CONTENTS

List of Figures xv
List of Tables xix
About the Editors xxi
Contributors xxiii
Preface xxvii

Anatomy and Taxonomy 3
Tara Auxt Baugher
Pome Fruit 3
Stone Fruit 5
Other Temperate Tree Fruit 7

Breeding and Molecular Genetics 11
Ralph Scorza
Hybridization 13
Nontraditional Breeding Techniques 14

Carbohydrate Partitioning and Plant Growth 21
Alan N. Lakso
James A. Flore
Seasonal Patterns of Carbohydrate Production 21
Partitioning to Tree Organs 23
Environmental Factors Affecting Partitioning 28

Cultivar Selection 31
Duane W. Greene
Selection Criteria 31
Multidisciplinary and International Evaluation of Cultivars 35
Major Cultivars of the World 35
Diseases

David A. Rosenberger

Background on Tree Fruit Diseases and Their Control 41
Common Pome Fruit Diseases 43
Common Stone Fruit Diseases 51

Dormancy and Acclimation

Curt R. Rom

Forms of Dormancy 57
Specific Cases of Dormancy 59
Physiological Basis for Dormancy 61
Acclimation 62

Dwarfing

Stephen S. Miller

Genetic Dwarfing 66
Horticultural Practices to Induce Dwarfing 66

Flower Bud Formation, Pollination, and Fruit Set

Peter M. Hirst

Flower Formation 75
Pollination 78
Fertilization 79

Fruit Color Development

L. L. Creasy

Color Measurement 83
Pigments 84
Physiology of Color Formation in Tree Fruit 87

Fruit Growth Patterns

Alan N. Lakso
Martin C. Goffinet

What Is a Stone or Pome Fruit? 91
What Is Fruit Growth? 93
Growth by Cell Division and Cell Expansion 94
Growth Patterns of Different Fruit 95
Irrigation  
*D. Michael Glenn*  
Irrigation Scheduling 149  
Irrigation Systems 151

Light Interception and Photosynthesis  
*David C. Ferree*  
Photosynthesis 157  
Factors Affecting Photosynthesis 159  
Light Interception 160  
Responses of Fruit Trees to Light 161  
Orchard Practices to Improve Light 163

Marketing  
*Desmond O’Rourke*  
Key Agents 169  
Key Functions 170

Nematodes  
*John M. Halbrendt*  
Beneficial Free-Living Nematodes 177  
Plant-Parasitic Nematodes and Associated Problems 177  
Major Nematodes That Affect Fruit Trees 179  
Nepovirus Diseases 180  
Diagnosis of Nematode Problems 181  
Nematode Control 182

Nutritional Value of Fruit  
*Andrea T. Borchers*  
*Dianne A. Hyson*  
Health Benefits of Fruit Consumption 185  
Phenolic Compounds in Pome and Stone Fruit 190

Orchard Floor Management  
*Ian A. Merwin*  
Orchard Groundcover Advantages 195  
Orchard Groundcover Disadvantages 198
Orchard Planning and Site Preparation
Tara Auxt Baugher

Site Assessment 203
Orchard Design and Tree Quality 204
Orchard Preparation 205
Tree Planting 205

Packing
A. Nathan Reed

Presizing and Presorting 209
Weight Sizing, Color Sorting, and Packaging 210
Defect Sorting 213
Modified-Atmosphere Packing 213
Bruise Prevention 214
Nondestructive Quality Assessment 215

Physiological Disorders
Christopher B. Watkins

Types of Physiological Disorders 220
Major Physiological Disorders of Temperate Tree Fruit 223

Plant Growth Regulation
Christopher S. Walsh

Regulation of Tree Vigor and Enhancement of Flowering 236
Chemical Thinning 237
Control of Preharvest Drop of Fruit 238
Specialty Applications in Targeted Situations 240

Plant Hormones
Christopher S. Walsh

Auxin 246
Gibberellin 246
Cytokinin 248
Abscisic Acid 248
Ethylene 249
Mode of Action 249
Plant Nutrition 251

Dariusz Swietlik

Soil As a Reservoir of Plant Nutrients 251
Nutrient Absorption and Transport 252
Physiological and Biochemical Functions of Plant Nutrients 255
Modern Trends in Fruit Tree Nutrition 257

Plant-Pest Relationships and the Orchard Ecosystem 259

Tracy C. Leskey

Arthropods 259
Disease-Causing Pathogens 260
Nematodes 261
Vertebrates 262
Weeds 262

Postharvest Fruit Physiology 265

Christopher B. Watkins

Respiration and Ethylene Production 266
Texture 267
Color 269
Flavor 270

Processing 273

Mervyn C. D’Souza

Apple Cultivars and Quality Characteristics 273
Apple Sorting 273
Applesauce Production 274
Apple Slice Production 275
Apple Juice Production 275
Quality Assessments 276
Other Temperate Fruit 277

Propagation 279

Suman Singha

Sexual Propagation 279
Vegetative Propagation 280
Rootstock Selection  287
  Curt R. Rom
  Effects of Rootstocks and Reasons for Selection  287
  Rootstock-Scion Compatibility  288
  Types of Rootstocks  289
  Multicomponent Plants  290

Soil Management and Plant Fertilization  295
  Dariusz Swietlik
  Methods of Estimating Fertilizer Needs  296
  Fertilizer Application Practices  298
  Managing Extreme Soil Environments  300

Spring Frost Control  303
  Katharine B. Perry
  Frost Control Principles  303
  Frost Control Techniques  304

Storing and Handling Fruit  309
  A. Nathan Reed
  Precooling  309
  Cold Storage  311
  Controlled Atmosphere Storage  313
  Relative Humidity  314
  Monitoring Storages  315

Sustainable Orcharding  319
  Tracy C. Leskey
  Integrated Pest Management  319
  Integrated Fruit Production  321
  Organic Production  322

Temperature Relations  327
  Rajeev Arora
  Freezing Tolerance versus Freezing Avoidance  327
  Overwintering  332
  Systems and Strategies to Distinguish Cold Hardiness and Dormancy Transitions  333
Training and Pruning Principles 339
Stephen C. Myers

Apical Dominance and Growth 339
Shoot Orientation Effect on Apical Dominance 340
General Responses to Pruning 341
Types of Pruning Cuts 341
Training and Pruning Objectives 343

Training Systems 347
Tara Auxt Baugher

Central Leader Systems 347
Open Center Systems 350
Vertical and Horizontal Trellis Systems 351

Tree Canopy Temperature Management 355
D. Michael Glenn

Temperature Assessment 356
Cooling Strategies 357

Water Relations 361
D. Michael Glenn

Pathway of Water from the Soil to the Leaf 361
Ascent of Water in Plants 363
Transpiration Stream of Water 363
Components of Plant Water Relations 364

Wildlife 367
Tara Auxt Baugher

Integrated Approach to Wildlife Management 367
General Control Strategies 368

Index 371
Tree fruit production and the associated areas of science and technology have undergone momentous transformations in recent years. Growers are adopting new cultivars, planting systems, integrated management programs, and fruit storage and marketing practices. The changes have resulted in an intensified need to increase basic and applied knowledge of fruit physiology and culture. A commitment to lifelong learning is essential for those who want to succeed in this field.

The *Concise Encyclopedia of Temperate Tree Fruit* is addressed to individuals who aspire to learn more about both the science and art of tree fruit culture. All aspects of pomology are covered, ranging from the critically important but often overlooked topic of site selection and preparation to the role of biotechnology in breeding programs. We recognize that it is difficult in a book of this breadth to adequately discuss minor crops, and thus the emphasis is on the primary tree fruit crops of the temperate zone.

To facilitate use, topics are listed alphabetically and covered in sufficient detail to provide the reader with the most significant and current information available. Related topics and selected references are provided at the end of each section for those who desire to explore a subject in greater depth. As with any concise reference book, the objective has been to make the subject matter comprehensive yet succinct.

We thank the group of outstanding contributors who made this project possible. Each is recognized as an authority in a particular research area and enthusiastically contributed his or her knowledge to making this a fine encyclopedia. We also extend appreciation to Susan Schadt and John Armstrong for their assistance with illustrations, Martin Goffinet for reviewing the text on anatomy and taxonomy, and the many educators and industry professionals who provided figures or information for tables. Finally, we acknowledge our grandfathers...
for nurturing our interests in horticulture. They were dedicated orchardists who served as teachers and mentors during our formative years. It was this common background that fostered the beginning of a valued professional relationship between the two of us.

One of the greatest rewards of a vocation in pomology is working with individuals who are genuinely committed to finding novel ways to modernize agriculture, improve human nutrition, and safeguard farmlands. We offer this book as a tribute to the students, growers, and scientists whose collaborative efforts lead to advancements in feeding and sustaining our world.
1. ANATOMY AND TAXONOMY
Anatomy and Taxonomy

Tara Auxt Baugher

Nomenclature, classification, and description are the basic components of systematic pomology. The identification or study of a fruit species involves detailed examination of distinguishing anatomical characteristics, such as leaf shape, inflorescence type, and fruit type (Figure A1.1). International codes of nomenclature govern family, genus, and species taxa.

**POME FRUIT**

Apple (*Malus* Mill.)

Family Rosaceae, Subfamily Pomoideae; approximately 30 species; domestic apples derived mainly from *M. pumila* Mill.; domestic crab apples, hybrids of *M. pumila* and *M. baccata* (L.) Borkh. or other primitive species; hybrids numerous and complex. Deciduous, infrequently evergreen, branching tree or shrub; leaves folded or twisted in buds, ovate or elliptic or lanceolate or oblong, lobed or serrate or serrulate; buds ovoid, a few overlapping scales. Flowers white to pink or crimson, epigynous, in cymes; stamens 15 to 50; styles 2 to 5; ovary 3 to 5 cells. Fruit a pome, oblong or oblate or conic or oblique, diameter 2 to 13 centimeters, various hues of green to yellow to red, varying russet and lenticel characteristics; flesh lacking stone cells.
FIGURE A1.1. Illustrations of terminology used to describe temperate tree fruit
(Source: Modified from Harris and Harris, 1997, Plant Identification Terminology; and Bailey et al., 1976.)
Pear (*Pyrus* L.)

Family Rosaceae, Subfamily Pomoideae; approximately 20 species; European (*P. communis* L.) possibly derived from *P. caucasica* Fed. and *P. nivalis* Jacq.; Asian mostly from *P. pyrifolia* (Burm. f.) Nakai and *P. ussuriensis* Maxim. selections; hybrids numerous and complex.

Deciduous or semievergreen tree; leaves rolled in buds, ovate or oblong or elliptic or lanceolate or obovate, crenate or serrate or entire, infrequently lobed; buds ovoid, overlapping scales.

Flowers, white, sometimes with pink tinge, epigynous, in corymbs, open with or before leaves; stamens 20 to 30; styles 2 to 5; ovules 2 per cell.

Fruit a pome, pyriform or globose or ovoid, diameter 2 to 12 centimeters, various hues of green/yellow or red/brown, varying russet and lenticel characteristics; flesh usually containing grit or stone cells.

Quince, Common (*Cydonia oblonga* Mill.)

Family Rosaceae, Subfamily Pomoideae.

Deciduous small tree or shrub; leaves ovate or oblong, entire, tomentose on underside; buds pubescent, small.

Flowers pink or white, epigynous, solitary, terminal on leafy shoots; stamens 20 or more; styles 5; ovary 5 cells.

Fruit a pome, pyriform or globose, hard, diameter 4 to 8 centimeters.

**STONE FRUIT**

Peach/Nectarine (*Prunus persica* (L.) Batsch.)

Family Rosaceae, Subfamily Prunoideae, Subgenus *Amygdalus* (L.) Focke.

Deciduous, small tree; branches glabrous; leaves alternate, folded in buds, long-lanceolate, serrulate; buds 3 per axil, the 2 laterals being flower buds.

Flowers pink to red, perigynous, sessile or on short stalk, open before leaves.
Fruit a drupe, peach tomentose, nectarine glabrous, globose or oval or oblate, sometimes compressed, diameter 4 to 10 centimeters, yellow to red; stone sculptured or pitted.

**Almond (Prunus amygdalus Batsch.)**

Family Rosaceae, Subfamily Prunoideae, Subgenus *Amygdalus* (L.) Focke.
Deciduous, spreading tree; branches glabrous; leaves alternate, folded in buds, lanceolate, serrulate; buds 3 per axil, the 2 laterals being flower buds.
Flowers white to pink, perigynous, sessile or on short stalk, open before leaves.
Fruit a drupe, tomentose, oblong, compressed, length 2 to 6 centimeters, green, dry; stone pitted; kernel sweet.

**Apricot (Prunus armeniaca L.)**

Family Rosaceae, Subfamily Prunoideae, Subgenus *Prunophora* Focke.
Deciduous, small tree; bark reddish; branches glabrous; leaves alternate, usually ovate, serrate, pubescent veins on underside.
Flowers white or pink, perigynous, solitary, open before leaves.
Fruit a drupe, pubescent when immature, almost smooth when mature, oblong or globose, sometimes compressed, diameter 2 to 6 centimeters, yellow, sometimes red cheek; stone smooth, flattened, ridged suture.

**Plum, Common or European (Prunus domestica; also P. cerasifera, P. spinosa, and P. insititia); Japanese or Oriental (P. salicina); Native American (many species, including P. americana or wild plum)**

Family Rosaceae, Subfamily Prunoideae, Subgenus *Prunophora* Focke.; numerous species and hybrids.
Deciduous, small tree; leaves alternate, usually ovate/obovate or oblong/elliptic, often serrate or crenate.
Flowers usually white, perigynous, solitary or clustered, open before or sometimes with leaves.
Fruit a drupe, glabrous, usually with bloom on skin, length 2 to 8 centimeters, globose or oblong or cordate or elliptical, sometimes
compressed, variable colors, including blue/purple or red/pink or yellow/green; stone smooth, flattened.

**Cherry, Sour** (*Prunus cerasus* L.); **Sweet** (*P. avium* L.); **Duke** (hybrid, *P. avium x P. cerasus*); **Native American** (*P. besseyi* L. H. Bailey or sand cherry, and others)

Family Rosaceae, Subfamily Prunoideae, Subgenus *Cerasus* Pers.; various species and hybrids. Deciduous, small to large tree; leaves alternate, folded in buds, ovate or obovate or obovate/elliptic, serrate or crenate/serrate. Flowers white to pink, perigynous, solitary or in inflorescences ranging from few-flowered umbels to racemes. Fruit a drupe, globose or oblate or cordate, diameter 1 to 3 centimeters, dark or light red or yellow; stone sculptured or smooth.

---

**OTHER TEMPERATE TREE FRUIT**

**Fig, Common** (*Ficus carica* L.)

Family Moraceae. Deciduous, small, irregular tree; leaves thick, deeply lobed (3 to 5), pubescent on underside, scabrous on top. Flowers small, solitary and axillary. Fruit a syconium, pyriform, diameter 2 to 6 centimeters, greenish purple/brown, many-seeded.

**Mulberry** (*Morus* L.)

Family Moraceae; approximately 12 species. Deciduous, open tree; leaves alternate, frequently lobed, crenate or serrate or dentate, scabrous or glabrous; buds of 3 to 6 overlapping scales. Flowers unisexual, male and female in separate inflorescences, usually on separate trees (dioecious), sometimes on the same tree (monoecious), appear with leaves. Fruit a syncarp, ovoid or cylindric, length 1 to 4 centimeters, red/purple or pink/white, resembles a blackberry.
Papaw, Northern (also Pawpaw; *Asimina triloba* (L.) Dunal.)

Family Annonaceae.
Deciduous, small tree; leaves alternate, oblong and obovate, drooping.
Flowers purple, on hairy stalks, axillary, open before leaves.
Fruit a berry, usually oblong or elliptical, length 7 to 12 centimeters, usually green/yellow to brown/brownish when ripe; seeds compressed.

**Persimmon (** *Diospyros* L.**)

Family Ebenaceae.
Deciduous or evergreen, dioecious tree or shrub; leaves alternate, variable shapes; buds ovoid, a few outer scales.
Flowers usually white or yellow, unisexual, female solitary, male in cymes.
Fruit a berry, usually globose or oblate, diameter 2 to 10 centimeters, usually orange/yellow, turning brown/black, large persistent calyx; seeds large, compressed, 1 to 10.

Jujube, loquat, medlar, pomegranate, and serviceberry also are grown in temperate zones. These shrubs or small trees are described in an encyclopedia on small fruit, to be edited by Robert Gough and published by The Haworth Press, Inc.

Knowledge of taxonomy and anatomy is important in studies on fruit physiology and culture. Moreover, classification and description systems have practical applications, such as ensuring graft compatibility and increasing fruit set.

**Related Topics:** CULTIVAR SELECTION; FRUIT GROWTH PATTERNS; ROOTSTOCK SELECTION

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