

A Dictionary of **Bible Plants**



LYTTON JOHN MUSSELMAN

A close-up photograph of a pink flower with five petals, some showing a gradient from white to pink. The flower is in sharp focus, while the background is dark and blurred. A large green leaf is visible on the left side of the flower.

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A DICTIONARY OF BIBLE PLANTS

This book describes and illustrates each plant mentioned in the Old and New Testaments and the Apocrypha. It draws on Lytton John Musselman's extensive field investigations from Beirut to Borneo and from the Atlas to the Zagros mountains and includes his own photographs of each plant. The text also reviews recent analytical studies of plants used in materials and technology as well as beer production, medicine, tensile materials, soaps, and other articles. On the basis of these materials, Musselman provides several new plant identifications from controversial biblical passages. In addition, the book surveys the history of biblical plant literature from the time of the Greeks and Romans to the present and reviews and correlates it with biblical plant hermeneutics. To aid readers, extensive references for further study are provided, along with an index to all verses containing references to plants that enables the reader to quickly locate a plant of interest in its textual setting.

Lytton John Musselman is Mary Payne Hogan Professor of Botany in the Department of Biological Sciences at Old Dominion University and a longtime student of plants of the Bible and Quran. Among his books on this topic are *Jordan in Bloom: Wildflowers of the Holy Land* and *Figs, Dates, Laurel, and Myrrh: Plants of the Bible and the Quran*. He is also founder and manager of the Blackwater Ecologic Preserve in southeastern Virginia and is presently part of a team working on a flora of Iraq.

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BIBLE PLANTS

LYTTON JOHN MUSSELMAN

Old Dominion University



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*For my parents, who taught me to
appreciate the Book of Revelation
and the Book of Creation*

Solo Deo Gloria

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My prayer is that this book will be a blessing to its users, drawing attention to the beauty of the written word and the glories of God's wondrous handiwork as revealed in plants.

PREFACE

In this book, I review biblical plant literature from the past half millennium. It could be asked if another treatment is needed. Has any new information been obtained? If so, what are the sources of these data? Put another way, what makes this dictionary different from its many worthy predecessors?

First, it is the only dictionary in which each biblical plant is studied *in situ*. This means not only that each plant was seen and photographed in the field but also that indigenous knowledge about the plant and its uses was gathered. In other words, each entry has a strong ethnological basis, essential to a proper understanding of the plant in its scriptural context, as noted by several earlier writers. Collecting this knowledge involved years of fieldwork from Beirut to Borneo and from the Atlas to the Zagros mountains.

Second, research into the utilization of a crop in ancient eras often revealed the basis of misunderstandings of the texts. One of the best examples of this is the almost exclusive use of emmer wheat in Egypt during biblical times, a crop that required additional specialized preparation not necessary for modern wheats.

Finally, extraordinary advances in analytical processes in archeology, including the development of the science of archeobotany, have elucidated the plants that produced ancient products, for example, the plants used in Egyptian embalming, and have shown the extraordinary ability to determine the composition of materials found in vessels. All this new information is now handily available through immense databases.

The plan of the book is simple: plants are arranged alphabetically by their most frequently used English names, and their scientific names are also provided. For each entry, I do not exhaustively review how the plant has been treated by earlier writers; however, I place emphasis on plants that I consider to be mistreated and note those features necessary to understand the context in which the plant is used in the text. Verses in which the plant is mentioned are listed.

INTRODUCTION

REVIEW OF BIBLE PLANT LITERATURE

Publications on Bible plants are a small part of the vast corpus of biblical literature. Botanically, they are an inchoate group of plants from diverse plant families with varying agronomic features and differing ecologies, considered as a group only by their inclusion in the scriptures. The reason for relatively few publications is simply that Bible plants have little impact on either Christian doctrine or praxis.

However, knowing these plants helps us understand the content and imagery of the scriptures. To quote from the first American writing on the subject, “in every part of the sacred writings images are introduced from the works of nature, and metaphors drawn from the manners and economy of animals, the growth of trees, and the properties of plants; and unless we know precisely the animal, tree, or plant referred to, we cannot discern the propriety of the allusion, nor be suitably impressed with the full force of the doctrine, precept, or narrative, which it was intended to illustrate. But these things, judiciously explained, serve to clear up many obscure passages, solve many difficulties, correct many wrong interpretations, and open new beauties in the sacred volume” (Harris, 1824, ii). For example, the “judicious explanation” of the deep red color of pomegranates helps when likening that fruit to the cheeks of the beloved in Song of Songs 4:3, and realizing that cedar of Lebanon is the largest tree known to many of the ancients makes its image as a powerful ruler understandable (e.g., Ezekiel 31:3). Crop plants, on the other hand, being more quotidian, often require less judicious explanation.

There are libraries of information on crops vital to civilization such as wheat, barley, olive, legumes, and flax. These were – and are – essential for food, forage, and fiber. On the other hand, some of the lesser known plants, such as galbanum, aloeswood (usually translated as “aloes” in most English versions), and gum, have received relatively little attention, from either biblical scholars or botanists. Even the well-known mustard is remarkably understudied, at least from an ethnobotanical standpoint.

Reviews of biblical plant literature are few. In his classic bibliography of botany, Jackson (1881) included a brief section on Bible plants. Prior to that,

Royle (1846) provided a brief but cogent review of early work. The most recent and exhaustive review of work during the past four centuries is *Plants of the Bible*, published 60 years ago and containing references to approximately 550 books and journal articles almost exclusively from Western literature (Moldenke and Moldenke, 1952). The first American book had about 150 references (Harris, 1824), and the present work has 149. In the present review, major works with continuing influence are emphasized, as are factors that have shaped thinking on the topic.

Who studies Bible plants? The short answer is divines and botanists. But the panoply of writers includes artists, herbalists, agriculturalists, encyclopedists, and people with an interest in natural history and, recently, in natural foods. Among them are famous botanists (Linnaeus, Balfour), a cleric appointed as librarian to George Washington (Harris), a leader in the British Chartist movement, a precursor to modern labor unions (Carpenter), a woman who was the first person to personally record an earthquake in Chile (Callicott), and writers with a commercial bent. At least four authors (Balfour, Callicott, Cook, and Hasselqvist) produced their volumes posthumously or during the last days of their lives or else died while in pursuit of plants. However, most contributions, certainly the most meaningful, have been by plant scientists and theologians.

This specialized area of study fits comfortably into neither a botanical nor a theological framework. Most Bible scholars and theologians have, at best, limited experience and knowledge of botany and, conversely, even fewer botanists have theological training. Quoting again from the father of American Bible botany who, in turn, is paraphrasing the famous explorer James Bruce (1730–1794), putative discoverer of the source of the Blue Nile, “many learned men have employed themselves with success upon these topics, yet much remains still to do; for it has generally happened that those perfectly acquainted with the language in which the Scriptures were written have never travelled, nor seen the animals of Judea, Palestine, or Arabia; and again, such as have travelled in these countries and seen the animals in question, have been either not at all, or but superficially acquainted with the original languages of Scripture” (Harris, 1824, vii). Bruce was speaking of animals, but the same is true of plants.

Any controversy concerning Bible plants results less from philology or literary structure, contra Trever (1959), who states, erroneously, that most books on Bible plants were written by botanists – if such were true, there might be less controversy – rather the misinterpretations are usually based on ignorance of the features of the plants and how local people used them. This is due to several factors, geographical and historical. First, many plants in Holy Writ do not grow in northern Europe, the site of most research on the topic, at least since the Reformation. And several of the best-known plants and plant products in the Bible grow neither in Europe nor in the Levant but

in regions farther afield. Good examples of well-known plants never grown in the Middle East are frankincense and aloes (aloeswood), plants that most Bible readers would recognize.

A HISTORY OF BIBLE PLANT RESEARCH

The following brief overview is chronological, beginning with the ancient Greeks and Romans and progressing through the late Renaissance, Linnaeus and his students, and the development and broadcasting of biblical encyclopedias and dictionaries, culminating in the Moldenkes and their successors. My goal is to show the evolution of our present conceptions – both understandings and misunderstandings – of Bible plants and how changes in the epistemology of science affected interpretation.

Ancient Greeks and Romans

An invaluable source of information on Bible plants – indeed, on any plant used in ancient times – is Greek and Roman writers. The earliest is Theophrastus (ca. 371–ca. 287 B.C.), who was a student of Plato and Aristotle and was best known for his *Enquiry into Plants*, an encyclopedic review of botanical information. Pliny the Elder (A.D. 23–79) was a Roman citizen who wrote *Naturalis Historia* (*Natural History*), producing an exemplar for many successive works. He founded the science of natural history, which reached its zenith in the late 1800s. Also writing in Latin, Dioscorides (A.D. 40–90) penned the classic *Materia Medica* on plants used in medicine. So influential was this work that well into the twentieth century, a course on materia medica was required of medical students. His book is one of few volumes remaining in circulation for almost 2,000 years.

The contributions by ancient authors can shed much light on Bible plants, especially on plants no longer grown or that are utilized in different ways. Accordingly, any of the major works discussed subsequently draws on Theophrastus, Pliny, and Dioscorides. Much of the information from the ancients was preserved and transmitted by Arab authors, who also transmitted additional notable original contributions not discussed here.

The Late Renaissance

The earliest botanist to study Bible plants in situ was Leonhard Rauwolf (Rauwolff) (died 1596), who visited Jerusalem and Baghdad, among other places – the first European plant scientist to do so (Dannenfeldt, 1968). Rauwolf's herbarium is still extant, and the plants he collected provide insight into both local plants and those traded from farther east, including the way these plants were used. He was trained in traditional Aristotelian pedagogy at the University of Montpellier, where the curriculum in medical education was

based on Aristotle, Galen, Avicenna, Dioscorides, and other classical writers (Dannenfeldt, 1968). Thus Rauwolf represents a vestige of the classical or Aristotelian school.

Up to the time of the Reformation, virtually all botanical knowledge in Western Europe was based on Aristotelian thinking. This changed in the late Renaissance, when science became more objective.

To combat the pervasive influence of Aristotle and its perceived threat to the integrity of the scriptures, there was a movement in the late 1500s to bring philosophy and physics (physics as understood in the original sense, as incorporating the natural world, not just the study of energy) into line with the teaching of the Bible, an approach called *Christian* or *pious philosophy* and also known as *mosaic physics*. The impact of this epistemological shift is important because it resulted in an attempt to conform the natural world – in our case, plants – to theological rather than scientific thinking. Put another way, this development confused the study of the Bible with the study of science. This broad topic is reviewed by Blair (2000), but for our purposes, what is important is how this was applied to natural history, that is, the study of nature as found in the sacred pages during the late Renaissance. Blair reviews the work of Johann Amos Comenius (1592–1670), who provided a list of writers considered to be good examples of Christian philosophers, including the Dutch botanist Levinus Lemnius.

Lemnius (the Latinized form of Lievens Lemmens) (1505–1568) wrote the first comprehensive treatment of all plants in the scriptures. Trained as a theologian, he later became a physician, a contemporary prerequisite to a botanical career. Lemnius wrote several books on a diversity of theological and medical topics and, in 1568, published a treatment of Bible plants in Latin that was widely circulated in several editions and languages (Blair, 2000). It appeared in an English translation by Thomas Newton in 1587 as *An herbal for the Bible: Containing a plaine and familiar exposition of such similitudes, parables, and metaphors, both in the olde Testament and the newe, as are borrowed and taken from herbs, plants, trees, fruits and simples, by obseruation of their vertues, qualities, natures, properties, operations, and effects: and by the holie prophets, sacred writers, Christ himselfe, and his blessed Apostles vsually alledged, and into their heauenly oracles, for the better beautifieng and plainer opening of the same, profitably inserted*. I cite the entire quaint title to show that the purpose of the book was not just an explication of Bible plants; it also included *simples*, an archaic term for medicinal plants, “their vertues, qualities, natures, properties, operations and effects” referring to medical usage. In other words, Lemnius had produced a sequel to Theophrastus and, in the tradition of pious natural philosophy – noted earlier – linked it with the scriptures. His was an herbal rather than an exegetical work, but it was an herbal with spiritual significance.

Lemnius’s work preceded that of the best-known English herbalist, John Gerard (1545–1611/12) whose classic *Great Herball, or General Histoire of*

Plantas appeared in 1597 (Woodward, 1994). Gerard included numerous Bible plants in his book, a work remaining a favorite for herbal remedy even after four centuries. He does not mention the work of Lemnius, though Gerard is recognized for not acknowledging his sources (Woodward, 1994). Lemnius's book was the standard reference for Bible plants and their simples for almost two centuries.

Shortly after Lemnius, *Silva allegoriarum totius sacrae scripturae* was published (Lloret, 1622).

Trees have received special attention, perhaps because of their prominent imagery in the Bible – the tree of the knowledge of good and evil, the tree of Calvary, and the tree of life in the last book of the Bible.

As Arber (1912) notes, the production of herbals immediately followed the advent of moveable-type printing. The earliest herbals were a continuation of Aristotelian science, produced simply by printing existing manuscripts. This changed dramatically with the advent of Linnaeus.

Linnaeus and the Expansion of Botanical Knowledge

Both Lemnius and Gerard published before the establishment of the science of botany as it is presently understood. In 1753, the great Swedish botanist Carolus Linnaeus, also known as Karl von Linné (1707–1778), published *Species Plantarum*, a work universally accepted as the starting point for plant nomenclature. Linnaeus studied at the University of Uppsala, where he was tutored by Olaf Celsius (1670–1756), a professor of theology. Celsius's (Latinized as "Celsii") opus magnum was *Hierobotanicon, sive de plantis Sacrae Scripturae, dissertationes breves*, an extensive review of plants of the Bible published in 1748 (Celsius, 1748). Replete with Hebrew, Greek, Arabic, Syriac, and abundant references to earlier work, especially that of the classic Roman and Greek observers of nature like Dioscorides, Theophrastus, and Pliny, this remained the standard reference on Bible plants for a century. Having trained with Celsius, it is easy to understand the source of Linnaeus's interest in biblical botany.

This interest continued after Celsius's death. Linnaeus was asked to review the botanical entries for a new translation of the Swedish Bible (Fries, 1907). Like his mentor, Linnaeus was effective at instilling enthusiasm for Bible plants in his pupils.

One such student was Frederik Hasselqvist (Hasselquist) (1722–1752). Under Linnaeus's tutelage, Hasselqvist's doctoral research was a study of plants of the Holy Land and surrounding regions. He also studied birds, insects, fish, and other organisms, many of which he scientifically described for the first time. Tragically, Hasselqvist died in Smyrna (modern Izmir, Turkey), and Linnaeus published the results of his travels posthumously as *Iter Palestinum*, which appeared in various translations and editions

(Hasselqvist, 1756). Linnaeus explains in the introduction to *Iter Palestinum* that he inspired his ill-fated student to the study of Bible plants. He later apparently regretted the untimely death of this young scientist (Blunt, 2001).

Hasselqvist, like Rauwolf, was one of the few early plant scientists actually to visit biblical lands. As a result, his observations are of historical value as many of the major crops have changed since his day. For example, he noted the cultivation of flax, which is presently virtually unknown in the Levant. He also describes forests that have since been cut. Hasselqvist's travelogues were widely read and inspired further work.

The Eighteenth Century, Exploration, and Biblical Dictionaries

Exploration of biblical lands increased during this time. The Levantine coast was well known to Europeans, especially to merchants, who regularly traded in the port of Tripoli (in present-day Lebanon) and the markets of Damascus and Aleppo. But few traveled far inland, and even fewer reported on the natural history of the region.

In addition to Rauwolf, having the greatest botanical impact were the travel reports of Hasselqvist and Peter Forskål (1736–1763), who, like Hasselqvist, died overseas in pursuit of natural history (Hansen, 1964). Although Hasselqvist and Forskål were trained naturalists, other travelers returned with information on plants and their uses in the Middle East. Working in northern Syria, Alexander Russell (ca. 1715–1768), a British physician, documented agricultural crops and practices (Russell, 1756).

One of the repositories of this expanded knowledge was encyclopedias (or dictionaries – I use the terms interchangeably). By the time of Linnaeus, biblical encyclopedias were being produced in increasing numbers (Sheehan, 2003). This continued apace as further exploration, philological studies, and new findings in archeology and science fueled the incremental advance in knowledge facilitated by increased production of books. A major contribution was the biblical dictionary of the French Benedictine Antoine Augustin Calmet (1672–1757), one of the first such volumes by a Roman Catholic. Calmet wrote in the pious philosophy tradition, that is, reconciling the natural world with the teachings of the Bible.

The original iteration of this work appeared in the first quarter of the eighteenth century. It was a great success and was translated into several European languages. The first English translation with additions was published by Charles Taylor as Calmet's *Great Bible Dictionary*, which had several editions. For our purposes, the 1814 edition is the most pertinent as it deals with natural history (Taylor, 1814). Much additional information was added to Calmet's work in the numerous editions and revisions that appeared in the first half of the nineteenth century, although it is not always clear who contributed what. Numerous other biblical dictionaries, with varying

treatments of plants largely taken from previous writers, appeared throughout the eighteenth and nineteenth centuries. A surprising number of these titles are still in print, most of which placed emphasis on the plants, animals, geology, and minerals of the Bible – in other words, on natural history.

The use of the term *natural history*, apparently first applied to the study of the Bible by Taylor (1814), reflects the status of biology during that era. From the seventeenth century until the present, the term has referred to a discipline dealing largely with the careful observation of nature, even if it is not clear how much of the added information is original.

The Nineteenth Century and the Prominence of Natural History

Fewer than 25 years after Hasselqvist's work was published, the first American book on Bible plants appeared in 1793 and was written by Thaddeus M. Harris (I have not located a copy of this work). Harris (1768–1842) was a clergyman in the Congregational Church. After graduating from Harvard University, he was offered employment as librarian to George Washington (Bush, 2008) but declined because of health problems.

His first edition was a great success, and in 1824, he published an expanded edition titled *Natural History of the Bible* (Harris, 1824). (For a contemporary review of Harris' book and its strengths and weaknesses, see Anonymous, 1824.) Like Linnaeus before him, and like his contemporaries, Harris emphasized the need to see the plants in their native settings, information "which can be obtained only on the spot and by personal inspection." Harris was familiar not only with the writings of the ancients and the contributions of Forskål and Hasselqvist but also with the reports of travelers such as Leonhard Rauwolf and Bruce. Harris' work was republished numerous times on both sides of the Atlantic, often with additions and critical comments (e.g., Anonymous, 1833). Following Harris, most publications were guides based on reviews of previous work, usually updated with information from contemporaries and knowledge garnered by travelers.

An example of a compiled dictionary is *Bible Natural History*, published by Francis A. Ewing (1805–1857), a New Jersey physician (Ewing, 1835). This work anticipates later biblical encyclopedias in giving comprehensive coverage of all the biota and minerals of the Bible, drawn chiefly from other works. This is an oft-repeated phenomenon, that is, taking information from the ancient writers, conflating it with the work of more contemporary authors, and publishing it under a new title.

At least one book for children was produced in the first half of the nineteenth century: *The Trees, Fruits, and Flowers of the Bible* (Cook, 1846). Earlier, Harriet Newell Cook, née Rand (1814–1853), had produced a book on biblical animals, with over 30,000 copies being published in English alone and with translations into other languages (Sigourney, 1853). Numbers for the plant

book are not available. Like Maria Callicott, Cook's book was her last and, in fact, was completed by someone else.

The Middle East was becoming better known, and botanical exploration and research reached new heights by the beginning of the nineteenth century. On the other hand, relatively few exegetical works dealing with Bible plants were published. Chief among these were Rosenmüller's *Minerology and Botany of the Bible* (published in English in 1840). Ernst Frederick Karl (Carl) Rosenmüller (1768–1835) was an orientalist who wrote many books on travel, Arab literature, and a diversity of other subjects. His scholarly treatment is still useful today, although, as could be expected from a nonbotanist, some of the information he presents is more philologically than plant oriented. One example is the wild gourd (2 Kings 4:39), which Rosenmüller considered to be the squirting cucumber, *Ecballium elaterium*. When ripe, this could hardly be easily collected because of the explosive nature of the fruits. This is one of many examples of philologists and theologians writing about plants with which they had little, if any, contact. Later, Rosenmüller published a volume on the natural history of the Bible and, after that, a volume on the animals of the Bible.

In contrast to many of his contemporaries, John Kitto (1804–1854) compiled an original biblical dictionary rather than one largely borrowed from past sources. His *Cyclopedia of Biblical Literature* was apparently first published in England in 1845. The most widely distributed version was published in the United States in 1880 (other editions may exist). For this work, Kitto enlisted the aid of the well-known ethnobotanist John F. Royle (1798/1799–1858). Royle was born in British India and became professor of materia medica at King's College. His entries reveal careful scholarship, including acquaintance with Aramaic, Hebrew, and Greek texts as well as reviews of previous treatments. These were enriched by his own experience in economic botany. Although these treatments should receive more attention than they have by other Bible plant scholars, Royle's lack of firsthand experience with Mediterranean vegetation is evident. Despite this major contribution, Royle is not cited in the Moldenkes' book (Moldenke and Moldenke, 1952).

The volume *Scripture Natural History*, by William Carpenter (1797–1874), was first printed in London; the earliest edition I have found is dated 1828. Neither a cleric nor a botanist, Carpenter was a prominent figure in the Chartist movement in England, an eclectic who wrote on a wide variety of topics. An American edition, heavily edited by Gorham D. Abbot (1807–1874), was first published in 1833 (Carpenter and Abbot, 1833) and is the best-known edition of this work. The book is of interest less from a botanical viewpoint than as an example of the fascination with natural history and its application to the Bible, yet another example of mosaic physics. Gorham politely excoriates Carpenter on a variety of what appear to be trivial points. The edited version also shows how rapidly such a work was imbibed and

reissued. Gorham, a Presbyterian theologian, apparently had some theological disagreements with Carpenter, who may have been a Wesleyan, if he is the author of a collection of sermons by John Wesley (Carpenter, 1840). It is unfortunate that the recent reprint of *Scripture Natural History* (by Kessinger) erroneously ascribes the work to W. B. and J. E. Carpenter, father and son, a physiologist and a theologian, respectively, with no known relation to the actual author of *Scripture Natural History*.

After Linnaeus, the first books on Bible plants written by a professional botanist were apparently those of Balfour (1808–1884), who was the Regius Keeper of the Botanic Garden in Edinburgh and one of the leading botanists of his day. His first book (Balfour, 1857) treats only woody plants, each illustrated with watercolor prints. In his preface to this book, Balfour notes, “It is to be regretted that, of the numerous visitors at the present day to the Holy Land, few have turned their thoughts in this direction, and that thus many valuable opportunities for acquiring botanical information have been lost. The Botany of the Bible can be fully worked out only by those who travel in Eastern countries.” Balfour’s second book, *The Plants of the Bible* (Balfour, 1885, iv), covers the remainder of the plants and was published posthumously. Despite being the products of a respected botanist, little is original in either of Balfour’s volumes, both of which were produced for the general public. Balfour was likely the last author on Bible plants trained, like virtually all professional botanists of the day, as a physician

Two missionary–scientists with botanical training contributed to biblical dictionaries in the second half of the nineteenth century. They were members of the faculty of the nascent Syrian Protestant College, now the American University of Beirut: Cornelius van Dyck (1818–1895), who wrote entries for the Smith Bible dictionary (Smith, 1860–1863), and his colleague, George Edward Post (1838–1909), who added some notes to van Dyck’s articles in later editions of the Smith dictionary and wrote more expansive treatments of Bible plants and animals for the Hastings Bible dictionary (Hastings, 1901). An abridged edition was still in print in 2010. Post was one of the fathers of the American University of Beirut and a professor there until his death. Trained as a cleric, physician, dentist, and botanist, Post wrote the first modern flora of the Middle East (Musselman, 2006). Because of his credibility as a scientist resident in the Levant, Post exerted great influence on how Americans viewed Bible plants.

Some of the most widely used books on Bible natural history were written by clerics who lived and worked in the Middle East. The contribution of H. B. Tristram (1822–1906) as a careful observer of nature in the Holy Land is noteworthy. Eventually appointed canon of Durham Cathedral, Tristram was a clergyman with a keen interest in natural history, especially ornithology (Mearns and Mearns, 1988). His *The Natural History of the Bible* first appeared in 1867; the seventh edition is apparently the most widely

distributed (Tristram, 1883). It remains one of the most influential sources of information on Bible plants in the Holy Land, as evidenced by recent reprinting. Tristram spent almost a year traveling throughout the Levant and published numerous books in addition to the one on natural history. Further understanding of the lands of the Bible was provided by the works of the American cleric W. M. Thomson (1806–1894); H. M. Field (1822–1907), who was also an American cleric and wrote books on his extensive travels; and the Irishman J. L. Porter (1823–1889), a missionary. These volumes were widely distributed and had a great impact on Bible readers interested in the Middle East. Several are still in print.

George Henslow (1835–1925), an Englishman, wrote several treatments of Bible plants (Henslow, 1896, 1906; there are, no doubt, other editions). He was a clergyman with considerable training in botany, as is evidenced by his election as a fellow of the Linnaean Society. His father, J. S. Henslow, was one of the teachers of Charles Darwin at Cambridge. Henslow drew heavily on the observations of Tristram but also visited, at the least, Egypt and Malta and so had some firsthand information on Bible lands. The 1889 production by Alfred Knight (1861–1931), a British botanist, again utilizes information from travelers in the Holy Land as well as references to earlier works. The treatment of the mustard plant is one of many examples of confusing imagery with botanical reality (Knight, 1889), a further attempt to forge botanical facts into the mold of scripture.

Thus, by the end of the nineteenth century, treatments of Bible plants drew on ancient sources as well as an increasing number of reports from travelers to biblical lands. This was coupled with a rapidly expanding body of botanical knowledge.

The Twentieth Century and Scientific Contributions

Books on Bible plants in the early twentieth century had increased numbers of photographs yet little new information. Wilfred Edward Shewell-Cooper (1900–1982) was a British organic gardener and a pioneer of no-dig gardening, so it is not surprising that his book, *Plants, Flowers, and Herbs of the Bible* (Shewell-Cooper, 1977), with a foreword by Billy Graham, should have a sizable chapter on gardens. About the same time, Winifred Walker's beautifully illustrated book appeared, with watercolors by the author (Walker, 1979). Some of the entries, such as sorghum for hyssop, are erroneous. Walker was a well-known artist who wrote several books on biblical topics. Other treatments with artwork include that by Paterson and Paterson (1986) and the beautifully illustrated book by Anderson (1956). The most recent production of a well-illustrated Bible plants book is a French volume by Maillat and Maillat (1999), intended to aid the Bible reader with many color images but with no cited literature.

The most widely referenced philological treatment of Bible plants appeared in 1924 (Löw, 1924): *Flora der Juden*, by Immanuel Löw (1854–1944). The volumes include all the Hebrew and Aramaic plant names in the Old Testament and in the extrabiblical writings of Judaism, but although the book is an invaluable guide to the original names, much of its information is of limited botanical value.

The Moldenkes to the New Millennium

In 1952, the classic *Plants of the Bible*, by Harold (1909–1996) and Alma (1908–1997) Moldenke, appeared (Moldenke and Moldenke, 1952). Harold Moldenke was, for many years, associated with the New York Botanical Garden, one of the premier botanical institutions in the world.

Plants of the Bible is an invaluable reference. Coverage is exhaustive, with detailed treatments of debatable plants such as the apple versus apricot controversy; discussion of the identity of biblical mustard; and discourse on such topics as a possible vegetable source for manna. Quirky (there is a list of misspelled, often humorous, Bible verses; the reference section is not sequential; anecdotal information is often included) yet erudite, their work is meticulously researched, with extensive referencing. The Moldenkes' book sets a high standard for future researchers. One can only speculate what they would have produced with color plates and access to modern digital databases. One weakness is their lack of field experience in the Middle East in the preparation of the book (Andy Moldenke, personal communication).

More recently, the treatment by F. Nigel Hepper is an excellent, well-illustrated resource (Hepper, 1993b). Hepper was on the staff of the Royal Botanic Gardens, Kew, and had extensive experience in biblical lands. *All the Plants of the Bible*, by the Israeli botanist Michael Zohary, provides succinct treatment of each plant and very good illustrations (Zohary, 1982). The volumes by Hepper and Zohary are intended more for a general audience of Bible readers than for professional botanists. *Figs, Dates, Laurel, and Myrrh Plants of the Bible and the Quran* (Musselman, 2007) aims to make information on Bible plants accessible to a general audience. It is unique in including plants of both the Quran and the Bible. Several volumes from the biblical plant preserve in Israel, Neot Kedumin, deal with plants in their native setting (Hareuveni, 1980, 1984). Włodarczyk (2007) has prepared a comparative list of taxonomic treatments in Bible plant books from the Moldenkes' work up to 2007.

The last major American biblical dictionary of the nineteenth century is the *Anchor Bible Dictionary* (Freedman, 1992). This work includes an entire section on Bible plants, but with little original information, drawing heavily on earlier Bible dictionaries and repeating many of the same errors.

The first Bible dictionary of the new millennium is *The Interpreters Bible Dictionary* (Sakenfeld, 2009). It is unique in that it includes both a section on

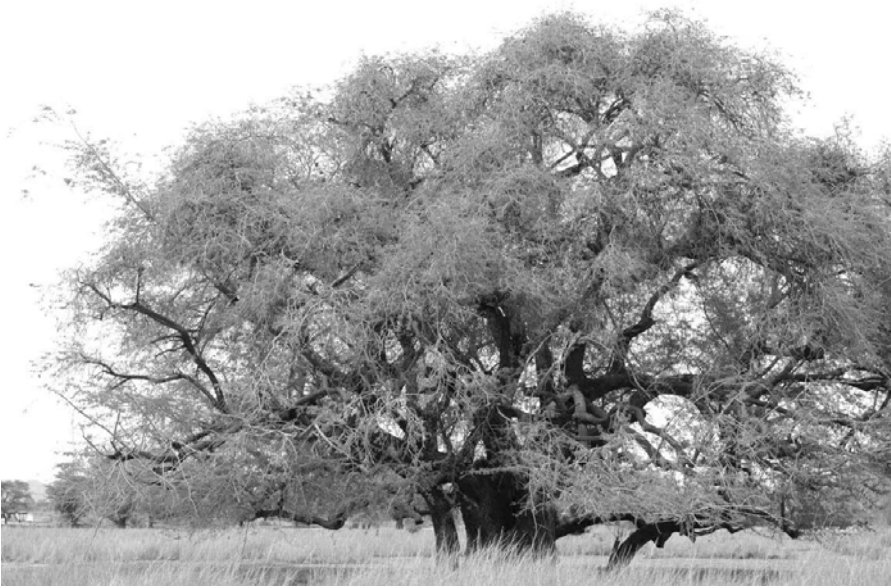
plants by the well-known student of Bible plants F. Nigel Hepper (Hepper, 2009) and detailed individual treatment of each entry by various contributors, including the present writer. For the first time, emmer wheat is recognized as the most commonly planted wheat of biblical days, but other entries perpetuate previous errors such as the use of aloe vera rather than aloeswood (species of *Aquilaria*) for the preparation of Jesus's body for burial. Unlike many earlier biblical dictionaries, *The Interpreters Bible Dictionary* helpfully includes the Apocrypha.

SUMMARY

The study of Bible plants was not isolated from the mainstream of botanical science. However, unlike more empirical studies, it was strongly influenced by streams of theological thought and broad religious movements. The most lasting influence was the continuing effect of the Reformation, with its emphasis on reading and understanding the Bible. There were other influences as well in the seventeenth and eighteenth centuries, including exploration; revivals, which both influenced theological thought and inspired missionary zeal; and the popularization of natural history through printing of inexpensive magazines and books (e.g., Fyfe, 2004). The result was more Bible plant books, articles, and – of especial import – the widely utilized Bible dictionaries, some of which are still in print.

A DICTIONARY OF
BIBLE PLANTS

A



Large *Faidherbia alba* (also known as *Acacia alba*) north of Windhoek, Namibia. This widespread African tree is unusual in keeping its leaves during the dry season.

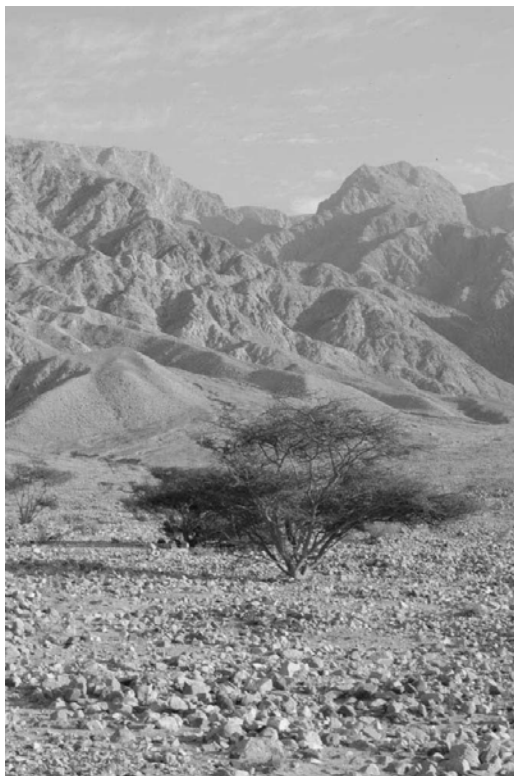
Acacia *Acacia nilotica*, *A. albida*, and Other Species

[Hebrew *shittah*, *shittim*; Exodus 25:5, 10, 13, 23, 28; Exodus 26:15, 26, 32, 37; Exodus 27:1, 6; Exodus 30:1, 5; Exodus 35:7, 24; Exodus 36:20, 31, 36; Exodus 37:1, 4, 10, 15, 25, 28; Exodus 38:1, 6; Numbers 25:1; Deuteronomy 10:3; Isaiah 41:19; Joshua 2:1; Joshua 3:1; Joel 3:18; Micah 6:5]

Acacia is the most prominent tree, and sometimes the only tree, in the desert landscape. Viciously armed with long thorns and spines, acacia trees are well protected from grazing animals. To conserve water, the small leaves

can be dropped in a short time, reducing the surface area of the tree and the loss of water. Flowers are born in globose clusters, white or yellow and fragrant. They are an important nectar source for honey bees. Fruits are pod-like and relished by camels and other livestock for food. There are several species of acacia in the Middle East.

Because it is slow growing, the wood of acacia is hard and impregnated with tannins and other phenolic compounds, making it resistant to decay. All the wood in the tabernacle – the supporting poles and staves (Exodus 26), the ark and the framework of the altars (Exodus 30 and 37) – are from acacia wood.



Acacia raddiana in the desert north of Aqaba, Jordan.

Homan (2002) states that only two species of acacia grow large enough to produce the lumber necessary for the tabernacle. These are *Acacia nilotica* and *A. albida*, the latter more accurately known as *Faidherbia alba*. Neither of these species is abundant in the Sinai, where the largest indigenous acacias include *A. tortilis* and *A. raddiana*. This raises the issue of why some of the few other indigenous trees were not used. However, like other components of the tabernacle system, the woods of *A. nilotica* and *F. alba* could have been transported from afar. Both species are abundant throughout much of Africa.

As Homan (2002) notes, the width of the lumber used in construction of the tabernacle is not given, and the author points out that if solid wood were used, it would be so heavy as to preclude transport by the four pair of oxen designated for carrying it (Numbers 7:8). He therefore suggests that the boards were thin.

There are several locations in the Old Testament named “Acacia” or “Acacia Grove”; among these are those named in Numbers 25:1, Joshua 2:1, Joshua 3:1, Joel 3:18, and Micah 6:5.

Algum *Buxus sempervirens*

[Hebrew *almuggyim*; 2 Chronicles 2:8–11]

The woods translated “algum” and “almug” (see *Almug*) are the most mysterious plants in the scriptures. Most Bible versions leave the words untranslated (ASV, ESV, KJV, NASB, NIV). “Sandalwood” is used for both in the Darby translation. The NLT uses “red sandalwood,” also known as rosewood. Some of the linguistic problems with these words are discussed by W. E. Clark (1920), Schafer (1957), Greenfield and Mayrhofer (1967), and Golka (1977).

I am unaware whether anyone has suggested that almug and algum might represent two different trees. My reason for positing this is based on the context of the verses. *Almuggyim* is used only for the timber requested from Hiram, king of Tyre: “Send me also cedar, pine and algum logs from Lebanon, for I know that your men are skilled in cutting timber there. My men will work with yours to provide me with plenty of lumber, because the temple I build must be large and magnificent. I will give your servants, the woodsmen who cut the timber, twenty thousand cors of ground wheat, twenty thousand cors of barley, twenty thousand baths of wine and twenty thousand baths of olive oil” 2 Chronicles 2:8–11 (NIV). The verse clearly states that the logs were to be cut from Mount Lebanon, which is underscored by noting that the wages paid “the woodsmen who cut the timber.”

A good candidate for algum is boxwood, *Buxus sempervirens*, a well-known shrub used for hedges and topiary in the north temperate region that, if left unpruned, can grow to a tree. The leaves are small, shiny, and evergreen. The wood is hard and



Boxwood, *Buxus sempervirens*, at the National Arboretum in Washington, D.C.

durable with an attractive grain, making it in demand for musical instruments, furniture, and artifacts (Meiggs, 1982). Its importance in Egypt has been well documented (Gale et al., 2000).

In addition to its recorded use in Egypt, further support for algum as boxwood is found in the work of Moorey (1999), who noted that Amanus, the mountain to the north of the Lebanon ridge in what is now modern-day Turkey, was recorded in the *Annals of Tiglath-Pileser II* as the “Boxwood Mountain.” There are vestiges of boxwood as far south as present-day Syria (Musselman, unpublished), perhaps a remnant of what once were more extensive stands.

Almond *Prunus dulcis*, Also Known as *Amygdalus communis*

[Hebrew *luz*; Genesis 30:37; Exodus 25:33; Exodus 37:19

[Hebrew *shaqed*; Genesis 43:11; Exodus 25:34; Exodus 37:20; Numbers 17:8; Ecclesiastes 12:5; Jeremiah 1:11

The flowering of the almond, *Prunus dulcis* (*Amygdalus communis* is a synonym), marks the beginning of the agricultural season in the Middle East. Almond is the first fruit tree to flower, often in January. Green almonds, a popular snack in the region relished for their sour taste, are sold in March, and the almond seeds, as nuts, are ready in midsummer. Not a long-lived tree, almond is widely planted, often on grafted stock, throughout the region and can tolerate aridity better than many trees. Several species of indigenous almonds are among the most drought-resistant trees.

Jacob used branches of the almond in his attempt to influence the breeding of his father-in-law’s flock in Genesis 30. He so valued the nuts that he included almond in his gift for the ruler of Egypt in Genesis 43. This is the only reference to the fruit of the almond in the Bible.

Interestingly, it is cited more frequently for its beauty than as food. It is in the lamp stand, the menorah, of the tabernacle that the almond is best known, where the individual lamps are shaped like almond flowers. Like its relatives



Almond grove near Mount Tabor (in background), Israel, in February.

in the rose family, almond flowers are large and showy. From a distance, they look white.

This snowy appearance may be the image used in Ecclesiastes 12:5b: “when men are afraid of heights and of dangers in the streets; when the almond tree blossoms and the grasshopper drags himself along and desire no longer is stirred” (NIV).

The reference in Jeremiah 1:11 is somewhat enigmatic: “Then the Lord said to me, ‘Look, Jeremiah! What do you see?’ And I replied, ‘I see a branch from an almond tree’” (NLT). This is apparently a play on words, with interplay of *shaqed* (almond) and *shaqad* (to be alert).

Traditional cultivars of almonds are totally dependent on bees for pollination, and the



Almonds near maturity in a commercial almond grove in Chico, California, in July.

decline in honeybee populations in recent years has been cause for concern among almond growers (Mandelik and Roll, 2009).

Almug *Santalum album* or *Pterocarpus santalinus*

[Hebrew *almug*; 1 Kings 10:11, 12; 2 Chronicles 9:10, 11

Like algum, this is a mysterious tree or timber that has been subject to a variety of interpretations (*see* Algum). Some scholars think the same word is intended, the difference being in transposition of the letters (Greenfield and Mayrhofer, 1967; Lipovitch, 2009). But even if this is true, the origins of the two timbers, one from Ophir and the other from Lebanon, raise questions about the type of wood involved. The Lebanon source of algum seems clear (*see* Algum), the Ophir shipment less so.

In 1 Kings 10:11–12, we read that “Hiram’s ships brought gold from Ophir; and from there they brought great cargoes of almugwood and precious stones. The king used the almugwood to make supports for the temple of the Lord and for the royal palace, and to make harps and lyres for the musicians. So much almugwood has never been imported or seen since that day” (NIV; *see* also 2 Chronicles 9:10–11). From this we see that the origin of the shipment is Ophir (likely a place on the southern coast of the Arabian Peninsula, e.g., Baker, 1992). Second, the timber is linked with precious stones, clearly material from outside the Levant. Third, it is used not only in construction but for musical instruments. Fourth, large quantities were imported. And it is important to see that this is included as an aside in the discussion of the queen of Sheba, herself from outside the Middle East.

Ophir was the site of transshipment of many different materials, including spices (Miller, 1998; Schoff, 1917), that came from the Far East. Among these materials were valued timbers such as rosewood and sandalwood (Schafer, 1957).



Sandalwood on a plantation in Sri Lanka in March.

Both rosewood (*Pterocarpus santalinus*), also known as red saunders or red sandalwood, and sandalwood (*Santalum album*) are logical candidates for the wood that Solomon imported. Both were – and are – highly valued, rosewood for its beautiful color and grain, sandalwood for its scent as well as its wood-working qualities. Sandalwood is native to the Indian subcontinent and is the source of one of the most valuable oils used in the perfume and incense trade. Rosewood does not have these aromatic qualities but has been used as a traditional medicine. Either of these (among other

timbers) could be the costly wood noted in the merchandise of Babylon in Revelation 18:12.

Aloeswood Species of *Aquilaria*

[Hebrew *ahaloth*, a loan word from Asia; cognate with the current Malay word *gaharu*; Numbers 24:6; Psalms 45:8; Proverbs 7:17; Song of Songs 4:14

[Greek *aloay*; John 19:39

It is unfortunate that one of the most distinctive and intriguing plants in the Bible has been frequently translated as “aloe,” leading to confusion with the well-known aloe vera. This fleshy relative of asphodels is used in the cosmetics industry and is unrelated to aloeswood. True aloeswood are species of the genus *Aquilaria* (Thymeleaceae), also known as eaglewood. Greppin (1988) traces the confusion over the translation of the plant referred to as aloe.

The verses with aloeswood in Psalms, Proverbs, and Song of Solomon refer to fragrance, clearly indicating that the plant is not aloe vera, which has an odorless sap. The only questionable translation is in Balaam’s



Red saunders, *Pterocarpus santalinus*, in the Royal Botanic Garden, Peradeniya, Sri Lanka, in March.

prophecy in Numbers 24:6: “Like valleys they spread out, like gardens beside a river, like aloes planted by the Lord, like cedars beside the waters” (NIV). It has been argued that the aloes here, translated as “lign” (tree) aloes in the KJV and as “aloes” in the NIV and ESV, could not be *Aquilaria*. There is nothing striking about the appearance of the evergreen, tropical aloeswood tree. The Geneva Bible, the precursor to the KJV, gives “tents” as an alternate reading, an interpretation used by some other writers. But the word is the same as translated in other places where its role as incense is incontrovertible (e.g., Psalms 45:8). The Numbers verse is intriguing because it is the only reference to the trees of aloeswood. Furthermore, in the Numbers passage, it is linked with another well-known tree, the cedar of Lebanon, which likewise did not grow in either Moab, where Balaam prophesied, or in northern Mesopotamia, his purported birthplace. That this is botanical literary license is further made evident by the fact that cedar of Lebanon does not typically grow as “trees beside the waters” but rather on mountain slopes. That aloeswood does not grow in the Middle East does not mean it was not well known; it has been an important article of trade since ancient times as an expensive incense and perfume.

Aloeswood, also known in the incense trade by its Malay name, *gaharu*, is the incense derived from the wood of the tree. This has been highly valued since ancient times and was used both as an incense and as a costly perfume. Production of the scented wood is dependent on a fungus that penetrates the tree either through natural lesions or by deliberate incisions into the bark. After several years, dark strands of infected tissue develop; this dense wood is the source of the fragrance. This hard, dark marbling is in contrast to the light, almost spongy wood of the uninfected tree. So valuable is this product that tree rustling of infected trees supports a large clandestine industry, even in protected forest preserves.



Large *Aquilaria malaccensis* tree in a forest preserve in Sungai Liang, Brunei Darussalam.

For example, in Borneo, rustlers locate susceptible trees, then return at night to cut them down and process the *gaharu* (Musselman, unpublished). A single tree can fetch many thousands of dollars. For this reason, large infected trees are rare in the region, even though species of *Aquilaria* were once common components of the rainforest. Thankfully, a successful program of establishing plantations of *Aquilaria* has been established in several countries of Southeast Asia, which, it is hoped, will lessen the destruction of native trees.

This great demand for a product used by ancients has its basis in several religions. In addition to the Bible, the Hadith (sayings of the Prophet Muhammed) contains reference to aloeswood, both as a fumigant and as a medicine.

The single reference in the New Testament involves the preparation of Jesus's body for



Piece of heavily infected wood, valuable for preparing incense and distilling oil, in the University of Brunei Darussalam Field Station, Temburong Province, Brunei Darussalam.

burial (John 19:39), a practice consonant with the treatment of dead bodies in Roman times (Caseau, 2007).

Apricot *Prunus armeniaca*

[Hebrew *tappuach*; Proverbs 25:11; Song of Solomon 2:3, 5; Song of Solomon 7:8; Song of Solomon 8:5; Joel 1:12

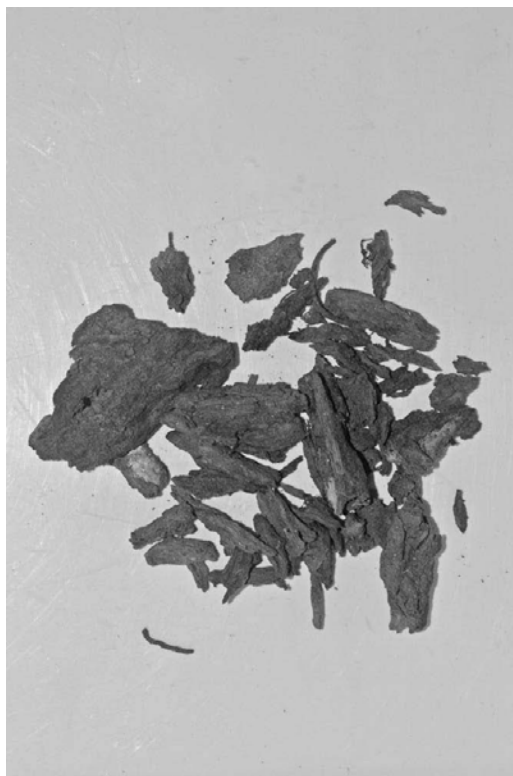
Apple, *Malus pumila* (there are other botanical synonyms), was probably not a significant crop in the Levant, at least not in the time the Bible was written. It is native to central Asia and requires cool growing conditions only found at higher elevations in the Middle East, where sustained low temperatures are present (Juniper and Mabblerley, 2006). A much better fit for *tappuach* is the apricot, long cultivated in the region and agronomically suited to a variety of growing conditions.

The origin of confusion between the apple and apricot has a long history, well discussed by Moldenke and Moldenke (1952), to whom the interested reader is referred.

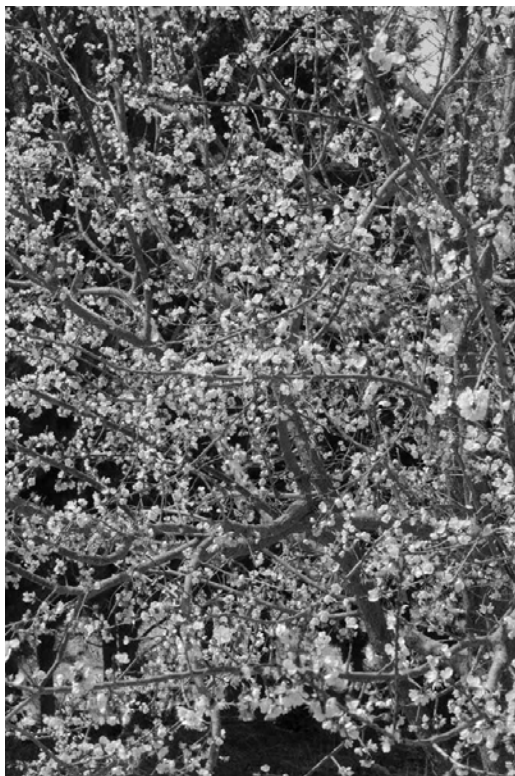
Apricots are lovely trees both in flower and in fruit. The masses of light pink flowers occur in the early spring, followed by fruits in mid-summer. There is an astonishing diversity of apricots in the eastern Mediterranean, including white and orange varieties. Yields can be high, and the fruits are eaten either fresh or

dried or are made into a paste that is mixed with water to provide a refreshing drink.

The beauty of the apricot is expressed in Proverbs 25:11: "Like apples of gold in settings of silver is a word spoken in right circumstances" (NASB). The picture is clearer when it is realized that some varieties of apricot have a silvery aspect to their leaves, a feature most noticeable in a slight breeze. The image of the golden fruits is evident. Apricots contain considerable amounts of sugar, reflected in Song of Solomon 2:3b: "I sat down under his shadow with great delight, and his fruit was sweet to my taste" (ASV). A third feature of apricots recorded in the scriptures is the pleasant smell of the ripe fruits, as noted in Song of Songs 7:8.



Fragments of a decayed tree heavily infected with the odor-producing fungus. After a tree dies or is cut, these fragments are sought out. In ancient times, aloeswood was apparently traded in this form, suggesting the Hebrew name *ahaloth*, implying sticks of wood. University of Brunei Darussalam Field Station, Temburong Province, Brunei Darussalam.



Flowering apricot tree at a monastery in Qarayatan, Syria, in May.

The expression “apple of my eye” should not be confused with *tappuach* as it is a different word.

Aspalathus

[Greek *aspalathus*, a hapex legomenon; Ecclesiasticus 24:15: “Like cassia and camel’s thorn I gave forth perfume” (NSV)]

This remains one of the most mysterious of all Bible plants. It is perhaps best discussed under the rubric of what it is not. Biblical aspalathus is not camel’s thorn, *Alhagi maurorum*, a common spiny leguminous shrub of dry areas in the Middle East, nor is it clear how aspalathus was translated this way. Causing further complications is that a common tree in southern Africa is also called “camel’s thorn” (*Acacia erioloba*). Linnaeus, for reasons inexplicable, applied the name to a group of shrubby legumes of southern Africa, one of which, *Aspalathus linearis*, is the source of the well-known roibos tea. Moldenke and Moldenke (1952) review the history of names translated for aspalathus and determine that it is *Alhagi*



Mature apricots at Abu Arkoub, Syria, in June.



Flowering branches of camel thorn, *Alhagi maurorum*, at Wadi Seer, Jordan, in October.

maurorum, a common subshrub of steppes and deserts.

The accounts of ancient writers on this plant are conflicting and well reviewed by Royle

(1880a), who comes to the conclusion that evidence from reliable sources, including Avicenna and Galen, points to a product from the Far East. Royle, who had considerable experience in British India, suggests *Myrica sapida*, a tree of the Himalayan foothills with an edible fruit and a bark with medicinal uses.

A seldom considered identity for aspalathus is myrtle (*Myrtus communis*). In a discussion of medieval Arabic toxicology, Levey (1966) points out a translation error where the Arabic word *ās*, “myrtle” in English, is confused with *Alhagi maurorum*. Myrtle, with its fragrant foliage and flowers, would meet the requirement of being fragrant, unlike *A. maurorum*.

Despite this, the true identity of aspalathus remains shrouded in uncertainty.

B



Mature barley (white) with ripening wheat (green) on the right. Barley matures three to four weeks earlier than wheat. Near Kerak, Jordan, in June.

Barley *Hordeum vulgare*

[Hebrew *seorah*; Exodus 9:31; Leviticus 27:16; Numbers 5:15; Deuteronomy 8:8; Judges 7:13; Ruth 1:22; Ruth 2:17, 23; Ruth 3:2, 15, 17; 2 Samuel 14:30; 2 Samuel 17:28; 2 Samuel 21:9; 1 Kings 4:28; 2 Kings 4:42; 2 Kings 7:1, 18; Chronicles 11:13; 2 Chronicles 2:10, 15; 2 Chronicles 27:5; Job 31:40; Isaiah 28:25; Jeremiah 41:8; Ezekiel 4:9, 12; Ezekiel 13:19; Ezekiel 45:13; Hosea 3:2; Joel 1:11

[Greek *krithe*; John 6:9, 13; Revelation 6:6

Barley's importance in the agriculture of ancient Israel is attested by its listing as one of the seven species of the land in Deuteronomy 8:8, along with one other grain: wheat.

The two grains, while superficially similar, are quite different in cultural requirements, nutrition, and uses.

Both are planted in the winter and harvested in the spring. But barley has a shorter growing season (Exodus 9:31) and is harvested several weeks before wheat, in May or June, depending on the rains. This allows us to determine the time of year that Ruth arrived in Bethlehem: it was during the barley harvest (Ruth 1:22). The color of the two grains is also different when traditional varieties mature. Barley is whitish, whereas wheat is darker. For this reason, Jesus's comment about the fields being "white unto harvest" in John 4:35 likely means



Traditional harvesting of barley in Ethiopia in October.

a barley field. He refers to the harvest as coming in four months, dating his words to around the end of the calendar year.

Although the yield of barley is less than that of wheat, barley can be planted in areas where wheat cannot be grown: in poorer soils with less water. Barley also has a higher tolerance for salinity, an important consideration in the Middle East, where salt accumulation is a constant problem.

Despite the almost 30 references to barley, we have little idea of how it was actually used as a food. Barley bread is mentioned in six

verses: Ezekiel 4:9, 12; 2 Kings 4:42; Judges 7:13; and John 6:9, 13. But what is this? Certainly it could be prepared from a mixture of wheat and barley flour, allowing the bread to rise and giving more typical wheaten bread consistency. Because most of the wheat used was emmer wheat, even a mixed loaf would not rise much because of the low gluten content of emmer. If the bread were prepared in the household of a poor person, it is less likely that wheat flour would be used as wheat is always presented as being twice the cost of barley, both in the Old Testament and the New Testament (e.g., 2 Kings 4:42 and Revelation 6:6).

Despite its well-documented origin in the Middle East as human food since earliest times (Zohary and Hopf, 2000), barley is seldom eaten in the Middle East, having been supplanted by rice. Today, little barley is grown for human consumption, except as a specialty food, other than in Nepal and Ethiopia. In Ethiopia, barley cakes (“loaves”) are prepared by grinding barley and mixing it with oil and salt, perhaps in a manner similar to biblical days. Kurds in eastern Iraq make a barley



Winnowing barley in Ethiopia with the traditional winnowing fork. October.



Traditional barley beer, Tigray State, Ethiopia. Note the numerous pieces of chaff in the brew, which would be filtered out by a straw or sieve.

bread by using about half barley meal and half durum flour. Without wheat flour, baking barley produces flat, crisp bread much different than wheaten bread because of the low amount of gluten in barley.

The use of barley in ancient bread is poorly understood, as is the use of barley in beer. Beer has been overshadowed by wine. Homan (2004) provides evidence that the Hebrew word *shekhar* (Greek *sikera*, used only in Luke 1:15 in reference to John the Baptist) is best translated as “beer” rather than the almost universal “strong drink” based on the widespread production of beer in surrounding countries. Of the 25 or so occurrences of *shekhar*, it is most frequently translated as “strong drink.” Barley was essential to the large beer industry in pharaonic Egypt (Samuel, 2000) and the Middle East (Homan, 2004). Furthermore, widespread alcohol distillation was not common until around A.D. 800. All this is evidence of the production and use of beer in biblical days.

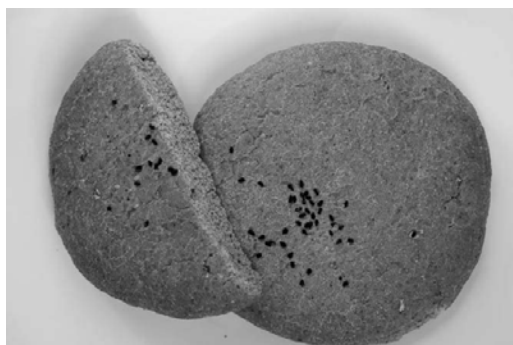
Production of beer, whether from wheat or barley, requires malt, which is prepared from germinated grain that is dried, usually ground, and placed in a mixture of cooked grains, along with yeast. The malt breaks down the carbohydrates in the grains, which the yeast can then convert to alcohol. A culture of yeast, similar to the leaven of the Bible, had to be maintained

from one batch of beer to the next, perhaps as bits of the dried malt, which could be placed in the mixture of cooked grain and water. This process has been used to explain Ecclesiastes 11:1 (Homan, 2002): “Cast thy bread upon the waters; for thou shalt find it after many days” (ASV).

Ancient beers contained considerable amounts of chaff from the barley, which had to be strained out of the brew either through filters or using straws. Numerous filters and straws are abundant in the archeological record (Homan, 2004). This beer was prepared without hops (*Humulus lupulus*), which Europeans in the Middle Ages discovered as a preservative against bacterial decay. Instead, other materials were added to beer in the ancient Middle East as preservatives, which



Barley cakes prepared by grinding barley and mixing it with oil and seasonings, central Ethiopia.



Traditional Kurdish barley bread made by using approximately half barley meal and half durum wheat flour. This could be similar to the barley cakes in John 6:9.



Chickpeas, *Cicer arietinum*, ready for harvest near Diyatha, Syria, in June. This is a region of low rainfall, where chickpea is one of the few crops that can produce an acceptable yield.

would have given the beer a different taste than the traditional lagers (beer made with hops) best known today.

In addition to its uses for bread and beer, the barley plant was used like wheat for temper for bricks, for animal provender, and as straw.

Beans *Cicer arietinum*, *Pisum sativum*, and Perhaps Other Legumes

[Hebrew *pole*; 2 Samuel 17:28; Ezekiel 4:9]

Beans could be a general term for any vegetable legume, although the scriptures distinguish between them and lentils (*see* Lentil). In addition to lentils, agriculture in the Levant several thousand years before the present used at least three legume species, all derived from indigenous ancestors: pea (*Pisum sativum*); chickpea (*Cicer arietinum*), often known in the United States as the garbanzo bean; and bitter vetch (*Vicia ervilia*) (*see* Vetches). In addition, broad beans or fava beans, *Vicia fava*, were an important crop in the Nile Valley, where they are still an important protein source.

Most widely cultivated is chickpea because it can grow in drier areas and still give a predictable yield. In some places, chickpea is planted after the harvest of wheat as it is able to use residual soil moisture.



Garden pea, *Pisum sativum*, near Harrar, Ethiopia, in November.



Lentils, upper left, and chickpeas, lower right, two of the most important legume crops in the Middle East. Market in Sulimaniya, Iraq, in June.

The fruits mature in late spring or early summer and are eaten fresh or dried. It is in this form that they are presented in 2 Samuel 17, when David was at Mahaniam, a city in Gilead on the Jabbok River (the present-day Zarka River).

Zeroa is the word used to describe the food that Daniel and his colleagues chose in Daniel 1 and is usually translated as “vegetables.” The precise definition of this food is unknown, but legumes seem a likely possibility not only because they were widely grown but because they would be a protein substitute for the king’s meat. Ezekiel was also resident in Mesopotamia, and his “bread” contained beans (Ezekiel 4:9), indicating that they were available.

Broad bean or fava (or faba) has been grown for millennia (Zohary and Hopf, 2000). It is very popular in Egypt and Sudan, where the large seeded form is grown, and is also an important crop on the Indian subcontinent, where the small seeded form is considered choice. All of the known ancient varieties were small seeded.

As they do today, legumes provided a vegetable protein source in ancient times. The review by Abbo et al. (2009) suggests that neolithic farmers appreciated their nutritional value as much or more than their yield, reflected in the cropping systems then and still extant today.

Bitter Herbs *Cichorium intybus* and Others

[Hebrew *merorim*; Exodus 12:8; Numbers 9:11; Lamentations 3:15 (translated as “worm-wood,” except in NIV); “They shall eat the flesh that night, roasted on the fire; with unleavened bread and bitter herbs they shall eat it” Exodus 12:8 (ESV)

Much has been written on the plants that might be considered bitter herbs (Moldenke and Moldenke, 1952), including dandelion (*Taraxacum officinale*), lettuce (species of *Lactuca*), horseradish (*Amoracia rusticana*), chicory (*Cichorium intybus*), and lesser known plants. Horseradish is not native to the Middle East, but lettuce, dandelion, and chicory are. Endive is the closely related *C. endiva*.

Chicory is a perennial plant with beautiful sky blue flowers and a milky juice. It has been introduced into North America and has spread widely as a weed. The popular salad component radicchio is derived from *C. intybus*.

Of the three native to the Levant (dandelion, lettuce, and chicory), all are well-known vegetables, important salad foods up to the present. However, only chicory is still collected in the wild in the Middle East.

Lettuce, *L. sativa*, is native to western Asia and was valued in ancient times as an aphrodisiac because of its milky latex, which was thought to resemble semen. It has a naturally bitter taste and is traditionally considered one of the plants that could be the bitter herbs,



Chicory, *Cichorium intybus* (center), in a vegetable shop near Bet Eddin on Mount Lebanon in May.



Chicory in full flower on the island of Chios, Greece, in June. The flowers open midday and close by evening.



Wild lettuce, *Lactuca serriola*, at ruins in ancient Tyre, Lebanon, in May.

especially since it is native to Egypt. Interestingly, lettuce, dandelion, and chicory are all in the same family, Asteraceae, the sunflower family.

Because there are several plants of the indigenous flora that are bitter yet edible, it is not possible to say with authority which is the bitter herb to be eaten with the Passover meal.

Black Cumin *Nigella sativa*

[Hebrew *qesach*; Isaiah 28:25, 27]

The identity of the plant translated *qesach* in these verses varies considerably among translations. As examples, the KJV uses “fitches,” ESV “dill,” NIV “caraway,” and NLT “black cumin.” “Fitches” is used in the KJV for unrelated plants (*see* Vetches), caraway was unknown in the ancient Middle East, and both dill and black cumin are documented from Egyptian tombs (Murray, 2000a). The context of the verses requires a crop that is threshed by beating with rods: “A heavy sledge is never used to thresh black cumin; rather, it is beaten



Threshing black cumin on a farm near Tubas, Palestinian Territory.

with a light stick” Isaiah 28:27 (NLT). Dill, on the other hand, is not harvested by this method. The seed heads are harvested, dried, and threshed. On this basis, I think that black cumin is the best choice for *qesach*.

Black cumin is planted in the winter, often at the edge of field crops such as barley and

wheat, and matures rapidly. After being harvested in the spring, the stalks are allowed to dry and then are beaten with a stick. The jet black seeds are used to flavor bread and other baked goods. In recent years, black cumin has become increasingly popular for its purported health benefits.



Retam shrubs in Wadi Arabah, south of the Dead Sea, Jordan, in October. In this season, the shrubs have lost their leaves.



Flowering branches of broom in April, west of Amman, Jordan.

Broom *Retama raetam*

[Hebrew *rethem*; 1 Kings 19:4; Job 30:4; Psalms 120:4]

[Hebrew *aroer*; Jeremiah 48:6]

After fleeing the threats of Queen Jezebel, Elijah ends up in the countryside around Beersheba, where he “came and sat down under a broom tree. And he asked that he might die” 1 Kings 19:4 (ESV). Other versions translate *rethem* as “juniper” (KJV, NASB), a name applied to species of the unrelated gymnosperm genus *Juniperus*. *Retam*, the common name of broom in both Hebrew and Arabic, is a common shrub of desert regions in North Africa and the Middle East. Its adaptations to the harsh desert environment include the dropping of small leaves after the brief rains and a deep root. Most of the photosynthesis is carried on by the green stems, which provide a stark contrast to the surrounding desert.

Masses of white, fragrant flowers are produced in the spring, followed by podlike fruits. All parts of the plant are toxic and have been implicated in livestock poisoning (el Bahri et al., 1999). For this reason, the translation of broom as food in Job 30:4 (KJV, ESV, NASB, NJB, NLT) is misleading. The reference is no doubt to the use of the roots as a fuel for cooking food, as is still practiced by Bedouins, and to Psalms 120:4, where the heat of the coals of broom is mentioned.

The shrub in Jeremiah 48:6 is likely a reference to broom, although the Hebrew word *arorer* is used, implying a plant with a broom-like structure. It has been translated as “heath” (KJV), “juniper” (ESV, NASB), and “donkey” (NJB). Heath (species of *Erica*) does not occur in the region of Moab. The translation as “juniper” is considered earlier. It could refer to the city of Aroer (now in ruins) on the edge of the Arnon Gorge (Wadi Mujib in central Jordan).

C

Cane *Arundo donax*

[Hebrew *qaneh*; Genesis 41:6; Exodus 37:17; Isaiah 36:6; Isaiah 42:3; Isaiah 58:5; Ezekiel 29:6; Ezekiel 40:3; Ezekiel 41:8; Ezekiel 42:16

[Greek *calamus*; Matthew 27:29; Mark 15:19

Qaneh is a descriptive term sometimes translated as “stalk” (as in Pharaoh’s dream of the wheat during the good and the lean years in Genesis 41:6) or as “branch” (as in the lamp stand for the tabernacle in Exodus 37:17). Thus it is applied to plants or plant parts that have a stalklike or spearlike appearance and is used for unrelated plants that have a similar appearance (see Sweet Cane).

When *qaneh* is described as being strong or durable (as in a measuring rod), I assume it is giant cane, *Arundo donax*, a native bamboo (bamboos are woody members of the grass family). This impressive grass grows up to 5 meters (15 feet) tall and has long, tough leaves. The stems are especially tough and are cut and woven together to make fences or shelters. They are also cut longitudinally into strips to be woven into baskets. Giant cane is widespread in western Asia, growing anywhere there is ample water.

Because of its strength, giant cane was used as a measuring rod. In fact, *qaneh* is translated as “rod” in many Bible translations of Ezekiel 41:8: “I saw that the temple had a raised base all around it, forming the foundation of the side rooms. It was the length of the rod, six long cubits” (NIV). Ezekiel 42:16 is translated similarly.



Bundles of cane stems ready for sale. Living cane is upper right. Amchit, Lebanon, in April.

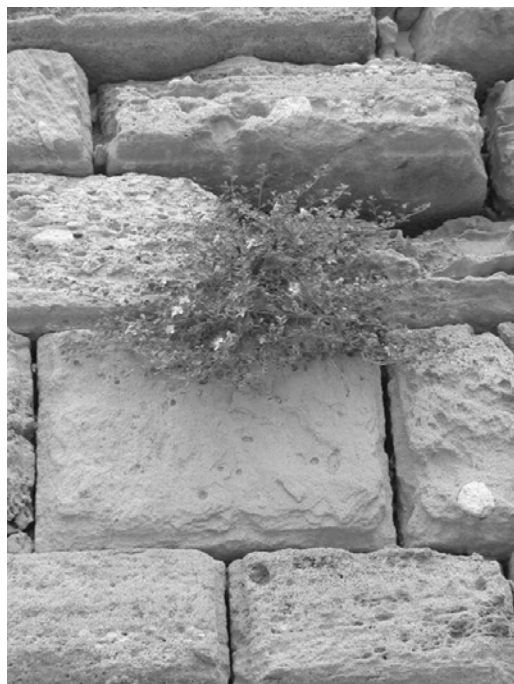
There are two occurrences of giant cane in the New Testament in association with the crucifixion of Jesus. The first is in the mock trial: “They put a staff in his right hand and knelt in front of him and mocked him (Matthew 27:29b

NIV). While this could be either reed or giant cane, the latter seems a better choice because of its size. In Mark 15:19, giant cane is used for beating: “They kept beating His head with a reed, and spitting on him, kneeling and bowing before Him” (NASB). Reed would inflict less pain compared to the thicker and heavier giant cane.

Caper *Capparis spinosa*

[Hebrew *abionyah*; Ecclesiastes 12:5]

There is considerable debate about the identity of the plant, if indeed a plant is intended, in this verse (well reviewed by Moldenke and Moldenke, 1952). But as so many students of Bible plants have attested that this the caper bush, this spiny shrub, *Capparis spinosa*, deserves some attention here.



Caper bush on a wall in the ruins of Byblos, present-day Jbail, Lebanon, in April. The whitish branches are caper bush stems persistent from the winter when, unlike most plants in a Mediterranean climate, caper bush loses its leaves.

Widespread and conspicuous, it is surprising that caper is not mentioned more frequently in the scriptures. Found throughout much of western Asia as far east as China, around the Mediterranean, and parts of Africa and Australia, caper bush is a sprawling, low shrub with rounded, gray green leaves and stems viciously armed with spines. The flowers are large and showy and open in the evening to be pollinated by moths. Flowers arise from spherical buds, which are the capers of commerce valued for their pungent, distinct flavor. The fruits bear a fanciful resemblance to human testes, and for this reason, caper was suggested as an aphrodisiac, likely the reason it is included in Ecclesiastes. However, in an extensive review of the medical uses of *Capparis spinosa*, aphrodisiacal use is minor, regional, and restricted to the flowers, not the fruits (Jiang et al., 2007). An alternate thought is that the drooping fruits on the shrubs resemble a bowed head, as in old age (Royle, 1880b), an image I find difficult to see.

Carob *Ceratonia siliqua*

[Greek *keration*, a hapax legomenon; Luke 15:16]

The most frequent translation of *keration* is “husk” or “pod,” an adequate description of the fruit of the carob tree, *Ceratonia siliqua*. This is the source of a chocolate substitute as well as locust bean gum, a common food additive.

Carob is widespread around the Mediterranean, and its precise origins remain unknown, though they are perhaps in a hotter, drier climate than where carob is typically found today (Liphshitz, 1987; Zohary and Hopf, 2000). Because it is a valued crop, it may be more abundant now than in ancient times, as evidenced by the archeological record.

It is mentioned only once in the Bible, although there are suggestions that the seeds, which are remarkably uniform in size, were used in ancient times as a measure (*gerah*), as in Exodus 30:13 and Ezekiel 45:12 (Liphshitz,



In addition to flowers, numerous buds – the source of commercial capers – are present. Ahmed Awa, Iraq, in June.



Developing caper fruits. Sertake, Iraq, in June.



Carob, showing the dense pattern of the leaves. Near Ramallah, Palestinian Territory, in June.

1987). In fact, our English word *carat* is derived from the Greek name of this tree (*keration*).

It can be a sizable tree, unique among its Mediterranean congeners in producing flowers directly from the stem. Most trees

are unisexual, so understandably, there has been selection for the female trees in cultivation.

The fruits are long, flat pods containing numerous small seeds separated in the fruit



Carob pods and characteristic seeds. Purchased in the market in Eskisehir, Turkey, where it is used to make a summer drink by soaking the pods in water.



Edge of cedar stand in Chouf Cedar Preserve, Mount Lebanon, in early spring.

by a gummy wall that is the source of much sugar and other carbohydrates. Traditionally, it has been used as fodder, as in the story of the Prodigal Son, in which carob was used to feed pigs. Ironically, what was once provender for swine is now a highly valued natural food.

Cedar of Lebanon *Cedrus libani*

[Hebrew *erez*; Leviticus 14:4, 6, 49, 51, 52; Numbers 19:6; Numbers 24:6; Judges 9:15; 2 Samuel 5:11; 2 Samuel 7:2, 7; 1 Kings 4:33; 1 Kings 5:6, 8, 10; 1 Kings 6:9, 10, 15, 16, 18, 20, 36; 1 Kings 7:2, 3, 7, 11, 12; 1 Kings 9:11; 1 Kings 10:27; 2 Kings 14:9; 2 Kings 19:23; 1 Chronicles 14:1; 1 Chronicles 17:1, 6; 1 Chronicles 22:4; 2 Chronicles 1:15; 2 Chronicles 2:3, 8; 2 Chronicles 9:27; 2 Chronicles 25:18; Ezra 3:7; Job 40:17; Psalms 29:5; Psalms 80:10; Psalms 92:12; Psalms 104:16; Psalms 148:9; Song of Solomon 1:17; Song of Solomon 5:15; Song of Solomon 8:9; Isaiah 2:13; Isaiah 9:10; Isaiah 14:8; Isaiah 37:24; Isaiah 41:19; Isaiah 44:14; Jeremiah 22:7, 14, 15, 23; Ezekiel 17:3, 22, 23; Ezekiel 27:5;



Large cedar in Slunfeh Cedar Preserve, Syria, in June. The multiple trunks on the same tree is a characteristic of cedar of Lebanon.

Ezekiel 31:3, 8, 15; Amos 2:9; Zephaniah 2:14; Zechariah 11:1, 2

Cedar of Lebanon is mentioned about 70 times in the Bible, only in the Old Testament and more than any other forest tree, which is intriguing, considering it never grew within the traditional boundaries of Israel. But in a region of the world where forests were limited, cedar of Lebanon was famed for its beauty and utility. Cedars are still the largest of any indigenous tree in the Middle East, although the populations on Mount Lebanon are a fraction of what they were in biblical days. These massive trees were likely the largest living things that generations of people saw during their lifetimes.

These forest giants project an image of the mighty ruler, as in Ezekiel 31:3, in which the king of Assyria is likened to a cedar: "Behold, Assyria was a cedar in Lebanon, with beautiful branches and forest shade, and of towering height, its top among the clouds" (ESV). Their strength was unequalled, so a measure of divine strength would be the breaking of the cedars, as in Psalms 29:5: "The voice of the Lord breaketh the cedars; yea, the Lord breaketh the cedars of Lebanon" (KJV).

Not only are the trees impressive but their habitat is one of great beauty. Because of its requirement for cool temperatures, cedar of Lebanon is restricted to higher elevations on the Lebanon ridge, where it receives moisture as rain, fog, and snow from the westerly winds off the Mediterranean. The dark green trees and associated plants form a distinct vegetation. This forest beauty and fastness is noted in several verses, for example, Song of Solomon 5:15: "His legs are as pillars of marble, set upon sockets of fine gold: his countenance is as Lebanon, excellent as the cedars" (KJV).

The remoteness of the cedar forest is evident in a lament describing King Jehoiakim, who considered himself lofty and secure. This is illustrated by the allusion to being discovered even in a Lebanese forest: "O inhab-

itant of Lebanon nested among the cedars" Jeremiah 22:23 (ESV).

Beautiful and living in a magnificent setting, the cedars were harvested mercilessly by every invader and used in imperial building projects (Hansman, 1976; Meiggs, 1982). Cedars are slow growing with a solid heartwood and are resistant to decay. They were the largest trees available in western Asia. When Solomon wanted timber for his building projects, he contracted with Hiram, king of Tyre, for the delivery of cedar logs for the construction of both the temple in Jerusalem (1 Kings 5) and his palace (the Palace of the Forest of Lebanon, 1 Kings 7:2).

Cedar of Lebanon was valued as a high-quality timber, so its use reflected on the wealth and power of the monarch. In the days of King Solomon, cedar is recorded as being as common as sycomore trees (*Ficus sycomorus*) in the Shephalah (2 Chronicles 1:15, 1 Kings 10:27). This allusion is obviously not to growing cedars but to the use of the wood, as cedars would not thrive in the Shephalah.

Cedar (*erez*) is prescribed for several offerings, for example, for cleansing the leprous house (Leviticus 14) and for the offering of the red heifer (Numbers 19). This is somewhat problematic as there is little evidence of wood or oil from cedar of Lebanon being used. However, there is ample record of the extracts of the juniper, *Juniperus oxycedrus* or related species, being used. These extracts are utilized throughout much of the juniper's range as a folk medicine, including for the treatment of skin ailments (Oizzo et al., 2007). Both true cedar, *Cedrus libani*, and species of *Juniperus* are confusingly referred to in English as cedar. *J. oxycedrus*, though a shrub or small tree, bears similarity to cedar; perhaps *erez* was applied to it. Meiggs (1982) provides a helpful review of the long-standing confusion between cedar and juniper.

The legacy of cedar of Lebanon not only in the Bible but in other ancient documents and in folk botany is extensive. It is planted in



Cinnamomum verum, cinnamon, on a plantation in southern Sri Lanka in March.

suitable climates around the world. In its eponymous homeland, however, little of the original forest remains. Today, only about 3 percent of the original forest remains on Mount Lebanon, with small populations continuing in Cyprus and Syria and extensive forests in the Taurus Mountains of eastern Turkey.

Cinnamon *Cinnamomum verum*; Also Cassia *C. aromaticum*

[Hebrew *qinnamon*; Exodus 30:23; Proverbs 7:17; Song of Solomon 4:14

[Hebrew *qiddah*; Exodus 30:24; Psalms 45:8; Ezekiel 27:19

[Greek *kinamomon*; Revelation 18:13

As it is today, cinnamon was a valued commodity in biblical times. The present-day

spice known as cinnamon is derived almost exclusively from the bark of the shrub *Cinnamomum verum*, which is considered to be superior in quality to *C. aromaticum*, known as cassia. I find it difficult to distinguish between the aroma of the two, although cassia's aroma is less intense. Cassia (not to be confused with the unrelated genus of legumes) and cinnamon bark can be used as a spice as well as for oil, and oil can also be distilled from the leaves of each.

What is the difference between cassia and cinnamon? Miller (1998) suggests that cassia was more widely used in the ancient world because it had long been cultivated in China. True cinnamon, on the other hand, was collected from the wild in the East Indies and was therefore more precious. Both were extensively traded over well-developed trade routes (Schoff, 1917; Miller, 1998). Perhaps the two terms *qinnamon* and *qiddah* were applied



Stripping bark from cinnamon stems. Cinnamon Research Station, Sri Lanka.



Field of coriander near Tubas, Palestinian Territory, in May.

individually to the product of the leaf or of the stem.

Both cassia and cinnamon are small trees but are grown as shrubs for the bark and leaves. Stems are cut, and the bark is stripped off and dried. Sri Lanka is the world's largest producer of cinnamon.

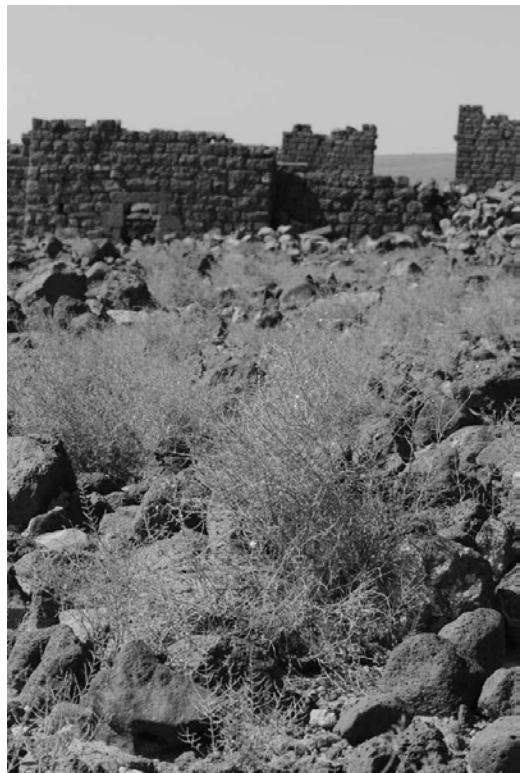
In addition to being a constituent of the anointing oil (Exodus 30:23), cinnamon was valued as a perfume, as in the harlot's bed in Proverbs 7 and the redolent garden of Song of Solomon 4:14. Likewise, cassia's fragrance is highlighted in Psalms 45:8: "All your robes are fragrant with myrrh and aloes and cassia; from palaces adorned with ivory" (NIV).

As a valued object of trade, cassia is mentioned among the merchandise sent to Tyre (Ezekiel 27:19), as is cinnamon in the traffic of Babylon (Revelation 18:13).

Coriander *Coriandrum sativum*

[Hebrew *gadh*; Exodus 16:31; Numbers 11:7

Coriander is planted in late winter and harvested in spring, about the time of the barley



Extensive population of *Haloxylon salicornicum* on the steppe near Diyatha, Syria, in June.



The sweet, white exudate from *Haloxylon salicornicum*. The aphid that induces this is evident as the brown dot on the lowermost branch.

harvest. The seeds are used in a variety of Middle Eastern dishes, especially with meat and rice.

A helpful review of the history of this plant in the Bible is provided by Royle (1880b), who traces its treatment from Celsius to his day. Selection of coriander for *gadh* is based entirely on its widespread use in the Middle East over many centuries, including its seeds (technically fruits) and leaves, the latter of which provide the herb cilantro.

Thus the true identity of *gadh* needs further research. The color of the manna in the wilderness is described as like coriander seed: "The people of Israel called the bread manna. It was white like coriander seed and tasted like wafers made with honey" Exodus 16:31 (NIV). The problem is that coriander seed is not white but brown.

Intimately linked with the problem of the true identity of coriander is the nature of manna. If it were a plant exudate, as favored by several writers (e.g., Moldenke and Moldenke, 1952), it would be white, or certainly whiter than the brown coriander. The comparison with bdellium (Numbers 11:7), either myrrh or frankincense, is likewise of little aid as this would also be white, at least after being transported (see Frankincense).

One product that is manna-like, white and sweet, is the exudate induced by aphids on the common steppe and desert shrub *Haloxylon salicornicum* (*Hammada salicornica* is a synonym), known by the English name "saxaul." Although it is white and sweet, features of manna, it is also very sticky and would be hard to harvest and dry. It is difficult, therefore, to envision it being collected in large



Madder in flower, Eskisehir Province, Turkey, in June.

enough quantities to feed the multitudes of the Children of Israel. Donkin (1980) reviews the various plants that produce mannalike material.

In parts of Iraq and Iran, the lore of manna survives in the names of various candies that may contain exudates similar to those discussed earlier.

Crimson *Rubia tinctoria*

[Hebrew *carmiyl*; 2 Chronicles 2:7, 14; 2 Chronicles 3:14

Dyes are mentioned several times in the Bible: in connection with the skins used to cover the tabernacle (Exodus 25, 26, 35, 36) as well as for the garments of individuals in Isaiah 63:1 and Ezekiel 23:14. Specifics are not

given, but a diversity of dye sources are known from archeological records, including cochineal from an insect, purple from a mollusk, and, what concerns us here, colors from a diversity of plants. These plants are not explicated in the Bible, but some of them are widespread and well known as sources of dyes in ancient times such as woad (*Isatis tinctoria*), whose dye produces an attractive blue color, and madder (*Rubia tinctorum*), whose dye is crimson.

Madder is a low-growing, sprawling plant with asperous leaves and small flowers. This perennial is common in western Asia and around the Mediterranean. Madder is often abundant among rocks and clambering over rock walls.

It is still important as a dye and in the compounding of pigments for painting (Baghalian et al., 2010). The same authors report that it is cultivated and used in making traditional carpets. The dye is obtained from the roots, which are cleaned and dried. They are then ground and put in a mixture of water and alcohol before being applied to the wool of sheep or goats.

Crown of Thorns *Sarcopoterium spinosum*

[Greek *akantha*; Matthew 13:7, 22; Matthew 27:29; Mark 4:7, 18; Mark 15:17; Luke 8:7, 14; John 19:2, 5; 2 Corinthians 12:7; Hebrews 6:8

As noted in the discussion of thistle (*see* Thistle), terms used for armed plants are general and do not indicate any botanical relationship among the plants. For that reason, I believe the plant used to plait the crown of thorns at Jesus's crucifixion is most likely different from the plant in the parable of the sower in Mark 4 and Luke 8 and from the thorns in 2 Corinthians 12 and Hebrews 6.

The most common plant in many areas of the hills around Jerusalem is known in English as spiny burnet, *Sarcopoterium spinosum*, a low, compact, viciously armed plant that can deter grazing by sheep and goats and thus is one



Lower stems and roots of madder, showing the red pigment used for dyes. Eskisehir Province, Turkey, in June.



Hills above Jerusalem (Jerusalem is at upper right). Most of this is spiny burnet, *Sarcopoterium spinosum*. Al Bireh, Palestinian Territory, in February.



Spiny burnet in flower near Latakia, Syria, in April. The pink are the female flowers; the male flowers are not evident. Note the multibranched thorns.

of the few shrubs to survive in heavily grazed areas. It is abundant throughout the Middle East and around the Mediterranean (Ronel et al., 2007). Usually less than 0.5 meter (1.5 feet) tall, it bears small leaves that drop in

times of water stress. Flowers are small and inconspicuous.

The well-developed, often branched thorns are its most notable feature, however. These are borne on stems that are flexible and easily



Chate melon, the cucumber of the Bible, in Thale, Syria, in June. This form of the chate melon is favored when it is quite small.



Chate melons in a market in Suweida, Syria, in June. Note the muskmelon to the left, which botanists usually consider a form of the chate melon.

twisted, lending themselves to being woven into a crude tiara. This flexibility is why Palestinians use the shrubs as coarse brooms for cleaning stables. These two features – abundance in the Judean Hills and flexible stems – make it the most likely candidate for the crown of thorns. There are numerous unrelated plants that have been given the name “crown of thorns,” reflecting their botanical armor rather than any link to the Bible.

In the Old Testament, *S. spinosum* may be one of the translations of the Hebrew *atad* (see Thornbush). The verse in Psalms 58:9, “before your pots can feel the heat of the thorns – whether they be green or dry – the wicked will be swept away” (NIV), suits this inflammable shrub well. Because the branches are thin and its leaves are few, even green bushes burn with a fury. Once again, however, it is important to note that terms for armed plants could apply to a diversity of species.

Cucumber *Cucumis melo* subspecies *melo*.

[Hebrew *qishuim*; Numbers 11:5; *miqshah*, Isaiah 1:8

Translating *qishuim* as “cucumber” is misleading to the average English reader as it calls to mind the well-known cucumber available in every grocery store – long, usually straight, with a green skin. However, the cucumber of the Bible, *Cucumis melo*, is actually a type of melon and a very close relative of the common cantaloupe or muskmelon. Known in English as chate melon, it is seldom seen in North America.

Like its relatives watermelon and true cucumber (*C. sativus*), the chate melon is grown as an annual. It is considered a summer delicacy in parts of the Middle East and has the ability to produce a substantial yield with little water. There are two main types: one is yellow-green, long, and curved and the other is green and thicker. Both have a characteristic fluting. Both are eaten fresh or made into pickles, similar to true cucumbers, but can also be eaten as a cooked vegetable (Andrews, 1958a).

Using linguistics, archeology, and modern history, Paris and collaborators have traced the history of the chate melon from its cultivation in Egypt to its introduction in Palestine, along



Field of cumin in Jordan Valley, Jordan, in spring.

with the selection of longer, more slender cultivars, in contrast to the thicker forms for which the Children of Israel longed in Numbers 11:5 (Paris and Janick, 2008).

Thus inclusion of chate melon in the list of vegetables in Numbers 11 reflects the traditional diet of the time. The only other reference to chate melon is in Isaiah 1:8: “Beautiful Jerusalem stands abandoned like a watchman’s shelter in a vineyard, like a lean-to in a cucumber field after the harvest” (NLT). This reference indicates that chate melon was grown on a large scale and was a crop of value, as indicated by the necessity for a watchman’s shelter in the field.

Cumin *Cumin cyminum*

[Greek *kuminon*, a hapax legomenon; Matthew 23:23]

Cumin (also cummin) is one of the most widely used spices throughout the Mediterranean

region. It is a therefore a highly valued crop that is planted in winter and matures in early spring. The short plants are attractive when the white flowers appear. Adaptable, it can be grown with little water.

The short plants are harvested and then threshed for the seeds (technically fruits). One of the strongest spices in the region, cumin contains oils that help carry the pungency so desirable in a variety of dishes.

Jesus strongly rebuked the Pharisees for their showy tithing of cumin: “Woe to you, scribes and Pharisees, hypocrites! For you tithe mint and dill and cumin, and have neglected the weightier matters of the law: justice and mercy and faithfulness” (Matthew 23: 23, ESV). Before refrigeration, food preservation often relied on salt, drying, or spices. For example, putting spices, including cumin, in butter helps preserve it (Arslan et al., 2009).



Mature cypress grove maintained as part of a shrine at Ain Al Crumb, Syria, in June.



The two growth forms of cypress, *Cupressus sempervirens*, at the ruins of Ephesus (modern Efes, Turkey). The narrow (fastigate) form was widely distributed in the Roman era, whereas the form with longer branches is thought to be the typical form of cypress forests.

Spices were thus in demand and expensive: a show of spices indicated wealth, and so spices were flaunted by the Pharisees.

Like other Mediterranean spices, cumin is now very popular for its health benefits, especially in Asian countries, from which emanates much research on the use, chemistry, and health benefits of spices.

Cypress *Cupressus sempervirens*

[Hebrew *berothim*; 2 Samuel 6:5; 1 Kings 5:8, 10; 1 Kings 6:15, 34; 1 Kings 9:11; 2 Kings 19:23; 2 Chronicles 2:8; 2 Chronicles 3:5; Psalms 104:17; Song of Solomon 1:17; Isaiah 14:8; Isaiah 37:24; Isaiah 41:19; Isaiah 44:14; Isaiah 55:13; Isaiah 60:13; Ezekiel 27:5–6; Ezekiel 31:8; Hosea 14:8; Nahum 2:3; Zechariah 11:2

I am ascribing the use of *berothim* to cypress based on the value of this wood in the construction of ancient buildings, as recorded by Meiggs (1982) and as indicated by the generally inferior quality of pinewood from species that are fire adapted (*see* Pine).

Cypress is a gymnosperm tree that is widespread around the Mediterranean, where it has been used for construction of buildings, idols, and ships for millennia because of its durable wood and fine grain. Very little remains of natural stands of cypress. As recently as the mid-1800s, when the Austrian botanist Kotschy visited Lebanon (Meiggs, 1982), he found large stands of native cypress, of which only vestiges remain. It was also widely planted as an ornamental because of its attractive shape and evergreen condition. Since the time of the Romans, the narrow form of the tree has been selected, while it is generally assumed that the most frequent growth form had spreading branches (Farjon, 2005). This form can grow into a very large tree, comparable to cedar of Lebanon. Like its relative the juniper, cypress has a somewhat fleshy cone, globose in shape, that opens to release the winged seeds.

Cypress was a prominent timber in the construction of Solomon's temple (1 Kings 5 and 6) and was obtained by contract with Hiram,



Mature female cones of cypress. Three stages of maturity are evident: open, last season, and present season. Male cones are borne earlier in spring and, unlike the female, drop from the tree. Ein Al Crumb, Syria.

king of Tyre. It was used for paneling and flooring (1 Kings 6:15). The doors of Solomon's temple were constructed of cypress, a frequent use of this wood in the ancient Near East (Meiggs, 1982).

Some translations use "pine" rather than "cypress" (NIV) or "fir" (ASV). I believe the textual evidence favors "cypress" for several reasons. First, cedars and cypress were historically found in the same regions but at different altitudes. Cypress grows in a zone below that of the cedar, though natural stands of cypress are now very rare. This zonation is intimated in 2 Kings 19:23 and Isaiah 37:24, where both cypress and cedar are grow-

ing in Lebanon. Second, true fir, *Abies cilicica*, is restricted in its Levant distribution. The use of cypress wood in ancient shipbuilding is well documented, for example, as suggested by Giachi et al. (2003) and in Ezekiel 27:5: "You were like a great ship built of the finest cypress from Senir. They took a cedar from Lebanon to make a mast for you" (NLT). Other uses included spear making (Nahum 2:3).

The beauty of cypress was appreciated by the ancients, as it is today. In a description of the beauty of Lebanon, cypress is mentioned (Isaiah 60:13). In Zechariah 11:2, cypress is one of a guild of glorious trees.

D

Date Palm *Phoenix dactylifera*

[Hebrew *tamar*; Exodus 15:27; Leviticus 23:40; Numbers 24:6; Numbers 33:9; Deuteronomy 34:3; Judges 1:16; Judges 3:13; Judges 4:5; 1 Kings 6:29, 32, 35; 1 Kings 7:36; 2 Chronicles 3:5; 2 Chronicles 28:15; Nehemiah 8:15; Psalms 92:12; Song of Solomon 7:7, 8; Isaiah 9:14; Isaiah 19:15; Ezekiel 40:16, 22, 26, 31, 34, 37; Ezekiel 41:18, 19, 20, 25, 26; Hosea 9:13; Joel 1:12; John 12:13; Revelation 7:9

In structure, the date palm is unique among Middle Eastern trees. The single tall, unbranched trunk with immense leaves often over 2 meters (6 feet) long makes a striking figure, especially when in a desert with little other vegetation. Not only is the date palm beautiful but it is the basis of existence in desert regions, providing construction material with leaves for thatching, logs for construction (although the trunk is of little value as sawn timber), and shade. In short, it is an icon of desert civilization, one of the reasons it is the most frequently mentioned plant in the Quran.

The imagery of the date palm, *Phoenix dactylifera*, is used in both the Old and New Testaments. This tree is also the basis for geographic names of sites with groves of palm trees. For example, Jericho is referred to as the “city of palm trees” (Deuteronomy 34:3; Judges 1:16, 3:13; 2 Chronicles 28:15), no doubt because of the oases there as well as the distinct climate – hot and dry. Elim (Exodus 15:27), one of the first stops after the Children of Israel crossed the Red Sea, was characterized

by 70 palm trees. Such habitations were objects of beauty; Balaam likens Israel to a large palm grove (Numbers 24:6). Tadmor (from *tamar*), modern-day Palmyra in Syria, is a date palm oasis captured and fortified by Solomon (2 Chronicles 8:4).

Use of the massive leaves of the palm for thatching is implied in Leviticus 23:40 with the festival of Succoth and the building of booths, particularly interesting considering the long-established use of palm thatch in the Middle East up to the present.

Remarkably little is recorded in the Bible about the eating of dates. Perhaps this is not surprising because many other sources of food were available, unlike in a desert situation. For example, date palm is not mentioned in the list of the six species of the land in Deuteronomy 8:8, although it is included in the list of plants that perished in Joel 1:11–12, clearly indicating that it was an important food source. Ancient products of the fruits, including wine and a sweet syrup, though not explicitly mentioned, were certainly used in biblical times.

The palm is likened to a righteous person in the well-known verse of Psalms 92:12: “The righteous shall flourish like the palm tree: he shall grow like a cedar in Lebanon” (KJV). This imagery is clear – a tall, straight tree, able to survive in the most trying circumstances yet fruitful year after year. Song of Songs suggests this in 7:7 as well. Isaiah refers to the palm branch as the “honored man” (Isaiah 9:14–15 ESV). Representing the honored or upright



Date palm in the Gezira Oasis, northern Hajjar Mountains, Oman, in February.

person may be why the palm is mentioned as the site where Deborah held court (Judges 4:5) and why the palm is such an important ornament in both the temple of Solomon (1 Kings 6:29, 7:36; 2 Chronicles 3:5) and

Ezekiel's temple (Ezekiel 40:16, 41:18). The reference in Hosea 9:13 is variously translated and may not be the palm.

The best-known passage mentioning the date palm is the one describing Jesus's



Date palm in the Jimi Oasis, El Ein, United Arab Emirates, in October.



Wild date palms in Wadi Mayz, northern Hajjar Mountains, Oman, in October.



The finely dissected leaves are the source of the herb known as dill weed. These plants are just starting to flower.

triumphal entry into Jerusalem, when palm branches were cut and placed in his path (John 12:13). The people who did this would certainly have known of the imagery of the palm. This same imagery is found in the last reference to this tree in Revelation 7:9.

Dill *Anthemum graveolens*

[Greek *anethon*, a hapax legomenon; Matthew 23:23]

Matthew's account of Jesus's excoriating the Pharisees is the only place where dill is mentioned. It is sometimes translated as "black cumin" in Isaiah 28 (see Black Cumin). There is ample evidence that dill was used in biblical times both for its leaves and its fruits (Murray, 2000a). Anise, *Pimpinella anisum*, is used for *anethon* in the KJV and ASV but was unknown in biblical days.

Just which part of the dill plant was used for tithing is not clear, but it is likely that it was the fruits because cumin – mentioned in the same verse – is used almost exclusively for its fruits, unlike rue and mint. The fruits would also be easier to store.

Cultivation of dill is similar to that of cumin, although dill matures about a month later and requires better soil and more water.

Dove's Dung

[Hebrew *chirionim*, a hapax legomenon; 2 Kings 6:25: "And there was a great famine in Samaria, as they besieged it, until a donkey's head was sold for eighty shekels of silver, and the fourth part of a kab of *dove's dung* for five shekels of silver" (ESV)]

No Bible vegetable has been subject to such wildly varying interpretation, ranging from the literal droppings of doves or their offal



Dill “seed” purchased as a spice.

(Harris, 1824) to the bulbs of the lilylike star of Bethlehem (*Ornithogalum umbellatum*) (Moldenke and Moldenke, 1952) to the seeds of carob (*Ceratonia siliqua*) (Harrison, 1966) and

chickpea (*Cicer arietinum*) (Carpenter and Abbott, 1833). Further confusing the identity of the dove’s dung is its link with the donkey’s head. This bizarre and at first glance inedible



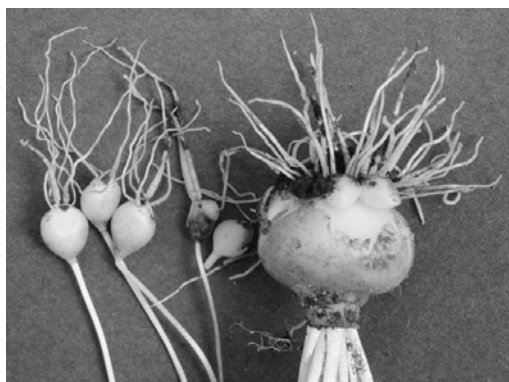
Varieties of chickpeas. The large, pale seeds in the middle are the *kabuli* type, a more recently derived form, whereas the small black seeds above and the row of brown seeds below are the *desi* type. *Desi* was the most widely planted variety in ancient times and bears a closer resemblance to pigeon dung than the *kabuli* chickpea.



Star of Bethlehem, *Ornithogalum umbellatum*, a spring-flowering bulbous ornamental common both in natural areas of the Middle East and in gardens. May.

cuisine may have resulted from an extreme famine in Samaria.

The use of animal dung for food is, at best, highly unlikely. If there was an adequate amount of pigeon droppings, why not just eat the pigeons, a well-known food and a delicacy even now in parts of the Middle East? The second choice for dove's dung is star of Bethlehem, which produces numerous small bulblets reported to be edible after boiling. There are various references to the edibility of this plant but an equal number to its toxicity. Although it is common and well known by local people throughout the Middle East, I know of no report of it being eaten. Third, the respected philologist Harrison (1966) suggests that *chirionim* is a corruption of the word for "carob," and because the fruits of carob are a



The bulb of star of Bethlehem produces numerous bulblets at the base of the bulb, an effective form of asexual reproduction and also the purported source of the food known as dove's dung because of their resemblance to the droppings of doves.

known source of food for the poor and destitute (i.e., the Prodigal Son in Luke 15), "carob" is a plausible translation.

The fourth choice appears to me to be the most parsimonious and logical. Chickpea, also known as garbanzo bean, is an ancient and well-known crop in the Middle East. When dry, the beans resemble pigeon droppings, a similarity masked in recent years by unfamiliarity with an ancient strain of the crop. There are two main strains of chickpea: the *desi* type and the *kabuli* type (Singh and Saxena, 1999). Of the two, the *desi* is the most ancient and is likely the type that was grown in biblical days. It clearly bears resemblance to dove's dung.

Some support for this is found in the work of Meyer (1980), where remains from seeds carbonized by the eruption of Vesuvius in A.D. 79 were recovered. Among these were chickpeas. Meyer illustrates these, along with an image of modern chickpeas. Tantalizingly, he records one of the common names of *C. arietinum* as "dove pea."

E



Ebony, *Diospyros ebenum*, in the Royal Botanic Garden, Perideniya, Sri Lanka, in March.

Ebony *Diospyros ebenum*

[Hebrew *hoben*; Ezekiel 27:15; “The men of Rhodes traded with you, and many coastlands

were your customers; they paid you with ivory tusks and ebony” (NIV)

Ezekiel 27 is a wonderful look into trade and merchandise in the eastern Mediterranean. Among the material that arrived in Tyre were articles from the Far East, including ebony.

The wood in this verse has uniformly been translated as “ebony,” *Diospyros ebenum*, a native of India and Sri Lanka, or a related species. An unrelated tree, *Dalbergia melanoxylon*, is sometimes referred to as ebony, but it

is African in origin and seldom grows to the size of true ebony. Likewise, there are other trees with heavy, dark wood that are called ebony.

Ebony is one of the heaviest woods and is jet black, which makes it a prized source for furniture and artifacts. Ancient trade in ebony between the Far East and the Middle East is well documented (Schoff, 1917; Meiggs, 1982).

F



Fig in flower near Chami Razan, eastern Iraq, in late March. Note the developing leaves; fig is one of the last trees to leaf in spring.

Fig *Ficus carica*

[Hebrew *teen*, *teenah*; Genesis 3:7; Numbers 13:23; Numbers 20:5; Deuteronomy 8:8; Judges 9:10, 11; 1 Samuel 25:18; 1 Samuel 30:12; 2 Samuel 16:1; 1 Kings 4:25; 2 Kings 18:31; 2 Kings 20:7; 1 Chronicles 12:40; Nehemiah 13:15; Psalms 105:33; Proverbs 27:18; Song of Solomon 2:13; Isaiah 9:10; Isaiah 28:4; Isaiah 34:4; Isaiah 36:16; Isaiah 38:21; Jeremiah 5:17; Jeremiah 8:13; Jeremiah 24:1, 2, 3, 5, 8; Jeremiah 29:17; Hosea 2:12; Hosea 9:10; Joel 1:7, 12; Joel 2:22; Amos 4:9; Amos 7:14; Micah 4:4; Micah 7:1; Nahum 3:12; Habakkuk 3:17; Haggai 2:19; Zechariah 3:10

[Greek *sukon*; Matthew 7:16; Matthew 21:19, 20, 21; Matthew 24:32; Mark 11:13, 20, 21; Mark 13:28; Luke 6:44; Luke 13:6, 7; Luke 21:29; John 1:48, 50; James 3:12; Revelation 6:13

There is little controversy regarding the identity of the common fig, *Ficus carica*, such an important component of the agricultural system of the Levant and most of the Mediterranean. Fig is now planted throughout much of the world but is native to the Mediterranean basin (Zohary and Hopf, 2000).

Fig is a tree, although some cultivars are more shrublike and long-lived. The wood is of



A fig syconium split to show the tiny flowers lining the cavity. The scales at the top provide access to insects for pollination.

little value and subject to decay (Giachi et al., 2003). Although the fruits are well known, few students of the Bible have ever seen the flowers because they are hidden inside a specialized receptacle, the syconium (from the Greek word for “fig”). This walnut-sized structure contains unisexual flowers, with both male and female located in the same syconium. The pollination of the female flowers is one of the classic examples of highly specialized insect-plant relationships: the female wasp enters the syconium, is fertilized by the male wasp, leaves the original syconium to find one that is suitable for depositing eggs, and, in so doing, pollinates the flowers (Verkerke, 1989). Modern varieties of fig are not dependent on the wasps.

The first fruits develop in summer, with continued production (in different varieties) until late autumn. These have to be harvested when ripe, or they will fall from the tree, hit the ground, and then spoil, as in Isaiah 34:4. “All thy strong holds shall be like fig trees with the firstripe figs: if they be shaken, they shall even fall into the mouth of the eater” (Nahum 3:12 KJV). The same figure is used in the New Testament in Revelation 6:13.

Of the fruit trees mentioned in Deuteronomy 8:8, where the five species of the land are recorded, the fig fruit has the highest sugar content. This is noted in several scriptures. In the botanical lecture by Jotham in Judges 9:11a,

the fig tree states, “Should I give up my fruit, so good and sweet?:12–14” (NIV). When the Egyptian soldier is abandoned in 1 Samuel 30, one of the foods he is given to resuscitate him is dried figs, which would have a good supply of sugar. For this reason, a poultice of figs was used to draw out the boil from King Hezekiah (Isaiah 38:21).

Because they can be readily dried, figs were the equivalent of trail mix in biblical days. Abigail presented them to David (1 Samuel 25:18), and they were available when people traveled from northern Israel to Hebron to make David king (1 Chronicles 12:40).

Because they are relatively easy to grow and provide a consistent yield, each household would have had a fig tree, a matter of food security. This is alluded to in Zechariah 3:10, where it is stated that every man will have his own fig tree and grape vine. Figs and grapes are conjoined as an agricultural guild in several verses in addition to the preceding one, including Habakkuk 3:17 and Haggai 2:19.

The incident of Jesus cursing the fig tree in Mark 11:12–14 is perplexing: “The next day as they were leaving Bethany, Jesus was hungry.



Developing figs and full, expanded leaves. Island of Chios, Greece, in June.



Commercial field of flax, Stutsman County, North Dakota, in July.

Seeing in the distance a fig tree in leaf, he went to find out if it had any fruit. When he reached it, he found nothing but leaves, because it was not the season for figs" (NIV; see also Matthew 21). As this was in spring around the time of Passover, no figs would have been ready. In fact, the fig tree is the last of the fruit trees to produce leaves, and even in early spring, no leaves are evident. Why, then, was the fig tree cursed?

Hiers (1968) posits that Jesus was expecting to "find fruit on the fig tree because he was expecting the messianic age to begin" for in that era, figs would always be in season. The other place that unripe figs are mentioned is in Song of Solomon 2:13: "The fig tree forms its early fruit; the blossoming vines spread their fragrance" (NIV). Here the image is clear: the young figs start developing about the time the fragrant grape flowers appear.

Jesus also refers to the phenology of the fig tree in Luke 21 and Mark 13. Reminiscent of Jotham's parable of the trees in Judges 9, Jesus

tells his listeners to "look at the fig and all the trees. When they sprout leaves, you can see for yourselves and know that summer is near" (Luke 21:29–30 NIV). Obviously, the late leafing of the fig was well known.

Flax *Linum usitatissimum*

[Hebrew *pisteh*; Exodus 9:31; Leviticus 13:47–48, 52, 59; Deuteronomy 22:11; Joshua 2:6; Judges 15:14; Judges 16:9; Proverbs 31:13; Isaiah 19:9; Jeremiah 13:1; Ezekiel 40:3; Ezekiel 44:17–18; Hosea 2:5, 9

Pisteh is used interchangeably for the plant as well as the linen product. In the New Testament, there are about a dozen references to linen, but the flax plant is not mentioned. The fruit is a capsule, producing the well-known flaxseed, also called linseed.

Along with barley, flax is the oldest known food (Zohary and Hopf, 2000), although in the Bible, it is mentioned only in connection with linen, the fabric produced from the strong



Field of flax with developing capsules almost ready to be harvested. Oromia State, Ethiopia, in October.

fibers in the stem. It is an annual with sky blue flowers.

To obtain the fibers, the flax is soaked in water until a kind of controlled decay, termed *retting*, releases the fibers from the softer surrounding tissues. The fibers are then washed and dried. Alternatively, the bundled stems can be allowed to ret with moisture from dew. This could be the method employed by Rahab in Joshua 2. Although flax was a well-known crop in ancient times (e.g., Abbo et al., 2009) it is no longer commercially planted in the Levant.

Linen, the fabric produced by flax, is strong, durable, and cool. Linen was prescribed for the garments of the priests (Leviticus 13, Ezekiel 44). It was the only available fabric other than wool and is mentioned more than 100 times in the Bible. Especially valued was the high-quality linen from Egypt known as byssus (Isaiah 19).

Because neither silk nor cotton were well known before Roman times, it could be that byssus is intended in Ezekiel 16:10: “I wrapped you with fine linen and covered you with silk” (NASB). Although the fine linen, *shesh*,

seems clear enough, it is not certain how *meshiy* should be translated.

Some translations use “cotton” when describing the trappings of the palace in Susa, where the story of Esther is set. “The courtyard was beautifully decorated with white cotton curtains and blue hangings” (Esther 1:6a, NLT; ESV also uses “cotton”). As noted earlier, cotton was not generally available until Roman times. In this passage, the usual word for “flax” *pisteh*, is used, as it is in Isaiah 19:9, where ESV translates it as “cotton.”

Flower of the Field *Papaver rhoeas*

[Hebrew *tsits*; Exodus 25:31, 33, 34; Exodus 37:17, 19, 20; Numbers 8:4; 1 Kings 6:18, 29, 32, 35; 1 Kings 7:26, 49; 2 Chronicles 4:5, 21; Job 8:12; Job 14:2; Psalms 103:15; Song of Solomon 2:12; Isaiah 5:24; Isaiah 18:5; Isaiah 28:1, 4; Isaiah 40:6, 7, 8

[Greek *anthos*; James 1:10, 11; 1 Peter 1:24

The Hebrew and Greek words are the general terms used to describe flowers and so are applied to various different species of plants.



Field poppy, *Papaver rhoeas*, at the ruins of Ephesus (modern-day Efes, Turkey) in June, showing open flowers and developing capsules.

In some cases, it is possible to suggest a definite plant, as in Isaiah 40 – “A voice says, ‘Cry!’ And I said, ‘What shall I cry?’ All flesh is grass, and all its beauty is like the flower of the field. The grass withers, the flower fades when the breath of the Lord blows on it; surely the people are grass. The grass withers, the flower fades, but the word of our God will stand forever” (ESV) – and James 1:11: “For the sun rises with its scorching heat and withers the grass; its flower falls, and its beauty perishes. So also will the rich man fade away in the midst of his pursuits” (ESV).

The plant best fitting this description is the widespread and abundant field poppy, *Papaver rhoeas*, which opens in the morning and, by mid-afternoon, begins to shed its petals, a clear image of the transitory nature of human life. Although the poppy is the best fit for these verses, it is not possible to state this authoritatively, and other plants could be included. What does seem clear, however, is that true grasses (members of the family Poaceae) are not intended. Grasses have

small, green, inconspicuous flowers that could hardly be an image of “beauty.”

Frankincense *Boswellia* Species

[Hebrew *lebonah*; the Arabic is similar: *luban*; Exodus 30:34; Leviticus 2:1, 2, 15, 16; Leviticus 5:11; Leviticus 6:15; Leviticus 24:7; Numbers 5:15; Nehemiah 13:5, 9; Song of Solomon 3:6; Song of Solomon 4:6, 14; Isaiah 43:23; Isaiah 60:6; Isaiah 66:3; Jeremiah 6:20; Jeremiah 17:26; and 140 other references

Frankincense trees, species of the genus *Boswellia*, are frequent in the arid regions of the southern Arabian Peninsula and north-eastern Africa, with some species extending farther east (Martinetz et al., 1989). They have large compound leaves that drop during the dry season. During that season, the attractive, small pink flowers appear.

[Greek *libanos*; Matthew 2:11; Revelation 18:13

The Hebrew word *qetoreth* is used for “incense” in numerous places in the Old Testament and, by implication, could include frankincense.



Frankincense tree, *Boswellia papyrifera*, near Adearc, Ethiopia, in October, just at the end of the growing season, when a few leaves remain on the tree. The papery nature of the bark of this frankincense species is evident.



Incising the frankincense tree using a sharp rock. Near Adearc, Ethiopia, in October.

It does not, however, occur in the Middle East, yet it was imported in large quantities and was therefore a familiar item of commerce (Groom, 1981). This trade continued into the New Testament era, when frankincense is recorded as a luxury item of value (Revelation 18:13).

Although it is not possible to state unequivocally which species were the source of the frankincense used in biblical days, two species predominate in the frankincense trade: *B. sacra* and *B. papyrifera*. The latter is the preferred for the incense trade with Oman, the largest producer, although *B. papyrifera* is also used



Myrrh (species of *Commiphora* unknown) on left, showing the characteristic red color of the resin. Frankincense (likely *Boswellia papyrifera*) on right.

and harvested widely in Sudan and Ethiopia. I cannot discriminate between the fragrance of these two.

The utility of the tree is in the latex, the white-colored sap that exudes when the bark is incised and dries to a clear white to yellow color. After the bark is incised, either through cutting or simply by gashing with a stone, the thick, milky latex oozes and dries and is collected a few days later. This resin is the frankincense of commerce.

In the Bible, the only use for frankincense is as incense, and the two terms are interchangeable in some verses. Harvey (2006) traces the use of frankincense in the early church, noting that the quality of the air (i.e., the scent) was considered to be an important health factor. Although the chief value of frankincense lies in its use as a fumitory incense, it is also valued as a medicine by local people and is being studied as the source of new medicines (Moussaieff and Mechoulam, 2009).

G

Galbanum *Ferula* Species

[Hebrew *chelbenah*; Exodus 30:34]

The identity of the plant that provided this component of the holy incense remains mysterious, but most scholars consider it an extract of plants from the genus *Ferula* (also known as *Ferulago*), a member of the Apiaceae, the family of dill, cumin, and other spices. These are attractive plants, being tall with large masses of usually bright yellow flowers. There are many species in western Asia and around the Mediterranean, plants that have provided medicine and flavorings for millennia. The resin is used; it is unusual among plant resins in being harvested from the cut roots (Langenheim, 2003). Asafoetida, a well-known flavoring of Indian cuisine, for example, is derived from *F. assa-foetida*.

Galbanum was one of several ingredients in the holy incense, along with frankincense, stacte (see Myrrh), and “sweet spices” (about which little, if anything, is known). Even today, galbanum, chiefly from Iran, is used in the perfume industry.

Gall *Conium maculatum*

[Hebrew *rosh*; Deuteronomy 29:18; Deuteronomy 32:32, 33; Job 20:16; Psalms 69:21; Jeremiah 23:15; Lamentations 3:5, 9; Amos 6:12; Hosea 10:4]

[Greek *chole*; Matthew 27:34; Acts 8:23]

Several indigenous plants would fit the description of gall, meeting the requirement



Species of Galbanum in Cyprus in April.

by tasting like bile. The verses in Job 20:16 and Lamentations 3 obviously refer to this bodily fluid and not a plant product. Candidates for gall from plants are opium poppy (*Papaver somniferum*), golden henbane (*Hyoscyamus aureus* and other species in that genus), and poison hemlock (*Conium maculatum*). Of these, the most likely is poison hemlock.

Found throughout most of western Europe and western Asia, this is a perennial plant that grows to 3 meters (9 feet) tall and produces masses of small flowers on flattened heads in



Large poison hemlock plant along an irrigation canal near Antakya (biblical Antioch), Turkey, in April. The purple blotching on the stems and developing fruits are evident.

the spring. The stem of the plant has purple blotches, and the entire plant has a distinct odor something like carrots and parsley, relatives in the same family. Poison hemlock is most common in wet areas such as the margins of ditches and irrigation canals. In the summer, the seeds (technically fruits) are produced and bear a dangerous resemblance to celery seed, cumin, and related spices in the same family. All parts of the plant contain the deadly toxin, coniine, which is a central nervous system poison, though it is especially concentrated in the seeds. This toxicity is no doubt why *rosh* is simply translated as “poison,” as in Jeremiah 23:15 and Amos 6:12b: “You have turned justice into poison” (ESV).

The weediness of poison hemlock is evidenced in Hosea 10:4. The KJV is one of the few versions to translate *rosh* in this verse as

“hemlock,” perhaps because poison hemlock would have been familiar to those translators, and Socrates’ suicide by drinking a decoction of poison hemlock would also be well known to them.

The incident with Socrates helps us in understanding Matthew 27:34: “There they offered Jesus wine to drink, mixed with gall; but after tasting it, he refused to drink it” (NIV). The coniine in the plant destroys the central nervous system and thus would be analgesic. The soldiers may also have wanted to speed the death of Jesus.

A second candidate for *rosh* and *chole*, though in my opinion less likely, is the opium poppy. Now widely grown in western Asia, this poppy produces various opiates (morphine, codeine) and the poppy seeds used in cooking. There is little evidence for the widespread cultivation of opium poppy in the ancient Middle East.

Garlic *Allium sativum*

[Hebrew *shom*, cognate with the modern Arabic *thom*, a hapax legomenon; Numbers 11:5: “We remember the fish we ate in Egypt that cost nothing, the cucumbers, the melons, the leeks, the onions and the *garlic*” ESV.

Garlic, *Allium sativum*, is perhaps the most widely used flavoring for main courses in the eastern Mediterranean, just as it was in ancient times, at least in Egypt (Murray, 2000a). Unlike its relatives leek and onion, garlic rarely produces seed and so must be grown from the bulbils (daughter bulbs) formed at the base of the plant. In the Levant, the segments of the bulb, known as cloves, are planted in winter, then dug up in late spring or early summer and allowed to dry.

The origin of garlic is poorly understood (Zohary and Hopf, 2000), although recent research suggests that both garlic and leek are related to the widely distributed native *A. ampeloprasum* (Hirscheegger et al., 2009).



Field of opium poppies grown for production of medicines, Yazillkaya, Eskisehir Province, Turkey, in June. This species has variably colored flowers; most of the plants grown for opium production have white flowers.

Gourd, Wild Colycinth *Citrullus colycinthis*

[Hebrew *paqim*; 1 Kings 6:18; 1 Kings 7:24; 2 Kings 4:39; 2 Chronicles 4:3]

A relative of the watermelon (*see* Watermelon), colycinth (*Citrullus colycinthis*) is, however, a bitter cathartic. Just the slightest taste makes the tongue numb. This is the reason why there was alarm when it was found that colycinth, inadvertently collected, was found in a cooking pot for a meal Elisha was preparing for the sons of the prophets (2 Kings 4:39).

This vine is common throughout the Middle East in open, dry areas and has attractive, small yellow flowers that develop into round, hard fruits. When young, these have attractive stripes on them, which may be the reason they were used as a motif in Solomon's temple (1 Kings 6:18; 1 Kings 7:24; 2 Chronicles 4:3). As they ripen, the gourds become light brown. The numerous seeds resemble pumpkin seeds and are used as a food in various African



Field of garlic in Wadi Jhannem, northern Lebanon, in March.



Ripening gourd near Madeba, Jordan, in May.

dishes. I know of no records of the seeds being consumed in the Middle East, although there are sparse references to oil being extracted from the seeds (Murray, 2000).

The dried fruits are widely used in the Middle East as a medicine.

Grape *Vitis vinifera*

[Hebrew *eneb* (grape); Genesis 40:10, 11; Genesis 49:10, 11; Leviticus 19:10; Leviticus 25:5; Leviticus 26:5; Numbers 6:3, 4; Numbers 13:20, 23, 24; Numbers 20:5; Deuteronomy 23:24; Deuteronomy 24:21; Deuteronomy 28:39; Deuteronomy 32:14, 32; Judges 8:2; Judges 9:27; Judges 13:14; Nehemiah 13:15; Job 15:33; Psalms 80:12; Isaiah 5:2, 4; Isaiah 18:5; Isaiah 24:13; Isaiah 32:10; Isaiah 62:9; Isaiah 65:8; Jeremiah 6:9; Jeremiah 8:13; Jeremiah 18:13; Jeremiah 25:30; Jeremiah 31:29, 30; Jeremiah 48:32; Jeremiah 49:9; Ezekiel 18:2; Hosea 3:1; Hosea 9:10; Joel 3:13; Amos 9:13; Obadiah 1:5; Micah 6:15; Habakkuk 3:17; Matthew 7:16; Luke 6:44; 1 Corinthians 9:7; James 3:12; Revelations 14:18, 19

[Hebrew *yayin* (vine); Genesis 9:20, 21, 24; Genesis 14:18; Genesis 19:32, 33, 34, 35; Genesis

27:25, 28, 37; Genesis 40:9, 10; Genesis 49:11, 12, 22; Exodus 22:5; Exodus 23:11; Exodus 29:40; Leviticus 10:9; Leviticus 19:10; Leviticus 23:13; Leviticus 25:3, 4, 5, 11; Numbers 6:20; Numbers 15:5, 7, 10; Numbers 18:12; Numbers 20:17; Numbers 21:22; Numbers 22:24; Numbers 28:14; Deuteronomy 6:11; Deuteronomy 7:13; Deuteronomy 8:8; Deuteronomy 11:14; Deuteronomy 12:17; Deuteronomy 14:23, 26; Deuteronomy 18:4; Deuteronomy 20:6; Deuteronomy 22:9; Deuteronomy 23:24; Deuteronomy 24:21; Deuteronomy 28:30, 39, 51; Deuteronomy 29:6; Deuteronomy 32:32, 33, 38; Deuteronomy 33:28; Joshua 24:13; Judges 9:12, 13; Judges 13:4, 7; Judges 14:5; Judges 15:5; Judges 19:19; Judges 21:20, 21; Ruth 2:14; 1 Samuel 1:14, 15, 24; 1 Samuel 8:14; 1 Samuel 10:3; 1 Samuel 16:20; 1 Samuel 22:7; 1 Samuel 25:18, 37; 2 Samuel 13:28; 2 Samuel 16:1, 2; 1 Kings 4:25; 1 Kings 21:1–18; 2 Kings 4:39; 2 Kings 5:26; 2 Kings 18:31, 32; 2 Kings 19:29; 2 Kings 25:12; 1 Chronicles 9:29; 1 Chronicles 12:40; 1 Chronicles 27:27; 2 Chronicles 2:10; 2 Chronicles 2:15; 2 Chronicles 11:11; 2 Chronicles 26:10; 2 Chronicles 31:5; 2 Chronicles 32:28; Ezra 6:9; Ezra 7:22; Nehemiah 2:1; Nehemiah 5:3, 4, 5, 11, 18; Nehemiah 8:10; Nehemiah 9:25;



Seeds of colycinch, *Citrullus colycinchis*, in a market in Kano, Nigeria, where it is sold to be ground and added to stews.

Nehemiah 10:37, 39; Nehemiah 13:5, 12; Esther 1:7, 10; Esther 5:6; Esther 7:2, 7, 8; Job 1:13, 18; Job 15:33; Job 24:6, 18; Job 32:19; Psalms 4:7; Psalms 60:3; Psalms 69:21; Psalms 75:8; Psalms 78:47, 65; Psalms 80:8, 14, 16; Psalms 104:15; Psalms 105:33; Psalms 107:37; Psalms 128:3; Proverbs 3:10; Proverbs 4:17; Proverbs 9:2, 3, 4, 5; Proverbs 20:1; Proverbs 21:17; Proverbs 23:30, 31; Proverbs 24:30; Proverbs 31:4, 6, 16; Ecclesiastes 2:3, 4; Ecclesiastes 9:7; Ecclesiastes 10:19; Song of Solomon 1:2, 4, 6; Song of Solomon 2:13, 15; Song of Solomon 4:10; Song of Solomon 5:1; Song of Solomon 6:11; Song of Solomon 7:2, 8, 9, 12; Song of Solomon 8:2, 11, 12; Isaiah 1:8, 22; Isaiah 3:14; Isaiah 5:1–12, 22; Isaiah 7:23; Isaiah 16:8, 9, 10; Isaiah 17:10; Isaiah 22:13; Isaiah 24:7, 9, 11; Isaiah 25:6; Isaiah 27:2; Isaiah 28:1, 7; Isaiah 29:9; Isaiah 32:12; Isaiah 34:4; Isaiah 36:16, 17; Isaiah 37:30; Isaiah 49:26; Isaiah 51:21; Isaiah 55:1; Isaiah 56:12; Isaiah 61:5; Isaiah 62:8; Isaiah 65:8, 11, 21; Jeremiah 2:21; Jeremiah 5:10, 17; Jeremiah 6:9; Jeremiah 8:13; Jeremiah 12:10; Jeremiah 13:12; Jeremiah 23:9; Jeremiah 25:15; Jeremiah 31:5, 12; Jeremiah 32:15; Jeremiah 35:2, 5, 6, 7, 8, 9, 14; Jeremiah 39:10; Jeremiah 40:10, 12; Jeremiah 48:32, 33;

Jeremiah 51:7; Jeremiah 52:16; Lamentations 2:12; Ezekiel 15:2, 6; Ezekiel 17:6, 7, 8; Ezekiel 19:10; Ezekiel 27:18, 19; Ezekiel 28:26; Ezekiel 44:21; Daniel 1:5, 8, 16; Daniel 5:1, 4, 23; Daniel 10:3; Hosea 2:8, 9, 12, 15, 22; Hosea 4:11; Hosea 7:5, 14; Hosea 9:2, 4; Hosea 10:1; Hosea 14:7; Joel 1:5, 7, 10, 11, 12; Joel 2:19, 22, 24; Joel 3:3; Joel 3:18; Amos 2:8, 12; Amos 4:9; Amos 5:11, 17; Amos 6:6; Amos 9:14; Jonah 4:6, 7, 8, 9, 10; Micah 1:6; Micah 2:11; Micah 4:4; Micah 7:1; Nahum 2:2; Habakkuk 2:5; Habakkuk 3:17; Zephaniah 1:13; Haggai 1:11; Haggai 2:12, 16, 19; Zechariah 3:10; Zechariah 8:12; Zechariah 9:15, 17; Zechariah 10:7; Malachi 3:11; Matthew 20:1–8; Matthew 21:8, 33, 39, 40, 41; Matthew 26:29; Mark 12:1, 2, 8, 9; Mark 14:25; Luke 13:6, 7; Luke 20:9–16; Luke 22:18; John 15:1, 4, 5; 1 Corinthians 9:7; Revelations 14:18

[Greek *staphule* (cluster of grapes); 2 Esdras 16:43; Ecclesiasticus 24:17; Matthew 9:17; Matthew 27:34, 48; Mark 2:22; Mark 15:23, 36; Luke 1:15; Luke 5:37, 38, 39; Luke 7:33; Luke 10:34; Luke 23:36; John 2:3, 9, 10; John 4:46; John 19:29, 30; Acts 2:13; Romans 14:21; Ephesians 5:18; 1 Timothy 3:8; 1 Timothy 5:23; Titus 2:3; Revelation 6:6; Revelation 14:8, 10; Revelation 16:19; Revelation 17:2; Revelation 18:3, 13



A very old vine, grown without a trellis. The pruned branches are evident. Zagros Mountains, eastern Iraq, in March. Recent research suggests that this region may be where grapes were originally domesticated.

[Greek *ampelos* (vine); Matthew 26:29; Mark 14:25; Luke 22:18; John 15:1, 4, 15; Revelation 14:18

[Hebrew *boser* (unripe grape); Jeremiah 31:29; Ezekiel 18:2

The wine grape, *Vitis vinifera*, is the most widely cultivated and economically important fruit crop in the world (Arroyo-Garcia et al., 2006) and has been the subject of intense study for millennia. Grape is the most frequently mentioned plant in the scriptures.



Grapevines growing over a wall near Lebrak, Syria, in June.



All grapes have small, reduced flowers that are very fragrant. *Vitis riparia*, a native North American grape, Virginia Beach, Virginia, in May.

No plant is more intimately associated with Christianity than the grape. In fact, in John 15:1, Jesus calls himself the true vine, an echo of the song of the vineyard in Isaiah 5. The imagery and lore of the grape are therefore well known, as is the chief product of the vine: wine. Wine was an essential part of the diet in ancient times. There are almost 250 references to wine, second only to bread, with 350 references. What concerns us here is the plant and its features rather than its products.

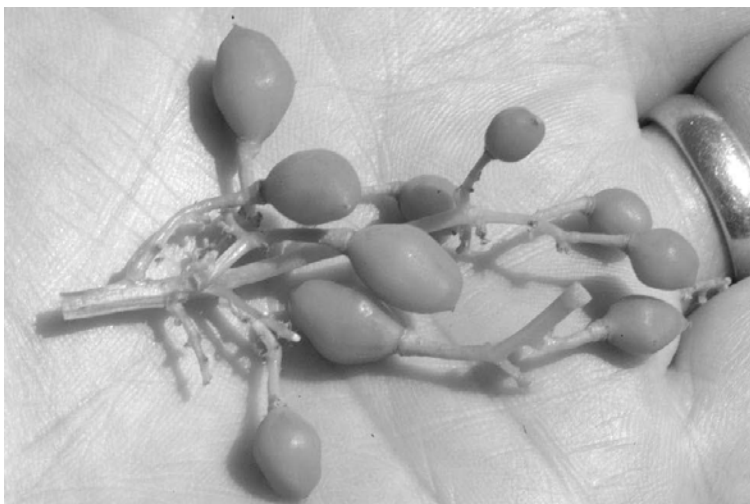
The wine grape, *V. vinifera*, has multiple origins, one in the Near East and the other in the western Mediterranean area (Arroyo-Garcia et al., 2006). Unlike its wild progenitors, the cultivated variety usually produces bisexual flowers, which means that it can be self-fertile, though most propagation is by cuttings (Zohary and Hopf, 2000). It is a woody vine that must be pruned to be productive.

Pruning is done in late winter or early spring, before the grape flowers, as suggested in Song of Solomon 2:12: “For behold, the winter is past, / The rain is over and gone. The flowers have already appeared in the land; / The time has arrived for pruning the vines, / And the voice of the turtledove has been heard in our land” (NASB; most translations have a time of “singing” rather than “pruning”). In any event, pruning must be done early. That is why Isaiah 18:5 states, “For, before the harvest, when the blossom is gone and the flower becomes a ripening grape, he will cut off the shoots with pruning knives, and cut down and take away the spreading branches” (NIV). Pruning at this time would cause damage to the vines. The best-known reference to pruning is in John 15, where Jesus speaks of the necessity of pruning if fruit is to be borne.

There are two forms of grape cultivation. The first, which is most common in areas of low rainfall, allows the vines to creep along the ground. This method does not require the effort and materials necessary if they are trellised. This is the way grapes are grown in poorer areas, where resources for trellising are limited. On the other hand, yield is lower than when trellised. It is not clear if trellises were used in biblical days. A verse like Genesis 49:22, “Joseph is a fruitful bough, even a fruitful bough by a well; whose branches run over the wall” (KJV), suggests a vine on the ground that can climb over a rock wall, a common scene in many parts of western Asia.

The greenish, very fragrant flowers are produced in the spring, yielding the well-known fruit, technically a berry, in late summer or autumn. Grape leaves are important in some Middle Eastern dishes, but there is no mention of their use in the Bible. The flowers, mature and immature fruits, vines, and wood are all mentioned in the scriptures.

Because the cultivated grape can interbreed with less desirable varieties or even feral plants, an inferior crop may result, as



Green grapes at the stage at which they are harvested, dried, and ground for use as a seasoning. Island of Chios, Greece, in June.

suggested in Isaiah 5:2: “He dug it up and cleared it of stones and planted it with the choicest vines. He built a watchtower in it and cut out a winepress as well. Then he looked for a crop of good grapes, but it yielded only bad fruit” (NIV).

It seems likely that both green and red varieties of grape have been grown since the earliest times, but there is no explicit reference to green grapes in the Bible (not to be confused with unripe grapes, which are green regardless of the variety). A well-known inference to red grapes is Revelation 14:20.

The ripe fruit, which is rich in sugars, can be eaten fresh, as recorded in several places, including Deuteronomy 23:24 and Numbers 6:3, or the fruit can be dried to make raisins. Both raisins and wine are ways to preserve the nutrition of the grape for extended periods.

The surface of the grape berry contains a natural wax that traps wild yeast so that when the grapes are crushed and the juice is expressed, the agent of fermentation is present. Wine can be stored indefinitely; there are numerous records of amphorae of wine recovered from ships sunk in the Mediterranean thousands of years ago. (For the origin and history of ancient wine, see McGovern et al., 1996, and for use in

ancient Israel, see Broshi, 2001.) A by-product of wine is vinegar, mentioned in Numbers 6:3, Ruth 2:14, Psalms 69:21, Proverbs 10:26,



Poa bulbosa, a common grass in the Middle East. Near Sulimaniya, Iraq, in March.



Rooftop in late winter supporting plants. Caradagh Mountain, Iraq, in March.

Proverbs 25:20, Matthew 27:48, Mark 15:36, Luke 23:36, and John 19:29, which results from bacterial fermentation of wine.

One of the lesser-known uses of the grape is for the unripe fruits, which are very sour, as noted in Jeremiah 31:29 and Ezekiel 18:2, both of which apparently refer to the same proverb: “Why do you quote this proverb concerning the land of Israel: ‘The parents have eaten sour grapes, but their children’s mouths pucker at the taste?’” (NLT). Arab villagers regularly use unripe grapes to make a seasoning. The grapes (red and green varieties are both used) are harvested when the berries are about 0.75 centimeters (1 inch) in diameter. These are dried and then finely ground. One of the common methods is mixing the grape powder with salt, pepper, and hyssop (*see* Hyssop). This mixture is then added to meat and vegetable dishes to impart a pleasantly sour taste. Green, that is, unripe, grapes are also mentioned in Job 15:33, but in reference to destruction of the developing harvest.

Last, the utter uselessness of the wood of the vine is referred to in Ezekiel 15: 2: “Son of

man, how is the wood of a vine better than that of a branch on any of the trees in the forest?” (NIV).

Grass

[Hebrew *deshe*; Genesis 1:11, 12; 2 Samuel 23:4; Job 6:5; Job 38:27; Proverbs 27:25; Isaiah 15:6; Jeremiah 14:5; Jeremiah 50:11

[Hebrew *khatsir*; Numbers 11:5; 1 Kings 18:5; 2 Kings 19:26; Job 8:12; Job 40:15; Psalms 37:2; Psalms 90:5; Psalms 103:15; Psalms 104:14; Psalms 129:6; Psalms 147:8; Proverbs 27:25; Isaiah 15:6; Isaiah 35:7; Isaiah 37:27; Isaiah 40:6, 7, 8; Isaiah 44:4; Isaiah 51:12

[Greek *chortos*; Mark 6:39; Matthew 14:19; Luke 12:28; John 6:10; James 1:10, 11; 1 Peter 1:24; Revelation 8:7; Revelation 9:4; “blade,” Matthew 13:26; Mark 4:28; “hay,” 1 Corinthians 3:12

Several commentators (Rösenmüller, 1840; Harris, 1824; Moldenke and Moldenke, 1952) point out that in the Old Testament, three very general types of vegetation are recognized:



Village on Mount Assos in eastern Iraq in July. The houses have traditional mud-and-wattle construction, which, in the rainy season, supports considerable plant growth, but in the summer, no green remains.

grass, herbs (larger plants), and trees. The distinction among these is not sharp; they are literary, not scientific, conventions. Botanically, grass refers to a member of the grass family (Poaceae), which includes major crops such as maize, wheat, barley, sorghum, rice, and millet as well as pasture and lawn grasses. The word translated as “grass” in the Bible, however, includes more than true grasses – what would commonly be referred to as herbaceous (i.e., nonwoody) native vegetation. Sometimes the word is translated as “herb,” “vegetation,” or, in the case of Numbers 11:5, as the vegetable leek (*see* Leek), perhaps because of its grasslike leaves.

Many grasses are native to the Middle East, some forming an important component of fodder in grazing lands. Rainfall is generally unimodal in that part of the world: there is a flush of growth when the grasses and other plants flourish, but then most of them die back.

Within as little as two months, there is little green remaining.

This transitory growth is referred to in several scriptures as a picture of the fleeting nature of human life, as in 1 Peter 1:24: as the scriptures say, “People are like grass; their beauty is like a flower in the field. The grass withers and the flower fades” (NLT). A comparison that is less clear for present-day readers involves the grass on the rooftops, an image in 2 Kings 19:26, Psalms 129:6, and Isaiah 37:27: “while their inhabitants, shorn of strength, are dismayed and confounded, and have become like plants of the field and like tender grass, like grass on the housetops, blighted before it is grown” (ESV).

The characteristic mud-and-wattle construction allows for roofs to support grass and other rapidly growing plants, all of which soon wither and die. This would be a familiar scene to the original recipients of the Bible.

H



A cluster of henna flowers in Masah Oasis, Hajjar Mountains, northern Oman, in October.

Henna *Lawsonia inermis*

[Hebrew *kofer*; Song of Songs 1:14; Song of Songs 4:13; “While the king was on his couch, my nard gave forth its fragrance. My beloved is to me a sachet of myrrh that lies between my breasts. My beloved is to me a cluster of henna blossoms in the vineyards of Engedi” Song of Songs 1:14 (ESV)]

Today, henna is best known as a coloring agent for hair treatments and is widely used in many countries of Asia to ornament hands and feet for weddings (El Khalifa, 2002). In this verse, however, reference is to the wonderful fragrance of the henna blossoms, a fitting

climax to the well-known fragrances of nard and myrrh. The location of Engedi is significant because henna is native to tropical and subtropical regions of Africa but is now widely grown in many parts of the world.

Henna is a many-branched shrub seldom over 8 meters (18 feet) tall, with small, opposite leaves and creamy white flowers produced almost any time of year. It is the leaves that are used to prepare the henna dye after they are dried, ground, and mixed with water. The mixture is left overnight and then used to dye fingers, hands, and nails. This is an ancient practice that may be reflected in the account of the



Henna shrubs, lower middle of picture, planted as a border on a date palm plantation, Masah Oasis, Hajar Mountains, northern Oman.

female war captives chosen as brides: “And you bring her home to your house, she shall shave her head and pare her nails” Deuteronomy 21:12 (ESV). After this, she was to remain a month before she could be accepted as a wife, which is approximately the length of time required for the fading of henna stain on the nails and hands.

Recent research (Al-Sobi, 2007) documents its tolerance for saline soils, making it a suitable plant in desert oases, where it is frequently found as a border on date palm plantations.

Hyssop *Origanum syriacum*

[Hebrew *esov*; Exodus 12:22; Leviticus 14:4, 6, 49, 51, 52; Numbers 19:6, 18; 1 Kings 4:33; Psalms 51:7

[Greek *hussupos*; John 19:29; Hebrews 9:19

Hyssop has received as much or more attention than most Bible plants. The Hebrew *esov* has been ascribed to very different plants, including “caper” (see Caper). Moldenke and Moldenke (1952) and Musselman (2007) summarize these views and come to the consensus that botanically and textually, the best choice



Ground henna leaves produced in Iran and purchased in a market in Sulimaniya, Iraq.



Hyssop (top) sold along the road with other mountain herbs. Slunfeh, Syria, in June.



Hyssop in flower. Slunfeh, Syria, in June.

is *Origanum syriacum*. This is a native oregano common throughout the eastern Mediterranean region and widely valued as a spice by indigenous people.

Hyssop is a semishrub with very hairy leaves and stems that grows among rocks. This hairiness would allow it to be used as an applicator, as in the story of the Passover in Exodus 12.

Small, white flowers appear in late spring. In early spring, the young leaves are collected and dried to make the spice known in Arabic as *zaatar*. Added to bread that has been dipped in olive oil, *zaatar* is a common breakfast food.

The presence of essential oils in the plant, like so many of its relatives in the mint family, may be the reason that hyssop was used for the treatment of skin diseases ("leprosy") in Leviticus 14. This may be the same application in Psalms 51:7: "Purge me with hyssop, and I shall be clean: wash me, and I shall be whiter than snow" (KJV). There are data supporting the antimicrobial action of *O. syriacum* against fungi (Soylu et al., 2007). Numbers 19 is the account of the red heifer and the cleansing of the congregation, also referred to in the New

Testament in Hebrews 9:19, where the purgative effect of the plant is noted.

Two problem verses remain. The first is the reference to the greatest botanist in the Bible, King Solomon: "He could speak with authority about all kinds of plants, from the great cedar of Lebanon to the tiny hyssop that grows from cracks in a wall" 1 Kings 4:33a (NLT). The problem is that hyssop never grows out of walls, contra natural rock outcrops. For that reason, some writers have thought that the best choice is the caper (*Capparis spinosa*), which is frequent on stone walls. But caper, because of its lack of hairs, its spiny nature,

and its absence of essential oils, does not fit the criteria required of *esov* in Exodus or Leviticus.

A second problem is in the use of hyssop at the crucifixion: "A jar full of sour wine stood there, so they put a sponge full of the sour wine on a hyssop branch and held it to his mouth" John 19:29 (ESV). Because hyssop is a diminutive shrub, it could not be used as a means of putting the sponge to Jesus's mouth. Apparently, the sponge was put on a hyssop branch or plant, which in turn was on a reed or cane pole. The hyssop, likely a common plant in the vicinity of the crucifixion, was a means of steadying the sponge on the long pole.

I



Ivy, *Hedera helix*, on the stone face of Mount Lebanon at Ehden Cedars Preserve in April.

Ivy *Hedera helix*

[Greek *kissos*; 2 Maccabees 6:7; 3 Maccabees 2:29

There is no disagreement as to the identity of this widespread and well-known woody vine, commonly known in the United States as English ivy. The attractive shape and ever-green nature of the leaves are reasons it was widely used in the Greek world as an ornament.

Specifically, ivy was associated with the worship of Dionysius: “Those who object this

[to the hostile actions against the Jews in Alexandria] are to be taken by force and put to death; those who are registered are also to be branded on their bodies by fire with the ivy-leaf symbol of Dionysius” 3 Maccabees 2:28b–29a (RSV). This is even more extreme than the measure imposed in 2 Maccabees 6:7 for Antiochus’s birthday, when Jews were mandated to wear ivy wreaths in honor of Dionysius. Because of this idolatrous association, ivy was anathema to Jews, an attitude continued by early Christians and not mitigated until the Middle Ages (Trapp, 1958).



Young stem of ivy climbing an alder tree at Frondlok Forest Preserve in northern Syria in June.

The appeal of this high-climbing woody vine is understandable, especially in winter, when ivy would contrast sharply with the dormant and brown features of the

trees. Flowers of ivy are greenish white and easily overlooked. The dark blue berries are an important food source for birds.

J



Stand of *Juniperus oxycedrus* above the city of Bsherri, Mount Lebanon, in February.

Juniper *Juniperus oxycedrus* and Other
Species

[Hebrew *tidhar*, *teashur*; Isaiah 41:19; Isaiah 60:13

I have chosen juniper for the translation of these two Hebrew terms. Both have been

translated as “box,” or boxwood, a species of *Buxus*, in each of the two verses in Isaiah in the KJV. Although boxwood cannot be ruled out, this tree is not found in most of the Lebanon and Anti-Lebanon ranges (*see* Algum). The wood was valued, but the tree would not be familiar to most of the original hearers of these



Developing berries, actually cones, on *Juniperus oxycedrus*, Mount Lebanon, in February.

verses. Cypress, *berosh*, is included in each of the verses, indicating that a different wood is intended.

Juniperus oxycedrus is a wide-ranging gymnosperm in the Middle East. It is a shrub that fits both *teashur* and *tidhar*. Like true boxwood, it is evergreen. There are extensive stands of it on Mount Lebanon, which is consonant with Isaiah 60:13: “The glory of Lebanon shall come to you, the cypress, the plane, and the pine [*teashur*] to beautify the place of my sanctuary,

and I will make the place of my feet glorious” (ESV).

A species of *Juniperus* could be the plant intended for algum and almug (see Algum, Almug), particularly *J. excelsa*, which is a valued timber tree (Farjon, 2005) growing at higher elevation in the Lebanon and Amanus ranges. This was a valued timber item in both the Levant (Meiggs, 1982) and Mesopotamia (Moorey, 1999) and was known to Bible writers.

L



Rockrose, *Cistus creticus*, near Latakia, Syria, in May.

Ladanum *Cistus creticus* and Perhaps Other Species

[Hebrew *lote*; Genesis 37:25; Genesis 43:11

The first use of *lote* is for the cargo that Ishmaelites were taking to Egypt. This is regularly translated as “myrrh” (ASV); only the Darby translation uses “ladanum” for *lote*. The usual word for “myrrh” is *mor*. That the caravan is specifically stated as coming from Gilead suggests that the product is from Gilead, although, of course, it could have been transshipped from elsewhere. In English, the resin is known as ladanum, not to be confused with laudanum, a tincture of opium popular in the Victorian era.

Later, in Genesis 43:11, Jacob specifically states that *lote* is one of the “best products of the land” (NIV), clearly suggesting that it was a local product. I believe the most likely plant is rockrose, *Cistus creticus*. In the Levant, there are two species of rockrose: *C. creticus* and *C. salvifolius*. The former is widespread around the Mediterranean.

Species of *Cistus* are attractive, small shrubs adapted to fire-maintained ecosystems. The flowers are large and showy, either pink or white. Volatile, fragrant compounds are produced in specialized hairs, which cover most of the plant.

C. creticus has been harvested for millennia for its resin, which is used both as a



Young leaves of *Cistus creticus* showing the glandular hairs, which produce the valued resin. Near Salhab, Syria, in June.

medicine and to compound perfume (Langenheim, 2003). There is considerable interest in its use for skin diseases and other ailments (Falara et al., 2008).

Laurel *Laurus nobilis*

[Greek *daphne*

The word *laurel*, for “victory,” reflected in many English words, is drawn directly from this plant and its use. Words such as *laurel* and *laureate* can be traced directly to the use of the leaves of this evergreen Mediterranean shrub to honor winners. This victor’s crown is mentioned in 2 Timothy 2:5: “Similarly, if anyone competes as an athlete, he does not receive the victor’s crown unless he competes according to the rules” (NIV). Although not explicit in the Bible, the laurel crown is strongly suggested.

Widespread around the Mediterranean, laurel (*Laurus nobilis*) is a medium-sized shrub with thick, evergreen, leathery leaves that provide the bay leaf of the spice trade. Flowers are small, white, and borne in spring. In late summer, a dark blue fleshy fruit develops.

Just as bay leaves fade when kept in the light or stored near heat and lose their color (and flavor), so the Apostle Peter draws on this image: “And when the Chief Shepherd appears, you will receive the crown of glory that will never fade away” 1 Peter 5:4 (NIV). Obviously, gold and silver do not fade, so this verse must refer to the laurel crown.



Laurus nobilis, Dmet, Mount Lebanon, in March, with young flowers.

Leek *Allium kurrat*

[Hebrew *khatsir*; “We remember the fish we ate in Egypt that cost nothing, the cucumbers, the melons, the leeks, the onions and the garlic” Numbers 11:5 (NIV)]

This is the only verse in which *khatsir* is translated as “leek.” Of the 20 or so occurrences, it is mostly translated as “grass,” something that perishes quickly. Because of its association with related vegetables, it is rendered as “leek” in the Numbers passage. Also, leek leaves, especially when young, resemble a grass plant. Seasonally, at least with present cultivation, leeks would ripen much earlier than the associated cucumbers, melons, onions, and garlic.

Leek, a relative of onion and garlic, was well known in ancient Egypt (Murray, 2000a), although its cultivation in other parts of the Middle East appears to have been limited. This kind of leek is known by horticulturalists as *kurrat* (*Allium kurrat*), the modern Egyptian



Harvesting *kurrat* in March near Alexandria, Egypt. The farmer has a strand of a palm leaf in his mouth to tie the bundle to take to market.



Kurrat sold in a market in Alexandria, Egypt.

name for the plant. It is still grown in Egypt and harvested in spring for the tender young leaves used in salads and other foods. The leaves are repeatedly cut so that the plants are much shorter than traditional garden leeks (*A. ampeloprasum*, also known by the scientific name *A. porrum*).

Some botanists have considered *A. kurrat* as distinct from *A. ampeloprasum*. Recent molecular research (Hirscheegger et al., 2009), however, suggests that the garden leek and *kurrat* are separate species.

Although leek cultivation is restricted in the Middle East, onion, garlic, and cucumber (see Cucumber) are found in virtually every meal.

Lentil *Lens culinaris*

[Hebrew *adash*; 2 Samuel 17:28; 2 Samuel 23:11; Ezekiel 4:9]

[Hebrew *edom*; Genesis 25:34]

Lentils are one of the most widely grown legumes on a worldwide basis and are a staple crop in many regions. Like their fellow



Test plots of lentils at the International Center for Agricultural Research in the Dry Areas (ICARDA) near Aleppo, Syria, in May. ICARDA is one of the world centers for lentil research.

legumes peas, chickpeas, and probably fava beans, lentils originated in the Middle East (Zohary and Hopf, 2000), where they are still grown on a large scale and can make a major contribution to sustainability in the eastern Mediterranean region (Ryan et al., 2010).

Lentils are planted in winter and mature in spring. They are diminutive plants with delicate blue or whitish flowers that yield flattened fruits containing one or two seeds. Because they can do well on marginal agricultural lands, lentils have long been consi-

dered a food for the poor. This may be why they are included as part of Ezekiel’s bread in Ezekiel 4:9.

They can also be preserved for a long time by drying, an important factor in their artificial selection as a crop (Abbo et al., 2009). It was in this form that they were brought to David at Mahanaim (2 Samuel 17:28).

Jacob’s stew that enticed his brother Esau in Genesis 25:34 is assumed to have been made from lentils because of its red color (Hebrew *edom*, a name that would be applied to Esau’s



Red lentils, first on the left in the second row, and brown lentils, last on the right in the second row, in a market in Sulimaniya, Iraq, in June.



Red lentils are produced by grinding the hard seed coat, revealing the reddish inside of the seed. Removal of the seed coat makes cooking more rapid, an important consideration in areas with little fuel.

descendants). Red lentils are made by grinding the thick seed coat so that the lentils can be rapidly cooked, an important consideration when one is dependent on firewood or charcoal for a fire.

Lily of the Field; Also Lily of the Valley, Lily, Narcissus *Narcissus tazetta*, and Others

[Hebrew *shushan*; 1 Kings 7:19, 22, 26; 2 Chronicles 4:5; Psalms 60:1; Song of Songs 2:1, 2, 16; Song of Songs 4:5; Song of Songs 5:13; Song of Songs 6:2, 3; Song of Songs 7:2; Hosea 14:5

[Greek *krinon*; Matthew 6:28; Luke 12:27

One of the best-known images in all the Bible is the lily, an image that has pervaded Christian hymnody and poetry. In a famous American hymn, *The Battle Hymn of the Republic*, we sing, "In the beauty of the lilies Christ was born across the sea, / With a glory in his bosom that transfigures you and me." These are beautiful words, but they are botanically misleading as it is virtually certain that a true lily, genus *Lilium*, exemplified by the well-known

Easter lily (*L. candidum*), is neither the lily of the field nor the lily of the valley. Precisely which plant is intended is unclear. Historical treatments of the plant purported to be the lily are reviewed by Moldenke and Moldenke (1952) and are not repeated here.

Considering the features of the lily in the three occurrences in the Old Testament, that is, in the design of the temple of Solomon, in the gardens of Song of Songs, and as a beautiful plant in the restored Israel in Hosea, the plant should have the following features: it should have some resemblance to the brim of a cup, be stylized as in the carving on the capitals of the pillars Jachin and Boaz (though this gives us little morphological information), and be fragrant, as in Solomon's love poem: "His cheeks are like beds of spice yielding perfume. His lips are like lilies dripping with myrrh" Song of Songs 5:13 (NIV). In Hosea, the imagery is of a restored, fruitful Israel.

Jesus's famous words about the lilies of the field yield little botanical information other than emphasizing the beauty of these flowers. With characteristic Semitic hyperbole, their



Field of narcissus at Hazer Merd, Sulimaniya Province, Iraq, in March.

beauty exceeds that of the most resplendent king of Israel, Solomon.

What, then, is this plant? A prime candidate is narcissus, *Narcissus tazetta*, which is widely distributed from the Mahgreb to the Zagros Mountains and around the Mediterranean. The intensely fragrant white and yellow flowers appear in spring, coinciding with the vernal equinox. Narcissus is therefore a symbol of Newroz, a celebration of the spring equinox in several western Asian countries. Thus the symbolism of narcissus has an ancient tradition. After flowering, the leaves wither, and little is left to mark their presence.

The distinctive shape of the flower, with its white corona (the trumpetlike modification) and contrasting yellow sepals, makes it a feasible model for the laver of the temple (1 Kings 7). Its redolent nature fits well with the imagery in Song of Songs and of a restored Israel (Hosea 14).

The present-day abundance of the narcissus is diminished, like that of many other segetal species that disappeared with the advent of deep, mechanical plowing rather than the



Kurdish man offering a traditional bouquet of narcissus. Dokan, Iraq, in March.



Narcissus at Hazer Merd, near Sulimaniya, Iraq, in March.

traditional shallower plowing of draft animals, a form of cultivation allowing many of these plants to persist. This is especially true of plants that have underground storage organs – corms, bulbs, and rhizomes – including tulips, narcissus, and gladiolus. Gentle, shallow plowing does not destroy these and, in some cases, favors their growth. But when the soil is deeply plowed, the organs are buried to a level at which they cannot grow. At the same time, there has been an alarming degradation of the environment through development and overgrazing. As a result of widespread habitat destruction, fields of narcissus are less common in the Middle East.

The association of this plant with Jesus's ministry seems likely because the setting of Jesus's teaching suggests that wildflowers such as narcissus were nearby. But other showy wildflowers could be indicated, including anemone, *Anemone coronaria*, gladiolus, *Gladiolus italicus*, and related species (Musselman, 2007). These blossom at the same time as the narcissus and are likewise showy, though far less fragrant.

M



Mediterranean saltbush, *Atriplex halimus*, on the Syrian steppe near Qarataryan, Syria, in April.

Mallow, Wild Greens *Atriplex halimus*

[Hebrew *malluah*, a hapax legomenon; Job 30:4

Malluah has been variously translated as “saltwort” (ASV, ESV), “mallow” (KJV, NASB), “salt herbs” (NIV), and “wild greens” (NLT). Saltwort is the common name usually given to species of *Salicornia*, plants that grow in salt marshes. Although the setting of Job could include such plant communities, the preceding verses speak of dry ground. The inclusion of roots of the broom shrub (*see* Broom), traditionally used as a fuel, suggests a desert or

steppe setting. For that reason, I prefer *Atriplex halimus* for the translation of *malluah*, though other plants might be included.

A. halimus, known by the English common name of “Mediterranean saltbush,” is a native shrub throughout much of the arid Middle East. The leaves are silvery gray, thick, and covered with glands that excrete salt. It makes a tasty potherb when the leaves are young and tender. Flowers are small and inconspicuous.

Because it is able to survive in a harsh desert environment, saltbush is often planted in restoration projects, though it is heavily



Mediterranean salt shrub near Aqaba, Jordan, in October. Note the crystals of salt on the surface.

grazed by livestock; camels are especially fond of it. Recent research documents its nutritive value (Allazze et al., 2009), an interesting reflection on Job's disdain for this indigenous knowledge.

Mandrake *Mandragora officinarum*

[Hebrew *doday*; Genesis 30:14, 15, 16; Song of Solomon 7:13; Jeremiah 24:1

No plant mentioned in the Bible has as long and mysterious a tradition as the mandrake (Stewart, 2009). There is some disagreement over the number of species of the widespread mandrake that occur across southern Europe and into western Asia, so more than one species may be involved.

A long-lived perennial arising from a large rootstock, the crinkled leaves appear with the rains and dry by early summer. Like many rosette-forming plants, for example, the common dandelion (*Taraxacum officinale*), mandrake probably has the ability to pull itself into the ground so that the large leaves are



Mandrake in a wheat field south of Wadi Mujib, Jordan, in March.



Mature mandrake fruits in Addasir, Jordan, in May.

flat on the soil. In the Middle East, the bell-shaped flowers appear in late winter, with special adaptations to prevent the entry of rain.

Mandragora officinarum is a segetal plant, that is, a plant associated with grain fields. It can survive in these fields only if they are plowed shallowly, as with draft animals. This is where Reuben collected the mandrakes that he gave to his mother while they were living in Mesopotamia (Genesis 30). Like many herbal remedies with putative narcotic and psychoactive properties, chemical analysis documents the efficacy of the plant's compounds (Hanuš et al., 2005).

Because of the ill effects of eating the root and leaves, there has been debate over the edibility of the fruits. Mandrake is a member of the nightshade family (Solanaceae), with other plants that have both toxic and edible parts such as potato (*Solanum tuberosum*) and tomato (*Lycopersicon esculentum*). The fruits have an intense fragrance and, in my limited experience, a pleasant taste with no ill effects. Fruits are produced in early summer and resemble small, yellow tomatoes.

In Jeremiah 24, the story of the good and bad figs, the word *doday* is translated as “baskets” rather than *sal*, the usual word for “basket.” Considering the size and shape of a large mandrake plant, comparison to a basket is reasonable. Could the use of *doday* also be linked with the lesson of the bad figs?

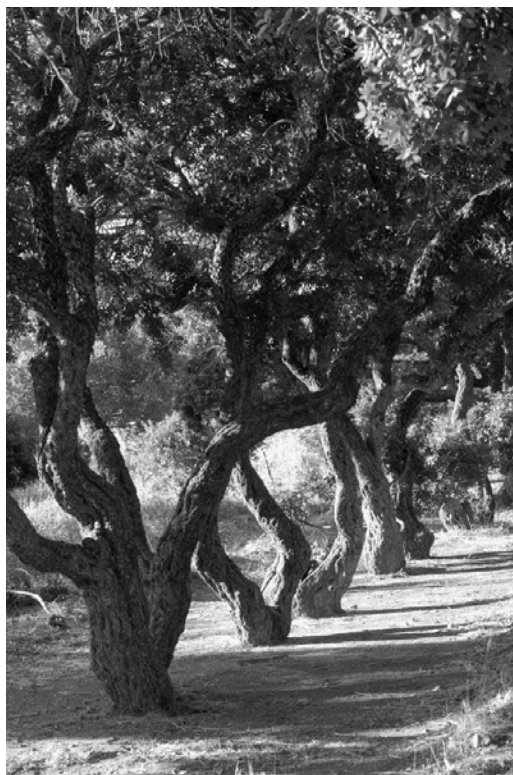
Mastic *Pistacia lentiscus*

[Hebrew *nekoth*; Genesis 37:25; Genesis 43:11

[Greek *schinos*; Susanna 1:54

This word occurs only once in the Bible, in the charming story of Susanna, when her false accusers are asked to identify the tree under which the alleged transgression took place. In what is the ancient equivalent of botanical forensics, Daniel says, “‘Now then, if you really saw this woman, tell me this: Under what tree did you see them being intimate with each other?’ He answered, ‘Under a mastic tree.’” Susanna 1:54 (RSV).

Mastic is a gum produced by incising the bark of the mastic tree, *Pistacia lentiscus*, and has long been used as a masticatory, as an



Plantation of mastic on the south part of the island of Chios, Greece, in June.



Leaves of the mastic tree on the southern part of the island of Chios, Greece, in June.

ingredient in medicines, and for the compounding of incense. Therefore it is not surprising that the home of Joakim, Susanna's husband, should have a mastic tree.

The finest mastic comes from the Greek island of Chios, where a recognized variety occurs, *P. lentiscus* var. *chia*. It is still an important crop on that island. Like other



Commercial Chios gum mastic. Note the label in Arabic. This is very popular in the Arabian Gulf countries as a masticatory and aid to digestion.

members of the genus, mastic has male and female trees. Only the male trees are used for gum production. Trees have been selected for the quality and quantity of gum production and are planted in plantations. Stems are incised in July, and the harvest of the exuded, dried gum is finished in October (Belles, 2007).

Although they do not produce the quality of gum of their Chios congeners, mastic trees (*P. lentiscus* var. *lentiscus*) are common in the drier regions of the Mediterranean hills. Like the mastic gum trees, they are small in stature with spreading branches. The branches that were collected and burned to evict the refugees in the tower in Shechem could have been mastic (pine, also highly flammable, is also present in that region): “All the people also cut down each one his branch and followed Abimelech, and put them on the inner chamber and set the inner chamber on fire over those inside, so that all the men of the tower of Shechem also died, about a thousand men and women” Judges 9:49 (NIV). Because of the oil in the leaves, mastic burns readily, an adaptation to a fire-maintained ecosystem.

The plant that produced the product rendered *nekoth* in Genesis 37:25 (the cargo of the Ishmaelites who would carry Joseph to Egypt) and Genesis 43:11 (the gift that Jacob sent to the Egyptian ruler) is not clear. It has been variously translated as spicery (ASV, KJV), aromatic gum (NASB), and gum (ESV, NLT). A parsimonious explanation is that *nekoth* is simply gum from the mastic tree, which is common in the region. I think it is unlikely, though not improbable, that it is gum derived from a gum-bearing species of *Astragalus*. These are more abundant farther east in Iraq and Iran.

Millet *Pennisetum americanum*

[Hebrew *dokhan*, a hapax legomenon; Ezekiel 4:9

So-called Ezekiel’s bread is popular with health food faddists – reflecting the idea that

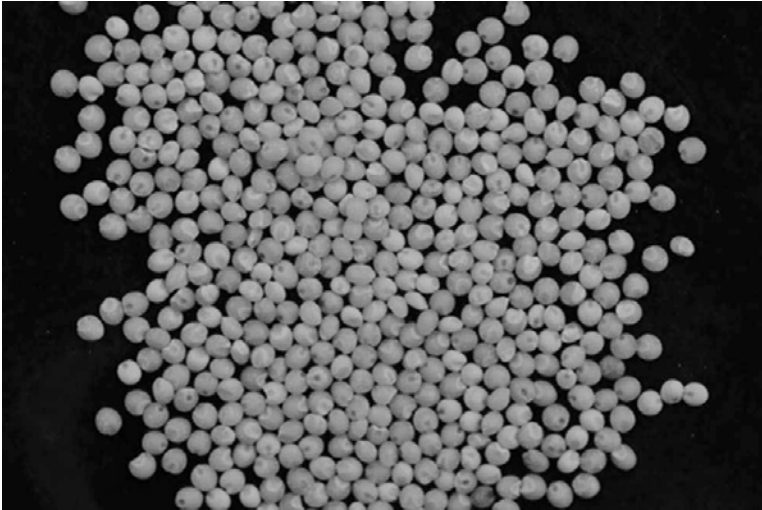
a recipe included in the scriptures must be salutary. Even purists, however, are unlikely to cook it the prescribed way – over human (vs. animal) dung. Most translations render *dokhan* as “millet” based on the close similarity to the Hebrew and modern Arabic. In modern Arabic, *dokhan* refers to bulrush millet, *Pennisetum americanum* (there are several synonyms of the scientific name), not to be confused with other grains called millet such as finger millet and Italian millet.

Bulrush millet is native to Africa and is a subsistence grain in the Sahel as well as other arid parts of the world with poor soil. Though unknown as a crop in Egypt or the Levant, millet was grown in Mesopotamia (Zohary and Hopf, 2000), where Ezekiel was living in exile.

Several writers have commented on Ezekiel’s bread representing the food of the very poor, but wheat is included. In biblical



The narrow grain heads are evident on these millet plants in October near Hyderabad, India.



Millet grains. These can be simply boiled and eaten or ground into meal.

settings, barley is highlighted as the food of the poor (*see* Barley). For that reason, it was apparently assumed that bulrush millet was a sign of poverty (i.e., Moldenke and Moldenke, 1952). If wanton poverty is the theme, other grains might have been cited, for example, *Echinochloa frumentaceum* or *E. esculentum* (one English common name for these grasses is “barnyard grass”), both of which can be considered true famine food.

Another subsistence grain of semiarid regions is sorghum (*Sorghum vulgare*), which has also been suggested for *dokhan*. However, its cultivation in the Middle East as a food crop in biblical days is unrecorded.

Mint *Mentha longifolia*, *M. spicata*, and Other Species

[Greek *hedousmon*; Matthew 23:23; Luke 11:42

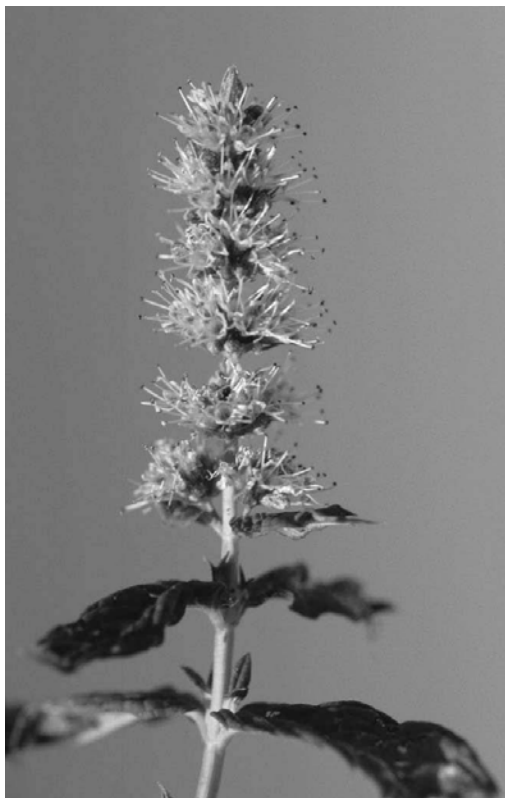
Unlike dill and cumin, mint is a perennial plant. There are several species and hundreds of cultivars, so it is not possible to state which species is included in the Bible. The mint family, the Lamiaceae, is especially well represented in the eastern Mediterranean, and several of the native genera are used for teas and flavorings. Andrews (1958b) suggests

that *hedousmon* could refer to several of these, including the widespread native mint, or spearmint, *Mentha longifolia*.

The native habitats for this species are moist places such as low marshy areas or margins of streams and irrigation ditches. The attractive pink flowers are born in the spring, but it is



Leaves of cultivated mint, *Mentha piperata*, at a stage for harvesting.



Flowers of mint, *Mentha longifolia*, in a market in eastern Iraq.

the young and tender leaves that are used for flavoring. How they were used in Bible times is not indicated, but present use in the Middle East includes flavoring yogurt, adding to black tea, and sprinkling in salads. Because the vegetative portion is used, it is likely that mint was more widely used by lower-income people than dill and cumin, as they required fruiting material. Perhaps this is why it is mentioned in both Matthew 23 and Luke 11.

Mulberry *Morus nigra*

[Greek *moron*, a hapax legomenon; 1 Maccabees 6:34: “They offered the elephants the juice of grapes and *mulberries*, to arouse them for battle” (ESV)]

This is an intriguing verse, in which grapes and mulberries are fed to warrior elephants apparently to stimulate them to battle. The precise imagery – almost certainly related to bloodshed – is not clear.

Mulberries, members of the genus *Morus*, are required for the rearing of silkworms for their cocoons. Two species have been introduced into the Middle East: *M. alba* and *M. nigra*. Until the first quarter of the twentieth century, there was a vibrant silk industry in



Mature fruits of mulberry, *Morus nigra*, at Byzantine ruins in Qanawat, Syria, in June. This is a cultivar selected for its exceptionally tasty fruit.



Dried mulberry fruits in a market in Sulimaniya, Iraq, in June.

the Middle East, where mulberry trees were first introduced about a century before Christ. Therefore it is unlikely that “silk” is correctly translated in the Old Testament (Ezekiel 16:10, 13). In Revelation 18:12, silk is listed among the luxury items of Babylon. Little remains of sericulture (production of silk), except for the numerous mulberry trees, which are spread largely by birds.

Mulberry trees are deciduous, with tiny, inconspicuous male and female flowers. The fruits are the well-known mulberries used for cooking or, more widely in the Middle East, for juice, which is commonly sold by street vendors in bazaars.

As noted, mulberry trees do not attain the height of a pine or the girth of a plane tree. For that reason, I disagree with Hepper (2009), who considers the tree in Luke 17:6 as a mulberry; it is better treated as the fig sycamore (*Ficus sycomorus*), which can attain a very large and impressive trunk.

Mustard *Brassica nigra* and Perhaps Other Members of the Mustard Family, the Brassicaceae

[Greek *sinapi*; Matthew 13:31, 32; Mark 4:30, 31, 32; Luke 13:19; Luke 17:6

Mustard may be the best-known vegetable image in all of the New Testament, but it



Roadside near Suweida, Syria, in March. *Sinapis alba* is abundant in pastures and on road margins.



Sinapis alba on the campus of the School of Agriculture, Sulimaniya University, Sulimaniya, Iraq, in March.

is still not clear which plant is intended for the Greek word *sinapi*. The writings on the topic are numerous and are not reviewed here. The interested reader is directed to Royle (1846), Moldenke and Moldenke (1952), and Musselman (2007) for discussion of how authors have treated this topic. I am considering four possibilities: *Salvadora persica* (miswak), *Eruca sativa* (arugula), *Brassica nigra* (mustard), and *Raphanus sativus* (radish).

The mustard family, the Brassicaceae, is a large and diverse element of the flora of western Asia. It is also one of the few families with no seriously toxic species, so it would not be surprising that several indigenous, wild mustards would be collected and eaten. Despite this, the archeological record makes it fairly

clear that true mustard (*B. alba*) was never used in ancient times to prepare a condiment from the seed. In fact, there are very few references to mustard in the Mediterranean region, despite the recent statement of Tan (2009), who implies the contrary.

How is this word treated in the text? It is a crop, as Jesus refers to it as being sown (Mark 4:31) and planted in a garden (Luke 13:19), that is, not collected in the wild. The seeds are small, though not the smallest. When any crop member of the mustard family (the Brassicaceae) is compared to the common crops, such as lentils, wheat, barley, chickpea, and broad bean, the mustard is discernibly the smallest.

For this reason, the desert shrub *Salvadora persica* is ruled out, the source of a widely used dentifrice known in modern Arabic as *miswak*. First, the seed would be larger than the crop seeds mentioned earlier, but perhaps more germane is the shrubby nature of the plant, which is hardly characteristic of a garden crop. Second, its desert habitat militates against this shrub being mustard. The reason *S. persica* is an attractive choice is that its name, in both Hebrew and Arabic (*khardal*), is the word for “mustard.”

The second candidate, arugula (*E. sativa*), is one that I have previously posited as mustard (Musselman, 2007). It has long been a crop in the Middle East, where it is native and covers large areas of the steppe. Local people harvest it in the spring and use it either as a component of a salad or sautéed in olive oil. Presently, it is the most widely utilized of the native mustards. The seeds are small, considerably smaller than the seeds of true mustard. A weakness in the argument for this plant is the lack of compelling ethnobotanical evidence, though Yaniv et al. (1998) record the use of arugula seed like mustard.

This leaves the most frequent choice, *B. nigra*, black mustard. Some sources report a plant of *B. nigra* as growing to the

stature of a tree, which would support an adult man climbing on the branches. This appears to be an attempt at Christian philosophy, making the passage more literary than literal.

I appreciate the comments of K. W. Clark (1943, 82) in his exegesis of the parable of the mustard in Mark 4. He writes, "The development from a small seed to large plant is told as casually as are described the stages of growth in Mark's preceding parable of the Self-Productive Soil." It is helpful to consider the mustard story within the context of the other parables of the Kingdom in Matthew 13. One of the recurring themes is that something small, or easily overlooked (the treasure in the field, the leaven in the meal, the tares in the wheat), can become large or important.

The mustard plant can grow to a large size in a single growing season (it is an annual) from a very small seed. But what about the birds of the air lodging in the branches? As K. W. Clark (1943) and others suggest, the description could read "taking shelter," which would certainly be feasible considering the often large populations that *B. nigra* forms.

What about radish? As noted, there is no compelling evidence that *B. nigra* was ever grown as a crop in the Middle East. In fact, the only member of the mustard family with documented cultivation in this region is radish. It is apparently native to the area but known only in cultivation. Talking of the parable of the radish seed may not have the appeal of the mustard seed but may be closer to the truth.

Myrrh *Commiphora* spp.

[Hebrew *mor*; Arabic is also *mor*, both meaning "bitter"; Exodus 30:23; Esther 2:12; Psalms 45:8; Proverbs 7:17; Song of Songs 1:13; Song of Songs 3:6; Song of Songs 4:6, 14; Song of Songs 5:1, 5, 13

[Hebrew *nawtaf* (stacte), see the following; Exodus 30:34

[Greek *smurna* (myrrh); Matthew 2:11; John 19:39

[Greek *muron* (myrrr, ointment); Matthew 26:7, 9, 12; Mark 14:3, 4; Luke 7:37, 38, 46; Luke 23:56; John 12:2, 3, 5; Revelation 18:13

Myrrh is the resin collected from species of *Commiphora*, a genus of trees and shrubs of the Burseraceae growing in arid and semi-arid regions of North Africa, Arabia, and the Indian subcontinent. These are usually armed with thorns and spines and all contain a milky sap known botanically as a latex owing to its milklike color, which dries into a translucent resin. Like other resins, myrrh contains both volatile and nonvolatile elements and is soluble in lipids (contra gums, which are soluble in water; Langenheim, 2003).

Two types of myrrh have historically been recognized. At their simplest, these can be considered liquid and solid myrrh. The first exudes naturally from the tree and is considered the most precious because it contains a greater percentage of volatile substances and therefore is more fragrant. This is likely the product indicated by "stacte" in the Bible and chiefly collected from *C. guidotti* (Thulin and Claeson, 1991). Pliny also refers to the



Coarse myrrh, likely from *Commiphora kataf*, in a shop in northern Ethiopia.



A large specimen of *Commiphora kataf* in central Ethiopia in October.

oozing resin as stacte. Other species produce solid myrrh, used chiefly for incense and medicine.

Examples of fragrant myrrh are the perfumed bed of the harlot in Proverbs 7:17 and the references in Song of Solomon (5:5, 13), the latter alluding to liquid myrrh. There is considerable confusion in the literature regarding liquid myrrh. As noted, it could be the liquid found in the fresh exudates with a higher percentage of volatiles. Most probable is the preparation of myrrh by dissolving it in a lipid, in most cases, a vegetable oil. This can be prepared as follows: 40 grams (1.4 ounces) of powdered myrrh is heated with 235 milliliters (1 cup) of oil, to which an equal amount of water is added. After the water boils for two minutes, the oil is decanted (Musselman, unpublished).

Myrrh was an essential material in funeral practices to maintain the quality of the air (Caseau, 2007).

Less clear is the use of the myrrh dissolved in wine offered to Jesus on the cross: "And they offered him wine mixed with myrrh, but he did not take it" Mark 15:23 (ESV). This seems puzzling, until it is realized that myrrh was commonly put in wine probably as a preservative and perhaps used as much for this as for incense and perfume.

Why this mixture should have been administered to the suffering man on the cross has been debated. Koskenniemi et al. (2005) conclude that this was a form of torture because it would increase thirst. Just a verse before, Jesus had uttered, "I thirst."

That myrrh was used to flavor wine is well documented (Koskenniemi et al., 2005), but the amount is uncertain. According to Broshi (1984), such wine was among the choicest. Dissolving 1/2 teaspoon (~2.0 grams) in 1 cup (~240 milliliters) of red wine makes a pleasantly bitter drink. It seems unlikely that the executioners would expend a valuable item



Myrtle in flower in June, showing the characteristic globe-shaped buds. Chios, Greece.

like myrrh on their victim. Though we can only postulate the reason for the wine mingled with myrrh, it seems most likely that it was simply a medicament.

Considering the high value placed on myrrh for medicine may elucidate why the magi included it with gold and frankincense for the child Jesus.

Myrtle *Myrtus communis*

[Hebrew *hadas*; Nehemiah 8:15; Isaiah 41:18, 19; Isaiah 55:13; Zechariah 1:8, 10, 11

Myrtle, *Myrtus comunis*, is an evergreen shrub or small tree with attractive, fragrant white flowers and an edible, fleshy blue fruit. It is widely distributed around the Mediterranean. Because of its evergreen nature and ease of growth, it is extensively

planted in Mediterranean climates around the world.

The Bible gives a clear habitat description: "In a vision during the night, I saw a man sitting on a red horse that was standing among some myrtle trees in a small valley. Behind him were riders on red, brown, and white horses" Zechariah 1:8 (NLT). Some translations, that is, ESV and NRSV, use "glen," though "small valley" more clearly describes the setting because myrtle is typically found along stream banks, especially intermittent streams that dry during the summer. When so much of the surrounding vegetation is dry and brown, myrtle is verdant and fresh and thus suitable as an offering.

This evergreen feature may be why it is mentioned in the Feast of Tabernacles celebrated in Nehemiah 8, along with the equally evergreen



Dry streambed with myrtle, the dark green shrub in the center. The pink flowers of oleander are conspicuous above the myrtle. These two plants, myrtle and oleander, occupy a similar habitat. Chios, Greece, in June. ■

olive and date palm (Nehemiah 8:15). Likewise, the scene in Isaiah 41:18–19 refers to the restoration of Israel, replete with streams in the desert lined with trees, including myrtle.

These qualities – evergreen, fragrant – are the reasons that myrtle is presently used in the Middle East as a grave decoration for Muslim holidays. It is also used in the incense and perfume trade.

N



Freshly dug plants. Lauribinayak, Rasuwa, Nepal, in June.

Nard, Spikenard *Nardostachys jatamansii*

[Hebrew *nayrd*, loan word from Sanskrit; Song of Solomon 1:12; Song of Solomon 4:13, 14

[Greek *nardos*; Mark 14:3; John 12:3

Long a mainstay of lotions and medicine, it is not surprising that nard, *Nardostachys jatamansii*, is referred to in the Bible. Its alternate name, spikenard, apparently refers to the plant when the above-ground parts are still attached. The two names are used interchangeably.

Nard is a perennial growing in alpine and subalpine regions of the Himalayas. Strapped-shaped leaves arise from hairy rhizomes, and flowers are produced in the monsoon season.

The rhizomes are used in a variety of ways, including in the compounding of local medicines, as nard is an important component of Ayurvedic medicine, the most prevalent medical practice on the Indian subcontinent. Rhizomes are also the source of oil, a commodity traded since ancient times. This oil is still in demand in the modern perfume industry.

Spikenard as a perfume is mentioned three times in the Song of Solomon, where it is linked with other fragrant plants with which it would never be found in nature (Murphy, 1992).

Nard was a well-known, widely used material in the Greek and Roman worlds. In what



Population of nard in a dense shrub zone, Lauribinayak, Rasuwa, Nepal, in June at 3,368 meters (11,210 feet) elevation.

could rightly be called ancient aromatherapy, perfumes and incenses were thought to be salutary for health (e.g., Caseau, 2007). The rich and privileged had ready access to these, but for the poor, the quantity used by Mary in Simon the leper's house would be a tremendous investment.

There are two references to nard for a single event in the New Testament – the anointing of Jesus by Mary from the broken alabaster box: “Mary then took a pound of very costly perfume of pure nard, and anointed the feet

of Jesus and wiped His feet with her hair; and the house was filled with the fragrance of the perfume” John 12:3 (NASV); also Mark 14:3. This type of container was noted by Pliny as the best for storing perfumes and ointments.

There is confusion with a related plant, *Valeriana italica*, and other species in the genus *Valeriana*, known as Gallic nard. Less valued than true nard, it has been used as an adulterant of true nard. References to the use of nard leaves as food, for example, in Roman cookbooks (Grant, 1996, 1999), could refer to a valerian, likely *V. italica*, rather than true nard. In Nepal, where nard is an important and well-known commodity, I found no tradition of using the leaves of true spikenard, *N. jatamansii*, for food. On the other hand, the use of *V. italica* as food is well known. The rhizomes of valerian also have a pleasant odor, though it is distinct from true nard.



Nard rhizomes purchased in an herbal shop in Patan, near Kathmandu, Nepal.

Nitrite *Salsola kali* and Related Plants

[Hebrew *nether* (natron, nitrite); “Whoever sings songs to a heavy heart is like one who takes off a garment on a cold day, and like vinegar



Salsola kali can form large stands and favors dry, disturbed areas. Beach on Chesapeake Bay, Virginia, in June.

on soda” Proverbs 25:20 (ESV); “Though you wash yourself with lye and use much soap, the stain of your guilt is still before me, declares the Lord God” Jeremiah 2:22 (ESV)

[Hebrew *boriyth* (lye, potash, soap, alkali); “But who can endure the day of his coming, and who can stand when he appears? For he is like a refiner’s fire and like fullers’ soap” Malachi 3:2 (ESV)

Sodium carbonate (washing soda), sodium bicarbonate (baking soda), and sodium chloride (table salt) together make up a mineral known as natron (also known as nitre or soda ash), used in ancient times for washing and making glass. When natron was unavailable from mineral sources, ashes from plants were substituted. These plants are usually halophytes, that is, they can grow in soil with high salt concentrations and sequester salt in their

cells so that when they are incinerated, the ash is obtained and yields soda ash.

One plant that produces reasonable amounts of soda ash is *Salsola kali* (Russian thistle), documented as a source of nitre in ancient glass (Barkoudah and Henderson, 2006). This plant is known in Arabic as *kali* or *al kali*, the origin of the English word



Flowering branch of *Salsola kali* in June. The flowers are small and inconspicuous.

alkali. Native to the Middle East, it often forms extensive populations and at one time was collected on a large scale, burned, and exported for glass manufacture and other processes requiring alkali. In addition to *S. kali*, numerous other plants, many in the family Chenopodiaceae, have been used for this purpose. The English common name, Russian thistle, is unfortunate as it is not a true thistle, but the plant obtained this name

because it was suspected of arriving in North America with crop seed from Russia and because, like a thistle, it is armed with stiff prickles.

A second use of nitre is in the production of soap. The nitre is boiled with animal fat to produce the soap, a simple representation of the way most soap is made. Present-day Bedouins in Syria still use plant-sourced nitre for making soap from sheep fat.

O

Oak *Quercus* species

[Hebrew *elon*; Genesis 12:6; Genesis 13:18; Genesis 14:13; Genesis 18:1; Genesis 35:4, 8; Deuteronomy 11:30; Joshua 19:33; Joshua 24:26; Judges 4:11; Judges 6:11, 19; Judges 9:6, 37; 1 Samuel 10:3; 2 Samuel 18:9, 10, 14; 1 Kings 13:14; 1 Chronicles 10:12; Isaiah 1:29, 30; Isaiah 2:13; Isaiah 6:13; Isaiah 44:14; Isaiah 57:5; Isaiah 61:3; Ezekiel 6:13; Ezekiel 27:6; Hosea 4:13; Amos 2:9; Zechariah 11:2

The Hebrew words *elon* and *elah* have been variously translated as “oak” (species of *Quercus*), “terebinth” (species of *Pistacia*), “elm” (species of *Ulmus*), and “holm” (*Q. ilex*). In the upland forests of the Levant, there are few angiosperm trees that reach a goodly size. The plane tree (*Platanus orientalis*; see Plane) can become large but is usually restricted in its habitat to water-courses. The two species of pine in the region, *Pinus brutia* and *P. halepensis*, are relatively short-lived trees. Cypress, *Cupressus sempervirens*, and cedar of Lebanon, *Cedrus libani*, are gymnosperms attaining their greatest girth at higher elevations.

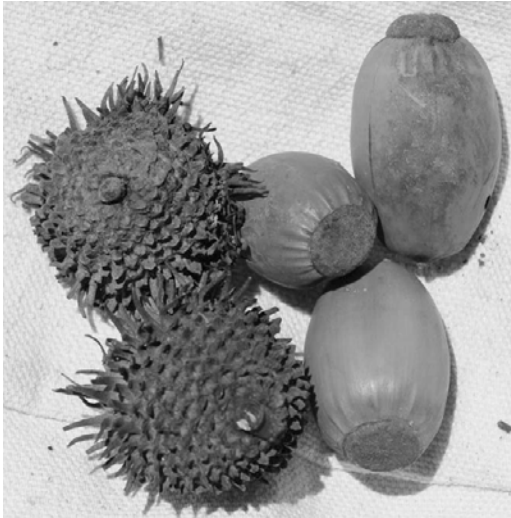
So how can the Bible reader discern between the terebinths and oaks? Bible ecology gives some clues, as in the oaks of Bashan. Historically, this region has been known for its once extensive oak forests (see later). A species of terebinth, *P. atlantica*, does occur there but is not as abundant as oak, especially *Q. calliprinos* (kermes oak), which tolerates more aridity than *P. atlantica* (Lipshitz et al., 1981). *Q. infectoria* (Aleppo oak) also occurs in the forests

of Bashan, but like *Q. calliprinos*, its frequency today is vastly different from biblical times.

In a few verses in the ESV, both *elon* and *elah* occur, suggesting that two different trees are present in such scriptures as Isaiah 6:13 and Hosea 4:13. Most confusing is the ESV in 2 Samuel 18:9a: “Absalom was riding on his mule, and the mule went under the thick branches of a great terebinth [*elah*], and his head caught fast in the oak [*elah*]”! This conflating of two unrelated trees is symptomatic of the way these two common trees, oak and pistacia, have been handled in Bible translations. Clearly what is intended in such verses is simply a large tree.

Oaks are well known to residents of the north temperate regions. The few species native to the Middle East are long-lived trees growing to a considerable size, although few large trees remain because of cutting for fuel and construction. Several place names in the Bible are identified with these trees, such as the oaks of Mamre, where Abraham lived (Genesis 13:18), or the trees are used to mark a place, like the grave of Rebekah’s servant Deborah (Genesis 35:8).

These large trees produce excellent timber. The use of oak timber in the ancient world is well documented (e.g., Meiggs, 1982). The oaks from the Bashan region (a series of extinct volcanoes in southeastern Syria and contiguous Jordan) were well known in biblical days. These were impressive trees, likened to the cedars of Lebanon in majesty in Isaiah 2:12–13a: “The Lord Almighty has a day in store for



Quercus calliprinos acorns and acorn cups. Near Suweida, Syria (ancient Bashan), in May. These large acorns were once an important source of food.

all the proud and lofty, for all that is exalted (and they will be humbled), for all the cedars of Lebanon, tall and lofty, and all the oaks of Bashan” (NIV). The extent of the Bashan forest is noted in Zechariah 11:2b: “Wail, oaks of

Bashan, for the thick forest has been felled!” (ESV). Little remains of what was once a vast forest, although the Syrian government has now established several conservation areas in the Bashan region (modern-day Jebel al Arab, also known as Jebel Druze and Jebel Hauran).

Like other large trees, oaks were noted for their shade, as in 1 Kings 13:14. Their chief utility, of course, was their timber – strong and durable. The oak wood of Bashan was favored for oars (Ezekiel 27:6).

Other uses of oak are less familiar such as for food, charcoal, and tanning. Food and charcoal are not explicitly mentioned in the Bible, but there is a long tradition of both. As recently as the last century, acorns were a staple in parts of Bashan. The extent and importance of oaks in Bashan are witnessed by the carvings of acorns on Byzantine ruins in the region.

Tanning is cited in only one place, in Acts 9 and 10, where Peter visited the home of Simon the tanner, who is noted as having lived by the sea, likely because of the stench produced by the tanning process (Poole and Reed, 1962).



Acorns and galls of *Quercus aegilops* in a medicinal herb shop in Sulimaniya, Iraq. The high concentration of tannic acids in the galls and acorns aids in digestive problems. On the upper left are dried gourds (see Gourd, Wild Colycinth).



Preparing wood for charcoal near Bzel, Lebanon. Oaks are favored for the production of the highest-quality charcoal.



Carving of an acorn on a doorway of a Byzantine church in Qanawat, Syria, associated with other food plants, suggesting the importance of oak acorn as food.

Among the sources of tannin for preserving the leather were oak galls, often from *Q. infectoria*, a tradition still practiced in some parts of western Asia. This oak is often infected with insect galls – hence the specific epithet *infectoria* – which contain high concentrations of tannic acid and are still collected for tanning leather.

Olive *Olea europaea*

[Hebrew *zayith*; Genesis 8:11; Exodus 23:11; Exodus 27:20; Exodus 30:24; Leviticus 24:2; Deuteronomy 6:11; Deuteronomy 8:8; Deuteronomy 24:20; Deuteronomy 28:40; Joshua 24:13; Judges 9:8, 9; Judges 15:5; 1 Samuel 8:14; 2 Samuel 15:30; 2 Kings 5:26; 2 Kings 18:32; 1 Chronicles 27:28; Nehemiah 5:11; Nehemiah 8:15; Nehemiah 9:25; Job 15:33; Job 24:11; Psalms 52:8; Psalms 128:3; Isaiah 17:6; Isaiah 24:13; Isaiah 41:19; Jeremiah 11:16; Hosea 14:6; Amos 4:9; Micah 6:15; Habakkuk 3:17; Haggai 2:19; Zechariah 4:3, 11, 12; Zechariah 14:4

[Greek *agrielaios*; Matthew 21:1; Matthew 24:3; Matthew 26:30; Mark 11:1; Mark 13:3;



Olive grove near Tubas, Palestinian Territory, in May.

Mark 14:26; Luke 19:29, 37; Luke 21:37; Luke 22:39; John 8:1; John 18:1, 26; Acts 1:12; Romans 11:17; James 3:12; Revelation 11:4; Revelation 18:13

No tree is more characteristic of eastern Mediterranean agriculture than the olive, which has been one of the keystone crops of the region since earliest times. It is the sole source of oil for a variety of uses throughout its range. In fact, in the Bible, the sole use for the olive is its oil, mentioned in almost 200 verses, unless the various translations that refer to olive wood are considered to actually be referring to wood from that tree (see later).

Present cultivation of the tree follows ancient practices. Many olives are grown on grafted stock ("wild olive") selected from the suckers of especially desirable trees, either for yield or for quality and quantity of oil. This is the image presented in Psalms 128:3: "Your

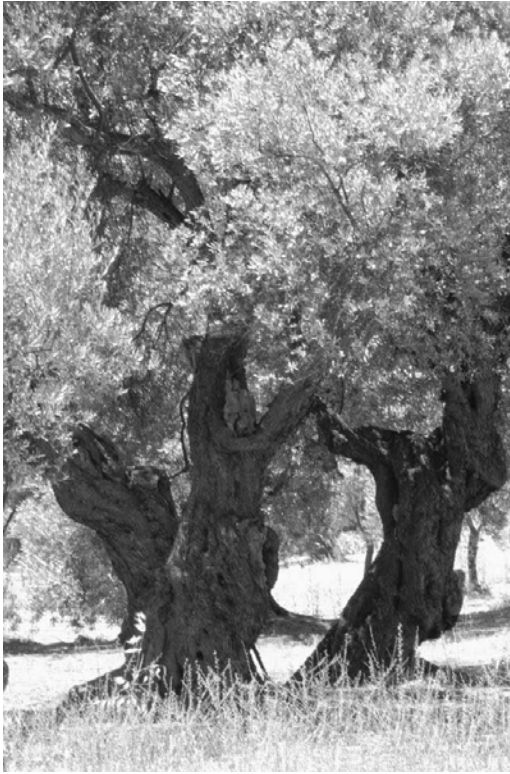
wife will be like a fruitful vine within your house; your children will be like olive shoots around your table" (ESV). The image is clearly in reference to the shoots that appear at the bases of olive trees and are removed to increase the vigor of the main trunk. But if the tree is especially fruitful, the shoots can be harvested and rooted or grafted into wild olive stock.

Wild olives are mentioned in Romans 11:17 in reference to the relationship between Gentiles and Jews. The Apostle Paul is drawing on the well-known use of wild olives, also thought of as weedy olives that have come up in the grove and are used for grafting.

Once established, olive trees can live for up to a millennium and still be productive. Old, venerable oil trees have a distinct character and beauty reflected in such verses as Psalms 52:8: "But I am like a green olive tree in the house of God. I trust in the steadfast love



Sprouts from the base of an olive tree near the village of Zababdeh, Palestinian Territory, in May.



Ancient olive denizens on the southern end of the island of Chios, Greece, in June.

of God forever and ever" (ESV). Likewise in Hosea 14:6: "His [restored Israel] shoots shall spread out; his beauty shall be like the olive, and his fragrance like Lebanon" (ESV).

Flowers are produced in May or June and are white and slightly fragrant. They are easily overlooked and fall without notice, as recorded in Job 15:33: "He will be like a vine stripped of its unripe grapes, like an olive tree shedding its blossoms" (NIV).

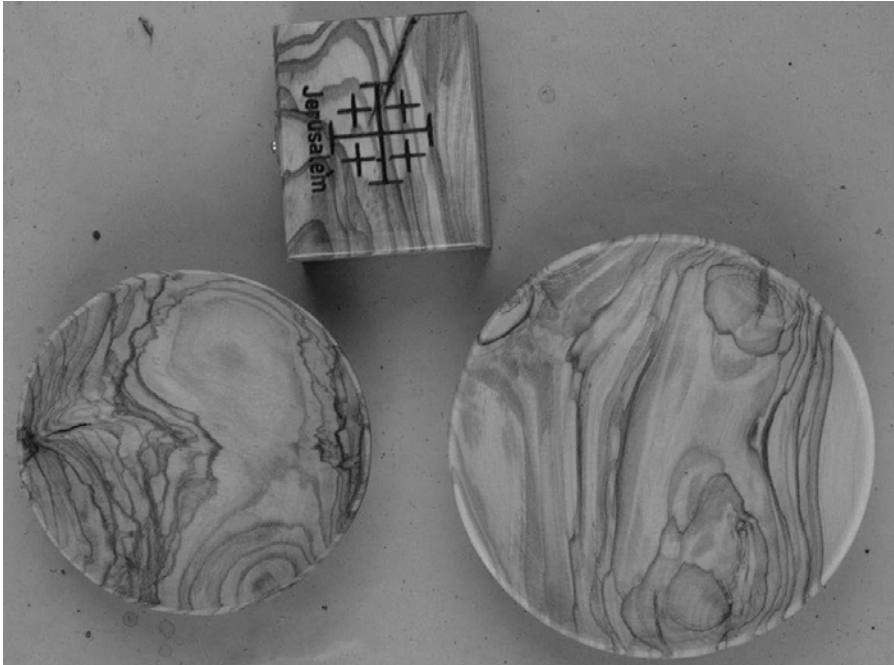
The fruits appear in late autumn and are still harvested in villages in the traditional manner of beating the boughs with long sticks and then collecting the olives that fall on the ground, as in Isaiah 17:6: "Gleanings will be left in it, as when an olive tree is beaten – two or three berries in the top of the highest bough, four or five on the branches of a fruit tree" (ESV). The faithful Israelite was to only do a single beating, leaving the remaining olives for the

poor: "When you beat your olive trees, you shall not go over them again. It shall be for the sojourner, the fatherless, and the widow" Deuteronomy 24:20 (ESV). The olives are green at this stage as green olives are better for oil production than ripe, black olives.

After gathering, the olives are taken to the olive press, where the oil is expressed. This is now done with hydraulic presses, but in biblical days, large stones drawn by draft animals were used. The oil is stable and can be stored for several years, especially if it is kept in a dark, cool place. As food, the oil was an essential commodity, and a lack of oil indicated a desperate situation, as in Habbakuk 3:17: "Though the fig tree should not blossom, or fruit be on the vines, the produce of the olive fail and the fields yield no food, the flock be cut off from the fold and there be no herd in the stalls" (ESV). Olive groves were of national importance, as noted in David's catalog of strategic resources in 1 Chronicles 27:28.



Massive numbers of flowers are borne in the spring but are not conspicuous because of the leaves. Island of Chios, Greece, in June.



Traditional handicrafts made from olive wood in Bethlehem. Olive wood is hard and durable but unsuitable for saw timber.



Samples of diverse cultivars of local olives at the National Center for Agricultural Research and Extension Center, Baqaa, Jordan.

In addition to food, olive oil had numerous other uses: for skin ointment, illumination, leather preservative, and soap. In a dry climate, oil for skin care would be important and was considered a divine provision: “You cause the grass to grow for the livestock and plants for man to cultivate, that he may bring forth food from the earth and wine to gladden the heart of man, oil to make his face shine and bread to strengthen man’s heart” Psalms 104:14–15 (ESV).

Olive oil was also used in the compounding of the anointing oil for the priests (Exodus 30:25). In other cases, plain olive oil was used for anointing, as when Jacob anointed the altar at Bethel (Genesis 31:13) and numerous other examples.

In daily life, the oil was essential not only for food but also for illumination. That olive oil was used is evidenced by such verses as found in Zechariah 4, where olive trees provide the oil for the lamps of the temple (see also Revelation 11:4 for a New Testament corollary).

A lesser-known use for olive oil was for the preservation of leather, as implied by the oil of leather-covered shields mentioned by David in his lament for Saul in 2 Samuel 1:21: “You mountains of Gilboa, let there be no dew or rain upon you, nor fields of offerings! For there the shield of the mighty was defiled, the shield of Saul, not anointed with oil” (ESV). Last, olive oil, as today, was used in biblical days for the manufacture of soap.

Although today, olives are among the best-known foods, there is no record in the Bible of olives ever being eaten. To be made palatable, the olives must be soaked in a saline solution to remove the extremely bitter components contained in the aqueous portion, not the oil, of the olive. This process takes about four months.

The use of olive wood for construction is mentioned regarding Solomon’s temple (1 Kings 6), for constructing the cherubim as well

as doors. The word used is not *zayith* but rather *shemen* (oil), a tree with “oil” or resin, so pine could be implied. The wood of olive is not suitable for lumber in the traditional sense of providing boards because of the twisted, knotty growth of the tree, exacerbated in older specimens. However, the wood is hard and dense and was used for tackle blocks on sailing ships and for treenails (pegs of hard, durable wood that were used to fasten planks; Giachi et al., 2003).

Onion *Allium cepa*

[Hebrew *betsel*, cognate with the modern Arabic word for onion, *basal*, a hapax legomenon; Numbers 11:5: “We remember the fish we ate in Egypt that cost nothing, the cucumbers, the melons, the leeks, the onions and the garlic” (ESV)]

One of the most familiar vegetables, onion was widely used in the ancient Middle East (e.g., Murray, 2000a), so it is surprising that it is mentioned only once in the Bible. There are many varieties of onion; red onions are the most frequently grown in western Asia and could have been the type eaten in ancient times. Onions are raised from seed planted in the rainy season in December or earlier and harvested in spring.



Field of onions in flower near the village of Zebabdeh, Palestinian Territory, in May.

P

Papyrus *Cyperus papyrus*

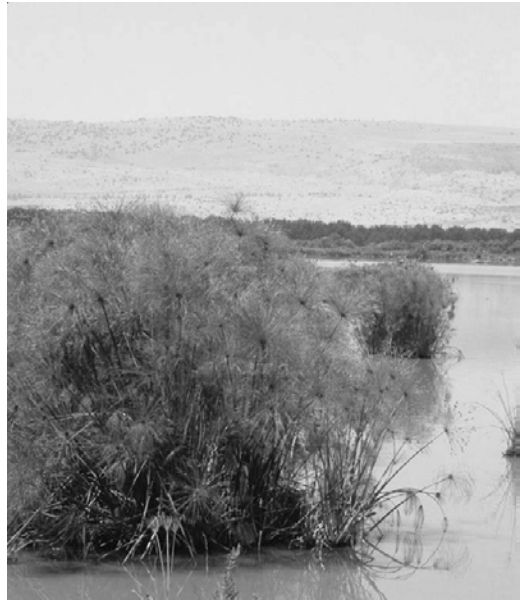
[Hebrew *gome*; Job 8:11; Job 9:26; Exodus 2:3; Isaiah 18:2

The identities of the few wetland plants mentioned in the Bible have been subject to some confusion. For example, in the most recent treatment of this group (Hepper, 2009), various plants, including rushes, reeds, and papyrus, are lumped together. I believe, however, that a finer resolution of *gome* is possible using the settings of the texts. Papyrus, *Cyperus papyrus*, best fits the four verses noted earlier. (For the other places where *gome* is used – Job 8:11 and Isaiah 35:7 – see Reed.)

Papyrus is a chiefly tropical plant, widespread in Africa, with only a few outliers in the Middle East. Once abundant in the Nile Delta, it was virtually extirpated by the time of Napoleon’s invasion of Egypt (Parkinson and Quirke, 1995). The only extant population in the Middle East is in the Hula Swamp in northern Israel, where considerable efforts at protection and restoration of the papyrus-dominated swamp have been undertaken.

These are impressive aquatic plants reaching as tall as 3.5 meters (10 feet), with large globe-shaped masses of flowers. The stems are tough and spongy and were traditionally used for the construction of skiffs as well as mats, baskets, and other items.

In the account of the construction of the protective ark for baby Moses in Exodus 2, the logical plant is papyrus because of its abundance in the Nile region. Likewise in Isaiah 18:2b,



Floating mat of papyrus in the Hula Swamp, northern Israel, in June.

speaking of Cush, modern Ethiopia, “Woe to the land of whirring wings along the rivers of Cush, which sends envoys by sea in papyrus boats over the water” (NIV), the choice of papyrus for *gome* seems best because the other possibilities, reed and cane, were not used to make boats.

The only mentions of paper in the Bible are in 3 Maccabees 4:20 and 2 John 12a: “Having many things to write unto you, I would not write with paper and ink” (ESV). The Greek word used here for paper is *chartes*. By the time of the New Testament, paper was being used in addition to parchment. In the Levant, paper was made chiefly from papyrus.

Pine *Pinus brutia* or Other *Pinus* Species

[Hebrew *tidhar*; Isaiah 41:19; Isaiah 60:13]

I believe the KJV translation of this as “pine” is the closest fit for the identification of *tidhar* – though with some diffidence as the distinction between pine (members of the genus *Pinus*) and cypress, *Cupressus sempervirens*, is not entirely clear. My choice is based on the use of the wood in the construction of Solomon’s temple, which I am taking to be cypress because this is considered a higher-quality wood. Considering the value of the other materials used, such as cedar of Lebanon, gold, and silver, it seems reasonable that high-quality wood would be utilized as well.

Pines are the most familiar of all gymnosperms, that is, plants that produce seeds but lack flowers. Within the boundaries of modern-day Israel, there is only one native pine, the Aleppo pine, *P. halepensis*, ironically named after the city in northern Syria, where it is not indigenous. There are significant remnant stands of Aleppo pine in Jordan as well. However, the most widely distributed pine in the eastern Mediterranean region is the Calabrian pine, *P. brutia*.

Both the Aleppo and Calabrian pines are adapted to a fire regime that destroys the trees but ensures extensive reproduction through release of the seeds retained in the cones. These cones, known botanically as serotinous cones, are mature but not open. The heat of the fire melts the resin of the cone, releasing the seeds onto the now-cleared soil surface. In addition to serotinous cones, another adaptation of these two pines is persistent lower branches. In other words, the trees are not self-pruning; the lower branches are retained. This ensures that fire will spread to the upper boughs of the tree, opening the serotinous cones. Because of this adaptation, the wood of both the Calabrian and Aleppo pines has many knots, which make the wood less suitable for woodworking. Cypress, on the other hand, lacks these



A stand of Calabrian pine, *Pinus brutia*, on the island of Chios, Greece, in June.

branches (i.e., is self-pruning) and is therefore more useful for planking and construction. Other regal buildings in the ancient Near East used cypress as well (Meiggs, 1982).

An essential use of pine is for the resins and tars, which were strategic for building wooden ships. The best-known example of pitch in shipbuilding is the construction of the ark in Genesis 6:14 by Noah, who was told to “cover it inside and out with pitch” (ESV). Bitumen, often gathered from the Dead Sea, was also used for pitch, but the wide range of pine trees makes pine pitch easier to obtain. In places where pines were not common, as in Egypt, bitumen was more likely (Exodus 2:3: the ark prepared by Jochebed for Moses).

Pistachio *Pistacia vera*

[Hebrew *boten*, a hapax legomenon; Genesis 43:11]

Not to be confused with its relatives *Pistacia atlantica* and *P. lentiscus*, pistachio is



Calabrian pine, Island of Chios, Greece, in June. Calabrian and Aleppo pine are superficially similar and often confused. One difference is that the cones of Calabrian pine are borne at right angles to the branch, as evident on the upper left branch.



A grove of pistachio trees with developing fruit south of Aleppo, Syria, in July.



Large terebinth, *Pistacia atlantica*, in the eastern part of the island of Chios, Greece, in June.

mentioned only in this verse, which is a helpful commentary on the agriculture and commerce of the region: "Then their father Israel said to them, 'If it must be, then do this: Put some of the best products of the land in your bags and take them down to the man as a gift – a little balm and a little honey, some spices and myrrh, some pistachio nuts and almonds'" (NIV).

Native to central Asia (Zohary, 1996), pistachio nuts are one of the most important nut crops in the world. Unlike the indigenous *Pistacia* species, the hard seed coat opens when dried. The Hebrew *boten* is cognate with the traditional Arabic name of *P. atlantica*, *butim*.

Today, the largest production in the Levant is near the city of Aleppo in northern Syria, where the nuts have long been cultivated. In Syrian Arabic pistachios are called the "nuts of Aleppo," reflecting the importance of this tree

crop in the region. Iran is one of the leading producers in the world.

Like today, pistachios were obviously valued in ancient times, as evidenced by the gift Jacob prepared for the ruler of Egypt.

Pistacia, Balm of Gilead

[Hebrew *elah*; Genesis 35:4; Judges 6:11, 19; 2 Samuel 18:9, 10, 14; 1 Kings 13:14; 1 Chronicles 10:12; Isaiah 6:13; Ezekiel 6:13; Hosea 4:13]

The genus *Pistacia* is an important genus of trees and shrubs that forms a major component of Mediterranean woodlands. Ecologists refer to much of the forest cover of the region as an oak–terebinth association because the trees are typically found growing together. Because the oak and terebinth are associated, it is virtually



Developing fruits in June. Because *Pistacia atlantica* is dioecious – that is, it has separate male and female plants – not all trees produce these red, single-seeded fruits.



Artisan's shop in the old city of Damascus. The wood of *Pistacia atlantica* is white; the darker wood is from apricot.

impossible to determine from the use of *elah* which tree is intended. However, the terebinth can survive much harsher conditions than the oak and, for this reason, will be found in steppe regions where no oak is present.

Unlike oak, the signature tree of Bashan (*see* Oak), the Bible does not characterize any particular region as being dominated by terebinth. As noted earlier (*see* Oak), at least one translation uses both “oak” and “terebinth” for the same Hebrew word in a single verse.

The most frequent species of *Pistacia* in the region is *P. atlantica*, which can attain a very large size. It is easily distinguished from oak by its compound leaves and red, single-seeded fruits. In drier regions, *P. khinjuk* replaces *P. atlantica*, and farther east, *P. eurycarpa* is found; these are used in a similar way (*see also* Mastic). The wood is hard, sturdy, and used in construction, charcoal production, and the manufacture of small items such as spoons.

Pistacia species, like other members of the Anacardiaceae (the family that includes cashew, mango, and poison ivy), has a clear



Solidified resin (white slabs on boxes) from *Pistacia eurycarpa* in a market in Sulimaniya, Iraq, in June. The resin is collected from the trees after being excised from the bark; it is put into forms to solidify and sold as a masticatory and medicine, perhaps similar to the way balm of Gilead was used.

resin, which has been widely used for a variety of purposes and has considerable potential for development of new products (Golan-Goldhirsh, 2009). One of these products is the famed balm of Gilead referred to only by the Prophet Jeremiah (Jeremiah 8:22; 46:11). Gilead, the northwestern portion of present-day Jordan, still has considerable forests of oak-terebinth. The resin of the tree was apparently harvested there, as it was in other places in its range. A review of entries for *Pistacia* in medical databases turns up hundreds of papers reporting research on the compounds found in this tree, further support for the medical efficacy of the balm of Gilead.

Plane *Platanus orientalis*

[Hebrew *armon* or *ermon*; Genesis 30:37; Ezekiel 31:8; Ecclesiasticus 24:14



Leaves and developing fruits of a plane tree at Dmeit, Mount Lebanon, in April.



A large plane tree planted along the Barada River in Damascus, Syria, in March.

The plane tree can live to a great age and attain a very large circumference. As a result, it often has immense boughs, as intimated in Ezekiel 31:8: “The cedars in the garden of God could not rival it, nor the fir trees equal its boughs; neither were the *plane trees* like its branches; no tree in the garden of God was its equal in beauty” (ESV). This description, comparing Pharaoh to trees, draws on the image of a well-known tree found in moist soil in the Middle East, often along streams. The Geneva Bible and KJV translate this as “chestnut,” a tree not native to the Levant.

Genesis 30 describes Jacob’s early attempt at genetic engineering. He placed peeled branches of trees in front of mating cattle to ensure the color of their offspring. One of these branches was from the plane tree (Genesis 30:37). The bark of the mature plane tree is mottled with brown patches of rough bark



Leaves and developing fruits of a plane tree at Dmeit, Mount Lebanon.

against smooth, white bark. Young branches are not white, but the inner bark would appear whitish when peeled, a feature of the other woody plants that Jacob used.

The plane tree is widespread throughout western Asia, native to watercourses and other wet places, but is also widely planted because it is easy to grow and attains a large size, affording ample shade. It would be familiar to residents of the region and a suitable image for strength and majesty.

Pomegranate *Punica granatum*

[Hebrew *rimmon*; Exodus 28:33, 34; Exodus 39:24, 25, 26; Numbers 13:23; Numbers 20:5; Deuteronomy 8:8; 1 Samuel 14:2; 1 Kings 7:18, 20, 42; 2 Kings 25:17; 2 Chronicles 3:16; 2 Chronicles 4:13; Song of Solomon 4:3, 13; Song of Solomon 6:7, 11; Song of Solomon 7:12; Song of Solomon 8:2; Jeremiah 52:22, 23; Joel 1:12; Haggai 2:19

Pomegranate, one of the six species of the land (Deuteronomy 8:8), is perhaps the most appealing of all six, with beautiful flowers and attractive fruits. It is an easily cultivated shrub bearing crimson red to orange flowers in spring and summer, from which the large, grapefruit-sized fruits develop in late summer and autumn.

The fruits are unusual in containing seeds that have a highly specialized seed coat that is fleshy rather than hard. This fleshy layer is the source of the juice for which the pomegranate is prized. There are innumerable cultivars of the pomegranate, including some with yellow fruits. In general, however, they can be divided into two main categories – those with sweet and those with sour juice. The seeds are also eaten in some countries. The leathery covering of the fruit allows it to be stored for a long time, and a dye can be prepared from the rind.

It is the beauty of the pomegranate rather than its culinary use that is most frequently mentioned in the Bible. The border of the



Branch of a large pomegranate shrub at the ruins of Ephesus, modern-day Efes, Turkey, in June.



Single flower of the pomegranate, near Damascus, Syria, in May.

skirt of the high priest was ornamented with pomegranates (Exodus 28:33–34; Exodus 39:24), as were the pillars in Solomon’s temple (1 Kings 7:18, 20; 2 Kings 25:17; 2 Chronicles 3:16, 4:13; Jeremiah 52:22).

The Song of Solomon contains numerous references to the beauty of the pomegranate, emphasizing the red color: “Your cheeks are like rosy pomegranates behind your veil” Song of Solomon 4:3 (NLT); also Song of Solomon 6:7. The reference later in that chapter, verse 4:13, has been variously translated, in the ASV as “thy shoots are an orchard of pomegranates, with precious fruits; henna with spikenard plants” and in the NLT as “your thighs shelter a paradise of pomegranates with rare spices – henna with nard,” perhaps best capturing the erotic tone of the book. Flowers are referred to in 6:11: “I went down to the orchard of nut trees to



Seeds and juice.

see the blossoms of the valley, to see whether the vine had budded or the pomegranates had bloomed” (NASB).

Pomegranate juice is mentioned only in Song of Solomon 8:2. This ancient beverage is now available in most American supermarkets and is touted for its health benefits, for which there is ample evidence from recent studies. Two examples are Park et al. (2010), who show that an extract of pomegranate can protect skin against ultraviolet radiation, and Grossman et al. (2010), who report on the anticancer effects of pomegranate.

The two references in the minor prophets (Joel 1:12 and Haggai 2:19) refer to the demise of pomegranate along with other crops as a sign of judgment. Pomegranate is not mentioned in the New Testament.

Poplar *Populus euphratica*

[Hebrew *baca* and *bacaim*; Psalms 84:6; 2 Samuel 5:23, 24; 1 Chronicles 14:14, 15

[Hebrew *arab*; Leviticus 23:40; Psalms 137:2

The helpful treatment of this plant by Royle (1880a) has unfortunately not received due attention for clarifying a word that has been variously translated. Like most, the KJV translation of Psalms 84:6 leaves the word untranslated (“Who passing through the valley of *Baca* make it a well; the rain also filleth the



Pomegranate fruits.



Along a branch of the Tigris River in eastern Iraq in June. This tree has widely varying leaf shapes (hence the name *heterophylla*) on a single plant.

pools"). The incident in the story of Absalom's rebellion that includes this word has been translated as "mulberry" (KJV) or "balsam" (ESV, NASB, NIV, NJB), whereas the NLT is more botanically accurate: "But after a while the Philistines returned and raided the valley again. And once again David asked God what to do. 'Do not attack them straight on'" 2 Samuel 5:23–24. God replied, "Instead, circle around behind and attack them near the poplar trees. When you hear a sound like marching feet in the tops of the poplar trees,

go out and attack! That will be the signal that God is moving ahead of you to strike down the Philistine army." This story is repeated in 1 Chronicles 14:14 (*see* Mulberry).

As Royle notes, the tree in these verses should favor wet sites (valleys, near pools) and have leaves easily rustled, features of poplars (species of the genus *Populus*). The petiole (leaf stalk) of Euphrates poplar, like other poplar species, has an aerodynamic foil that greatly exaggerates the very slightest breeze, causing the leaves to tremble when the air appears



The leaf stalk of Euphrates poplar, showing the knifelike edge that catches the slightest air current, causing the leaves to rustle (2 Samuel 5:24).



The poplar with its characteristic blue-green leaves is in the center, with willows (*Salix alba*) on either side. Along the Chami Razan River in eastern Iraq in June.

virtually motionless. Hence the name trembling aspen (*P. tremuloides*) for one of the most widespread trees of the northern United States and Canada. An additional feature of poplar leaves is their stiff nature, which create more noise when rustled than less stiff leaves.

One of the most frequent trees of riverine habitats in the Middle East is the Euphrates poplar, *P. euphratica*, frequent in the Jordan Valley and along the Euphrates and Tigris rivers and their tributaries. It best meets the criteria suggested by this verse: wet habitat, easily rustled, and stiff leaves that would make a louder noise than many other trees.

Like other poplars, Euphrates poplar is a rapidly growing tree with soft wood, unsuit-

able for most uses, except for crude lumber and withes. It could be the tree mentioned in Jeremiah 12:5 as the “thickets of the Jordan” (NLT), or this could be the related willow (species of the genus *Salix*, which is in the same family as the poplar, the Salicaceae) (see Willow).

In the verses noted earlier, I believe *baca* is best translated as “Euphrates poplar.” Leviticus 23:40 suggests trees with ample leaves, a feature more characteristic of poplar than willow. The well-known verse of Psalms 137:2, in which the Children of Israel hang their harps on the “willows” of Babylon, could be either the Euphrates poplar or a true willow as both are abundant along the Euphrates.

R



Reeds, *Phragmites australis*, in shallow water of Lake Iznik near Iznik (ancient Nicea), Turkey.

Reed *Phragmites australis*

[Hebrew *qaneh*; 1 Kings 14:15; 2 Kings 18:21; Job 40:21; Psalms 68:30; Isaiah 19:6 (reeds and rushes); Isaiah 35:7 (reeds and rushes); Isaiah 36:6; Isaiah 42:3; Isaiah 58:5; Jeremiah 51:32; Ezekiel 29:6; Ezekiel 40:3, 5–8; Ezekiel 41:8; Ezekiel 42:3, 16–19

[Greek *kalamos*; Matthew 11:7; Matthew 12:20; Matthew 27:29, 30, 48; Mark 15:19; Luke 7:24

Qaneh is a descriptive term sometimes translated as “stalk” (as in Pharaoh’s dream of the wheat during the good and lean years in Genesis 41:5 or of a branch as in the lamp stand for the tabernacle in Exodus 37:17). Thus it is

applied to plants or plant parts that have a stalklike or spearlike appearance and is used for unrelated plants.

Most frequently, I believe it is the common reed, *Phragmites australis*, a cosmopolitan plant in wetlands throughout the world. In the Middle East, it is abundant along the Jordan, Euphrates, and Tigris rivers as well as in other wetlands such as the Azraq Oasis in Jordan and parts of the Hula Swamp in Israel. The rhizomes are tough and woody, from which long stems arise that form almost impenetrable thickets. Flowers are produced, but seed production is rare; the plant reproduces by fragmentation of the rhizome. The flowering



Cutting reeds along a small stream in Sulimaniya Province, Iraq, in June for construction.

heads often bend, an image noted in Isaiah 58:5a: “Is it a fast like this which I choose, a day for a man to humble himself? Is it for bowing one’s head like a reed?” (NASB).

In ancient Egypt, reed was important in the manufacture of baskets and mats, both the flexible stems and leaves being utilized (Wendrich, 2000). This use has continued until the present. The weakness of the stems as a sign of frailty is mentioned in 2 Kings 18:21, Isaiah 36:6, and Ezekiel 29:6. The best-known verse dealing with this is in Isaiah 42:3: “A bruised reed he will not break and a dimly burning wick he will not extinguish; he will faithfully bring forth justice” (NASB); also Matthew 12:20.

Reeds burn furiously, causing water in the stem of the reed to expand rapidly and explode, producing a sound like a rifle report. This is alluded to in Jeremiah 51:32, which describes the burning of the marshes on the Euphrates at Babylon: “The fords have been seized, the marshes are burned with fire, and the soldiers are in panic” (ESV).

Rose of Jericho *Nerium oleander*

[Greek *rhodo*; Ecclesiasticus 24:13–17; Ecclesiasticus 39:13; Ecclesiasticus 50:8; “I grew tall like a palm tree in Engedi, and like rosebushes in Jericho” Sirach (Ecclesiasticus) 24:14 (NRSV); “Listen to me, my faithful children, and blossom like a rose growing by a stream of water” Ecclesiasticus 39:13 (NRSV)]

Ecclesiasticus 24:13–17 is one of the most botanically rich passages of the Bible. In these four verses, cedar of Lebanon, cypress, date palm, plane tree, cassia (or cinnamon), camel’s thorn, galbanum, onycha, stacte, frankincense, terebinth, myrrh, and grape are not only mentioned but mentioned in their ecological contexts. The rosebush in both verses indicates that the writer was aware of vegetation along a watercourse in the vicinity of Jericho. Furthermore, all the plants have fragrance and beauty (“camel’s thorn” is a mistranslation).

The most likely candidate for this rose, *Nerium oleander* – known in English as oleander – is often an abundant shrub along



Oleander along a dry streambed with wild date palm. Hajjar Mountains, northern Oman, in October.

watercourses throughout western Asia and the Mediterranean region. Unlike most shrubs, oleander can flower almost any time of year. The flowers are large, pink (occasionally white), and very fragrant. The evergreen leaves are striking during the dry season, when the surrounding vegetation is dried. The fruits are a type of capsule that opens to release the airborne seeds. All parts are very toxic, and there are numerous documented deaths resulting from ingestion.

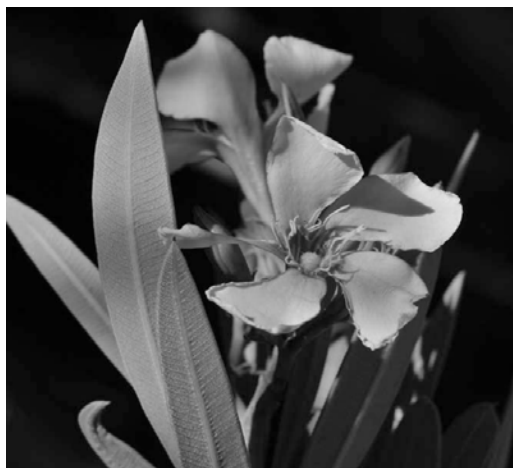
Rose has been used in English for a variety of unrelated flowers, so it is not surprising that it is applied here.

Rose of Sharon *Tulipa* Species

[Hebrew *chabazzeleth*; Song of Solomon 2:1; Isaiah 35:1

The only clue to the identity of this plant is its geographic location, the Plain of Sharon, a fertile strip between the Mediterranean and the Judean Foothills. What other characters must it have to provide this imagery? The flower in Song of Songs obviously requires an attractive plant. And there is a suggestion of a

fragrant flower as the verse follows a redolent cascade: nard, myrrh, henna, cedar, and pine. In the only other place *chabazzeleth* occurs, it is also linked with Sharon, but without a suggestion of fragrance: "The wilderness and the dry land shall be glad; the desert shall rejoice and blossom like the crocus [*chabazzeleth*]; it shall blossom abundantly and rejoice with joy and singing. The glory of Lebanon shall be given



Oleander flower showing its distinct evergreen leaves. Hajjar Mountains, northern Oman, in February.



Tulipa systole, Caramadagh Mountain, Sulimaniya Province, Iraq, in March.

to it, the majesty of Carmel and Sharon. They shall see the glory of the Lord, the majesty of our God" Isaiah 35:1 (ESV).

Earlier travelers, for example, Tristram (1883), reported large stands of a native tulip in Sharon, so it seems likely, though not definite, that *chabazzeleth* could refer to a species of tulip, a member of the genus *Tulipa*. Most are red in color but only slightly, if at all, fragrant. Tulips are part of a guild of early-flowering plants that, like the narcissus, are harbingers of spring. Several species of this genus are found in the Middle East and western Asia and are spectacular in large numbers. Being bulb plants, they have little tolerance for the deep plowing of recent years. With the advent

of modern agriculture and extensive development in that part of Israel, almost all vestiges of these attractive plants have vanished from the Plain of Sharon.

Another candidate for the rose of Sharon is a species of crocus. There are numerous species of the genus *Crocus* in the Middle East, some flowering near melting snow and others blossoming in autumn. The ESV, among other versions, translates *chabazzeleth* as "crocus." Although this translation is plausible, not all species of crocus are fragrant, nor are they usually as showy as the bright red tulips.

What is not plausible is likening *chabazzeleth* to a true rose, a species of the genus *Rosa*, the well-known garden roses. There is at least one native rose in the Levant, flowering later than the tulip. Perhaps more pertinent, it is a plant of the mountains and is not characteristic of the Sharon plain.

The image of the rose of Sharon is enshrined in the names of many church buildings as well as poetry and other literature. Caution is needed, however, in ascribing it to a definite species.

Rue *Ruta chalepensis* or *R. graveolens*

[Greek *peganon*, a hapax legomenon; Luke 11:42



Tulipa montana, Pira Magrun Mountain, Sulimaniya Province, Iraq, in March.



Rue in a garden in May. The compound leaves of rue are characteristically gray-green and contain a diversity of essential oils.

Rue is mentioned only in this verse: “But woe to you Pharisees! For you tithe mint and rue and every herb, and neglect justice and the love of God” (ESV), along with “every herb,” perhaps an allusion to Deuteronomy 14:22, which required a tithe of all crops.

The most common rue in the Middle East is *Ruta chalepensis* or *R. graveolens*, the latter cultivated but also found in the wild. Rue is a short-lived perennial growing to a height of 1 meter (3 feet), with bright yellow flowers in the late spring. The entire plant is suffused with aromatic oils. The leaves are the part used.

As with the other spices and herbs associated with pharisaical tithing, the scriptures do not tell us how these plant products were used. For this we are dependent on other sources, including archeological and current indigenous practices. The situation with rue is particularly interesting as it contains several compounds that are toxic in higher doses. One traditional use has been as a contraceptive (Ulubulen and Öztürk, 2006). In Palestinian villages, I have eaten black olives cured with chopped rue leaves, a practice not to be encouraged, considering the considerable literature on its toxicity.

I question whether rue was used as a spice in biblical days, at least not as something that was added to flavor food. It is well documented as the cause of photosensitization, which occurs when a plant compound enters the skin and then is exposed to ultraviolet light, which alters the composition of the compound, causing eruptions.

Considering its documented medical uses since ancient times, I suggest that it may have been grown as a medicine. The writer of Luke was a physician, and it is interesting that it is only mentioned in his Gospel.

Rush Species of *Juncus*, *Schoenoplectus*, or *Typha*

[Hebrew *gome*; Job 40:21; Isaiah 19:6; Isaiah 35:7; Isaiah 58:5]

The identity of the plant translated from *gome* remains uncertain, although it is likely



Rush, *Juncus arabicus*, Wadi Arabah, Jordan, just south of the Dead Sea in October.



Cattail, *Typha laxmannii*, on the shore of Lake Iznik (ancient Nicea), Turkey, in June.

not papyrus, reed, or cane (see Reed, Cane). Papyrus is eliminated because it occurs in the

same verses as those containing *gome*. I do not think *gome* is reed (*Phragmites australis*) in Job 8:11–12 – “Can papyrus grow where there is no marsh? Can reeds flourish where there is no water? While yet in flower and not cut down, they wither before any other plant” (ESV) – because of the reference to wilting, which would be more characteristic of the candidates discussed subsequently.

So what is this plant? Because of its widespread distribution in wetlands in western Asia, I suggest that *gome* could be rush (species of the genus *Juncus*) or bulrush (species of the genus *Schoenoplectus*, also known as *Scirpus*).

There are numerous species of *Juncus* native to the Levant. *J. arabicus* forms large stands in brackish, damp soils and was used to make writing quills. But other species could be implicated as well. Bulrush, *S. lacustris* (or *Scirpus lacustris*), is a widespread plant of lake and river shores and occurs in the Sea of Galilee. Last, cattails, species of *Typha*, are found virtually anywhere there is adequate moisture. All three wetland plants – rush, bulrush, and cattail – are familiar to anyone living in temperate regions, but it is impossible to emphatically state which is intended by *gome*.

S

Saffron *Crocus sativus*

[Hebrew *karkom*; Song of Solomon 4:14: “Your shoots are an orchard of pomegranates with all choicest fruits, henna with nard, nard and saffron, calamus and cinnamon, with all trees of frankincense, myrrh and aloes, with all chief spices” (ESV)]

This is the only place in the Bible where saffron is mentioned. The setting is significant as it is in a garden of fragrant plants, some of which are better known for other purposes today such as henna as a dye and saffron as a spice. The origin of saffron is not known but is likely western Asia (Kafi et al., 2006).

Saffron is a true crocus, with grasslike leaves and showy flowers that arise from a bulb (technically a corm) that dies back to the rootstock after flowering. The flowers of saffron are purple with a strong, fragrant aroma. Unlike most other crocus species, saffron does not reproduce sexually and can only be propagated from offshoots of the corm (Kafi et al., 2006). The spice saffron is derived from the dried stigmata (female pollen-receiving structures) and is the costliest spice in the world (Basker, 1993). The pleasantly bitter taste and bright yellow color are valued culinary attributes. But in the Bible, this use is not mentioned; rather, it is the fragrant flowers that are noted – a fragrance linked with such products as frankincense, myrrh, spikenard, and aloes (aloeswood).

Styrax *Styrax officinalis*

[Hebrew *libneh*; Genesis 30:37; Hosea 4:13]



Saffron ready for harvest of the stigmata, the drooping, threadlike structures hanging from the flowers, in a commercial field in Andalucia, Spain, in October.

Two different woody plants are translated from *libneh*: “white poplar” (*Populus alba*) and “styrax” (*Styrax officinalis*). There is reasonable evidence that either species might be correct. Without being dogmatic, I suggest that the textual evidence and natural distribution favor styrax as the best candidate.

S. officinalis is a well-known shrub, sometimes a small tree, common in woodlands of the eastern Mediterranean region and southern Europe. It is widely planted as an ornamental for its showy white, fragrant flowers in spring and attractive gray-green leaves with white undersides. Neither the twigs nor the branches, however, are white. The specific epithet, *officinalis*, refers to its purported derivative, storax, long recognized as a medicinal plant. There is convincing evidence that it has been regularly confused with the resin



Styrax just beginning to flower on Mount Lebanon in April.

of an unrelated tree, *Liquidambar orientalis*. For example, the resin from *L. orientalis* is known in the perfume and cosmetic industry as Levant storax (Duru et al., 2002). Whereas the resin of the *Liquidambar* is fragrant, that of *Styrax* has little or no discernible odor. It is, therefore, important to distinguish between styrax the tree or shrub and styrax (or storax) the compound.

My choice of styrax for *libneh* is based on three factors. First, it is associated with other woody plants that are characteristic of upland forests. In Genesis 30, Jacob is still in northern Mesopotamia serving his father-in-law, Laban, where this shrub would be found. Second, styrax has been documented in the flora of the region, unlike white poplar, which has been introduced. Third, contra white poplar, styrax is found in uplands.

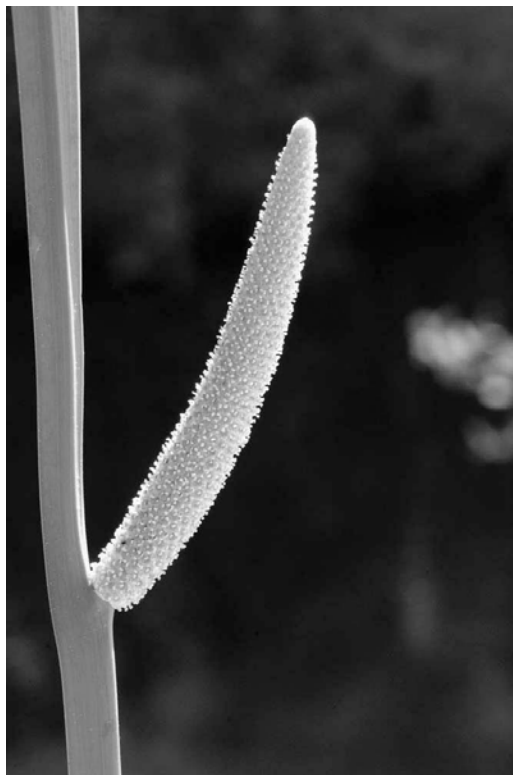
Libneh is variously translated in Hosea 4:13: “They sacrifice on the tops of the mountains

and burn offerings on the hills, under oak, poplar [*libneh*], and terebinth, because their shade is good” (ESV). I would hardly choose styrax as an outstanding shade tree, although they can reach a height of 10 meters (30 feet).

On the other hand, white poplar, though taller than styrax, does not have a spreading crown and could hardly be put in the same category as oak and terebinth. Furthermore, white poplar is a tree of lowlands and reaches its optimum growth along streams and other wet areas. It would not characteristically be found growing on hills and certainly not with the guild of plants either in Genesis 30 or Hosea 4.

Sweet Cane *Acorus calamus*

[Hebrew *qaneh*; Exodus 30:23; Song of Songs 4:14; Isaiah 43:24; Jeremiah 6:20; Ezekiel 27:19



Flowering branch of sweet cane showing the tiny flowers. Virginia in April.



Fresh rhizome of sweet cane. The shoots and leaves are removed and the rhizomes dried. In this state, they are used medicinally or for oil production. Vermont in August.

Sweet cane has long been an important component of incenses and perfumes as well as a widely utilized medicinal plant. It is grown on a large scale in Asia and is readily available

in herbal shops as an important component of Ayurvedic medicine. So vital is it to everyday life that many households in Sri Lanka grow it for ready home consumption.



Commercial planting of sweet cane for oil production in Kathmandu, Nepal, in June.



A large sycomore (*Ficus sycomorus*) in Jericho in March.

Acorus calamus is very easy to grow, although it thrives best only in wet or damp soil. The thick, tough rhizomes are dug, dried, and used directly or to prepare the oil.

Trade in sweet cane, also known as calamus, has a long and ancient legacy (Schoff, 1917; Miller, 1998). In the Bible, sweet cane is a component of the sacred anointing oil (Exodus 30:23) and had to be imported from distant lands and therefore was of considerable value (Isaiah 43:24; Jeremiah 6:20; Ezekiel 27:19). In these verses, it is no doubt the dried, commercial form of the plant that is intended.

It is therefore a fitting plant to put into an aroma garden along with “henna with nard, nard and saffron, calamus and cinnamon, with all trees of frankincense, myrrh and aloes, with all chief spices” Song of Songs 4:14 (ESV). The attraction of the plant is only in its fragrance as the grasslike leaves and tiny flowers would not draw attention.

Sycomore *Ficus sycomorus*

[Hebrew *shaqam*; 1 Kings 10:27; 1 Chronicles 27:28; 2 Chronicles 1:15; 2 Chronicles 9:27; Psalms 78:47; Isaiah 9:10; Amos 7:14

[Greek *sukaminos*; Luke 17:6; Luke 19:4

Sycomore is a kind of fig and should not be confused with the widespread American sycamore, *Platanus occidentalis*, nor the commonly planted shade tree in Britain, *Acer pseudoplatanus*. It is unfortunate that the ESV uses the spelling “sycamore” rather than “sycomore,” which is closer to the Greek *sukaminos*. Sycomore fig, as in the NIV, is more descriptive. This fig is native to Africa but was introduced into Egypt in antiquity and was obviously widely planted in ancient Israel, as noted in 1 Kings 10:27, where the allusion to the widespread use of cedar is compared to the common sycomore: “And valuable cedar timber was as common as the sycamore-fig trees that grow in the foothills of Judah” (NLT); see also 2 Chronicles 1:15 and 9:27.

Sycomore can become very large trees. The trunks can reach impressive sizes and so were valued for the production of coffins and other articles requiring timber of that girth. Thus their destruction would require supernatural power, as suggested in Psalms 78:47. Likewise, the large size of the tree is used as an example of faith doing great feats in Luke 17:6: “And the Lord said, If ye had faith as a grain of mustard seed, ye might say unto this sycamine [sycomore] tree, Be thou plucked up by the root, and be thou planted in the sea; and it should obey you” (KJV). The use of “mulberry” for the Greek *sukaminos*, as in ESV, NASB, and NIV, is unfortunate and confusing (though both the mulberry and all figs are in the same plant family).

Like its relative the common fig, sycomore has a highly specialized floral system with tiny, unisexual flowers enclosed in a plum-sized receptacle, the syconium (see Fig). And like fig, the sycomore produces valued fruits that require special husbandry.



Developing sycomore figs near Harrar, Ethiopia, in November.

Reference to culture of the sycomore is in the book of Amos. The prophet tells of his association with this tree: “Then Amos answered and said to [King] Amaziah, ‘I was no prophet, nor a prophet’s son, but I was a herdsman and a dresser of sycomore figs’” Amos 7:14 (ESV). For fruits to develop, they need to be slightly gashed before maturity; an ancient practice, gashed sycomore figs have been recovered from Egyptian tombs (Steiner, 2003).

In an extensive review of sycomore and the life of the prophet Amos, Steiner (2003) points out the connection between being a herdsman and being a keeper of sycomore. The large leaves of the sycomore could be used as fodder, especially during times of drought.

In the well-known story of Zacchaeus, a resident of Jericho climbed into a sycomore to see Jesus. The low, spreading branches of a sycomore make it suitable for climbing.

T



Tamarix gallica on a Mediterranean shore of the island of Chios, Greece, in June. The pink flowers are evident.

Tamarisk *Tamarix* Species

[Hebrew *eshel*; Genesis 21:33; 1 Samuel 22:6; 1 Samuel 31:13]

There are numerous species of tamarisks, which are often difficult to distinguish from one another. All are evergreen shrubs or trees with overlapping, scalelike leaves. The plant has the remarkable ability to excrete salt against a concentration gradient due in part to an extraordinary root system that is able to tap into water sources at great depths. The flowers are very small, usually pink, and borne in

large numbers, producing tiny, air-transported seeds.

Although some species of tamarisk are found in deserts, almost all are able to survive in saline soils. Widespread through western Asia, species of *Tamarix* have become serious weeds in saline deserts in other parts of the world such as the American West and Australia.

Tamarisk wood is hard and durable, prized for making beams and supports, and is one of the few woody plants in desert regions that would be available for timber and charcoal.



Twigs of a species of *Tamarix* at Al Ein, United Arab Emirates, in October. The salt secreted by the plant is evident.

For example, it was used in the fortifications at Masada (Lipshitz et al., 1981).

The planting of a tree was often used in ancient times to mark a special event. Just why Abraham chose tamarisk is not clear. It occurs in the region of Beersheba, and tamarisk might have been favored by the elite as a shade or ornamental tree (Fahmy et al., 2008).

Because of the extensive salt excretion, the tamarisk absorbs available moisture in the evening air. This evaporates during the heat of the day, making the shade of the tamarisk even cooler. This could explain why Saul held court under a tamarisk tree (1 Samuel 22:6). Perhaps this is also why the remains of Saul and his son Jonathan were buried under a tamarisk tree in Jabesh (1 Samuel 31:13). This distinctive tree may have been an icon of his reign.

Tares *Lolium temulentum* and Perhaps Other Species

[Greek *zizanian*; Matthew 13:25, 26, 27, 29, 30, 36, 38, 40]

I have presented elsewhere (Musselman, 2001, 2007) arguments for the plants considered as

the tares of the Bible. When considering the Greek *zizanian* as tares, a weed, it is important to consider how crop weeds were treated at that time. For example, weeding was not extensively practiced in ancient Egypt (Murray, 2000b). Unlike today, weeds had value as fuel for cooking and heating so that the idea of the burning of the tares in the parable of the sower in Matthew 13 refers more to their use as fuel rather than an image of judgment.

The plant in Matthew 13 has all the characteristics of a segetal weed, that is, a weed that is adapted to grain crops, in the case of this parable wheat. To meet the features of the parable, the tares must have a life cycle consonant with that of the crop – germinate at the same time, mature at the same time, and have nutritional requirements in common.

The parable refers to the sowing of the tares by an enemy. Although this is necessary for the legend, most weeds found in crops are distributed along with the seeds. In other words, the farmer, when collecting seed for the next season, inadvertently gathers the weed seed along with the good seed.



Tares, *Lolium temulentum*, in a barley field near Latakia, Syria, in May. The tares are in the foreground, the one on the left near maturity. Tares are better adapted to wheat, which ripens at the same time.

The weed that best fits these requirements is the very common *Lolium temulentum*, which has numerous common names. In addition to tares, it is also known as darnel, bearded darnel, or darnel ryegrass. It is an annual grass native to western Asia and now spread around the world as a valuable forage crop. Although the plant itself is not poisonous to ingest, it can be infected with a micro-organism that can render it toxic.

Another candidate for tares is the unrelated *Cephalaria syriaca* (Syrian cephalaria), which is not toxic but has extremely bitter seeds that contaminate flour (Musselman, 2001).

Thistle Various Species, Usually in the Aster Family (Asteraceae)

[Hebrew *dardar*, *shoach*, *qimmosh*; Genesis 3:18; 2 Kings 14:9; 2 Chronicles 25:18; Isaiah 34:13; Hosea 9:6; Hosea 10:8

[Greek *tribolos*; Hebrews 6:8

[Greek *akantha*; Matthew 7:16

The various words for armed plants are translated differently, depending on the setting,



Onopordum acanthium, Akkar Province, northern Lebanon, in April.



Scolymus maculatus, island of Chios, Greece, in June.

either as “thorn,” “thistle,” or “nettle.” In each case, the meaning seems clear – a worthless or even harmful plant. Botanically, these categories are different. A thorn is produced only by a woody plant, thistle is a general term for

plants that have sharp protuberances, and nettles are more specialized, with stinging hairs that inject an irritant into the victim. In the end, it is not always clear which plant is intended in the verse (*see* Thornbush).

Perhaps the best-known thistle verse is that in Genesis 3:18, where thistles are considered to be a result of the curse of sin. In Isaiah 34:13 and Hosea 10:8, thistles are noted as occurring after judgment, a description consonant with the ecology of thistles, which are often abundant in disturbed and especially in overgrazed areas, where the armament of the thistle discourages foraging.

Jesus’s parable of the sower refers to thorns. The word used is *akantha*, the same word used for the crown of thorns at the crucifixion (*see* Crown of Thorns). However, the agricultural setting (“And some fell among thorns, and the thorns sprang up with it and choked it” Luke 8:7 (NKJV); also in Mark 4) militates against the plant being the shrub used to weave the crown of thorns and implies a rapidly growing plant for which “thistle” is a better translation.



Flowering *Zizyphus spini-christi* in Wadi Arabah, Jordan, in October. Note the spines: the upper are curved, the lower straight.



Brown fruits are evident on this shrub near Zababdeh, Palestinian Territory, in May.

Thornbush *Zizyphus spini-christi*

[Hebrew *atad*; Judges 9:14, 15; Isaiah 7:19

[Greek *akantha*; Matthew 7:16, 13:7, 27:29; Mark 4:7; Luke 6:44, 8:7, 14; John 19:2; Hebrews 6:8

As noted earlier (*see* Thistle and Crown of Thorns), Hebrew and Greek terms for armed plants cannot be taken in a botanical taxonomic sense; in other words, the terms are general and not restricted to a certain genus or family of plants.

In Judges 9:14–15, I believe the intended plant is *Zizyphus spini-christi*. (The species name, *spini-christi*, comes from the assumption that it was the plant used in making the crown of thorns; *see* Crown of Thorns.) My supposition is based on the location of Jotham’s parable of the trees in the vicinity of Shechem, where one of the prominent plants is Christ thorn, *Z. spini-christi*.

These are shrubs or small trees of dry regions with vicious spines at the base of each leaf. The stems are flexuous and, for this reason, could be made into a crown of thorns (*but see* Crown

of Thorns). The flowers are greenish and yield brown, sweet fruits that are used for food.

The thornbush (*atad*) in Isaiah 7 helps little in identifying the thornbush; either *Zizyphus* or *Sarcopterium* would fit.

The thorn in the flesh to which the Apostle Paul refers in 2 Corinthians 12:7 is a sharpened piece of wood or pale rather than a plant part.

Thyine *Tetraclinis articulata*

[Greek, *thuinos*, a hapax legomenon; Revelation 18:12: “The merchandise of gold, and silver, and precious stones, and of pearls, and fine linen, and purple, and silk, and scarlet, and all thyine wood, and all manner vessels of ivory, and all manner vessels of most precious wood, and of brass, and iron, and marble” (KJV)

Thyine was a wood well known to the Greeks and Romans, so it is surprising that there are a diversity of translations of *thuinos*, including “citron wood” (NIV, NASB), “scented wood” (ESV), and “sandalwood” (NJB). Because thyine wood was a luxury item, there seems little doubt that thyine, *Tetraclinis articulata*, is the intended wood. Pliny the Elder wrote about this wood (Rackham, 2000), and in the



Clump of trees on a mountain slope near Tamara, Morocco. Thyine is unlike most gymnosperms in that it can form multiple branches from the base of its trunk.

Odyssey, Calypso burned the fragrant logs in her fireplace. Clearly the original hearers and readers of the New Testament would be familiar with this product.

Thyine is a small, scrubby gymnosperm tree native to northwest Africa. It apparently occurred in the region of ancient Tripoli but has been extirpated. The largest populations are currently in the Atlas Mountains of Morocco, where the tree is protected. Outlier populations occur in Spain and Algeria, and there is a small population on the island of Malta.

Unlike most gymnosperms, thyine has the ability to form shoots from the stumps, a feature called *coppicing*. Although the trunks, though small in diameter, are valued for furniture, it is the underground parts of the tree that have the beautiful grain in the form of bird's-eye burls. The wood is hard and takes

on a shiny finish. In addition, it is fragrant. The coastal town of Essaouira, Morocco, is one of the centers of a craft industry revolving around thyine, which is abundant in the surrounding mountains.

It is not possible to state with certainty what the "most precious wood" also mentioned in this verse might be. Among other timbers, it is likely that it could include sandalwood, *Santalum album*, native to India, or one of the species of rosewood of the genus *Pterocarpus*.

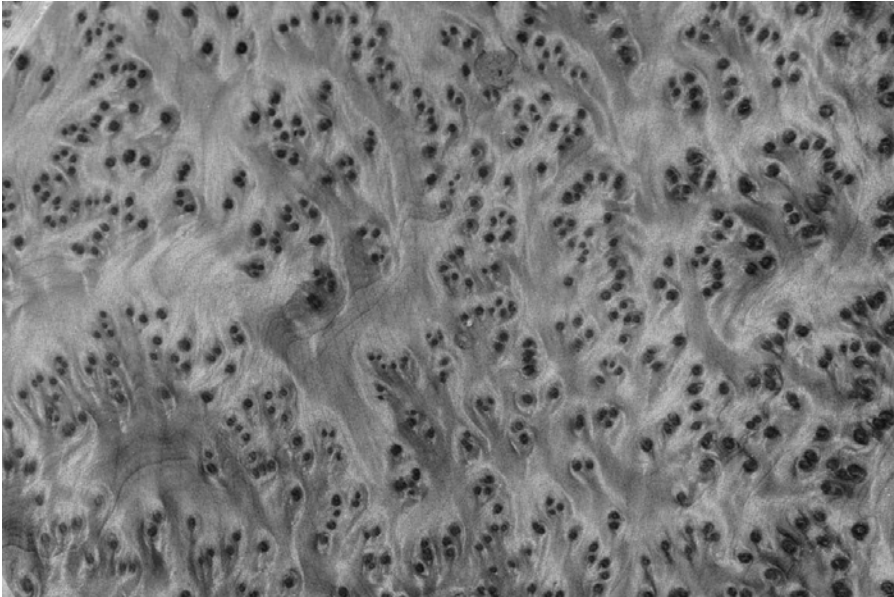
Tumbleweed, Gundelia *Gundelia tournefortii*

[Hebrew *galgal*; Psalms 83:13; Isaiah 17:13; Ecclesiasticus 33:5]

Among modern translations, only the NIV translates *galgal* as "tumbleweed." The ESV uses the words "rolling thing" in the Isaiah passage: "The nations shall rush like the



Artisan in Essaouira working with thyine. This wood is from the aerial part of the tree. The inlay is from a lemon tree.



A finished piece of thyme wood from the underground portion of the tree showing the characteristic bird's-eye pattern

rushing of many waters: but God shall rebuke them, and they shall flee far off, and shall be chased as the chaff of the mountains before the wind, and like a rolling thing before the

whirlwind." For the passage in Psalms, it uses "wheel." Most Bible dictionaries, for example, the *New Interpreters Bible Dictionary* and many older dictionaries, do not include tumbleweed,



Flowering plant, south of Sulimaniya, Iraq, in March. At this stage, the plant is too old to harvest for food.



Tumbleweed, *Gundelia tournefortii*, plants that have separated from the base and can be carried by the wind. Alujailat, Syria, in June.

an indication of the tentative association of *galgal* with tumbleweed.

One bit of evidence for considering gundelia is the location in the first verse of the Isaiah chapter, which mentions Aroer. This city, now in ruins, is on the edge of the Wadi Mujib in Jordan, the Arnon Gorge of the Bible. Gundelia is common in this steppe area.

Gundelia tournefortii is a true tumbleweed. It is a characteristic species of the steppe ecosystem that covers so much of the Middle East, the area between the desert and regions with higher rainfall that can support agriculture. A hearty perennial, gundelia flowers in spring, and at maturity, the stem abscises from the

base of the plant, allowing it to be carried by the hot, dry wind. As it tumbles, seeds are distributed.

A kind of thistle, well armed for the intense grazing in almost all of the Middle East, young gundelia stems are prized as a comestible in spring, when they are harvested in large numbers and sold in local bazaars. The seeds, technically fruits, are also eaten and resemble sunflower seeds in taste.

In recent years, gundelia has gained fame through the Shroud of Turin, on which its pollen was found, enabling workers to suggest a geographic origin for the shroud (Karis et al., 2001).

V

Vetches *Vicia* or *Lathyrus* Species

[Hebrew *kussemeth*; Exodus 9:32; Ezekiel 4:9

Kussemeth has been translated in a variety of ways in the Exodus and Ezekiel verses: “rye” (TGB, KJV), “emmer” (ESV), “emmer wheat” (NLT), and “spelt” (ASV, JND, NASB, NJB). On the other hand, the Vulgate in the Exodus verse uses “*vicia*” (*et tu sume tibi frumentum et hordeum et fabam et lentem et milium et viciam*).

The use of the word *kussemeth* for a completely different crop in Isaiah 28:25, 27 can be explained if “fitches” is understood as a descriptor of some physical feature of the plant, in this case, some projection (see Black Cumin). In English, unrelated succulent plants are often called cacti, and many plants are called moss that have little in common with true mosses – so in the case with fitches, different plants are lumped under a similar common name. The English word *fitches* originally was applied to species of *Vicia* and its relatives, members of the legume family (Fabaceae), a definition extending back to the Vulgate but lost in modern English.

What does seem evident is that rye and spelt are not intended in the Exodus account. Rye is a crop of northern climes and was virtually unknown in the ancient Middle East. Spelt, a kind of hulled wheat (see Wheat), was never grown in Egypt, at least not until after the time of Alexander the Great (Murray, 2000b). Considering the phenology (ripened barley but not wheat), a good possibility for *kussemeth* is one of the legumes known as vetches, species of



Lathyrus sativus near Adwa, Tigray State, Ethiopia.

the genera *Vicia* and *Lathyrus*. That these were grown in Greco-Roman Egypt has been documented by Murray (2000a), and it is plausible that they were also grown in pharaonic times as both crops have been cultivated since antiquity in neighboring Ethiopia, producing a yield when other crops fail.

In the nutrient-deficient soils of Ethiopia, *L. sativus* (grass pea) is a dependable crop.



Lathyrus sativus seeds near Adwa, Tigray State, Ethiopia.

Although it provides a suitable yield under extreme conditions, the seeds contain a toxin-producing disease called neurolathyrism, a neurodegenerative disease that can cause paralysis of the lower body. Another vetch that is also grown under conditions similar to those of grass pea is *V. sativa*, which has been

reported from archeological sites in the Levant (Zohary and Hopf, 2000).

Thus it is reasonable that the fitches of Exodus and Ezekiel do not represent a grain, at least not spelt in Exodus, as the vetches were part of an ancient guild of plants that could include barley, wheat, and flax.

W



Commercial walnut grove near Chico, California, in July.

Walnut *Juglans regia*

[Hebrew *egoz*, a hapax legomenon; Song of Solomon 6:11

Three nut trees are mentioned in the Bible: pistachio, almond, and walnut, the latter mentioned only in this single verse: “I went down to the grove of walnut trees and out to the valley to see the new spring growth” (NLT).

Walnut is a large, deciduous tree that, in addition to producing nuts, is highly valued for its timber. Flowers are unisexual and inconspicuous and appear in the spring. The fruits are egg shaped with a thick husk that contains the hard-shelled nut. In addition to nuts

and timber, walnut was used as a dye. Walnut husks are sold in eastern bazaars to dye hair.

This single reference is somewhat surprising, considering how widespread English or Persian walnut, *Juglans regia*, was in the eastern Mediterranean. Where walnut originated is not certain (Zohary and Hopf, 2000), but there is considerable evidence that it was widely cultivated in biblical days (e.g., Chester, 2009).

The setting in Song of Solomon 6 is full of sensual images, and the walnut has a long history of being associated with fertility. Remarkably, recent research has identified progesterone in walnut (Pauli et al., 2010), lending credence to this tree being a symbol of fertility.



Male flowers (long spike) slightly past flowering and developing fruits. Island of Chios, Greece, in June.

Watermelon *Citrullus lanatus*

[Hebrew *avotikhim*; “We remember the fish we ate in Egypt that cost nothing, the cucumbers, the melons, the leeks, the onions and the garlic” Numbers 11:5 (ESV)]

Watermelon, *Citrullus lanatus*, is native to the sub-Saharan region and has been cultivated in North Africa for millennia (Zohary and Hopf, 2000). There is, therefore, little disagreement over the translation of *avotikhim* as “watermelon.”

One of the most familiar of all summer fruits in many parts of the world, watermelon is an annual vine grown for its fruits and seeds. Watermelon seeds are not well known in the United States, but some cultivars are grown exclusively in Egypt and western Asia to produce this common snack food. Dried and roasted, the seeds add considerably to the nutritional value of the crop. The Numbers text does not indicate how the Children of Israel used watermelon, but it is reasonable that it was used both ways. In some parts of western Asia, the waxy rinds of the watermelon are boiled and the wax used to make soap.

The citron, not mentioned in the Bible but widely referred to in Jewish literature, is a kind of watermelon (*C. lanatus* var. *citroides*). The name is also applied to a type of citrus fruit, *Citrus medica*, for its flavoring and oil rather than its fruit.

Wheat *Triticum durum*

[Hebrew *bar*, *khittah*, *khintin*; Genesis 30:14; Exodus 9:32; Exodus 29:2; Exodus 34:22; Deuteronomy 8:8; Deuteronomy 32:14; Judges 6:11; Judges 15:1; Ruth 2:23; 1 Samuel 6:13; 1 Samuel 12:17; 2 Samuel 4:6; 2 Samuel 17:28; 1 Kings 5:11; 1 Chronicles 21:20, 23; 2 Chronicles 2:10, 15; 2 Chronicles 27:5; Ezra 6:9; Ezra 7:22; Job 31:40; Psalms 81:16; Psalms 147:14; Song of Solomon 7:2; Isaiah 28:25; Jeremiah 12:13; Jeremiah 23:28; Jeremiah 41:8; Ezekiel 4:9; Ezekiel 27:17; Ezekiel 45:13; Joel 1:11; Amos 8:5, 6]

[Greek *sitos*; Matthew 3:12; Matthew 13:25, 26, 29, 30; Luke 3:17; Luke 16:7; Luke 22:31; John 12:24; Acts 27:38; 1 Corinthians 15:37; Revelation 6:6; Revelation 18:13]

Wheat is the most important crop in the Bible because it was the source of bread. Bread is the most frequently mentioned food in the Bible, with more than 340 references, and though barley bread was also known, most of the references refer to wheaten bread.

But numerous other uses for wheat, essential in an agrarian society, include production



Watermelon vines with developing fruits. Island of Chios, Greece, in June.

of beer and basketry, a source of temper for making bricks, and fodder. In other words, all parts of the wheat plant were valued: the

grain, the stalks, and the by-products of grain production. Of all the crops and other food plants familiar to Bible readers, wheat has the



Developing watermelon. Island of Chios, Greece, in June.



Traditional wheat harvest in Ethiopia in October. The wheat has been cut and piled into bundles for the threshing floor.

distinction of being the crop that is most different in its present form from what it was in biblical days. I have reviewed the evolution of wheat in relation to the Bible (Musselman, 2007) and here want to emphasize the importance of the distinctions between the ancient forms of wheat and those used today.

The form of wheat grown in biblical days was all durum wheat, also known as semolina wheat. This is different genetically and nutritionally from most wheat grown presently in Europe and North America, which is bread wheat. For our discussion, the most important difference is in the amount of gluten. Bread wheat has considerable gluten, so the bread made with this wheat rises to produce the traditional spongy loaf. Durum wheat, on the other hand, has less gluten and therefore does not rise as much in baking, forming the characteristic flatter breads of indigenous peoples in the Middle East. Virtually no bread wheat was grown in biblical times (e.g., Zohary and Hopf, 2000).

The only kind of wheat known from ancient Egypt is emmer wheat, a kind of durum (Delwen, 1999). With a greater understanding of



Traditional threshing of wheat using oxen in Ethiopia in October.



Traditional wheat planting near Ajlon, Jordan, in spring.

the kinds of ancient wheats, it is not surprising that the ESV uses “emmer” but, unfortunately, misapplies it in the account of the plague of hail in Egypt called by Moses: “The flax and the barley were struck down, for the barley was in the ear and the flax was in bud. But the wheat and the emmer were not struck down,

for they are late in coming up” Exodus 9:31–32 (ESV). The wheat was emmer wheat so that a different plant is indicated by the word translated “emmer.” (For a discussion on the translation of *kussemeth*, see Vetches.)

Two types of durum wheat were grown; these are recognized by the manner in which



Emmer wheat at the International Center for Agricultural Research in the Dry Areas near Aleppo, Syria.

the grain is released. In hulled wheats, the grain is retained within the tight-fitting bracts, and further effort is needed to remove the bracts. Wheat that is not hulled, known as free-threshing wheat, releases the grains on threshing.

Threshing is one of the stages in the wheat harvest. After cutting (or pulling of the entire plant, a means of increasing the fodder value), the grain is threshed. In free-threshing wheat, this yields grains, whereas in hulled wheat, the grain remains covered with the bracts. Winnowing – the separation of the grain from the attending bracts – yields grain in free-threshing varieties but is only one of several steps necessary to separate the grain. The product of winnowing is chaff (see later). The grain is then ready for storage and use.

Storage of wheat was an important household concern because the wheat had to be freshly ground shortly before use. Unlike modern-day white flour, which removes the wheat embryo and its oil and protein, allowing virtually unlimited storage, whole wheat flour cannot be stored long.

Emmer wheat, simply durum wheat that is hulled, requires an additional step in its preparation. This was usually done with a hand mill. Understanding this wheat will help explain such scriptures as Deuteronomy 24:6: “Do not take a pair of millstones – not even the upper one – as security for a debt, because that would be taking a man’s livelihood as security” (NIV).

Knowing the features of hulled emmer wheat will also help with Proverbs 27:22: “Though you grind a fool in a mortar, grinding him like grain with a pestle, you will not remove his folly from him” (NIV). This should not be thought of as the kind of mortar and pestle used in kitchens or often displayed at pharmacies but rather as a large wooden mortar and wooden pestle, similar to those seen in many African countries for pounding grain. The use of mortars and pestles in the preparation of emmer and other kinds of wheat

in ancient western Asia is well documented (Samuel, 1999; Ebeling, 2002).

Products from the wheat plant other than the grain are also mentioned in the scriptures. One of the best known is chaff, the tiny flower parts that surround the grain removed by winnowing and, in the case of hulled emmer wheat, grinding. Perhaps the best known is in Psalms 1:3–4, with its contrast between the righteous and the ungodly man: “And he shall be like a tree planted by the rivers of water, that bringeth forth his fruit in his season; his leaf also shall not wither; and whatsoever he doeth shall prosper. The ungodly are not so: but are like the chaff which the wind driveth away” (KJV). An additional dozen or so verses have the same imagery – chaff is a worthless material, only good for burning. In reality, chaff did have value, both from wheat and barley, in the production of bricks.

It was the shortage of temper for bricks that caused the Children of Israel so much hardship in the account in Exodus 5. Chaff as well as straw were used for temper, as it is today. Despite the low esteem of chaff, its inclusion in ancient bricks now enables botanists to determine which grain, barley or wheat, and, if the latter, which type, was used in their manufacture. This in turn gives an indication of the kinds of crops that were grown.

Straw was used much as it is today – for animal bedding and fodder, as in Genesis 24, where Rebekah tells the servant of Abraham that both fodder and straw are available. Straw was also used to make baskets. Although this is not explicit in the scriptures, there is abundant historical evidence of the production of baskets and mats from straw, an industry seldom seen in the modern Middle East.

Wheat could have been used in the production of beer, but in most cases, barley was the grain of choice because wheat was favored for bread (see Barley).

The cropping cycle of wheat is instructive in understanding the seasons in some verses, for



Willow, likely *Salix acmophylla*, along the upper stretch of the Jordan River north of the Sea of Galilee in Israel in July.

example, “Now stand here and see the great thing the Lord is about to do. You know that it does not rain at this time of the year during the wheat harvest. I will ask the Lord to send thunder and rain today. Then you will realize how wicked you have been in asking the Lord for a king!” ¹ Samuel 12:16–17 (NLT). Rain would be unusual in late May to early June, when wheat is harvested. Likewise, the fruiting of mandrakes would coincide with the wheat harvest in late May or early June, as in the story of Reuben and the mandrakes (Genesis 30:14).

The best-known New Testament story of wheat sowing is the Parable of the Tares in Matthew 13 (see Tares). What is seldom understood from this story is that burning the weeds was a common practice, as it is today in parts of Syrian Mesopotamia, where locals collect weeds for fuel.

Willow *Salix acmophylla* and *S. alba*

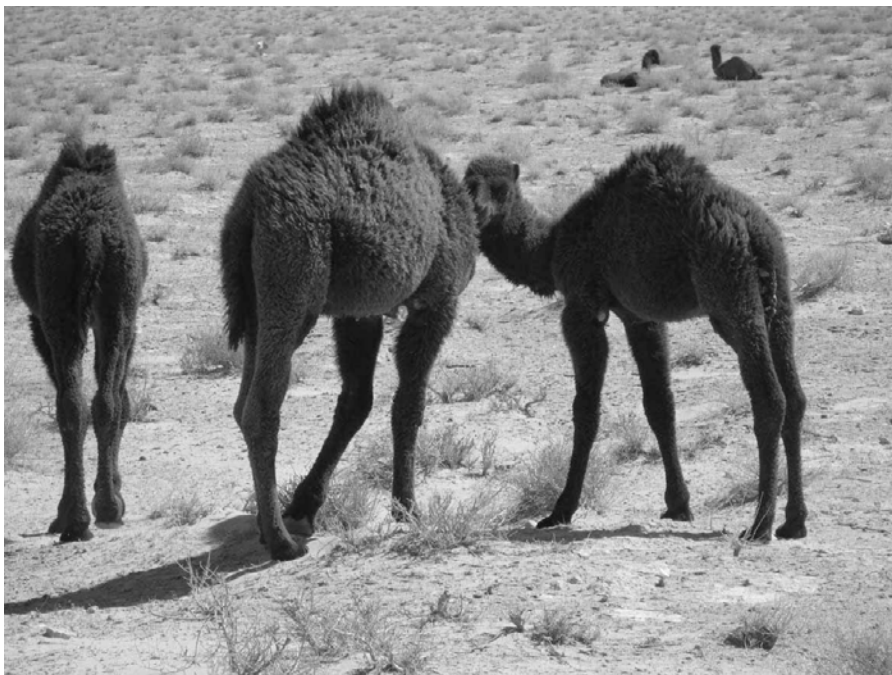
[Hebrew *arab*; Job 40:22; Isaiah 15:7; Isaiah 44:4

[Hebrew *sapthsapth*; Ezekiel 17:4, 5

In common with other trees known by their size (oak, pistacia) or habitat (cedar of Lebanon), the Hebrew *arab* could apply to one of two widely distributed wetland trees in the Middle East: Euphrates poplar (see Poplar) or willow, species of the genus *Salix*. Both form dense stands along streams, but willow tolerates considerably less salinity than Euphrates poplar.



Salix alba male flowers. Eastern Iraq in March.



Young camels grazing on wormwood in March. Livestock Research Station near Tadmor, Syria.

For this reason, it is possible to speculate which tree is intended by noting the quality of the water mentioned in the verse. Dissecting these verses, I suggest that the three preceding verses, which use *arab*, are best treated as being “willow” because of the emphasis in the verses on the abundance or quality of the water.

Sapthsapth occurs only in Ezekiel 17: “He placed it beside abundant waters. He set it like a willow twig” (ESV). This word is very close to the modern Arabic name of the willow, *safsaf*. Furthermore, it is set in the context of abundant – and by implication, fresh – water. Willows are very easy to root by simply placing a shoot in the moist soil, which may be reflected in this verse.

Like their relatives the poplars, willows are unisexual shrubs or small trees of wet areas. Their tiny flowers are borne on dense spikes in early spring, before the leaves fully expand. By early summer, the female trees release small seeds with long, silky hairs that enable the seeds to be carried by wind currents.

Wormwood *Artemisia herba-alba*

[Hebrew *laanah*; Proverbs 5:4; Lamentations 3:15, 19; Amos 5:7; Amos 6:12

[Greek *apsinthos*; Revelation 8:11

The context of the word *laanah* gives us some information about the intended plant: that it is extremely bitter. Bitterness is widespread in a wide diversity of plants, for protection against insect damage, among other things. Second, though it may be intensely bitter, it is not poisonous. For that reason, I consider Deuteronomy 29:18 as “gall” (see Gall) as the verse indicates that the plant is toxic.

Likewise, Lamentations 3:15 – “He has filled me with bitter herbs and sated me with gall” (NIV) – seems to clearly suggest something bitter but not poisonous. In contrast, Amos 6:12 links a poisonous plant with a bitter plant: “But you have turned justice into poison and the fruit of righteousness into wormwood” (ESV).



Wormwood, *Artemisia herba-alba*, severely overgrazed. Livestock Research Station near Tadmor, Syria.

The verses in Amos are instructive because he was a herdsman who would be familiar with the fodder plants in the vicinity of Tekoa, which is on the edge of the Judean Desert, in terms of ecology actually more of a steppe community than a desert. In this region, *Artemisia herba-alba* would be present as it is a valuable food plant for livestock.

The only mention of wormwood in the New Testament is in Revelation 8:11: “And the name of the star is called Wormwood: and the

third part of the waters became wormwood; and many men died of the waters, because they were made bitter” (ASV). Although this is highly symbolic, characteristic of Revelation, that death is associated with drinking the wormwood might imply that a different compound was involved. However, the Greek word *apsinthos*, from which we get our word *absinthe*, was well known in New Testament days and was noted by Dioscorides (Gunther, 1934).

REFERENCES

- Aaronson, S. 1988. *Paspalum* spp. and *Claviceps paspali* in ancient and modern India. *Journal of Ethnopharmacology* **24**: 345–348.
- Aaronson, S. 1989. Fungal parasites of grasses and cereals: Their role as food or medicine, now and in the past. *Antiquity* **63**: 247–257.
- Abbo, S., Saranga, Y., Pele, Z., Kerem, Z., Lev-Yadun, S., and Gopher, A. 2009. Reconsidering domestication of legumes versus cereals in the ancient Near East. *Quarterly Review of Biology* **84**(1): 29–50.
- Abel, G. 1986. Chromosomenschädigende Wirkung von asaron in menschlichen lymphocyten. *Planta Medica* **53**(3): 251–253.
- Aharoni, Y. 1973. *Beer-Sheba I: Excavations at Tel Beer-Sheba*. Tel-Aviv, Israel: Peli Printing Works.
- Allazze, A. Y., AbuGhazaleh, A. A., Awawdeh, F. T., Abdelrahman, M. M., and Al-Rayyan, N. A. 2009. Impact of feeding saltbush twigs on feed intake, weight gain, and some mineral levels of fattening Awassi lambs. *Biological Trace Element Research* **130**(1): 13–19.
- Al-Sobi, O. A. 2007. Impact of NaCl salinity on the germination of *Acacia mellifera*, *Aloe vera*, *Amaranthus graecizans* and *Lawsonia inermis* plant seeds growing in Saudi Arabia. *Biosciences Biotechnology Research Asia* **4**(2): 371–376.
- Anderson, A. W. 1956. *Plants of the Bible*. London: Crosby Lockwood and Son.
- Andrews, A. C. 1958a. Melons and watermelons in the classical era. *Osiris* **12**: 368–375.
- Andrews, A. C. 1958b. The mints of the Greeks and Romans and their condimentary uses. *Osiris* **13**: 127–149.
- Anonymous. 1824. [Untitled review of *The Natural History of the Bible* by T. M. Harris]. *The North American Review* **19**(44): 86–92.
- Anonymous. 1833. *A Dictionary of the Natural History of the Bible or, a Description of all the Quadrupeds, Birds, Fishes, Reptiles, and Insects, Trees, Plants, Gums, and Precious Stones, Mentioned in the Sacred Scriptures*. London: T. T. and J. Tegg.
- Arber, A. 1912. *Herbals, Their Origin and Evolution: A Chapter in the History of Botany, 1470–1670*. Cambridge University Press.
- Arroyo-García, R., Ruiz-García, L., Bolling, L., Ocete, R., López, A., Arnold, S., Ergul, A., et al. 2006. Multiple origins of cultivated grapevine (*Vitis vinifera* L. ssp. *sativa*) based on chloroplast DNA polymorphisms. *Molecular Ecology* **15**: 3707–3714.
- Arslan, D., Sert, D., Ayar, A., and Ozcan, M. M. 2009. Shelf life determination of Yayik butter fortified with spice extracts. *International Journal of Dairy Technology* **62**(2): 189–194.
- Baghalian, K., Maghsodi, M., and Naghavai, M. R. 2010. Genetic diversity of Iranian madder (*Rubia tinctorum*) populations based on agromorphological traits, phytochemical content and RAPD markers. *Industrial Crops and Products* **31**: 557–562.
- Baker, D. W. 1992. Ophir. In *The Anchor Bible Dictionary*, ed. D. N. Freedman, 27. Princeton, NJ: Yale University Press.
- Balfour, J. H. 1857. *Trees and Shrubs of the Bible*. London: T. Nelson.
- Balfour, J. H. 1885. *The Plants of the Bible*. London: T. Nelson.
- Barkoudah, Y., and Henderson, J. 2006. Plant ashes from Syria and the manufacture of

- ancient glass: Ethnographic and scientific aspects. *Journal of Glass Studies* **48**: 297–321.
- Basker, D. 1993. Saffron, the costliest spice: Drying and quality, supply and price. *Acta Horticulturae* **344**: 86–97.
- Belles, C. 2007. *Mastiha Island, Chios, Greece*. Aegeas: G. N. Merousis. 335.
- Blair, A. 2000. Mosaic physics and the search for a pious natural philosophy in the late Renaissance. *Isis* **91**: 32–58.
- Blunt, W. 2001. *Linnaeus: The Compleat Naturalist*. New Brunswick, NJ: Rutgers University Press.
- Broshi, M. 2001. Bread, wine, walls, and scrolls. *Journal for the Study of the Pseudepigrapha* **36**: 1–312.
- Bush, J. 2008. Thaddeus Mason Harris. <http://www.dorchesteratheneum.org/page.php?id=1389> (accessed December 12, 2009).
- Carpenter, W. 1849. *Wesleyana, or a Complete System of Wesleyan Theology*. New York: Mason and Lane.
- Carpenter, W., and Abbot, G. D. 1833. *Scripture Natural History; Containing a Descriptive Account of the Quadrupeds, Birds, Fishes, Insects, Reptiles, Serpents, Plants, Minerals, Gems, and Precious Stones, Mentioned in the Bible*. Boston, MA: Lincon, Edmands.
- Caseau, B. 2007. Incense and fragrances: From house to church, a study of the introduction of incense in the early Byzantine Christian churches. In *Material Culture and Well-being in Byzantium (400–1453): Proceedings of the International Conference*, ed. M. Grünbart, E. Kislinger, A. Muthesius, and D. C. Stathakopoulous, 75–92. Vienna: Austrian Academy of Sciences.
- Celsius, O. 1748. *Hierobotanici, sive de Plantis sive Scripturae, pars Posterior*. Amsterdam: Wetstenium.
- Chester, P. I. 2009. Pollen analysis of a soil sample associated with a Greek cult statue as a guide to provenance. *Journal of Archaeological Sciences* **36**(7): 1424–1429.
- Clark, K. W. 1943. The mustard plant. *Classical Weekly* **37**(7): 81–83.
- Clark, W. E. 1920. The sandalwood and peacocks of Ophir. *American Journal of Semitic Languages and Literatures* **36**(2): 103–119.
- Cook, H. N. 1846. *The Trees, Fruits, and Flowers of the Bible*. New York: American Tract Society.
- Dannelfeldt, K. H. 1968. *Leonhard Rauwolf: Sixteenth-century Physician, Botanist, and Traveler*. Monographs in the History of Science XX. Cambridge, MA: Harvard University Press.
- Donkin, R. A. 1980. *Manna: An Historical Geography*. The Hague: Junk.
- Ebeling, J. R. 2002. Why are ground stone tools found in middle and late Bronze Age burials? *Near Eastern Archeology* **65**(2): 149–151.
- el Bahri, S., Djegham, M., and Bellil, H. 1999. *Retama raetam* W [sic]: A poisonous plant of North Africa. *Veterinary and Human Toxicology* **41**(1): 33–35.
- Ewing, F. A. 1835. *Bible Natural History, or, a Description of the Animals, Plants, and Minerals Mentioned in the Sacred Scriptures, with Copious References and Explanations of Texts*. Philadelphia: American Sunday-School Union.
- Fahmy, A. G., Khodary, S., Fadl, M., and el-Garf, I. 2008. Plant macroremains from an elite cemetery at predynastic Hierakonpolis, Upper Egypt. *International Journal of Botany* **4**(2): 205–212.
- Falara, V., Fotopoulos, V., Margaritis, T., Anastasaki, T., Pateraki, I., Bosabalidis, A.M., Kafetzopoulos, D., Demetzos, C., Pichersky, E., and Kanellis, A. K. 2008. Transcriptome analysis approaches for the isolation of trichome-specific genes from the medicinal plant *Cistus creticus* subsp. *creticus*. *Plant Molecular Biology* **68**(6): 633–651.
- Farjon, J. 2005. *A Monograph of Cupressaceae and Sciadopitys*. Kew, UK: Royal Botanic Gardens.
- Freedman, D. N. 1992. *The Anchor Bible Dictionary*. New Haven, CT: Yale University Press.
- Fries, T. M. 1907. *Bref och Skrifvelser af oct till Carl von Linné*. Stockholm: Aktiebolaget.
- Gale, R., Gasson, P., Hepper, F. N., and Killen, G. 2000. Wood. In *Ancient Egyptian Materials and Technology*, ed. P. T. Nicholson and I. Shaw, 334–371. Cambridge: Cambridge University Press.
- Giachi, G., Lazzeri, S., Lippi, M. M., Macchioni, N., and Paci, S. 2003. The wood of “C” and

- "F" Roman ships found in the ancient harbor of Pisa (Tuscany, Italy): The utilization of different timbers and the probable geographical area which supplied them. *Journal of Cultural Heritage* 4: 269–283.
- Golan-Goldhirsh, A. 2009. Bridging the gap between ethnobotany and biotechnology of *Pistacia*. *Israel Journal of Plant Sciences* 57(1–2): 65–78.
- Golka, F. W. 1977. The aetiologies of the Old Testament: Part 2. *Vetus Testament* 27(1): 36–47.
- Grant, M. 1996. *Anthimus: De observatione ciborum – On the Observance of Foods*. Totnes, UK: Prospect Books.
- Grant, M. 1999. *Roman Cookery: Ancient Recipes for Modern Kitchens*. London: Serif.
- Greenfield, J. C., and Mayrhofer, M. 1967. The alummim/almuggim-problem reexamined. *Supplements to Vetus Testamentum* 6: 83–89.
- Greppin, J. A. C. 1988. The various aloes in ancient times. *Journal of Indo-European Studies* 16(1–2): 33–48.
- Groom, N. 1981. *Frankincense and Myrrh: A Study of the Arabian Incense Trade*. London: Longman.
- Grossman, M. E., Mizuno, N. K., Schuster, T., and Cleary, M. P. 2010. Punicic acid is an omega-5 fatty acid capable of inhibiting breast cancer proliferation. *International Journal of Oncology* 36(2): 421–426.
- Gunther, R. T. 1934. *The Greek Herbal of Dioscorides*. Repr., London: Hafner, 1968.
- Hansen, T. 1964. *Arabia Felix: The Danish Expedition of 1761–1767*. New York: Collins.
- Hansman, J. 1976. Gilgamesh, Humbaba and the land of the erin-trees. *British Institute for the Study of Iraq* 38(1): 23–35.
- Hanuš, L. O., Řezanka, T., Spížek, J., and Dembitsky, V. M. 2005. Substances isolated from *Mandragora* species. *Phytochemistry* 66: 2408–2417.
- Hareuveni, N. 1980. *Nature in Our Biblical Heritage*. Trans. H. Frenkley. Kiryat Ono, Israel: Neot Kedumin.
- Hareuveni, N. 1984. *Tree and Shrub in Our Biblical Heritage*. Trans. H. Frenkley. Kiryat Ono, Israel: Neot Kedumin.
- Harris, T. M. 1824. *The Natural History of the Bible, or, a Description of all the Quadrupeds, Birds, Fishes, Reptiles, and Insects, Trees, Plants, Flowers, Gums, and Precious Stones Mentioned in the Sacred Scriptures*. London: Thomas Tegg.
- Harrison, R. H. 1966. *Healing Herbs of the Bible*. Leiden, Netherlands: E. J. Brill.
- Harvey, S. A. 2006. *Scenting Salvation: Ancient Christianity and the Olfactory Imagination*. Berkeley: University of California Press.
- Hasselqvist, F. 1756. Voyages and travels in the Levant: In the years 1749, 50, 51, 52. In *Containing Observations in Natural History, Physick, Agriculture, and Commerce: Particularly on the Holy Land and the Natural History of the Scriptures*. London: Davis and Eymers.
- Hastings, J., ed. 1901. *A Dictionary of the Bible Dealing with Its Language, Literature and Contents Including the Biblical Theology*. 7 vols. New York: Scribners.
- Henslow, G. 1896. *The Plants of the Bible*. London: Religious Tract Society.
- Henslow, G. 1906. *The Plants of the Bible: Their Ancient and Mediaeval History Popularly Described*. London: Masters.
- Hepper, F. N. 1993a. Timber trees of western Asia. Paper presented at the Furniture of Western Asia Ancient and Traditional Conference. Institute of Archaeology, University College, London.
- Hepper, F. N. 1993b. *Baker Encyclopedia of Bible Plants: Flowers and Trees, Fruits and Vegetables, Ecology*. Grand Rapids, MI: Baker Book House.
- Hepper, F. N. 2009. Rushes. In *The New Interpreters Dictionary of the Bible*, vol. 4, ed. K. D. Sakenfeld, 864–865. Nashville, TN: Abingdon Press.
- Hiers, R. H. 1968. Not the season for figs. *Journal of Biblical Literature* 87(4): 394–400.
- Hirschegger, P., Jakse, J., and Bohanec, B. 2009. Origins of *Allium ampeloprasum* horticultural groups and a molecular phylogeny of the section *Allium* (*Allium*: Alliaceae). *Molecular Phylogenetic Evolution* 54(2): 488–497.
- Homan, M. M. 2002. *To your tents, O Israel! In The Terminology, Function, Form, and Symbolism of Tents in the Hebrew Bible and the Ancient Near East*. Leiden, Netherlands: E. J. Brill.

- Homan, M. M. 2004. Beer and its drinkers: An ancient Near Eastern love story. *Near Eastern Archaeology* 67: 84–95.
- Jackson, B. D. 1881. *Guide to the Literature of Botany Being a Classified Selection of Botanical Works, Including Nearly 6000 Titles Not Given in Pritzel's "Thesaurus."* London: Longman's Green.
- Jiang, H.-E., Li, X., Ferguson, D. K., Wang, Y.-W., Liu, C.-J., and Li, C.-S. 2007. The discovery of *Capparis spinosa* L. (Capparidaceae) in the Yanghai Tombs (2800 B.P.), NW China, and its medicinal implications. *Journal of Ethnopharmacology* 113: 409–420.
- Juniper, B. E., and Mabberley, D. J. 2006. *The Story of the Apple*. Portland, OR: Timber Press.
- Kafi, M., Koocheki, A., and Rashed, M. H. 2006. *Saffron (Crocus sativus) Production and Processing*. Enfield, NH: Science.
- Karis, P. O., Eldenäs, P., and Källersjö, M. 2001. New evidence for the systematic position of *Gundelia* L. with notes on delimitation of *Arctoteae* (Asteraceae). *Taxon* 50(1): 105–114.
- Knight, A. E. 1889. *Bible Plants and Animals: Illustrations of Over One Thousand Passages of Scripture, from the Works of Travelers and Other Sources*. London: Nisbet.
- Krause, K. 1926. Über *Allium kurrat* Schweinf. *Botanischer Garten* 87(4): 35–524.
- Langenheim, J. H. 2003. *Plant Resins: Chemistry, Evolution, Ecology, and Ethnobotany*. Portland, OR: Timber Press.
- Levey, M. 1966. Medieval Arabic toxicology: The book on poisons of Ibn Wahshiya and its relation to early Indian and Greek texts. *Transactions of the American Philosophical Society, New Series* 56(1): 1–130.
- Lipshitz, N. 1987. *Ceratonia siliqua* in Israel; an ancient element or a newcomer. *Israel Journal of Botany* 36(4): 191–197.
- Lipshitz, N., Lev-Yadun, S., and Waisel, Y. 1981. Dendroarchaeological investigations in Israel (Masada). *Israel Exploration Journal* 31(3–4): 230–234.
- Lipovitch, D. 2009. Almug. In *The New Interpreters Dictionary of the Bible*, vol. 1, ed. K. D. Sakenfeld, 106. Nashville, TN: Abingdon Press.
- Lloret, J. 1622. *Sylva allegoriarum totius Sacrae Scripturae, mysticos eius sensus, et magna etiam ex parte literales complectens, syncerae theologiae candidatis perutilis ac necessaria, quae loco integrae bibliothecae cuilibet sacrarum literarum studioso acquirere poterit*. Lugduni: sumptibus Thomae Soubbron.
- Löw, I. 1924. *Flora der Juden*. 4 vols. Hildesheim: Georg Olms.
- Maillat, S., and Maillat, J. 1999. *Les Plantes dans la Bible Guide de la Flore en Terre Sainte*. Méolans-Revel, France: DésIris.
- Mandelik, Y., and Roll, U. 2009. Diversity patterns of wild bees in almond orchards and their surrounding landscape. *Israel Journal of Plant Sciences* 57(3): 185–191.
- Martinetz, D., Lohs, K., and Janzen, J. 1989. *Weihrauch und Myrrhe Kulturgeschichte und Wirtschaftliche Bedeutung Botanik Chemie Medizin*. Berlin: Akademie.
- Matthews, V. H. 2009. Rue. In *The New Interpreters Dictionary of the Bible*, vol. 4, ed. K. D. Sakenfeld, 862. Nashville, TN: Abingdon Press.
- McGovern, P. E., Fleming, S. J., and Katz, S. H., eds. 1996. *The Origins and Ancient History of Wine*. Amsterdam: Gordon and Breach.
- Mearns, B., and Mearns, R. 1988. *Biographies for Birdwatchers: The Lives of Those Commemorated in Western Palearctic Bird Names*. New York: Academic Press.
- Meiggs, R. 1982. *Trees and Timber in the Ancient Mediterranean World*. Oxford: Oxford University Press.
- Meyer, F. G. 1980. Carbonized food plants of Pompeii, Herculaneum, and the Villa at Torre Annunziata. *Economic Botany* 34(4): 401–437.
- Miller, J. I. 1998. *The Spice Trade of the Roman Empire*. Oxford: Clarendon.
- Moldenke, H. N., and Moldenke, A. 1952. *Plants of the Bible*. In *Chronica Botanica*. New York: Ronald Press.
- Moorey, P. R. S. 1999. *Ancient Mesopotamian Materials and Industries: The Archeological Evidence*. Winona Lake, IN: Eisenbrauns.
- Moussaieff, A., and Mechoulam, R. 2009. Boswellia resin: From religious ceremonies to medical uses; a review of in-vitro, in-vivo and clinical trials. *Journal of Pharmacy and Pharmacology* 61(10): 1281–1293.

- Murphy, R. E. 1992. Song of Songs. In *Anchor Bible Dictionary*, ed. D. N. Freedman, G. A. Herion, D. F. Graf, J. D. Pleins, and Beck, A. B., 40–54. New York: Doubleday.
- Murray, M. A. 2000a. Fruits, vegetables, pulses and condiments. In *Ancient Egyptian Materials and Technology*, ed. P. Nicholson and I. Shaw, 609–655. Cambridge: Cambridge University Press.
- Murray, M. A. 2000b. Cereal production and processing. In *Ancient Egyptian Materials and Technology*, ed. P. T. Nicholson and I. Shaw, 505–536. Cambridge: Cambridge University Press.
- Musselman, L. J. 2001. Zawan and tares in the Bible. *Economic Botany* 54(4): 537–542.
- Musselman, L. J. 2006. The botanical activities of George Edward Post (1838–1909). *Archives of Natural History* 33(2): 282–301.
- Musselman, L. J. 2007. *Figs, Dates, Laurel, and Myrrh Plants of the Bible and the Quran*. Portland, OR: Timber Press.
- Oizzo et al., 2007.
- Paris, H. S., and Janick, J., 2008. Reflections on linguistics as an aid to taxonomical identification of ancient Mediterranean cucurbits: The Piqqus of the Faqqous. In *Cucurbitaceae 2008: Proceedings of the IXth EUCARPIA Meeting on Genetics and Breeding of Cucurbitaceae*, ed. M. Pitrat, 43–52. Avignon, France: INRA.
- Park, H. M., Moon, E., Kim, A.-J., Kim, M. H., Lee, S., Lee, J. B., Park, Y. K., Jung, H.-S., Kim, Y.-B., and Kim, S. Y. 2010. Extract of *Punica granatum* inhibits skin photoaging induced by UVB irradiation. *International Journal of Dermatology* 49(3): 276–282.
- Parkinson, R., and Quirke, S. 1995. *Papyrus*. Austin: University of Texas Press.
- Paterson, J., and Paterson, K. P. 1986. *Consider the Lilies: Plants of the Bible*. New York: Clarion Books.
- Pauli, G. F., Friesen, J. B., Gödecke, T., Farnsworth, N., and Glodny, B. 2010. Occurrence of progesterone and related animal steroids in two higher plants. *Journal of Natural Products* 73(3): 338–345.
- Poole, J. B., and Reed, R. 1962. The preparation of leather and parchment by the Dead Sea Scrolls community. *Technology and Culture* 3(1): 1–26.
- Rackham, H., trans. 2000. *Pliny Natural History Books XII–XVI*. Cambridge, MA: Harvard University Press.
- Ronel, M., Malkiel, H., and Lev-Yadun, S. 2007. Quantitative characterization of the thorn system of the common shrubs *Sarcopoterium spinosum* and *Calicotome villosa*. *Israel Journal of Plant Sciences* 55: 63–72.
- Rösenmüller, E. F. C. 1840. *The Mineralogy and Botany of the Bible*. Translated from the German, with additional notes by T. G. Repp and N. Morren. Edinburgh: Thomas Clark.
- Royle, J. F. 1846. On the identification of the mustard tree of scripture. *Journal of the Royal Asiatic Society of Great Britain and Ireland* 8: 113–137.
- Royle, J. R. 1880a. Aspalathus. In *Cyclopedia of Biblical Literature*, vol. 1, ed. J. Kitto, 239–240. New York: American Book Exchange.
- Royle, J. R. 1880b. Abioyonah. In *Cyclopedia of Biblical Literature*, vol. 1, ed. J. Kitto, 15–16. New York: American Book Exchange.
- Royle, J. R. 1880c. Baca. In *Cyclopedia of Biblical Literature*, vol. 1, ed. J. Kitto, 276–277. New York: American Book Exchange.
- Russell, A. 1756. *Aleppo and Parts Adjacent Containing a Description of the City, and the Principal Natural Productions in Its Neighborhoods*. London: Millar.
- Sakenfeld, K. D., ed. 2009. *New Interpreter's Bible Dictionary*. Nashville, TN: Abingdon Press.
- Samuel, D. 1999. Bread making and social interactions at the Amarna workmen's village, Egypt. *World Archaeology* 31(1): 121–144.
- Samuel, D. 2000. Brewing and baking. In *Ancient Egyptian Materials and Technology*, ed. P. T. Nicholson and I. Shaw, 537–576. Cambridge: Cambridge University Press.
- Schafer, E. H. 1957. Rosewood, dragon's blood, and lac. *Journal of the American Oriental Society* 77(2): 129–136.
- Schoff, W. H. 1917. The Periplus of the Erythraean Sea. In *Travel and Trade in the Indian Ocean by a Merchant of the First Century*. New York: Longmans.
- Sheehan, J. 2003. From philology to fossils: The biblical encyclopedia in early modern

- Europe. *Journal of the History of Ideas* **64**(1): 41–60.
- Shewell-Cooper, W. E. 1977. *Plants, Flowers, and Herbs of the Bible*. New Canaan, CN: Keats.
- Sigourney, L. H. 1853. *Memoir of Mrs Harriet Newell Cook*. New York: Carter.
- Singh, K. B., and Saxena, M. C. 1999. *Chickpeas*. London: Macmillan Education.
- Smith, W., ed. 1860–1863. *A Dictionary of the Bible; Comprising Its Antiquities, Biography, Geography, and Natural History*. 3 vols. London: John Murray.
- Soylu, B., Yigitbas, E. M., Soylu, S., Yigitbas, E. M., and Kurt, Ş. 2007. Antifungal effects of essential oils from oregano and fennel on *Sclerotinia sclerotiorum*. *Journal of Applied Microbiology* **103**(4): 1021–1030.
- Steiner, R. C. 2003. *Stockmen from Tekoa, Sycomores from Sheba: A Study of Amos' Occupations*. Catholic Biblical Quarterly Monograph Series **36**. 1–158.
- Stewart, A. 2009. *Wicked Plants: The Weed That Killed Lincoln's Mother & Other Botanical Atrocities*. Chapel Hill, NC: Algonquin Books.
- Tan, K.-H. 2009. Mustard. In *The New Interpreters Dictionary of the Bible*, vol. 4, ed. K. D. Sakenfeld, 183. Nashville, TN: Abingdon Press.
- Taylor, C. 1814. *Scripture Illustrated, by Means of Natural Science, in Botany, Geology, Geography, Natural History, Natural Philosophy, Utensils, Domestic and Military, Habiliments, Manners, and Customs, &c.* Charlestown, MA: Etheridge.
- Trapp, J. B. 1958. The owl's ivy and the poet's bays: An enquiry into poetic garlands. *Journal of the Warburg and Courtauld Institutes* **21**(3–4): 227–255.
- Trever, J. C. 1959. The flora of the Bible and biblical scholarship. *Journal of Bible and Religion* **27**(1): 45–49.
- Tristram, H. B. 1883. *The Natural History of the Bible. Being a Review of the Physical Geography, Geology and Meteorology of the Holy Land: with a Description of Every Animal and Plant Mentioned in Holy Scripture*. London: Society for Promoting Christian Knowledge.
- Ulubulun, A., and Öztürk, M. 2006. Alkaloids and coumarins from *Ruta* species. *Natural Product Communications* **1**(10): 851–857.
- Verkerke, W. 1989. Structure and function of the fig. *Experientia* **45**: 612–622.
- Walker, W. 1979. *All the Plants of the Bible*. New York: Doubleday.
- Wendrich, W. Z. 2000. Basketry. In *Ancient Egyptian Materials and Technology*, ed. P. T. Nicholson and I. Shaw, 254–267. Cambridge: Cambridge University Press.
- Włodarczyk, Z. 2007. Review of plant species cited in the Bible. *Folia Horticultural* **19**(1): 67–85.
- Woodward, M. 1994. *Gerard's Herbal*. London: Senate.
- Yaniv, Z., Schafferman, D., and Amar, Z. 1998. Tradition, uses and biodiversity of rocket (*Eruca sativa*, Brassicaceae) in Israel. *Economic Botany* **52**(4): 394–400.
- Zohary, M. 1982. *Plants of the Bible: A Complete Handbook*. Cambridge: Cambridge University Press.
- Zohary, D. 1996. The Genus *Pistacia* L. In *Taxonomy, Distribution, Conservation and Uses of Pistacia genetic resources*, ed. S. Padulosi, T. Caruso and E. Barone, 1–11. Report of a workshop, 29–30 June 1995, Palermo, Italy. International Plant Genetic Resources Institute, Rome, Italy.
- Zohary, D., and Hopf, M. 2000. *Domestication of Plants in the Old World: The Origin and Spread of Cultivated Plants in West Asia, Europe, and the Nile Valley*. 3rd ed. Oxford: Clarendon Press.

BIBLE VERSIONS

Following book and verse citations, I provide the translation for that particular interpretation in abbreviated form; if all translations agree, I do not identify a particular source. The translations I have used and their abbreviations are as follows.

ASV, Authorized Standard Version

ESV, English Standard Version

JND, Authorized Version of John Nelson Darby

KJV, King James Version (more formally referred to as the Authorized Version or AV)

MSG, The Message

NASB, New American Standard Bible

NIV, New International Version

NKJV, New King James Version

NLT, New Living Translation

(The preceding versions are from <http://www.biblegateway.com/>)

Geneva Bible 1560 Edition. 2007. Peabody, MA: Hendrickson.

NJB, New Jerusalem Bible, Doubleday, New York.

RSV, Revised Standard Version Electronic Edition STEP Files. Omaha: QuickVerse.

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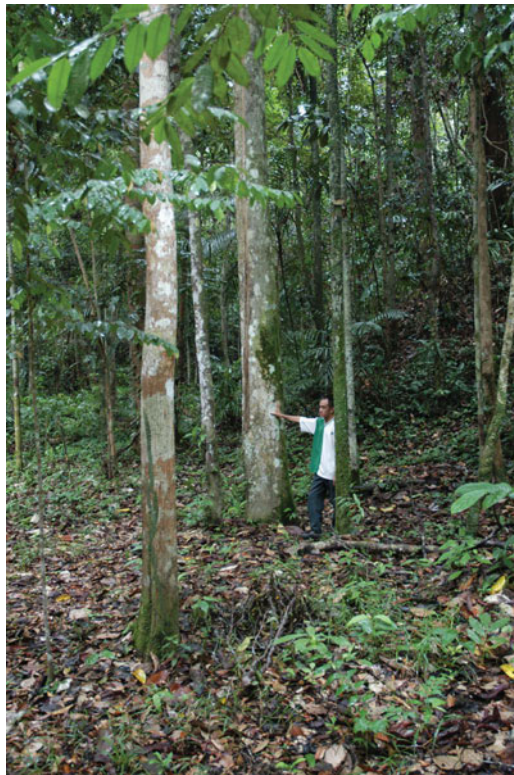
Large *Faidherbia alba* (also known as *Acacia alba*) north of Windhoek, Namibia. This widespread African tree is unusual in keeping its leaves during the dry season.



Acacia raddiana in the desert north of Aqaba, Jordan.



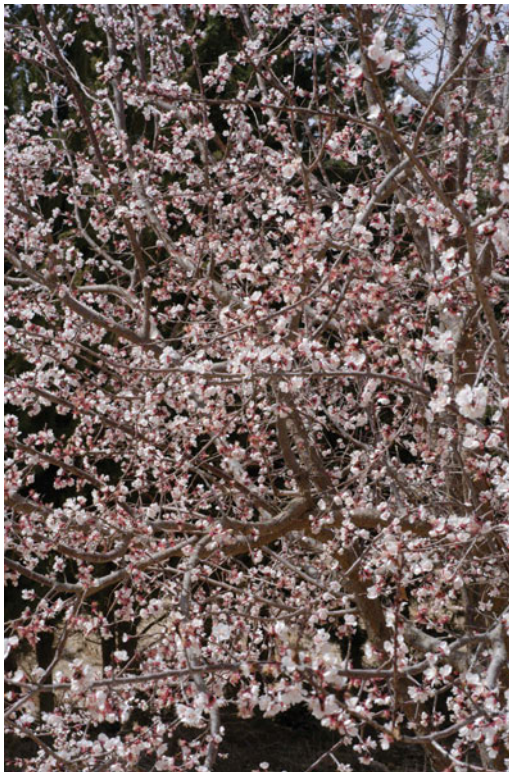
Boxwood, *Buxus sempervirens*, at the National Arboretum in Washington, D.C.



Large *Aquilaria malaccensis* tree in a forest preserve in Sungai Liang, Brunei Darussalam.



Piece of heavily infected wood, valuable for preparing incense and distilling oil, in the University of Brunei Darussalam Field Station, Temburong Province, Brunei Darussalam.



Flowering apricot tree at a monastery in Qarayatan, Syria, in May.



Mature apricots at Abu Arkoub, Syria, in June.



Mature barley (white) with ripening wheat (green) on the right. Barley matures three to four weeks earlier than wheat. South of Aleppo, Syria in June.



Chickpeas, *Cicer arietinum*, ready for harvest near Diyatha, Syria, in June. This is a region of low rainfall, where chickpea is one of the few crops that can produce an acceptable yield.



Garden pea, *Pisum sativum*, near Harrar, Ethiopia, in November.



Lentils, upper left, and chickpeas, lower right, two of the most important legume crops in the Middle East. Market in Sulimaniya, Iraq, in June.



Chicory in full flower on the island of Chios, Greece, in June. The flowers open midday and close by evening.



Retam shrubs in Wadi Arabah, south of the Dead Sea, Jordan, in October. In this season, the shrubs have lost their leaves.



In addition to flowers, numerous buds – the source of commercial capers – are present. Ahmed Awaa, Iraq, in June.



Edge of cedar stand in Chouf Cedar Preserve, Mount Lebanon, in early spring.



Field of coriander near Tubas, Palestinian Territory, in May.



Extensive population of *Haloxylon salicornicum* on the steppe near Diyatha, Syria, in June.



Lower stems and roots of madder, showing the red pigment used for dyes. Eskisehir Province, Turkey, in June.



Chate melon, the cucumber of the Bible, in Thale, Syria, in June. This form of the chate melon is favored when it is quite small.



Chate melons in a market in Suweida, Syria, in June. Note the muskmelon to the left, which botanists usually consider a form of the chate melon.



Date palm in the Gezira Oasis, northern Hajjar Mountains, Oman, in February.



Date palm in the Jimi Oasis, El Ein, United Arab Emirates, in October.



The finely dissected leaves are the source of the herb known as dill weed. These plants are just starting to flower.



Varieties of chickpeas. The large, pale seeds in the middle are the *kabuli* type, a more recently derived form, whereas the small black seeds above and the row of brown seeds below are the *desi* type. *Desi* was the most widely planted variety in ancient times and bears a closer resemblance to pigeon dung than the *kabuli* chickpea.



Ebony, *Diospyros ebenum*, in the Royal Botanic Garden, Peradeniya, Sri Lanka, in March.



Field of flax with developing capsules almost ready to be harvested. Oromia State, Ethiopia, in October.



Field poppy, *Papaver rhoeas*, at the ruins of Ephesus (modern-day Efes, Turkey) in June, showing open flowers and developing capsules.



Field poppy, *Papaver rhoeas*, at the ruins of Ephesus (modern-day Efes, Turkey) in June, showing open flowers and developing capsules.



Incising the frankincense tree using a sharp rock. Near Adearc, Ethiopia, in October.



Species of Galbanum in Cyprus in April.



Field of opium poppies grown for production of medicines, Yazillkaya, Eskisehir Province, Turkey, in June. This species has variably colored flowers; most of the plants grown for opium production have white flowers.



Colycinth, *Citrullus colycinthis*, in eastern Syria in June.



Grapevines growing over a wall near Lebrak, Syria, in June.



Rooftop in late winter supporting plants. Caradagh Mountain, Iraq, in March.



Ground henna leaves produced in Iran and purchased in a market in Sulimaniya, Iraq.



Hyssop in flower. Slunfeh, Syria, in June.



Rockrose, *Cistus creticus*, near Latakia, Syria, in May.



Red lentils, first on the left in the second row, and brown lentils, last on the right in the second row, in a market in Sulimaniya, Iraq, in June.



Red lentils are produced by grinding the hard seed coat, revealing the reddish inside of the seed. Removal of the seed coat makes cooking more rapid, an important consideration in areas with little fuel.



Field of narcissus at Hazer Merd, Sulimaniya Province, Iraq, in March.



Kurdish man offering a traditional bouquet of narcissus.
Dokan, Iraq, in March.



Narcissus at Hazer Merd, near Sulimaniya, Iraq, in March.



Mandrake in a wheat field south of Wadi Mujib, Jordan, in March.



Mature mandrake fruits in Addasir, Jordan, in May.



Leaves of cultivated mint, *Mentha piperata*, at a stage for harvesting.



Mature fruits of mulberry, *Morus nigra*, at Byzantine ruins in Qanawat, Syria, in June. This is a cultivar selected for its exceptionally tasty fruit.



Dried mulberry fruits in a market in Sulimaniya, Iraq, in June.



Roadside near Suweida, Syria, in March. *Sinapis alba* is abundant in pastures and on road margins.



Sinapis alba on the campus of the School of Agriculture, Sulimaniya University, Sulimaniya, Iraq, in March.



A large specimen of *Commiphora kataf* in central Ethiopia in October.



Dry streambed with myrtle, the dark green shrub in the center. The pink flowers of oleander are conspicuous above the myrtle. These two plants, myrtle and oleander, occupy a similar habitat. Chios, Greece, in June.



Massive numbers of flowers are borne in the spring but are not conspicuous because of the leaves. Island of Chios, Greece, in June.



Traditional handicrafts made from olive wood in Bethlehem. Olive wood is hard and durable but unsuitable for saw timber.



Field of onions in flower near the village of Zebabdeh, Palestinian Territory, in May.



Calabrian pine, Island of Chios, Greece, in June. Calabrian and Aleppo pine are superficially similar and often confused. One difference is that the cones of Calabrian pine are borne at right angles to the branch, as evident on the upper left branch.



Solidified resin (white slabs on boxes) from *Pistacia eurycarpa* in a market in Sulimaniya, Iraq, in June. The resin is collected from the trees after being excised from the bark; it is put into forms to solidify and sold as a masticatory and medicine, perhaps similar to the way balm of Gilead was used.



Branch of a large pomegranate shrub at the ruins of Ephesus, modern-day Efes, Turkey, in June.



Single flower of the pomegranate, near Damascus, Syria, in May.



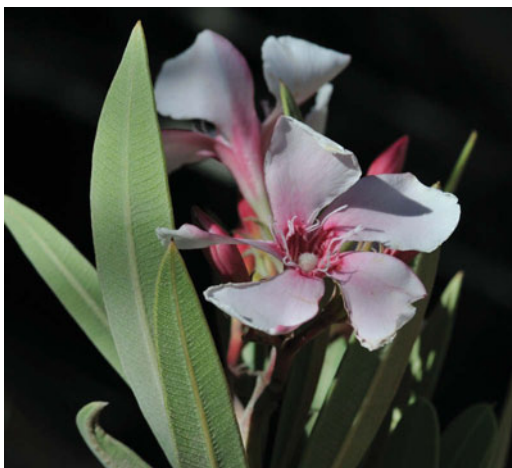
Pomegranate fruits.



Reeds, *Phragmites australis*, in shallow water of Lake Iznik near Iznik (ancient Nicea), Turkey.



Oleander along a dry streambed with wild date palm. Hajar Mountains, northern Oman, in October.



Oleander flower showing its distinct evergreen leaves.
Hajar Mountains, northern Oman, in February.



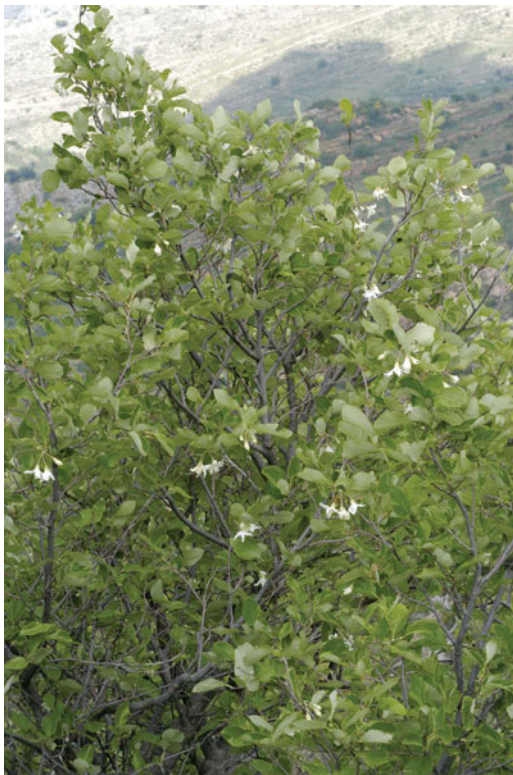
Tulipa systole, Caramadagh Mountain, Sulaimaniya Province, Iraq, in March.



Tulipa montana, Pira Magrun Mountain, Sulimaniya Province, Iraq, in March.



Saffron ready for harvest of the stigmata, the red threadlike structures. Grown from corms from a commercial saffron field in Andalucia, Spain, in October.



Styrax just beginning to flower on Mount Lebanon in April.



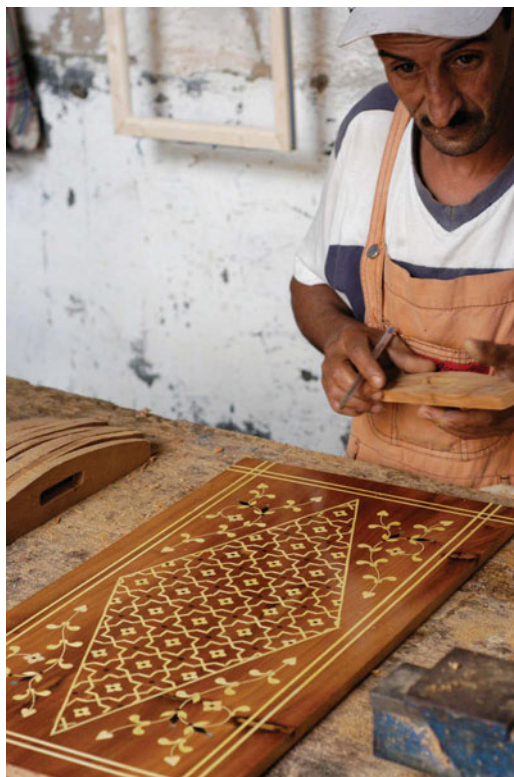
Tamarix gallica on a Mediterranean shore of the island of Chios, Greece, in June. The pink flowers are evident.



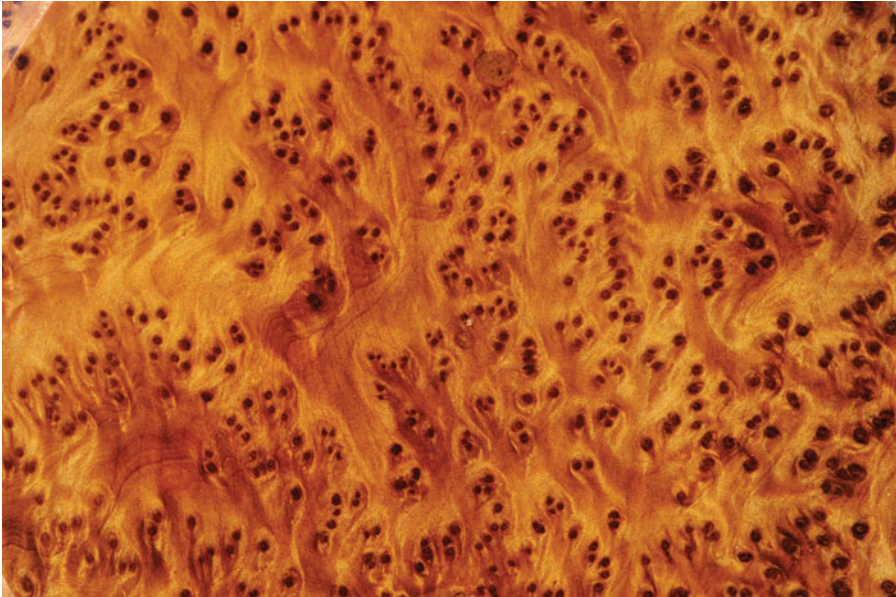
Onopordum acanthium, Akkar Province, northern Lebanon, in April.



Brown fruits are evident on this shrub near Zababdeh, Palestinian Territory, in May.



Artisan in Essaouira working with thuyne. This wood is from the aerial part of the tree. The inlay is from a lemon tree.



A finished piece of thiyne wood from the underground portion of the tree showing the characteristic bird's-eye pattern



Lathyrus sativus near Adwa, Tigray State, Ethiopia.



Lathyrus sativus seeds near Adwa, Tigray State, Ethiopia.



Salix alba male flowers. Eastern Iraq in March.