

## Medieval iconography of watermelons in Mediterranean Europe

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• **Background and Aims** The watermelon, *Citrullus lanatus* (Cucurbitaceae), is an important fruit vegetable in the warmer regions of the world. Watermelons were illustrated in Mediterranean Antiquity, but not as frequently as some other cucurbits. Little is known concerning the watermelons of Mediterranean Europe during medieval times. With the objective of obtaining an improved understanding of watermelon history and diversity in this region, medieval drawings purportedly of watermelons were collected, examined and compared for originality, detail and accuracy.

• **Findings** The oldest manuscript found that contains an accurate, informative image of watermelon is the *Tractatus de herbis*, British Library ms. Egerton 747, which was produced in southern Italy, around the year 1300. A dozen more original illustrations were found, most of them from Italy, produced during the ensuing two centuries that can be positively identified as watermelon. In most herbal-type manuscripts, the foliage is depicted realistically, the plants shown as having long internodes, alternate leaves with pinnatifid leaf laminae, and the fruits are small, round and striped. The manuscript that contains the most detailed and accurate image of watermelon is the *Carrara Herbal*, British Library ms. Egerton 2020. In the agriculture-based manuscripts, the foliage, if depicted, is not accurate, but variation in the size, shape and coloration of the fruits is evident. Both red-flesh and white-flesh watermelons are illustrated, corresponding to the typical sweet dessert watermelons so common today and the insipid citron watermelons, respectively. The variation in watermelon fruit size, shape and coloration depicted in the illustrations indicates that at least six cultivars of watermelon are represented, three of which probably had red, sweet flesh and three of which appear to have been citrons. Evidently, citron watermelons were more common in Mediterranean Europe in the past than they are today.

**Key words:** Art history, *Citrullus lanatus*, Cucurbitaceae, cucurbit crops, crop diversity, crop history, domestication, plant iconography, watermelon.

### INTRODUCTION

The watermelon, *Citrullus lanatus* (Thunb.) Matsum. & Nakai (Cucurbitaceae), is an important vegetable crop in the warmer regions of the world (Maynard, 2001; Wehner *et al.*, 2001, 2008; Maynard and Paris, 2008; Wehner, 2008). Watermelon plants are annual, multiple-branched, procumbent tendril-bearing vines with extensive root systems. They require much space, fertile ground and a long, sunny growing season to mature their fruits. As is typical for cucurbits, the internodes are long and the leaves are distributed alternately on the stems. Watermelons are readily distinguished from most other cucurbits by the pinnatifid shape of their leaf laminae. Somewhat elongate and slightly folded adaxially along the central vein, the leaf laminae are supported by slender, stiff petioles that are not as long as the laminae and usually curved near their juncture with the stems. From these junctures, referred to as leaf axils, tendrils, flowers and fruits develop. The tendrils, which anchor the plants to nearby objects, are branched and can become highly coiled. The flowers of watermelon plants are solitary, 2–3 cm in diameter, with five light yellow petals. Watermelon plants typically are monoecious, most of the flowers are staminate and generally a pistillate flower occurs at every seventh or eighth leaf axil. The

flowers open in the early morning and are functional until mid-afternoon, when they begin to wither; they do not re-open. Pollination is effected by bees. The ovaries and young fruits are lanate. The fruits become less hairy as they grow and, typically, they are harvested when fully mature, a month or more after anthesis, at which time they are glabrous and smooth. Fruit size can vary from 1 to 100 kg, but most commercially available watermelons range from 3 to 13 kg. Fruit shape usually ranges from spherical to oval to short oblong. Rind colour ranges from light to dark green, usually marked by darker stripes which can range in their breadth from very narrow to very broad. The fruit flesh of watermelons is the endocarp, placental tissue. Depending on the genotype, the fruit flesh can range in colour from red to pink, orange, yellow, green and white, and can be of various textures, including soft, crisp or hard. Seeds can be of a variety of colours, including black, brown, tan, white, yellow, red, purple, green and orange, and can be patterned with a second colour. Watermelons are familiar in most of the world as a sweet, wet, cooling dessert fruit. In southern Africa, the hard, bland citron watermelons or 'tsamma' are widely grown for cooking and for use as animal fodder. In western Africa and China, bland, highly seedy watermelons are cultivated for consumption of their seeds, rather than their flesh.

*Citrullus lanatus* is indigenous to open, semi-arid and arid areas of subtropical Africa (Rubatsky, 2001). Wild watermelon plants can cover large areas, especially in years of above-average rainfall. Watermelons are thought to have been first domesticated in southern and central Africa, where they are an important source of water and article of food, especially in resource-poor, remote areas (Jensen, 2012; Mujaju et al., 2012). The bland, hard, long-keeping citrons are the most widely cultivated watermelons there. They are very much like the fruits of nearby wild watermelon populations, being rather small, mostly spherical in shape, and highly variable for external striping and mottling of dark and light green. These native citrons are thought to be progenitors of modern sweet watermelons (Rubatsky, 2001), a view supported by the wide genetic variability of citron watermelons and their close relationship to sweet watermelons, observed using molecular techniques (Levi et al., 2000; Dane and Lang, 2004; Dane et al., 2004; Levi and Thomas, 2005; Dane and Liu, 2007; Mujaju et al., 2011).

A good understanding of crop plant history is best achieved using a multidisciplinary approach that encompasses botany, horticulture, cookery, philology, archaeology, history and iconography (Dalby, 2003). Iconography is probably the most important of these with regard to cucurbits (Eisendrath, 1961; Paris, 2000; Paris et al., 2011). Illustrations of watermelons date to Mediterranean Antiquity, appearing in depictions from 3100–2180 BCE at the Temple of Meir in Egypt, Old Kingdom, and mosaics from 4th century CE Carthage of Imperial Rome and fifth-century Greece. However, images of watermelons are less frequently encountered than those of melons, *Cucumis melo* L., and bottle gourds, *Lagenaria siceraria* (Mol.) Standl. (Janick et al., 2007).

Throughout most of the medieval period, depictions of plants were poor copies made from images dating to Roman times that are no longer extant. The copies are inaccurate and often diagrammatic or stylized, the result being that they are often useless for taxonomic identification to the species level (Pächt, 1950; Opsomer et al., 1984; Collins, 2000; Givens, 2006). Around the year 1300 CE, original, accurate illustrations based on the plants themselves began to be produced. The accuracy and originality of these late medieval images is often high, and sufficient to allow assessment of phenotypic variability within cucurbit species (Paris et al., 2009, 2011).

Our objective, as part of a continuing investigation into the history of cucurbit crops, was to access, collect and examine as many medieval images of watermelon as possible. We did not find any early medieval images that were accurate and detailed enough to allow positive identification as watermelon, but we found late medieval images from Italy and France that were fairly accurate and realistically detailed. These will be presented and discussed with regard to watermelon history and diversity in Mediterranean Europe.

#### SOURCES OF THE ILLUSTRATIONS

Late medieval illustrated manuscripts, their origin, provenance and relationships among them, have been discussed and compared at length by Pächt (1950), Baumann (1974), Opsomer et al. (1984), Collins (2000), Segre Rutz (2002), Collins and Raphael (2004), and Givens (2006). The ultimate origin of many of them is the medical school at Salerno, southern Italy. Beginning in the latter half of the 11th century, scholars there

collected classical and early medieval medical works and translated, compiled, and integrated medical knowledge and theory accumulated over the centuries since antiquity. Matthaeus Platearius (d. 1161) is credited with having written a synthesis of this knowledge and theory, combined with his personal experience, in a work commonly referred to as *Circa instans*. This work became widely distributed and translated from Latin to other languages, and subsequently modified and expanded considerably. Watermelon is not among the 273 simple medicines in the late 12th century copy of the *Circa instans* preserved in the New York Botanical Garden Library as Ms. 0011 (Platearius, 1200).

The oldest manuscripts known to us to contain images that are accurate and detailed enough to be positively identified as watermelon, *Citrullus lanatus*, are illustrated descendants of the *Circa instans* (Table 1). The oldest of these, known as the *Tractatus de herbis*, was compiled in Salerno around 1300 and is catalogued by the British Library (London) as Egerton ms. 747 (Pächt, 1950; Baumann, 1974; Opsomer et al., 1984; Collins, 2000; Segre Rutz, 2002; Collins and Raphael, 2004; Givens, 2006). The *Tractatus de herbis* retains the original prologue, text and arrangement of the *Circa instans* but has much additional text and many more plants. The next oldest illustrated descendant of the *Circa instans*, the *Tractatus de herbis, de avibus, et piscibus*, of Manfredus di Monte Imperiali, is maintained at the Bibliothèque Nationale de France (Paris) as ms. Lat. 6823. This manuscript was conceived in southern Italy around 1335. Although it is close in content, format and organization to the *Tractatus de herbis*, its illustrations are not copies of those in the earlier manuscript. Instead, the illustrations are more life-like and strikingly realistic, serving as an inspiration to the production of more illustrated herbals in both northern and southern Italy. Another extant version of the *Tractatus de herbis* is Ms. 873 of the Pierpont Morgan Library (New York), which was produced in the third quarter of the 14th century, probably in northern Italy. This manuscript closely follows the *Tractatus de herbis, de avibus et piscibus* of Manfredus di Monte Imperiali. A fourth and more refined version of the *Tractatus de herbis* is ms. Masson 116 of the Bibliothèque de l'École Nationale Supérieure des Beaux Arts (Paris), which was produced in northern Italy, perhaps Padua, around 1375. A deluxe illustrated version of the *Tractatus de herbis*, known as *Historia plantarum*, Biblioteca Casanatense (Rome) ms. 459, was produced in northern Italy around 1395.

Versions of the *Tractatus de herbis* produced in France are known as the *Livre des simples médecines* (Pächt, 1950; Opsomer et al., 1984; Collins, 2000; Givens, 2006). The illustrations are derived from Egerton 747, but they are not as detailed or realistic. In most, the text is in French. Numerous copies of the *Livre des simples médecines* are extant. Perhaps the oldest, produced between 1420 and 1440 in northern France, is Ms 227 2° of the Kongelige Bibliothek (Copenhagen) (Table 1). Most subsequently produced copies of the *Livre des simples médecines* contain the same or nearly the same accompanying text but the images are more simplified and vary according to the part of France in which they were produced. Ms. Estero 28 =  $\alpha$ . M. 5. 9 of the Biblioteca Estense (Modena) was produced around 1450 in western France.

An herbal manuscript unrelated to the *Tractatus de herbis* and having original, strikingly realistic images of plants is known as

TABLE 1. *Medieval manuscripts containing noteworthy illustrations of Citrullus lanatus and their approximate years of production, depositories, catalogue and folio numbers, captions, and provenances*

Name	Provenance	Year of production*	Depository	Catalogue no.	Abbreviated name used in text	Folio no.	Caption	Figure no.
<i>Tractatus de herbis</i>	Southern Italy	1300	London, British Library	Ms. Egerton 747	Egerton 747	66v	<i>Melones palestini ul' Saracenicici</i>	1A
<i>Tractatus de herbis, de avibus et piscibus, Manfredus di Monte Imperiali</i>	Southern Italy	1335	Paris, Bibliothèque Nationale de France	Ms. Latin 6823	Manfred Herbal	42v	<i>Cucumeris</i>	1B
<i>Tractatus de herbis</i>	Northern Italy	1363	New York, Pierpont Morgan Library	Ms. 873	Morgan 873	65r	<i>mellones</i>	1C
<i>Tractatus de herbis</i>	Northern Italy	1375	Paris, Bibliothèque de l'École nationale Supérieure des Beaux Arts	Ms. Masson 116	Masson 116	120v	<i>Cucumeres</i>	1D
<i>Tacuinum sanitatis</i>	Northern Italy	1385	Paris, Bibliothèque Nationale de France	Ms. Nouv. Acq. Lat. 1673	BNF Lat. 1673	37r, 38r	<i>Melones dulces, Melones palesini</i>	2A–C
<i>Tacuinum sanitatis</i>	Northern Italy	1390	Liège, Bibliothèque de l'Université de Liège	Ms. 1041	Liège 1041	20r	<i>Mellones dulces</i>	2D
<i>Tacuinum sanitatis</i>	Northern Italy	1395	Vienna, Österreichische Nationalbibliothek	Cod. Ser. N. 2644	ONB 2644	21r, 21v	<i>Melones dulces, Melones insipidi</i>	2E, F
<i>Historia plantarum</i>	Northern Italy	1395	Rome, Biblioteca Casanatense	Ms. 459	Casanatense 459	82v	<i>Cucumeres</i>	3A
<i>Carrara Herbal</i>	Northern Italy	1400	London, British Library	Ms. Egerton 2020	Carrara Herbal	163r	<i>Anguria</i>	3B
<i>Livre des simples médecines</i>	Northern France	1430	Copenhagen, Kongelige Bibliotek	Ms. 227 2 °	KLB 227	152r	<i>Melons</i>	4A
<i>Livre des simples médecines</i>	Western France	1450	Modena, Biblioteca Estense	Ms. Estero 28 = α. M. 5. 9	Estense 28	119v	<i>Melons</i>	4B
<i>Libro de componere herbe e fructi</i>	Northern Italy	1471	Paris, Bibliothèque Nationale de France	Ms. ital. 1108	BNF Ital. 1108	56v	<i>Meloni</i>	4C
<i>De re medica</i>	Northern Italy	1472	Vienna, Österreichische Nationalbibliothek	Ms. 5264	ONB 5264	82v	<i>Meloni</i>	4D

\* Approximate year as given by Pächt (1950), Segre Rutz (2002), Collins (2000), Givens (2006) or depository.

the Carrara Herbal (Baumann, 1974). This manuscript, preserved by the British Library (London) as Egerton 2020 (Table 1), is not based on the *Circa instans* but rather on a translation of the 11th-century Arabic treatise on medical simples by Ibn Sarabi (Serapion the Younger). Containing magnificent illustrations, it was produced in Padua, northern Italy, between 1390 and 1404.

Unrelated to the herbal manuscripts are various productions of the manual of agriculture and well-being known as the *Tacuinum sanitatis* (Pächt, 1950; Cogliati Arano, 1976; Segre Rutz, 2002; Hoeniger, 2006). This manual is the Latin translation of another 11th-century Arabic treatise, the *Taqwim al-sihha*, a tabular guide for healthy living, written by the physician and philosopher Ibn Butlan (Elkhadem, 1990). Perhaps the oldest extant illustrated version of the *Tacuinum sanitatis*, from approx. 1385, is Bibliothèque Nationale de France (Paris) ms. Nouv. Acq. Lat. 1673, which was produced in Lombardy, northern Italy (Table 1). Another early version, produced in Veneto, northern Italy, is Bibliothèque de l'Université de Liège, Ms. 1041. A third version, perhaps produced in the same Lombardian workshop as the first but about a decade later, is Österreichische Nationalbibliothek (Vienna), Cod. Ser. N. 2644. Altogether, there are five strikingly different images of watermelons in these three manuscripts. Three other archetypal versions of the *Tacuinum sanitatis*, produced as late as the mid-15th century, contain two images of watermelons that are similar to those in Cod. Ser. N. 2644 (Paris et al., 2009).

Finally, two other manuscripts from the late medieval period contain original illustrations of watermelons. These two manuscripts can be considered composites as they contain images both similar to those in herbals as well as market scenes (Segre Rutz, 2002). Both of these manuscripts contain an image of watermelon fruits being marketed. One of them, entitled *Libro de componere herbe e fructi*, is preserved as Bibliothèque Nationale de France (Paris) ms. Ital. 1108 (Table 1). This manuscript contains the notation that it was authored by Maestro Giohane Cadamosto of the City of Lodi, who studied plants and foods of all kinds, and was presented to its patron, the Duke of Ferrara, in February 1471 ([www.mandragore.bnf.fr](http://www.mandragore.bnf.fr)). Another work by the same author composed no later than 1472, entitled *De re medica*, is preserved as Österreichische Nationalbibliothek (Vienna) ms. 5264.

Fifteen images of watermelons are presented together here to facilitate comparisons among them. They are presented in chronological order with two objectives: (1) to obtain a more accurate assessment of the phenotypic variability in *Citrullus lanatus* in medieval Mediterranean Europe and (2) to obtain an improved understanding of the history of watermelons in this region.

## THE ILLUSTRATIONS

Tractatus de Herbis, 1300: British Library (London), ms. Egerton 747

Folio 66v (Fig. 1A) has an opening text of *Melones palestini ul' Saracenici* and shows a simplified image of a part of a watermelon plant, easily recognizable by its long internodes, alternate leaves and pinnatifid leaf laminae. The stem is drawn as slender, tendrils are absent and small very light yellow flower buds are

depicted only near the apex. The fruits, which arise at or near the leaf axils, are smaller than the leaf laminae, round and medium green with darker, longitudinal, narrow stripes.

Tractatus de Herbis, de Avibus et Piscibus, Manfredus di Monte Imperiali, 1335: Bibliothèque Nationale de France (Paris), ms. lat. 6823

Folio 42v (Fig. 1B) has simplified images of a part of two slender plants having long internodes and alternate leaves, one is cucumber, *Cucumis sativus* L. (left), and the other is watermelon, *Citrullus lanatus* (right). The text refers to the cucumber as *citruli* and the watermelon as *cucumeris*, as in the modern Italian *cetrioli* and *cocomeri*, respectively. The watermelon plant has branched, slightly coiled tendrils arising from leaf axils. Flower buds are drawn almost schematically, uncoloured, at two apical leaf axils. The leaf laminae, depicted as halves seen from the side and thereby reflecting the folding along their central veins, are realistically pinnatifid. The fruits, which arise from the leaf axils, are again depicted as smaller than the leaf laminae, round and medium-dark green with darker, longitudinal, narrow striping.

Tractatus de Herbis, 1363: Pierpont Morgan Library (New York), ms. 873

Folio 65r, labelled *Mellones*, shows a simplified image of part of a watermelon plant (Fig. 1C), with long internodes, alternate leaves and pinnatifid leaf laminae depicted as halves seen from the side. Highly coiled tendrils arise from the leaf axils, but they are incorrectly shown as unbranched and flowers are absent. The four fruits are smaller than the leaf laminae, round and medium green with darker, longitudinal, narrow striping. The most apical fruit of the four is shown as smaller than the other three, indicating that it is still developing and immature.

Tractatus de Herbis, 1375: Bibliothèque de l'École nationale Supérieure des Beaux Arts (Paris), ms. Masson 116

Folio 120v, labelled *Cucumeres*, shows a stunning image of part of a watermelon plant (Fig. 1D). The plant is shown as having long internodes, leaves that are alternating and pinnatifid, and tendrils, most of them branched, arise from leaf axils. What might be a small, pale flower bud appears in an apical leaf axil. The four fruits are smaller than the leaf laminae, round and light green with longitudinal, dark green, broad stripes. The most apical fruit of the four is shown as smaller than the other three, indicating that it is developing and immature.

Tacuinum Sanitatis, 1385: Bibliothèque Nationale de France, ms. Nouv. Acq. Lat. 1673

Folio 37r, labelled *Melones dulces*, shows a viney plant without tendrils and flowers, and having acutely palmate leaf laminae, not shaped like those of watermelon (Fig. 2A). The fruits are depicted as approximately as long as a person's head, elliptical and striated yellowish dark green. One person is picking a fruit and another appears to be eagerly sucking the juice from the end of a harvested fruit.

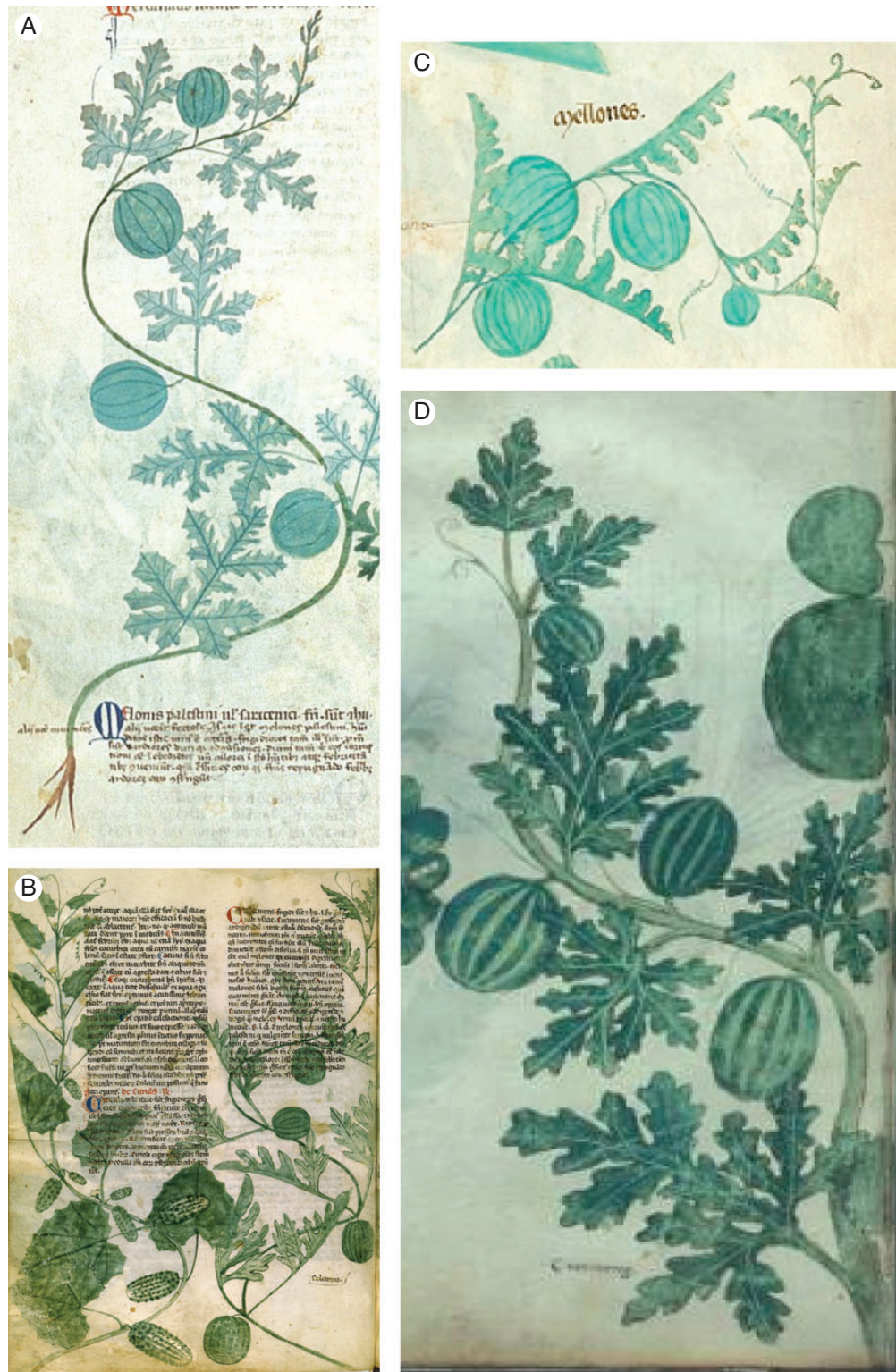


FIG. 1. Images of watermelon drawn from approx. 1300 to 1375. (A) *Melones palestini ul' Saraceni* of the *Tractatus de herbis*, British Library (London) ms. Egerton 747, folio 66v. The image is of a simplified watermelon plant bearing fruits that are small, round, medium green with narrow darker stripes. (B) *Cucumeris* (at right) of the *Tractatus de herbis, de avibus et piscibus*, *Manfredus di Monte Imperiali*, Bibliothèque Nationale de France (Paris), ms. lat. 6823, fol. 42v. The image is of a simplified watermelon plant bearing fruits that are small, round, medium to dark green with narrow darker stripes. *Citruli* (at left) is an image of a simplified cucumber plant, *Cucumis sativus* (Paris et al., 2011). (C) *Mellones* of the *Tractatus de herbis*, Pierpont Morgan Library (New York), ms. 873, fol. 65r. The image is of a much simplified watermelon plant bearing fruits that are small, round, medium green with narrow darker stripes. (D) *Cucumeres* of the *Tractatus de herbis*, Bibliothèque de l'École nationale Supérieure des Beaux Arts (Paris), ms. Masson 116, fol. 120v. The image is of a simplified watermelon plant bearing fruits that are small, round, light green with broad dark green stripes.



FIG. 2. Images of watermelon drawn from approx. 1385 to 1395. (A) *Melones dulces* of the *Tacuinum sanitatis*, Bibliothèque Nationale de France, ms. Nouv. Acq. Lat. 1673, fol. 37r. This image depicts elliptical fruits that are striated yellowish dark green; one that has been harvested is being sucked. (B) *Melones palesini* of the *Tacuinum sanitatis*, Bibliothèque Nationale de France, ms. Nouv. Acq. Lat. 1673, fol. 38r. This image depicts fruits that are rather small, short oval and light yellow-green. A cut piece of a fruit is about to be partaken. (C) *Melones palesini* of the *Tacuinum sanitatis*, Bibliothèque Nationale de France, ms. Nouv. Acq. Lat. 1673, fol. 38r. Magnification of the cut piece, showing its white flesh and black seeds. (D) *Mellones dulces* of the *Tacuinum sanitatis*, Bibliothèque de l'Université de Liège, Ms. 1041, folio 20r. The long oval fruits are striated dark yellow-green. (E) *Melones dulces* of the *Tacuinum sanitatis*, Österreichische Nationalbibliothek, Vienna, Cod. Ser. N. 2644, fol. 21r. The long oval fruits are light green distinctly and rather broadly striped dark green. Several of the fruits have split or been cut longitudinally to reveal red flesh. (F) *Melones insipidi* of the *Tacuinum sanitatis*, Österreichische Nationalbibliothek, Vienna, Cod. Ser. N. 2644, fol. 21v. The round fruits are plain dark green with a hint of yellowing.

Folio 38r, labelled *Melones palesini*, also shows a viney plant without tendrils and flowers, and the leaves that are not shaped like those of watermelon (Fig. 2B). The fruits are depicted as nearly as long as a person's head, short oval and light yellow-green. One person is cutting open a fruit and another is about to nibble a cut piece, but without any obvious enthusiasm. When examined closely, this cut piece of watermelon is seen to have white fruit flesh and black seeds (Fig. 2C).

Tacuinum Sanitatis, 1390: *Bibliothèque de l'Université de Liège, Ms. 1041*

Folio 20r, labelled *Mellones dulces*, shows two highly simplified vines having acutely palmate leaf laminae, not shaped like those of watermelon (Fig. 2D). The long oval fruits are striated dark yellow-green.

Tacuinum Sanitatis, 1395: *Österreichische Nationalbibliothek, Vienna, Cod. Ser. N. 2644*

Folio 21r, labelled *Melones dulces*, shows viney plants with tendrils and yellow flowers, but the leaf laminae are acutely palmate, not shaped like those of watermelon (Fig. 2E). The long oval fruits are light green distinctly and rather broadly striped dark green. Some are depicted as on the plants and some have been harvested into a basket. Two fruits on the plants have burst lengthwise and two in the basket have also burst or have been cut lengthwise, revealing red flesh.

Folio 21v, labelled *Melones insipidi*, shows viney plants with tendrils and yellow flowers, but the leaf laminae are acutely palmate, not shaped like those of watermelons (Fig. 2F). The round fruits are plain dark green with a hint of yellowing.

Historia Plantarum, 1395: *Biblioteca Casanatense (Rome), ms. 459*

Folio 82v, labelled *Cucumeres*, shows a highly simplified image of a watermelon plant with long internodes, alternate leaves and pinnatifid leaf laminae (Fig. 3A). The tendrils are correctly shown as branched but flowers are absent. The four round to slightly oval fruits are small, less than the size of the leaf laminae, medium-dark green, with longitudinal darker narrow stripes.

Carrara Herbal, 1400: *British Library (London), ms. Egerton 2020*

Folio 163r, labelled *Anguria*, shows a simplified but strikingly realistic image of a plant having long internodes and alternate pinnatifid leaves just like those of watermelon (Fig. 3B). The tendrils, flower and flower bud, and fruits arise from the leaf axils. The tendrils are coiled, two or three appear to be branched and the others unbranched. Quite accurately depicted are a staminate, five-petalled, yellow flower at anthesis and another, more apically placed, approximately 2 d prior to anthesis. One newly set fruit, with remains of the calyx and corolla still visible, arises from the leaf axil immediately basal to that of the open staminate flower. A more fully developed fruit, arising from a more basal leaf axil, is of medium size, its diameter approximately equal to that of the length of the largest leaf laminae, spherical and dark green with rather inconspicuous, very narrow, darker stripes.

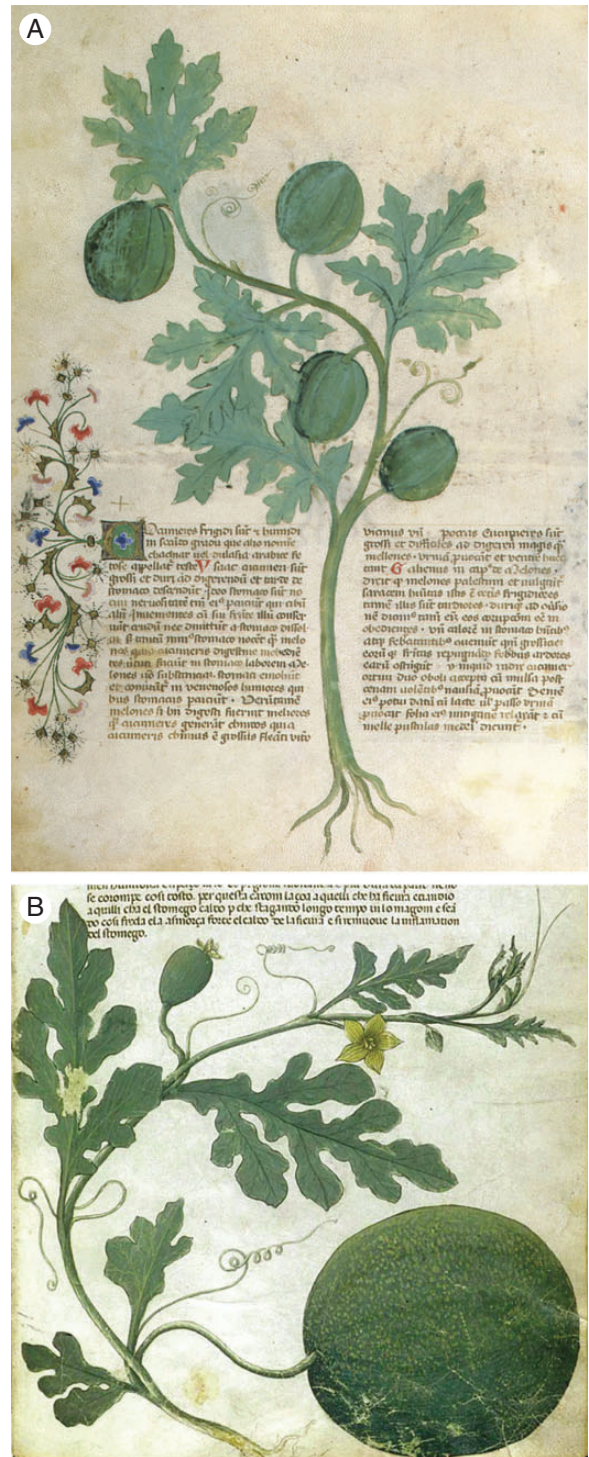


FIG. 3. Images of watermelon drawn from approx. 1395 to 1400. (A) *Cucumeres* of the *Historia plantarum*, Biblioteca Casanatense (Rome), ms. 459, fol. 82v. The simplified viney plant has leaves similar in shape to those of watermelon, branched, coiled tendrils, no flowers, and small, round to oval fruits of medium-dark green with narrow darker stripes. (B) *Anguria* of the *Carrara Herbal*, British Library (London), ms. Egerton 2020, fol. 163r. The image depicts part of a viney plant having leaves exactly like those of watermelon, realistically coiled tendrils, five-petalled, yellow flowers with two fruits, one that is newly set and another, more fully grown, that is medium-sized, round, dark green with rather inconspicuous, very narrow darker stripes.



FIG. 4. Images of watermelon drawn from approx. 1430 to 1475. (A) *Melons* of the *Livre des simples médecines*, Kongelige Bibliotek (Copenhagen), ms. GKS MS 227 2°, fol. 152r. This image depicts a much simplified plant with fruits that are small, round to obovate, medium green with narrow darker stripes. (B) *Melons* of the *Livre des simples médecines*, Biblioteca Estense (Modena), ms. Estero 28 =  $\alpha$ . M. 5. 9, fol. 119v. This image depicts an overly simplified plant with fruits that are small, elliptical and plain medium-dark green. (C) *Meloni* of the *Libro de componere herbe e fructi*, Bibliothèque Nationale de France, ms. ital. 1108, fol. 56v. This image depicts watermelon fruits, in a basket, that are being offered for sale. The fruits appear to be fairly large, and are long oval, medium green with dark green stripes of intermediate breadth. (D) *Meloni* of *De re medica*, Österreichische Nationalbibliothek, Vienna, ms. 5264, fol. 82v. This image depicts watermelon fruits, in a large basket, that are being offered for sale, one held by a fruit seller and one by a prospective buyer. The fruits are slightly oval, dark green with distinct but rather narrow darker green stripes, and several are sliced to reveal red flesh.

*Livre des Simples Médecines, 1430: Kongelige Bibliotek (Copenhagen), ms. GKS MS 227 2°*

Folio 152r, accompanied with the text opening *Melons que sen appelle ponpons*, shows an image of a highly simplified watermelon plant (Fig. 4A). The plant is depicted as having long

internodes, alternate leaves and pinnatifid leaf laminae. However, tendrils are absent and large yellow-tipped flower buds, depicted near the apex of the plant and without adjacent leaves, are condensed into an almost single, complex inflorescence. The fruits are smaller than the laminae, round to obovate, medium green with narrow darker stripes.



Livre des Simples Médecines, 1450: *Biblioteca Estense (Modena)*, ms. Estero 28 =  $\alpha$ . M. 5. 9

Folio 119v, also accompanied with the text opening *Melons que sen appelle ponpons*, shows an image for a watermelon plant that is so overly simplified that, without the text, it would have precluded specific identification (Fig. 4B). The plant is depicted as having long internodes and alternate leaves, but the leaf laminae are rounded palmate and wider than long. The stem is thick at the base, obviously narrowing toward a tendrillike apex. The four yellow-tipped flower buds are drawn together near the apex, without any leaves. Except for the yellow tips of the flower buds and simple brown roots, the image is monochromatic medium-dark green. However, the three rather small fruits, which do not arise from leaf axils, are depicted as elliptical, longer than the leaf laminae, and plain unmarked medium-dark green, the same colour as the foliage.

Libro de Componere Herbe e Fructi, 1471: *Bibliothèque Nationale de France*, ms. ital. 1108

Folio 56v, labelled *Meloni*, shows a basket filled with watermelon fruits depicted together with a vendor (left) and a prospective customer (right) (Fig. 4C). The fruits are fairly large, long oval, medium green with darker stripes of intermediate breadth.

De Re Medica, 1472: *Österreichische Nationalbibliothek, Vienna*, ms. 5264

Folio 82v, labelled *Meloni*, shows a large basket containing watermelon fruits as well as one fruit held by a fruit seller and another by a prospective buyer (Fig. 4D). The fruits are oval, dark green with rather narrow darker stripes. One fruit held by the vendor, one being held and cut by the prospective buyer, and one in the basket are sliced to reveal red-coloured flesh.

## DISCUSSION

Most medieval manuscripts containing discussions of plants are not illustrated (Collins, 2000). Of the medieval manuscripts that are illustrated, those having depictions of cucurbits that can be identified to the taxonomic level of species are uncommon. Notable exceptions are two Dioscorides-derived manuscripts that are probably descended from the same lost archetype (Collins, 2000; Hummer and Janick, 2007; Janick et al., 2007). Both contain a magnificent illustration of a close relative of watermelon, the colocynth, *Citrullus colocynthis* (L.) Schrad. One of these manuscripts is the *Juliana Anicia Codex*, Österreichische Nationalbibliothek, Vienna, Cod. Med. Gr. 1, produced in Constantinople, 512 CE, and the other is *Biblioteca Nazionale*, Naples, Cod. Gr. 1, produced, perhaps, in approximately 600 CE. We have made an extensive search of medieval manuscripts for images of *C. lanatus*. The oldest one that we have encountered that contains an image that can be positively identified as watermelon is Egerton 747, which dates to approx. 1300. We found a dozen more manuscripts produced from then until the late 15th century, nearly all of Italian origin, that contain original images of watermelons (Table 1). Other images of watermelons can be found in numerous late

medieval illustrated manuscripts, including later productions similar to the *Tractatus de herbis*, the *Livre des simples médecines* and the *Tacuinum sanitatis*, but all of the ones we have seen appear to be copies and, as copies, they are usually inferior in detail and accuracy.

The late medieval manuscripts containing images of watermelon can be considered to be of two types, herbal and agricultural. Most of the herbal manuscripts show the foliage fairly accurately and the fruits as small and nearly spherical (Figs 1, 3A and 4A). The Carrara Herbal, however, differs from the others by depicting a larger fruit, perhaps a sweet watermelon rather than a citron (Fig. 3B), and Estense 28 also differs by inaccurately depicting the foliage and showing the fruits as elongate (Fig. 4B). The agricultural manuscripts do not depict the foliage accurately, if at all, but the fruits are emphasized, and in some cases the interior of the fruit is shown or descriptive captions are provided (Figs 2 and 4C, D). The differing focus of the herbal versus the agricultural manuscripts could be expected as the herbals were devoted to the study of plants for their medicinal uses, whilst agricultural manuscripts were concerned with food and commerce. The widely disparate images provided by these two manuscript types are complementary, providing vivid yet differing perspectives on the watermelons of late medieval Italy and France.

The four oldest original images of watermelon are from the herbal manuscripts (Fig. 1). In chronological order, these are Egerton 747 (approx. 1300), the Manfred Herbal (approx. 1335), Morgan 873 (approx. 1363) and Masson 116 (approx. 1375). Although the oldest manuscript, Egerton 747, is considered to have instigated the production of similar manuscripts (Collins, 2000), the watermelon depictions in these other three manuscripts are not copies of the one in Egerton 747. The watermelon in the Manfred Herbal (Fig. 1B) depicts correctly two features which are absent from the watermelon in Egerton 747 (Fig. 1A), branched tendrils and adaxial folding of the leaf laminae. The image of watermelon in Morgan 873, produced in approx. 1363, although showing half leaves like the image in the Manfred Herbal, depicts the tendrils as highly coiled as well as a small, developing fruit near the plant apex (Fig. 1C), features which indicate that the artist, or his instructor, had directly observed a watermelon plant. The image in Masson 116, the most pleasingly life-like of these four, shows the fruits as having broad striping (Fig. 1D), distinctly different from the narrow striping of the fruits in the three antedating images of watermelon. In each of these early herbal images of watermelons, the fruits are depicted as small and round, and the fruit-flesh colour is not shown. Given the differing, narrow and broad, fruit striping, plants of two cultivars appear to be illustrated.

The five images of watermelons in the three renditions of the *Tacuinum sanitatis* produced from approx. 1385 to 1395 (Paris et al., 2009) share inaccurately displayed foliage but show a variety of fruit shapes and external colours, and reveal fruit flesh colour and even organoleptic quality (Fig. 2). The sucking, perhaps slurping, of the watermelon in BNF Lat. 1673, folio 37r (Fig. 2A), strongly suggests that this fruit was watery inside and sweet. The depicted hesitancy toward the oval, yellow-green watermelon, folio 38r (Fig. 2B), indicates that its eating quality was not very good; indeed, the fruit has the white flesh (Fig. 2C) typical of the insipid citron watermelons. The fairly large, long oval, striated, rather large fruits

depicted in Liège 1041 (Fig. 2D) are probably of the same cultivar as that of the sucked fruit in BNF Lat. 1673 (Fig. 2A), but the image does not appear to be a copy of the earlier manuscript. The watermelons in ONB 2644, folio 21r (Fig. 2E), are also depicted as fairly large, long oval and striped, with some split or cut to reveal the red flesh, the label *Melones dulces* (Fig. 2E) suggesting that this indeed was a cultivar of sweet, dessert watermelons. However, the watermelons in ONB 2644, folio 21v (Fig. 2F), are distinctly different, depicted as spherical and plain dark green, with the label *Melones insipidi* indicating that the image represents citron watermelons. The *Tacuinum* manuscripts, therefore, illustrate at least three cultivars of watermelons, one of which has long oval and striped, sweet fruits with red flesh (Fig. 2A, D, E) and two others that are insipid, one being oval and light yellow-green (Fig. 2B, C) and the other spherical and dark green (Fig. 2F). The images of crop plants in the *Tacuinum* manuscripts, however, tend to be idealized (Hoener, 2006), depicting an inordinate abundance of fruit production and exaggerated fruit size. Moreover, in the *Tacuinum* manuscripts, the fruits are seen at a distance, rather than close-up as in the herbal manuscripts, and therefore finer detail, such as narrow stripes or streaks on watermelon fruits, would be expected to be lacking. Possibly, then, the spherical dark green watermelon, *Melones insipidi*, of ONB 2644, folio 21v (Fig. 2F), represents the same cultivar as that portrayed of plants bearing round, medium-dark green, narrowly striped fruits in the *Tractatus de herbis* (Figs 1A–C, 3A and 4A).

The simplified image of a watermelon plant in Casanatense 459 (Fig. 3A) recalls those appearing in the older *Tractatus de herbis* manuscripts. Like the images of watermelon in Egerton 747 (Fig. 1A) and Masson 116 (Fig. 1D) but unlike those of the Manfred Herbal (Fig. 1B) and Morgan 873 (Fig. 1C), the image in Casanatense 459 shows the leaf laminae as not adaxially folded (Fig. 3A). As in the Manfred Herbal and Masson 116 but unlike Egerton 747 and Morgan 873, the tendrils are correctly depicted as branched, and they are mildly coiled. The fruits have the same size and shape as in the other herbals, differing in striping pattern only from those in Masson 116. Thus, the image of watermelon in Casanatense 459 differs from each of its predecessors in one or more correctly depicted features. It, too, is original, drawn with knowledge of the plant or fruit, rather than copied.

The magnificent image of watermelon in the Carrara Herbal (Fig. 3B) is astonishingly finely detailed and accurate, far superior to all of its predecessors. Besides the strikingly life-like pinnatifid leaf laminae, it displays, arising from the leaf axils, tendrils that are branched and coiled, flowers at two developmental stages, one fully open and the other approximately 2 d prior to anthesis, and one very young and one mature fruit. The mature fruit is almost spherical and with a colour differing slightly, by being darker with less obviously darker stripes, from that depicted in Egerton 747 (Fig. 1A), the Manfred Herbal (Fig. 1B), Morgan 873 (Fig. 1C) and Casanatense 459 (Fig. 3A). The fruit is also noticeably larger than those in the other herbals, equal or greater than the length of the leaf laminae, suggesting that the image was made from a different, larger-fruited cultivar.

The image of watermelon in the earliest French version of the *Livre des simples médecines*, KLB 227 (approx. 1430) from northern France (Fig. 4A), is more schematic than in the older herbal manuscripts. As in the *Tractatus de herbis* manuscripts (Fig. 1),

the watermelon plant in KLB 227 (Fig. 4A) is depicted as having long internodes, alternate leaves and pinnatifid leaf laminae, and small, nearly round, narrow-striped fruits. Moreover, in both KLB 227 (Fig. 4A) and Egerton 747 (Fig. 1A), the leaf laminae are depicted in the same unique fashion, the medial segments being smaller than the basal and more distal segments, tendrils are absent, and flower buds are depicted only near the apex of the plant and without adjacent leaves. The images do have a striking difference, however, the flower buds in KLB 227 being depicted inordinately large and unrealistically multi-petalled, in brilliant yellow. Thus, the image of watermelon in KLB 227 exhibits some creativity by the artist but not necessarily derived from familiarity with the watermelon plant. The image of watermelon in Estense 28 (approx. 1450), which is accompanied by the same text for *Melons* as in KLB 227, has fewer flower buds but they are in a near apical arrangement and similarly exaggerated (Fig. 4B). Evidently, the artist either drew this image in haste or was not familiar, or was not too concerned, with the appearance of watermelon plants, as the leaves were drawn as entire and rounded, rather than pinnatifid. However, he depicted the fruits as elliptical, very unlike the obovate fruits depicted in KLB 227 (Fig. 4A), and therefore he was probably familiar with elongate watermelons.

The image of watermelon fruits in a basket, in BNF Ital. 1108 (dated 1471), is perhaps the earliest depiction of watermelon fruits gathered and offered for sale. They are fairly large, long oval and display distinct stripes (Fig. 4C), quite similar in appearance to the *Melones dulces* being harvested in ONB 2644 folio 21r (Fig. 2E) and perhaps of the same cultivar. Another image of watermelon fruits in a basket appears in a similar work, ONB 5264 (1472) (Segre Rutz, 2002), but these fruits are smaller, short oval and three are cut to reveal their red flesh (Fig. 4D). Evidently, by the 1470s, there were at least two sweet watermelon cultivars in Italy, one larger and long oval, the other medium-sized and short oval.

Together, the herbal manuscripts contain depictions of four watermelon cultivars, the most common having small, round fruits of medium-dark green with narrow darker stripes (Figs 1A–C, 3A and 4A), another having medium-sized, round fruits, dark green with fainter stripes (Fig. 3B), a third having small, round fruits that are light green with broad dark stripes (Fig. 1D), and a fourth having elliptical fruits (Fig. 4B). The manuscripts concerning agriculture or containing market scenes show at least four cultivars of watermelons, two of which might be the same as depicted in the herbals. The medium to fairly large size, long oval, and striped, probably sweet fruits (Figs 2A, D, E and 4C) appear to be from the same cultivar and perhaps correspond to the poor, almost monochrome image in Estense 28 (Fig. 4B); the spherical, dark green fruit labelled *Melones insipidi* (Fig. 2F) might represent the same cultivar as shown in four of the herbals (Figs 1A–C and 3A). The oval, light yellow-green, white-fleshed citron illustrated on folio 38r of BNF Lat. 1673 (Fig. 2B, C) appears to be unique. Likewise, the medium-sized, short oval, dark green, distinctly striped, red-flesh watermelon illustrated on folio 82v of ONB 5264 (Fig. 4D) appears to be unique. When the watermelons illustrated in each of the manuscripts are compared and considered, at least six watermelon cultivars can be distinguished, of which three, represented in (a) Figs 2A, D, E and 4B, C, (b) Fig. 3B and (c) Fig. 4D, appear to have been of sweet, dessert watermelons.

The other three, represented in (d) Figs 1A–C, 3A and 4A, (e) Fig. 2B, C and (f) Fig. 1D, appear to have been citron watermelons.

Watermelons were familiar to educated herbalists, doctors and apothecaries, but also to common people as well. The images of watermelons in the *Tacuinum sanitatis* manuscripts (Fig. 2) indicate that *Citrullus lanatus* was a common garden plant in northern Italy by the late 14th century (Paris et al., 2009). These images depict both sweet watermelons and citrons. Ironically, in the literary source which eventually inspired the production of the illustrated *Tacuinum sanitatis* manuscripts, the Arabic-language, 11th-century *Taqwim al-sihha*, Ibn Butlan wrote that the best sweet *battikh* (Arabic, usually meaning watermelons but can be melons) were from Samarqand (Elkhadem, 1990), which is situated in a region that has been famous for the supreme quality of its melons, *Cucumis melo*, since the 10th century (Paris et al., 2012). As only watermelons, and not melons, are labelled *Melones dulces* in the *Tacuinum sanitatis* manuscripts (Paris et al., 2009), it appears that, in late medieval northern Italy, some watermelons were markedly more sweet than any of the melons that were present there at that time.

Watermelons were not mentioned in the mid-12th century *Circa instans* (Platearius, 1200). Albertus Magnus wrote, in mid-13th century Germany, that the *pepo* was most often yellow and not smooth, and the *citrullus* was a kind of *pepo* that was green and smooth (Jessen, 1867), indicating that what he called *pepo* was more common than the *citrullus*. Albertus Magnus' description leaves no doubt that for him the *pepo* was melon, *Cucumis melo*, and the *citrullus* was watermelon, *Citrullus lanatus*. Cucurbit names, however, have tended to change over time and place, and have become juxtapositioned among various languages (Paris et al., 2011). In medieval Latin of Italy, *citruli* referred to cucumbers, *Cucumis sativus*. The *cucumis* and *pepo* of classical Latin indicated snake melon and watermelon, respectively (Paris et al., 2012). The text for watermelons in the *Livre des simples médecines* indicates synonymy for the words *melons* and *ponpons*. In the medieval manuscripts of Italian provenance (Table 1), watermelons are variously labelled *cucumeres*, *meloni* or *anguria*, probably reflective of different local Italian dialects. In modern Italian, *anguria* is perhaps the most frequently used word for watermelon, followed by *cocomero*. In modern French, the most frequently used word for watermelon is *pastèque*, which is derived from the Arabic *battikh*. Obviously, correct taxonomic interpretations of the various words used historically for cucurbits can only be achieved in the context of time frame, geographical area, and language.

An early Renaissance illustrated work on gardening known as the *Grandes heures d'Anne de Bretagne*, produced during the first decade of the 16th century in Tours, France, contains illustrations of three cucurbits: cucumber, bottle gourd (*Lagenaria siceraria*) and the first known European illustration of an American gourd (*Cucurbita pepo*) (Paris et al., 2006). Even the Queen of France, however, did not have melons or watermelons in her garden, probably attributable to the temperate climate of the region. However, paintings in the fabulous Villa Farnesina in Rome, produced during the second decade of the 16th century, have all five of these cucurbits (Janick and Paris, 2006). The five watermelon fruits depicted in the Villa Farnesina are shown whole, averaging a bit longer than most adjacent clusters of

grapes and thus of medium size and were spherical, dark green with narrow darker green stripes, very much like the fruit depicted in the Carrara Herbal (Fig. 3B).

Realistically detailed illustrations of plants greatly proliferated during the Renaissance. The number of localities at which new illustrations were produced increased and, as would be expected, so did the number of plant taxa and their variants. The *Herball* of John Gerard, published in 1597, provides a summary of the then current state of watermelons in much of temperate Europe, including Germany and most of France, during Renaissance times. Gerard's description of watermelon plants is stunningly detailed and accurate (Janick et al., 2012). He observed that these were tender, viney, branched plants with deeply cut, jagged leaves, tendrils and yellow flowers. The fruits were round with a smooth surface, streaked or striped, green except for the white ground spot. Underneath the surface, the fruit was hard, more like that of pumpkins than cucumbers or melons, and within was spongy, slimy, inner pulp enclosing the flat seeds, which had a hard coating that was black or 'of an overworne reddish colour'. The inner part of the watermelon, including that just underneath the coloured exocarp, was usually boiled. He observed that the fruit had less tendency to rot than the melon, and could keep for a fairly long time. Gerard also wrote that the watermelon thrived mostly in hot regions, naming localities in southern Italy and the Middle East, remarking that he had diligently attempted to grow them many times, but they never fully ripened. There is no description of the colour of the fruit flesh, which suggests that it was either white or greenish, nor is there mention of a sweet taste. The fruit flesh of watermelons, however, acquires pigmentation and sweetness as the fruit ripens. Given Gerard's description of the fruits as being hard and often cooked, apparently some of the watermelons he knew were citrons. Indeed, Gerard wrote that he knew of two kinds of watermelons and, therefore, he may have known of both, citrons and sweet ones, but never was able to enjoy the latter because of the cool climate prevailing in England. Citron watermelons have more vigorous growth and wider adaptability (Bush, 1978; Goldman, 2002). However, subsequent breeding or introduction of sweet watermelons that could develop and ripen earlier led to their expansion into the cooler climate prevailing over much of the Continent. The citron watermelons were displaced, having today the status of a relict crop in Europe (Laggetti and Hammer, 2007).

Watermelons were illustrated in ancient Egypt (Keimer, 1924; Manniche, 1989) and they were longed for by the Children of Israel during their journey in the Sinai Desert (the *avattihim* of *Numbers* 11:5). However, the appreciation of them appears to have been secondary to that of the cucumber-like melons (the *qishu'im*). From pharaonic times through the Roman Era, the very long cucumber-like melons, known as snake melons, *Cucumis melo* Flexuosus Group, were more frequently illustrated and discussed than watermelons (Janick et al., 2007), implying that watermelons at that time did not possess all of the outstanding qualities of modern sweet watermelons. As both, red-flesh and white-flesh watermelons are illustrated and labelled, respectively, *dulces* and *insipidi* or *palesini*, in the *Tacuinum sanitatis* manuscripts of late 14th-century northern Italy (Fig. 2), the first watermelon cultigens having sweet fruit flesh must have been selected before then. Quite likely, a missing part of the history of sweet watermelons lies in more

southerly and easterly regions which had warmer, sunnier climates better suited to their production.

Both, sweet, red-flesh dessert watermelons and insipid, white-flesh citron watermelons were grown in late medieval Mediterranean Europe. When cultured in the same vicinity, these two kinds of watermelons can be naturally cross-pollinated by bees. Curiously, however, sweet and citron watermelons have largely maintained their distinct identities throughout the centuries. Quasi-linkage produced by massive co-segregation and non-random assortment of non-homologous chromosomes, observed in a mapping population derived from crossing sweet and citron watermelons, was suggested by *Levi et al.* (2003) to be a prevalent anomaly. Quite recently, the genomes of sweet and citron watermelons were found differ in ribosomal DNA configuration (*Reddy et al.*, 2013). Moreover, the new sequencing of the watermelon genome indicates that there is considerable genomic divergence between sweet and citron watermelons (*Guo et al.*, 2013).

In conclusion, we found 13 manuscripts from Mediterranean Europe, dating to 1300–1472, that contain original, realistic illustrations of watermelon, *Citrullus lanatus*. The eight herbal-type manuscripts have more accurate depictions of the foliage whilst the five agriculture-based manuscripts have more informative images of the fruits. Both the sweet, dessert watermelons and the insipid, citron watermelons are depicted in these manuscripts, and these two kinds of watermelons are represented nearly equally. Citrons seem to have been as common in Europe as sweet watermelons through the early Renaissance, probably due to their wider adaptability. Since then, citrons have been largely replaced by sweet watermelon cultivars that either were introduced from elsewhere or bred for improved adaptation to conditions prevailing in Europe.

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