
Introduction

This book continues as volume 4 of a multi-compendium on *Edible Medicinal and Non-Medicinal Plants*. It covers edible fruits/seeds used fresh, cooked or processed into other by-products, or as vegetables, cereals, spices, stimulant, edible oils and beverages. It covers selected species from the following families: Fagaceae, Grossulariaceae, Hypoxidaceae, Myrsinaceae, Olacaceae, Oleaceae, Orchidaceae, Oxalidaceae, Pandanaceae, Passifloraceae, Pedaliaceae, Phyllanthaceae, Pinaceae, Piperaceae, Rosaceae and Rutaceae. However, not all the edible species in these families are included. The edible species dealt with in this work include to a larger extent lesser-known, wild and underutilized crops and also common and widely grown crops.

As in the preceding three volumes, topics covered include: taxonomy (botanical name and synonyms); common English and vernacular names; origin and distribution; agro-ecological requirements; edible plant part and uses; plant botany; nutritive and medicinal/ pharmacological properties with up-to-date research findings, traditional medicinal uses; other non-edible uses; and selected/cited references for further reading.

Fagaceae or more commonly known as the beech family comprises about 900 species of evergreen and deciduous trees and shrubs. It includes economically important species like the oak (*Quercus*), beech (*Fagus*) and the chestnut (*Castanea*) – all provide invaluable timber. The cork oak (*Quercus suber*) provides cork for bottles and other uses while *Castanea* also provides the delectable tasty and nutritive chestnut. Wood

chips from the genus, *Fagus* are often used in flavoring beers. *Castanea sativa* and another lesser known species *Quercus infectoria* are covered in this volume. The latter has edible seeds that is used in food and nut galls used in herbal drinks and tea. Both species also possess medicinal properties.

Several edible species of *Ribes* of the family Grossulariaceae, namely gooseberry, black currant and red currant are covered in this volume. *Ribes* is a genus of about 150 species found in the temperate areas in the northern hemisphere. Besides being rich in nutrients, currants and gooseberries contain many phenolic compounds that include phenolic acids, flavonoids, anthocyanins and carotenoids with good antioxidant activity.

Hypoxidaceae is a family of flowering plants belonging to the Monocots, under the order Asparagales. Members are small to medium herbs, with grass-like leaves and an invisible stem, modified into a corm or a rhizome. Many are ornamental genera such as *Curculigo*, *Hypoxis*, and *Rhodohypoxis*. *Molineria latifolia* (*Curculigo latifolia*) produces an edible fruit which contains a high intensity sweetening protein called neoculin which is 430–2,070 times sweeter than sucrose on a weight basis (Yamashita et al. 1995; Kurihara 1992).

Myrsinaceae or Myrsine family comprises about 35 genera and about 1,000 species of trees, shrubs and lianas. The members occur in both temperate and tropical climates. Some economically important genera include *Ardisia* (medicine,

oil, edible, wild vegetables), *Maesa* (edible, tea, dye), *Aegiceris* (tannin, fine fuel), *Embelia* (vermifuge, edible) and *Myrsine* (medicine, fine wood, tannin, fuel). Two *Ardisia* species, *Ardisia crenata* and *A. elliptica* are covered in this volume. Both species produce edible fruit and leaves. Both plants contain bioactive phytochemicals which impart numerous pharmacological properties that include antimicrobial, anticancer, antiplatelet and antimalarial properties.

Members of the family Olacaceae comprising 180–250 species from 23 to 27 genera, are found in tropical and warm-temperate regions worldwide. They comprised scandent shrubs, trees, or lianas, sometimes hemiparasitic. Edible fruit species of this family include *Ximenia* (false sandalwood, hog-plum) and *Scorodocarpus borneensis* (wood garlic, forest onion). The latter treated herein has fruit (nut), bark and leaves which are edible and medicinal. Many parts of wood garlic have medicinal properties, the nuts contain alkaloids and sesquiterpenes (Wiar et al. 2001), the leaves have megastigmanes and flavonoids (Abe and Yamauchi 1993).

The Oleaceae or olive family, comprises 30 genera and about 600 species of mesophytic shrubs, trees and occasionally vines. Many species have economic significance such as the olive (*Olea europaea*) valued for its fruit and oil extracted from it, the ashes (*Fraxinus*) important for their timber, and the ornamental plants forsythia, lilacs, jasmines, osmanthus, privets and fringetrees. Olive leaves, fruit, pomace and oil have a host of pharmacological properties that include anticancer, antiathrogenic, cardioprotective, antiinflammatory, antihyperglycemic, antihyperlipidemic, antihypertensive, antiplatelet, antinociceptive antimicrobial and wound healing activities. Olive wood is hard and durable and olive branch is an ancient symbol for peace.

Orchidaceae, the orchid family, is a morphologically diverse and widespread family of monocots in the order Asparagales. This family is regarded to be the largest family of flowering plants having between 22,000 and 26,000 currently accepted species, found in 880 genera. The family includes *Orchis* (type genus) and many commonly cultivated orchids, such as

Phalaenopsis, *Dendrobium*, *Epidendrum* and *Cattleya* and *Vanilla* (*Vanilla planifolia* which is covered in this volume). The dried seed pods of *Vanilla* are commercially important as flavouring in confectionery, dairy products, for perfume manufacture and aromatherapy.

The Oxalidaceae, or wood sorrel family, is a small family of eight genera of herbaceous plants, shrubs and small trees, with vast majority of the 900 species in the genus *Oxalis* (wood sorrels). The family is represented in this volume by an under-utilised, lesser known tropical fruit *Sarcotheca diversifolia*. The genus *Averrhoa* of which starfruit is a member, is often included in this family, but some botanists placed it in a separate family Averrhoaceae. Several currently recognised *Averrhoa* species with edible fruits have been dealt with in Volume 1 of the multi-compendium under Averrhoaceae.

Pandanaceae is a large family of flowering plants found in the tropical and subtropical regions of the Old World from West Africa through to the Pacific. Pandanaceae is a highly variable genus complex of trees, climbing or scrambling shrubs that are adapts well from sea level in salted beaches to montane cloud-forest, and riverine forest habitat. One distinctive feature is that the stems have aerial prop roots to provide support and display sympodial branching. Seven species producing edible drupes are covered in this volume.

Passifloraceae, the passion fruit family, comprises about 530 species of flowering plant in about 18 genera of trees, shrubs, lianas and climbing plants, mostly found in tropical America and Asia. Seven species with edible fruits and medicinal properties are covered in this volume.

Pedaliaceae, the sesame family, is a small family of 13 genera and 70 species. Its native distribution is exclusively the Old World, in tropical and dry habitats, and its best-known member is *Sesamum indicum* (sesame). Sesame seeds are rich in lignans like sesamin, sesamol and other bioactive phytochemicals responsible for its culinary and pharmacological attributes.

Phyllanthaceae comprises about 2,000 species grouped into 54–60 genera of mostly trees, shrubs and herbs. A few are climbers or succulents and

one *Phyllanthus fluitans*, an aquatic plant. Several genera produce edible fruits such as *Phyllanthus*, *Upaca*, *Antidesma* and *Baccaurea*. Some species of the latter two genera are covered in this volume. *Baccaurea* was previously classified under the family Euphorbiaceae. Unlike many of the Euphorbiaceae, no member of Phyllanthaceae has latex and only a very few produce a resinous exudate.

Pinaceae or pine family comprises shrubs or trees and include many of the familiar conifers of commercial importance such as cedars, firs, hemlocks, larches, pines and spruces. The family is the largest extant conifer family with between 220 and 250 species in 11 genera found mostly in temperate regions but also in sub-arctic to tropical areas. Two *Pinus* species providing edible pine nuts are discussed in this volume.

Piperaceae, better known as the pepper family, is a large family of flowering herbs, shrubs and small trees. It has been reported to have 3,610 currently accepted species in five genera distributed pantropically. The vast majority of peppers can be found within the two main genera: *Piper* (2,000 species) and *Peperomia* (1,600 species). Three *Piper* species are covered including *Piper nigrum* which provide the important spice, peppercorns. *Piper nigrum* (black pepper) is used not only in human dietaries but also for a variety of other purposes such as medicinal, as a preservative, and in perfumery.

Rosaceae or the rose family is a medium-sized family of about 2,830 species in 95 genera of flowering herbs, shrubs, climbers and trees. Among the largest genera are *Prunus* (430) *Alchemilla* (270), *Sorbus* (260), *Crataegus* (260), *Cotoneaster* (260), and *Rubus*. *Rubus* consists of about 750 species (Daubeny 1996) which have been separated into blackberry (subgenus *Rubus* including *R. armeniacus*, *R. laciniatus* and *Rubus* hybrids) and raspberry (subgenus *idaeobatus* including, *Rubus idaeus* and *Rubus occidentalis*) types according to the abscission of the fruit; in raspberry this comes off a woody or fleshy receptacle which remains on the plant, and in blackberry the fruit separates from the plant with the soft, edible receptacle included (Clark et al. 2007). Also included in the genus are the

hybridberries (including boysenberries, loganberries and other hybrid types). Most raspberry species are diploid ($2x=14$) as are a few blackberries, but the bulk of blackberry species and all hybridberries are polyploids, ranging from $3x=21$ to $18x=126$.

Rosaceae provides many economically important products which include edible fruits *Malus* spp. (apples), *Prunus* spp. (apricot, cherry, nectarine, peach, plums, prune, damson, sloe), *Cydonia* (quince), *Pyrus* (pears), *Eriobotrya* (loquat), *Rubus* (blackberry, boysenberry, loganberry, black and red raspberry), *Fragaria* (strawberry), *Mespilus* (medlar), *Amelanchier* spp. (serviceberry, Juneberry); *Prunus dulcis* (almond nuts); many ornamental trees and shrubs or hedge-plants, e.g. *Spiraea*, *Photinia*, *Cotoneaster*, *Kerria*, *Filipendula* (meadowsweets) *Pyracantha* (firethorns), *Crataegus* (hawthorns), *Rhodotypos*, *Rosa* (roses), *Sorbus* (mountain ash, rowan) and *Potentilla* (cinquefoils). Roses can be herbs, climbers, shrubs or small trees. Many of the edible fruit species in the genera *Malus*, *Pyrus*, *Prunus*, *Rubus*, *Cydonia*, *Mespilus*, *Eriobotrya*, *Fragaria*, *Chaenomeles* and *Sorbus* also have important nutrients and bioactive secondary phytochemicals with a diverse range of pharmacological activities.

Rutaceae, the rue or citrus family is a large, morphologically diverse, cosmopolitan family of flowering plants of 160 genera and 1,900 species with great economic importance in warm temperate and sub-tropical climate areas. The most economically important genus is *Citrus*. Several taxonomical studies employing molecular DNA techniques have supported a wider polyphyletic classification of Citreae and *Citrus*. Studies by Araújo et al. (2003) and Bayer et al. (2009) supported the broader definition of *Citrus* to include *Clymenia*, *Eremocitrus*, *Fortunella*, *Microcitrus*, *Oxanthera* and *Poncirus*. Bayer et al. (2009) also supported the monophyly of the subfamily Aurantioideae and the transfer of *Murraya* sensu stricto and *Merrillia* from Clauseneae to Citreae. Likewise, data from Guerra et al. (2000) supported segregation of *Berbera* from *Murraya*, and movement of *Murraya* sensu stricto and *Merrillia* from

Clauseneae to Citreae. The results of studies by Groppo et al. (2008) supported monophyly of Spathelioideae and Aurantioideae, but not of other subfamilies and tribes. Thus, the genus *Citrus* boast of many economic important edible fruits such as oranges, mandarins, citrons, grapefruits, pumello, lemons, limes, kumquats and a diverse host of *Citrus* hybrids. More taxonomical work is required to classify the many hybrids. Other edible non-Citrus fruits include white sapote (*Casimiroa edulis*), orangeberry (*Glycosmis pentaphylla*), clymenia (*Clymenia polyandra*), limeberry (*Triphasia trifolia*), elephant apple (*Limonia acidissima*), wampee (*Clausena lansium*) and the bael (*Aegle marmelos*). *Bergera kongii* although has edible fruit is cultivated mainly for its aromatic spicy leaves (curry leaf) and is treated in a later volume. Other important genera include *Ruta* (treated in later volume), *Zanthoxylum* and *Boronia*, a large Australian genus, some members of which are plants with highly fragrant flowers and are used in commercial ornamental, cutflower and oil production. *Zanthoxylum* is represented in this volume by *Z. simulans*, an important source of Szechuan pepper. Rutaceous species in general possess extraordinary array of secondary chemical metabolites, many have medicinal, antimicrobial, insecticidal, or herbicidal properties. *Citrus* species in particular are important sources of bioactive polyphenolic flavonoid compounds such as the flavones, flavonols and flavonones with many important pharmacological properties (antioxidant, anticancer, antiviral, antidiabetic, antilipidemic, antihypercholesterolemic, antiinflammatory, etc.).

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