
Pratylenchus spp., 68
Pratylenchus reglectus, 175, 182
Pratylenchus fallax, 175
Pratylenchus hornei, 175, 182
Pratylenchus hornei, 175, 182
Pratylenchus thornei, 175, 182
Rhabditis oxycerca, 176
Thornenema wickeni, 176, 179
Trichodorus spenditivus, 57
Trichodorus primitivus, 57
Trichodorus primitivus, 57
Trichodorus primitivus, 57
Trichodorus velatus, 174
Trichodorus velatus, 174
Trichodorus velatus, 174
Trichodorus viruiliferus, 58 dichloropropenes, 186, 187 effect of clay content of soil on, 188 effect of drought on, 173 effect of drought on, 173
effect of soil organic matter on, 187
effect on barley yields, 182
granular, 160, 186, 187
incorporation into soil, 184, 187
organophosphorus, 187
oximecarbamate, 187
phytotoxicity of, 187
residual effect of, 236
systemic, 188
translocation within roots, 187
See also Soil fumigation, and names of chemicals used as nematicides used as nematicides
lematodes
cement secretion by, 176
copulatory spicules, 175
cuticle structure of, 176
cyst-nematodes, 55, 174, 175, 176, 177, 178, 180,
181, 184, 185, 186
defaecation of, 179
depth of, in soils, 187
Docking disorder of sugar beet and, 57, 66, 174, 186
effect of bare fallow and cultivation on, 182
effect of irrigation on, 181, 188
effect of paraquat on, 182
effect of rainfall on, 185
effect of soil compaction on, 66
effect of soil fumigation on, 67, 132, 182, 184, 185,
187, 188
effect of soil type on numbers of, 57
effect on root systems, 180
egg laying, 179
endoparasites of cyst-nematodes, 176
Entomophthora-like fungus on, 185
feeding of, 179
filming of, 178, 179 Nematodes endoparasites of cyst-nematodes, 176
Entomophthora-like fungus on, 185
feeding of, 179
filming of, 178, 179
functional morphology of, 178
gel electrophoresis of proteins in, 180
genera and species separation, 175, 180
genus reappraisal, 182
giant race of Ditylenchus dipsaci, 183
hatching factors, 181
identification of, 174, 182
in beans, 124, 131, 173, 182, 183, 236
in cereals, 57, 173, 178, 182, 185
in potatoes, 57, 127, 173, 174, 177, 180–183, 184,
186, 188
in sugar beet, 54, 55, 57, 66, 174, 186
in weeds in barley, 182
interaction with Verticillium dahliae, 182, 184
microscope slide collection of, 174
migratory, 182
oat race of Ditylenchus dipsaci, 183
onions sensitive to, 183, 188
P and K deficiency induced by, 181
pathotypes of Heterodera spp. 174, 177, 180, 184
population studies of, 57
rectal valves of, 176, 179
root-ectoparasitic, 57, 66, 173, 184, 186
root-lesion, 182 Trichodorus primitivus, 57 Trichodorus velatus, 174 Trichodorus viruliferus, 58 Trichuris trichiura, 188
Tylenchorhynchus spp., 68, 131, 185
Tylenchus spp., 68
Xiphinema spp., 175
Neutron moisture meters, 205, 218
'NF 48' as fungicide for mildew on barley, 157 movement of, in soil, 240 Nigeria
forests of, 197, 295
soils of, 195, 197
See aiso Tropical soils
Nitrifying bacteria in soils, 253
Nitrogen fertiliser cost and efficient use of, 75, 288 cost and eincient use of, 75, 288 crop responses to, 287 effect on amino acids in cereal protein, 22 effect on composition of grass, 85 effect on root growth in barley, 31, 76, 78 for barley, 31 for grass, 78, 85, 110, 125, 128

Nitrogen fertiliser (contd.) for sugar beet, 58, 59, 61, 63	Park Grass, (contd.) weeds on, 40
for wheat, 22, 25–29, 76, 80–83, 85, 86, 124, 127	See also Grass
loss by leaching, 76, 78	Particle-size analysis of soils, 273
movement in soil, 78, 160	Paspalum notatum, 250
pollution of waters by nitrate, 76	Peas
rainfall and N requirement, 288	freedom from broad bean streak virus, 236
residual effect of, 76, 78, 82	Rhizobium leguminosarum on, 245
slow-acting, 76, 77, 78 split dressings of, 78	Peat boron applied in, 88
time of application to cereals, 76, 79–82	classification of, 272, 273
trimethylamine, 79	effect on potatoes, 77, 85, 87
See also Ammonia gas; Ammonium nitrate;	effect on wheat yields, 77, 86
Ammonium sulphate; Sulphur-coated urea;	Pembrokeshire
Urea	maps of potential cropland in, 277
Nitrogen fixation, 247, 249, 250, 251 Nitrogen in plants	soil survey in, 270 trace elements in soils of, 271
amides in N mobility, 19	Penicillium spp., on cereals, 215
in organic combinations, 18	Periplaneta americana. See Cockroach
in wheat grain, 80-82	Permethrin ('NRDC 143')
Nitrogen in soil	as insecticide, 55, 136, 137, 140, 141, 147, 150
effect of cultivation on, in tropical soils, 197	for control of wheat bulb fly, 147
Nitrogenase activity, 247, 249	mammalian metabolism of, 141 microencapsulation of, 147, 150
Nodulation, 245–249, 251	photodecomposition of, 141
Norfolk, soil survey in, 260	radio-labelled isomers of, 140
Northamptonshire, soil survey in, 262	residue determination of, 140
Northumberland, soil survey in, 260	solubility of, 141
Nottinghamshire, soil survey in, 263	Perenospora parasitica, on rape, 237
'NRDC 102', 141	Pesticides  Common of Posticide Chamister, Heleinki 126
'NRDC 103', 141 'NRDC 143'. See permethrin 'NRDC 161'	Congress of Pesticide Chemistry, Helsinki, 136 effect of repeated applications on soil, 159
'NRDC 161'	effect on soil fauna, 113
'NRDC 161' 'NRDC 161' crystal structure of, 169	effect on soil microflora, 253
effect on cockroach, 142	liquid chromatography for, 160
effect on housefly, 143	microencapsulation of, 147, 150
insecticidal activity of, 136, 139, 140	poisoning of honey bees by, 146, 158
mode of action of, 141	repellency trials of, 150
stability of, 137 X-ray examination of, 140	residues in soil, 158, 159, 160, 187, 236 seed-treating machinery, 158
'N-Serve' (nitrapyrin) 160	uptake by worms, 158
'N-Serve' (nitrapyrin), 160	WHO tolerance limits, 183
Oats	See also Aphicides; Fungicides; Insecticides;
as 'break' crop in rotations, 124 nematodes on, 178	Nematicides
	Phaedon cochleariae. See Mustard beetle
virus diseases of, 214	Phaseolus vulgaris (navy bean), inoculation with
yields, 124 Omethoate	Rhizobium spp., 246 Phenacyl kojate, 168
as aphicide for sugar beet, 55	Phenmedipham ('Betanal E'), 67, 123
resistance of housefly to, 144	Phenyl mercuric acetate, as fungicide for cereal seed,
Oospora pustulans (skinspot), on potato, 240, 242	155
Organic manures	Phialophora radicicola
boron in, 88	Gaeumannomyces graminis and, 18, 212, 226–229
effect on potatoes, 77, 85, 86 effect on wheat, 76, 77, 80, 81, 85, 86	viruses in, 228 Phoma betae on sugar beet, 51
residual effect of, 77	Phoma exigua foveata (gangrene), in potato, 239, 241,
Woburn Organic Manuring experiment, 88	242
Oxamyl, as pesticide, 48, 49, 54, 55, 57, 187, 188	Phorate, 125, 20, 235, 241
Oxfordshire	Phosphamidon, as aphicide for sugar beet, 55
soil survey in, 266	Phosphate fertilisers
soil variation in, 276	calcium tetra-hydrogen diorthophosphate, 85
Oximecarbamates, as nematicides, 187 Oxygen! concentration in plants, plant growth and,	correlation with aluminium, 77
207	effect on composition of grass, 85
	effect on root growth in barley, 31 incorporation into subsoil, 132
Papua-New-Guinea, virus diseases in plants, 215	rock phosphate and nodulation in plants, 251
Paraoxon, housefly resistance to, 144	uptake by mycorrhizal plants, 251
Paraquat	Phosphohomoserine, chemical and enzymic synthesis,
effect on nematodes, 182 for cereals, 66, 123, 126, 182	20
use on Rothamsted farm, 123	Phosphorus in soil
Parathion	deficiency and Pythium infection of cereals, 229
housefly resistant to, 145	immobility in soil, 181
toxicity of, to housefly and mustard beetle, 139	nematodes, and, 181 uptake by cereals with take-all, 219
Park Grass	Photorespiration, in cereals, 27, 29, 30
ammonium sulphate for, 77, 83	Photosynthesis
botanical composition of, 40 effect of lime on, 40, 77, 84	carbon dioxide concentration and, 28–30, 206, 287
effect of lime on, 40, 77, 84 K deficiency on, 77, 83	effect of high humidity on, 34
P deficiency on, 83	effect of light intensity on, 27-29
324	

Photosynthesis (contd.)
effect of N fertiliser on, 25, 28
effect of sulphur dioxide on, 33
enzyme activities and, 28 Potatoes (contd.) subsoil fertilising for, 132 top-roll of, 212 241 top-roll of, 212 241
tuber distortion by pesticides, 154
tuber formation and photosynthesis in, 38
Verticillium dahliae on, 181, 182, 184
virus diseases of, 17, 104, 212, 213, 241
wound healing in, 239, 240
yields, 67, 125, 127, 174, 205
'PP 395', as fungicide on wheat seed, 223
'PP 505', as insecticide for sugar beet, 48, 49
Propionic acid, for mouldy hay and potato pulp, 216
Propoxur, as aphicide for sugar beet, 56
Protein in cereals, 26-33 oxygen concentration in plants and, 207 photosynthetic efficiency of plants, 206 potato-tuber formation and, 38
Phoxim, as nematicide, 187
Phytophthora erythroseptica, on potatoes, 123
Phytophthora infestans (blight), on potatoes, 125, 169,
242 Pirimicarb, as aphicide for sugar beet, 52, 53, 54, 55, 56, 146 Pirimiphos methyl, as insecticidal bait, 150 PK and Take-all experiment, 223 Plant Breeding Institute, Cambridge, 59, 99, 184 amino acids in, effect of sulphur and nitrogen on, effect of environment on seed protein in cereals, 22 enzyme activity and content of wheat leaves, 28 extraction from wheat grains, 21 in grass, 77, 84, 85 Plant diseases aerial photography for studying, 217
effect of cultivation on, 230
effect of weather on, 211
measuring the effects of, 216
Quantimet Image Analysing Computer for studying, in grass, 77, 84, 85
in potato haulms, 89
in wheat, 21-23, 28, 76, 80, 134
Protoplasts, virus multiplication in, 212
Psychrometers, thermocouple, 206
Puccinia hordei (brown rust), on barley, 76, 79, 124, 127, 222
Pygmy beetle in sugar beet, 47
Pyrazone ('Pyramin'), 66, 67, 71
Pyrethrin 1, effect on cockroach, 142
Pyrethroids, synthetic, 136-143, 147
Pythium spp. See aiso Individual crops Plant Protection Ltd, 230 Podzolisation, 191 Polygonum aviculare (knotgrass), 38 Polygonum convolvulus (black bindweed), 39 Potassium fertilisers correlation with aluminium, 77
effect on composition of grass, 77, 83
for sugar beet, 60, 61, 62
incorporation into subsoil, 132
Potato Marketing Board, 38, 240 Pythium spp. in bean roots, 132 in cereal roots, 229 Woronina pythii infecting, 230 o-Quinones, modification of viruses by, 17 Quintozene as soil-applied fungicide, 154, 158 otatoes amino-acid sprays for, 153
aphids on, 104, 125, 241
bacterial disease of, 238
black scurf (Rhizoctonia solani) on, 184, 242
blackleg (Erwinia sp.) on, 238, 240, 241
blight (Phytophthora infestans) on, 125, 169, 242
bromide residues in tubers, 183
bruising of tubers, 38
common scab (Streptomyces scabies) on, 127, 136, 153, 154, 238, 242
dehydration of tubers, 89
dry rot (Fusarium solani) on, 242
effect of aldicarb on yield, 183, 184, 185
effect of chloropicrin on, 184, 185, 187
effect of day length on tuber formation, 38
effect of gibberellins on tuber formation, 38
effect of methyl bromide on yield, 183
effect of N fertiliser on, 85
effect of organic manures on, 77, 85, 86, 87 Potatoes 'R 28921', as fungicide for cereals, 157, 223 Radiant energy, leaf water potentials and, 34 Rainfall effect on movement of N in soil, 78 effect on nematodes, 185 N requirement of crops and, 288 Rainwater silicon in, 89 Rainwater
silicon in, 89
sulphur in, 77, 87
Raman spectrometer, 167
Rape (Brassica napus)
cover crop for sugar beet, 50
diseases of, 237
insecticide sprays on, damage to bees, 147
Residual Phosphate experiment, 224
Resmethrin, 143
Respiratory disease from grain elevators, 216
Rhizobium spp.
in beans and peas, 132, 245
in tropical soils, 246
in Vigna spp., 245, 247
Rothamsted Culture Collection of, 245
Rhizoctonia sp., in bean roots, 132
Rhizoctonia solani, on potato, 184
Rhynchosporium spp.
development of, in soil, 230
effect of cultivation on, 230
on barley, 212, 222
Rotation experiment at Saxmundham, 234
Rotations
on Rothamsted farm, 123 effect of organic manures on, 77, 85, 86, 87 effect of rainfall on, 185 effect of waterlogged soil on, 127 fractionation of, 89 fungicides, adsorption by tubers, 240 gangrene (*Phoma exigua foveata*) on, 239, 240, 241, 242 growth regulators for, 38, 153
haulm pulverizer, 125
haulm sprays for, 153
in rotations with wheat, 82, 83, 85
irrigation for, 181, 205, 238, 239
linuron/paraquat sprays for, 39, 125, 127
nematodes on, 57, 127, 173, 174, 177, 180–183, 184,
186, 188 Rotations on Rothamsted farm, 123 on Woburn farm, 126 Rothamsted Ley-Arable experiment, 225 Rothamsted Reference experiment, wheat in 5-course phorate granules for diseases in, 125, 220, 235, 241 phytuberin in blighted potatoes, 169 pink rot (*Phytophthora erythroseptica*) on, 123 powdery scab (*Spongospora subterranea*) on, 242 protein in haulms, 89 pulp, mould prevention in 216 rotation in, 81 'RU 11 679', 141 'RU 15 525', 141 protein in liating, 89
pulp, mould prevention in, 216
seed tubers, diseases in, 242
silver scurf (Helminthosporium solani) on, 241
skin spot (Oospora pustulans) on, 240, 242
storage, 158, 239, 240, 241 Saline soils, evaporation from, 203 Salop, soil survey in, 263 Saxmundham N fertilisers for barley at, 79 Rotation experiment at, 234

0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Scanning electron miscroscopy of nematodes, 175, 176,	Soil organic matter (contd.)
182	effect of fumigation on, 187, 197
'SD 8832', 49, 54	effect on potato yields, 77, 85
Septoria nodorum, on cereals, 154, 155, 156	effect on wheat, 77
Sewage-sludge treated soil, heavy metals in, 191, 198 'Shell WL 24073', used in insecticidal baits, 150	in light soil at Woburn, 77
Silicon in drainage waters, 88	mineralisation of, 191 minimum cultivation and, 197
Simazine, effect on beans, 70, 123, 124, 127	ultransonic dispersal of soil and, 197
Smectite in clay soils, 192, 193, 194, 195	Soil respiration, 204, 206
Sodium	Soil shrinkage, 271
as fertiliser for sugar beet, 60, 61, 62	roil sterilisation. See Soil fumigation
complexes of, 167	Soil structure
Soil acidity	bonds between particles, 202
aluminium and, 77	effects on sugar beet, 65
effect on grass composition, 83	pore-size distribution, 195
Soil biomass	Soil Structure Enclosure, Woburn, 160
effect of cultivation on, in tropical soils, 198	stability of, 202
method of measuring, 191, 196	ultrasonic probe generator for measuring, 202
Soil classification	Soil surveys
codes for, 274	Avon, 266
for sugar-beet soils, 277	Berkshire, 265
statistical analysis for, 288	Buckinghamshire, 265
Soil clays	Cambridgeshire, 260
boulder clay, 191, 194	Cheshire, 258
iron oxides in, 192, 195	Clwyd, 268
K release from, 193	Cornwall, 267
soil structure and, 195	Cumbria, 258
See also Soil mineralogy	Derbyshire, 261
Soil compaction, effect on sugar-beet yield, 65, 66	Devon, 267
Soil fauna	Dyfed, 269
arthropods, 46–49	Essex, 265
cutworms, 111	Gloucestershire, 267
damage to winter wheat by, 113	Herefordshire, 263
earthworms, 112, 113, 158	Kent, 266
effect of pesticides on, 113	Lancashire, 259
effect of soil aggregation on, 113	Lincolnshire, 261
effect of soil cultivation on, 112	Norfolk, 260
leatherjackets, 111	North Yorkshire, 259
slugs, 113	Northamptonshire, 262
Soil fumigation	Northumberland, 260
effect of clay content of soil on, 188	Nottinghamshire, 263
effect on cereal yields, 68	Oxfordshire, 266
effect on decomposition of soil organisms, 197	Pembrokeshire, 270
effect on N reserves in soil, 197	Salop, 263
effect on nematodes, 67, 132, 182, 184, 185, 187, 188	Somerset, 268
effect on plant parasitic fungi, 184	South Yorkshire, 260
effect on <i>Rhizobium</i> spp., 132 effect on rotations of barley, beet and potatoes, 188	Staffordshire, 263, 264
effect on soil metabolism, 191, 196	Suffolk, 260 Warwickshire 264
for beans, 131	Warwickshire, 264 West Yorkshire, 260
for measuring soil biomass, 196	Wiltshire, 268
for whipworm, 188	Worcestershire, 263
residual effects of, 67	Soil temperature, measurement of, 271
soil organic matter and, 187, 197	Soil water. See Soil moisture
with chloroform, 197	Solanum spp., 177
See also names of chemicals used for fumigation	'Solubor' (diboron trioxide), as spray for sugar beet,
Soil geochemistry, 196	128
Soil mapping, 274–276	Somerset, soil survey in, 268
Soil microstructure, 274	South Yorkshire, soil survey in, 260
Soil mineralogy	Spindle bush (Euonymus europaeus)
computer models for, 192, 196	as host for aphids, 52, 106, 152, 174
determination of, 273	Spongospora subterranea (powdery scab), on potato,
in Southern England, 192, 275	242
interstratified expanding clay minerals, 192	Staffordshire, soil survey in, 263
major and minor elements in silt and clay fractions,	Stagnogley soils, 266, 270, 274
196	Statistical analysis
minerals in clay fractions, 194, 273	cluster analysis, 289
of Nigerian soils, 195	fertiliser responses, 287
X-ray diffraction of, 192, 194, 273	for Commonwealth and Overseas, 295
X-ray fluorescence spectrometry of, 196	for livestock experiments, 289
Soil moisture	for National Potato Harvester Damage Survey, 290
deficits in wheat, 219	for National Survey of Keeping Quality of Milk,
effect on nematodes, 57	290 for sail electification, 288
effect on potato diseases, 239	for soil classification, 288
neutron moisture meters for, 205, 21 8	multivariate analyses, 288
uptake by cereals with take-all, 218	Principal coordinate analysis, 288
water levels in fens and chalk, 270	Rothamsted General Survey Program, 289
Soil organic matter	Rothamsted Insect Survey, 288
decomposition of, 191, 197 effect of cropping on, 197	scaling techniques, 288 Survey of Fertiliser Practice, 289
	Survey of Perunser Fractice, 209
326	

Sugar beet (contd.)
seed production, 59
seed-spacing experiments, 47
seed yield, factors affecting, 58
seedling diseases, 51
sodium fertilisers for, 60, 61, 62
soil classification for, 277
soil compaction during harvesting, 65
soil structure, effect of, 65
sowing time, 64
subsoil fertilising for, 68, 132
virus diseases of, 34, 46, 50, 51–56, 58, 66, 128, 136,
143, 213
water stresses in, 34 Statistical Programming: GENSTAT cluster analysis program (CLASP), 294 contour plots, 293 distribution, 293 generalised linear interactive modelling (GLIM), 294 generalised linear interactive modelling (GLIM), 294
implementor's manual, 293
macro library, 293
maximum likelihood program (MLP), 294
maximal predictive criterion, 293
non-linear models, 293
transfer to other machines, 293
User's Guides, 293
Statistical theory
analysis of variance, 292
curve fitting, 291
diagnostic keys, 292
diversity of species, indices of, 288
fiducial combination of information, 291
fiducial probability, 290
Fisher's logarithmic series, 288
hierarchical classifications, 291
inconsistency principle, 290
multivariate analysis, 291
Procrustes rotation, 291
robust regression, 291
stable parameters, 291
statistical inference, 290
transformations for exponential families, 292
Stellaria media (Chickweed), in grass, 125
Stomatal resistance in plants, 205, 206
Streptomyces scabies (common scab), on potato, 127, 136, 153, 154, 238, 242
Strongwellsea castrans, infecting wheat bulb fly, 108
Stubble
cultivation of, 66
spraying with insecticides, 123 water stresses in, 34
weed control in, 66, 71, 123
yields, 49, 50, 64, 65, 66, 67, 69, 71
Sulphanilamide, microbial degradation of, in soil, 254
Sulphare soils, 191, 199
Sulphur of the deposition of, 77, 87 effect of air drying on release of, from soil, 197 effect on amino acids in cereal protein, 22 from rain and the atmosphere, 77, 87 in drainage water, 87 photosynthesis inhibited by, 33 pollution from brickworks, 33 Sulphur-coated urea, 76, 77, 78 Take-all on cereals ake-all on cereals cell-wall degrading enzymes and, 18 decline of, 223, 224, 227, 229 effect of crop sequences on, 224-226 effect of cultivation on, 230 effect of fallows on, 224 effect of nitrogen on, 250 effect of nutrition of host and fungus on, 250 effect of PK fertilisers on, 224 effect of rainfall on, 212 effect on water uptake by plants, 218 fungi reported as causing, 212 on consecutive susceptible crops, 226 Phialophora radicicola and, 18, 212, 226-229 rotations against, 223, 224 soil sampling for studying, 230 stubble
cultivation of, 66
spraying with insecticides, 123
straw chopper for, 125
Sucrose synthesis, glycollate pathway in, 31
Suffolk, soil survey in, 260
Sugar beet uffolk, soil survey in, 260
ugar beet
arthropod pests of, 46
Aphanomyces cochlioides on, 51
aphicides for, 52-56, 123, 128, 145
aphids on, 51-56, 123, 128, 135, 143, 145
artificial defoliation of, 50
auxins in, 37
bolting, effect of growth regulators on, 35
Collembola in, 47, 48
copper deficiency in, 63
damage by mammals and birds, 45, 50, 51
Docking disorder, 57, 66, 186
effect of farmyard manure on, 67
effect of seed advancement on, 62
effect of shoot or root removal on, 58
effect of soil temperature on seedlings, 59
ethyl mercuric phosphate steep for, 51
frequency of beet and barley, 67
fungus diseases of, 51, 56, 58
green manuring for, 65
groundkeepers, 52
growth regulators and, 35-38
harvesting time, 64
in Ley-Arable experiment, 123
insecticides for, 48-49, 52-56
irrigation for, 34, 59, 63
K fertiliser for, 60, 61
leaf diseases, 56
magnesium fertiliser for, 60
manganese sprays for, 62
millipedes in, 47 Phialophora radicicola and, 18, 212, 226–229 rotations against, 223, 224 soil sampling for studying, 230 survival in soil, 229 Survival-of-Take-all experiment, 227 'take-all rating', 225 translocation of ions through infected roots, 218 viruses and, 212, 228, 229

Taro (Colocasia esculenta), virus diseases in, 214 TCHTB, as fungicide for sugar beet, 51
Tea, effect of aluminium on, in acid soils, 77 'Technicon AutoAnalyzer', 141

Telone', for Docking disorder in sugar beet, 57, 186
Terbutryne ('Prebane'), as herbicide, 38, 122
Termites, measurements for classification of, 288
'Terrazole', as fungicide for wheat seeds. 223
Tetrachlorvinphos, housefly resistance to, 144
Thiabendazole, 187, 240
Thiophanate methyl as fungicide for cereals, 157
movement of, in soil, 240
Thiram, for control of wood mice, 50
Tillage experiment, use of mobile shelter for, 202
Tobacco, virus diseases of, 212, 213
Trace elements in soils, 196, 271
See also names of individual trace elements
Triazophos, as insecticide for wheat bulb fly, 147
Tridemorph, as fungicide, 69, 70, 124, 127, 212, 215, Triazophos, as insecticide for wheat bulb fly, 147
Tridemorph, as fungicide, 69, 70, 124, 127, 212, 215, 220, 221, 223, 237
Trifolium pratense (red clover), breeding for increased N fixation in, 246 magnesium fertiliser for, 60
manganese sprays for, 62
millipedes in, 47
N fertilisers for, 58, 59, 61, 63
nematodes in, 54, 55, 57, 66, 174, 186
P fertilisers for, 59
pelleted seed, 47, 48, 50, 59, 70
pest aggregation in, 47
Phoma betae in, 51
plant spacing, 64
pygmy beetles in, 47
seed placement in soil, 59 Trimethylamine, 79 Tropical soils
chloroform fumigation of, 197
effect of clearing forests and cropping on, 197
flush of decomposition in, 197
mineralogical composition of, 195
nutrient reserves of, 197
of Nigeria, 195, 197 327

Tropical soils (contd.)
on Basement-Complex rocks, 195
organically combined nutrients in, 191 Warwickshire, soil survey in, 264 Wasps, biological control of aphids and thrips by, 151 pressure-bomb measurements of, 205
radiant energy and, 34
thermocouple psychrometers for measuring, 206
Water Quality, Confernce on, 288
Water Resources Planning Unit, 276
Weather Rhizobium spp. in, 246 Ultrasonic dispersion of soil, 202 movement in soil, 78 scorching of wheat by, 27 sulphur-coated, 76, 77, 78 at Broom's Barn (1973–74), 308 at Rothamsted (1973–74), 306 at Saxmundham (1974), 309 at Woburn (1973–74), 307 effect on crops, 121, 126, 211 effect on nematodes, 173 Ustilago nuda (Smut), on barley, 157 Verticillium chlamydosporium, infecting nematodes, Verticillium dahliae, 181, 182, 184 Vigna spp., 247 Viruses Weed Research Organisation, 112, 230 antiserum for, 214 aphid-transmitted, 51-56, 104, 212, 213, 232, 234, Weeds biology of, 38-42 effect of fertilisers on, 39, 42 effect of rotations on weed seeds in soil, 39 aphid-transmitted, 51-56, 104, 212, 213, 232, 234, 236, 237, 241 control by seed treatment, 235 effect of irrigation on, in sugar beet, 34 electronmicroscopy of, 111, 116, 220, 232 in beans, 124, 234-236 in cereals, 212, 214 in cutworms, 11 in grass, 212, 214, 231, 232 in honey bees, 115 in potatoes, 17, 104, 158, 212, 213, 241 in sugar beet, 34, 46, 50, 51-56, 58, 66, 128, 136, 143, 213 in tropical crops, 214 effect of rotations on weed seeds ground-keeping potatoes, 39 herbicides for control of, 38, 122 in grass, 40, 125, 128 mechanical weeding, 123 nematodes in, 182 on Barnfield, 123 on Broadbalk, 38, 122 on Hoosfield, 39, 122

See also Agropyron; Agros Equisetum; Wild oats
Weevils, 211, 234–236
Welsh Plant Breeding Station, 184
West Yorkshire, soil survey in, 260
Wheat Agrostis; Alopecurus; in tropical crops, 214 inhibitors of infection, 213 mechanical transmission of, 231 Vest Yorkshire, soil survey in, 260
Wheat
baking and milling quality, 76, 133
boron fertiliser for, 63
bread making and protein content, 22, 76, 80
bushel weight of, 133
carbohydrate metabolism of, 27, 30, 32
composition of cell walls of roots, 18
effect of farmyard manure on, 76, 80, 81, 86
effect of fertilisers on, 76, 80–83
effect of growth substances on, 32, 33, 127
effect of organic manures on, 76, 77, 80, 81, 86
enzymes and photosynthesis in, 28
eyespot on, 124
flour yield of, 133
foliar sprays of N for, 76, 80
gibberellins in grain, 33
in rotations, 76, 77, 82, 83, 85
in Rothamsted Reference experiment, 81
irrigation for, 205
lodging of, 124, 127
N content of, 76, 80–83, 127
N fertilisers for, 22, 25–29, 76, 80, 85, 86, 124, 127
on Broadbalk, 76, 80, 81, 122, 185, 224
photorespiration in, 27, 29
photosynthesis in, 26–31
protein content of, 22, 28, 76, 80
scorching of, by urea, 27
silicon content of glumes, 219
slug damage, 113
soil-moisture deficit in, 219
sugar content of, 26
wheat bulb fly on, 107–109, 123, 147, 148 mite-transmitted, 212, 231 modification by o-quinones, 17 multiplication, inhibition of, 212 necrotic local lesions caused by, 214 nematode-transmitted, 174
oats as diagnostic host for, 214
plant hoppers as vectors, 215
protein of, 17, 214
seed-borne, 234, 235
transmission component for, 213
weevil-transmitted, 212, 234, 235 Viruses, names of Arkansas bee, 116 barley yellow dwarf, 212 bean leaf roll, 235 bean tear roll, 255 bean yellow mosaic, 235 bee chronic paralysis, 116 bee slow paralysis, 115 bee virus X, 116 beet mosaic, 52 beet yellows, 34, 46, 50–56, 58, 66, 128, 136, 143, 213 broad bean stain, 124, 234–236 broad bean true mosaic, 234 brome mosaic, 214 cocksfoot mild mosaic, 214 cocksfoot mottle, 214 cucumber mosaic, 214 dasheen mosaic, 214, 215 Echtes Ackerbohnenmosaik, 234–236 euonymus mosaic, 174 festuca mottle, 214 oat sterile dwarf, 214 sugar content of, 26
wheat bulb fly on, 107–109, 123, 147, 148
yields, 67, 68, 70, 81, 82, 83, 124, 127, 230
See also Cereals; Eyespot; Take-all
Wheat after Intensive Barley experiment, 250
Wheat bulb fly pea enation mosaic, 235 pea enation mosaic, 235
pea mosaic, 235
phleum mottle, 214
potato leaf-drop streak, 241
potato leaf roll, 241
potato X, 17
potato Y, 213, 241
ryegrass mosaic, 212, 231, 232, 233
sowbane mosaic, 214
tobacco mosaic, 214
turnip mosaic, 237
turnip rosette, 214 Activated charcoal for controlling, 148 activated charcoal for controlling, 148 adult activity of, 107 compost for controlling, 148 effect of depth of sowing seed on, 148 effect of pesticides on, 123, 147, 148, 158 Entomo mercury/dieldrin for controlling, 123 permethrin for controlling, 147 population studies, 107

Wheat bulb fly (contd.)
Strongwellsea castrans on, 108
Whipworm, 188
Wild Oats (Avena spp.), 39, 113, 122
Wiltshire, soil survey in, 268
Woburn farm
boron content of soils, 88
effect of soil organic matter on crops, 85
Intensive Cereals experiment at, 83
irrigation at, 205
Market Garden experiment at, 198
Organic Manuring experiment at, 88
rotations on, 126
Stackyard Field, experiments on, 32
toxic metal residues in soils, 198
weather at, 307

Wojnowicia graminis, 228 Worcestershire, soil survey in, 263

X-ray diffraction, 192, 194, 273 X-ray fluorescence spectrometry, 196

Yorkshire North York Moors, moorland and arable land on 276 soil surveys in, 259, 260

Zaire River Expedition, leguminous seeds collected on, 21 Zambia, grouping of species for vegetation map, 295 Ziram, for control of wood mice, 50