The Cucurbits of Mediterranean Antiquity: Identification of Taxa from Ancient Images and Descriptions

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INTRODUCTION

Various species of the Cucurbitaceae originating in Europe, Asia and Africa have been collected or cultivated since antiquity for a number of uses including food, medicinals, culinary vessels, utensils, fishing floats, musical instruments, masks and articles of clothing (Heiser, 1979; Robinson and Decker-Walters, 1997; Jeffrey, 2001). References to cucurbits are scattered in ancient literature, notably in three 1st century CE texts by Dioscorides, Columella and Pliny, which, remarkably, were written within 18 years of each other, and in compilations of rabbinic law derived from the same time period together with cucurbits images dating from antiquity including paintings, mosaics and sculpture. The goal was to identify taxonomically the Mediterranean cucurbits at the time of the Roman Empire.

• Background A critical analysis was made of cububit descriptions in Dioscorides’ De Materia Medica, Columella’s De Re Rustica and Pliny’s Historia Naturalis, works on medicine, agriculture and natural science of the 1st century CE, as well as the Mishna and Tosefta, compilations of rabbinic law derived from the same time period together with cucurbits images dating from antiquity including paintings, mosaics and sculpture. The goal was to identify taxonomically the Mediterranean cucurbits at the time of the Roman Empire.

• Findings By ancient times, long-fruited forms of Cucumis melo (melon) and Lagenaria siceraria (bottle gourd) were selected, cultivated and used as vegetables around the Mediterranean and, in addition, bottle-shaped fruits of L. siceraria were employed as vessels. Citrullus lanatus (watermelons) and round-fruited forms of Cucumis melo (melons) were also consumed, but less commonly. A number of cucurbit species, including Bryonia alba, B. dioica, Citrullus colocynthis and Echallium elaterium, were employed for medicinal purposes. No unequivocal evidence was found to suggest the presence of Cucumis sativus (cucumber) in the Mediterranean area during this era. The cucum of Columella and Pliny was not cucumber, as commonly translated, but Cucumis melo subsp. melo Flexuosus Group (snake melon or vegetable melon).

Key words: Columella, De Re Rustica, Dioscorides, De Materia Medica, Pliny, Historia Naturalis, Mishna, Tosefta, plant iconography, Bryonia alba, Bryonia dioica, Citrullus colocynthis, Citrullus lanatus, Cucumis melo, Cucumis sativus, Echallium elaterium, Lagenaria siceraria, Luffa cylindrica.

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completed in the year 77 CE, a sourcebook of classical information on a wide range of topics including agriculture, art, astrology, astronomy, botany, chemistry, geography, medicine, mineralogy and zoology. Pliny was a compiler and the work is a monumental collection of science, technology and superstition. Although Pliny appears overly credulous, his encyclopaedic compilation is the best-known and most widely cited sourcebook of ‘classical’ natural history and a rich source of information on agriculture and horticulture. A side-by-side Latin–English version is found in the ten-volume Loeb Series, Harvard University Classical Library. Cucurbits are described in Book 19, which is in volume 5, and Book 20, which is in volume 6, with translations by Rackham (1950) and Jones (1951), respectively.

The Mishna is the codex of Jewish oral law compiled during the 2nd century CE in Israel under Roman rule. Organized by a chief rabbi, Yehuda HaNasi (Judah the President), it consists of six ‘orders’ or volumes, each of which consists of 7–12 tractates for a total of 63. Each tractate or massekhet concentrates on a particular subject of Jewish law, citing mostly the expoundings of 1st and 2nd century rabbis, known as the Tanna’im, on these subjects. As Jewish society was primarily agricultural in the Roman period, one of the six orders of the Mishna, named Zera’im (Seeds), deals primarily with Jewish laws of agriculture. Another compilation of Jewish oral law as expounded by these same rabbis is the Tosefta (Supplement), which is organized similarly to the Mishna, but has traditional statements in a more expanded, often significantly varying form, supplemented with explanatory notes. Much of it was written down at the same time as the Mishna, but the Tosefta is generally believed to have been compiled in the century after the completion of the Mishna. Both the Mishna and the Tosefta can be browsed and searched online at http://www.mechon-mamre.org (Mechon Mamre, 2007).

Plant iconography is often the most unequivocal tool for assessing the historical presence of botanical taxa in a particular region, and this has proven to be especially true for the Cucurbitaceae (Eisendrath, 1961). Images often are not entirely realistic, however, and interpretations and identifications of plant taxa based on them should take into account the contemporary cultural context and possible symbolism (Sillasoo, 2006). Although some of these images are familiar to art historians, they have not been widely circulated among students of crop evolution.

The objectives here are to review and analyse the cucurbits descriptions of the Roman authors, Dioscorides, Columella, and Pliny, and the descriptions from Israel of near-contemporary rabbinic sages, the Tanna’im, and to compare them. Moreover, we escort, integrate, and attempt to reconcile these 1st and 2nd century writings with images of cucurbits, including paintings, mosaics and sculpture, from various Mediterranean cultures, from the time of the Old Kingdom of ancient Egypt (approx. 3100–2180 BCE) through the 6th century CE. Based on these diverse sources, the traditional identification of these cucurbits is reconsidered in relation to their origin, usage and development.

### TEXTUAL REFERENCES FROM DIOSCORIDES, COLUMELLA AND PLINY

The cucurbits of Dioscorides with images from the Juliana Anicia Codex

In the translation of Dioscorides by Beck (2005), there are six epithets which can be identified as cucurbits: *ampelos leuke*, *ampelos melaine*, *kolokynthia*, *sikyos agrios*, *sikyos hemeros* and *pepon*. As the text of Dioscorides is almost all confined to medicinal properties it is often difficult to determine the precise species by the text, but in some cases the names are indicative. The illustrations in the Juliana Anicia Codex of 512 CE facilitate the identification of *ampelos leuke*, *ampelos melaine*, *kolokynthia* and *sikyos agrios*. It needs to be stressed that the original Dioscorides manuscript was not illustrated, although Singer (1958) has suggested that some of the illustrations in the 512 codex may have been derived from Krataeus, author of a lost herbal and physician to the King of Pontus, Mithridates VI Eupater, in the 1st century BCE.

*Ampeles leuke*, literally ‘white vine’, was described by Dioscorides as having tendrils similar to the cultivated grape and red fruit bunches. Beck (2005) identified it as *Bryonia dioica*. In the facsimile edition of the Juliana Anicia Codex (Fig. 1A), an illustration annotated by a later hand as *bryonia leuke* shows a plant consisting of a large yellow root and four branches bearing leaves with cleft margins, long tendrils and 13 clusters of small bluish fruits resembling berries. Overall, this image appears to represent *Bryonia alba* L.

*Ampeles melaine*, literally ‘black vine’, was described by Dioscorides as having a root that is black externally but the colour of boxwood internally, leaves resembling those of ivy, tendrils clinging to trees and pale green fruit that become black upon ripening. In the facsimile edition of the Juliana Anicia Codex (Fig. 1B), an illustration labelled *bryonia melaine* shows a thick yellow root and two branches with leaves consisting of long petioles with deeply five-lobed, serrated laminae, without tendrils, one flower bud and no fruit, suggestive of a stamine plant. Although it is difficult to make a positive identification, the description and illustration are suggestive of *Bryonia dioica* Jacq., but Beck (2005) identified *ampeles melaine* from the Dioscoridean text as *Tamus communis* L. (Dioscoreaceae).

*Kolokynthia*, for which Dioscorides considered the epithets *sikyos pikra* and *kolokynthis* as synonyms (Beck, 2005), was described as sending out twigs and leaves that are strewn on the ground, similar to that of cultivated *sikyos*. The stunning image labelled *kolokynthis* in the Juliana Anicia Codex (Fig. 1C, 100v) shows a plant consisting of a large root from which four trailing stems emerge (curiously, without tendrils), bearing leaves having pinnatifid laminae, 16 yellow flowers each with four petals (rather than the usual five), and eight round fruits of various sizes that are dark green with darker stripes.

*Sikyos agrios* (wild *sikyos*) was described by Dioscorides (Beck, 2005) as having a large, white root, leaves and stems similar to cultivated *sikyos* but smaller fruits resembling...
longish acorns, typically growing in building lots and sandy places, the entire plant being bitter. Dioscorides indicated that this plant was the source of the medicinal product elaterium, which was extracted from the fruit that ‘springs back’ when squeezed. On this basis, it can be concluded that Dioscorides was referring to *Ecballium elaterium* (L.) Rich., as the ripe fruits of this plant, when touched, vigorously squirt their seeds, hence the common name for this plant in English, squirting cucumber. The illustration labelled *sikyos agrios* in contemporary red letters in the *Juliana Anicia Codex* (Fig. 1D) shows a plant with a thick orange root, two stems bearing sagittate leaves with seven yellow flowers, both pistillate and staminate, emerging from leaf axils, and four small fruits. This plant, an inedible wild species, is common in the Mediterranean basin and bears bristly, oval fruits that are 2–3 cm long.

*Sikyos hemeros* (cultivated *sikyos*) was briefly mentioned in two sections of Beck’s translation, immediately after wild *sikyos*, suggesting that in both cases it is an interpolation. Although the medicinal uses of *sikyos hemeros*
are mentioned, no description of it is provided. Beck (2005) identified sikyos hemeros as cucumber.

Pepon was mentioned in the same section as sikyos hemeros. The pepon was described as having a rind which can be applied to the top of a child’s head. This suggests a large fruit with a firm exocarp. The word pepon has the connotation of ‘ripe’ or ‘cooked’, particularly in reference to a cucurbit that is not eaten until ripe. Pepon appears to have been applied to watermelon as, according to Stol (1987), the Greek physician Galen (129–200 CE) specifically used the term sikyopepon (literally ‘ripe cucurbit’) for watermelon.

The sikyos hemeros (cultivated sikyos) of Dioscorides has almost universally been identified as cucumber since the Renaissance (e.g. Gerard, 1597; de Candolle, 1886; Sturtevant in Hedrick, 1919). Over 300 years earlier than Dioscorides, Theophrastus (371–287 BCE), in Historia Plantarum (Enquiry into Plants), referred to four cucurbits: sikya, sikyos, sikyos agrios and kolokynthe (Hort, 1916). Sikya (the feminine form of sikyos) was translated as bottle gourd [Lagenaria siceraria (Molina) Standley] by Hort (1916), Liddell et al. (1968) and Dalby (2003), and indeed has a secondary medical meaning of ‘cupping instrument’, probably because the instrument was reminiscent of the bottle gourd. Used in an ancient medical treatment, the heated cup (flaming of cotton wad soaked in alcohol was one method) applied to the skin would form a partial vacuum when cooled, drawing blood to the surface (Stol, 1987) (see Fig. 4A). Interestingly, and certainly not coincidentally, the Latin word for this instrument was cucurbitula, which is derived from cucurbita, Latin for the bottle gourd.

The cucurbits of Columella

The focus of De Re Rustica is agriculture. For cucurbits, the subject matter includes descriptions of management systems for climate control, specifically the use of a specularium (an ancient greenhouse using mirrorstone or mica) for out-of-season production, training of plants, propagation and use of extracts of wild plants for pest control. In contrast to the work by Dioscorides, the focus is food, not medicine. The citations from Columella, Books 2 and 11, below, will be given by book number, chapter and line. Book 10, written in verse, will be referred to by line number only.

The two cucurbits most repeatedly mentioned by Columella are cucumis and cucurbita. The most descriptive passage is in verse form, as follows:

and the twisted cucumber [cucumis]
And swelling gourd [cucurbita], sometimes from arbours hang.
Sometimes, like snakes beneath the summer sun,
Through the cool shadow of the grass do creep.
Nor have they all one form: now, if you desire
The longer shape which hangs from slender top,
Then from the narrow neck select your seed;
But if a gourd of globelike form you seek,
Which vastly swells with ample maw, then choose

A seed from the mid-belly, bearing fruit
Which makes a vessel for Narcian pitch
Or Attic honey from Hymettus’ mount,
Or handy water-pail or flask for wine;
’Twill also teach the boys in pools to swim.

But bluish [lividus] cucumber [cucumis] with swollen womb,
Hairy [hirtus] and like a snake with knotted grass
Covered, which on its curving belly lies
Forever coiled, is dangerous and makes
Still worse the cruel summer’s maladies;
Foul is its juice and with fat seeds ‘tis stuffed.
The white cucumber ‘neath the arbour’s shade
Creeps towards running water and pursues
Its course—by such devotion worn and thin—
More quivering than the udder of a sow
Lately delivered, softer than the milk
Just thickened and into the cheese-vat poured;
Sweet will it be, and when it ripened is
And yellow grows upon well-watered ground
Oft to sick mortals sure relief will bring.

(Book 10, beginning on line 380).

The Latin cucumis was translated as ‘cucumber’ by Forster and Heffner (1955), the modern English word which most closely resembles it. Cucumber, Cucumis sativus L., is a tuberculate, spiny and otherwise glabrous fruit. However, in this passage, the cucumis fruit did not have any of these characteristics, but instead was hairy, twisted or coiled, and snake-like (Book 10, lines 389–393). The young fruits of the melon, Cucumis melo L. subsp. melo, are pilose or lanate (Kirkbride, 1993; Robinson and Decker-Walters, 1997). Moreover, to the present day, melons with very long, typically curved fruits, known as snake melons and formally referred to as Cucumis melo subsp. melo Flexuosus Group (Pitrat et al., 2000) are commonly grown in Asia Minor, North Africa and the Middle East, where they are called faqqous. The long, bluish cucumis had seeds which became plump (fat), which would have occurred when the fruit was physiologically ripe. The faqqous or snake melons, when mature, have a sour taste and tend to rot quickly, hence the description of the foulness of its ‘juice’. On the other hand, Columella described another cucumis, a whitish one, which softened and turned yellow when ripe, at which time, and unlike its long-fruited counterpart, had a pleasant flavour.

The cucumis was forced for out-of-season production for the Emperor Tiberius, who took great delight in them (Book 11, 3: 52–53). They were planted in large containers on wheels that were covered with specularius (‘talc or mica windows’), so that they could be brought outdoors on warm or sunny days and wheeled inside at night or during cold, rainy weather. This appears to be the first mention and description of a greenhouse.

Columella’s use of the term cucurbita, translated as ‘gourd’, indicates that at least two cultigens were being grown at the time. One was long-fruited and for eating, and hence this certainly commands a better price than any other (Book 11, 3:50). The fruit of the other was broader and used when dried for making various kinds of vessels and instruments: for the fruits are quite suitable
for use as vessels, like the Alexandrian gourds, when they have been thoroughly dried (Book 11, 3:49). In addition, of the broad bottle gourd: which makes a vessel for Narycian pitch, or attic honey from Hymettus' mount, or handy water-pail or flask for wine; 'twill also teach the boys in pools to swim (Book 10, lines 385–388). Clearly, it was difficult to maintain the cultivars separately. Columella offered advice as to how overcome the problem: if you desire the longer shape which hangs from slender top, then from the narrow neck select your seed (Book 10, 381–383) and if you are growing them to sell for eating, the seed will have to be taken from the neck of the gourd (Book 11, 3:50). Or if a gourd of globelike form you seek, which vastly swells with ample maw, then choose a seed from the mid-belly (Book 10, lines 383–384) and You should take the seed from the middle of a gourd (cucurbitae) (Book 11:3, 49). The cucurbita cultigen having rounder, more voluminous fruits was grown for the use of its mature fruits as vessels for carrying liquids. The cucurbita cultigen having longer and narrower fruits was a valuable vegetable grown for consumption of the immature fruit. The description fits the calabash or bottle gourd, Lagenaria siceraria. This species is especially variable for fruit shape. The mature, dried, round and bottle-shaped fruits have thick, woody rinds and are still employed as vessels and have a myriad of other uses (Heiser, 1979). By contrast, the long, narrow, immature green cocuzzi are still a popular vegetable in Sicily and elsewhere.

Columella indicated that the cucumis and the cucurbita had similar horticultural requirements and appearance. For example, he noted (Book 11, 3:48): The cucumis and cucurbita require less care when there is plenty of water; for they take a very great delight in moisture.

Columella recommended using extracts of a wild cucurbit, which he referred to as cucumeris anguinei, to control underground pests (Book 2, 9:10). Ecballium elaterium is a common, wild-growing Mediterranean cucurbit. However, it would not fit the epithet anguinei (snake-like) as the plants of this species are not viney nor can its fruits be described as serpentine.

The cucurbitae of Pliny

Pliny's work on natural history contains more descriptions of the plants and fruits as well as the geographical origins of the cultivated cucurbits than does Columella.

Pliny described the cucumis and cucurbita plants as normally prostrate on the ground but they could also climb. Pliny clearly differentiated cucumis and cucurbita as follows: cucumis was a generic term for fruit composed of 'cartilage (pliable skin) and flesh' whilst cucurbita was for fruit composed of 'rind and cartilage'; it was the only fruit whose rind becomes like wood (lignum) as it ripens (Book 19, 22: 61–62). Thus, both cucumber, Cucumis sativus, and melon, C. melo, would fit the definition of cucumis. Bottle gourds, Lagenaria siceraria, would fit the definition of cucurbita, as lignification develops in the rind of these fruits as they approach maturity.

Pliny described considerable variation among cucumis grown in various regions: They grow in any shape they are forced to take; in Italy green ones of the smallest possible size are popular, but the provinces like the largest ones possible, and of the colour of wax or else dark (Book 19, 23: 65). He described the African ones as being the most prolific and those of Moesia as the largest. Those that were exceptionally large were referred to as pepones. The variation in fruit size and colour observed by Pliny may reflect in part regional preferences for stage of growth as well as differences among varieties. Nonetheless, the variation described is more suggestive of the highly polymorphic Cucumis melo than it is of C. sativus.

Pliny (Book 19, 24: 69–70) wrote that the cucumis and the cucurbita were similar in plant growth habit and had similar cultural requirements, adversely affected by cold but thriving when well irrigated on fertilized soil. He observed that their seeds were often sown during the spring or early summer. Although he considered 21 April to be the most suitable date, he noted that some preferred to plant the cucurbita on 1 March and the cucumis on 7 March. He wrote: These two plants both climb upward with shoots creeping over the rough surface of walls right up to the roof, as their nature is very fond of height. They have not the strength to stand without supports, but they shoot up at a rapid pace, covering vaulted roofs and trellises with a light shade. Owing to this they fall into these two primary classes, the roof-gourd and the common gourd which grows on the ground; in the former class a remarkably thin stalk has hanging from it a heavy fruit which a breeze cannot move. The gourd as well as the cucumber is made to grow in all sorts of long shapes, mostly by means of sheathes of plaited wicker, in which it is enclosed after it has shed its blossom, and it grows in any shape it is compelled to take, usually in the form of a coiled serpent. But if allowed to hang free it has before now been seen three yards long. Then there is a most telling description of the cucumis by Pliny: particulatim cucumis floret, sibi ipse superfloroscens, et sicciros locos patitur, candida lanugine obsductus, magisque dum crescit [The cucumber makes blossoms one by one, one flowering on the top of the other, and it can do with rather dry situations; it is covered with white down (lanugine), especially when it is growing]. Although both melons (Cucumis melo) and cucumbers (C. sativus) produce more than one flower per node, which usually do not reach anthesis at once, only the young fruits of Cucumis melo are densely covered with soft, white hairs, i.e. are downy. The young fruits of Cucumis sativus are glabrous except for tubercles and spines. Likewise, extraordinary length of the fruit can be achieved in C. melo but not C. sativus. Clearly, Pliny was describing snake-like melons, C. melo subsp. melo Flexuosus Group.

Pliny, like Columella, refers to out-of-season production of this crop, as cucumis was a delicacy for which the emperor Tiberius had a remarkable partiality; in fact there was never a day on which he was not supplied with it, as his kitchen-gardeners had cucumber [cucumis] beds mounted on wheels which they moved out into the sun and then on wintry days withdrew under the cover of frames glazed with transparent stone (Book 19, 23: 64).

Although it would appear that the young fruits of cucumis were preferred to those of cucurbita by the
Emperor Tiberius and presumably by the general population, Pliny noted that *cucurbita* was more utilitarian. He stated that the long-fruited gourds were the ones used for culinary purposes: *There are a larger number of ways of using gourds [cucurbitarum]. To begin with, the stalk is an article of food. The part after the stalk is of an entirely different nature; gourds have recently come to be used instead of jugs in bath-rooms, and they have long been actually employed as jars for storing wine. The rind of gourd while it is green is thin, but all the same it is scraped off when they are served as food ... The longer and thinner gourds are, the more agreeable they are for food, and consequently those which have been left to grow hanging are more wholesome; and this kind contain fewest seeds, the hardness of which limits their agreeableness as an article of diet* (Book 19, 24: 71).

Pliny mentioned that it was possible to preserve the fruits of both *cucumis* and *cucurbita* in edible condition for a considerable length of time: *A plan has been invented by which they are preserved for food also—and the same in the case of cucumbers—to last almost until the next crops are available. This method employs brine; but it is reported that of cucumbers* (Book 19, 24: 74).

Pliny gave instructions for seed propagation, quite similar to the instructions given by Columella concerning the determination of fruit shape in the following generation of plants: *semina quae proxima a collo fuerunt proceras pariunt* (Book 19, 24: 72–73) [*The seeds that were nearest the neck of the plant produce long gourds.*] (Pliny was clearly referring to the neck of the fruit.) As for propagation, Pliny gave clear instructions: *The seeds are dried in the shade, and when they are wanted for sowing they are steeped in water ... Gourds kept for seed are not usually cut before winter; after cutting they are dried in smoke for storing seeds of garden plants—the farm's stock in store.*

Besides the commonly known *cucumis* and *cucurbita*, there was, according to Pliny, an epithet for another cucumber, and this he defined clearly: *Curious to say, just recently a new form of cucumber has been produced in Campania, shaped like a quince. I am told that first one grew in this shape by accident, and that later a variety was established grown from seed obtained from this one; it is called apple pumpkin [melopepo]. Cucumbers of this kind do not hang from the plant but grow of a round shape lying on the ground; they have a golden colour. A remarkable thing about them, beside their shape, colour and smell, is that when they have ripened, although they are not hanging down they at once separate from the stalk when ripe, although they do not hang from the stem, they separate from it at the stalk* (Book 19, 23:67). Separation of the ripened fruit from the peduncle is a common characteristic of melon, *Cucumis melo*, not cucumber, *C. sativus*. Clearly, *melopepo* was a form of *C. melo*. It also differed distinctly from the long-fruited melons commonly grown and consumed by his contemporaries by its being grown only on the ground (never climbing), by its round shape and its being harvested upon attaining full maturity, when it changed colour. It can also be inferred that upon ripening and separating from the peduncle, the fruit was aromatic, a further characteristic distinguishing melons from other cucurbits.

Another epithet used by Pliny probably to indicate a cucumber was *pepones*. He used it twice, once apparently in reference to large melons: *... those of Moesia the largest. When they are exceptionally big they are called pumpkins [pepones]* (Book 19, 23: 65). In the other instance (Book 20, 6: 11), the *pepones* were described as such: *Qui pepones vocantur refrigereant maxime in cibo et emolliant alvum. [The gourds called pepones make a very refreshing food, and are also laxative.]* The description as very refreshing suggests watermelon, *Citrullus lanatus* (Thumb.) Matsum. & Nakai. Pliny followed this statement with medicinal applications of the fruit and root of this plant.

Pliny described a wild-type *cucumin* as a source of the drug elaterium with medicinal properties (Book 20, 2: 3). *We have said that there is a wild cucumber much smaller than the cultivated kind. From it is made the drug called elaterium by pressing the juice out of the seed. Unless, to prepare it, the cucumber be cut open before it is ripe, the seed sprouts out, even endangering the eyes. This description perfectly matches *Echallium elaterium*. Pliny then described *cucumin* (Book 20, 3: 7) from several localities that reportedly had superior qualities, but these may be references to other wild cucurbit taxa.

Pliny described yet another wild cucurbit: *Colocynthis vocatur alia, ipsa plena semine, sed minor quam sativa. Utilior pallida quam herbacea* (Book 20, 8: 14) [*Another kind of wild gourd is called colocynthis. The fruit is smaller than the cultivated, and full of seed. The pale variety is more useful than the grass-green.*] Pliny was referring to the colocynth, *Citrullus colocynthis* L., but we understand the Latin *utilior pallida quam herbacea* as not to compare the medical usefulness of different varieties but rather the mature, pale-coloured fruit with the immature green fruit. Another wild cucurbit mentioned briefly (Book 20, 7: 13) was *sonfos*, described as found growing only in rocky soils and having hollow fruits. This meagre description is insufficient for taxonomic identification.

**SCRIPTURE AND JEWISH COMMENTARY**

The three cucurbits mentioned in the Hebrew Bible, the *qishu’im*, the *avatthim*, and the *paqq’u’ot sade*, as well as several other cucurbits, are the subject of rabbinical commentary in the *Mishna* and the *Tosefta*. The citations from the *Mishna* and *Tosefta* below will be given according to the name of the *masekhet* (tractate), chapter number and statement number. Most significant is that the first four cucurbits described below were mentioned along with edible fruits of various other plant families on the subject of tithing (*Mishna, Ma’asrot* 1:4) and therefore must have been food sources growing in Israel in the 2nd century.

The *qishu’im* were known to the Children of Israel from Egypt, who longed for them during their wanderings in the Sinai Desert (*Numbers* 11:5). No later than by the time of the first temple in Jerusalem, their cultivation in Judea...
must have been common, as there was a special word in Hebrew for a field of them, miqsha (Isaiah 1:8). Moreover, these qishu’im or qishu’in, or in the singular form, qishut, are the most frequently mentioned cucurbit in the Jewish commentary, reflecting their relative importance and widespread culture in the Israel of Roman times. The possibility of growing the plants in a pot or receptacle (Mishna, ‘Ogaizin 2 : 10) is reminiscent of Pliny’s description of out-of-season production of cucumis. Indeed, Rabbi Yehuda HaNasi was said to have had qishu’in on his table throughout the year, according to the 7th century compilation of Jewish law derived from the Mishna, the Babylonian Talmud (Berakhot 57b) (Mechon Mamre, 2007, http://www.mechon-mamre.org); this is reminiscent of Columella’s and Pliny’s description of the year-round availability of cucumis for Emperor Tiberius. The qishu’im had a very short shelf life and were deemed fit as contributions until only a day after harvest (Tosefta, Terumot 4 : 5). The qishut was so obviously and densely hairy that, in a play on words, the hairs collectively were referred to as keshut shel qishut (down of qishut) (Mishna, ‘Ogaizin 2 : 1). The Greek pekos is the likely source for the special Hebrew word for the removal of the hairs prior to the use of the fruits in culinary preparation, piqqus (Mishna, Ma’asrot 1 : 5) (Feliks, 1968; Lieberman, 1993). This piqqus was probably accomplished by vigorously rubbing the fruit or perhaps by dipping the fruits in boiling water (Feliks, 2005), apparently with the purpose of removing the dirt and grit that tended to accumulate on the surface of the fruits because of the hairs. Growers near the town of Zippori in northern Israel habitually wiped the fruits with a sponge upon harvest until rabbis deemed this practice unacceptable (Tosefta, Makshirin 3 : 3). The Hebrew qishut is the linguistic equivalent of the Arabic qitha or qatta, and both appear to be linked to the Greek sikyos by an ancient, common root epithet of the Mediterranean region (Stol, 1987), of which the French courge and the Italian cocuzza and zucca are derivatives. Vesling (1640), in his supplement to Alpini’s De plantis Aegypti liber, presented an illustration, labelled Chate, which was clearly based on a plant of Cucumis melo having rather elongate, nearly rhomboidal fruits. The epithet ‘chate’, a blundered rendition of cultivar-group of C. melo that is distinguished by fruits having a length-to-broadest-width ratio of around 2 : 1 or 3 : 1 and that are not sweet, but are used when young, like cucumbers, raw, pickled or cooked (Pitrat et al., 2000). Feliks (1967, 1968) and Zohary (1982) concurred that the qishu’im of Biblical times were chate melons. The Arabic faqqous, used to designate the long-fruited snake melons, C. melo Flexuosus Group, is obviously linked linguistically to the Hebrew piqqus. Although it seems that the qishu’im of Biblical times were mostly chate melons, the qishu’im of the Mishna and Tosefta appear to have referred mostly to snake melons (Kislev, 2000b).

A second edible cucurbit from the Mishna and Tosefta is the delu’im or delu’in, or the singular form dela’at. The name of a Biblical town, Dil’an (Joshua 15 : 37–38), may be derived from this. By the time of the Mishna and Tosefta, the delu’im must have been commonly grown, as a field of them had a specific name in Hebrew, midla’ (Mishna, Shevi’it 2 : 1, 2; Tosefta, Oholot 17 : 11). The delu’im are most often mentioned in connection with the qishu’im, and it was permissible to plant the two together in the same garden or field on the condition that they were trained to grow in separate directions (Mishna, Kil’ayim 3 : 3, 5), which suggests that both of these crops were viney plants. They could also be grown in the same field with other vegetables but had to be given adequate spacing as to not to interfere or intermingle with them (Mishna, Kil’ayim 3 : 4, 6–7). The delu’im were hairy fruits and, as with the qishu’im, they had to undergo piqqus prior to the use of the fruits in culinary preparation (Mishna, Ma’asrot 1 : 5), and wiping them with a sponge was unacceptable (Tosefta, Makshirin 3 : 3). The shelf life of the delu’im was as short as that of the qishu’im, just 1 d (Tosefta, Terumot 4 : 5). Löw (1928), Feliks (1967, 1968, 2005) and Zohary (1982) identified the delu’im as bottle gourds, Lagenaria siceraria. Three distinct varieties of delu’im were grown, the Greek, the Egyptian and the ramoza (Mishna, Kil’ayim 1 : 5). There is also reference to the Aramean dela’at (Tosefta, Kil’ayim 1 : 4), but it is regarded as synonymous with the Egyptian (Feliks, 1967). The ramoza differed from the others by the bitterness of its fruits, which could be eliminated by roasting them in hot embers. The Greek cultigen was not to be intermingled with the others together in the field (Mishna, Kil’ayim 1 : 5) or at least not with the ramoza (Tosefta, Kil’ayim 1 : 4) (Kislev, 2000a). Given the genetic bitterness of the ramoza, it certainly would have been ill advised to save seeds from edible-fruited L. siceraria growing next to it. For a person who vowed to abstain from delu’in, the prohibition applied to the Greek cultigen only (Tosefta, Kil’ayim 1 : 4), suggesting that its fruits were used for culinary purposes. This could also account for the observation that the Greek cultigen required more space in the field than the others (Feliks, 1979). Maturing fruits and seeds slow vegetative growth but continual removal of immature fruits for use as food allows cucurbit plants to sustain rampant growth.

A third cucurbit, the melafefonot, or in the singular form, melafefon, was also an article of food and thus subject to tithing. These fruits could be used when young. They would be tithed after removal of the hairs by dipping in boiling water (Tosefta, Ma’asrot 1 : 3–5), which would have tended to clean, disinfect and preserve the fruit. One of the Tanna’im, Rabbi Yishma’el, is on record, however, as exempting the immature fruits from tithing, prior to their becoming ‘bald’, an indication of the strong preference for consuming these fruits after they became glabrous, close to or at their maturity (Lieberman, 1993). As more mature fruits, the melafefonot would be expected to have had a longer shelf life than the qishu’im, and indeed they were considered as being fit for contribution for as much as 3 d after harvest (Tosefta, Terumot 4 : 5). They also must have been rounder than the qishu’im, the linguistic origin of the Hebrew melafefonot obviously being from the Greek melopepones, the name Pliny used in describing a quince-shaped fruit. For the purpose of tithing, most of
The Tanna’im considered the melafefon and qishut as one and interchangeable (Mishna, Terumot 2 : 6) and most agreed that it was permissible to plant them close to one another (Mishna, Kil’ayim 1 : 2). Feliks (1967, 1968, 2005) and Kislev (2000a) identified the melafefonot as melons, Cucumis melo.

The avattihim of Egypt were longed for by the Children of Israel in the Sinai Desert (Numbers 11 : 5). As edible produce, in Israel the avattihim were subject to tithing (Mishna, Ma’asrot 1 : 4). However, along with figs, table grapes and pomegranates, they were exempt if purchased directly from the field (Mishna, Ma’asrot 2 : 6). The association with those fruit crops suggests that the avattihim, like them, were indeed juicy fruits. The avattihim along with the other three edible cucurbits were mentioned again together with figs and grapes with regard to contributions (Mishna, Terumot 8 : 6). The avattihim have been identified by Feliks (1967) and Zohary (1982) as watermelons, Citrullus lanatus. Like the melafefonot, the watermelons were also to be tithed and marketed after being dipped in boiling water (Mishna, Ma’asrot 1 : 5), and probably for the same reasons or to blanch the exocarp (Lieberman, 1993; Feliks, 2005). In contrast to the qishu’im and delu’im, which could be piled in the field in preparation for sale or transport to market, mature watermelon fruits had to be laid out one by one (Mishna, Ma’asrot 1 : 5). Apparently, the watermelons of the time differed from those familiar today by being considerably smaller and by having more fragile rinds (Feliks, 2005), characteristics that can still be found in a number of east Asian cultivars.

The paqqu’ot sade were not luscious; instead they were poisonous and extremely bitter (2 Kings 4 : 39–40). Although the paqqu’ot fruits were inedible, the young shoots of the plants were palatable (Mishna, ‘Oqazin 3 : 4), and they were consumed after pickling in brine or vinegar (Feliks, 1968). An entirely different use of the paqqu’ot is also revealed in the Mishna. Oil was pressed from the seeds, and used for illumination (Mishna, Shabbat 2 : 2). Feliks (1968) identified the paqqu’ot as colocynth, Citrullus colocynthis. Colocynth oil was a familiar commodity in ancient Egypt (Darby et al., 1977). Dried colocynth rinds could also be employed as vessels (Mishna, Kelim 17 : 17) (Feliks, 1968). As attested to by Arabic writers, colocynth fruits continued to be used for medicinal and other purposes around the Mediterranean throughout the Middle Ages until modern times (Amar and Hazot, 2003). Citrullus colocynthis was to become a source of contention in early Christianity. In the Hebrew Bible (Jonah 4 : 6–7), the fast-growing plant called qiayon, castor (Ricinus communis L., Euphorbiaceae), provided shade to Jonah at Nineveh, but in the Septuagint (the Greek translation of the Hebrew Bible in the 2nd and 1st century BCE), the plant was incorrectly translated with the similar-sounding word kolokynthis, and thus has been often translated into English as ‘gourd’. This mistranslation serves as the basis for images of Jonah under a ‘gourd’ plant (typically Lagenaria siceraria) in early and medieval Christian mosaics, a textual error that continued to be repeated for over 1500 years, through the King James Version of the Bible and beyond (Janick and Paris, 2006).

The garmulin or qarumalin (Tosefta, Shevi’it 4 : 12) were suggested by Löw (1928) to be Luffa, and Feliks (1979) concurred, citing a comment referring to its dark green colour (Tosefta, Nega’im 1 : 3). Smooth luffa, L. cylindrica (L.) Roemer (syn. L. aegyptica Mill.), is grown mainly for use of the dried mature fruit flesh as a sponge, but its young fruits are edible and of an intense green colour. As the long, narrow fruits of smooth luffa resemble those of Lagenaria siceraria except in external colour, they are referred to as delu’in, subject to tithing as a vegetable, in the Jerusalem Talmud (Feliks, 1979). Luffa may have been a recent arrival in Israel at the time the Tosefta was redacted or compiled.

The yaroqet hamor (Mishna, Oholot 8 : 1) was mentioned in regard to laws of purity and separation of the pure from the impure. It was identified by Löw (1928) as Ecballium elaterium, squirting cucumber. This is a common wild plant in Israel and other Mediterranean countries to the present day.

### IMAGES FROM ANTIQUITY

We have located cucurbit images from ancient Egyptian, imperial Roman and early Byzantine sources. The cucurbit illustrations from the 6th-century Byzantine manuscript Juliana Anicia Codex have already been discussed above and here are presented various images from ancient Egypt and from the Roman empire and early Byzantine empire.

#### Ancient Egypt

A wealth of cucurbit images has been discovered among archaeological finds of ancient Egypt although the taxonomic attribution of the images has been subject to error among various writers. Most frequently found among the images are representations of Cucumis melo, especially of the Chate Group (Loret, 1892). Keimer (1924) presented over 20 tracings of images from ancient Egypt of fruits of C. melo, mostly of this group as well as some noticeably longer, almost serpentine forms, thus of the Flexuosus Group. Keimer also presented an image of a Citrullus lanatus fruit attached to a stem with two highly divided leaves, a Lagenaria siceraria fruit, and leaves and branches of Ecballium elaterium.

Six cucurbit images from ancient Egypt dating from the 16th to the 12th century BCE are presented in Fig. 2. The oldest is a wall painting (Fig. 2A) of a large, oblong striped watermelon, Citrullus lanatus, from a tomb at Meir dating to the Old Kingdom, 3100–2180 BCE (Manniche, 1989). A crude wall painting (Fig. 2B) from a Theban tomb of the 18th dynasty in the New Kingdom (approx. 1500 BCE) showing a basket containing ten elongate cucurbit fruits, narrower near their peduncular than stylar ends, appears to be Cucumis melo but Lagenaria siceraria cannot be ruled out. A wall painting from the same epoch (Fig. 2C) depicts an elongate fruit, together with attached peduncle and clinging corolla, having longitudinal striations which appear to represent shallow furrows, a common feature of Cucumis melo fruits but not of either C. sativus or L. siceraria. Another
painting (Fig. 2D) shows two large, elongate, striped fruits of Cucumis melo in a basket together with figs and dates. Wooden models (Fig. 2E) from the New Kingdom (1517–1192 BCE) have been identified as fruits of Cucumis melo (Darby et al., 1977). These cucurbit images and those presented by Keimer (1924), although far from forming a comprehensive collection, indicate that chate and snake melons, Cucumis melo, were a familiar vegetable crop in ancient Egypt. Finally, a crude carving on the walls of the Temple of Amun in Karnak (Fig. 2F) of plants brought back from Syria (approx. 1450 BCE) by Thothmes III was identified as Ecballium elaterium by Singer (1958) and appears to be Ecballium elaterium, as evidenced by the thick root, bushy growth habit and small oval fruit.

Roman and Early Byzantine empires

A number of cucurbits were found in mosaics and sculpture from various regions of the Roman and Byzantine empires from the 2nd to the 6th centuries CE. Mosaics by their nature often have limited resolution for species identification, and in some cases it was difficult to distinguish among long-fruited Cucumis melo and Lagenaria siceraria or among round-fruited C. melo, Citrullus lanatus and Citrullus colocynthis. Therefore, the long-fruited cucurbit images are considered separately from the round-fruited ones. Furthermore, the long-fruited cucurbit images assumed to be Cucumis melo subsp. melo Flexuosus Group (snake melons) are considered first, followed by L. siceraria (gourds). Images will be considered chronologically within each group.

The images of long-fruited cucurbits identified here as Cucumis melo are displayed in Fig. 3A–G. A 2nd-century mosaic from Tunisia (Fig. 3A) depicts two fruits with small yellow–orange corollas clinging to the acute stylar ends. Two other 2nd-century Tunisian mosaics (Fig. 3B, C) each depict two similar long fruits although the fruits depicted in Fig. 3C might represent Lagenaria siceraria. Three elongated fruits in a tomb painting from Thessaloniki, Greece (Fig. 3D), dated to the second half of the 3rd century and now located in the Museum of Byzantine Culture in that city, were thought to be eggplant Solanum melongena L. (Solanaceae) (Pazaras, 1981). Quite the contrary, this image appears to us to be of three cucurbit fruits, the yellow–orange flower colour of the fruit on the right indicating C. melo, but the bulbous peduncular ends and the rather thick-appearing peduncles resemble L. siceraria. A 3rd-century Tunisian mosaic (Fig. 3E) depicts one large, maturing, elongate melon split longitudinally and four younger ones; the longitudinal split is characteristic of C. melo rather than L. siceraria. A 3rd-century Tunisian mosaic (Fig. 3F) illustrates two rather small thin melons with acute stylar ends typical of some snake melons. A 4th-century bas relief from Spain...
(Fig. 3G) depicts an erect plant with two striated fruits and dentated leaves below a sheaf of wheat; the striations are characteristic of snake melons and not bottle gourds. A late 6th-century Lebanese mosaic (Fig. 3H) shows tangent round medallions, each containing two small, crossed melons with narrow peduncular ends, resembling fruits of the extant ‘Green Snake’ and ‘Striped Snake’ cultivars of the Flexuosus Group of *C. melo* (Goldman, 2002, figs. 66 and 67, respectively).

The images of long-fruited cucurbits identified here as *Lagenaria siceraria* are displayed in Fig. 4A–G. The 1st century bronze cupping vessel (Fig. 4A) from the House of the Surgeon, Pompeii, resembles a gourd in which the neck has been cut off. Known as *sikya* in Greek or *cucurbita* in Latin, it is modelled after a bottle- or flask-shaped fruit of *L. siceraria*, which has been reported to be the original source of the cup (Einarson and Link, 1976, p. 76 footnote d.; Liddell and Scott, 1925–1940). A 3rd-century mosaic from Tunisia (Fig. 4B) shows elongated fruits with prominent knob-like swelling of the peduncular end often characteristic of *L. siceraria*. Depictions of Jonah at Nineveh (Fig. 4C–E) reclining under the shade of a plant bearing long gourds are common early Christian images (Janick and Paris, 2006a). The 3rd-century statue (Fig. 4C) from central Turkey shows a *Lagenaria* gourd; the identification is based on the rounded stylar base and unduly long and narrow proximal end. The fruits hanging on a trellis from both a 3rd-century Tunisian mosaic (Fig. 4D) and a 4th-century Italian mosaic (Fig. 4E), obviously related in style, show the clear peduncular enlargement characteristic of long-fruited *L. siceraria*. A simplified 4th-century mosaic from Carthage (Fig. 4F) shows three elongated curved fruits that could be *L. siceraria*. Finally, images of bottle
gourds (Fig. 4G) were found in calligraphic decorations of the letter T observed in a guidebook to Mount Athos, Greece (Provatakis, undated), the home of a number of monasteries with collections of Byzantine manuscripts. This image has been identified as an illustration from a handwritten manuscript entitled The Three Services by the hieromonk Parthenios of the Koutloumousiou monastery, dated 1677. Five gourds are illustrated: two long smooth fruits emanating from the mouths of snakes and three shorter fruits with red warts with a prominent calyx growing from a vine. The snake provides an obvious erotic overtone to the image. The two fruit types resemble two forms of Lagenaria, serpentine and flask-shaped, that are well illustrated in the Renaissance ceiling of the loggia of Cupid and Psyche in the Villa Farnesina (Janick and Paris, 2006b). Fruit wartiness has been observed in Lagenaria (Heiser, 1979). Since Lagenaria occurs in a myriad of shapes, in our judgement it would not be a stretch that this image helps to explain the fact that as the Greek sikya, the feminine form of the word, refers to bottle- or flask-shaped (breast-shaped) gourds, therefore sikyos, the male form, refers to long-fruited (phallic) gourds or melons (see Dalby, 2003 p. 215).

Five images of round-fruited cucurbits from mosaics (Fig. 5A–E) could represent watermelon (Citrullus lanatus), melon (Cucumis melo) or colocynth (Citrullus colocynthis). A 4th-century mosaic from Carthage, Tunisia (Fig. 5A), depicts two round, striped fruits, probably watermelon. Round-fruited melons appeared in other 4th-century mosaics: an image from Torre de’ Schiavi, Italy (Fig. 5B), displays one oval and two oblate melons; and an image from Thuburbo Majus, Tunisia (Fig. 5C), shows five oblate fruits differing from one another in colour pattern. Three of these are partly yellow, indicating that they are mature or nearly so while the green fruits are either immature or differ genetically from the yellow ones.
by retaining their green colour at maturity. The differences in colour suggest that these fruits were derived from separate plants in a segregating population. In a late 4th- or early 5th-century mosaic from Greece (Fig. 5D), the left hand of the young man holds a round, striped fruit that could be a small watermelon rather than a large colocynth because the green striping pattern on the detached fruits is intact, whilst, according to Dioscorides, Book 4, 176:1 (Beck, 2005) and Pliny, 20, 8:14 (Jones, 1951), colocynths were usually harvested when the colour fades. The large, round, striped fruit held in the right hand by a young man in an early 6th-century image from Greece (Fig. 5E) is more easily identified as watermelon, *Citrullus lanatus*, in right hand (Akerstrom-Hougen, 1974).

**DISCUSSION: INTEGRATING TEXTS AND IMAGES TO IDENTIFY TAXONOMICALLY THE CUCURBITS OF ANTIQUITY**

An accurate understanding of the history and development of food plants requires critical evaluation and comparison of widely interdisciplinary evidence from horticulture, botany, archaeology, history and philology (Dalby, 2003). This understanding is dependent upon the degree of descriptive detail and accuracy of the original sources as...
well as the accuracy of the translations of these sources. As eruditely discussed by Dalby (2003), misleading translations, such as ‘ripe cucumber’ for sikyos pepon, have made their way into standard reference books and scientific literature, becoming self-perpetuating and difficult to redress, but independent translations as well as interpretations by specialists in particular plant taxa can provide enlightening reassessments. For a historical example, some writers, including de Candolle (1886), asserted that a species of squash and pumpkins, Cucurbita maxima Duchesne, was known in the classical world and this view had persisted in the scientific literature for quite some time. Iconographic, archaeological, historical and philological evidence has refuted this view (Gray and Trumbull, 1883; Whitaker, 1947), and it is universally accepted that the genus Cucurbita was unknown to the ancient Greeks or Romans.

The Cucurbitaceae, an extremely polymorphic family, encompass a number of economically important food plants and exhibit much parallel variation among species and genera (Chester, 1951). This has resulted in much overlapping and juxtaposition of cucurbit names in various languages. Often, epithets for cucurbits have changed over time to designate different taxa, and from the distant past to the present can designate various taxa in different localities (Andrews, 1958). There may be no other family of plants in which the misuse of names has been so widespread. Inaccurate and confusing use of names for various cucurbits has continued to the present, some noteworthy examples being the use of ‘melon’ for watermelon and ‘cantaloupe’ for muskmelon in the USA, the oxymorons ‘round zucchini’ and ‘round courgette’, and the misnomer ‘Armenian Yard Long Cucumber’ for the snake melon of Cucumis melo. Hence, artistic detail and literary accuracy are of the utmost importance for enabling the correct identification of cucurbit taxa.

Plant iconography has played the most important role in the accurate identification of cucurbit taxa in Europe since the Renaissance (Eisenrauth, 1961), especially with regard to the American genus Cucurbita (Paris, 2001). However, for historical periods prior to the Renaissance, both detailed depictions and accurate descriptions of cucurbit plants are much more scarce. Ancient images vary in their quality. Moreover, the mosaic images, though impressive works of art, are of limited resolution, sometimes not even enough to allow definite identification of plant species. The major treatises of the 1st century describing cucurbits are those of Dioscorides, Columella and Pliny, but Dioscorides focused on medicinal properties. Although the descriptions by Columella and Pliny are brief, some of the traits mentioned are of the utmost importance for correct identification of cucurbit taxa. In addition, Jewish texts of the 1st and 2nd centuries, while devoted to religious issues and affairs, refer to cucurbits because these were food plants, and a number inferences can be made concerning their taxonomic identity. We are aware that the images and literary accounts of ancient cucurbits presented here are not fully comprehensive and we hope this paper will encourage others to provide examples which have escaped our attention. Nonetheless, we have derived a number of conclusions concerning cucurbit crop history and development based on the materials that we accumulated and carefully considered.

Our interest in the taxonomic identity of ancient Mediterranean cucurbits was instigated by the writings of Columella and Pliny, particularly with regard to the predilection of the emperor Tiberius Caesar (42 BCE to 37 CE) for cucumis, leading to the invention of the greenhouse. Cucumis, according to Pliny, was a fruit of pliable cartilage and flesh, and this word is the source from which the English word cucumber is ultimately derived (Gove, 1967). The Latin cucumis was translated into English as cucumber by the translators of Columella and Pliny, even though young melon fruits fit the definition of cucumis by Pliny at least as well. This led to statements that cucumbers were appreciated by the Greeks and Romans in authoritative monographs on cucurbits (Whitaker and Davis, 1962; Kirkbridge, 1993; Robinson and Decker-Walters, 1997; Jeffrey, 2001). Traditionally, the Biblical Hebrew word qishu’im, for a well-appreciated esculent known to the ancient Israelites from the Land of Egypt, has also been translated as cucumbers, and this has persisted even in modern, improved translations, such as that of Fisch (1992). Despite this apparent consensus, we found nothing in the writings of Columella and Pliny, nor in the rabbinical texts, to indicate that the cucumis or the qishu’im were Cucumis sativus. Certainly, if the cucumis and the qishu’im were of that species, we would expect to encounter a comment alluding to the warty or spiny surface of the fruits. Instead, both the Roman and the Jewish writers indicated that the cucumis and the qishu’im were downy, softly hairy, which is characteristic of the young fruits of C. melo (Robinson and Decker-Walters, 1997). Moreover, a more-or-less round-fruit ed cucumis, known as the melopepo, was said by Pliny to detach from the stem when ripened. This is a common characteristic of Cucumis melo but has not, to our knowledge, ever been described for Cucumis sativus. Depictions of both long and round C. melo fruits are found in ancient images from the Mediterranean basin but we have yet to encounter a single image that can definitely be ascribed to C. sativus. The textual and iconographic evidence, in our opinion, makes it doubtful that Tiberius grew cucumbers (Cucumis sativus) as indicated by the translators of Columella and Pliny and as assumed by Darby et al. (1977), Stol (1987) and many others, and we propose that snake melon (Cucumis melo Flexuosus Group) is the correct identification.

Columella and Pliny used the epithet cucurbita for those cucurbits that produce a woody rind when mature. Most translators use ‘gourd’ for cucurbita, but as this word is generic and can be synonymous with cucurbit, it offers little help as to the specific identity. Moreover, cucumbers and elongated forms of Cucumis melo, as well as elongated forms of Lagenaria siceraria, do resemble one another superficially, but can often be readily distinguished in accurate depictions. C. melo and L. siceraria fruits are smoother than those of C. sativus and are hirsute when young and often have enlarged stylar ends. C. melo fruits can be striped and/or lobed, characteristics absent from those of L. siceraria. Elongate L. siceraria fruits can often be distinguished by their rounded, swollen peduncular ends.
A number of the images are clear enough to allow the conclusion that both elongate *C. melo* and elongate *L. siceraria* were grown as food around the Mediterranean during the first centuries CE.

Melons have been found growing wild in eastern tropical Africa, including parts of Sudan (Keimer, 1924; Mohamed and Yousif, 2004). There the fruits of primitive indigenous melon cultivars, known locally as *tibish*, are harvested when they are immature and usually are eaten fresh in salads, but also are pickled or added to cooked foods (Mohamed and Yousif, 2004). The fruits of Tibish Group melons have been described as medium small, lacking furrowing but having longitudinal dark and light green stripes, with fruit shape varying from oblate to oval, the latter being the more common (Pitrat et al., 2000). Sympatric wild melons are usually smaller than the *tibish* but they also are striped and vary in shape as well as taste (Mohamed and Yousif, 2004). Of the species of cucurbits, *Cucumis melo* was probably the most widely grown and perhaps the most ancient in cultivation around the Mediterranean Sea (Zohary and Hopf, 1993). This is not surprising, given the greater proximity of the geographical origin of this species to the Mediterranean than other edible-fruited cucurbits. Most of the melons depicted in ancient Egypt show a length-to-broadest-width ratio of approximately 2 : 1 or 3 : 1 (Keimer, 1924), typical of chate melons and typically longer and narrower than the wild melons and primitive *tibish* melons of Sudan. Some other ancient Egyptian depictions show melons that were considerably longer and narrower than the chate melons. On one, the elongate fruits are clearly striped (Fig. 2D), a common characteristic of melon that has not been described in cucumber, *C. sativus*. On another one, the fruit has striations reflecting the topography of the fruit, indicating longitudinal furrows (Fig. 2C). Had this been a cucumber, tubercules and not furrows would have been depicted. Moreover, the wooden models from ancient Egypt (Fig. 2E) also are suggestive of melons as none of them shows the tubercules typical of cucumber. These paintings and models show *Cucumis melo* fruits with a length-to-broadest-width ratio that was considerably higher than that of chate melons, attaining and even exceeding 4 : 1. An even higher proportion of the melons depicted in the first centuries CE were quite long. These long melons, 4 : 1. An even higher proportion of the melons depicted in ancient Egypt show a length-to-broadest-width ratio that was considerably higher and models show tubercules and not furrows would have been depicted.

Moreover, the wooden models from ancient Egypt show melons that were con-
(Numbers 11:5). Nonetheless, there are relatively few images of watermelons from ancient Egypt (Andrews, 1958). Even from the time of the Roman Empire, there are few depictions of watermelons, and they are not mentioned nearly as much as the fruits of *Cucumis melo* or *Lagenaria siceraria* in Roman and Jewish writings, apparently reflecting lesser appreciation for these fruits. This might seem odd, at first, because watermelons had the advantage over the others of being sweet. On the other hand, watermelons can cross spontaneously with non-sweet watermelons, known as citrons, that are used for pickling and preserves. Worse, watermelons can hybridize with the naturally occurring bitter colocynth, and it was almost unavoidable that these two often grew in near proximity to one another. Hybridizations with the citron and with the colocynth would have resulted in the frequent occurrence of non-sweet or bitter watermelons, and thus limited their popularity.

Many of the Renaissance botanists identified the cultivated *sikyos* of the Greeks as cucumber. Observers of more recent times, including de Candolle (1886), Sturtevant (Hedrick, 1919) and Hyams (1971), have concurred. However, as de Candolle (1886) admitted, the origin of cucumbers is the foothills of the Himalayas. Although Roberts (2001) identified two ancient mosaic images as depicting cucumber (see Figs 3E and 4B) the origin of cucumbers is the foothills of the Himalayas. Archaeobotanical records include find-ings of several seeds purportedly of cucumber, but it is extremely difficult, even for experts, to differentiate between the seeds of *C. sativus* and *C. melo* (Bates and Robinson, 1995). Possibly, an identification of the species of these seeds could be accomplished by analysis of ancient DNA (Gyulai *et al.*, 2006). In this survey of Mediterranean iconography and verbal sources of Roman times, we have found no hard evidence of the presence of cucumbers. There is some linguistic evidence that they became known in the region during the early Middle Ages (Amar, 2000) but the earliest European image known to us of what can be unquestionably identified as cucumber is from approx. 1335, post-dating the Mongol invasions. Renaissance depictions of cucumbers, although very common, show much less variation than do those of melons, which is suggestive of their being more recently introduced or of their lesser culinary appreciation or economic importance.

The results of this survey of ancient iconography and writings contribute toward a better understanding of cucur-bit crop evolution. Wild cucurbits bear fruits which are almost always round or nearly so. From the images and written accounts, it is clear that at least two cultivars or market types of both *Cucumis melo* and *Lagenaria siceraria* were grown around the Mediterranean, certainly by Roman times. By that early time, long-fruited types of both taxa had already been selected by people, from ancestral round-fruited progenitors, for the culinary use of the immature fruits while non-elongate types of both taxa were grown for the use of the mature fruits, either for consumption (melon) or for utilitarian purposes (bottle gourd). A similar history and relationship between fruit shape and maturity occurs in the ancient domesticate of North America, *Cucurbita pepo* (squash), and seems to be generally characteristic of cucurbits (Paris, 1989). Unlike these three species, *Citrus lanatus* (watermelon) does not have what could be described as elongate-fruited market types or cultivar-groups and, not surprisingly, its fruits are almost always consumed when mature. The opposite situation occurs for *Cucumis sativus* (cucumber), the fruits of which are almost always rather long to elongate and are almost always consumed when immature. Long-fruitnessedness is also associated with culinary use of the young fruits in cucurbit taxa derived from a wide variety of geographical origins, including *Luffa acutangula* (L.) Roxb. (ribbed luffa, ridged gourd), *Trichosanthes cucumerina* L. (snake gourd) and *Sicana odorifera* (Vell.) Naudin (casabana). It has been suggested that the culinary use of the mature cucumber fruit preceded that of the young fruit (Hammer *et al.*, 1986). Quite to the contrary, among cucurbit crops, culinary use of the immature fruits is an ancient practice, preceding the culinary use of the mature fruits and, due to the desire for a smaller, narrower seed cavity, led to the early development of long-fruited cultigens (Paris, 1989).

One problem remains: the ancients presumably grew their long-fruited and round-fruited melons in near proximity of one another, and their long-fruited and bottle-shaped bottle gourds in near proximity of one another. Intercrossing within each respective species certainly occurred. Hybrid progeny would have appeared in the following growing season, which was problematic because such plants would have borne fruits of intermediate characteristics, which were less desirable than those of both of the parents for any given purpose, e.g. eating as a vegetable or for use as a vessel. Columella (Book 11, 3:49–50) and Pliny (Book 19, 24:72) suggested a solution, taking seeds from different parts of the bottle gourd fruit. Those taken from the stylar end would produce rounder fruits and those from the peduncle end the more desirable, longer fruits. This seemingly bizarre suggestion has received experimental support. Wilson and Payne (1994) grew two accessions of *Cucurbita pepo*, one a zucchini (uniformly cylindrical fruits) and the other a gourd (oval fruits) and applied measured proportions of zucchini and gourd pollen to the stigmas of each. The results showed that the pollen of the pistillate parent was favoured in both, indicating that microgametophytes are adapted for maximal performance within the context of their respective gynoecia. That is, the pollen of long-fruited cultivars is more fit to fertilizing ovules of such cultivars than those of cultivars having nearly round fruits, and vice versa. Moreover, there was greater fertilizing success of zucchini pollen at the peduncular end of the fruit than at the stylar end. Apparently the male gametes from the zucchini had greater ability to travel the greater distance required to reach the ovules near the peduncle than did those from the gourd, but the gametes of the gourd were better adapted to reaching the nearer ovules. Although the nature of gametophyte competition is unclear, the results seem to suggest that interactions of microgametophyte growth rate and gynoecium shape and size play a critical role.
CONCLUSIONS

The descriptions of Columella and Pliny, the Jewish writings, and the artistic legacy from around the Mediterranean Sea are consistent with the growing and food use of several cucurbit crops in this area during Roman times. We identify these taxonomically, in order of importance, as Cucumis melo (melon), Lagenaria siceraria (bottle gourd) and Citrullus lanatus (watermelon). The long-fruited vegetable forms of Cucumis melo were the most widely grown cucumber from ancient times and through the Roman period, and round-fruited melons were of lesser importance. L. siceraria was also widely grown, for use of long-fruited forms as a vegetable and of the round and bottle-shaped forms as vessels or utensils. The text of Dioscorides indicates that several other species of the Cucurbitaceae were collected or grown mainly for medicinal purposes, but not for human consumption of the fruits. These included Bryonia species (bryony), Ecballium elaterium (squirtig cucumber) and Citrullus colocynthis (colo-cynth). There is no compelling evidence for the existence of Cucumis sativus (cucumber) around the Mediterranean in this time period.

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