

Index

- abamectin 64, 68, 320
- Abate 323
- acetone 98, 250
- acetylcholine 66, 67, 69
- acetylcholinesterase 69
- Acrididae 182
- Actellic 323
- Acyrtosiphon kondoi* 45, 259
- Acyrtosiphon pisum* 181, 229
- Advantage 320
- Advisory Committee on Releases to the Environment, UK (ACRE) 266
- Aechmophorus occidentalis* 112
- Aedes* 18, 66, 71, 127, 193, 202, 292
- Aedes aegypti* 4, 9, 17, 34, 44, 46, 47, 49, 132, 133, 162, 197, 198, 201, 202, 261, 268, 278, 286, 307
- Aedes albopictus* 18, 133, 197, 198, 257, 307
- Aedes polynesiensis* 197, 198
- aegyptianellosis 3
- aerial spraying 65, 82, 151, 194, 300, *see also* rivers
- aerosols, insecticidal 93, 258
- African honey bees 8
- African Programme for Onchocerciasis Control (APOC) 269, 282
- African swine fever 260
- African trypanosomiasis 251, *see also* trypanosomiasis
- afrofuran 59
- aggregated distributions 153, 154, 158
- Agricultural Development Advisory Service 289, 290
- agricultural practices and diseases 20–24
- Agrobacterium* 218
- Agriotes* 142
- Agrostis* 290
- AIDS 185
- air-assisted sprayers 92–3
- air-barriers 244
- aircraft disinfection 258
- airport malaria 257
- Alaskan paper birch 231
- aldicarb 67, 320
- aldrin 63, 66, 322
- Aleyrodidae 134, 224, 259
- Aleyrodioidea 152, 182, 247
- alkaloids 223, 232
- alkylating agents 200
- Allantoin 28
- allethrin 67, 95, 323
- allomones 204
- allylisothiocyanate 224
- almond moth 212
- alphacypermethrin 97, 323
- Alticinae 134, 225, 247
- Altosid 321
- aluminium foil 252
- aluminium phosphide 96
- Amblyomma* 238
- Amblyomma americanum* 143, 238
- Amblyseius* 118
- Ambush 324
- American bison 35
- American cockroach 210
- American buckwheat 167
- amethopertine 200, 320
- amino acids 228, 229
- amitraz 69, 97, 256, 321
- amplifying hosts 130, 144
- Anabrus simplex* 7
- Anagrapta falcifera* 184

- Anagrus* 166, 174
Anagrus epos 166
 animal destruction 136, *see also* game destruction
Anopheles 21, 98, 105, 129, 193, 201, 202
Anopheles albimanus 193, 194, 195
Anopheles aquasalis 24
Anopheles arabiensis 48, 175, 197
Anopheles bellator 22, 23
Anopheles culicifacies 10, 48
Anopheles darlingi 24
Anopheles freeborni 171
Anopheles funestus 50
Anopheles gambiae 10, 17, 18, 20, 42, 48, 99, 197, 257, 307
Anopheles melas 197
Anopheles pulcherrimus 171
Anopheles sacharovi 21, 171
Anopheles sinensis 130
Anopheles stephensi 171, 244
 anopheline mosquitoes 1, 2, 13, 19, 20, 22, 23, 43, 49, 52, 63, 128, 138, 171, 175, 243, 287, 293
Antestia bug of coffee 2, 131
Antestiopsis 131, 163
Anthomyiidae 118
Anthonomus grandis 195, 209, 224, 309
Anthonomus pomorum 13
 antibiosis 220, *see also* plant resistance
 antifeedants 254, 256
 anti-fly curtains 244
 anti-insecticide lobby 318
 anti-juvenile hormones 71
 anti-malarial drugs 108, 110
 anti-metabolites 200
Antirrhinum majus 25
 antixenosis 220, *see also* plant resistance
 ants 28, 147
Aphelinus flavus 155
Aphidius rhopalosiphii 141
 aphids 2, 5, 9, 14, 17, 27, 28, 31, 32, 34, 45, 46, 54, 60, 66, 67, 69, 128, 130, 131, 141, 145, 155, 162, 165, 182, 205, 213, 216, 223, 224, 225, 226, 228, 229, 230, 231, 233, 234, 235, 236, 252, 253, 274, 276, 281, 284, 285, 288, 290, 291, 296, 297, 298, 300
Aphis fabae 5, 32, 236, 290
Aphis gossypii 136, 155
 apholate 200, 201, 320
 Aphox 320
Apis mellifera scutellata 8
 apple blossom weevil 13
 apple mildew 233
 apples 6, 13, 14, 25, 31, 62, 63, 113, 114, 156, 223, 228, 233, 247, 275, 284, 289, 300, 309, 310
 apple sawfly 223
 Aprocarb 320
 aquatic habitats, spraying 99–102, *see also* rivers
 arboviruses 2, 3, 21, 22, 129, 143, 201, 255, 260, 262, 284, 287, 289
Archips semiferana 206
 Argasid ticks 3
 armyworms 5, 10, 128, 184, 235, 239
 arsenic 52, 62
Artemesia annua 262
 artemesins 262
Ascotis selenaria 302
Atomaria linearis 145
Atropa belladonna 61
 attractant baits 248, 249, 254
 attractants 98, 137, 162, 200, 208, 210, 253–4, 301
 attractant traps 248–50
 Autan 324
 autocidal control 190
 autumn crocus 217
 avermectins 64, 68, 320
 Avoncrisp lettuce 216
Azadirachta indica 61
 azadirachtin 61, 322
 aziridines 200
Azolla 244

Babesia 7
 babesiosis 3
Bacillus popilliae 188, 321
Bacillus sphaericus 188, 321
Bacillus thuringiensis (B.t.) 156, 178, 186, 187, 188, 219, 228, 232, 233, 234, 266, 308, 310, 322
Bacillus thuringiensis serotype H-14 101, 187, 322
Bacillus thuringiensis var. *israelensis* (B.t.i.) 101, 178, 187, 188, 277, 298, 319, 322
 bacteria 2, 3, 19, 20, 156, 175, 202, 218, 239, 278
Bactrocera tryoni 301
 Baculoviridae 183
 Baculoviruses 183, 186
 bananas 5, 44, 132, 135
 banana weevil 135
 Bancroftian filariasis 21, 48, 68, 133, 201, 244, 292
 band spraying 68, 301–2
 bark beetles 2, 205, 209
 barley yellow dwarf virus 2, 8, 46, 145, 288, 292
 bats 148, 153, 253
 bat towers 148
 Baygon 320
 bayrepel 255, 324
 Baytex 323
 beans 11, 223, 224, 290

330 Index

- Beauveria* 177, 181
Beauveria bassiana 181, 183, 322
 bedbugs 13, 63, 78, 83, 95, 97, 109, 206, 244
 bed nets *see* mosquito nets
 bees 2, 25, 26–7, 114
 beeswax 27
 beet curly top 2
 beet eelworm 260
 beet leafhopper 2
 beetle banks 163
 beetles 6, 15, 19, 28, 29, 54, 95, 125–41, 153,
 163, 173, 174, 188, 228, 309, *see also*
 pheromones
 beet yellows 2
 beet yellow virus 290
 behaviour modifying chemicals 253–6
Bemisia tabaci 259
 bendiocarb 320
 beneficial insects 247, 272, 276
 benzoylphenyl ureas 72
Bessa remota 168
Betula resinifera 231
 β -farnesene 213
 BHC 322, *see also* HCH
 biconical traps 250, 251
 bioallethrin 95, 324
 biodiversity 160, 163, 165, 266
 biolistics 218
 biological control 6, 7, 26, 38, 45, 65, 70, 72,
 123, 125, 131, 141, 147–76, 177, 189,
 190, 211, 229, 230, 237, 247, 253, 258,
 263, 271, 274, 275–8, 281, 294–5, 296,
 297, 299, 301, 302, 303, 304, 305, 306,
 308, 309, 311–13, 317
 advantages 149–51
 alternative and alternate prey 164–6, 173
 attacks by predators, parasitoids 174
 augmentation 175, 294–5
 classical methods 150, 154, 158
 conservation 125, 162–3, 167
 costs 150
 disadvantages 149, 151–3
 disarmed animal viruses 175
 failures 161, 162, 172–4
 flowers 166–7, 173
 genetic modification 175
 gene transfer 175, 176
 glasshouses 148, 150, 152, 160–1, 162, 170,
 172
 habitat modification 22, 109, 125, 126,
 127–8, 163, 167
 inoculative releases 158–61
 inundative releases 150, 161–2
 malaria vectors 170–2
 natural or not? 174–6
 nematodes 148, 152, 153
 parasites 153, 159, 165, 166, 168, 169, 170,
 171
 parasitoids 149, 150, 153, 154, 159, 162,
 163, 166, 172
 pathogens 156
 predators 149, 153–4, 160, 162, 163, 172,
 173, 175, 176
 resistance 150–1
 side-effects 149
 stored products 172
 successes 148, 167–72, 174
 techniques 158–67
 weeds 160, 163, 173
 biotechnology 180
 biotypes 222, 239, *see also* plant resistance
 bird-cherry aphid 2
 birds 17, 19, 22, 34, 65, 108, 112, 113, 125,
 126, 127, 153, 163, 185, 253, 256, *see also*
 predatory birds
 bison *see* American bison
Bison bison 35
 biting lice 13
 biting midges 7, 14
 black bean aphid 5, 32, 285, 290, 291
 blackberries 166, 294
 blackberry leafhopper 166
 blackcurrant gall mite 135
 Black Death 6
 black flies (simuliids) 7, 46, 99, 119, 178, 188
 blackfly (aphid) 236
 black scale 162
 bladder pod midge 142
 Blandford fly 46
 blanket dragging 288
 blanket spraying 77, 112, 272
Blastophaga psenes 25
Blatella germanica 210
Blissus 139
Blissus leucopterus 131
 blister beetles 15, 28, 224
 blow flies 197, 248
 bluebottles 15, 27
 blue-green alfalfa aphid 45, 259
 blue tongue virus 14
 body louse 3, 7, 13, 44, 61, 63, 75, 94, 251, 292
 boll weevil 195, 209, 224, 309
 bollworms 5, 11, 34, 120, 130, 139, 144, 212,
 224, 229, 233, 280, 308, 309
Bombus 25
Bombyx mori 27
 boom sprayers 83, 88, 92, 164
Boophilus 143, 239
Boophilus microplus 143, 238, 239
 Bordeaux mixture 82, 321
Borrelia burgdorferi 292
Bos indicus 238
Bos taurus 238
 Bostrychid beetle 172
Botrytis 252
Brachiola algerae 189

- Braconidae 118, 298
Bracon mellitor 118
 brassicas 5, 11, 93, 134, 229, 245, 246, 247, 264
 Breteau index 287
Brevicoryne brassicae 4, 32, 48, 141, 229, 297
 broad beans 228
 Brome grass 137
 Bromeliads 22, 23
Bromus sterilis 137
 brown citrus aphid 2
 brown planthopper 2, 5, 11, 119, 234
 Bruchid beetles 62, 228
 Brussels sprouts 141, 264
 Bubonic plague *see* plague
 buckwheat *see* American buckwheat
 buffalo-bur 6
 buffer zones 265
Bufo marinus 149, 277
 bulb flies 250
 bumble bees 25, 28
 bush crickets 250
 bush fly 14, 25
Busseola 134
 butanone 98
 butterflies 29

 cabbage aphids 32, 48, 113, 141, 223, 229, 297
 cabbage caterpillars 229
 cabbage looper 181
 cabbage root fly 77, 96, 141, 166, 201, 227, 245, 246, 290
 cabbages 137, 141, 166, 184, 218, 223, 224, 245
 cabbage white butterfly 32, 70, 140, 223
Cactoblastis cactorum 26
 cactus mealybug 27
Calliphora 15, 27
Callosobruchus 62, 228
 Camphchlor 323
 cane beetle 149
 Cañete Valley 269, 272, 273, 302
 cane toad 149, 277
 cankerworm 5
 cannibalism 70, 137, 140
 Cantharidin 28
 carabid beetles 290
 carbamates 62, 64, 66–7, 100, 103, 119, 235, 256, 275, 297, 298, 320
 carbaryl 64, 66, 119, 235, 264, 320
 carbofuran 58, 59, 67, 320
 carbon dioxide 252, 287
 carbosulfan 320
 carcinogenic 55, 66, 200
 carnations 6, 15, 259
 carp 130
 carrot root fly 77, 141, 142
 carrots 141

 carrying capacity 32, 34
 cash flow for insecticide development 58
 cassava 22, 254
 cassava mealybug 149, 170, 254
 cat 258
 cat flea 13, 70, 71
 cattle 4, 7, 10, 13, 17, 22, 23, 24, 32, 34, 46, 68, 102, 103, 137, 138, 142, 191, 194, 209, 210, 220, 224, 238, 239–41, 319, *see also* vertebrate host resistance
 dipping 102, 103
 spraying 102, 103, 183
 Cecidomyiidae 67
Cecidophyopsis ribis 135
 Cekutrotion 59
 celery looper 184
 Centers for Disease Control and Prevention (CDC) 262
Cephus cinctus 137, 144, 227
Ceratitis capitata 195, 202, 301
 cereal aphids 14, 213, 291
 cereal field margins 29
 cereal leaf beetle 13, 125
 cereal root aphids 125, 228, 229
 cereal rusts 234
 cereals 7, 45, 46, 75, 125, 128, 135, 139, 141, 142, 144, 145, 163, 164, 165, 166, 167, 173, 213, 224, 227, 230, 280, 288
 chafers 142
 Chagas disease 3, 78, 97, 135, 202, 268, 283, 318
 changes in agricultural systems 143–5
 Chaoborids 28
Chaoborus astictopus 112
 chemical control *see* insecticides
 chemical radiation shields *see* pathogens of insects
 chemosterilants 200, 248, 320–1, *see also* genetic control
 cherries 25
 chickens 288
 chickpeas 207
 chigoe flea 18
Chilo 227
Chilocorus cacti 152
Chilo suppressalis 113, 227
 chinch bug 131, 139
 Chironomids 28, 29
 chitin synthesis inhibitors 72
 chlordimeform 69, 321
 chloropyrifos 119, 323
 chlorphoxim 119, 323
 cholinesterase 66, 67
Chromaphis juglandicola 172
 chromosomal translocations 196, *see also* genetic control
 chromosomes 196, 198, 203
Chrysanthemum cinerariifolium 52, 53, 61

332 Index

- chrysanthemums 271, 273–5, 276, 281, 302
Chrysomya megacephala 18
 Chrysopidae 153, 232
 cicadas 28
 Cicadellidae 224, 252, 300
Cicadulina mbila 11
Cimex 95
 citronella oil 254, 256, 324
 citrus 13, 14, 44, 114, 147, 148, 168, 301
Citrus tristeza 2
Cladosporium 225
 Clear Lake, California 112
 climate changes 48–51
Coccinella bipunctata 297
 Coccinellidae 141, 149, 232
 Coccoidea 182, 301
 cochineal 27
Cochliomyia hominivorax 191, 282, 307
 cockroaches 12, 75, 78, 84, 98, 112, 210, 248,
 249, 260, 301, *see also* pheromones
 cockroach traps 248–9
 cocksfoot grass 163
 cocoa 22, 25, 82, 83, 135, 214
 cocoa capsid 2
 coconut husks 133, 134
 coconut moth 168–70
 cocoyams 5
 Codex Committee on Pesticide Residues
 (CCPR) 265
 codlemone 205, 323
 codling moth 63, 71, 113, 156, 184, 188, 205,
 253
Coelomomyces 178, 183
 coffee 131, 135, 163, 174, 301, 302
 coffee berry borer 135
 coir pits 133, 134
 colchicine 217
Coleomegilla maculata 118
 Coleoptera 116, 142, 154, 187
 colonization, by people 42
 Colorado beetle 6, 19, 42, 43, 52, 63, 156, 259
 Colorado tick fever 3
 community involvement *see* community
 participation
 community participation 68, 261, 266–70
 competition 34
 competitive displacement
 compression sprayer 83
 concealed antigens *see* vertebrate host resistance
 conifers 226, 293, *see also* pine trees
Conium maculatum 61
 conservation 70, 136
 conservation biological control *see* biological
 control
 Consultative Group on International
 Agricultural Research (CGIAR) 215, 263
 contagious distribution 153
 container index 287
Contarinia nasturtii 137
Contarinia pisi 142, 206
 contest competition 33, 34, 35
 Control of Substances Hazardous to Health
 Regulations, UK (COSHH) 265
 control versus eradication 306–7
 controlled atmosphere storage 252
 controlled droplet application (CDA) 89,
 91
 conventional competition 34
 copper aceto-arsenite 62, 63
Cordia 173
 corn borer 228
 corn earworm 137, 235
Cosmopolites sordidus 135
 cost–benefit analysis *see* pest and vector
 management
Cotesia 298
 cotton 11, 13, 22, 34, 55, 120, 130, 135, 136,
 139, 140, 144, 180, 194, 209, 211, 212,
 214, 224, 225, 229, 233, 235, 252, 260,
 269, 271, 272, 273, 276, 280, 300, 302,
 308–9
 cotton aphid 136
 cotton bollworm 11, 34
 cotton-stainer 136
 cottony cushion scale 167, 169
 coumaphos 323
 countryside stewardship 163
 cow parsley 166
 cowpeas 12, 62, 140, 225, 226, 228, 231, 256,
 267, 269, 298
Crataegus monogyna 166
 crickets *see* named crickets
 critical thresholds *see* pest and vector
 management
 crop
 background 141, 163
 losses 1, 5, 17, 18, 50, 114, 279
 residues 134, 135, 295, 311
 rotation 128, 142, 173, 272
 scouting 285, 308
 yield 6, 14, 96, 114, 130, 137, 174, 269,
 279, 311, 313
 crowding 34, 40
 crucifers 166, 218, 229
Cryptolaemus montrouzieri 229
Ctenocephalides canis 13
Ctenocephalides felis 13
 cucumbers 155, 224, 275, 302
 cucurbits 55
Culex 193, 202, 244
Culex pipiens 197, 199
Culex quinquefasciatus 17, 21, 44, 48, 49, 133,
 134, 193, 201, 244, 245, 292
Culex tarsalis 144, 287

- Culex tritaeniorhynchus* 21, 129, 130, 144, 197, 287
 culicine mosquitoes 2, 63, 244
Culicinomyces 183
Culicoides 7
Culicoides imicola 14
 cultural control 39, 123–46, 160, 242, 275, 277, 295, 303, 304, 306, 309, 311, 314, *see also* environmental control
 Curaterr 59, 320
 currant bushes 114
 cuticle 54, 59, 61, 71, 72, 105–6, 115, 117, 181, 182, 206, 213
 cutworms 16, 128, 290
 Cycloxydim 264
Cydia nigricana 227, 289
Cydia pomonella 63, 71, 113, 156, 184, 208, 253
 cyfluthrin 324
 cypermethrin 67, 324
Cyprinus carpio 130
 cyromazine 72, 96, 321
 cytochrome oxidase 65
 cytoplasmic polyhedrosis virus 185
- Dactylis glomerata* 163, 165
Dactylopius coccus 27
Daktulosphaira vitifoliae 130, 235
 Dalmatian insect powder 61
 damage-induced changes in plants *see* plant resistance
Dasyneura brassicae 142
 day degrees 289
 DDD 112
 DDT 24, 44, 48, 56, 58, 62, 63, 64, 65, 67, 68, 77, 99, 105, 109, 110, 111, 113, 148, 170, 171, 271, 272, 301, 302, 322
 DDT-era 108, 148
 DDVP 323, *see also* dichlorvos
 deadly nightshade 61
 Decis 324
 deer 68, 136
 DEET 254, 255, 256, 324
 defoliation 279, 284, 285, 309
 deforestation 22, 46
 delayed density-dependence 38, 39
Delia coarctata 142, 230, 290
Delia radicum 77, 96, 141, 166, 201, 227, 245, 290
 deltamethrin 67, 97, 138, 255, 283, 324
 demasculation 217
 demeton 272, 323
Demolepida albohirtum 149
 dengue 2, 9, 18, 44, 46, 47, 133, 151, 162, 257, 262, 267, 268, 278, 286, 307, 318
 dengue haemorrhagic fever (DHF) 44, 46
- density-dependence 33, 35–8, 40, 41, 42, 45, 70, 152, 173, 315
 density-independence 35–40, 41, 42, 45, 48, 152, 173
 derris plant 61, 322
 desiccants 144, 309
 development projects 44, 292, 306
Diadegma 166
Diaeretiella rapae 297
 diamond-back moth 5, 11, 17, 166, 178, 188
 diapause 71, 290
 diarrhoeal infections *see* enteric infections
Diatraea centrella 135
 diazinon 66, 98, 210, 323
 Dibrom 323
 dibutyl phthalate 255, 324
 dichlorvos 76, 264, 275, 278, 323
 Dicofen 59, 323
Didus ineptus 35
 dieldrin 64, 66, 104, 322
 diesel oil 62
 diethyl-3-methyl benzamide *see* DEET
 diethyl-3-toluamide *see* DEET
 diflubenzuron 72, 321
Dikrella californica 166
 DIMBOA 228, 229
 dimethoate 65, 323
 dimethyl phthalate *see* DIMP
 Dimilin 321
 DIMP 254, 255, 324
 Diptera 72, 98, 116, 142, 154, 187, 206, 297
 direct drilling 128
Dirphya nigricornis 135
 disasters 292–3
 disease control 147, 261, 263, 281
 disease eradication 152, 277, 281, 306
 disease monitoring 288–9
 disease outbreaks 24, 272, 288, 292, 293, 294, 319
 disulfoton 66, 323
Ditylenchus dipsaci 250
Diuraphis noxia 19
 diversionary hosts 136–9
 DNA 175, 218, 221, 294
 dodo 35
 dog flea 13, 70, 71, 256
 dogs 55, 136, 253, 256, 258
 dose-response curves *see* insecticides
 dragonflies 29, 253
 drainage 126, 127
Drosophila melanogaster 29, 202
 drosophilids 202
 drug resistance 262
 drugs, role of 261–2, 277, *see also* named ones
 ducks 147
 dung beetles 25
 Dursban 323

334 Index

- Dutch elm disease 2
Dysdercus fasciatus 136
- ear tags 256
 earwigs 153
 East Coast fever 10
 ecdysone 71, 321
 ecomones 204
 economic injury level (EIL) 279, 280, 281,
 283, 284, 285
 economic monetary losses 266, 282, 284
 economic threshold (ET) 209, 278–81, 283,
 284, 285, 289, 295, 303, 308, 311, 314
 economically neutral insects 166
 ecotypes 172, 175
 ectoparasites 17, 68, 76
 ectoparasitoids 154
Ectopistes migratorius 35
Edwardsiana prunicola 166
 eelworms 139, 142, 188, 250
 egg counts 285, 290
 electrodyne sprayer 91
 electronic buzzers 253
 electrostatic sprayers 91, 92, 93
Elephantias maximus 205
 elephantiasis 68
 elephants 8, 126, 205
 El Niño phenomenon 50
Encarsia formosa 170, 247, 253, 274
 endemic ridge 38, 39, 40, 45
 endemic situation 40, 41, 42, 45
 endoparasitoids 154
Endopiza viteana 209
 endosulfan 65, 297, 300, 308, 311, 322
 endotoxin 186, 187, 319
 enteric infections 3, 18, 44, 134
 environmental contamination 277, 301
 environmental control 123–46, 242, 244, 275,
 277, 305, 306, 317, *see also* cultural
 control
 environmental damage 112, 277, 306
 environmental factors 36, 292, 310
 environmental management 277, 305, 306
 environmental pollution 242
 environmental Protection Agency (EPA) 234,
 264, 266, 271
 environmental sanitation 133
 Enzyme-Linked Immunosorbent Assay
 (ELISA) 294
 enzymes 60, 65, 66, 67, 106, 113, 115, 117,
 120, 200, 201, 214, 235, 298
Ephestia cautella 212
Ephestia kuehniella 212
 epidemic relapsing fever 3
 epidemic ridge 38, 39, 40
 epidemic situations 40–51, 63, 151, 288, 292
 epidemic typhus 3, 7, 44
- Epidinocarsis lopezi* 170, 254
 epizootic 40
 eradication 46
Erioischa brassicae 96
Erynia neoaphidis 181
Erythroneura elegantula 166
Escherichia coli 239
 esbiothrin 95, 324
 ethyl dimethyl sulphate 217
 ethyl parathion 65, 323
 European corn borer 18
 European sawfly 185
 European Union 257, 266
 extinction 35, 41, 149
- famine 7, *see also* Great Chinese famine
 FAO Code of Conduct for Pesticide
 Distribution and Use 57
 Farmathion 59
 farm mechanization 22–4
 Federal Insecticide, Fungicide, and Rodenticide
 Act (FIFRA) 264, 266
 feeding deterrents *see* plant resistance
 fenitrothion 59, 323
 fenoxycarb 71, 321
 fenthion 96, 323
 Fenitron 59, 323
 fertilizers 23, 41, 130–2, 216, 236, 244
 Ficam 320
 field cricket 198
 fig wasp 25, 26
 filaria 2, 3
 filariasis 2, 17, 42, 44, 197, 267, *see also*
 Bancroftian filariasis
 film-coating 93, 301
 filth flies 15
 fireblight 1, 2
 fish 56, 70, 100, 102, 112, 127, 130, 153, 158,
 160, 171, 276, 277, 297
 flat fan nozzle 83, 85
 flea beetles 134, 225, 247
 flea circus 13
 flea collars 70
 fleas 3, 6, 9, 18, 70, 71, 256, 306
 fleece *see* horticultural fleece
 flies 1, 14, 28, 34, 44, 78, 98, 112, 118, 153,
 173, 174, 244, 247, 260
 Flor's hypothesis 220
 flour beetles 202
 fluidized bed heating 251
 fluoroacil 200, 321
 fluorosilicate 62
 fly-belts, tsetse flies 4, 240
 flylure 210, 323
 fly papers 247
 foggers 87
 Folithion 59

- Food and Agricultural Organization of the United Nations (FAO) 192, 262, 263, 264, 265, 266, 303, 305
 Food and Drug Administration, USA (FDA) 68
 Food and Environmental Protection Act, UK (FEPA) 265
 food chains *see* insecticides
 food resource ceiling 34
Forcipomyia 25
 forecasting pest and vector outbreaks *see* pest and vector management
 forensic entomology 30
 forests 22, 27, 33, 42, 46, 49, 165, 183, 209, 214, 293, 294
 formamidines 69, 256, 321
Frankliniella occidentalis 137
 Frego bract 225, 233, 309
 frit fly 32, 128, 227
 frontier malaria 43
 frosts 290
 fruit crops 114, 214, 230, 254, 318
 fruit flies 29, 135, 195, 254, 301
 fruit thinners 279
 fungi
 as insect pathogens 96, 182
 as crop diseases 2, 8, 181, 227, 228, 252, 304
 fungicides 82, 110, 183, 256, 276
 funnel trap 207
 Furadan 59, 320

Galanthus nivalis 219
Galleria melonella 156
 galls 8, 25, 27, 218
Gambusia 160, 171
Gambusia affinis 158, 171
 game birds 163
 game destruction 136, 277
 gamma-HCH 322
 gamma radiation *see* sterility, radiation induced
 under genetic control
 gangrene 18
 gene frequency 214
 gene pool 159, 218, 219
 genes 201, 218, 220–1, 231, 233, 234, 266, 280, 319
 gene transfer 118, *see also* biological control and plant resistance
 genetic control 34, 118, 190–203, *see also* sterile insect techniques
 attractant baits 200
 chemosterilants 190, 191, 194, 199–201
 chemosterilization 199–201
 chromosomal translocations 190, 196–7
 competitive displacement 198–9, 202
 cytoplasmic incompatibility 190, 199, 201
 drugs 203
 genetic engineering 118, 201–3, 227, 319
 genetic manipulation 195, 199, 201–3
 genetic modification 190, 201, 202
 hybrid sterility 190, 197–8
 incompatible populations 198
 meiotic drive 203
 screwworms 191–3, 195
 sterile insect technique (SIT) 190, 191–5, 201
 sterility, radiation induced 191, 193, 194, 195, 196, 199
 transgenic strains 202
 transposons 202
 transposable elements 202
 vaccines 203
 genetic variation 229
 genetically modified (GM) crops 18, 296, 308, 319
 ecological damage 266
 human consumption 266
 genetically modified organisms (GMO) 257, 266
 genotypes 187, 201, 214
 geographical information system (GIS) 293
 gerbils 136
 German cockroach 210
 germplasm banks 217, 219
 giant looper of coffee 269, 302
 gladioli 252
 glandular hairs 224
 glasshouses 25, 72, 83–93, 95, 137, 138, 161, 181, 236, 247, 248, 252, 259, 271, 273–5, 276, 302
 glasshouse whitefly 170, 259, 274
 glassy-winged sharpshooter 19, 20
 Global Collaboration for Development of Pesticides for Public Health (GCDPP) 57
 global warming 19, 49, 50
Glossina 4, 195, 240, 250
Glossina austeni 194, 197
Glossina morsitans 42, 194, 250
Glossina palpalis 194, 250
 glow-worms 29
 glycoproteins 239
 glycosides 223
 Glyodin 276
 GM crops *see* genetically modified crops
 goliath beetle 30
Goliathus cacicus 30
 Golubatz fly 7
 gossypol 224, 225, 235, 309
Gracula religiosa 147
 grafting 228, 235
 grain aphid 14, 141, 285
 grain stores 123, 244
 granule applicator 94
 granulosis viruses (GV) 183, 184, 322
 grape berry moth 209

336 Index

- grape leafhopper 166
 grapes 209, 214
Grapholitha funebrana 211
 grass and cereal fly 45, 145
 grasses 11, 15, 45, 128, 137, 142, 145, 165,
 166, 188, 213, 288, *see also* named
 grasses
 grasshoppers 5, 11, 139, 189
 grease bands 245
 Great Chinese famine 5
 Great Plague 7
 grebe *see* Western grebe
 greenbottles 27
 greenfly 31
 green muscle disease 182, 322
 green rice leafhopper 2, 11, 234
 grey partridge 29
 grey squirrel 198
 ground beetles 56, 96, 141, 163
 groundnuts 5, 22
Gryllotalpa 173
 gummosis *see* plant resistance
 guppy 171
 gypsy moth 165
- habitat modification *see* biological control
 habitat stability 39, 40
 halogen compounds 321
 Hannane 252
 hardness of plant tissues *see* tissue hardness *under*
 plant resistance
 hard ticks 142, *see also* Ixodidae
 harmonious control *see* pest and vector
 management
 harvesting 123, 136, 144, 145, 173, 179, 187,
 230, 280, 309, 313
 hawthorn 166
 HCH 65, 264, 322
 head louse 260, 264
 heavy metal salts 61, 62–3, 321
 hedge parsley 166
 hedges 41, 77, 114, 166, 300
Helicoverpa 130, 140, 144, 225, 308
Helicoverpa armigera 11, 34, 140, 207, 224,
 229, 233, 280
Helicoverpa zea 137, 140, 235
Heliothis 130, 134, 308
Heliothis virescens 235
 Hemiptera 116
 hemlock 61
 Hepialidae 28
 herbicides 110, 114, 128, 163, 167, 173, 256,
 264
Hermes 202
 hessian fly 144, 235
 Heteropteran bugs 153
Himar 202
- hippopotamus 112
 histerid beetles 172
 hollow cone nozzle 83, 84, 86, 92
Homalodisca coagulata 19, 278
 honey 26, 27, 141
 honey bee 1, 8, 187
 honeydew 28, 162, 213, 253, 254
 honey-pot ants 28
 hooked hairs 224
Hoplocampa testudinea 223
 Hopperburn 231
 hormone mimics 69
 horticultural fleece 245, 246
 Horticulture Research International (HRI)
 290
 host immunity *see* vertebrate host resistance
 host plant resistance *see* plant resistance
 house flies 9, 32, 54, 67, 72, 98, 117, 133, 134,
 173, 187, 197, 200, 202, 244, 248, 264,
 278, 301, 316, *see also* pheromones
 house-spraying 48, 63, 64, 65, 78, 84, 98–9,
 104, 109, 110, 112, 171, 262, 283,
 318
 hover flies 67, 141, 153, 232, 250
 Hudson sprayer 84
 human bait catches 287
 human flea 13
 human migration *see* migration
 humidity 50, 124, 125, 131, 141, 163, 179,
 180, 181, 182, 183, 241
 hybridization 217
 hybrid sterility *see* genetic control
 hydraulic nozzles 89
 hydraulic sprayers 83–6, 90
 hydrogen cyanide 167
 Hydrophyllaceae 167
 Hymenoptera 118, 154, 232, 274, 297, 298
 hyperparasitoids 174
 hypersensitive plant reaction 216, 221
Hypothenemus hampei 135
- Icerya purchasi* 148, 167, 169
 Icon 324
 IGR *see* Insect growth regulators
Ilyanassa obsoleta 198
 Imidacloprid 64, 69, 322
 immunization *see* vertebrate host resistance
 impoundments 127
 Indian meal moth 212
 indole acetaldehyde 162, 213, 253
 inorganic insecticides 321
 insect abundance 32–40
 insect electrocutors *see* ultraviolet electrocutors
 insect growth regulators (IGR) 69–72, 76, 96,
 194, 297, 310, 321, *see also* named ones
 resistance 69, 71, 72
 insect nutrition 228

- insecticides 5, 35, 41, 42, 45, 46, 52–76, 100, 101, 102, 103, 107–22, 123–4, 137, 138, 143, 149, 150, 151, 152, 156, 158, 161, 162, 163, 167, 173, 174, 176, 177, 178, 179, 180, 181, 183, 187, 188, 191, 194, 195, 199, 202, 203, 207, 208, 209, 210, 211, 212, 214, 215, 219, 232, 233, 234, 236, 237, 238, 242, 245, 248, 250, 252, 254, 255, 256, 257, 259, 268, 269, 271, 272, 275–8, 279, 280, 281, 284, 294, 295, 302, 303, 304, 306, 308, 309, 312, 313, *see also* named insecticides *and* insecticide resistance
- accumulation 105, 106, 112
- active ingredients 77, 83, 87
- additives 104, 179, 298
- aerosols 87
- application in space 300–2
- application methods 57, 77–106, 264–5, 295–302
- application times 299–300
- baits, toxic 67, 98, 250, 301
- bans 65, 67, 76, 110, 111, 264, 272, 275, 277, 317
- bio-accumulation 56, 112
- body fat 111
- breakdown products 55, 63, 65
- briquettes 71, 76, 188
- contact 59, 61, 69, 297
- contamination 62, 83, 252
- controlled droplet application 89, 91
- cords 98
- costs 56, 57, 82, 103, 121, 150, 179
- deaths 96, 110, 111
- degradation 104
- deposits 81, 104–6, 298
- destruction of natural enemies 6, 11, 14, 68
- detoxification 103, 298
- development costs 57, 121, 150
- development of new compounds 53–7, 121, 295
- diluents 87
- dosage–mortality curves 117
- dose rates 92, 105, 265, 299, 301, 302
- dose reductions 93, 298–9, 312, 313
- dose–response curves 299, 313
- drift 75, 82, 87, 91, 114, 116, 265
- droplet coalescence 80, 104
- droplet evaporation 80
- droplet size 78–93, 105
- dusts 63, 75, 93–4
- economics 54, 55, 121
- effects on wildlife 53, 112–14
- emulsifiable concentrates 74
- emulsifiers 72, 74
- emulsions 87, 298, 301
- encapsulation 298
- environmental damage 65, 71, 93, 99, 100, 112, 148
- evaluation 54, 56
- failure 271–5
- flowable concentrates 188
- fogs 87
- food chains, accumulation in 56, 112
- formulations 54, 57, 58, 63, 72–6, 77, 114, 298
- fumigants 60, 65, 66, 67, 95, 96, 116, 297
- granules 66, 70, 71, 75, 94, 188, 301
- half-life 104
- impregnated mosquito nets *see* mosquito nets
- impregnated plastics 76
- irritancy 68, 99, 116
- labelling 265
- lacquers *see* paints and lacquers
- LD₅₀ and LD₉₀ 55, 116, 117
- mat, vaporizing 95
- maximum residue levels 55, 56, 265
- microcapsules 70, 74
- minimizing usage 316
- mists 87
- mode of action 65, 66, 67, 69
- monitoring susceptibility 118
- non-target organisms 55, 56, 62, 67, 100, 102, 114
- number mean diameter (nmd) 82, 86, 87, 88, 89, 91
- oil formulations 61–2, 74, 87, 91
- paints and lacquers 74–5
- pellets 75
- penetration 72, 106
- permitted uses 264
- persistence 53, 55, 57, 62, 65, 66, 67, 69, 72, 77, 104, 105, 107, 298
- pesticide-free produce 281
- phenology, crops 313
- photochemical oxidation 104
- phytotoxicity 55, 62, 72, 114
- plant derivatives 61
- poisonings 63, 66, 110, 111
- potentiation 55
- pour-on 96–7
- problems 6, 107, 148, 308
- production 121
- quasi-systematic 60, 65
- reduced dosages 272
- registration 56, 57, 66, 264, 265, 271, 272
- regulations 110, 111, 262, *see also* safety
- repellency 68, 116
- residual 59, 213, 262
- residues 55, 60, 64, 68, 102, 104–6, 111, 112, 183, 238, 265, 298
- resurgent pest problems 53, 113
- retention on leaves 79, 82, 104
- routes to insects 59–60

338 Index

- insecticides (*cont.*)
 run-off 104, 116
 safety 55, 56, 57, 110
 screening 54–7
 screens 98
 selection pressure 116
 selectivity 68, 77, 113, 275, 276, 279, 294,
 295–302, 312, 313
 self application 97
 shelf-life 72
 side effects 107, 112, 158
 smokes 94–5
 solvents 87, 106
 spot-on 96–7
 spray applications 78–93, 289–90, 296, 297
 spray reflection 79
 spray windows 120
 spreaders 62, 72, 104, 179
 stickers 72, 94, 104
 storage in tissues 106, *see also* body fat *under*
 insecticides
 sublethal effects 112, 182
 suspension concentrates 73
 synergists 120, 121, 206, 324
 synthetic 52, 53, 64, 107
 systemic 60, 66, 67, 69, 75, 297
 targets 98, 250
 toxicity 54, 55, 67, 68, 297, 298
 acute 55
 birds 69
 chronic 55
 dermal 55, 264
 fish 69
 oral 55
 to beneficial fauna 56, 57
 toxins 115
 translaminal 60, 65, 67
 traps 98
 ultra-low-volume 87
 usage, total 317
 volume mean diameter (vmd) 82, 84, 86, 87,
 88, 89, 91
 water-dispersable (wetttable) powders 73, 98,
 105, 109, 188, 298
 water-miscible liquids 73
 water-soluble powders 73
 wetters 72, 104, 114, 179
 wildlife, effects on 107
 to humans and mammals 53, 55, 57, 63,
 64, 65, 66, 67, 69, 107, 110–11
 insecticide resistance 11, 23, 48, 53, 65, 67, 68,
 69, 70, 72, 101, 103, 109, 110, 115–21,
 124, 137, 148, 150, 162, 167, 176, 188,
 194, 199, 202, 214, 238, 248, 262, 265,
 272, 273, 274, 277, 298, 302, 306, 309,
 316, 318
 cross 67, 117, 119
 behavioural 115
 delaying resistance 119–21
 detection 116
 mechanisms 117–18
 multiple 117, 120
 natural enemies 118
 physiological 115
 resistance race 121, 277
 rotation 119
 selection pressure 121
 spray windows
 tolerance 46, 62, 68, 69, 72, 116, 119, 121,
 233, 247, 271, 312, 313
 unnatural 116
 insects
 animal food 29
 beneficial 8, 24–30
 human food 28–30
 natural enemies 26
 pollination 25–6
 products 26–8
 scavenging 24–5
 useful 29–30
 Insect War 5, 124
 insurance spraying 281
 Integrated Control (IC) 118, 273, 278–302,
 305, 306, 317, *see also* pest and vector
 management
 concepts, crops 302–4
 concepts, medical and veterinary 304–6
 Integrated Crop Management (ICM) 304,
see also pest and vector management
 integrated pest control 160, 306, *see also* pest
 and vector management
 Integrated Pest Management (IPM) 121, 124,
 125, 230, 232, 235, 261, 263, 269, 304,
 306, 307, 308, 309, 311, 313, 315, 316,
 317, 318, *see also* pest and vector
 management
 integrated vector control 305, 306, *see also* pest
 and vector management
 Integrated Vector Management (IVM) 306,
see also pest and vector management
 intercropping 139–41
 intermittent irrigation *see* Irrigation
 International Atomic Energy Agency 193
 International Centre of Insect Physiology and
 Ecology (ICIPE) 263, 269
 International Commission of the Red Cross
 (ICRC) 263
 international organizations, roles of 261,
 262–3
 intraspecific competition 32, 34, 38
 introduced pests 294
 inverse density-dependence 39, 41, 42
 Ipsdienol 205
Ips pini 205

- irradiation *see* sterility, radiation induced *under*
genetic control
- irrigation 12, 13, 20–2, 41, 44, 124, 128–30,
144, 172, 272, 292, 309
intermittent 129, 130, 278
- isobenzan 210, 322
- isolation of crops 127–43
- isoprenoids 223–4
- isostearyl alcohols 62, 322
- Itonididae 67
- ivermectin 68, 101, 269, 277, 320
- Ixodes ricinus* 143
- Ixodidae 142
- Ixodid ticks 3
- jail fever 7
- Japanese beetle 188
- Japanese encephalitis 21, 129, 130, 144, 145,
260, 281, 287
- jigger flea 18, 68
- juvenile hormone analogues 71
- kairomones 162, 204, 213
- kale 137
- Kenya mealybug 174
- kerosene 62
- kinoprene 71, 321
- knapsack sprayer 83, 85, 91
- knockdown 302
- k-strategists 39
- Laccifer lacca* 27
- lacewings 232
- ladybirds 14, 45, 56, 67, 118, 141, 148, 149,
152, 153, 165, 167, 173, 174, 229, 230,
232, 296, 297, 300
- Lagenidium* 183
- lambdacyhalothrin 97, 283, 324
- Lampyridae 29
- landing catches *see* human bait catches
- Landsat satellites 293, *see also* satellite imagery
- lannate 320
- large grain borer 172
- Lariam *see* Mefloquine
- Larva americana* 173
- larvicides 99, 100, 101, 108, 109, 188, 194,
269, 278, 318
- latexes 226
- lead arsenate 63, 272, 321
- leaf area index 279, 280
- leaf-cutter ants 8
- leafhoppers 2, 9, 13, 19, 131, 166, 224, 231,
233, 252, 278, 300
- leaf insects 29
- leaf-mining grubs 60
- leafroller moth 300
- leatherjackets 142
- lecithins 62, 322
- lectin 219
- leeches 254
- legislative controls 107, 242, 257–61, 265, 299
containing entry 258–9
eradication 259–60
excluding entry 257–8
internal quarantine 259
International Animal Health Code 259
kennels 258
notifiable diseases 260
notifiable pests 259
Notification Order 259
Post-entry Quarantine Certificate 258
preventing spread 259
prophylactic measures 260–1
quarantine 258–9, 260
rotation order 260
Sale of Diseased Plants Order 259
- legislative regulations *see* legislative controls
- legume pod borer 225, 226, 298
- legumes 11, 62, 140, 142, 226, 228, 230, 280,
300, *see also* individual crops
- Leishmaniasis 3, 97, 136
- lemon eucalyptus oil 254, 324
- Lepidoptera 72, 116, 140, 178, 185, 187, 188,
198, 205, 212, 219, 309
- Leptinotarsa decemlineata* 6, 42, 43, 52, 156,
259
- Leptotrombidium* mites 255
- lethal temperatures 14, 250–2
- lettuce 216, 223
- lettuce root aphid 216
- Levuana iridescens* 169
- lice 1, 6, 9, 63, 68
- life-tables 310
- light intensity 41, 60, 73, 96, 179, 205, 236,
244, 248, 252, 280
- light-traps 284, 287
- lindane 322
- Littorina littorea* 198
- lizards 174
- locusts 1, 4–5, 11, 15–16, 17, 28, 105, 147,
182, 187, 294
gregarious phase 15, 16
outbreak areas 15
solitary phase 15
- Lolium perenne* 141, 165, 227
- Lotka–Volterra curve 33
- louping ill 143
- louse-borne typhus 260, 292, *see also* epidemic
typhus
- lucerne 17, 45, 162, 233, 259, 271, 273, 276,
302, 309
- lucerne aphid 17, 298
- Luciferin 29
- Lucilia* 27

340 Index

- Lucilia sericata* 197
 lufenuron 72, 96, 321
 lupin aphid 45
 lure and kill 301, *see also* pheromones
 Lurectron 210, 323
Lygus 233, 280, 309
Lymantria dispar 165
 lyme disease 1, 3, 136, 292, 293
Lytta vesicatoria 15
- machinery damage to crops 280
Macrocentrus ancyliivorus 118
Macrosiphum albifrons 45
 maggot therapy 28
 maggots 27, 28
 Mahaweli Irrigation Scheme 21
 maize 11, 13, 34, 134, 139, 140, 142, 228
 maize leafhopper 2, 11
 maize leaf streak virus 2, 11
 maize planthopper 2
 malaria 1–4, 9, 10, 13, 17, 18, 19, 20, 21, 22,
 23, 24, 42–4, 48, 49, 50, 61, 63, 78, 97,
 98, 99, 107, 109, 110, 111, 129, 130, 138,
 151, 171, 172, 175, 194, 197, 201, 243,
 244, 257, 260, 261, 262, 267, 281, 282,
 283, 288, 293, 307, 315, 318
 malaria, avian 202
 malaria control 48, 64, 99, 109, 110, 138, 171,
 262, 276, 277, 307
 malaria eradication 24, 48, 78, 108, 109, 148,
 171, 306
 failure 108–10
 malathion 65, 323
 male sterile crop variety 217
 Mallophaga 13, 288
 mammals 55, 69, 112, 256
 mange mites 68
 Mangold fly 145
Mansonia 128
 manuring 131
Maruca testulalis 225, 226, 298
 mastitis 3
Mayetiola destructor 144, 235
 mealybugs 174, 289
 mechanical control 125–8, *see also* physical
 control methods
 Mectizan 320
 Médecine sans Frontière 263
 Mediterranean flour moth 212
 Mediterranean fruit fly 195, 202, 301
 Mefloquine 262
 meiosis 196
 Meloidae 15, 224
Meredon 250
 metaldehyde 98
 metamorphosis 69, 71
Metaphysus helvolus 162
Metarhizium anisopliae 181, 182, 183, 322
 Metasystox 65, 297, 323
 methomyl 66, 298, 320
 methoprene 71, 96, 194, 321
 methoxychlor 323
 methyl bromide 96, 321
 methyl demeton 323
 methyl parathion 65, 235, 323
Metopolophium dirhodum 14
 mice 260
 microbial insecticides 62, 101, 177, 178, 180,
 183, 188, 277, 319, 321–2
 microclimate 123, 126, 163
 micron sprayer 90
 micronair spinning cage 88
 microsporidians *see* pathogens
 midges 67, 142
 migration
 human 7, 17, 20, 42–5
 pests and vectors 11, 16–17, 42–5, 194
 mildew 229
 mildura lettuce 216
 minimum tillage 128
Minos 202
 mistblowers 86–7, 92, 94
 mites 62, 116, 117, 118, 131, 153, 254, 275,
 309, 310
 modelling 19, 37, 39, 40, 49, 50, 119, 191,
 209, 234, 310, 315–6, 319, *see also*
 predictive modelling
 mole cricket 173
 molecular techniques 319
 molluscicides 98
 monitoring 287, 310, *see also* pest and vector
 management
 monoconical traps 250
 monoculture 20, 41, 42, 45, 148, 272, 294,
 302, 315
 monogerm seeds 145
 monomolecular surface films 62, 322
 Mormon cricket 7
Mosl 202
 mosquito buzzers 253
 mosquito coils 95
 mosquito doom 158
 mosquitoes 1–4, 5, 9, 10, 12, 13, 14, 17, 18, 19,
 20, 21, 22, 23, 24, 32, 34, 35, 42, 44, 46,
 48, 49, 50, 52, 54, 55, 56, 61, 62, 63, 66,
 68, 69, 70, 71, 72, 76, 77, 78, 83, 84, 95,
 97, 98, 99, 100, 105, 107, 108, 109, 113,
 116, 117, 119, 127, 129–30, 132, 133,
 137, 138, 144–5, 148, 149, 152, 153, 154,
 157, 158, 160, 162, 171, 172, 173, 177,
 178, 180, 187, 188, 189, 191, 193–4, 197,
 199, 202, 206, 237, 243–4, 245, 248, 253,
 255, 256, 257, 260, 267, 277, 278, 287,
 288, 292, 298, 305, 306, 307, 315, 316

- mosquito fish 171
 mosquito larviciding *see* larvicides
 mosquito nets 68, 97, 145, 276
 insecticide-impregnated 97, 110, 119, 243,
 244, 262, 267, 283
 mosquito screening 132
 moths 16, 17, 26, 69, 128, 168, 207, 225, 227,
 253, 269, 276, 289, 290, *see also*
 pheromones
 moulting 72
 moulting hormone 70, 71
 mud snail 198
 mulberry scale 152, 173
 mulching 131, 132
 multiple cropping 139–41
 multiplication of insects 5, 32, 48, 174, 284
Musca domestica 32, 197, 202, 210
Musca vetustissima 14, 25
 muscalure 210, 323
 Muscamone 210, 323
 muscid flies 3, 154
 mushroom fly 156
 mustard oils 201, 218, 223
 mutagenic 55, 200
 mutations 217
 Mynah bird 147
Myzus festucae 141, 290
Myzus persicae 229, 273, 274

 Nagana 4, 46, 77, 240
 Nairobi sheep disease 260
 naled 323
 natural enemies 46, 48, 68, 93, 113, 118, 125,
 137, 139, 141, 147, 150, 152, 158–60,
 161–2, 164, 166, 167, 172, 173, 174, 175,
 176, 177, 178, 201, 205, 232, 237, 253,
 254, 272, 273, 275, 276, 294–8, 299,
 300–2, 303, 308, 310, 311, 312–3, 314,
 see also parasites *and* predators
 importation 168, 172, 175
 ravine 38, 39, 40
 natural insecticides 61, 322
 natural selection *see* plant resistance *and*
 vertebrate host resistance
 nectar 25, 26, 27, 166, 167, 225, 228, 295, 311
 nectaries 225, 229
 nectary-less varieties 225, 229, 309
 neem tree 61, 322
 Nemasys 156
 nematodes 17, 68, 96, 139, 150, 152, 154–8,
 188, 205, 215, 227, 250, 277, 304
Nematospora taint, of coffee 2
Neoplectana 156
Neoplectana carpocapsae 156
Neodiprion sertifer 183, 185
Nephotettix 11
Nephotettix virescens 234

Nesolynx 154
 New World screwworm fly 193, 260, 282, 307
 nicotine 61, 322
 nicotinoids 64, 69, 322
Nilaparvata lugens 5, 11, 119, 234
 nitrogen 252
 Noctuidae 128, 184, 259, 290
 non-target organisms 153, 186, 219, 276, 277,
 300, 301
 non-tillage systems 145
 Nosema 189
Nosema algerae *see* *Brachiola algerae*
Nosema lucustae 189
 nozzles 79, 80, 81, 83–6, 88, 89, 90, 91, 92,
 104, 298, *see also* named nozzle types
 nuclear polyhedrosis viruses (NPV) 183, 184,
 185, 322
 Nuvanol 59, 323

 oak leafroller moth 206, 214
 oats 32
 octenol 98, 250
 octoxinol 62
 Office International des Epizooties (OIE) 259,
 260
 Ogee nozzle 91
 oils 52, 61, 109, 252
 oil seed rape 224, 264
 olfactory stimulants 250
 olives 214
 onchocerciasis 3, 17, 68, 100, 101, 188, 307
 Onchocerciasis Control Programme
 (OCP), 100–2, 119, 188, 277, 282, 287
 onions 141, 221
Operophtera brumata 247
Ophyra leucostoma 118
Opomyza florum 45, 145
Opuntia 26
 oranges 115
 orchards 72, 89, 92, 114, 208, 247, 253, 275,
 284, 289, 300, 301, 309, 310
 orchids 259
 organic farming 130, 266, 281, 318
 Organization for Economic Co-operation and
 Development (OECD) 264, 266
 organochlorines 52, 63–5, 66, 100, 102, 103,
 107, 112, 113, 114, 297, 308, 322–3
 organophosphates 48, 52, 62, 64, 65–6, 67, 75,
 76, 93, 100, 103, 111, 119, 235, 272, 273,
 309, 311, 323
 organotin compounds 256, 323
 oriental latrine-fly 18
 Orthoptera 250
Orthorhinus klugi 156
Oryctes 135
Oscinella frit 32, 128, 227
Ostrinia nubilalis 18, 228

342 Index

- Ostwald ripening 73
Oulema melanopa 13, 125
 outbreak areas *see* locusts
 outbreaks, pests and diseases 46, 165
 overcrowding 34, 35, 37, 41
 Overseas Development Administration (ODA) 263
 ovitraps 286
 oxalic acid 232
 Oxfam 263
 ozone layer 93
- Pachyneuron* 174
Paederus 15
 Palmerworms 5
 Panama Canal 4
 Pan American Health Organization (PAHO) 260, 262
 Panel of Experts on Environmental Management for Vector Control (PEEM) 305
Panonychus ulmi 6, 113, 233, 309
 paraffin *see* kerosene
 para-oxon 48, 113, 323
 parasites 66, 118, 125, 137, 229, 262, 276
 parasitic wasp 159, 172, 308
 parasitoids 45, 67, 118, 131, 141, 155, 213, 232, 247, 253, 254, 270, 273, 274, 294, 297, 298, 308, 313, *see also* biological control
 parasporal bodies 186, 187
 Parathion 64, 65, 235, 323
 Paris Green 52, 60, 62, 109, 321
 passenger pigeon 35
 pasture spelling 142–3
 patent life 57, 59, 121
 pathogens of insects 177–89, 281, 297, *see also* biological control
 advantages 178–9, 189
 bacteria 177, 178, 180, 186–8
 chemical radiation shields 179
 compatibility, insecticides, herbicides 182, 183
 costs 179
 development 179, 180, 181, 185
 disadvantages 179–81
 fungi 177, 178, 180, 181–3, 213
 genetic engineering 178, 186, 187, 188
 genetic modifications 179, 185, 187
 inundative use 180
 in vivo production 180, 183, 185, 189
 microsporidians 189
 non-toxic 178, 187
 oil formulations 182, 183
 persistence 178, 179, 188
 protozoa 177, 189
 recycling of pathogens 177, 188
 registration 180, 185, 189
 residues 178, 180
 resistance 178–9, 188
 safety 183, 185, 187, 189
 selectivity 189
 shelf-life 179
 specificity 178, 179, 185, 187
 storage 179, 180, 189
 stored foods 183
 threshold populations 180
 toxicity 180, 187
 toxins 178, 179, 180, 187, 188
 viruses 177, 180, 183–6
- pea and bean weevil 229
 pea aphid 181, 229
 peach-potato aphid 2, 229, 273–5
 pea midge 142, 206
 pea moth 227, 289
 peas 227, 229
Pectinophora gossypiella 135, 209
Pediculus capitis 264
Pediculus humanus 7, 13, 44, 61, 63, 75, 94, 251, 292
Pegomya hyoscyami 145
Pemphigus bursarius 216
 penicillin 28
 Pentatomidae 128
Perdix perdix 29
Periplaneta americana 210
 periwinkles 198
 Permethrin 68, 96, 97, 98, 119, 138, 250, 255, 324
- pest
 definition 8
 density 31–2, 279–81, 283–5, 290, 296, 300
 major 9–13, 48, 49, 113, 276, 311
 migrant 6, 15–19
 minor 13–14
 occasional 14–15
 outbreaks 14, 31–51, 159, 292, 293, 294, 311, 319
 potential 19–20
 resurgence 68
- pest and vector management 271–319
 agricultural pests 289–92
 augmentation *see* biological control
 breakpoints 284
 computer design 310–11, 313
 concepts of management 277–8
 conceptual framework 314
 cost–benefit analysis 281, 282–3, 306, 310
 cost-effectiveness analysis 282–3
 critical densities 281
 critical thresholds 278, 281–3, 284
 establishing thresholds 278–81, 283–4
 forecasting pest and vector outbreaks 289–94
 governments, role of 317, 318, 319
 grower bioassay 284

- harmonious control 303
- integrated control concept 275–7, 278
- management packages 307–15
- management systems 308, 310
- medical and veterinary pests 292–4
- menu systems 308–11, 315
- monitoring 285–8, 289, 290–2
- Pest Management Triad 312, 313
- Predictive Extension Timing Estimator system (PETE) 310–11
- protocols 311–15
- selective pesticide applications *see* selectivity *under* Insecticides
- supermarkets 318
- synthesis approach 313
- thresholds in practice 285–9
- pest management 40, 303, 304, 306, 307–10, 311, 317–8
- pest-resistant plants *see* plant resistance
- pesticide *see* insecticides
- Pesticide Safety Directorate, UK (PSD) 264
- petroleum oils 322
- Petunia* 137, 138
- Phacelia tanacetifolia* 167
- Phenacoccus manihoti* 149, 170, 254
- phenols 228
- pheromones 204–14, 248, 249, 253, 309, 323
 - aggregation 205, 209–10, 214, 309
 - alarm 213, 214, 224
 - assembly 209
 - beetles 205, 209, 214
 - cockroaches 206, 210, 249
 - confusion techniques 210–12, 214, 309
 - decoys 210
 - fibres 210–12
 - flies 214
 - genetic variability 214
 - house-flies 210
 - lure and kill technique 201, 208–10, 301, 309
 - moths 205, 212, 214
 - natural enemies 213
 - oviposition deterrent 213
 - population monitoring 207–8, 214
 - resistance, 214
 - sex 201, 205–6, 209, 210, 213, 214, 285
 - synthetic 204, 205, 207, 210, 211
 - ticks 209–10
 - trapping-out 208–10, 213, 214, 248
 - traps 200, 206, 207–8, 210, 270, 285, 289
 - tsetse flies 206
 - usage 214
- phlebotomine sand flies 97, 136, 206, 243, 255
- phosphine 96, 321
- Phyllonorycter blancardella* 300
- phylloxera 130, 235
- physical control methods 123, 242–53, *see also*
 - mechanical control
 - exclusion 243–5
 - lethal ambient temperatures 250–2
 - mosquito nets 243–4
 - repellent sounds 253
 - screening 244–5
 - traps 245–50
- Phytoseiulus persimilis* 160, 161, 274
- phytotoxicity 200, *see also* insecticides
- Pierce's disease 19, 278
- Pieris brassicae* 70, 141
- Pieris rapae* 32, 141, 223
- Piggybac* 202
- pigs 21, 125, 129, 130, 144, 145
- pine shoot moth 226
- pine trees *see* conifers
- pink bollworm 135, 202, 209, 211, 214
- pioneer insects 39
- piperidine 255
- piperonyl butoxide 121, 324
- Pirimicarb 67, 275, 276, 297, 320
- Pirimiphos methyl 323
- Pirimor 320, *see also* Pirimicarb
- pitfall traps 250
- plague 258, 260
 - bubonic 3, 6–7, 9, 13, 22, 49, 306
- plagues of insects 1, 4, 5, 7, 16
- Planococcus kenyae* 174
- plant attractants 201
- plant breeding 215, 280
- plant bugs 2, 233
- plant compensation *and see* compensation *under*
 - plant resistance 280
- plant diseases 215
- plant diversity 39
- plant extracts, insecticidal *see* plant derivatives *under* insecticides
- plant growth
 - regulators 236
 - stimulation by pests 280
- plant hoppers 2
- plant nutrients *see* nutritional factors *under* plant resistance
- plant odours 170, 205, 208, 254
- plant palatability 41
- plant resistance 39, 45, 131, 160, 187, 213, 215–37, 239, 267, 275, 278, 294, 311, 312–13
 - antibiosis 223, 234
 - antixenosis 223, 224, 228, 234
 - biotypes 220, 233–5, 237, 290
 - breakdown 234
 - classification 220–1, 223
 - colour 221–3
 - compensation 131, 223, 230
 - damage to biological control 232–3

344 Index

- plant resistance (*cont.*)
 damage-induced changes 227
 extrinsic 223, 229–30
 feeding deterrents 228
 field resistance 227
 gene-for-gene hypothesis 220
 gene transfer 218–9, 221, 224, 233
 GM crops 187, 219, 227, 228, 231, 232, 234, 235, 237
 GM safety 237
 gummosis 223, 226
 hairiness 223, 224, 233
 health hazards 232
 horizontal 221, 222
 induced 221, 236
 location of resistant sources 219–20
 mechanisms 221–31, 234, 235, 237
 monogenic resistance 234
 morphological characters 220, 223
 natural selection 220
 necrosis 223, 226–7, 228
 non-preference 220
 nutritional factors 40, 41, 131, 220, 223, 228–9, 230, 236
 palatability 41, 218, 223–4, 228
 partial 236, 314
 phenological 223, 227–8
 polygenic resistance 237
 problems 231–7
 problem trading 125, 233
 pseudo-resistance 227
 pyramiding 233
 race non-specific 221, 222
 race-specific 221, 222
 refuges, of crops 234, 272, 295
 sources of variation 217–9
 symptom expression 223, 230, 238
 tissue hardness 131, 223, 227
 toxins, 218, 219, 223, 224, 227, 228, 231, 232, 234, 237, 238
 tolerance to insecticides 235
 tolerance to pests 220, 223, 230, 231, 234
 variability of resistance 235–6
 varietal control 216
 varieties, resistant 215–23, 225, 226, 227–8, 229–31, 232, 233, 234, 235, 236, 237, 241, 269, 273, 295, 299, 309, 311, 312, 313
 vectors of plant diseases 236
 vertical 221, 222
 virulence genes 220, 221
 waxiness 223, 224–5
 yield 215, 218, 219, 221, 227
 yield loss 220, 221
 yield penalty 219, 231, 233, 237
 plastic collars, insecticidal 76
Plodia interpunctella 188, 212
 ploughing 123, 125, 126, 128, 134, 137
 plum fruit moth 211
Plusia gamma 16
Plutella xylostella 5, 17, 166, 178, 188
Podosphaera leucotricha 233
Poecilia reticulata 171
 pollen 166, 228
 pollinators 25–6, 114
 polybutenes 247
 polyethylene glycol 218
 polygerm seeds 145
 polystyrene beads 244, 245
Popillia japonica 188
 population density 32, 33, 34, 35–40
 population dynamics 26, 48, 49, 173, 190, 313
 population growth rate 33, 37–40
 population regulation 33–40
 potatoes 6, 42, 52, 139, 224, 232
 potato famine 7
 potato leaf roll virus 2, 9
 poultry 72
Pratylenchus penetrans 228
 praying mantis 29
 precision drilling 145, 227
 Precocenes 71
 predator–prey interactions 37–39
 predators 37–38, 45, 56, 66, 67, 70, 113, 114, 118, 126, 127, 141, 144, 200, 205, 211, 229, 232, 253, 297, 300, 309, 313, *see also* biological control
 monophagous 153
 mutual interference 154
 oligophagous 153
 polyphagous 153
 switching behaviour 153
 predatory birds 112, 174
 predatory mites 118, 153, 160, 161, 274–5
 predictive models 292, 294
 prickly pear cactus 26
 problem trading *see* plant resistance
 Propolis 27
 Propoxur 194, 195, 210, 320
Prostephanus truncatus 172
 protease inhibitor 223, 231
 protein crystals 186, 187, 188
 protozoa 2, 3, 4, 7, 10, 177, 189, *and see* pathogens
 pruning 14, 131, 132, 163
Pseudaulacaspis pentagona 152, 173
Pseudococcus 289
Psila rosae 77, 141, 142
Psoroptes 68
 public health 53, 55, 56, 57, 110, 121, 260, 261, 305, 307
Pulex irritans 13
 pumps, spray *see* named ones
 push–pull strategies 137

- pygmy beetle 145
 pyralid moth 212, 298
 pyramidal traps 250
 Pyrethrum 52, 53, 61, 67, 95, 302, 322
 pyrethroids 11, 62, 64, 67–8, 93, 95, 97, 98,
 99, 100, 103, 113, 119, 120, 182, 235,
 244, 250, 255, 256, 283, 302, 311, 323–4
 Pyriproxyfen 71, 96, 321
- quarantine 159, 175
 Queensland fruit fly 301
Quelea quelea 65
 quinine 108, 276
- rabbits 256
 rabies 8, 258
 races, geographical 198, 218, 220–1
 rain 9, 12, 18, 32, 35, 43, 48, 49, 50, 104,
 127–43, 144, 290, 292, 293
 rats 22, 260
 raptors *see* predatory birds
 recombinant antigens *see under* vertebrate host
 resistance
 red clover 142
 red spider mite 6, 113, 114, 160, 161, 233,
 274, 275, 276, 309
 red squirrel 198
 red ticks *see* vertebrate host resistance
 redwater fever 7
 reflective leaf surface 79
 refractoriness 201, 202, 319
 refuges *see* plant resistance
 remote sensing 293
 repellency 137, 141, 210, 228
 repellents 95, 252, 254–6, 324
 formulations 254–5
 skin irritation 255
 repellent sounds *see* physical control methods
 reptile 112
 reservoir hosts 22, 49, 136, 137, 277, 287
 reservoir weeds 136
 resettlement, people 42
 residual contact insecticides 63–8, 77, 98
 residual house-spraying *see* house spraying
 resins 226
 resistance to insecticides *see* insecticide
 resistance
 resistant plant varieties *see* plant resistance
 Resmethrin 64
 resource limitation 40
 resurgence 46, 48
 reversion virus 135
 rhinoceros beetle 135
Rhodnius prolixus 202
Rhodococcus rhodni 202
Rhopalosiphum padi 46, 145, 228, 288
 rhubarb 232
- Rhus* 27
Rhyacionia buoliana 226
 rice 5, 9, 11, 13, 20–21, 22, 43, 119, 128–30,
 135, 144–5, 147, 171, 227, 234, 235, 269,
 278, 281, 311, 317
 irrigation practices *see also* irrigation
 rice borer 100, 128
 rice grassy stunt 2
 rice malaria 129
 rice stem borer 113, 227
 rice stripe 2
 rice tungro 2
Rickettsia prowazekii 292
 Rickettsiae 3
 Rift Valley fever 50, 259, 260
 Rinderpest 42
 Rio Summit 263
 river blindness 17, 68, 100, 178, 188, 269, 307
 rivers, insecticidal dosing 101, 188
 rodents 22, 49, 134, 136
Rodolia cardinalis 148, 167, 169
 roguing 135
Romanomermis culicivorax 152, 157, 171, 172
 root crops 142, 230
 root lesion nematode 228
 rose-grain aphid 14
 Rotenone 61, 322
 routine spraying 304
 Royal jelly 27
 r-strategists 39
Rubus fruticosus 166, 294
 rural development 240
 Russian wheat aphid 19
 rusts 8
 Rynania 276, 322
 rye grass 141, 165, 227
- safety regulations 261, 262, 264–6
Saissetia oleae 162
 Sale of Diseased Plants Order *see* legislative
 controls
 saliva 12, 26, 231, 284
 sampling 294
 sand flies 3, 136
 sandfly fever 255
 sanitary measures 132–5
Sarcoptes scabiei 68
 satellite imagery 292, 293–4, 319
 satellites *see* Landsat satellites *and* satellite
 imagery
 sawflies 183
 scabies mites 68, 260
 scale insects 6, 14, 27, 28, 114, 148, 152, 174,
 182, 301
 Scarabaeidae 30, 142
 scarabid beetles 125
 scavengers 24–5

346 Index

- schistosomiasis 281
Schizaphis graminum 285
 Schradan(e) 323
Sciara 156
Scirpophaga incertulas 128
Scirpophaga innotata 269
Sciurus carolinensis 198
Sciurus leucourus 198
 scolytid beetles 135
 Scolytidae 209, 230
 scouting *see* crop
 scramble competition 33, 34
 screwworm fly *see* New World screwworms
 scrub typhus 255
Scyphophorus interstitialis 135
 searching capacity 153, 154, 159
 secondary compounds 223, 224, 228
 seed dressings 63, 94, 112
 seedling pests 145, 313
 selection pressure 179, 214, 220, 221, 234
 selectivity window 313
 selenium 228
 semiochemicals, 204, 205, 213
 sentinel animals 288
 set-aside 163
 Sevin 320
 Shaminliulin 59
 sheep 10, 13, 14, 143
 sheep tick 143
 Shellac 27
 shield bugs 128
 ship fever 7
 shot-hole borer 131, 230
 'Silent Spring' 107, 108, 112, 124, 271
 silica 227
 silkworm moth 27
 silverleaf whitefly 259
 silver-Y moth 16
 simulation of pest damage 284
 Simuliid black flies 3, 7, 17, 29, 32, 46, 56, 68,
 100, 101, 154, 177, 180, 187, 188, 287,
 288, 298, 316
 Simuliidae 119, 178
Simulium colombaschense 7
Simulium damnosum 17, 101
Simulium posticatum 46
 Sindbis virus 202
 sisal weevil 135
Sitobion avenae 14, 141, 166, 285
Sitona lineatus 229
 'Skin-So-Soft' 256
 sleeping sickness 1, 4, 6, 77, 98, 240, 261, 276
 slugs 98, 128, 250
 smallpox 306
 Smyrna fig 25
 snails 98, 281
 snapdragon flowers 25
 snowdrops 219
 soil
 compaction 125, 280
 cultivation 173
 drenching 112
 erosion 139
 somaclonal variation 217
 sooty moulds 225
 Sorghum 140
 source reduction 132
 sowing 143, 144
 soya bean 232, 235, 279
 Spanish fly 15
 sparrows 5
 spider mites 54, 200, 300
 spiders 153
 spinning cage 83, 88–9, 92
 spinning cup 89–91, 92, 182
 spinning disc 78, 91
 Spirochaetes 1, 3, 292
Spodoptera 128, 184
Spodoptera frugiperda 235, 239
Spodoptera littoralis 259
Spodoptera litura 259
 spotted alfalfa aphid 17, 45, 233, 272–3
 spotted lucerne aphid *see* spotted alfalfa aphid
 sprayers *see* named ones
 spraying cattle *see* cattle
 spray windows *see* insecticides
 stable flies 8, 237, 249
 stalk destruction 134, 309
 Staphylinid beetles 15
Steinernema carpocapsae 156
Steinernema feltiae 156
 stem borers 45, 60, 75, 131, 134, 145
 stem-boring sawfly 137
 stem nematode 250
 sterile insect release method (SIRM) 190, 307
 sterile insect technique (SIT) *see* Genetic
 control
 sterile male technique (SMT) 118, 190, 193,
 296, 309
 sterilization, radiation induced *see* genetic
 control
 stick insects 29
 sticky cards 248
 sticky traps 208, 245–7
 stilbenes 223
 stomach poisons 60, 62, 69, 74, 272, 276, 298
Stomoxys calcitrans 237, 249
 stored grain pests 96, 228, 251, 256
 Strepsiptera 154
Streptomyces avermitilis 68
 strip
 cutting 302
 farming 139
 harvesting 273, 301, 309

- suction traps 288, 290–2
 sugar beet 5, 32, 145, 260, 290
 sugar cane 149
 sulphur 52, 114
 Sumithion 59, 323
 supermarkets *see* pest and vector management
 superparasitism 154
 supersonic sounds 253
 surveillance 48, 109, 258, 288, 293, 319
Swammerdamia lutarea 166
 swarms 4, 5, 15, 16, 17, 294
 swede midge 137
 swift moths 28
 swine fever 319
 swirl chamber 86
 swirl plate 86
 swollen shoot of cocoa 2
 symbionts 199, 202
 synanthropic flies 133
 synergists *see* insecticides
 synomones 162, 204
 Syrphidae 67, 141, 153, 232
 systemic insecticides *see* insecticides
 systems analysis 310
 Systox 323
- Tabanids 8
 Tachinidae 154, 167, 168
 taint 114
 tannins 223
 target-specific controls 152, 308–10
 tar oil 113, 114
 tarred discs 246
 tea 131, 230, 276
Teleogryllus commodus 198
 Temephos 62, 76, 101, 102, 188, 277, 323
 Temik 320
 temperature 25, 35, 49, 50, 51, 73, 117, 125,
 159, 170, 172, 175, 179, 195, 208, 236,
 245, 251–2, 254, 289–90, 292, 300
 tempest 289
 Tepa 200, 321
 Tephritidae 135, 254
 teratogenic 200
 Terebrantia group 154
Teretriosoma nigrescens 172
 termitaria 12
 termites 8, 12, 24, 28, 71
 territorial behaviour 34
 Tetranychidae 300
Tetranychus cinnabarinus 160
Tetranychus telarius 274
Tetranychus urticae 160, 161, 200
 Tettigonioidea 250
 Texas fever 1, 7
Theileria parva 10
 theileriosis 3, 10
Therioaphis trifoli 17, 45, 233, 272, 298
 thermals 82, 92
 Thiotepa 200, 201, 321
 third generation insecticides 69
 thresholds 304, *see also* critical thresholds *under*
 pest and vector management
 thrips 128, 131, 138, 156, 221, 247, 259, 274,
 275
Thrips palmi 259
 Thysanoptera 247, 274
 tick-borne encephalitis 3
 tick-borne relapsing fever 3
 tick challenge 239
 TickGARD Plus *see* vertebrate host resistance
 ticks 1, 9, 17, 22, 68, 69, 78, 102, 103, 112,
 116, 136, 142, 143, 177, 183, 206, 254,
 255, 256, 288, 292, 293, 316, 319, *see also*
 pheromones
 Tipulidae 142
 tobacco bollworm 235
 tobacco plants 61
 tolerance to pests *see* plant resistance
 tomatoes 25, 231, 235
 top minnow 160, 171
 Tortricidae 226
 Total Pest Management (TPM) 307
 toxaphene 210, 323
 toxins in plants *see* toxins *under* plant resistance
Toxorhynchites 35, 162
 transgenic techniques 219, 221
 translaminar action *see* insecticides
 translocated heterozygotes 196, 197
 translocated homozygotes 196, 197
 translocations, radiation-induced 196
 transovarial transmission 9
 transtadial transmission 9
 trap crops 136–7, 138, 309
 trapping out 39, 251
 traps 98, 200, 285, 288, 294, *see also*
 pheromones *and* named traps
Trialeurodes vaporariorum 170, 252, 274
Triatoma infestans 33
 triatomine bugs 3, 33, 63, 75, 78, 83, 84, 97,
 135, 154, 202, 206, 243, 268
 triazines 72, 256
Tribolium castaneum 202
 2-tridecanone 235
Trichogramma 152, 308
Trichoplusia ni 181
 triflumuron 72, 321
Trioxys pallidus 172
 triphenyl acetate 256
 triphenyltin 256, 323
 triterpene 231
 tropical rat flea 6, 13, 22
Trypanosoma 220
Trypanosoma cruzi 202

348 Index

- Trypanosoma vivax* 8
 trypanosomes 238
 trypanosomiasis 136, 195, 250
 animal 1, 2, 4, 6, 22, 46, 77, 98, 194, 220,
 240, 241, 319
 human 2, 4, 77, 276
 trypsin inhibitors 219, 228
 tryptophan 162
 tsetse flies 1, 2, 4, 5, 8, 22, 39, 42, 46, 49, 63,
 65, 77, 79, 83, 98, 112, 113, 126, 136,
 150, 154, 194–5, 197, 239, 240, 251, 268,
 276, 277, 293, 300, 301, 319, *see also*
 pheromones
 tsetse fly traps 250, 268
Tunga penetrans 18, 68
 Tungro virus disease 9
 turbulence 92
 twin-orifice sprayers 91–2
Typhlodromus pyri 118, 309
 typhus 1, 3, 7, 63, *see also* named typhuses
 tyres 18, 132, 133
- ultra-low-volume (ULV) 182
 ultrasonic repellers 253
 ultraviolet electrocutors 248
 ultraviolet radiation 179, 223, 252
 Umbelliferae 166, 167
 uncultivated land 77
 undercrowding 35, 37, 41
 undersowing 141
 United Nations Centre for Human
 Settlements 305
 United Nations Environmental Programme
 (UNEP) 263, 305
 United Nations High Commission for Refugees
 (UNHCR) 263
 United Nations International Children's
 Emergency Fund (UNICEF) 263, 267
 United States Agency for International
 Development (USAID) 263
 United States Department of Agriculture
 (USDA) 266
 unstable habitats 173
- vaccines 110, 262
 vacuum samplers 294
 Vapona 323, *see also* dichlorvos
 varietal control, plants *see* plant resistance
Vavraia culicis 189
 vector control 304, 306
 vectors
 biological 8–9
 definition 8–9
 major 9–13
 mechanical 8–9
 migrant 15–19
 minor 13–14
 occasional 14–15
 outbreaks 31–51, 292
 potential 19–20, 288
 Vedalia beetle 169
 vegetables 141, 235, 259, 290, 318
 vegetation clearance, tsetse control 126, 276,
 277
 Venturi principles 86, 87
 vertebrate host resistance 237
 antibodies 238
 concealed antigens 239
 crossbred cattle 238, 240
 cytokines 237
 European cattle 238, 240
 GAVAC™ 239
 host immunity 237, 238, 239
 humped cattle 240
 humpless cattle 240
 immunization 237–8
 immunization of cattle 239
 Muturu cattle 240
 natural resistance 238–9
 natural selection 240
 N'dama cattle 240, 241
 North American cattle 240
 problems 241
 recombinant antigens 239
 recombinant vaccines 239
 red ticks 239
 resistance in ticks 239
 resistance to ticks 238
 taurine cattle 240
 TickGARD Plus 239
 ticks 237, 238–9
 tolerance 238
 trypanotolerant cattle 217, 220, 239–41
 vaccination 237, 238–9
 Zebu cattle 238, 240, 241
Verticillium lecanii 182, 322
 vinegar flies 29
 vines 19, 130, 167, 168, 235
 vine weevil 156
 vineyards 19, 130, 166, 167, 294
 virions 184
 viruses 144, 175, 202, 288
 as insect pathogens *see* pathogens
 as plant pathogens 2, 46, 145, 236, 252, 288
- walnut aphid 172
 walnuts 172
 wasps 152, 155, 162, 170, 173, 174
 waxiness *see* plant resistance
 wax layer 106, 225
 wax moth 156
 weather 310
 weather forecasts 208, 290
 weather monitoring 292

- weeds 6, 11, 15, 26, 29, 46, 54, 77, 128, 131, 136, 139, 141, 264, 304, *see also* biological control *and* reservoir weeds
- weevils 15, 195, 209
- Western equine encephalitis 144, 284, 287
- Western flower thrips 137
- Western grebe 112
- West Nile virus 19
- Wheastrel 162, 165
- wheat 13, 14, 45, 128, 137, 139, 141, 142, 144, 165, 229, 231, 235, 280
 - spring 128, 145
 - winter 128, 141, 145
- wheat aphid 166
- wheat bulb fly 142, 230, 290
- wheat stem sawfly 144, 227
- White stem borer 269
- whitefly 72, 134, 152, 182, 224, 225, 247, 252, 253, 274, 275, 276
- whitegrubs 125
- wilting 128
- wilt viruses 259
- windbreaks 265
- wine industry 167, 278
- winter moth 247
- wireworms 142
- Witchetty grub 28
- Wolbachia* 199, 202
- World Health Organization (WHO) 56, 71, 100, 101, 109, 110, 137, 148, 160, 183, 187, 201, 202, 258, 260, 262, 264, 265, 266, 267, 287, 305, 306
- World Health Organization Pesticide Evaluation Scheme (WHOPES) 56, 57, 201, 202
- world population 20
- World Wide Web 291, 293
- wrap-around spraying 91
- Xenopsylla* 22
- Xenopsylla cheopis* 6, 13
- Xyleborus fornicatus* 131, 230
- yams 22
- yeast hydrolysate 301
- yellow cards 247
- yellow fever 1, 2, 4, 9, 17, 162, 260, 262, 267, 286, 287
- yellow-headed borer 135
- yellow-headed cerambycid borer 135
- yields *see* crops *and* plant resistance
- zooprophylaxis 137, 138