



# CHRONICA HORTICULTURAE

VOLUME 52 - NUMBER 3 - 2012

A PUBLICATION OF THE INTERNATIONAL SOCIETY FOR HORTICULTURAL SCIENCE





# The 1500th Anniversary (512-2012) of the *Juliana Anicia Codex*: An Illustrated Dioscoridean Recension

Jules Janick and Kim E. Hummer

The Greek herbal of Pedanios Dioskurides entitled *Περί ὕλης ἰατρικῆς* (*On Medical Matters*) was written about the year 65. It was destined to be one of the most famous books on pharmacology and medicine but is also rich in horticulture and plant ecology. The oldest surviving and most famous recension of this famous work, completed in Constantinople about 512, is a Greek version in an alphabetical arrangement that was prepared and presented to the imperial Princess Juliana Anicia (462-527), daughter of the Anicius Olybrius, Emperor of the Western Roman Empire. The bound manuscript stored in Österreichische Nationalbibliothek in Vienna is available in facsimile and is now referred to as the *Juliana Anicia Codex* (*JAC*) or the *Codex Vindobonensis*. The *JAC* contains 383 paintings of plants, including many horticultural crops. An analysis of the illustrations indicates that they were made by numerous artists of varying skills and it is probable that some were derived from earlier lost versions. A comparison of illustrations with modern photographs indicates surprising similarities with contemporary plants.

## INTRODUCTION

The Greek herbal of Pedanios Dioskurides (Latinized as Pedanios Dioscorides, 20-70 CE) entitled *Περί ὕλης ἰατρικῆς* (*PUI*) and known in Latin as *De Materia Medica* (*On Medical Matters*) was written about the year 65. Although non-scientific (Singer, 1927), the treatise was historically acclaimed as one of the most famous works in pharmacology and consisted of botanical descriptions of herbs, including horticultural crops, stressing their medicinal uses. This original non-illustrated work, no longer extant, contained medical information on about 600 plants, 35 animal products, and 90 minerals, along with brief descriptions. Dioscorides, in a preface acknowledging his teacher Areios, criticizes his predecessors for their organization of herbs, inaccurate procedures, and erroneous content. Subsequent revisions and recensions added illustrations.

Dioscorides hailed from Anazarbus, a small city northeast of Tarsus in the Roman Province of Cilicia (now Turkey), and possibly served as a medical officer in the Roman legions. In his famous work he added details from personal experience based on his broad travels. He also included information that he learned from oral tradition and from previous texts. Included was a study of the 130 plants of the Hippocratic Collection and more than 11 plants from Crataeus, Greek physician to Mithridates VI Eupator, King of Pontus, and author of a lost herbal, *Agrimonia eupatorium*. At that time, codex parchment length dictated divi-

sions, or books, for long documents (Collins, 2000). Dioscorides divided his work into five books based on drug affinity: (1) Aromatic Oils Ointments, Trees; (2) Living Creatures, Milk and Dairy Products, Cereals and Sharp Herbs; (3) Roots, Juices Herbs; (4) Herbs and Roots; and (5) Vines and Wines, Metallic Ores. Some subsequent recensions have reorganized his information and presented it alphabetically.

Throughout the centuries *PUI*, translated into Arabic, Persian, Latin and other languages, was widely shared between cultures and civilizations, and formed the basis for most herbals of the West. The Latin Herbal of Pier Andrea Mattioli, first edition in 1544, was entitled *Commentary on the Six [sic] Books of Dioscorides*. Max Wellmann (1906-1914) published a critical Greek edition in 3 volumes in 1906-1914. This version has been translated from Greek into English by Lily Beck (2005), replacing a 1655 version by John Goodyear that now resides in Magdalen College, Oxford, based on a lost Latin translation (Gunther, 1959). Singer (1927) and Blunt and Raphael (1994) summarize the historical lineages of many other Dioscoridean recensions.

### *Juliana Anicia Codex* (*JAC*)

The oldest surviving and most famous recension of *PUI* was prepared and presented to the imperial Princess Juliana Anicia (462-527), daughter of Anicius Olybrius, Emperor of the Western Roman Empire. The bound volume, the most prized possession of the Österreichische

**Figure 1. Dedicatory drawing of Imperial Princess Julian Anicia (center) in the Dioscoridean recension of 512 CE, flanked by personification of Magnanimity on her right who holds gold coins and Wisdom on her left with scroll or codex. The Cupid-like putto offers an open codex and a prostrate female represents craftsmen who restored the church in Honorata on the beneficence of the princess.**



Nationalbibliothek in Vienna, Austria, is available in facsimile and is now referred to either as the *Juliana Anicia Codex* (*JAC*) or the *Codex Vindobonensis*. This volume celebrates its sesquimillennial anniversary in 2012. The *JAC* is a magnificent, gloriously illustrated Byzantine version of *PUI*, completed in Constantinople about 512, reformatted in an alphabetical arrangement that also includes sections on fishing and bird catching. It contains 383 paintings of plants including many modern and ancient horticultural crops. Analysis of the illustrations indicates that they were made by numerous artists of varying skills. Some images were probably derived from earlier *PUI* versions now lost to history. The frontis section of the manuscript contains a portrait of Princess Juliana honored as a religious devotee and patron of the arts of the town of Honorata (Fig. 1). This is the earliest donor portrait in an extant manuscript illumination. There are also two paintings of Dioscorides (Fig. 2) and portraits of then famous physicians and philosophers. The tome is accessible in a two-volume facsimile edition with commentary



**Figure 2.** Frontpiece drawings: (A, B) Dioscorides with the nymph Heuresis, the personification of discovery and inspiration, holding a mandrake plant tied to a dying dog. The sketch (B) is by Singer (1927). The presence of the dog is based on the belief that the mandrake emits a deadly shriek when pulled out of the soil. To harvest mandrake the plant is tied to a starving dog tempted by food, sparing the attendant with muffled ears but causing the demise of the dog. (C, D) Crateuas (ancient herbalist and illustrator of Mithridates) painting a mandrake held by Epinoia (incarnation of thought and intelligence) while Dioscorides is absorbed with his book; (D) sketch by M. Breen (D'Andrea, 1982).



in German, *Der Wiener Dioskurides* (1998, 1999). No complete English translation of the JAC exists.

The provenance of the JAC has been examined by Singer (1927), Heyd (1963), Blunt and Raphael (1994), and Collins (2000). It was fully restored, foliated, and rebound in 1406 by the notary John Chortasmenos at the request of Nathaniel, a monk at the St. John Prodromos Monastery in Constantinople, who placed the cursive numberings on the plant paintings and the transcript of the plant titles and some descriptions in Greek minuscule. Subsequent owners added Arabic, Greek, and Hebrew plant names on the folia. The manuscript eventually became part of the private collection of Moses Hamon (ca. 1490-1554), a Jewish physician and favorite of the Ottoman Sultan, Suleman the Magnificent. The collection was valued at 5000 ducats at the time of Hamon's death who in his life declared that he had spent 8000 ducats on acquisitions (Heyd, 1963). The Dioscoridean manuscript was seen by Ogier Ghiselin de Busbecq (1522-1592), Flemish writer, herbalist and diplomat who served as ambassador to the Ottoman Empire in Istanbul. Busbecq was a collector of coins, manuscripts, curios and plant materials (he sent tulips to his friend Charles de l'Écluse in Europe). Some of his correspondence was published in his *Turkish Letters* (1555-

1562). A letter written in December 1562, stated that he acquired "whole waggonfuls, whole shiploads" of Greek manuscripts, perhaps many from Hamon's son. He mentioned a copy of Dioscorides containing drawings of plants and

**Figure 3.** Blackberry (*Rubus tomentosus* of the European *Rubus fruticosus* aggr.): (left) JAC 83r; (right) photograph of blackberry (*Rubus armeniicus* also of the European *Rubus fruticosus* aggr.) by Kim E. Hummer, USDA ARS.



some fragments of Crateuas and a treatise on birds, but was deterred from purchasing it by the price (100 ducats), a sum "suitable for the imperial purse, but not mine." However, he pressed the Emperor Ferdinand I to purchase it and the manuscript was finally purchased by Ferdinand's son Maximilian II, and it arrived in Vienna about 1569 and was deposited in the Imperial Library in Vienna in 1592.

The purpose of this paper is to compare the illustrations of horticultural crops in the JAC with modern photographs or botanical illustrations. We include 11 examples (Table 1), listed in order of their presentation in JAC: blackberry, turnip, various allium species, arugula, English ivy, cultivated and wild brassicas, faba bean, rose, rhubarb, wild and cultivated carrot, and cowpea.

## PORTRAITS OF CROP PLANTS

The JAC contains many of today's common crop plants. Identification of these crops was originally determined by Otto Mazal, editor of the facsimile edition (Table 1) although in some cases these are not definitive. Many illustrations are the earliest surviving representations of those plants. An analysis of the illustrations indicates that they were made by multiple artists of varying skills by at least four different hands (Collins, 2000). It appears that the paintings were made more or less in sequence with the alphabetic text. The seven paintings in the introductory part of the manuscript were obviously made by a single artist, while the first three paintings of plants, quite crude, seem to be copies of an ancient text by a separate artist also different from the ones who painted the subsequent images. Some of the paintings may have been copies of earlier extant works, and a few seem to have been made directly from

**Table 1.** Some crop plants in the *Juliana Anicia Codex (JAC)* with their Greek name, species as designated by Otto Mazel, editor of the facsimile edition, accepted botanical species (if different), and the English name. Plants in boldface are discussed in the text. Greek names are listed alphabetically in *JAC*.

| JAC folio   | Greek name                       | Species designation of Otto Mazel                          | Accepted nomenclature, if different   | English name                     |
|-------------|----------------------------------|--|---|----------------------------------|
| 27v         | anethon                          | <i>Anethum graveolens</i> L.                               |   | dill                             |
| 32v         | aster attikos                    | <i>Aster amellus</i> L.                                    |   | Italian aster                    |
| 78r         | borbos                           | <i>Muscari comosum</i> L.                                  | <i>Muscari comosum</i> (L.) Mill.   | grape hyacinth                   |
| 81r         | bromos                           | <i>Avena fatua</i> L.                                      |   | wild oat                         |
| <b>83r</b>  | <b>batos</b>                     | <b><i>Rubus tomentosus</i> Wild.</b>                       | <b><i>Rubus fruticosus</i> aggr.</b>  | <b>blackberry</b>                |
| 85r         | geranion                         | <i>Geranium tuberosum</i> L.                               |   | geranium                         |
| 88r         | gingidion                        | <i>Daucus gingidium</i> L.                                 | <i>Daucus carota</i> L.   | wild carrot                      |
| <b>89r</b>  | <b>goggule</b>                   | <b><i>Brassica rapa</i> L.</b>                             |   | <b>turnip</b>                    |
| 108v 306r   | ereoselinon                      | <i>Apium graveolens</i> L.                                 |   | celery                           |
| <b>116v</b> | <b>elaphoskordon<sup>1</sup></b> | <b><i>Allium sativum</i> L.</b>                            |   | <b>garlic</b>                    |
| <b>118r</b> | <b>euzomon</b>                   | <b><i>Eruca sativa</i> L.</b>                              | <b><i>Eruca vesicaria</i> (L.) Cav. subsp. <i>sativa</i> (Mill.) Thell.</b>               | <b>arugula</b>                   |
| 122r        | elaphoboskon                     | <i>Pastinaca sativa</i> L.                                 |   | parsnip                          |
| 128r        | egilops                          | <i>Aegilops ovate</i> L.                                   | <i>Aegilops neglecta</i> Req. ex Bertol.  | goatgrass                        |
| 129r        | eduosmon emeron                  | <i>Mentha piperita</i> L.                                  | <i>Mentha × piperita</i> L.   | peppermint                       |
| 132r        | eduosmon agrion                  | <i>Mentha tomentosa</i> d'Urv.                             | <i>Mentha spicata</i> L. subsp. <i>condensata</i> (Briq.) Greuter & Burdet                | horsemint                        |
| 133r        | emerokalles                      | <i>Hemerocallis fulva</i> L.                               | <i>Hemerocallis fulva</i> (L.) L.   | orange daylily                   |
| 136r        | thridaks hemeros                 | <i>Lactuca sativa</i> L.                                   |   | lettuce                          |
| 147v        | iris                             | <i>Iris germanica</i> L.                                   | <i>Iris × germanica</i> L.  | iris                             |
| 148v        | ion porpuroun                    | <i>Viola odorata</i> L.                                    |   | violet                           |
| 167v        | kannabis hemeros                 | <i>Cannabis sativa</i> L.                                  |   | hemp                             |
| 170v        | krotonekeki                      | <i>Ricinus communis</i> L.                                 |   | castorbean                       |
| 172v        | kapparis                         | <i>Capparis spinosa</i> L.                                 |   | caper bush                       |
| <b>174r</b> | <b>kissos</b>                    | <b><i>Hedera helix</i> L.</b>                              |   | <b>English ivy</b>               |
| 176v        | krinon basilikon                 | <i>Lilium candidum</i> L.                                  |   | madonna lily                     |
| <b>182v</b> | <b>krambe hemeros</b>            | <b><i>Brassica oleracea</i> L.</b>                         |   | <b>cabbage, kale</b>             |
| <b>183v</b> | <b>krambe agria</b>              | <b><i>Brassica cretica</i> Lam</b>                         |   | <b>wild cabbage</b>              |
| <b>185v</b> | <b>kromuon</b>                   | <b><i>Allium cepa</i> L.</b>                               |   | <b>onion</b>                     |
| <b>189v</b> | <b>kramos</b>                    | <b><i>Vicia faba</i> L.</b>                                | <b><i>Vicia faba</i> L.</b>   | <b>faba bean, horse bean</b>     |
| 190v        | kolokunthis                      | <i>Citrullis Colocynthis</i> L.                            | <i>Citrullus colocynthis</i> L.   | colocynth                        |
| 192v        | krokos                           | <i>Crocus sativus</i> L.                                   |   | saffron crocus                   |
| <b>208v</b> | <b>lykoskordon</b>               | <b><i>Allium ampeloprasum</i> L.</b>                       | <b><i>Allium ampeloprasum</i> L.</b>  | <b>wild leek</b>                 |
| <b>235v</b> | <b>moly<sup>2</sup></b>          | <b><i>Allium magicum</i> L. or <i>Allium nigrum</i> L.</b> |   | <b>black garlic</b>              |
| <b>250r</b> | <b>ophioskordon</b>              | <b><i>Allium Scordoprasum</i></b>                          | <b><i>Allium scorodoprasum</i> L.</b>   | <b>giant garlic or sand leek</b> |
| <b>278v</b> | <b>prason chepaion</b>           | <b><i>Allium Porrum</i></b>                                | <b><i>Allium porrum</i> L.</b>  | <b>leek</b>                      |
| 280r        | perikslumenon                    | <i>Lonicera etrusca</i> Savi                               | <i>Lonicera etrusca</i> Santi   | honeysuckle                      |
| <b>282r</b> | <b>rodon e roda<sup>3</sup></b>  | <b><i>Rosa centrifolia</i> L.</b>                          | <b><i>Rosa × centrifolia</i> L.</b>   | <b>cabbage rose</b>              |
| 284r        | raphanos kephaia                 | <i>Raphanus sativa</i> L.                                  | <i>Raphanus sativus</i> L.  | radish                           |
| <b>284v</b> | <b>ra oi de rion</b>             | <b><i>Rheum rhaponticum</i> L.</b>                         |   | <b>rhubarb</b>                   |
| 292v        | strechnos melas kepaios          | <i>Solanum nigrum</i> L.                                   |   | black nightshade                 |
| 298v        | sikus (sikyus) agrios            | <i>Ecballium Elaterium</i> Rich.                           | <i>Ecballium elaterium</i> (L.) A. Rich.  | squirting cucumber               |
| 302r        | seutron melan agrion             | <i>Beta vulgaris</i> L.                                    |   | beet                             |
| 303r        | sisumbriou                       | <i>Mentha aquatica</i>                                     | <i>Mentha aquatica</i> L.   | watermint                        |
| <b>312r</b> | <b>staphylinos chephaios</b>     | <b><i>Daucus carota</i></b>                                | <b><i>Daucus carota</i> L.</b>  | <b>carrot (cultivated)</b>       |
| <b>314v</b> | <b>skordoprasou</b>              | <b><i>Allium descendens</i></b>                            | <b><i>Allium sphaerocephalon</i> L.</b>   | <b>giant garlic or sand leek</b> |
| 326v        | staphis agria                    | <i>Delphinium Staphis agria</i> L.                         | <i>Delphinium staphisagria</i> L.   | delphinium larkspur              |
| 357v        | uakinthos                        | <i>Hyacinthus orientalis</i> L.                            |   | hyacinth                         |
| 359v        | physallis                        | <i>Physalis Alkekegni</i>                                  | <i>Physalis alkekegni</i> L.  | Jerusalem cherry                 |
| <b>370v</b> | <b>phasiolos<sup>4</sup></b>     | <b><i>Phaseolus Nanus</i> L.</b>                           | <b><i>Phaseolus vulgaris</i> L.</b>   | <b>cowpea</b>                    |
| 373r        | chrysanthemone charkas           | <i>Chrysanthemum coronarium</i> L.                         |   | garland chrysanthemum            |
| 376r        | chondros or chrithe              | <i>Triticum spelta</i> or <i>Hordium vulgare</i>           | <i>Triticum aestivum</i> L. subsp. <i>spelta</i> (L.) Thell. or <i>Hordium vulgare</i> L. | spelt or barley                  |
| 387r        | okimon                           | <i>Ocimum basilicum</i> L.                                 |   | basil                            |

<sup>1</sup> Misidentified as *Allium sativum*, see text.

<sup>2</sup> Misidentified, not an *Allium*, either *Lilium* or *Fritillaria*.

<sup>3</sup> Most probably *Rosa gallica* L.

<sup>4</sup> Present designation is *Vigna unguiculata* (L.) Walp.



nature. Most images contain one plant per page but four pages contain two plants each. A comparison of illustrations from the JAC with either modern photographs or illustrations from *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997) is shown (Figs. 3 to 13).

### Batos (Blackberry)

Folio 83r, labeled *batos* (Fig. 3), is the oldest surviving image of a *Rubus*, a blackberry in the European group, *R. fruticosus* aggr. The text, which was written in cursive style and transcribed after the image was painted, specifies medicinal uses of blackberries (*batos*) as well as raspberries (*batos ideaia*). The illustration that superficially appears quite naturalistic is one of the finest of the JAC and shows five stems painted with recurved prickles on petioles, petiolules, and pedicels. A rooting tip layer is depicted as well as a broken stem; this latter stylistic conceit is also found in one other illustration, 23r of *Artemisia abrotanum*, suggesting the same artist. Fruiting occurs on this stem, which suggests primocane fruiting, as well as another, which could be a biennial (two-year-old) cane. Although the leaves are drawn with painstaking detail there are botanical errors: the foliage is predominantly pinnately rather than palmate compound and the pedicel of the basal leaflets are long rather than almost sessile. Flowers are in a raceme instead of a panicle-like cyme and have 6 and 7 petals instead of 5. There are no recurved prickles on the main mid vein of leaves. Intriguingly, in a very similar illustration of the *Codex Neapolitanus*, supposedly produced a century later, these errors are corrected, suggesting either that it was based on the JAC and corrected by a botanically astute copyist, or more likely, based on a similar lost archetype, being a sister image (Hummer and Janick, 2007). A photographic image made in Oregon shown on the right (Fig. 3) is similar to the JAC illustration.

### Goggule (Turnip)

Dioscorides notes that the boiled root of turnip can be pickled and is nutritious, causes flatulence, and makes the flesh flabby. Seed and roots are also used for various remedies. The JAC illustration (Fig. 4) shows a yellow, globular root with characteristic deeply cut compound leaves along the long petiole. The appearance is remarkably close to a modern yellow turnip.

### Elaphoskordon, Kromuon, Lykoskordon, Moly, Ophioskordon, Prasov Chepaion, Skordoprason (Garlic, Onion, Wild Leek, Giant Garlic, Ornamental Onion, Leek, Garlic Leek)

There are at least seven *Allium* species illustrated in the JAC but they are difficult to differentiate (Fig. 5). They have been identified by Otto Mazal, editor of JAC facsimile as follows: (A) 116v = garlic (*A. sativum*); (B) 185v = onion (*A. cepa*); (C) 208v = wild leek (*A. ampeloprasum*); (D) 235v = "a garlic" (*A. magicum* or *A.*

Figure 4. Turnip (*Brassica rapa*): (left) JAC 89r; (right) photograph by Shutterstock.

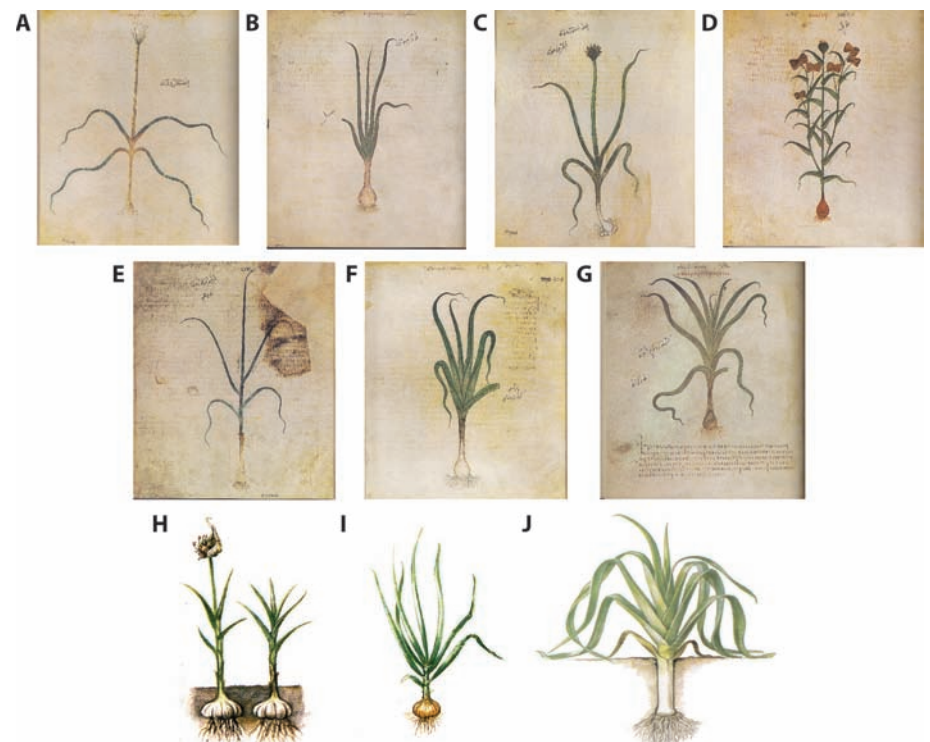


*nigrum*); (E) 250v = giant garlic, sand leek, or rocambole (*A. scoroprasum*); (F) 278r = leek (*A. Porrum* = *A. ampeloprasum* Porrum Group); (G) 314v = *A. descendens* (garlic leek): garlic, wild leek, and "moly" illustrations from JAC show flowers, while giant garlic shows a head bulb and perhaps a loose membranous coat. The garlic bulb does not show distinctive cloves. Modern paintings of garlic in flower (H), onion (I), and leek (J) are from *The New Oxford Book of Plants* pictures. The text of *PUI* mentions the pungency of onion and wild and cultivated forms for alliums and various medicinal uses are listed.

In modern *Allium* classification, the name of garlic applies to both *A. sativum* (true garlic) and

a large group of garlic-like plants, commonly known as "wild garlics." Several wild species of *Allium*, with garlic-like smell and taste (e.g., Chinese or Japanese garlic *A. macrostemon*, Naples garlic *A. neapolitanum*, ramsons *A. ursinum*, long-rooted garlic *A. victorialis*, Canada garlic *A. canadense*) are used as spices and green vegetables in different countries, but are not closely related to garlic (Kamenetsky, 2007). Elephant garlic is a form of leek (*A. ampeloprasum*), but it forms cloves resembling those of garlic, although the appearance and flavor predominantly resemble leek (Fritsch and Friesen, 2002). Most probably, in JAC name "garlic" was used in the larger sense, for a few garlic-like species. Thus, Fig. 5A presents garlic-

Figure 5. Alliums: (A) JAC 116v = "garlic" (*Allium* sp.); (B) JAC 185v = onion (*A. cepa*); (C) JAC 208v = wild leek (*A. ampeloprasum*); (D) JAC 235v = *A. magicum* or *A. nigrum*; (E) JAC 250r = giant garlic (*A. scoroprasum*); (F) JAC 278r = porrum onion or leek (*A. porrum* = *A. ampeloprasum*); (G) JAC 314 = garlic leek (*A. descendens*); (H) garlic, (I) onion, (J) leek, illustrations from *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997).



**Figure 6. Arugula (*Eruca sativa*): (left) JAC 118r; (right) illustration from *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997).**



like wild Mediterranean species, most probably *A. neapolitanum* or *A. trifoliatum*, B presents young onion (*A. cepa*) plants, and C depicts *A. ampeloprasum*, wild species that was largely consumed as wild garlic as well. *A. ampeloprasum* has purple or off-white flowers, and small bulblets underground (depicted in this figure) serve for vegetative propagation of this species. D is certainly not *Allium* species, but might belong to *Lilium* or *Fritillaria*. Leaves, flowers and fruits of this plant are not characteristic to the genus *Allium*. E was identified by Otto Mazal as giant garlic, *A. scorodoprasum*. Philip Simon suggested that this might be *A. sativum* var. *ophioscorodon* (snake garlic or rocambole). However, it is difficult to identify this species from the image, since its inflorescence is not visible. F can be onion at the late stage of plant development. The bulb of this plant is not characteristic to leek, which, in modern horticulture, possesses of underground false stem. G was identified as *A. descendens* (garlic leek). This species is clearly not *A. descendens* (the old name of *A. sphaerocephalon*), which is a small dark purple flowered ornamental, called drum-stick allium. Most probably this is sand leek *A. scorodoprasum*.

### Euzomon (Arugula)

The JAC includes a fine illustration of flowering arugula (rocket) with deeply cut leaves and whitish flowers with four petals and is quite close to the depiction of arugula in *The New Oxford Book of Food Plants* (Fig. 6). The plant is certainly *Eruca vesicaria* (syn.= *Eruca sativa*) since the flowers of the wild rocket, *Diplotaxis tenuifolia*, are bright yellow. The text in *PUI* mentions the presumed aphrodisiacal properties, based on the common assumption that plants with spicy flavor generated lust, and this assumption led to banning of arugulas in some monasteries in medieval times. *PUI* mentions a wild rocket (perhaps *Diplotaxis tenuifolia*) that grows in the western part of Spain, in which the seed is used in place of mustard.

**Figure 7. English ivy (*Hedera helix*): (left) JAC 174v; (right) photograph, source unknown.**



### Kissos (English Ivy)

Three types of ivy (*Hedera helix*) are described in *PUI*: white (white fruit), black (black or saffron colored fruit), and spiral (fruitless with "delicate angular and graceful" leaves) suggesting that the latter were vegetative clones. Pharmaceutical properties were listed for leaves, petioles, berries, sap and roots. The illustration in JAC (Fig. 7) is very fine and shows five shoots coming off a common root piece including one that bears a flowering stalk, which is improbable, indicating that it is a composite depicting several plant stages simultaneously. Four of the nonflowering shoots show juvenile leaf forms with characteristic palmate lobing. The one of flowering shoots shows two mature leaves that are elliptic lanceolate (one is partially concealed). The photographed ivy is amazingly similar and shows one stalk with five inflorescences with two mature leaves and juvenile leaves below the inflorescence.

### Krambe and Krambe Agrios (Cultivated and Wild Cabbage)

Dioscorides in *PUI* mentions many pharmaceutical effects for leaves, consumed raw or boiled, juice, seeds, flowers, or stalks of cabbage. The effects are often contradictory, for example the boiled leaves both ease the bowels and

constipate. It is noted that the wild cabbage is more bitter than the cultivated. The illustrated cultivated cabbage is of a young plant with only four large leaves each with basal lobing (Fig. 8), while the wild cabbage with the same leaf types shows a double stem and yellow inflorescence with four petals. Both cultivated and wild cabbage show simple basal lobing at the base of the leaf, a trait found in some modern brassicas. The cultivated cabbage illustration is similar in style to that of turnip (Fig. 4), suggesting that the same artist drew both. However, the wild cabbage is cruder, resembling student work; the stem is thick and unnatural and the work is superimposed on a block-like form, a technique found only in a few illustrations. Leaves have lobes in each of the three illustrations.

### Kramos (Faba Bean, Horse Bean, or Broadbean)

The flatulence caused by faba beans is discussed by Dioscorides in *PUI*, but medicinal values are ascribed. Interestingly, kramos is suggested to prevent genital development when plastered on children. A well drawn illustration of faba bean from JAC (Fig. 9) shows flowers and 12 pods in groups of three and is quite similar to the illustration in *The New Oxford Book of Food*

**Figure 8. Cultivated and wild *Brassica* spp.: (A) cultivated (*Brassica oleraceae*) JAC 182v; (B) wild (*Brassica cretica*) JAC 183v; (C) photograph of a cultivated *Brassica* by Jules Janick.**



Figure 9. Faba bean (horse bean, or broadbean) (*Vicia faba*): (left) JAC 189v; (right) *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997).



Plants, indicating little phenotypic changes over the millenia.

### Radon (Rose)

*PUI* provides medicinal values for rose flowers and hips. The illustration in JAC (Fig. 10) shows a plant with six branches and five flowering stems. The red flowers, two fully opened, one partly opening, and three in bud, appear to have at least 10 petals and can be described as double flowered. There are suggestions of prickles on stem and calyx, but they are not drawn precisely. Leaves show six leaflets. It is likely that the rose species is *Rosa gallica*, which has three leaflets, rather than *Rosa centifolia* as suggested by Otto Mazal. A painting of *Rosa gallica* from the United States Dispensatory is close to the JAC image but the increased petals may reflect modern selection.

### Ra (Rhubarb)

In *PUI* rhubarb (Ra) is also called *rheon* and is described as originating from lands above the Bosphorus. The reddish-black roots are described as astringent and containing various medicinal properties. The JAC illustration is confined to a single large root identified as *Rheum rhaponti-*

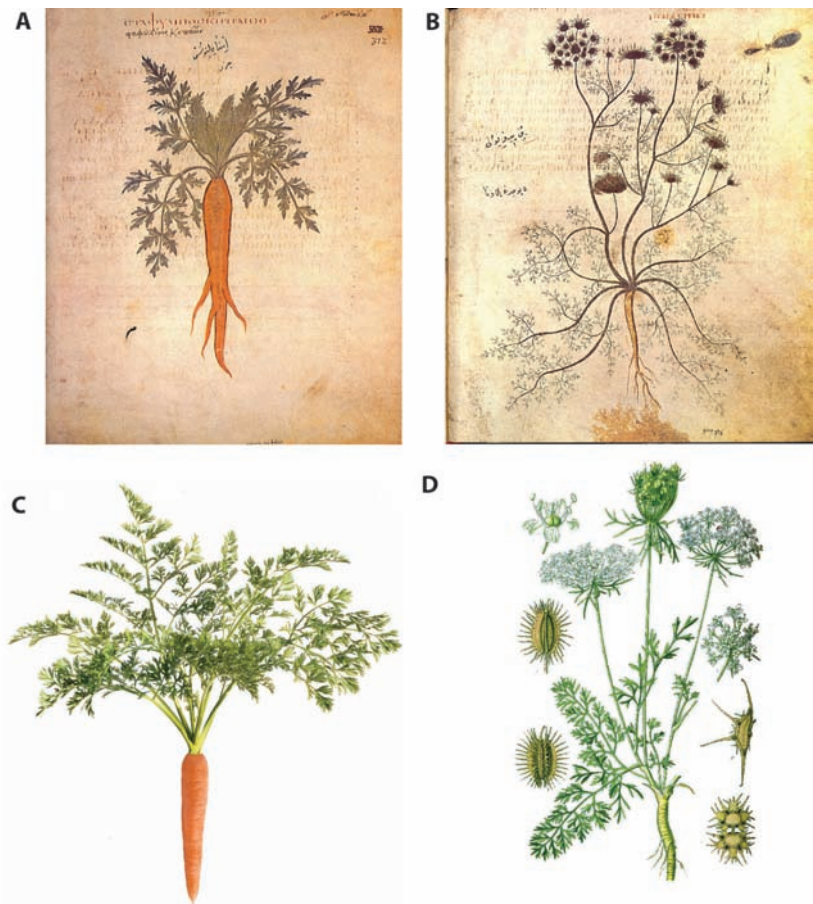
Figure 10. Rose (*Rosa gallica*): (left) JAC 282r; (right) modern painting of *R. gallica* from the United States Dispensatory, 1926.



Figure 11. Rhubarb (*Rheum* spp.): (left) JAC 284v; (right) photograph of *Rheum palmatum* var. *tanguticum*, courtesy of Danny L. Barney, USDA ARS.



Figure 12. Cultivated and wild carrot (*Daucus carota*): (A) cultivated carrot JAC 212r; (B) wild carrot (gingidion) JAC 88r; (C) photograph of modern carrot (courtesy of John Stolarczyk); (D) botanical print of wild carrot (Thomé, 1885, *Flora of Germany*, Plate 386).



*cum* by Otto Mazal, but Beck (2005) identified the rhubarb as *R. officinale* or *R. ribes*. The thick root illustrated in JAC is not dissimilar to roots of *R. palmatum* (Fig. 11).

### Staphylinos (Carrot)

Diocorides in *PUI* describes both wild and cultivated carrot, noting that the cultivated is more edible. Many remedies are assigned to seeds, roots, and leaves. The illustration (Fig. 12) of cultivated carrot (*Staphylinos chephaios*) in JAC (A) shows a long orange swollen root with three

small rootlets growing from the basal end. The rosette of leaves is pinnately decompose, and finely cut in many segments. The JAC illustration appears remarkably close to the photographed modern cultivated carrot, *Daucus carota* var. *sativus* (C). The orange color of the root in the 6th century is quite remarkable because in the Middle Ages and Renaissance, most carrots were purple and red, as a result of introductions from Central Asia following Arab conquests. The illustration of a wild carrot (B) called *Gingidium* (*Daucus gingidium*, a syno-

**Figure 13. Cowpea (*Vigna unguiculata*): (left) JAC 370v; (right) *The New Oxford Book of Food Plants* (Vaughan and Geissler, 1997).**



nym of *D. carota* var. *carota*) is almost identical to a 1885 print of wild carrot in the *Flora of Germany* (Thomé, 1885).

### Phasiolos (Cowpea)

The JAC illustration clearly depicts cowpea, now *Vigna unguiculata*, but labeled *Phaseolus Nanus* by Otto Mazal, editor of the Dioscorides facsimile, while L.Y. Beck (2005) calls it *Vigna sinensis* (kidney bean). The Greek name *Phasiolos* has been now used as *Phaseolus* for other legume species including *Phaseolus vulgaris* (common bean) of the New World. Clearly, there has been confusion in the nomenclature. The illustration in the JAC (Fig. 13) portrays a quite thick stemmed legume with long, single or double pods, quite erect with green flowers, and axillary shoots. The trifoliate leaves are ovate. The plant shows axillary shoots. The modern cowpea is more slender and the suggestion has been made by Richard E. Fery that the JAC illustration could be from a ratooned plant, which would explain the thickness of the stem.

### CONCLUSIONS

The JAC affirms the importance of plant illustration to depict plants. Indeed, plant illustration can be botanically useful by providing a representation of an entire plant during the course of yearly seasonal changes. It is difficult to accurately describe a plant with words despite the plethora of botanical terms.

The illustrations in JAC are mostly well drawn and appear to have been based on naturalistic drawings. However, it is unclear if they were drawn from nature *per se*, or copied from a lost archetypical volume that may have been owned by Theodosius II (401-450), great grandfather of Juliana Anicia (Collins, 2000).

A comparison of drawings with photographs or illustrations indicates great similarity between the images of the JAC to modern day crops, suggesting that changes in our crop plants over the last 1,500 years have not been extreme. The illustrations in the JAC formed the basis for many herbals in the 1000 years until the Renaissance brought about a new movement to naturalistic drawings, directly from nature. The stunning drawings of the JAC underscore the decline in botanical illustration during the next 1000 years.

### ACKNOWLEDGEMENTS

We thank Danny L. Barney, Richard E. Fery, Rina Kamenetsky, Philipp Simon, and John Stolarczyk for help with the manuscript and Anna L. Whipkey for assistance with the figures.

### REFERENCES

- Beck, L.Y. (ed. Trans.) 2005. Pedanius Dioscorides of Anazarbus: De Materia Medica. Olms-Weidmann, Hildesheim, Germany.
- Blunt, W. and Raphael, S. 1994. The Illustrated Herbal. 2nd ed. Thames and Hudson Inc., New York. p.12-53.
- Busbecq, O.G. de. 1555-1562. The Turkish Letters (reprinted 2001 by Eland Press, London).
- Collins, M. 2000. Medieval Herbals: The Illustrative Traditions. The British Library, London. p.39-105.
- D'Andrea, J. 1982. Ancient Herbs. J. Paul Getty Museum, Malibu, CA.
- Der Wiener Dioskurides. 1998, 1999. 2 vol. (commentary by Otto Mazal), Akademische Druck-u Verlagsanstalt, Graz.

- Fritsch, R.M. and Friesen, N. 2002. Evolution, domestication and taxonomy. p.5-30. In: H.D. Rabinowitch and L. Currah (eds.), *Allium Crop Science: Recent Advances*. CAB Intl. Wallingford, UK.
- Gunther, R.T. 1959. The Greek Herbal of Dioscorides. Illustrated by a Byzantine A.D. 512. Englished by John Goodyer A.D. 1655. Edited and First Printed A.D. 1933. Hafner, New York.
- Heyd, U. 1963. Moses Hamon, chief Jewish physician to Sultan Süleymân the Magnificent. *Oriens* 16 (Dec. 13.):152-170.
- Hummer, K.E. and Janick, J. 2007. *Rubus* iconography: Antiquity to the Renaissance. *Acta Hort.* 859:89-105.
- Kamenetsky, R. 2007. Garlic: Botany and horticulture. *Hort. Rev.* 33:123-172.
- Mattioli, P. 1544. Di Pedacio Dioscoride Anazarbeo Libri Cinque Della Historia, et Materia Medicinale Tradotti in Lingua Volgare Italiana...Venetia per Nicolo de Bascarini da Pavone di Brescia.
- Singer, C. 1927. The herbal in antiquity and its transmission to later ages. *J. Hellenistic Studies* 47:1-52.
- Thomé, O.W. 1885. *Flora von Deutschland*. Friederich von Zezschwitz, Gera, Germany. Plate 386.
- Vaughan, J.C. and Geissler, C.A. 1997. *The New Oxford Book of Food Plants*. Illustrations by B.E. Nicholson, E. Dowle and E. Rice. Oxford Univ. Press, Oxford, UK.
- Wellman, M. 1906-1914. *Pedanius Dioscuridis Anazarbei De Materia Medica Libri Quinque*. 3 vol., reprinted 1958. Weidmann, Berlin.

### ABOUT THE AUTHORS



**Jules Janick**



**Kim E. Hummer**

Dr. Jules Janick is the James Troop Distinguished Professor of Horticulture at Purdue University, West Lafayette, Indiana 47907, USA. Email: janick@purdue.edu

Dr. Kim E. Hummer is Vice President of ISHS and Research Leader at USDA ARS National Clonal Germplasm Repository, Corvallis, Oregon 97333-2521, USA. Email: Kim.Hummer@ars.usda.gov