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Tacuinum Sanitatis: Horticulture and Health in the Late Middle Ages

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Lavishly illustrated manuscripts known as the *Tacuinum Sanitatis* were first commissioned by northern Italian nobility during the last decades of the 14th century. These manuscripts were based on an 11th century Arabic manuscript known as the *Taqwim al-Sihha bi al-Ashab al-Sitta* (*Rectifying Health by Six Causes*), which was a guide for healthy living written by the Christian physician and philosopher Abu al-Hasan al-Mukhtar ibn al-Hasan ibn 'Abdun ibn Sa'dun ibn Butlan (d. 1063), who was born and educated in Baghdad and whose travels took him to localities that are today in Iraq, Syria, Egypt, Israel, and Turkey. The *Taqwim* was a guide for healthy living, based on ancient philosophical concepts of Greek sciences. It summarized in tabular form information on some 280 health-related items, in particular food and especially vegetables and fruits. A Latin translation of the *Taqwim* was commissioned by the Court of Sicily towards the middle of the 13th century, and was to become known as *Tacuinum Sanitatis*. One hundred years later the first illuminated copies of the *Tacuinum Sanitatis* were commissioned of artists by northern Italian nobility (Cogliati Arano, 1976; Segre Rutz, 2002; Hoeniger, 2006). The illustrated *Tacuinum Sanitatis* manuscripts portray an utopian feudal society in which nobles are engaged in play and romance whilst feudal laborers work the estate (Cogliati Arano, 1976; Witthoft, 1978; Opsomer-Halleux, 1991; Segre Rutz, 2002; Bertiz, 2003; Bovey, 2005; Hoeniger, 2006; Mane, 2006). Rich in horticultural imagery, they include vivid scenes of the harvest of vegetables, fruits, flowers, and culinary and medicinal herbs. Each scene is accompanied by a brief summary of the health aspects of the subject. These documents connect vegetables and fruits as well as the garden itself with human health (Bertiz, 2003).

Six *Tacuinum Sanitatis* recensions with full page illustrations have survived and are located in libraries in Austria, Belgium, France, Italy, and Spain (Table 1). Four of them can be viewed online (<http://mandragore.bnf.fr/html/accueil.html>, <http://bibliotheque.rouen.fr> and <http://www.casanatense.it>) and a number of facsimile editions have been published. These six copies are a rich source of information on cultivated plants of the late medieval period as the vivid, large images depict plants growing and being harvested *in situ*. Half a dozen of related manuscripts also exist, but their illustrations are not as large or as informative horticulturally.

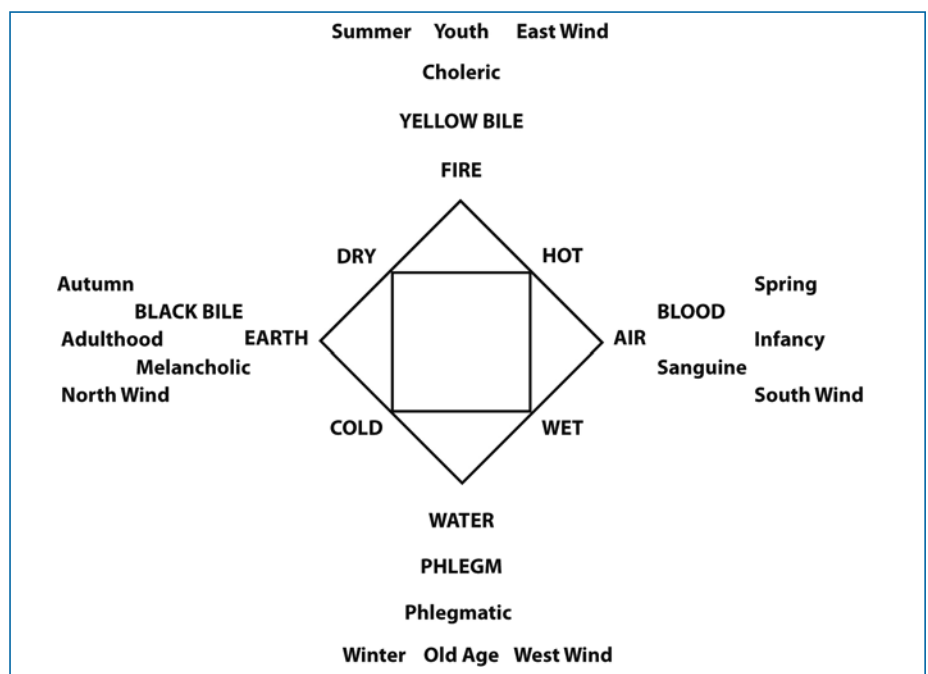
Table 1. The *Tacuinum Sanitatis* manuscripts discussed in this paper.

Text reference	Catalog no.	Depository	Date ¹
Paris 1673	Nouv. Acq. Lat. 1673	Bibliothèque Nationale de France, Paris	1380-1390
Liège 1041	Ms. 1041	Bibliothèque de l'Université de Liège	1380-1400
Vienna 2644	Cod. Ser. N. 2644	Osterreichische Nationalbibliothek, Vienna	1390-1400
Rome 4182	Ms. 4182	Biblioteca Casanatense, Rome	1390-1400
Paris 9333	Latin 9333	Bibliothèque Nationale de France, Paris	1445-1451
Rouen 3054 and Liechtenstein ²	Ms. 3054 [Leber 1088]	Bibliothèque municipale, Rouen, and private collection ²	1450

¹ Dates are according to Cogliati Arano (1976), Opsomer-Halleux (1991), Segre Rutz (2002), Bovey (2005), and/or Hoeniger (2006), and/or respective depository catalogues.

² The Rouen 3054 and Liechtenstein manuscripts are actually two parts of the same *Tacuinum* manuscript, separated from one another in the 19th century (Bertiz, 2003; Bovey, 2005).

Figure 1. Cosmology of ancient medicine based on Hippocrates and Galen (Source: Bovey, 2005).



THE HIPPOCRATIC CONCEPT OF MEDICINE

The *Taqwim* was the synthesis of ancient medical tradition, lore, philosophy, superstition, and science that traces back to the philosophical

system of Empedocle (ca. 490-435 BCE) in which four elements – water, air, fire and earth – were the principal components of matter. Hippocrates (ca. 460-370 BCE), now considered the Father of Medicine, indicated that diet influenced health and recommended moderation.

His concept was that health was based on a balance of “humors” – three observable entities, phlegm, blood, and yellow bile, and a theoretical entity, black bile. It was the balance between the four humors that determined health; their disequilibrium resulted in pain or disease. Each of the four humors was associated with a particular temperament or *complexio*, the phlegmatic, the sanguine, the choleric, and the melancholic. The humors also corresponded to four qualities (warm, cold, dry, moist) - each varying in four degrees of intensity - as well as to the four seasons and the four ages of man: infancy, youth, adulthood and old age (Fig. 1).

The therapeutic use of plants was a key part of ancient medicine. In the first century, Dioscorides (20-70 CE) assembled a treatise, *De Materia Medica*, that compiled the health giving properties of hundreds of herbs including many plants that were to become horticultural foods (Beck, 2005). The medical concept of Hippocrates was further developed by Galen (129-200 CE) who proposed six causes (called “non-naturals” in the Latin translations) that influence health: food and drinks, ambient air, movement and rest, sleep and wakefulness, elimination and retention, and psychological states. This conceptual corpus, adopted, elaborated upon, and further developed by Byzantine and Arab physicians, was later translated from Greek and Arabic into Latin, and dominated medicine until the 18th century. For a sick patient, the physician's role was to diagnose the elements responsible for the loss of balance and design a treatment with elements having opposite characteristics to those of the defecting humor, according to the compensation principle *contraria contrariis* (Ullmann, 1978).

The medical treatise of Ibn Butlan emphasized that a balanced regimen was the prerequisite to prevent disorders and diseases. He coordinated the doctrine of the six “non-naturals” by detailing 280 health-related items, their name, their nature according to the four elements, their degree, the best type, the usefulness, the noxious effects, the remedies to the noxiousness, the effects, the proper temperaments, the age, the season, the country, the authorities cited, and additional notes. These properties of the 280 items were arranged in 40 tables of 15 columns by Ibn Butlan so as to provide the general population with a direct, easy guide to preventive medicine.

HORTICULTURAL CROPS IN THE TACUINUM SANITATIS

Numerous horticultural crops are listed in the tables of the *Taqwim* (Elkhadem, 1990). The *Tacuinum Sanitatis* recensions illustrate a large sample of these, but also present some other plants, those grown in northern Italy during the late 14th century. The images in the six *Tacuinum Sanitatis* manuscripts depict harvest, when the horticultural product has reached the proper stage for consumption, and there are no

scenes of plowing, sowing, grafting, or planting. The Vienna 2644 *Tacuinum* (Table 1), which contains the most accurate depictions, includes some 26 vegetables, 33 fruits, 3 flowers, 21 culinary and medicinal herbs, and 1 mushroom (truffles) in addition to 9 cereals. Taxonomic identification of some plants illustrated is difficult and sometimes changes among the six recensions. Moreover, there are a number of mistranslations from Arabic to Latin, mislabelling, and mismatching between plant names and images, suggesting that some crops were not clearly distinguished from one another or that common names were not used consistently (Paris et al., 2009). In addition, the resulting uncertainty about the identity of some plants is exacerbated by mistranslations in some recent publications.

In the *Tacuinum Sanitatis* manuscripts, the crops often are idealized, the production and size being exaggerated, with insufficient attention paid to correct proportional and spatial relationships among the plant parts (Hoeniger, 2006). Polymorphism is shown for several crops but the market types illustrated do not always match the descriptions found in the *Taqwim*. Although botanical inaccuracies and lack of detail obscure precise identification in some cases, the images are, overall, of far better quality than those of most medieval manuscripts. Our objective is to present and interpret medieval horticultural crops and practices based on a sampling of 34 images out of the approximately 100 plant images that adorn each of

these six manuscripts. We will consider, as well, the health information provided in the Latin short text derived from the *Taqwim* and that accompanies each illustration, more precisely the modern translation from the paleographic Latin script as provided by Cogliati Arano (1976), Pazzini and Pirani (1980), and Opsomer-Halleux (1991). When modern translations of the *Tacuinum* text were not found, we used the corresponding text provided by the *Taqwim* tables (Elkhadem, 1990). We have selected the images on the basis of their informative value as regards to horticultural crop history and their pictorial quality. In the concluding section we will compare medieval and present-day attitudes toward horticulture and health.

Root Vegetables

Radish. In a neat medieval garden enclosed by a wattle fence in which trees are planted, a kneeling woman harvests evenly spaced small white-rooted plants, probably radishes, *Raphanus sativus*, from a straight row mounded to increase drainage (Fig. 2A). In another image labeled *Rafani* (Fig. 2B) a gardener harvests white radish (or possibly horseradish, *Armoracia rusticana*) while a lady washes the roots in a stream. Two harvested bunches show roots slightly longer than a person's head and foliage about the same length. In Fig. 2C, labeled *napones*, a peddler with a large basket strapped to his back overflowing with heart-shaped, black roots, probably radishes, offers a bunch to an elegantly gowned lady.

Figure 2. Root vegetables: (A) radish (*Raphanus sativus*) from Liechtenstein Ms folio 32r; (B) radish from Paris 9333 folio 49r; (C) black radish from Vienna 2644 folio 51r; (D) turnips (*Brassica rapa*) from Liège 1041 folio 23v; (E) parsnip (*Pastinaca sativa*) from Vienna 2644 folio 28r; (F) carrot (*Daucus carota*) from Roma 4182 folio 49r.



Interestingly all *Tacuinum Sanitatis* manuscripts allocate the name *rafani* to white roots, and *narbones* to black roots of plants we identify as *R. sativus* suggesting that both radish types were distinguished as different crops. The texts associated to Fig. 2C indicate that fresh sweet roots from the garden are best, provide good nourishment to people of all ages, and help urination but provoke flatulence and swellings.

Turnip. An image, labeled *rappe*, displays a harvest of white turnips being packed in a basket by a woman while her male companion carries off a full basket (Fig. 2D). Their shape is globular although the images of this crop in the other manuscripts show more elongate types. The text indicates that the best ones are domestic and although difficult to digest, improve eyesight and stimulate coitus.

Parsnip. In Fig. 2E, labeled *pastinace*, a gardener harvests very long and narrow, pale yellow roots of a species identified as parsnip, *Pastinaca sativa*, on the basis of the color of the roots and the shape of the leaves. In medieval Latin, *pastinace* designated both parsnip and carrot, but both species were sometimes distinguished as in the late 8th century list of garden plants of Charlemagne (www.oldcook.com/en/capitulary_charlemagne.htm).

Carrot. In a similar scene to the above and also labeled *pastinace* (Fig. 2F), a gardener is busy harvesting a root crop, the foliage of which is comprised of many small, slightly dentate leaflets. The long, thin roots, either purple or light yellow, intermingled in the foreground row and in the harvested pile clearly represent carrot, *Daucus carota*, segregating for root color. Purple and yellow carrots were known in Europe from late medieval times, while the deep orange ones were reported to appear around 1600 (Banga, 1963). The Latin text of Fig. 2F reports that *pastinace* stimulates sexual intercourse but slows down digestion, and that the purple type, ripe in winter, is the best.

Alliums

Onion. Red and white onions (*Allium cepa*), labelled *cepe*, are depicted planted in separate garden rows (Fig. 3A) indicating that they were recognized as separate cultivars by the end of the 14th century. Purple onions are often referred to as “red,” hence the red color used by the artist who probably never saw the real onions. The text informs that onions were considered to be a diuretic, sharpen eyesight, promote coitus, generate milk in nursing mothers and semen in men, but cause headaches.

Leek. A woman bunches freshly harvested leeks, *Allium porum*, labeled *pori*, laid out on a table for a peddler who carries a basket tied to his back and a bunch in each hand (Fig. 3B). The text recommends pungent-smelling leeks from the mountains. Leeks were asserted to be

Figure 3. Allium: (A) onion (*Allium cepa*) from Roma 4182 folio 44r; (B) leek (*Allium ampeloprasum*) from Vienna 2644 folio 25r; (C) garlic (*Allium sativum*) from Paris 9333 folio 23r.



a diuretic, favor coitus, and dissipate lung inflammation (catarrh).

Garlic. Fig. 3C, labeled *alea*, portrays garlic, *Allium sativum*, planted in straight rows and displaying long, erect leaves, being harvested in a field, bunched by one worker and carried away by a second. The best kind was considered to be one that does not have a too pungent smell. Garlic is described as effective against poisons but potentially damaging to the brain.

Leafy Vegetables

Kale. Fig. 4A, labeled *caules onati*, shows plants growing in an enclosed garden and a man carrying on his head a basket full of plants apparently cut at the base of the stem. The crop resembles kale (*Brassica oleracea* Acephala Group), a non-heading crucifer much like coleworts and collards. Although *B. oleracea* is represented in the *Tacuinum* only as kale, other sources, such as the *Mesnagier de Paris* (14th century), indicate that other cultivar-groups of this species were grown in late-medieval Europe (Mane, 2006). The *caules onati*, described as best when fresh and fleshy, were considered effective against constipation but could be damaging to the intestines.

Lettuce. Labeled *lactuce*, Fig. 4B depicts a smartly dressed couple placing bunches of leaves harvested from erect, rosette plants with narrow leaves, quite reminiscent of cos lettuce, *Lactuca sativa*. The text indicates that the best lettuce has large yellow leaves and was extolled as alleviating insomnia and gonorrhoea but harmful to eyesight and sexual vigor.

Spinach. Fig. 4C shows rosette plants of *spinachie*, *Spinacea oleracea*, with spade-shaped leaves, regularly planted and weeded in a neatly tended garden. A woman is about to exit the garden with a basket full of freshly harvested leaves on her head. Spinach was described as moderately nourishing, good for coughs, but spoiling digestion.

Cucurbits

Cucumber. In an image labeled *cucumeres et citruli*, a couple examines viney plants bearing yellow, short cylindrical fruits (Fig. 5A). As these fruits are clearly tuberculate, they can be identified as cucumbers, *Cucumis sativus*. In another *Tacuinum* manuscript, the image labelled identically depicts chate melons, *Cucumis melo*, instead of cucumber (Paris et al., 2009). The bipartite label can be traced back to Table 10, line 66 of the *Taqwim*, the Arabic being *al-qitha*

Figure 4. Leafy vegetables: (A) kale (*Brassica oleracea* Acephala Group) from Paris 9333 folio 20r; (B) lettuce (*Lactuca sativa*) from Paris 9333 folio 26r; (C) spinach (*Spinacia oleracea*) from Vienna 2644 folio 27r.



Figure 5. Cucurbits: (A) cucumber (*Cucumis sativus*) from Vienna 2644 folio 23v; (B) melon (*Cucumis melo* var. *melo* Adana Group) from Vienna 2644 folio 22r; (C) watermelon (*Citrullus lanatus*) from Vienna 2644 folio 21r; (D) bottle gourd (*Lagenaria siceraria*) from Paris 1673 folio 36v.



wa al-khiyar (Elkhadem, 1990) for the chate melon and the cucumber. This indicates that the Latin translation as *cucumeres et citruli* meant “melons and cucumbers.” The *qitha* (chate melon) and the *khiyar* (cucumber) were to be used similarly, marinated in vinegar or pickled (Elkhadem, 1990). Although Fig. 5A shows mature fruits that have turned yellow, the text advises green ones as best to consume. They were considered to reduce burning fevers thanks to their cold moist nature, to be diuretic, produce watery blood, but cause stomach aches.

Melon. In Fig. 5B, a courtier in a red tunic and a blue-gowned lady examine round, yellow melons labeled *melones indi et palestini*. The man is smelling the fruit indicating its fragrance. The text advises that they should be lemon-colored, large, sweet, and watery. They were good against warm, acute illnesses and suited to those with hot temperaments. The text indicates, though, that they can hinder digestion, but this can be remedied with sugar. Hence, these melons could not have been sweet like modern melons, and possibly were of the Adana Group (Pitrat et al., 2000). Other

depictions of melons in the various *Tacuinum* manuscripts include chate melon (discussed above), casaba melon, which is also labelled *cucumeres et cetruli*, and snake melon, labeled *Langurie* (Paris et al., 2009).

Watermelon. A gardener with a knife in his hand detaches a striped watermelon, *Citrullus lanatus* (*melones dulces*) from vines, which are

illustrated as growing erect to better show the fruits within the plant canopy (Fig. 5C). The fruits are being harvested at the peak of ripeness as indicated by the split ones on the plants and in the basket and that display their red flesh. The flowers are appropriately yellow. The text advises that the best *Melones dulces* are from Samarqand (modern Uzbekistan). Beneficial properties include splitting kidney and bladder stones, cleansing the skin, and curing fever, hepatitis, cough, and inflammation of urinary tracts. A noxious effect is the provoking of diarrhea. Illustrations of citron watermelons, labeled *melones insipidi*, are also found in the *Tacuinum* manuscripts (Paris et al., 2009).

Bottle Gourd. Two gowned ladies are displayed under an arbor from which dangle long, narrow bottle gourds, *Lagenaria siceraria*, labeled *cucurbite*, correctly shown as bearing white flowers (Fig. 5D). Long, narrow bottle gourds are the ones best suited for culinary preparation. The text indicates that the best ones are fresh and green. Nourishment is modest, but they quench thirst and are a swift laxative. In the other copies of the *Tacuinum*, both long, narrow and bottle-shaped forms are depicted, the latter for use when mature and dry, as vessels.

Other Vegetables

Asparagus. Labeled *sparagus*, the depiction (Fig. 6A) shows the harvest of green asparagus (*Asparagus officinalis*). A man snaps off by hand a green stalk while another man with two yoked baskets on his shoulders carries off the harvest. The asparagus does not appear to be planted in rows and is not mounded; it grows in a field or perhaps in the wild. The best ones are said to be fresh with tips bending towards the soil. Asparagus opens up occlusions and spurs coitus.

Cowpea. A blue-gowned lady with an apron is shown harvesting *faxioli*, i.e. cowpeas, also known as black-eyed peas, *Vigna unguiculata* (Fig. 6B). The pods are collected in a basket to be poured into a large sack nearby. Ibn Butlan

Figure 6. Other vegetables: (A) asparagus (*Asparagus officinalis*) from Paris 9333 folio 23v; (B) cowpea (*Vigna sinensis*) from Vienna 2644 folio 50v; (C) eggplant/aubergine (*Solanum melongena*) from Vienna 2644 folio 31v.



Figure 7. Temperate fruits (Vienna 2644): (A) grape (*Vitis vinifera*) folio 85r; (B) apple (*Malus domestica*) folio 9r; (C) pear (*Pyrus communis*) folio 6v; (D) peach (*Prunus persica*) folio 5v; (E) tart cherry (*Prunus cerasus*) folio 12r.



indicates that the best cowpeas are red and whole; they are very nourishing and stimulate urination (Elkhadem, 1990). Other legumes (broad beans, chickpea, lupine) are depicted in separate images.

Eggplant. A dramatic scene labeled *melongiana* portrays a garden of eggplants, *Solanum melongena*. A fondling, amorous couple is being admonished by a lady (Fig. 6C). Although we have not found any reliable textual source mentioning the aphrodisiac properties of eggplant, this assumption must have been persuasive based on the artist interpretation. The plants bear prolifically a crop of egg-shaped, purple fruits, a familiar shape and color close to the present 'Black Beauty' market type. Moreover, the plants, including their undulate leaf laminae, are depicted accurately in this image, but the attractive purple flowers are absent. Ibn Butlan mentioned the young, non-bitter, medium-sized Persian fruits are best, and are beneficial to the blood vessels and for stomach weakness (Elkhadem, 1990).

Temperate Fruits

Grape. Grape (*Vitis vinifera*) is found several times in the *Tacuinum* manuscripts, either illustrated for itself as *uve*, or for the production of verjuice (juice of immature grapes used in ancient and medieval cuisine), or as a symbol of fall, the time of wine making. Depending on the images, the vines grow on trees or are trellised, and bear black, light red, or gold grapes. In Fig.

7A, two men under an arbor constructed between trees prepare verjuice; one laborer washes the grapes, while the other extracts the juice with a mortar and pestle. Grapes were considered to cause thirst and cleanse the intestines.

Apple. Labeled *mala acetosa* (sour apple), Fig. 7B shows a courtier bringing down large apples, *Malus* sp., with a stick while an elegant lady carrying a basket watches in amazement. The best sour apples are very juicy, alleviate fainting and hepatitis but adversely affect joint articulation. Sweet apple (*mala dulcis*) shown in another illustration strengthens the heart.

Pear. The image labelled *pira* (Fig. 7C) shows two gowned ladies entranced by their pet monkey who is climbing on a pear tree, *Pyrus communis*. The tree bears long-necked russet pears. Ripened pears are said to be the best. Pears were advised for people with weak stomachs but are diarrhetic.

Peach. Labeled *persica*, Fig. 7D shows a courtier picking a yellow peach, *Prunus persica*. The tree, which shows the result of pruning at the basis of the trunk, is realistically depicted as having long, narrow leaves. The best peaches are musky and alleviate high fevers and stomach aches.

Cherry. Tart cherries (*Prunus cerasus*), labeled *cerosa acetosa*, are being harvested by a child who has climbed into the tree (Fig. 7E). A well-dressed lady opens her gown to catch fallen fruits and another elegant lady carries off two full baskets balanced on a pole. The very sour ones were considered best. The fruits cure bilious attack and dry out and settle upset stomachs. *Cerosa dulcia*, sweet cherry (*Prunus avium*), which softens the stomach, is displayed in a separate image.

Subtropical Fruits

Lemon. The image of *citra* (Fig. 8A) displays a lemon tree, *Citrus limon*, under which a courtier shows a large, yellow fruit to two elegantly dressed ladies. The best lemons are said to be large and with a strong scent. Lemons stimulate bile flow and syrup prepared from the juice helps against infectious fevers. A hindering effect on digestion is mentioned.

Pomegranate. An elegantly gowned woman places in a basket pomegranates, *Punica granatum*, labelled *granata acetosa* (Fig. 8B). Some ripe fruits are burst open, revealing their red arils on which a bird is pecking, while a rabbit nibbles at a fruit on the ground. Watery fruits are best and are good for inflamed liver, but harmful to the chest and voice. Sweet pome-

Figure 8. Tropical fruits (Vienna 2644): (A) lemon (*Citrus limon*) folio 19r; (B) pomegranate (*Punica granatum*) folio 7v.



Figure 9. Nuts (Vienna 2644): (A) chestnut (*Castanea sativa*) folio 17r; (B) hazelnut (*Corylus avellana*) folio 17v.



Figure 10. Flowers: (A) rose (*Rosa* sp.) from Rome 4182 folio 69r; (B) lily (*Lilium grandiflorum*) from Vienna 2644 folio 38v; (C) violet (*Viola* sp.) from Liechtenstein Ms folio 11.



granates, labeled *granata dulcia*, and considered useful for coitus and against coughs, are shown in a different illustration.

Nuts

Chestnut. Labeled *castanee*, the image shows a man and perhaps his son under the tree, roasting fallen chestnuts, *Castanea sativa* (Fig. 9A). The fully ripe chestnuts of Brianza were considered the best. Nutritious and favorable to coitus, chestnuts were also described as causing flatulence and headaches.

Hazelnut. The image labeled *avelane* (Fig. 9B) can be interpreted as a family scene, in which the father harvests nuts of *Corylus* sp., while his daughter offers them to her seated mother. Large fresh hazelnuts are best, stimulating the brain faculties, but weakening the stomach (Elkhadem, 1990).

Flowers

Rose. Labeled *roxo*, the image portrays two well-dressed ladies next to a large clump of rose plants, *Rosa* sp., bearing both white and red flowers (Fig. 10A). A standing lady harvests flowers while her seated companion with a floral wreath in her hair prepares a floral necklace.

The text indicates that the best roses are from Suri and Persia and that they are good for “inflamed brains” although they sometimes cause headache and dull the sense of smell.

Lily. The miniature labeled *lilia* depicts tall white lilies, *Lilium* sp., about to be cut with a knife by a gowned lady while her red-gowned male companion places some in a large, multicolored vase, indicating ornamental use (Fig. 10B). Lilies

were supposed to dissolve the superfluities of the brain, but the indication of the blue color of the best ones suggests some confusion between lily and iris.

Violet. A young man harvests violets (*violo*) in the countryside (Fig. 10C). The best plants have lapis-lazuli colored flowers and with many leaves. Smelling the flowers soothe and induce sleep, and when used as a beverage, release bile.

Culinary Herbs

Sage. Two elegant ladies are shown picking a plant labelled *salvia*, a *Salvia* species, growing in an enormous basket (Fig. 11A). Domestic sage was considered best and was good for paralysis and for the nerves, although slow to be digested.

Marjoram. The image labeled *maiorana* shows a man and a woman tending marjoram, *Origanum marjorana*, grown in a large urn on a bench; the woman holds an upturned vase and is watering the plant (Fig. 11B). Very small, aromatic marjoram was considered best, good for cold and moist stomachs, and to purify the blood. No noxious effects are described.

Dill. This image, labeled *aneti*, shows a woman and a child harvesting dill, *Anethum graveolens*, in a wild or weedy setting (Fig. 11C). The herb was considered best when green, fresh, and tender and was recommended for cold and flatulent stomachs but was harmful to the kidneys and nausea provoking.

DISCUSSION AND CONCLUSION

Horticulture is a little-recorded aspect of medieval life because textual sources are few and discontinuous (Bresc, 1972). Detailed medieval iconography of horticultural plants is quite scarce, widely dispersed, and difficult to obtain, although accessibility is easing. In this light, the illustrated *Tacuinum Sanitatis* manuscripts are an outstanding source of informa-

Figure 11. Culinary herbs: (A) sage (*Salvia* sp.) from Vienna 2644 folio 37v; (B) marjoram (*Origanum marjorana*) from Paris 9333 folio 30v; (C) dill (*Anethum graveolens*) from Vienna 2644 folio 32r.



tion on late medieval horticulture in northern Italy and its environs, presented through the lens of courtly life and play on the estates of the nobility (Bertiz, 2003).

The horticultural crops illustrated in the *Tacuinum* manuscripts are familiar to us and, by-and-large, their appearance has changed little over the centuries. Of the vegetable crops, radish, turnip, onion, leek, kale, spinach, cucumber, watermelon, bottle gourd, asparagus, and eggplant, appear identical to some existing cultivars. The manuscripts were made prior to the encounter of Columbus with the Americas and thus New World species such as potato, tomato, capsicum pepper and *Cucurbita* species are absent. Polymorphism, as expressed by phenotypic variation in the illustrations, is evident for carrot, turnip, onion, melon, watermelon, bottle gourd, grape, apple, cherry, pomegranate, roses and other crops not presented here. Scenes of gardens and fields planted in rows, garden fences and gates, raised beds, container grown plants, trellising, pruning, hand harvest at the peak of ripeness, bunching of produce, wine and juice production, roasting nuts, and retail trade display a medieval version of horticulture that is in many ways not basically different from traditional horticulture practiced today in many parts of the world, although much different in scale.

Vegetables are shown harvested mostly in gardens and fields, in dense plantings. In contrast, fruit trees are never pictured in orchards, though orchards existed in the Middle Ages (Mane, 2006), and this pictorial choice is probably due to the artist's concern of representing plants with as much details as possible. Aromatics are generally depicted in the *Tacuinum* manuscripts as growing in fields or open environments, though those pictured as growing in particularly tended conditions (beds or pots) such as sage and marjoram shown here, indicate that these plants were prized. Peasants and laborers are frequently pictured with the root and leafy vegetables, which were their basic food (Mane, 2006). Conversely, courtiers are more frequently found next to fruit vegetables such as cucurbits and eggplant, which because of their recent introduction in Europe (Daunay et al., 2008; Paris et al., 2009) were probably considered as rare curiosities affordable to the elite only. The upper class is also pictured next to fruit trees, and this is probably because fruits were considered a luxury food and thus reserved for the privileged (Mane, 2006). The medieval idea that the garden was a place for healing, relaxing, and physical and mental well-being was a premonition of horticultural therapy, now stressed in schools, hospitals, geriatric and rehabilitation centers, prisons, and community gardens (Flagler, 1990; Waliczek et al., 2005).

Interestingly, all of the horticultural crops presented in the illustrated *Tacuinum* manuscripts

were allocated physiological effects on the body and were fully part of the medieval pharmacopeia. Clearly, then as now, the population was concerned with general health and bodily functions, including flatulence, bladder and kidney stones, ill-health, and sexuality. Remarkably, the very short text that accompanies each illustration in the *Tacuinum* provides information for balancing the beneficial and noxious effects of each plant.

Although the basis of medicine has completely changed from the ancient philosophical concepts that date to the Greeks, the results are amazingly the same. All cultures, ancient, medieval, and modern have come to the same conclusion: horticulture is basic to a healthy life. Although, modern knowledge of medicine and nutrition has changed our understanding of food through advances in biology, chemistry, and genetics, and as we now view foods in terms of calories, vitamins, antioxidants, polyphenols, polysaccharides, proteins, and lipids (Goldman, 2003), it does appear as if all the analyses, ancient and modern, come to the same result: the horticultural crops we eat are sustaining, nutritious, healthy, and delicious. Although we no longer evaluate them on the basis of hot, cold, wet, or dry, or the effect on the "humors," yet some of the ancient feelings still persist. We still say colloquially "cool as a cucumber;" we refer to pungent chili peppers as "hot"; we associate spicy foods with passionate temperaments, and consider aroma and fragrance to affect our well-being. At times it may seem, as we investigate the healthful attributes of our food through chemistry, that we merely seek accreditation for our preferences. While we smile indulgently at the extravagant claims of the ancients, it appears that in a number of cases their experience was prescient. Thus, it turns out that horseradish does have a factor that affects urinary health (Shehata et al., 2008), and we have confirmed the health giving properties of the alliums (Desjardins, 2008) and crucifers (Monteiro and Rosa, 2008). We have also found that horticultural crops need to be considered carefully for detrimental effects as in the case of allergies (5% of the population is allergic to apples), excessive soluble fibers (such as persimmon), and toxic substances such as solanine in potato.

It is clear that the present-day emphasis on the connection between horticulture and health is an extension of ancient and medieval concerns. We suggest that our present understanding of nutrition will probably be considered naïve in the coming centuries and in the future the approach for attributing health benefits to horticultural crops will likely be very different from the present one. We predict however that the conclusions will be similar: horticultural crops are essential to good health!

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