

Contents

| | |
|--|-----------|
| Foreword | xiii |
| Acknowledgments | xv |
| Introduction | xvii |
| | |
| CHAPTER 1. Mushrooms, Civilization, and History | 1 |
| | |
| CHAPTER 2. The Role of Mushrooms in Nature | 5 |
| The Mycorrhizal Gourmet Mushrooms: Matsutake, Boletus, Chanterelles, and Truffles | 5 |
| Parasitic Mushrooms: Blights of the Forest | 9 |
| Saprophytic Mushrooms: The Decomposers | 11 |
| The Global Environmental Shift and the Loss of Species Diversity | 13 |
| Catastropia: Nature as a Substrate Supplier | 14 |
| Mushrooms and Toxic Wastes | 14 |
| Mushroom Mycelium and Mycofiltration | 15 |
| | |
| CHAPTER 3. Selecting a Candidate for Cultivation | 17 |
| | |
| CHAPTER 4. Natural Culture: Creating Mycological Landscapes | 21 |
| Methods of Mushroom Culture | 24 |
| Spore-Mass Inoculation | 24 |
| Transplantation: Mining Mycelium from Wild Patches | 25 |
| Inoculating Outdoor Substrates with Pure Cultured Spawn | 26 |
| When to Inoculate an Outdoor Mushroom Patch | 29 |
| Site Location of a Mushroom Patch | 29 |
| Stumps as Platforms for Growing Mushrooms | 29 |
| Log Culture | 33 |
| | |
| CHAPTER 5. Permaculture with a Mycological Twist: The Stametsian Model for a Synergistic Mycosphere | 39 |
| | |
| CHAPTER 6. Materials for Formulating a Fruiting Substrate | 45 |
| Raw Materials | 46 |
| Suitable Wood Types: Candidate Tree Species | 46 |
| Cereal Straws | 50 |
| Paper Products: Newspaper, Cardboard, Books | 51 |
| Corncobs and Cornstalks | 51 |
| Coffee and Banana Plants | 52 |
| Sugarcane Bagasse | 52 |
| Seed Hulls | 52 |
| Soybean Roughage (Okara) | 52 |
| Supplements | 53 |
| Structure of the Habitat | 54 |

| | |
|--|-----|
| CHAPTER 7. Biological Efficiency: An Expression of Yield | 55 |
| CHAPTER 8. Homemade vs. Commercial Spawn | 59 |
| CHAPTER 9. The Mushroom Life Cycle | 61 |
| CHAPTER 10. The Six Vectors of Contamination | 73 |
| CHAPTER 11. Mind and Methods for Mushroom Culture | 79 |
| Overview of Techniques for Cultivating Mushrooms | 82 |
| CHAPTER 12. Culturing Mushroom Mycelium on Agar Media | 85 |
| Preparing Nutrified Agar Media | 85 |
| Pouring Agar Media | 87 |
| Starting a Mushroom Strain by Cloning | 88 |
| Cloning Wild vs. Cultivated Mushrooms | 91 |
| How to Collect Spores | 91 |
| Germinating Spores | 92 |
| Purifying a Culture | 95 |
| CHAPTER 13. The Stock Culture Library: A Genetic Bank of Mushroom Strains | 97 |
| Preserving the Culture Library | 97 |
| The Stamets “P” Value System | 99 |
| Iconic Types of Mushroom Mycelium | 101 |
| The Event of Volunteer Primordia on Nutrified Agar Media | 108 |
| CHAPTER 14. Evaluating a Mushroom Strain | 109 |
| Features for Evaluating and Selecting a Mushroom Strain | 110 |
| CHAPTER 15. Generating Grain Spawn | 119 |
| Formulas for Creating Grain Spawn | 121 |
| First-Generation Grain Spawn Masters | 123 |
| Second- and Third-Generation Grain Spawn | 126 |
| Autoclavable Spawn Bags | 129 |
| Liquid-inoculation Techniques | 133 |
| Spore-Mass Inoculation | 133 |
| Liquid-inoculation Techniques: Mycelial Fragmentation and Fermentation | 137 |
| Pelletized (Granular) Spawn | 141 |
| Matching the Spawn with the Substrate: Critical Choices on the Mycelial Path | 142 |
| Spawn Storage | 143 |
| Chapter 16. Creating Sawdust Spawn | 145 |

| | |
|--|-----|
| CHAPTER 17. Growing Mushrooms on Enriched Sawdust | 149 |
| The Supplemented Sawdust “Fruiting” Formula: Creating the Production Block | 150 |
| Testing for Moisture Content | 152 |
| Choosing a Sterilizer, aka Retort or Autoclave | 153 |
| Sterilization of Supplemented Substrates | 154 |
| Post-Autoclaving | 157 |
| Unloading the Autoclave | 158 |
| Atmospheric Steam Sterilization of Sawdust Substrates | 158 |
| Inoculation of Supplemented Sawdust: Creating the Production Block | 160 |
| Incubation of the Production Blocks | 164 |
| Achieving Full Colonization on Supplemented Sawdust | 165 |
| Handling the Blocks Post-Full Colonization | 166 |
| CHAPTER 18. Cultivating Gourmet Mushrooms on Agricultural Waste Products | 167 |
| Alternative Fruiting Formulas | 168 |
| Heat-Treating the Bulk Substrate | 169 |
| The Hot Water Bath Method: Submerged Pasteurization | 170 |
| The “Phase II” Chamber: Steam Pasteurization | 171 |
| Alternative Methods for Rendering Straw and Other Bulk Materials for Cultivation | 175 |
| The Hydrated Lime Bath | 175 |
| The Bleach Bath | 175 |
| The Hydrogen Peroxide Technique | 175 |
| The High-Pressure Extrusion Method | 176 |
| The Detergent Bath | 176 |
| Yeast Fermentation | 177 |
| CHAPTER 19. Cropping Containers | 179 |
| Tray Culture | 179 |
| Vertical Wall Culture | 183 |
| Slanted Wall or A-Frame Culture | 183 |
| Bag Culture | 184 |
| Column Culture | 186 |
| Bottle Culture | 191 |
| CHAPTER 20. Casing: A Topsoil Promoting Mushroom Formation | 197 |
| CHAPTER 21. Growth Parameters for Gourmet and Medicinal Mushroom Species | 201 |
| Spawn Run: Colonizing the Substrate | 202 |
| Primordia Formation: The Initiation Strategy | 202 |
| Fruitbody (Mushroom) Development | 205 |

| | |
|---|-----|
| The Gilled Mushrooms | 207 |
| The Himematsutake Mushroom <i>Agaricus blazei</i> | 208 |
| The Portobello Mushroom <i>Agaricus brunnescens</i> | 217 |
| The Black Poplar Mushroom <i>Agrocybe aegerita</i> | 225 |
| The Shaggy Mane <i>Coprinus comatus</i> | 229 |
| The Enoki Mushroom <i>Flammulina velutipes</i> | 233 |
| The Clustered Wood-lovers | 239 |
| The Brown-Gilled Woodlover <i>Hypholoma capnoides</i> | 240 |
| Kuritake (The Chestnut Mushroom) <i>Hypholoma sublateritium</i> | 244 |
| The Beech Mushrooms | 248 |
| Buna-Shimeji <i>Hypsizygus tessulatus</i> | 249 |
| Shirotamogitake <i>Hypsizygus ulmarius</i> | 255 |
| The Shiitake Mushroom <i>Lentinula edodes</i> | 259 |
| The Nameko Mushroom <i>Pholiota nameko</i> | 276 |
| The Oyster Mushrooms | 282 |
| Golden Oyster Mushroom <i>Pleurotus citrinopileatus</i> | 284 |
| The Abalone Mushroom <i>Pleurotus cystidiosus</i> | 290 |
| The Pink Oyster Mushroom <i>Pleurotus djamor</i> | 295 |
| The King Oyster Mushroom <i>Pleurotus eryngii</i> | 301 |
| The Tarragon Oyster Mushroom <i>Pleurotus euosmus</i> | 305 |
| The Tree Oyster Mushroom <i>Pleurotus ostreatus</i> | 308 |
| The Phoenix or Indian Oyster Mushroom <i>Pleurotus pulmonarius</i> , “ <i>P. sajor-caju</i> ” | 316 |
| The King Tuber Oyster Mushroom <i>Pleurotus tuberregium</i> | 321 |
| The Caramel Capped Psilocybes <i>Psilocybe cyanescens</i> complex | 326 |
| The King Stropharia Mushroom <i>Stropharia rugosoannulata</i> | 334 |
| The Paddy Straw Mushroom <i>Volvariella volvacea</i> | 341 |
| The Polypore Mushrooms | 349 |
| Reishi or Ling Chi <i>Ganoderma lucidum</i> | 352 |
| Maitake or Hen-of-the-Woods <i>Grifola frondosa</i> | 367 |
| Zhu Ling or the Umbrella Polypore <i>Polyporus umbellatus</i> | 377 |
| Turkey Tail or Yun Zhi <i>Trametes versicolor</i> | 382 |
| The Lion’s Mane <i>Hericium erinaceus</i> | 387 |
| The Wood Ears <i>Auricularia polytricha</i> | 395 |
| The Jelly Mushrooms | 401 |
| White Jelly Mushroom <i>Tremella fuciformis</i> | 402 |
| The Cauliflower Mushrooms | 409 |
| The Cauliflower Mushroom <i>Sparassis crispa</i> | 410 |
| The Morels (Land-Fish Mushrooms) | 415 |
| The Morel Life Cycle | 417 |
| The Development of Indoor Morel Cultivation | 421 |
| The Black Morels <i>Morchella angusticeps</i> and Allies | 422 |
| CHAPTER 22. Maximizing the Substrate’s Potential through Species Sequencing | 431 |

| | |
|--|-----|
| CHAPTER 23. Harvesting, Storing, and Packaging Mushrooms for Market | 435 |
| Harvesting the Crop | 435 |
| Packaging and Storing the Crop for Market | 437 |
| Drying Mushrooms | 439 |
| Marketing the Product | 440 |
| CHAPTER 24. Mushroom Recipes: Enjoying the Fruits of Your Labors | 443 |
| CHAPTER 25. Cultivation Problems and Their Solutions: A Troubleshooting Guide | 455 |
| Agar Culture | 458 |
| Grain Culture | 459 |
| Straw Culture | 461 |
| Supplemented Sawdust Culture | 462 |
| Pre-harvest Period | 463 |
| Harvest Stage | 463 |
| Post-harvest | 465 |

APPENDICES

| | |
|---|-----|
| APPENDIX 1. Description of Environments for a Mushroom Farm | 467 |
| The Laboratory Complex | 467 |
| The Growing Room Complex | 468 |
| APPENDIX 2. Designing and Building a Spawn Laboratory | 475 |
| Design Criteria for a Spawn Laboratory | 477 |
| Good Clean Room Habits: Helpful Suggestions for Minimizing Contamination in the Laboratory | 479 |
| APPENDIX 3. The Growing Room: An Environment for Mushroom Formation and Growth | 481 |
| Design Criteria for the Growing Rooms | 483 |
| Managing the Growing Rooms: Good Habits for the Personnel | 487 |
| APPENDIX 4. Resource Directory | 489 |
| Recommended Mushroom Field Guides | 489 |
| Mushroom Book Suppliers | 490 |
| Annual Mushroom Festivals and Events | 491 |
| Mushroom Cultivation Seminars and Training Centers | 492 |
| Mushroom Study Tours and Adventures | 493 |
| International Mushroom Associations | 493 |
| North American Mushroom Societies and Associations | 493 |
| Mushroom Growers Associations | 497 |
| Sources for Mushroom Cultures | 498 |
| Sources for Mushroom Spawn | 499 |
| Sources for Marketing Information | 500 |
| Mushroom Newsletters and Journals | 500 |
| Mushroom Museums | 501 |
| Sources for Medicinal Mushroom Products | 501 |
| Mycological Resources on the Internet | 502 |

| | |
|--|-----|
| APPENDIX 5. Analyses of Basic Materials Used in Substrate Preparation | 503 |
|--|-----|

| | |
|---|-----|
| APPENDIX 6. Data Conversion Tables | 519 |
|---|-----|

| | |
|-----------------|-----|
| Glossary | 523 |
|-----------------|-----|

| | |
|---------------------|-----|
| Bibliography | 529 |
|---------------------|-----|

| | |
|---------------------------------------|-----|
| Photo and Illustration Credits | 553 |
|---------------------------------------|-----|

| | |
|--------------|-----|
| Index | 555 |
|--------------|-----|