

Index

Abbreviations

AAPFCO, 209
APHIS, 74
CDFA, 71
CIMIS, 134
ENTAV, 27
FPS, 71, 74
LiDAR, 450
MSDS, 361
NDVI, 460
NOP, 72, 209, 252, 269
NRCS, 50
USDA, 73

A

Acclimation, 13
Acidification, 173, 180, 251
Adjusted sodium adsorption ratio, 170
Adjuncts, 216, 318, 355
Advective freeze, 387
Airblast sprayers, 217, 379
Air-induction nozzles, 368
Air-shear (air-assisted) nozzles, 370
Allelopathic cover crops, 172
Alkalinity, 172
Annuals
 cover crops, 409
 weeds, 332
Anthocyanins, 12
Arms, 93
Aroma compounds, 13, 431, 434
Artificial intelligence, 444
Aspect, 49
Association of American Plant Food Control Officials, 209
Average growing season temperature, 45

B

Baco noir, 17

Bacterial pathogens, 287
Balanced pruning, 82, 95
Bamboo stakes, 79
Banding fertilizer, 214
Barbera, 20
Barn owls, 386
Base buds, 93
Beating tray, 260
Bellani plate atmometer, 135
Berry development, 7
Biennials
 cover crops, 410
 weeds, 332
Biopesticides, 268, 350
Biorationals, 268, 350
Bird control, 381
Black rot, 271
Botanicals, 351
Botrytis bunch rot, 273
Brassicas, 412
Brix, 432
Brix-acid ratio, 433
Broadcasting fertilizer, 213
Buckwheat, 412
Budburst, 3
Buds, 4
Buffer zone, 57
Buffers, 356

C

Cabernet Franc, 20
Cabernet Sauvignon, 21
Calcium fertilizers, 187, 212, 476
Calcium carbonate, 32, 57, 155, 173, 174, 252
Calcium carbonate equivalent, 252
Canes, 81, 93
Cane-pruned system, 98
Canopy management
 assessing canopy characteristics, 104
 crop yields, 430
 direct management techniques
 cluster thinning, 111
 global warming, 45
 leaf removal, 108
 hedging, 107
 removal of water sprouts and suckers, 112
 shoot positioning, 105
 shoot thinning, 106
 fruit composition, 435
 indirect management
 cultivar and clone selection, 112
 irrigation management, 114
 nutrient management, 113,
 root stock selection, 112
 trellis design and selection, 113
 vineyard floor management, 113
 microclimate, 103
Carbohydrate reserves, 5, 14, 73, 116, 141
Carbon:Nitrogen ratio
 cover crops, 410, 411, 417, 424
 organic amendments, 209
 rootstocks, 71
 soil, 250
Catawba, 15
Cation exchange capacity (CEC), 243
Cayuga White, 18
Centrifugal sand separators, 152
Certified grapevines, 71
Chambourcin, 17
Chancellor, 17
Chardonel, 18
Chardonnay, 24
Chelates, 207, 212, 237
Chenin Blanc, 24
Chlorination, 157
Citrus nematode, 326
Claypan soils, 60
Clay-rich soils, 60
Climate
 classification, 39
 components of climate, 40
 global warming, 45
Climbing cutworms, 297
Clones, 27
Cluster thinning, 111
Cold air lake, 49
Cold hardiness in grapevines, 400

Compost, 210
 Concord, 15
 Controlled droplet applicators, 376
 Cordons, 81, 83
 Cordons-pruned system,
 Couderc 161-49, 35
 Couderc-1616, 37
 Couderc-3309, 34
 Coulure, 6
 Cover crops
 benefits and drawbacks, 407
 canopy management, 113
 cover cropping systems
 mixtures, 413
 monocultures, 413
 criteria for selecting cover crops,
 417
 establishing and managing cover
 crops, 420
 life cycle of cover crops, 409
 managing pests, 415
 management systems
 annually tilled, 414
 no-till, 414
 nematode management, 329
 suppression or control of cover
 crops, 423
 taxonomy
 brassicas, 412
 forbs, 412,
 grasses, 411
 legumes, 410
 vineyard establishment, 64
 weed control, 333
 Crop coefficient, 134, 135
 Crop yields
 conditions affecting crop yields, 429
 estimation methods
 lag-phase method, 428
 pre-bloom method, 427
 Cropping levels
 balanced pruning, 95
 training young vines, 82
 winter protection, 402
 Cultivation
 site preparation, 62, 77
 weeds, 337
 Cynthiana, 18

D

Dagger nematode, 326
 Deacclimation, 14, 400
 Deer control, 384
 Deficit irrigation strategies
 partial root zone drying, 142
 regulated deficit irrigation, 139
 Delaware, 15
 Delayed pruning, 390

Dew-point temperature, 395
 Differential pressure tanks, 220
 Digital image processing, 464
 Disc filters, 153
 Diseases
 black rot, 271
 botrytis bunch rot, 273
 downy mildew, 276
 eutypa dieback, 278
 grape anthracnose, 280
 grape crown gall, 287
 grape leafroll, 291
 grapevine fanleaf degeneration, 292
 grapevine yellows, 288
 phomopsis cane and leaf spot, 282
 Pierce's disease, 289
 powdery mildew, 284
 rugose wood, 293
 Disk harrows, 338
 Disk plow, 62, 338, 405
 Diurnal temperature, 41
 Dormancy, 13
 Dormant benchgrafts, 69, 73
 Dormant rooted cuttings, 69, 73
 Dormant buds, 4
 Double pruning, 390
 Downy mildew, 276
 Drip irrigation, 120
 Drones, see unmanned aerial vehicles
 Drum pruners, 102

E

Economic thresholds, 265
 Electrical conductivity
 fertigation injectores, 228
 soils, 51, 55, 244
 water, 169
 Electric metering fertigation injectors,
 226
 Electromagnetic spectrum, 449
 Electrostatic sprayers, 372
 Elevation, 48
 EM38 electromagnetic sensors, 51
 Emitters
 line-source emitters, 149
 micro-sprinklers, 149
 point-source emitters, 148
 End posts, 85
 European grape varieties, 19
 European red spider mite,
 Eutypa dieback, 278
 Evaporation
 canopy management, 47, 104
 climate, 43
 irrigation, 47, 119, 134
 minimizing spray drift, 378
 overhead sprinkler irrigation, 121
 pesticide application, 379

soil water management, 408
 Exchangeable sodium percentage, 245
 Expert systems, 445

F

Federal Migratory Bird Treaty Act,
 383
 Fertigation
 calibrating injectors, 227
 dilute tank (batch method), 219
 design considerations, 229
 dosing methods, 219
 electric metering injectors, 226
 fertilizers, 188, 189, 191, 192, 193,
 214, 234
 fertilizer application considerations
 compatibility, 233
 formulations, 232
 solubility, 233
 water quality, 234
 injector comparison, 228
 in-line methods
 electric metering (EC/pH), 226
 positive displacement pump
 injectors, 222
 pressure differential tank
 injection, 220
 proportional injectors, 224
 venturi injectors, 221
 monitoring irrigation water, 238
 Fertilization
 canopy management, 113
 mature grapevines, 203
 young grapevines, 76
 Fertilizers
 antagonisms, 195
 application methods
 banding, 214
 broadcasting, 213
 fertigation, 214
 foliar application, 214
 compatibility, 231
 inorganic fertilizers
 acidity/basicity, 205
 fertilizer forms
 liquid, 205
 solid, 204
 fertilizer grade, 203
 salt index, 206
 types
 calcium, 206, 212
 magnesium, 207
 micronutrients, 207
 nitrogen, 206, 210
 phosphorus, 206, 210
 potassium, 206, 211
 sulfur, 206
 nutrient mobility in soils, 195

- organic fertilizers
 - compost, 209
 - manure, 209
 - mineral-based, 210
 - National Organic Program, 208
 - Field capacity, 118
 - Filters
 - centrifugal sand separators, 152
 - disc filters, 153
 - sand media filters, 153
 - screen filters, 153
 - Flabby, 10, 25
 - Flail mowers
 - cover crops, 425
 - weed control, 336
 - Flaming, 336
 - Flavonoids, 11
 - Flower cluster initiation, 4
 - Flowering, 5
 - Foliar spraying
 - fertilizers, 188, 190, 191, 192, 193, 214
 - pesticides, 373
 - Forbs, 412
 - Foundation Plant Services (FPS), 27
 - French-American grape hybrids, 16
 - French plow, 338
 - French Sauternes, 27
 - Frequency domain reflectometry, 127
 - Frontenac, 17
 - Frost
 - active methods for managing frost
 - heaters, 393
 - helicopters, 392
 - inverted sink fans, 393
 - micro-sprinklers, 397
 - over-vine sprinkler systems, 394
 - wind machines, 390
 - cover crops, 418
 - damage, 397
 - frost-free days, 45
 - frost potential, 42
 - passive methods for managing frost, 388
 - spring frost index, 45
 - types of frost
 - fall, 388
 - spring, 45, 388
 - Frost-free days, 45
 - Fructose, 9
 - Fruit set, 5
 - Fumigation
 - gophers, 386
 - nematodes, 328
 - Fungal pathogens, 271
 - Fungicide Resistance Action Committee, 344, 360, 383
 - Fungicides
 - breadth of activity, 344
 - general function, 344
 - methods of application, 344
 - mobility, 343
 - mode of action, 344
 - Furrow irrigation, 122
- ## G
- Geisenheim Research Institute, 28
 - Geneva double curtain trellis system, 89
 - Geographical information systems (GIS), 465
 - Gewürztraminer, 25
 - Glassy-winged sharpshooter, 261, 317
 - Global navigation satellite system, 447
 - Global positioning systems (GPS), 448
 - Global warming, 44
 - Glucose, 9
 - Gondola, 438, 440
 - Gopher control, 385
 - Granular matrix sensors, 129
 - Grape anthracnose, 280
 - Grape berry moth, 299
 - Grape cane borer, 300
 - Grape crown gall, 287
 - Grape flea beetle, 301
 - Grape hoe, 338, 04
 - Grape leaffolder, 302
 - Grape leafroll, 291
 - Grape maturity evaluation, 431
 - Grape omnivorous leafroller, 304
 - Grape phylloxera
 - rootstock, 31
 - insect, 314
 - Grape root borer, 305
 - Grape rootworm, 306
 - Grape tumid gallmaker, 307
 - Grape varieties, 15
 - Grapevine fanleaf degeneration, 292
 - Grapevine structure, 1
 - Grapevine yellows, 288
 - Grapevine importation and quarantine, 74
 - Grapevine planting stock
 - certified grapevines, 71
 - handling and storage, 73
 - importation, 73
 - nursery stock grades, 71
 - organic grape production, 72
 - purchasing grapevines, 70
 - quality attributes, 72
 - types, 69
 - Grapevine structure, 1
 - Grasses, 411
 - Graves, 27
 - Green benchgrafts, 69, 73
 - Green June beetle, 308
 - Ground-based or proximal sensing, 456
 - Groundwater wells, see wells
 - Growing degree days
 - crop estimation, 429
 - monitoring crop pests, 262
 - site selection, 44
 - Grow tubes, 79
 - Guidance and steering systems, 462
 - Gypsum blocks, 127
- ## H
- H-brace end assembly, 85
 - Hand-feel method, 124
 - Hang time
 - crop estimation, 429
 - harvest, 432
 - varieties, 25
 - winter protection, 402
 - Harvesting
 - chemical composition of grapes, 8
 - manual, 437
 - mechanical
 - harvester configurations, 440
 - types of picking heads, 441
 - varieties, 439
 - vineyard physical configuration, 439
 - Head, 93
 - Hedge bar pruners, 102
 - Head-trained, cane-pruned system, 98
 - Head-trained, spur-pruned system, 97
 - Headlands and alleyways, 65
 - Heaters, 393
 - Hedging, 107
 - Helicopters, 392
 - Hens and chickens, 6
 - Herbicide Resistance Action Committee, 347, 360, 500
 - Herbicides
 - methods of application, 346
 - mobility, 348
 - mode of action, 347
 - soil active, 340
 - target site, 348
 - time of applications, 341, 346
 - weed control in vineyards, 338
 - High-bilateral cordon trellis system, 88
 - High-tensile (HT) galvanized steel wire, 84
 - Humidity
 - adjective freeze, 387
 - canopy management, 104
 - evaporative-based irrigation

- scheduling, 134
- foliar fertilizer application, 217
- frost protection, 379
- grapevine water requirements, 56
- irrigation scheduling, 134
- over-vine sprinkler systems, 394
- pesticide application, 378
- site selection, 43
- weather stations, 137

Humus, 247

Hydrometer, 432

I

Igneous rocks, 239

Insect growth regulators, 352

Insect pheromones, 352

Insecticidal soaps, 318

Insecticide Resistance Action Committee, 345, 360, 495

Insecticides

- breadth of activity, 346
- methods of application, 345
- mode of action, 345

Insecticidal soaps, 352

Insects

- biology of insects
 - insect feeding, 296
 - insect growth and development, 296
 - mites, 297
- chewing insects, 297
- cover crops, 415
- sucking insects, 314
- types
 - climbing cutworms, 297
 - grape berry moth, 299
 - grape cane borer, 300
 - grape flea beetle, 301
 - grape leafroller, 302
 - grape omnivorous leafroller, 304
 - grape phylloxera, 314
 - grape root borer, 305
 - grape rootworm, 306
 - grape tumid gallmaker, 307
 - green June beetle, 308
 - Japanese beetle, 309
 - leafhoppers, 317
 - mealybugs, 319
 - multicolored Asian lady beetle, 311
 - rose chafer, 312
 - thrips, 323
 - western grapeleaf skeletonizer, 313

Integrated pest management

- economic thresholds, 265
- monitoring crops pests, 259
- pest identification, 264

- pest management tactics, 266
- record keeping, 269

Internode, 93

Inversion layer, 391

Inverted "V" end assembly,

Inverted sink fans, 393

Irrigation

- canopy management, 114
- deficit irrigation strategies, 139
- scheduling methods
 - evapotranspiration-based, 134
 - plant-based, 132
 - soil-based, 124
 - visual assesment, 123
 - water budget method, 136
- systems
 - drip irrigation, 120
 - furrow irrigation, 122
 - mico-sprinkler irrigation, 120
 - overhead-sprinkler irrigation, 121
- winter protection, 403
- young grapevines, 76

J

Japanese beetle, 309

Johannisberg Riesling, 25

K

Kicker canes, 97

Kober 125AA, 35, 470

Kober 5BB, 35, 470

L

Lag phase method, 428

Laser planting, 76

Lateral, 93

Lateral buds, 4

Latitude, 49

Latitude temperature index, 44

Leaching fraction, 256

Leaf layer number, 104

Leaf removal, 108

Leafhoppers, 317

Legumes, 410

Limescale potential, 174

Liming, 251

Line posts, 83

Little Ice Age, 45

Long-tailed mealybug, 319

Low temperature exotherm, 401

Lyre trellis system, 90

M

Machine learning, 444

Machine vision, 444

Macroclimate, 39

Macronutrients, 245

Magnesium fertilizers, 186, 476

Malbec, 22

Malègue 44-53, 37

Malic acid, 7, 9, 435

Management allowable depletion, 118

Manure, 209

Maréchal Foch, 17

Material safety data sheet, 361

Mealybugs, 319

Mechanization

- harvesting, 440
- hedging, 107
- laser planting, 76
- leaf removal, 108
- planting, 66, 76
- pruning, 101
- robots, 463
- shoot thinning, 106
- suckering, 106
- trellising, 85, 87

Merlot, 22

Mesoclimate, 39

Metamorphic rocks, 240

Methoxyypyrazines, 103, 434

Microbials, 351

Microclimate, 103

Microirrigation

- components
 - computer-based control systems, 151
 - controllers, 150
 - fertigation-chemigation sys, 151
 - flow-control devices, 146
 - emitters, 148
 - filters, 152
 - pipe network, 146
 - power units for pumping, 161
 - pressure gauges, 147
 - pump station, 145
 - timer-based control sysyems, 150
 - valves, 146
 - water flow meters, 148
- ground water wells, 159
- maintenance
 - filters, 156
 - line flushing, 157
- water
 - acidification, 158
 - chlorination, 157
- types
 - drip, 143
 - micro-sprinkler, 144

water quality, 154
 Micronutrients, 246
 Micro-sprinklers, 120, 397
 Mid-day leaf water potential (MDLWP), 142
 Millardet et de Grasset 101-14, 34
 Millardet et de Grasset 420A, 35
 Millerandage, 6
 Mineralization, 249, 250
 Minerals, 11, 352
 Mites, 297, 321
 Mode of action
 fungicides, 344
 herbicides, 345
 insecticides, 347
 Moldboard plow, 60, 62, 424
 Mole drains, 63
 Monoterpenes, 434
 Mowing
 cover crops, 425
 weed control, 335
 Mulching
 floor management, 113
 weed control, 334
 winter protection, 404
 Multicolored Asian lady beetle, 311

N

National Organic Program, 72, 209, 252, 269
 National Resource Conservation Service (NRCS), 50
 Native American grape varieties, 15
 Natural language processing, 445
 Nematodes
 managing, 327
 monitoring, 326
 species, 325
 Netting for birds, 382
 Neutron probe, 124
 Nitrogen
 fertilizers, 180, 210, 475
 plant nutrients, 177
 Nitrogenous compounds, 13
 Noble rot, 274
 Node, 91, 93
 Normalized Difference Vegetation Index, see NDVI
 Norton (Cynthiana), 18
 Nozzles, 217, 365, 367
 Nutrient management
 canopy management, 113
 diagnosis of nutritional deficiencies, 196
 fertilizer antagonisms, 195
 limiting factor, 194
 macro- and micronutrients
 boron, 188

 calcium, 186
 iron, 191
 magnesium, 184
 manganese, 190
 molybdenum, 192
 nitrogen, 177
 phosphorus, 181
 potassium, 183
 zinc, 187
 mobility in soils, 195
 monitoring
 soil analysis, 198
 tissue analysis, 200
 visual observations, 197
 rootstocks, 195
 seasonal variations in nutrients, 200
 soil and water conditions, 194
 weather and climate, 196

O

Organic acids, 9
 Organic grape production, 57, 72
 Organic matter
 additions, 250
 carbon:nitrogen ratio, 249
 compost, 209
 cover crops, 409
 fertility management, 247
 manure, 209
 Overcropping,
 pruning and training grapevines, 95
 vine balance, 92
 winter protection, 402
 Overhead sprinklers
 frost protection, 394
 irrigation, 121

P

Pacific spider mite, 321
 Pan evapotranspiration, 134
 Partial root zone drying, 142
 Pathogens, 271
 Paulsen 1103, 36
 Pectins, 8
 Peptides, 13
 Perennials
 cover crops, 409
 weeds, 332
 Permanent wilting point, 118
 Pest control
 biological, 267
 biorational, 267
 chemical (synthetic), 268
 cultural, 266
 Pesticides
 adjuvants, 217, 318, 355
 application, 363
 biorationals, 350
 chemical (synthetic), 349
 compatibility, 358
 formulations, 353
 fungicides, 343
 herbicides, 346
 inorganic, 348
 insecticides, 345
 labels, 353, 361
 laws and regulations, 360
 material safety data sheet, 361
 organic, 348
 pre mix vs tank mix, 357
 resistance, 342, 359
 spray coverage, 377
 spray drift, 342, 378
 Pest identification, 264
 pH
 irrigation water quality, 172
 soil properties, 194, 243
 wine grape maturity, 10, 433
 Phenolic compounds, 11
 Pheromone traps, 261
 Phomopsis cane and leaf spot, 282
 Phosphorus
 fertilizer, 182, 210, 475
 plant nutrients, 181
 Phylloxera, see grape phylloxera
 Pierce's disease, 289
 Pinot Blanc, 25
 Pinot Gris, 25
 Pinot Noir, 22
 Plant available water, 118
 Plant pathogens, 259
 Planting grapevines
 dormant benchgrafts, 70
 dormant rooted cuttings, 69
 fertilization, 76
 green benchgrafts, 69
 irrigation, 76
 laser planting, 76
 time of planting, 75
 weed control, 77
 Plowpan soils, 60
 Potassium
 fertilizers, 184, 211, 475
 plant nutrients, 183
 wine grapes, 10, 11
 Potato leafhopper, 317
 Powdery mildew, 284
 Pre-bloom method, 427
 Precision viticulture
 advantages, 443
 artificial intelligence, 444
 digital image processing, 464
 expert system, 445
 geographic information systems, 465

global navigation satellite systems, 447
 global positioning system, 448
 ground-based or proximal sensing, 456
 guidance and steering systems, 462
 limitations, 443
 natural language processing, 445
 remote sensing, 449
 robotics, 444
 robots, 463
 sensors, 449
 spectral reflectance, 459
 unmanned aerial vehicles (UAVs), 452, 453
 variable-rate technology, 461
 vegetation indices, 460
 wireless sensor network, 446
 Pressure chamber, 132
 Proportional fertigation injectors, 223
 Pruning
 crop yields, 430
 frost protection, 389
 mechanical pruning, 101
 principles of grapevine behavior, 94
 pruning weight, 96
 spur versus cane pruning, 94
 systems
 cordon-trained, spur-pruned, 100
 head-trained, cane-pruned, 98
 head-trained, spur-pruned, 97
 time of pruning, 94
 vine balance, 95
 winter-injured grapevines, 404
 Pump curve, 165
 Pumps
 fertigation, 222
 pesticides, 365
 wells, 160

Q

Quarantine, 74, 334

R

Radiant frosts, 387
 Rainfall
 deficit irrigation strategies, 141
 site selection, 43
 vineyard water requirements, 56, 115
 water budget scheduling method, 136
 Ramsey, 38
 Remote sensing, 55, 117, 137, 449
 Ravaz index, 96
 Record keeping

integrated pest management, 269
 nutrient management, 202
 pesticides, 361
 Regulated deficit irrigation, 139
 Remote sensing, 449
 Replacement spurs, 91, 98, 99
 Residual sodium carbonate, 171
 Richter-99, 36
 Richter-110, 39
 Riesling, 26
 Right triangle rule, 65
 Ring nematode, 326
 Riparia Gloire, 37
 Robotics, 444
 Robots, 463
 Rolling-crimping, 424
 Root-knot nematode, 325
 Root-lesion nematode, 326
 Rootstocks
 crop yields, 430
 environmental tolerance
 calcareous soils, 33
 drought tolerance, 32
 soil acidity, 32
 soil salinity, 33
 waterlogged, 32
 influence on the scion
 mineral nutrition, 33
 ripening tendency, 34
 vine vigor, 33
 nematode resistance, 31
 resistance to soil-borne diseases, 31
 species
 north american hybrids
 V. berlandieri x *V. riparia*, 30
 V. berlandieri x *V. rupestris*, 30
 V. riparia x *V. rupestris*, 30
 north american species
 Vitis berlandieri, 29
 Vitis champinii, 30
 Vitis riparia, 30
 Vitis rupestris, 29

Rose chafer, 312
 Rotary cultivators, 337, 338
 Rotary pruners, 102
 Row orientation, 48, 65
 Row spacing, 66, 101, 135, 439
 Ruggeri-140, 37
 Rupestris du Lot, 38
 Rugose wood, 293

S

Salinity
 rootstocks, 32
 soils, 51, 54, 255
 water, 168
 Sand media filters, 153, 156
 Sangiovese, 23

Satellites, 451
 Saturation, 118
 Sauvignon Blanc, 26
 Schwarzmatt, 35
 Scion, 11, 29, 33, 69, 72
 Scott Henry trellis system, 90
 Screen filters, 153, 156
 Sedimentary rocks, 239
 Selection Oppenheim, 35
 Sémillon, 27
 Seyval blanc, 18
 Shatter, 5
 Shoot density, 104
 Shoot positioning, 105
 Shoot thinning, 106
 Shoots, 93
 Shot berries, 6
 Slope, 49
 Smart-Dyson trellis system, 91
 Smudge pots, 393
 Sodium adsorption ratio (SAR)
 water, 170
 soil, 244
 Soils
 acidic soils
 causes of soil acidification, 253
 managing acidic soils, 253
 biological properties, 247
 chemical properties
 cation exchange capacity, 244
 electrical conductivity, 51, 245
 exchangeable sodium percentage, 245
 fertility, 54
 macronutrients, 246
 micronutrients, 247
 pH, 54, 244
 salinity, 54
 sodium absorption ratio, 246
 fumigation, 328
 mapping, 51
 moisture sensors, 124
 organic matter
 additions, 251
 benefits, 249
 carbon:nitrogen ratio, 250
 classification, 249
 conditions favoring buildup, 249
 mineralization, 250
 physical properties
 color, 244
 depth, 54, 241
 drainage, 53
 parent material, 239
 permeability, 243
 porosity, 242
 soil horizons, 241
 structure, 242
 texture, 53, 243

- water holding capacity, 54,
 - salt-affected soils
 - managing saline-sodic soils, 258
 - managing saline soils, 256
 - managing sodic soils, 257
 - properties, 255
 - soil depth
 - plant available water, 118
 - sampling, 255
 - site selection, 54
 - soil properties, 240
 - soil drainage, 53, 241,
 - soil sampling
 - established vineyards, 254
 - pre-vine analysis, 52
 - salt-affected soils, 255
 - soil survey, 52
 - soil water relationships, 118
 - timing of analysis, 198
 - vineyard site selection, 54
 - Solarization, 328
 - Solar radiation, 42, 134
 - Solarization in controlling nematodes, 328
 - Spectral reflectance, 459
 - Spray oils, 352
 - Sprayers
 - air-assisted sprayers, 373
 - controlled droplet applicators, 375
 - drone sprayers, 376
 - electrostatic sprayers, 376
 - hydraulic sprayers, 373
 - components
 - fans, 365
 - filtration devices, 365
 - nozzles, 365, 367, 380
 - other system components, 366
 - pumps, 364
 - tanks, 363
 - nozzles
 - droplet size classification, 371
 - materials, 365
 - nomenclature, 366
 - types
 - air induction, 368
 - air-shear (air-assisted), 370
 - controlled-droplet applicators, 370
 - hydraulic, 367
 - spray drift, 378
 - Spring frost index, 45
 - Spur, 93
 - St. George, 38
 - Sticky traps, 262
 - Stratified soils, 60
 - Subsoiling, 60
 - Suckering, 106, 112
 - Suckers, 93, 112
 - Sugars, 9, 432
 - Sulfur fertilizers, 476
 - Surfactants, 357
 - Sweep net, 261
 - Syrah, 23
- ## T
- Tannins, 12
 - Tartaric acid, 11
 - Teleki 5C, 36
 - Temperature
 - canopy, 103
 - climate, 41
 - diurnal temperature variation, 41
 - dormancy, 11
 - frost potential, 42, 385
 - growing degree days, 262
 - liquid fertilizers, 205
 - maximum summer temperatures, 42
 - minimum winter temperatures, 42
 - pesticide application, 379
 - site selection, 44
 - soil, 195
 - winter protection of grapevines, 399
 - Tendrils, 93
 - Tensiometers, 130
 - Terroir*, 15, 24, 39, 466
 - Thermal belt, 48
 - Three-banded leafhopper, 317
 - Thrips, 323
 - Tie-back end assembly, 85
 - Tile drains, 64
 - Time domain reflectometry, 126
 - Tissue analysis, 199
 - Titrate acidity, 432
 - Topography, 48
 - Total dynamic head, 163
 - Training young grapevines
 - developing the trunk, 78
 - establish the training system
 - canes, 81
 - cordons, 81
 - Tramnette, 19
 - Trellis
 - canopy management, 113
 - choosing a vineyard trellis system, 86
 - construction cost, 86
 - grape variety, 91
 - mechanically farmed vineyards, 85
 - trellis construction
 - end posts and anchorage
 - H-brace end assembly, 85
 - inverted “V” end assembly, 84
 - tie-back end assembly, 85
 - line posts, 83
 - wire, 84
 - trellis systems
 - Geneva double curtain, 89
 - high-bilateral cordon, 88
 - lyre, 90
 - Scott Henry, 90
 - Smart-Dyson, 91
 - umbrella kniffen, 88
 - vertical shoot position, 87
 - Trunk, 93
 - Two-spotted spider mite, 321
- ## U
- Umbrella kniffin trellis system, 88
 - Undercropping, 96
 - Unmanned aerial vehicles, 263, 452, 453
 - Undercutting, 334
 - Unmanned aerial vehicles (UAVs),
 - USDA soil survey maps, 50
- ## V
- Variable-rate application technology, 461
 - Variegated leafhopper, 317
 - Vegetation indices, 460
 - Venturi fertigation injectors, 221
 - Véraison*
 - berry growth, 7, 115, 139
 - cluster thinning, 111
 - crop estimation, 427
 - leaf removal, 109
 - regulated deficit irrigation, 139
 - sugars, 9
 - tissue analysis, 201
 - wine grape maturity, 434
 - Vertical boom hydraulic sprayers, 373
 - Vertical shoot position trellis system, 87
 - Vidal blanc, 19
 - Vignoles, 19
 - Vine balance, 82, 95
 - Vine mealybug, 319
 - Vine spacing, 66, 427, 437
 - Vineyard floor management
 - canopy management, 113
 - cover crops, 414
 - weed management, 333
 - Vineyards
 - design
 - headlands and alleyways, 65
 - partitioning into blocks, 65
 - row orientation, 65
 - row spacing, 66
 - vine density, 67
 - vine spacing, 66
 - establishment

- cover crops, 64
- land clearing, 59
- site drainage, 63
- soil analysis, 59
- soil physical limitations, 60
- subsoiling, 60
- tillage, 61
- weed control, 62
- wind breaks, 64
- planting grapevines, 75
- site selection
 - climate, 39
 - global warming, 45
 - organic certification, 57
 - precision viticulture, 55
 - soils, 50
 - temperature-based metrics, 44
 - topography, 48
 - water requirements and quality, 56
- training young grapevines, 77
- Viral pathogens, 291
- Virginia creeper leafhopper, 317
- Vivai Cooperativi Rauscedo, 28
- Volatilization, 210, 213, 378

W

- Waterlogging
 - frost prevention w/ sprinklers, 394
 - rootstocks, 32
 - soil, 53
- Water budget method, 136
- Water jet, 75
- Water quality
 - fertigation, 233
 - vineyard irrigation
 - alkalinity, 172
 - hardness, 174
 - pH, 172
 - salinity hazard, 168
 - site selection, 56
 - sodium hazard, 170
 - specific ions, 175
 - water analysis, 167
- Water requirements
 - frost protection, 397
 - grapevine growth stages, 115
 - vineyards, 56, 115
- Watersprouts, 93
- Water sensitive cards, 377
- Water stress symptoms, 117
- Water treatment
 - acidification, 173
 - chlorination, 157
- Weather
 - nutrient availability, 196
- Watersprouts, 93, 112
- Weather stations, 137

Weeds

- biology, 331
 - beneficial, 332
 - emergence, 332
 - life cycle, 331
 - reproduction, 332
 - seed banks, 332
- control
 - mature grapevines
 - chemical, 339
 - cover crops, 333
 - cultivation, 337
 - cultural, 333
 - flaming, 336
 - mowing, 335
 - vineyard establishment, established grapevines, 339
- integrated weed management, 62
- Weed Badger, 338
- Wells,
 - backflow prevention, 160, 230
 - pressure tanks, 160
 - power units, 161
 - pumps, 160
 - selecting a well pump, 162
- Western grape leafhopper, 317
- Western grapeleaf skeletonizer, 313
- Western flower thrips, 323
- White Riesling, 26
- Wildlife control
 - birds, 381
 - deer, 384
 - gophers, 385
- Willamette spider mite, 321
- Wind machines
 - frost protection, 390
 - winter protection, 405
- Wind breaks, 64
- Wine grape maturity
 - aromatic maturity, 434
 - phenolic maturity, 433
 - physiological maturity, 434
 - technological maturity, 432
 - wine grape sampling, 435
 - wine grape sample preparation, 436
- Wine grape varieties
 - European, 19
 - French-American hybrids, 16
 - Native American, 15
- Winter injury to grapevines
 - assessing winter injury, 399
 - cold hardiness in grapevines, 400
 - conditions influencing cold hardiness, 401
 - managing winter-injured grapevines, 405
- Winter protection of grapevines
 - active management strategies, 404
 - cultural practices, 403

Wireless sensor network, 446

Y

Yellow vine spider mite, 321
Yield-to-pruning-weight ratio, 96

Z

Zinfandel, 23, 38