

## Index

- Adkisson project 6  
aerial photographs 152  
aerobiology 90 (*see also* migration)  
  aerobiology process 91, 93  
  immigrants 90  
  movement biology 92  
  seed dispersal 96  
Africa 8, 402, 458, 462  
African citrus psyllid (*Trioza erytrae*) 346  
agricultural landscapes 151, 156  
agricultural systems 62, 397, 424  
agrochemicals  
agroecosystems 117, 119, 123, 192  
Alar 491  
alfalfa snout beetle (*Otiorhynchus ligustici*) 52  
alfalfa weevil (*Hypera postica*) 181  
allergen 444  
alternative prey 67  
American palm weevil (*Rhynchophorus palmarum*) 275  
amplified fragment length  
  polymorphism (AFLP) 240, 241  
*Anagrus* 124  
  *Anagrus epos* 124  
antagonism 144  
*Aphidius ervi* 63  
aphids 368  
  alatae 368  
  Aphid Alert 373  
  aphid vectors 368  
*Aphytis melinus* 64  
apiculture 424  
apple aphid (*Aphis pomi*) 181  
application equipment 142  
aquaculture 424  
  areawide IPM (AW-IPM) 298, 447, 514  
armyworm (*Pseudaletia unipunctata*) 152  
arthropods 47, 57  
Asia 462  
Asian citrus psyllid (*Diaphorina citri*) 345  
Asian corn borer (*Ostrinia furnacalis*) 266  
assassin bug (*Zelus renardii*) 156  
asthma 444  
Australia 8–9  
azadirachtin 496  
*Bacillus sphaericus* 137  
*Bacillus subtilis* 167  
*Bacillus thuringiensis* (Bt) 111, 137, 163, 247, 263, 330, 417  
bacteria 113  
bald eagle (*Haliaeetus leucocephalus*) 443  
barriers to adoption 485  
bean leaf beetle (*Cerotoma trifurcata*) 29  
*Beauveria anisopliae* 134  
*Beauveria brongniartii* 138  
beet armyworm (*Spodoptera exigua*) 52  
behavioral mechanisms 278  
  behavioral control 329  
beneficial arthropods 151, 326  
best management practices (BMPs) 33  
big-eyed bug (*Geocoris punctipes*) 68  
*Binodoxys communis* 110  
biodiversity 57, 58, 62, 116, 117, 490, 518  
  destructive biota 118  
  plant diversity 122  
  polyphagous 122  
  productive biota 117  
  species diversity 56, 57  
  species richness 154  
bioenergy 518  
biogenic amines 287  
biointensive IPM 443  
biological control 1, 8, 59, 62, 67, 107, 131, 133, 163, 179, 180, 330, 354, 358, 395, 406, 466, 494  
  augmentative 133, 151, 331, 363  
  biological control agents (BCAs) 163  
  biotic control 180  
  commercial suppliers 357  
  generalist predators 66  
  generalists 66  
  importation 151  
  predatory mites 498  
  provide/sell IPM 356  
biological pesticides 163  
biopesticides 166, 407  
  biopesticide market 163  
biotechnology 248, 260, 330, 464, 516  
bird cherry-oat aphid (*Rhopalosiphum padi*) 154  
black bean aphid (*Aphis fabae*) 367  
black cutworm (*Agrotis ipsilon*) 97, 274, 441  
boll weevil (*Anthonomus grandis*) 298, 304, 326, 335  
  boll weevil eradication 276  
boom-bust predator–prey cycles 63, 64  
Bordeaux mixture 2  
Boxworth Study 211  
brand security 380  
*Brassica* 68  
breeding 235  
broad-spectrum pesticides 286  
brown citrus aphid (*Toxoptera citricida*) 345  
brown planthopper (*Nilaparvata lugens*) 68  
Bt broccoli 251  
Bt cotton 11, 268, 330  
Bt maize 10  
cabbage aphid (*Brevicoryne brassicae*) 155  
cabbage looper (*Trichoplusia ni*) 28, 39, 180  
cabbage root maggot (*Delia radicum*) 68  
CABI Bioscience 508  
cactus moth (*Cactoblastis cactorum*) 8–9  
caddisfly (Trichoptera) 209  
Campbell Soup Company 448  
capacity building 514  
Carabidae 68  
carbon footprint 501  
carcinogen 491  
cassava green mite (*Mononychellus tanajoa*) 109  
cassava mealybug (*Phenacoccus manihoti*) 109  
Central America 9  
central nervous system (CNS) 287  
Certified Crop Advisor Program 452  
certified organic 449  
CGIAR 7, 508  
challenges 387  
chemical control 327, 372, 398  
chemical environmental index 19

- chemical industries 362  
 chemically inducible promoter 250  
 chestnut blight 414  
 cigarette beetle (*Lasioderma serricorne*) 383  
 citrus 341  
   citrus certification program 341  
   citrus greening 346, 348  
   clean stock program 341  
   graft-transmissible pathogens (GTPs) 341  
   rootstock 344  
   shoot tip grafting 348  
 Citrus Health Response Program (CHRP) 344  
 citrus leaf blotch virus 343  
 Citrus tristeza virus 341  
 classical biological control 108, 133, 134, 138, 151, 331  
*Coccinella septempunctata* 66  
 cockroach 382, 444  
 coconut rhinoceros beetle (*Oryctes rhinoceros*) 138, 276  
 codling moth (*Cydia pomonella*) 273, 276, 319, 495  
 Codling Moth Area-wide Management Program 276  
 Colorado potato beetle (*Leptinotarsa decemlineata*) 192, 199, 369  
 communication 513  
   communication plan 486  
 conservation 151  
   conservation biological control 133, 151  
 consultant roles 451  
 consumers 518  
 containment 298, 419  
 continental scale 93  
 conventional breeding 248  
 cooling aeration 317  
 Cooperative Agricultural Pest (CAPS) 418  
 corn earworm (*Helicoverpa zea*) 52, 97, 253  
 corn rootworms (*Diabrotica* spp.) 10, 263  
 corporate social responsibility 448  
 cotton 324  
   Bollgard cotton 330  
   Bollgard II cotton 330  
 cotton aphid (*Aphis gossypii*) 67, 134, 326, 367  
 cotton bollworm (*Helicoverpa armigera*) 265  
 cotton bollworm (*Helicoverpa zea*) 252  
 cottony cushion scale (*Icerya purchasi*) 107  
 crop protection 460, 508  
 crop rotations 494  
*Culex* 137, 403  
 cultural control 327, 374  
 damsel bugs 66  
 Delaney clause 220  
 developing countries 6, 267, 458  
 development strategies  
   indigenous IPM 467  
   knowledge based 463  
   post-development 467  
   post-IPM 466  
 diamondback moth (*Plutella xylostella*) 247  
 DIMBOA 248  
 diseases 358  
 diversification 116  
 Dutch elm disease (*Ophiostoma novo-ulmi*) 299, 414  
 ecologically based IPM 520  
   ecologically based pest management (EBPM) 123, 491  
 eco-certification 449  
 eco-label 449, 518  
 ecology  
   applied ecology 51  
   detritivores 68  
   ecological processes 51  
   ecological selectivity 184  
   ecological theory 51  
   host-parasitoid dynamics 64  
   resource biota 117  
   resource concentration hypothesis 57  
   restoration 433  
   structural diversity 57  
   trophic cascades 69  
   trophic level 153  
   trophic level omnivory 69  
 economic damage 25  
 economic decision making  
   action threshold (AT) 27  
   aesthetic damage 380  
   aesthetic injury level (AIL) 28  
   break-even probability 43  
   contingent valuation 20  
   decision making 33, 38, 44, 75, 220, 274, 332, 472  
   decision sampling 75, 85  
   decision-support systems (DSS) 319  
   dynamic 17  
   economic injury level 3, 25, 35, 36, 380, 459  
   economic threshold 3, 17, 25, 27, 36, 181, 331, 459  
   management 4, 35, 59, 425, 437  
   multiple-species EIL 29  
   sensory threshold 27  
 economic impact 14, 17  
 economic risk  
   benefit-cost analysis 18  
   central tendency 41  
   certainty equivalent  
   coefficient of variation (CV) 42  
   cumulative distribution function 40  
   expected value 40  
   expert opinion 15  
   *ex ante* 35, 47  
   *ex post* 35, 47  
   growers' attitudes 362  
   hedonic pricing 21  
   internal rate of return 19  
   median 41  
   mode 41  
   net present value 18  
   net returns 39  
   objective probability 37, 43  
   payoff matrix 38, 39  
   probabilistic EIL 29  
   probability distribution 37  
   probability weighted average 41  
   risk 17, 36, 37  
   risk aversion 45, 46  
   risk management 7, 231  
   risk perceptions 37  
   risk preference/attitude 37, 45  
   risk-adjusted returns 42  
   risk-return ratio 42  
   simple average 41  
   standard deviation 42  
   stochastic dominance 17, 46, 47, 55  
   subjective probability 37, 43  
   trade-off analysis 21  
   uncertainty 34, 37  
   value at risk (VaR) 42  
   variance 42  
 ecosystems 58, 424  
 edge effects 153  
 effective environment 52  
 eggplant 506  
 ELISA 369

- emerald ash borer (*Agrilus planipennis*) 58, 414
- emerging issues 453
- Encarsia* 109
- enterprise budgets 16
- entomopathogenic fungi 134
- Entomophaga maimaiga* 416
- environment
- environmental contamination 206
  - environmental effects 475
  - environmental health 266
  - environmental impact 206, 268
  - Environmental Impact Statement 422
  - environmental management 404
  - environmental profile 213
- Environmental Protection Agency (EPA) 6, 330, 381, 392, 418, 444, 471, 491
- environmental risk 205
- environmental economic injury level (EEIL) 29
  - environmental impact quotient (EIQ) 19, 461, 480
  - environmental requirements 139
  - environmental risk assessment 362, 501
  - environmental safety 137
  - freshwater ecosystems 209
  - mesocosms 212
  - multi-attribute toxicity factors 20
- epidemiology 223
- epizootic 135, 138
- eradication strategies 298, 334, 390, 398, 418, 430
- Ethiopia 402
- European corn borer (*Ostrinia nubilalis*) 9, 58, 112, 263, 280, 426
- European red mite (*Panonychus ulmi*) 182, 496
- European Union 358, 359, 492
- extension 463, 509
- extension service personnel 356
- fall armyworm (*Spodoptera frugiperda*) 97
- Farmer Field Schools (FFSs) 463, 514
- filtering 440
- fire ants 390–401
- black imported fire ant (*Solenopsis richteri*) 391
  - red imported fire ant (*Solenopsis invicta*) 299, 390
- Food Alliance 450
- food miles 501
- Food Quality Protection Act (FQPA) 221, 445, 491
- food safety 1, 380
- food processing 362, 378
- food webs 56
- fungicides 358
- garlic mustard (*Alliaria petiolata*) 426
- General Accounting Office (GAO) 471
- genes 249
- genetic engineering 260, 261
  - genetic manipulations 147
  - genetically modified (GM) 260, 466
  - genomic technologies 242
  - genotypes 193
  - phenotypes 193
- geographic positioning system (GPS) 406
- global climate change 517
- Global Welfare (GW) 303
- glyphosate-resistant weeds 265
- glyphosate-tolerant 95
- Golden Rice 261
- Government Performance and Results Act (GPRA) 480
- grape berry moth (*Lobesia botrana*) 290
- grape phylloxera (*Daktulosphaira vitifoliae*) 428
- greenhouse whitefly (*Trialeurodes vaporariorum*) 153
- green lacewing (*Chrysoperla carnea*) 181
- green peach aphid (*Myzus persicae*) 155, 367
- green world hypothesis 69
- greenhouse 354, 359
- greenhouse biological control 357
  - greenhouse crops 354, 355
- ground beetle (*Harpalus pennsylvanicus*) 71
- gypsy moth (*Lymantria dispar*) 58, 274, 300, 414
- habitat management 158
- habitat thresholds 153
- Harmonia axyridis* 66
- harvester termite (*Coarctotermes cleydra*) 211
- hazard indexes 19
- heliopsin 2
- hemlock woolly adelgid (*Adelges tsugae*) 414
- herbicides
- 2,4-dichlorophenoxy acetic acid 2
  - glyphosate 95
- herbicide-tolerant crops 265, 269
- Hessian fly (*Mayetiola destructor*) 237, 248
- high-value crops 464
- honeybee (*Apis mellifera*) 293
- hormone 286
- anti-juvenile hormones (JHs) 292
  - diapause hormone (DH) 287
  - ecdysis triggering hormone (ETH) 288
- ecdysone 286
- ecdysone agonists 288, 290
  - hormone-based insecticides 287
  - insect endocrinology 286
  - insect growth regulators 5, 10
  - juvenile hormones (JHs) 286, 291
  - juvenile hormone analogs 292
  - molting regulation 289
  - peptide hormones 286
  - preecdysis triggering hormone (PETH) 288
  - prostaglandins 287
  - terpenoid hormones 287
- horseweed (*Conyza canadensis*) 95
- host plant resistance 11, 235, 248, 329, 374, 466, 494
- additive dominance 236
  - antibiosis 329
  - antixenosis 329
  - epistatic 236
  - gene clusters 238
  - gene mapping 238
  - marker-assisted selection (MAS) 241, 261
  - mass selection 235
  - reduce host susceptibility 5
  - reduce pest numbers 5
  - recurrent selection 235
  - simple sequence repeat (SSR) 241
  - tolerance 6, 329
- housefly (*Musca domestica*) 2, 185
- Huffaker project 6
- impacts of IPM
- impact 463, 512
  - impact assessments 479, 515
  - level of measurement 483
- implementation 6, 7, 319, 361, 453, 461, 475, 476
- incentives 485
  - Indian Himalaya 499

- Indianmeal moth (*Plodia interpunctella*) 383
- infant anemia 409
- information technology 437, 519
- archiving 438
  - data management 439
  - distribution system 437
  - indexing and archiving 440
  - information life cycle 437
  - metadata 439
  - Really Simple Syndication (RSS) 438
  - uniform resource locator (URL) 438
- insecticides 5
- arsenic 1
  - calcium cyanide 391
  - DDT 2, 403
  - dieldrin 391
  - heptachlor 391
  - imidacloprid 187
  - indoxacarb 247
  - insecticide poisonings 269
  - insecticide resistance 25
  - kaolin 315
  - lead arsenate 2
  - nicotine 2
  - Paris Green 2, 300, 405
  - pyrethroids 358, 410
  - pyriproxyfen 408
  - soap 1
  - spinosad 247, 496
- insectory 124, 127
- insect-pathogenic fungi 187
- insects 3
- coleopteran 28
  - homopteran 28
  - insect pathogens 112
  - insect pests 28
  - lepidopterans 28, 97
- insect-vectoring pathogens 366
- latent period 367
  - nonpersistent viruses 367
  - persistently transmitted circulative viruses 367
  - stylet-borne 367
- integrated control 3
- integrated pest management 1–4, 6
- adoption 14, 15, 168, 443, 448, 471
  - assessment 381
  - biologically based 424
  - cost–benefit analysis 474
  - do-nothing 5
  - education 475
  - Europe 508
  - evaluation 479
  - fiber 1
  - forage 235
  - forestry 424
  - funding 6, 361
  - fruit 235
  - future of IPM 363, 506
  - gender issues 512
  - GAO report 471, 480
  - identification 393
  - implementation 479, 485
  - interdisciplinary approach 3
  - Institute 452
  - least possible risk 473
  - misunderstanding about IPM 363
  - multi-faceted approach 6
  - naphthoquinones 2
  - outcome level measures 483
  - philosophy 354
  - policies 513
  - program planning 332, 481
  - progressive growers 356
  - public-sector roles 443
  - reporting results 486
  - research needs
  - secondary outbreaks 2
  - site-specific IPM 373
  - tactics 327
  - technology development 482, 515
  - training 382, 509
- integrated vector management (IVM) 404
- integration 4, 35, 424, 459, 464
- international programs
- FAO 6, 366
  - Global IPM Facility 6
  - International IPM 507
  - IPM-CRSP 7, 506, 509
  - World Bank 7
  - World Health Organization (WHO) 299, 402, 409, 444
  - World Trade Organization (WTO) 309, 428, 466
- intraguild predation 67
- invasive species 274, 298, 424, 473
- arrival 424
  - climate suitability 429
  - CLIMEX 319
  - domestic quarantines 418
  - establishment 424
  - exotic 107, 424
  - global trade 515
  - Invasive Species Act 473
  - native 424
  - pathways 429
  - potential hazard 429
  - preventing pest invasion 429
  - probability of invasion 429
  - quarantine programs 342
  - risk assessment 221, 229
  - spread 424
  - trade liability 380
- invertebrates 210
- IPM Matrix 483
- IPM Road Map 4, 34, 471–478
- IR4 Program (USDA) 174
- Khapra beetle (*Trogoderma granarium*) 386
- K-selection 54
- Kudzu vine (*Pueraria lobata*) 299
- lacewing (*Chrysoperla carnea*) 67
- ladybird beetles 66, 152, 155
- landscape
- complexity 152
  - processes 151
  - scale 92
- larvivoracious fish 406
- Latin America 462
- lawsuits 380
- leguminous silverleaf (*Desmodium uncinatum*) 122
- linear programming 17
- Lodi-Woodbridge Winegrape Commission 447
- Lotka–Volterra model 52
- low-risk approach 473
- Lyme disease 444
- maize (*Zea mays*) 8, 58, 236
- malaria 402
- Anopheles* 403
  - chloroquine 402
  - insecticide treatment nets (ITNs) 404, 408
  - long-lasting insecticide nets (LLINs) 409
  - Plasmodium* 402
  - quinine 402
  - sulfadoxine-pyrimethamine (SP) 402
- mayfly (Ephemeroptera) 209
- mealybug destroyer (*Cryptolaemus montrouzieri*) 111
- mechanical trapping 5
- Mediterranean fruit fly (*Ceratitidis capitata*) 298, 302

- metapopulation 55, 59
- Mexican bean beetle (*Epilachna varivestis*) 59
- Mexico 9
- microbial control 138, 163
- microsatellite 240
- Middle East 275
- Midwest USA 110
- migration  
dispersal 90  
low-level jet (LLJ) streams 373  
migratory 92
- migratory locust (*Schistocerca gregaria*) 52
- mild strain cross-protection (MSCP) 349
- mites 28
- molecular markers 240, 516
- molecular tools 351
- monitoring 273, 383
- monocultures 62, 116, 489
- monophagy 122
- Monsanto 324
- Morrill Land-Grant Acts 6
- MSTRS mating disruption 280
- multicolored Asian lady beetle (*Harmonia axyridis*) 155, 426
- Muscaror albus* 143
- mutagenicity 222
- nanotechnology 517
- NASS 471
- National Alliance of Independent Crop Consultants (NAICC) 452
- National Cotton Council 324
- National Foundation for IPM Education 173
- National IPM Centers 508
- National IPM Program 473
- National IPM Road Map 471–478, 482
- National Organic Program (NOP) 489
- National Research Council (NRC) 179, 491
- natural enemies 5, 62, 66, 107, 117, 122, 137, 151, 180, 355
- natural populations 55
- natural resources 474
- nematodes 113
- no observable adverse effect level (NOAEL) 229
- non-governmental organizations (NGOs) 452, 514
- non-threshold (carcinogenic) effect 230
- NRCS 445
- NSF Center for IPM 6, 508
- nucleic acid spot hybridization (NASH) 369
- nucleopolyhedrosis virus 144, 416
- oak (*Quercus*) 416
- obliquebanded leafroller (*Choristoneura rosaceana*) 282
- Office of Pest Management Policy (OPMP) 472
- oilseed 235
- onion thrips (*Thrips tabaci*) 152, 180
- optimal level 17
- organic agriculture 492, 517  
apple farming 497  
production 6
- Organic Foods Production Act (OFPA) 490
- oriental fruit moth (*Grapholita molesta*) 273
- ornamentals 354, 360–361
- overwintering 157
- parasitism 64
- parasitoids 63
- participatory IPM 509, 512
- pathogenic microorganisms 131, 132  
autodissemination 142  
independent action 144  
mass production 143  
microsporidian 396  
pathogenesis 255  
dispersal 146  
synergism 144  
viral pathogens 112, 366, 368  
virulence 137
- pea aphid (*Acyrtosiphon pisum*) 63, 155, 367
- performance measures 476
- pest control advisors (PCAs) 168, 173
- Pest Information Platform for Extension and Education (PIPE) 101
- pest management systems 473  
ecologically based 59  
monitoring 441  
pest physiology 310  
risk assessments 429  
suppression 71
- pesticide risks 220  
chemical monitoring 208  
human health risks 222, 286, 474
- pesticide resistance management 192
- reproductive effects 222
- restricted entry level (REL) 231
- signal word 232
- pesticides 1  
agchem dealer 451  
aggregate risk 230  
agricultural pesticides 471  
antagonism 187  
dusts 315  
efficacy 137  
exposure assessment 223  
formulation 142  
general exposure 223  
hazard identification 221  
health 14, 380  
health advisory level (HAL) 19  
label 232  
Material Safety Data Sheet (MSDS) 233  
methyl bromide 314  
occupational exposure 225  
Pesticide Action Network (PAN) 508  
pesticide chemistry 193  
Pesticide Environmental Stewardship Program 444  
Pesticide Handlers Exposure Database (PHED) 229  
physiological selectivity 183  
product liability 380  
product registration 136  
Reduced Risk Pesticide Program 450  
reduced-risk pesticide 233  
residues 2  
resistance 194  
seed treatments 185  
sulfur 1  
threshold effect 229  
use 165, 180
- pest population dynamics 52
- pests 1, 4, 35  
occasional 4  
severe 4  
subeconomic 4  
vertebrate 3
- pheromones 5, 273, 329, 394  
calling females  
emission rate 279  
female's plume 281  
mass trapping 274, 317  
mating disruption 276, 282, 329, 497

- pheromones (*cont.*)  
 pheromone component blend 281  
 point sources 380  
 synthetic pheromone lures 281
- physical exclusion and control  
 exclusion 316, 384  
 heat treatment 317, 348  
 irradiation 317  
 physical methods 309  
 pneumatic control 314  
 sanitation 316, 384
- pine woodwasp (*Sirex noctilio*) 134
- pink bollworm (*Pectinophora gossypiella*) 252, 274, 298, 325, 335, 426
- pink lady beetle (*Coleomegilla maculata*) 152
- plant bug (*Cyrtorhinus lividipennis*) 70
- plant pathology 3  
 plant pathogens 3, 28, 47  
 plant protection philosophy 359  
 plant-incorporated protectants (PIPs)
- plum curculio (*Conotrachelus nenuphar*) 312–314, 499
- pollen 126
- polymerase chain reaction (PCR) 241, 369
- poplar (*Populus*) 416
- population density 53
- population dynamics 62, 146, 333, 416  
 carrying capacity 53  
 delayed mating 279  
 density-independent 54  
 density-dependent 54, 57, 63, 65  
 density-dependent mortality 416  
 diversity–stability hypothesis 57  
 enemies hypothesis 69, 122  
 general equilibrium position 3  
 growth 279, 355  
 intrinsic rate of increase 53  
 life history 213  
 life systems 52  
 life tables 52  
 monitoring 373  
 periodic oscillations 416  
 regulation 122  
*r*-selection 54  
 simulation models 332  
 spatial aggregation 64  
 structure 52  
 synchrony 416
- post-application inspections 385
- post-harvest pest control 309–320
- potato 366  
 certification programs 368  
 disease-free seed potatoes 366  
 protective barriers 374  
 recertification 370  
 recombinant strain 368  
 roguing 372  
 seed certification 368  
 seed potato 366  
 serological testing 372  
 visual indexing 370
- potato aphid (*Macrosiphum euphorbiae*) 367
- potato leafroll virus (PLRV) 366
- potato virus Y (PVY) 366, 368
- predatory mite (*Phytoseiulus persimilis*) 112
- pre-harvest pest control 312–314
- prickly pear cactus (*Opuntia* spp.) 8
- private sector roles 443, 511, 514
- production agriculture 473
- Protected Harvest 450
- Pseudomonas fluorescens* 148
- push–pull control 8, 465
- quality control 437
- quantitative trait loci (QTLs) 236
- Rachel Carson 3, 391, 491
- recombinant DNA
- red scale (*Aonidiella aurantii*) 63
- resistance 2, 179  
 behavioral adaptation 194  
 cadherin gene 255  
 cross-resistance 199  
 cycle of innovation 192  
 fitness 194  
 homozygous for resistance 249  
 inheritance 235, 254  
 initial gene frequency 254  
 insect-resistant crops 242  
 insecticidal crystal proteins (ICPs) 248  
 Insecticide Resistance Action Committee (IRAC) 198, 373  
 insecticide resistance management (IRM) 248, 373  
 mechanisms for *Bt* resistance 255  
 midgut binding sites 255  
 mosaic 250  
 operational requirements 253
- physiological adaptation 194
- random mating 252
- remedial action 256
- resistance management 11, 91, 194, 198, 247, 249, 327
- resistant hosts 5
- resistant pests 197
- rotation 250
- seed mixtures 252
- resistance monitoring 253, 254
- restriction fragment length polymorphism (RFLP) 240
- retailers 362
- rice 236
- rice leaf-folder (*Marasmia patnalis*) 70
- risk from pesticide use 471
- rove beetles 68
- r*-selection 54
- sabadilla 2
- sampling 75, 331  
 binomial distribution 79  
 biological monitoring 207  
 chance of detection 77  
 cluster sampling 84  
 detection sampling 75, 76  
 estimation sampling 75, 77  
 multi-stage subsampling 84  
 sample size 76, 80  
 sample unit 75, 82  
 sample universe 76  
 sampling distributions 78  
 sampling program 28  
 sequential sampling 28, 81, 332  
 simple random sampling 82  
 stratified random sampling 83  
 surveillance 399  
 survey methods 14  
 survey programs 274  
 Taylor's variance–mean relation 79
- screwworm (*Cochliomyia hominivorax*) 9, 299
- seedcorn maggot (*Delia platura*) 180
- selective pesticides 179, 182
- semi-field data 213
- semiochemicals 273, 516
- seven-spotted lady beetle (*Coccinella septempunctata*) 152, 155
- severe mosaic 371
- Silent Spring* 3
- silkworm (*Bombyx mori*) 287
- Slow the Spread (STS) 419

- smallpox prototype 299  
 small-scale farmers 268, 463  
 social insects 394  
 socioeconomic contexts 417, 467, 480  
 solar radiation 141  
 sorghum 236  
 South Africa 268  
 South America 275  
 soybean aphid (*Aphis glycines*) 110, 154, 182, 367, 426  
 soybean looper (*Pseudoplusia includens*) 97  
 soybean rust (*Phakopsora pachyrhizi*) 100, 426, 481  
 Soybean Rust Information System 101  
 spatial heterogeneity 196  
 spider mite (*Tetranychus urticae*) 28  
 squash bug (*Anasa tristis*) 156  
 stakeholders 355  
 Staphylinidae 68  
 sterile insect technique (SIT) 9, 301, 329  
 stink bug 332–334  
*Striga* spp. 122  
 structural IPM 384, 445  
   commodity disinfestation 385  
   structural habitats 378  
   public schools 378, 446  
   precision methods 385  
   residential and public areas 474  
   urban structures 378  
 subsistence farmers 459  
 suppression 298, 417, 432  
 sustainable agriculture 260, 267, 489, 517  
 sweetpotato whitefly (*Bemisia tabaci*) 326, 333  
 Syngenta Biotech 330  
 SYSCO Corporation 448  
 tarnished plant bug (*Lygus lineolaris*) 314, 333, 497  
 teachers 356  
 technology development 511  
 technology transfer 511  
 Tennessee Valley Authority 405  
 termites 10  
 theoretical models 64  
 thermotherapy 348  
 threshold level 379  
 tobacco budworm (*Heliothis virescens*) 325  
 tobacco hornworm (*Manduca sexta*) 287  
 Total Diet Study (TDS) 223  
 toxicology  
   acute toxicity 221  
   bioassay 212  
   biochemical pesticides 163  
   chronic toxicity 221  
   toxicity assessment 221  
   toxicokinetic 222  
 traditional farming systems 121  
 transgenic crops  
   high dose 249  
   high-dose/refuge strategy 252  
   maize 10  
   promoters 249  
   pyramids 250  
   refuges 157, 185, 251, 330  
   selective expression 250  
   tissue-specific 250  
   transgenic plants 9, 10, 247  
*Trichogramma* 111, 112  
 turnip aphid (*Lipaphis psuedobrassicae*) 369  
 two-spotted spider mite (*Tetranychus urticae*) 54, 112  
 ultra-low temperatures 317  
 United Nations  
   UNDP 6  
   UNEP 6  
   UN-FAO 507, 508  
 USAID 7, 507  
 US Department of Agriculture 6, 34, 100, 110, 391, 418, 445, 471, 489  
   APHIS 101, 274, 304  
   Pesticide Data Program (PDP) 223  
   Risk Management Agency (RMA) 102  
   USDA-ES 479  
   USDA-NASS 7  
   UV radiation 137, 141  
 vector efficiency 368  
 vedalia beetle (*Rodolia cardinalis*) 107  
 vegetable crops 235, 354  
 velvetbean caterpillar (*Anticarsia gemmatilis*) 144  
 vineyard 124  
 Vip3A vegetative protein 330  
 vitamin A deficiency 261  
 vole (*Microtus canicaudus*) 213  
 Wal-Mart 448  
 weeds 3, 28, 47  
 West Nile Fever 402, 444  
 western boxelder bug (*Boisea rubrolineata*) 497  
 western grape leafhopper (*Erythroneura elegantula*) 124  
 wheat (*Triticum aestivum*) 237  
 wildlife 207  
 willingness to pay (WTP) 20  
 Winrock International 499  
 witches' broom disease of lime (WBDL) 346  
 witchweed (*Striga hermonthica*) 8  
 wolf spider (*Pardosa pseudoannulata*) 70  
 World War II 2  
 World Wildlife Fund 172