On the Trail of Date-Plum (*Diospyros lotus* L.) in Italy and Its First Archaeobotanical Evidence

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Diospyros lotus L. is an arboreal species native to the Balkans and Caucasus and ranging to the Far East. In Italy, it has been cultivated for centuries and has reverted to the wild state in some regions. During archaeological excavations carried out in the historical center of Modena (northern Italy), two floral calyxes of *D. lotus* were discovered in a layer dating from the first century CE. These are the first and only remains of *D. lotus* found in an archaeological context in Italy thus far. The first historical mention of this species as an arboreal plant in Italy occurs in the 1565 edition of Dioscorides' *Commentarii de Medica materia* by Pietro Andrea Mattioli. Our research allowed us to establish that the first three Italian herbaria containing samples of *D. lotus*, dating to the 1551–1570 period, are the Erbario B of the Biblioteca Angelica of Rome, the Erbario Aldrovandi (Bologna) and the Erbario Cesalpino (Florence). However, archaeobotanical remains reveal that the fruits of this species were known during the Roman period, probably arriving in northern Italy as a luxury food owing to their exceptional flavor.

Diospyros lotus L. è una specie arborea nativa dei Balcani e del Caucaso, il cui areale si estende fino all'Estremo Oriente, coltivata in Italia da qualche secolo e inselvatichitasi in talune regioni. In occasione di scavi archeologici condotti nel centro storico di Modena, sono stati scoperti due calici fiorali di *D. lotus* in uno strato risalente al I sec. d.C.: trattasi dei primi e per ora unici reperti di questa specie rinvenuti in Italia in contesti archeologici. Le prime sicure citazioni storiche della sua presenza sono invece molto piú tarde: chi per primo la descrisse come individui arborei presenti sul territorio italiano è Pietro Andrea Mattioli, nell'edizione del 1565 dei suoi *Commentarii* ai *Discorsi* di Dioscoride. Dalle ricerche da noi condotte emerge che pressoché contemporanei sono pure gli erbari italiani che per primi includono campioni di *D. lotus*: l'Erbario B della Biblioteca Angelica di Roma, l'Erbario Aldrovandi (Bologna) e l'Erbario Cesalpino (Firenze), datati fra il 1551 e il 1570. Le testimonianze archeobotaniche rivelano però che almeno i frutti della pianta erano già noti ai Romani ed erano giunti in Italia settentrionale probabilmente come cibo di lusso per il loro particolare gusto.

Key Words: Date-plum, archaeobotany, *Mutina*, historical herbaria, historical sources.

Introduction

The recovery of two calyxes of *Diospyros lotus* L. (date-plum or Caucasian persimmon, Ebenaceae) from Roman deposits in Modena sparked our interest in investigating the history of this tree in Italy, a country outside of the natural range of the plant.

The arboreal and deciduous plant *D. lotus* is regarded as a native species in the Balkans and Caucasus, with a range stretching as far as China and Japan (Mishra 1982; van Wyk 2005; Yang et al. 2015). Iran is considered the center of origin of this

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species, and together with Uzbekistan, it forms the area where the plant is likely to have originated (IUCN Red List 2015; Khoshbakht and Hammer 2006). Today, *D. lotus* is widely distributed and naturalized in the Mediterranean basin, where it is regarded as an emerging invader (Heywood and Sharrock 2013). The fruits are globous, small (diameter 1.5–2 cm) and with a very visible calyx (Ayaz et al. 1997).

The taxon is included among economic plants (Wiersema and León 1999): Its edible fruit is used for making beverages in some Mediterranean countries such as Turkey (Ayaz et al. 1997). In the Eurasian zone, it is also appreciated for its wood (Heywood et al. 2007), mostly as fuel or furniture construction (Safdari et al. 2008; Sher et al. 2010). In most regions, *D. lotus* is cultivated as a rootstock for *Diospyros kaki* L. fil., giving it vigour and uniform development, thanks to its resistance to low temperatures and aridity and also its adaptability to various kinds of soils, even though it is vulnerable to parasite attacks (Lunati et al. 1995; Reich 1994). At present, China is the main country where its importance as a fruit tree, rootstock, ornamental and medicinal plant (also used for tannin extraction) is widely recognized (Luo and Wang 2008; Yang et al. 2015). Indeed, in Chinese traditional medicine, its fruits and seeds have well-known properties, such as sedatives, antipyretics and stimulants of organic secretions. The same uses are widespread in India, Malaysia and Pakistan (e.g. Khan et al. 2010; Mallavadhani et al. 1998).

Owing to the delicious taste of fully ripened *D. lotus* fruits, it has been suggested that they were already known in the classical period. Some botanists even believe that they might correspond to the "honey-sweet fruit" (μελιηδέα καρπόν) mentioned by Homer in the Odyssey (9.82–104; 9.94: Murray 1919) when speaking of the Lotus eaters (Bernhardt 2008, 70; Kew 2017). But how seriously can this identification be taken when no scientific data are available to validate it? In fact, the discovery and history of *D. lotus* as an economic plant in the Mediterranean and its introduction to the countries of southern Europe are topics that have not been fully investigated thus far. In this study, we try to fill this gap by readdressing the history of *D. lotus*, at least in Italy, where nobody has tried to re-evaluate the available sources since the nineteenth century.

Today, *D. lotus* is sporadically cultivated in Italy and sometimes is reported as growing wild, from northern to central regions and Campania (Ferrari and Medici 1998; Pignatti 1982, 320). It is present as an ornamental plant in many gardens, which are sometimes of historical value. It is now reported as an alien in Lombardy, Trentino-South Tyrol, Friuli-Venezia Giulia, Marche, Umbria, Latium and tentatively in Tuscany (Conti et al. 2005). Recently, it has been reported as an alien that escaped from cultivation and growing wild in other places such as Venetia (Masin and Scortegagna 2012). *D. lotus* is known in various Italian regions with different names, among which are *dattilo di Trebisonda*, *ermellino*, *guaiaco*, *loto falso*, *legno santo* and *legno* or *albero di Sant'Andrea* (Penzig 1924; Pignatti 1982). The origin of the latter names comes from a legend that says that the cross on which St. Andrew was crucified was made with wood of this tree (Savi 1811). In the nineteenth century, this belief was evoked by the selling of date-plum fruits on St. Andrew's day, November 30 (d'Alberti di Villanova 1825, 420). The botanist Ottaviano Targioni Tozzetti (1803) records that these fruits were a common presence in the markets of Rome around the Saint's feast day.

Methodology

In this paper, we report the archaeobotanical remains from Roman Modena and discuss the likelihood that *D. lotus* might have a longer history in Italy than commonly thought. We address this question by consulting all available sources of botanical research from ancient to modern times. While some sources like archaeobotanical findings and herbaria can be directly linked to the botanical species of *D. lotus*, the textual and iconographic sources have to be critically evaluated, especially if they are dating back to pre-Linnaean times, when a plant name was not necessarily used for a single botanical species. The periods we cover are the Greek and Roman antiquity and modern times beginning with the sixteenth century, when a new interest for science arose and "modern botany" was born (Moggi 2012a). Unfortunately, we have insufficient data to discuss the history of *D. lotus* during the Middle Ages; medieval times represent the "dark ages" also for the date-plum in Italy. In tracing the ancient history of *D. lotus*, we will first recount instances in which the plant was mentioned in the ancient Greek and Roman written sources.

Diospyros lotus: a Plant with a Controversial Name

Both the generic term *diospyros* and the specific epithet *lotus*—scientific names given to the plant in

the ages of early "modern botany"—are ancient plant names. The generic name *diospyros*—a Greek compound literally meaning as much as "Zeus' grain": Διόσ = Zeus (genitive) + πυρός = grain—is only rarely found in Greek and Latin texts (less than 10 occurrences); in all cases, *diospyros* can be quickly ruled out as an ancient name for *D. lotus*. Interestingly, Theophrastus of Eresus (History of Plants 3.13.3: Amigues 1989) compares the plant's fruit to a cherry; Pedanios Dioscorides (*De materia medica* 3.141: Beck 2011; Wellmann 1906) and Pliny (Natural History 27.98–99: Jones 1956) use the name as a synonym for a medicinal herb. The situation is different with the ancient term *lotus*: It is a rather common Greek and Latin term that was used for many different plant species and can indeed be counted as a possible ancient name for *D. lotus*. Even though there are certain limits when dealing with ancient texts as sources for modern botany, and the sparse information given rarely allows identification down to species level, in some cases this seems to be possible with *D. lotus*.

The Term Lotus in the Classical World

Lotus or *lotos* (borrowed from Greek λωτός) is probably one of the most elusive ancient Latin botanic terms: It is given to numerous species with different habits and habitat, ascribed to families distant from each other. The reason for such an ambiguity goes back to the pre-Linnaean era, when plants were not identified unmistakably by a single name, but by one (colloquial) term which could describe several botanical species sharing a similar appearance or usage. The documented story of *lotus*/*lotos* begins almost 3000 years ago. In Homer's epics, a λωτός plant is mentioned, which—following modern systematics—embraces at least two distinct species. One served as a fodder plant for horses and grew from the river plains up to the mountains of Asia Minor and Peloponnese (Iliad 2.776, 12.283, 14.348, 21.351: Murray 1924–1925; Odyssey 4.603: Murray 1919); the other was a good food source for men (Odyssey 9.82–104: Murray 1919) and was native to northern Africa, the region commonly believed to be the location of the lotus eaters. Unfortunately, Homer provides no actual description of the λωτός plant in the Iliad nor the Odyssey. The actual meaning of the name was probably forgotten soon after the famous works were written. A more complete history of the plant name *lotos* can be found in numerous other texts (e.g. Casoria and Guarino 1998; Herzhoff 1984; Steier 1927). Here, some of the most probable botanical "translations" of this plant name are highlighted. In some ancient works, the term *lotos* might have included the Linnaean *D. lotus*.

The first lengthy report on a λωτός plant comes from Herodotus, who talks about an aquatic plant (Histories, 2.92: Godley 1920) in Egypt, most probably *Nymphaea lotus* L., *Nymphaea nouchali* var. *caerulea* (Savigny) Verdc., and *Nelumbo nucifera* Gaertn. For more information about the role of those plants in ancient Egypt, see Keimer (1984) and Germer (1985). Herodotus distinguishes the Egyptian λωτός from the λωτός of the Lotus Eaters: For him, the latter is a shrub or tree, which bears a fruit (καρπός) and is native to modern Libya (Histories 2.96, 4.177: Godley 1920–1921). According to Theophrastus of Eresus (History of Plants 4.3.1–4: Amigues 1989) and Polybios (Histories 12.2: Paton et al. 2011), this λωτός plant can be identified as *Ziziphus lotus* (L.) Lam. or *Ziziphus spina-christi* (L.) Desf., depending on whether a shrub or a tree is discussed (Theophrastus, History of Plants 4.3.1 and 4.3.4: Amigues 1989).

Among the diverse λωτός plants, Theophrastus knew several herbaceous species. There were probably also other woody plants besides the related species *Z. lotus* and *Z. spina-christi*, but unfortunately, there is no final proof for this assumption. The only detailed description of a λωτός shrub/tree given by the Greek philosopher (History of Plants 4.3.1–4: Amigues 1989) regards the diverse African kinds (γένη). Nevertheless, it is commonly thought that—if not all—at least some of the many notes by Theophrastus on the λωτός wood might also refer to the wood of *Celtis australis* L. (Amigues 2006, 309).

C. australis certainly was addressed as a *lotos* tree by the Romans, as Pliny the Elder (Natural History 16.123–124: Rackham 1945) tells us: "the Greek bean-tree [*faba Graeca*; cfr. the Italian popular names *fava grega*, *falagrèa* and *falàgri*; see Penzig 1924], which in Rome they call the lotus [*lotos*] because of the sweetness of its fruit, which almost resembles cherries although it grows wild".

As in Greece, there was much confusion about the different *lotos* species in Rome (Pliny, Natural History 14.101: Rackham 1950), among which there were certainly several kinds (*genera*) of *lotos* trees (Virgil, Georgics 2.83–4: Fairclough 1916). The chaos continues when Pliny (Natural History 13.104–106: Rackham 1945), relying on

Theophrastus (History of Plants 4.3.1–3: Amigues 1989) as one of his main sources, suggests that the African or foreign *lotos* shrubs/trees (*lotos transmarina* = *Ziziphus lotus*; Natural History 16.121: Rackham 1945) and the Italian *lotos* (*C. australis*) bore not only the same names, but were the same plants, only "altered by the change of soil" (*lotos* [...] *quam* […] *Italiae familiarem, sed terra mutatam*).

Due to this confusion, it would not be a surprise if additional shrubs/trees besides *Z. lotus*/*spina-christi* and *C. australis* were known under the same name. There are some quotes that match neither *Z. lotus*/*spina-christi* nor *C. australis* perfectly: especially as the notes on the dark (*nigritia*/*niger*/*nigricans*: Pliny, Natural History 13.60, 13.106: Rackham 1945), hard, close-grained, fine corewood (Pliny, Natural History 16.186, 16.204: Rackham 1945) of *lotos* have been interpreted to mean *D. lotus* instead (Steier 1927, 1528–1529; Ziegler 1969). It was even believed that some of Pliny's *lotos* references certainly referring to *C. australis* would describe *D. lotus* (Steier 1927, 1528–1529; Ziegler 1969), thus making it a cultivated tree of Roman Italy (Pliny, Natural History 16.124, 17.5: Rackham 1945, 1950; Cicero, Letters to Friends 7.20.1: Shackleton Bailey 2001). Unfortunately, the remarks of Pliny on the *lotos* plant with dark wood all rely on Theophrastus' description of the African λωτός (History of Plants 4.2.5 and 4.3.4: Amigues 1989), which is commonly accepted to have been a *Ziziphus* species.

After all, it seems impossible to find a clear answer to which woody plants were all included under the Greek/Latin name λωτός/*lotos*. The confusing information given by the ancient authors is not always satisfying and does not allow certain identifications. Furthermore, no ancient recognizable image of *D. lotus* is known: The most ancient still existing coloured manuscripts of the Herbarium of Dioscorides, the *Codex Vindobonensis Medicus Graecus 1* and the *Codex Neapolitanus Graecus 1* from the sixth–seventh century CE, only show figures of herbaceous plants (Cod. Vind. f. 206^{v} and 207^{v}; Cod. Neap. f. 111^{r}) as λωτός (Mazal 1998; Menghini 2013). Meanwhile, Pedanios Dioscorides (*De materia medica* 1.117: Beck 2011; Wellmann 1907) originally also described a λωτός tree, probably *C. australis*.

Even if we cannot cite a special note in the ancient texts that undoubtedly points to *D. lotus*, this does not mean that the plant was unknown to Greeks and Romans. In some ancient texts, the tree could even be mentioned—unrecognized and unconsidered by us—by a different name or just as an anonymous plant (Amigues 1993, 69, on Theophrastus, History of plants 5.3.2).

Date-Plum in Italy

While the search for *D. lotus* in Roman sources was ambiguous, we did find clear evidence of the presence of *D. lotus* in Italy beginning in the sixteenth century CE. The evidence comes from several early Italian herbaria and demonstrates the knowledge of this botanical species during the Renaissance. Moreover, such specimens can be related to the contemporary treaty by Pietro Andrea Mattioli. In tracing the modern history of the date-plum in Italy, we will sum up the historical botanical sources of the nineteenth and early twentieth century: what has been previously hypothesized about the introduction of *D. lotus* in Italy and how this relates to our research. In the end, we will return to the Roman era, presenting the earliest findings of *D. lotus* in Italy thus far and try to understand how these remains ended up in a first century CE canal in Modena, 15 centuries before the plant "re-emerged" on Italian grounds in the sixteenth century CE.

First Evidence of D. lotus from Ancient Italian Herbaria

Surveys were carried out in five Italian herbaria with the earliest collections (Moggi 2012a, 2012b) dating from the second half of the sixteenth century CE. Four herbarium sheets of *D. lotus* were found:

Specimen Number 1 (Fig. 1) came from Erbario B (Biblioteca Angelica, Rome) and was collected in 1550–1553 (volume III, ms. 2347, c. 24r, n. 679). This herbarium collection, formerly ascribed to Gherardo Cibo (Penzig 1904), today is attributed to Francesco Petrollini (Chiovenda 1909; Moggi 2012b), a medical doctor from Viterbo who lived for a long time in Romagna. The sheet does not show any writing (Penzig 1904), and nothing is known about the provenance of Petrollini's sample.

Specimen numbers 2 and 3 (Figs. 2 and 3) came from the Erbario Aldrovandi (Sistema Museale di Ateneo, Erbario dell'Università di Bologna [BOLO]) and were collected sometime during

Fig. 1. Erbario B (Biblioteca Angelica, Rome); vol. III, ms. 2347, c. 24r, n. 679.

Fig. 2. Erbario Aldrovandi (Erbario dell'Università di Bologna): vol. 1, c. 275.

Fig. 3. Erbario Aldrovandi (Erbario dell'Università di Bologna): vol. 4, c. 17.

the time period 1551–1570 and following years (Moggi 2012b). Both of these specimens were collected in Bologna. Here, we provide some further details about these two herbarium sheets:

1) Volume 1, c. 275: The sheet contains the statement "Lotus vera. Laurus regia Pl. Lignum sanctum Patavij" (= *Lotus vera*, *Laurus regia* according to Pliny. *Lignum sanctum* of Padua); collection place: Bologna.
2) Volume 4, c. 17: The sheet contains the statement "Lotus arbor. Sebesten alijs. Pseudolotus in Germanico codice Matthioli. Laurus regia. Diospyros sive Faba Graeca latifolia. Pseudolotus Matth." (= *Lotus arbor*. For others [it is called] *Sebesten*. *Pseudolotus* in Mattioli's German codex. *Laurus regia*. *Diospyros* or *Faba Graeca latifolia*. *Pseudolotus* according to Mattioli); collection place: Bologna (Soldano 2005).

Specimen number 4 (Fig. 4) was housed at the Erbario Cesalpino (*Herbarium Universitatis*

Fig. 4. Erbario Cesalpino (Herbarium Universitatis Florentinae, Florence); n. 4. The specimen of *D. lotus* is in the lower left corner.

Florentinae, Firenze [FI] – Moggi 2008, 2009, 2012b) and dated to 1563 (Caruel 1858; Moggi 2012b). The specimen sheet bears the number 12 and the name *Uva d'India* written on it. Strangely, only the common name is reported, while in most cases Cesalpino, the collector, wrote the Greek name, the Latin name and the common name (Moggi 2009). This observation may be explained by the possibility that Cesalpino thought that *D. lotus* had probably just recently reached Italy, and thus, he did not regard it as a plant that could be mentioned in classical sources. Teodoro Caruel, in his *Illustratio in hortum siccum Andreae Caesalpini* (1858), wrote about the specimen as follows: "12. Uva d'India: ramus sterilis. / *Diospyros lotus* / Linn." (= Indian grapes: sterile branch. *D. lotus* L.).

Cesalpino's specimen was certainly collected in Tuscany (Moggi 2009).

Diospyros lotus in the Italian Sixteenth Century: Pietro Andrea Mattioli and His Commentarii

At present, there appears to be no Italian pre-Renaissance botanical text or codex (Ragazzini 1983; Moggi and Tesi 1986; Moggi et al. 2014) mentioning *D. lotus*. A major contribution on this topic was given by Pietro Andrea Mattioli (Siena, 1501–Trento, 1578), a medical doctor and botanist who, more than any other author, translated and disseminated Dioscorides' *De materia medica*. In Mattioli's 1565 edition of the *Commentarii*, regarded as the basis of the *editio princeps* in Italian (1568), more than 1000 large plates were included in the volume. The author had achieved a mature idea of the plants he described, and among those cited, the species illustrated in Table 1 are given the name "lotus."

In this edition, there are also two figures (Figs. 5 and 6) illustrating the *Pseudolotus* and the *Loti Africanæ species*, both ascribable to the genus *Diospyros*. The plate on page 257 (Fig. 6), under the name of *Loti Africanæ species*, clearly represents *D. lotus*. Thus, it appears that, in Italy, the first known iconographic representation of *D. lotus* is in Mattioli's *Commentarii*, edition of 1565. This is exactly the same period that the presence of *D. lotus* was documented in Italy (Bologna and probably Tuscany) from herbarium sheets. The contemporaneous presence of *D. lotus* in printed works and in gardens reveals the great interest in botany during the Renaissance.

Saverio Manetti (1765, p. 217) reported that Linnaeus, with whom he was in contact, called *D. lotus* Mattioli's and Bauhin's *Loto di Africa*. Mattioli (1568, p. 258) affirms that in the plate he was describing a plant sent from Constantinople

TABLE 1. THE TERM *LOTUS* IN MATTIOLI'S *COMMENTARII*, EDITIONS OF 1565 AND 1568 (*SENSU MARIOTTI 1997; THIS WORK).

Mattioli's name (1568)	Scientific name
TREES	
Loto albero, Bagolaro	*Celtis australis* L.*
Loto falso	*Diospyros* sp°
Loto di Africa	*Diospyros lotus* L.°
HERBS	
Loto domestico, Trifoglio odorato	*Melilotus officinalis* L.*
Loto selvatico	*Trigonella caerulea* (L.) Ser.*

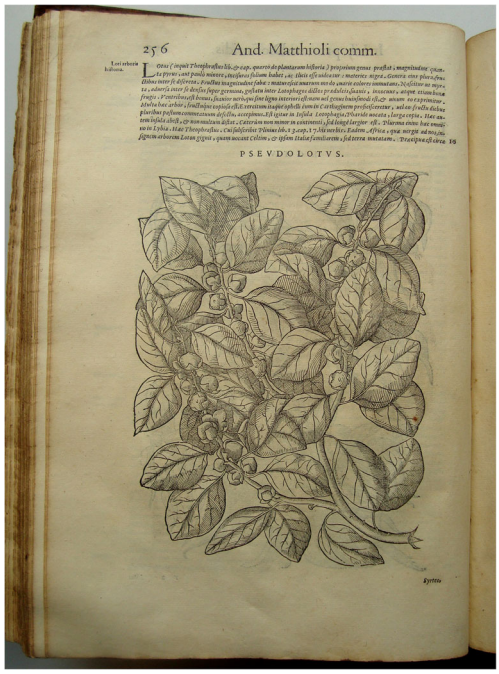

Fig. 5. Mattioli's *Commentarii*, edition of 1565: *Pseudolotus.*

Fig. 6. Mattioli's *Commentarii*, edition of 1565: *Loti Africanæ species* (= *D. lotus* L.). Biblioteca Storica A. Bertoloni-BIGEA-Università di Bologna; reproduction rights reserved.

by Mr. Augerio de Busbecke, ambassador (Arrighi 2011) of the emperor Ferdinand I of Augsburg. Below the plant was written "Dattoli di Trapesonda dolci & dilettevoli al gusto" (= Trabzon dates, sweet and of pleasant taste).

From the Early Nineteenth Century to Pier Andrea Saccardo: Some Contributions to the Question of the Introduction of Diospyros lotus in Italy

Some new information about the history of *D. lotus* in Italy became available in the early 1800s, when various scientists started to re-examine many of the plant species commonly cultivated in Italy. Among the most active scientists were members of two families of Tuscan scientists: the Savi and Targioni Tozzetti.

Gaetano Savi (1769–1844) in his *Trattato degli alberi della Toscana* (1811) identifies Mattioli's *Loto falso* as *D. lotus*. This, most likely, is a misunderstanding, though, between the two figures reported here (Figs. 5 and 6), Fig. 5 is the *Pseudolotus* and Fig. 6 is *D. lotus*. Furthermore, Savi believes that the various ancient Roman *lotus* forms described by Pliny (Natural History 13.104, 16.123–124 etc.: Rackham 1945) belonged to the taxon *D. lotus*, which in Savi's opinion is the only reliable interpretation owing to the stated habitat requirements and shade capacity. He estimates that it is native to the African coasts, well adaptable to every kind of terrain and reproducible by seed. He describes its fruits as "grossi in circa quanto le ciliegie" (= more or less as large as cherries), good to eat if kept after the leaves have fallen, "perché prima son'aspri" or "because before then they are sour" (Savi 1811). Most probably, this is a reference to the description by Pliny and his usage of the word "cherry" (Natural History 16.123: Rackham 1945). In a subsequent contribution (1830), Savi compares it to other *Diospyros* species, providing a detailed description and referring to the opinions of various botanists, both foreign (Linnaeus, Sprengel, De Candolle…) and Italian (e.g. Allioni, Pollini), concerning its origin and distribution. However, at this point, Gaetano Savi offered the opinion that *D. lotus* was not indigenous to Italy, even if he believed that it could correspond, at least partially, to a description present in Pliny. Therefore, according to Savi, during the Greek and Roman period, *D. lotus* had

already been introduced from Africa or from the Black Sea area.

Ottaviano (1755–1829) and Antonio (1785–1856) Targioni Tozzetti, father and son, respectively, were medical doctors and botanists (Barbagli and Vergari 2006). Targioni Tozzetti (1803) reports that Mattioli named Linnaeus' *Diospyros lotus* as *Loto d'Affrica* and that he had received it from Constantinople under the name of "Dattoli di Trapesonda dolci & dilettevoli al gusto," because the fruits are extremely sour when unripe, while they are soft and sweet when ripened. He also reports that the taxon can reproduce by seed, remembering that Gabriele Falloppio sowed it in the Botanical Garden of Padua and mistook it for the *guajaco*. Targioni Tozzetti (1853) writes that *D. lotus* "è da remotissimo tempo coltivato in Italia" (= has been cultivated in Italy for a very long time) and perhaps was "introdotto antichissimamente [...] dall'Oriente, ed in particolar modo dalle coste del Mar Nero" (= introduced in very ancient times from the Levant, particularly from the coasts of the Black Sea). A. Targioni Tozzetti probably has Savi (1830) in mind when he gives credit to the theory that the plant was introduced in the Greek/Roman period and then became naturalized in the Italian landscape. As proof, he speaks of ancient populations reverting to a wild state in numerous localities of northern and central Italy (e.g. Piedmont, Veneto, Emilia and Latium), but he bases his arguments mostly on authors writing in the eighteenth and nineteenth centuries (e.g. Allioni 1785; Pollini 1824). However, again A. Targioni Tozzetti includes *D. lotus* among the "ornamental trees," although he admits that its fruits have a certain food value, describing them as "pulpy, sweetish and edible."

According to the *Cronologie* (1909–1917) by Pier Andrea Saccardo, a Venetian botanist of the late nineteenth and early twentieth centuries and a world-famous mycologist (Davis 1920), the *lotus* mentioned by Pliny probably is *Celtis australis* and *D. lotus* was a plant "coltivata già nel Cinquecento ed ora qua e là inselvatichita" (= already cultivated in the sixteenth century and today growing wild here and there). Saccardo believed the plant was introduced in Italy mostly for ornamental purposes. The indications of its presence during the sixteenth century refer to the abovementioned herbarium specimens prepared by Petrollini in 1550 and Aldrovandi in 1551 and to the bibliographic citation by Mattioli in Mattioli 1565.

Archaeobotanical Records

The city of Modena (Emilia-Romagna, northern Italy [Fig. 7]), founded in 183 BCE under the name of *Mutina*, was a colony of fundamental strategic and military importance for Rome. *Mutina* was among the richest cities of northern Italy because of its very active production and trade, and many of its inhabitants had great wealth (Calzolari 2008). In the archaeological site of the Roman period named "ex Cassa di Risparmio," two perfectly preserved partially charred calyxes of *D. lotus* were recovered (Fig. 8). The identification was made with the reference collection of the Laboratory of Palynology and Paleobotany of the University of Modena and Reggio Emilia and the atlas by Cappers et al. (2009).

The calyxes were discovered in what was once a canal that was drained by infilling with amphoras, and then the canal was completely sealed off with masonry in the first half of the first century CE to allow urban development west of the city walls (Labate and Malnati 1988; Macchioro 1988; Malnati et al. 2009). Furthermore, a *domus* was built above it in the age of Nero, whose walls still stand on the sealed channel, thus forming an undisturbed space protected from contamination. This created an ideal condition for archaeobotanical studies because, apart from the abundance of findings and excellent preservation, the situation offers very precise archaeological dating. *Mutina* has been particularly well studied from an archaeobotanical standpoint. Thanks to some notable alluvial episodes acting as sealing time markers (Cremonini et al. 2013), both pollen and macroremains have been found in a very good state of preservation (Bosi et al. 2011, 2015a, b, 2016; Rinaldi 2010; Rinaldi et al. 2013).

A total of over 600 l of soil was soaked in water and then washed through a bank of three sieves with 10, 0.5 and 0.2 mm meshes. Archaeobotanical data show great diversity of plants that could be mostly the result of local cultivation. Fruits were the most represented category of ethnobotanical interest. There are 34 taxa in total, sometimes with good percentages: In addition to *D. lotus*, there were remains of *Citrullus lanatus* (Thunb.) Matsum. & Nakai, *Cucumis melo* L., *Cornus mas* L., *Corylus avellana* L., *Ficus carica* L., *Fragaria vesca/viridis*, *Juglans regia* L., *Lagenaria siceraria* (Molina) Standl., *Malus domestica* Borkh., *Morus nigra* L., *Olea europaea* L., *Physalis alkekengi* L., *Pinus pinea*

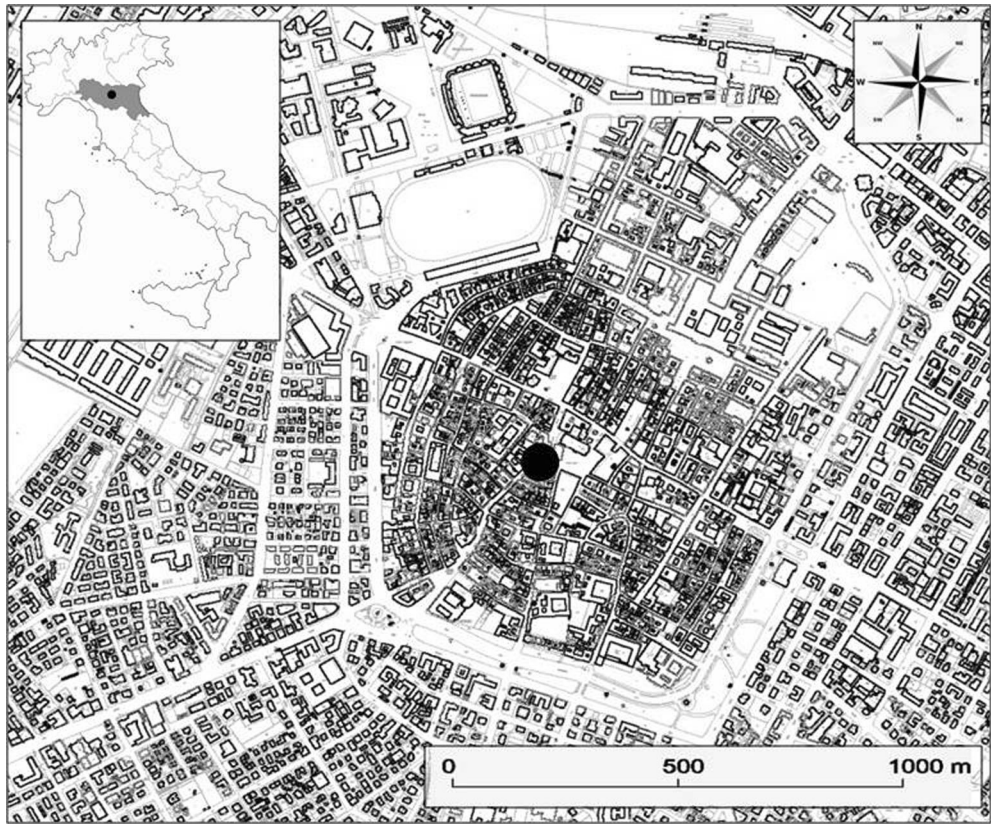

Fig. 7. Location of the archaeological site named "ex Cassa di Risparmio" in Modena.

L., *Prunus avium* L., *P. cerasifera* Ehrh., *P. domestica* L., *P. dulcis* (Mill.) Webb, *P. insititia* L., *P. persica* (L.) Batsch, *P. spinosa* L., *Punica granatum* L., *Pyrus communis* L., *Rubus* sp.pl., *Sambucus nigra* L., *Sorbus domestica* L., *Vitis vinifera* L. subsp. *vinifera*, etc. (for more information, see Bosi et al. 2016 and Rinaldi et al. 2013). This archaeological context also contained the most ancient remains of the beginning of the cultivation of peach tree in Italy (Sadori et al. 2009).

There are no further findings of carpological material belonging to *D. lotus* in the other Italian

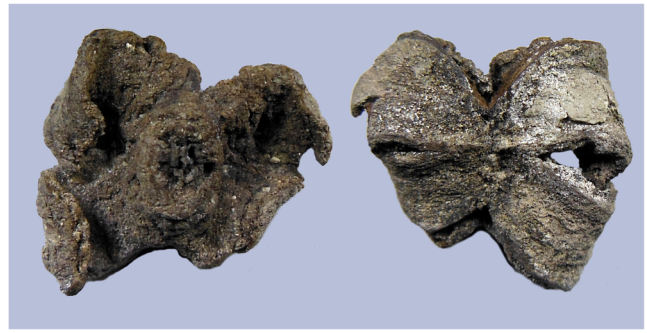

Fig. 8. *Diospyros lotus* calyx; archaeobotanical record (scale bar: 10 mm; photographs: R. Rinaldi).

archaeological sites, neither coeval nor of subsequent periods. Thus, the Modena remains are the only useful samples to investigate this taxon and its relationship to the Italian territory.

We do not know of any carpological remains of *D. lotus* from other archaeological excavations in Europe, either. According to Greek researchers, this species has not been found in Greece during the Greek or Roman periods so far. However, there are some rare reports of possible identifications of wood remains belonging to the genus *Diospyros*, notably from the ancient Roman *castrum* of *Vindonissa* in modern Switzerland (Fellmann 2009, 105; Neuweiler 1908) and from the ancient settlement of *Brigantium* (modern city of Bregenz on Lake Constance in Austria; Gärtner and Hilscher 1990). Another recent identification of *Diospyros*-type wood comes from the Roman port of Μ υὸς Ὅρμος (Myos Hormos) on the Red Sea in Egypt (van der Veen et al. 2011). Although none of these identifications can be safely attributed to *D. lotus*, the latter is one of the most likely candidates for ancient usage within a genus of mainly tropical species. Like the wood of ebony (*D. ebenum* Koenig ex Retz., from the Indian subcontinent), which, owing to its origin, is considered the most probable wood species used for the comb found at Myos Hormos (van der Veen et al. 2011), the wood of *D. lotus* is renowned as a precious, decorative wood (Begemann 1987, 1957). Indeed, the botanists researching the wooden body of a brush found at *Brigantium* have stated that it was most probably made out of the wood of *D. lotus* (Gärtner and Hilscher 1990).

Possible Reasons for the Presence of Date-Plum in *Mutina*

Concerning the possible origin of the two calyxes of *D. lotus* found in *Mutina*, we can hypothesize that this species was a luxury food, imported as a dried fruit, given that in Asia the commerce of desiccated fruits has been practiced since antiquity (Luo and Wang 2008). The dried fruits are still marketed in many parts of Asia following desiccation performed by the traditional method. Among the *Diospyros* species, *D. lotus* shows the highest density of tannin cells in the mesocarp (Utsunomiya et al. 1998). Because of this, the fruits cannot be consumed immediately after collection due to their very astringent taste and are almost always desiccated before they are sold (Ayaz et al. 1997). The elimination of the tannins (de-astringency) is recorded in ancient Chinese literature (sixth century CE) and may be achieved by leaving the fruits to dry directly on the tree, or using an oven after soaking them in limewater (Luo and Wang 2008). The collection of these fruits from the wild, carried out by a Tibetan-Burmese ethnic group, also requires desiccation in order to preserve them (Weckerle et al. 2006). In some ways, the final product resembles big dates, both in its oblong appearance with the calyx well fixed to the fruit, and in taste as reflected by many common names. The same ethnobotanical practice also occurs in Iran, where the fruits are collected mostly from wild plants (Khoshbakht and Hammer 2006).

Mutina developed a solid and prosperous economy in a short time (Calzolari 2008). Pomponius Mela (*De chorographia* 2.60: Silberman 1988) listed it among the *opulentissimae* (= wealthiest, most respectable) towns of the Adriatic side of the Italian peninsula and Cicero (*Philippics* 5.24: Shackleton Bailey 2010) described it as a *firmissimam et splendidissimam populi Romani coloniam* (= one of the most loyal and distinguished colonies of the Roman people). The city's wealth could allow the presence of several imported luxury goods, including the fruits of date-plums.

Conclusions

The two calyxes of *Diospyros lotus* found at *Mutina* document that date-plums had in some way reached Italy during Roman times. Even though distant from the central regions of the Roman Empire, *Mutina* was a very rich town as demonstrated by the diversity of artifacts found in the archaeological assemblage (Rinaldi et al. 2013). Furthermore, in other archaeological sites of *Mutina*, palm dates were found too, which were an exotic luxury food often used in funeral ceremonies in urban contexts (Marchesini and Marvelli 2007; Rinaldi et al. 2017; Rottoli and Castiglioni 2011). The most probable hypothesis is that the calyxes represent a waste product of dried fruits that were imported. Direct knowledge of these fruits does not imply the introduction and cultivation of the species, probably known in the classical world, but not necessarily present on the Italian territory. In fact, the gap is too long between the calyxes dated to the first half of the first century CE and the herbarium sheets of the second half of the sixteenth century, when Aldrovandi names the city of Bologna as a collection site of the plant.

At the present stage of research, it can be asserted that there is no trace of *D. lotus* growing in the Italian territory before 1550. This could confirm what Saccardo wrote in Saccardo 1909. Thus, the plants currently naturalized in some zones of Italy do not have a long history in botanical terms: They are neophytes, just like many American plants.

With the archaeobotanical remains of *D. lotus* in *Mutina*, we cannot confirm that the plant was certainly known as a *lotus* by the Romans: We do however know that it was recognized as an economic plant in antiquity.

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