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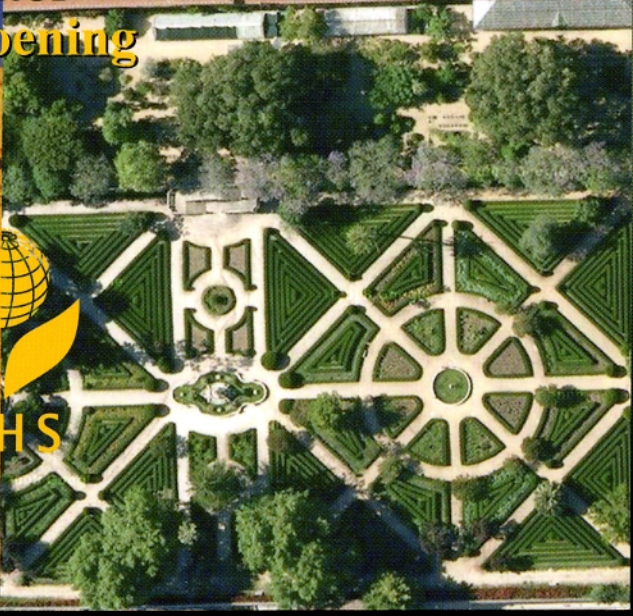
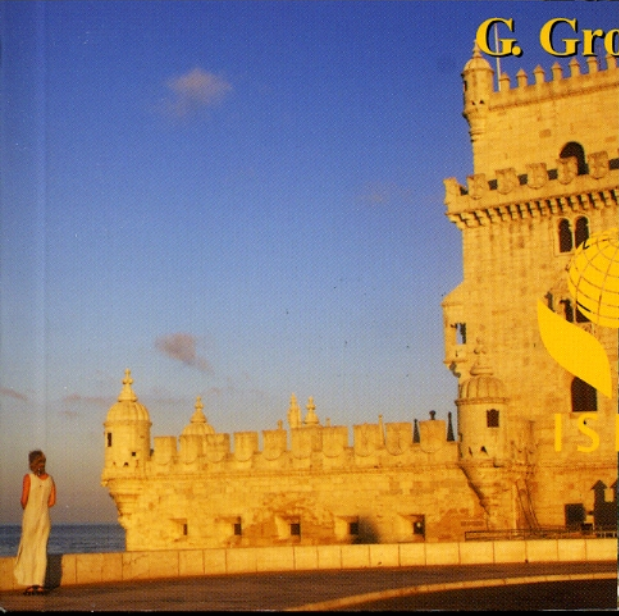
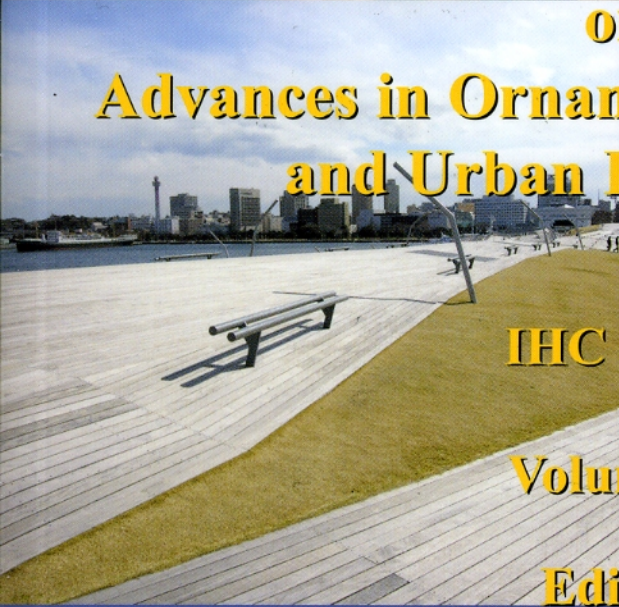
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# The Moorish Myrtle, History, and Recovery of Alhambra Garden Lost Species (*Myrtus communis* L. subspecies *baetica* Casares et Tito).

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**Keywords:** *Myrtus baetica*, myrtle, ornamental plant, Islamic garden, Clusius.

## Abstract

The gardens of the Alhambra and the Generalife (Granada, Spain) present several hundred years old specimens of a very rare type of *Myrtus*. They are characterised by crowded, large leaves frequently arranged in trimerous whorls. The morphology of these myrtles proves to be peculiar and clearly sets the samples found in Granada as different from both wild specimens and other commonly cultivated forms. Compared studies reveal that this was the main type of myrtle used during the Middle Ages in the Islamic gardens of the Iberian Peninsula. Knowledge of this plant and its use has been lost in Europe since the Renaissance until the present day. However it is still grown in the U.S. and Morocco. In this article we analyse the identity of these plants; describe the importance of their use in the medieval gardens of al-Andalus; investigate the cultivation and knowledge of myrtle in classical, Medieval-Islamic and modern times; localise the plant's distribution and identify the possible routes of its dispersal from the Mediterranean to Northern Europe, America and South Africa. Knowledge of the plant's historical importance can be used to reintroduce it in Europe and encourage cultivation in the U.S. This paper presents the results of the research project "Estudio Botánico e historiográfico de *Myrtus* en la Alhambra y Generalife", supported by the Patronato de la Alhambra y Generalife and the Junta de Andalucía, which the authors are working on.

## INTRODUCTION

The Nasrid kingdom of Granada was the last Islamic territory in Western Europe. The Alhambra and the Generalife (Granada, Spain) still retain some gardens which were created in the 13th and 14th centuries and have remained in use ever since. They can be considered the oldest gardens in the West. These gardens have a distinct botanical characterization, given by the presence of *Myrtus*, used to form clipped hedges or left to grow freely. As in the majority of European gardens, almost all the specimens cultivated today in the gardens of the Alhambra and the Generalife belong to *Myrtus communis* subsp. *tarentina*, although forms close to the wild *Myrtus communis* subsp. *communis* are also grown. Much rarer, but still existing today, is the robust broad leaved type of plant that we study here, very different from any myrtle we have been able to observe in any other European garden. It constitutes a unique, yet curious, element within the Alhambra and Generalife enclosures.

We detected the existence of this plant in 1995, when we had chance to collect a specimen of singular characteristics in the Carmen de los Mártires, an ancient walled garden in the vicinity of the Alhambra. Although the plant was eliminated in architectural restoration works, the specimen we collected is conserved in the herbarium of the University of Granada (GDA) n° 26717. Subsequently (Tito, 1998) we found new specimens of the same type in the gardens of the Generalife and the Alhambra, this time identifying them with the morphology of the *Myrtus baetica* described in 1576 by Carolus Clusius. He makes reference to some plants with the same characteristics as the ones we found in the Arabic gardens of Granada, beside pools and water deposits. Clusius also provides the local name of this taxon, "arayhan morisco, hoc est Mauritanicam myrtum vocant", the Moorish myrtle.

This type of myrtle was widespread in the Alhambra, as testified by the literature until the 17th century at least. Cosimo III de Medicis (1642-1723), who visited Granada

in 1668 wrote: “vi sono piante di mirto trasportato d’Africa, che è d’odore più acuto, e di foglia maggiore del nostro comunale” (“I saw some myrtle plants brought from Africa that smell stronger and have larger leaves than our common myrtle”, Mariutti, 1934:197).

## **METHODS AND MATERIALS**

### **The genus *Myrtus* and its history**

During the last 150 years the concept of the genus has altered, changing from containing more than 180 species (Berg, 1854) to only two in the latest generally accepted review by McVaugh (1968). At present the genus is considered limited to the Mediterranean region and adjacent areas in Northern Africa and Asia. The two recognised species are *Myrtus nivellei* Batt. & Trab., described in the Tassili and Tibesti mountains in the central Sahara in 1911 (Ozenda, 1991). The other is a Mediterranean species, *Myrtus communis*, known and cultivated since ancient times and whose morphological variability has generated, in the pre-Linnean period as much as after Carl Linnaeus, the description of a large number of taxa of confused denomination. Currently the existence of two subspecies (Campbell, in Tutin et al., 1968) – or varieties depending on the author (Paiva, 1997) – are accepted: *Myrtus communis* L. subsp. *communis*, which corresponds to the plants which grow naturally and without being cultivated, and the subsp. *tarentina* (L.) Nyman which is of a smaller size and has much smaller leaves than those of the *Myrtus communis* L., and it is currently the most frequently myrtle cultivated in European gardens.

### **Knowledge of myrtle in the ancient world**

Confirmation of the species morphological variability can be traced through texts by the earliest naturalists. Theophrastus, in 4th century B.C. (Teofrasto, 1988) states there are larger and smaller types. Cato in Pliny (Pline, 1851: XV 122, 37) divides them into three species, black, white and coniugala, using the colour of the fruit as the defining characteristic. Although it is Pliny the Elder who first establishes differences between wild and cultivated forms, starting from the latter “Sativarum genera topiarii faciunt Tarentinam folio minuto, nostratem patulo, hexasticham densissimo, senis foliorum uersibus. Haec non est in usu, ramosa atque non alta”,<sup>1</sup> this established the taxonomic base followed by the majority of writers until the 19th century. What Pliny named “hexasticham” myrtle corresponds in all probability with the *Myrtus baetica* we discovered in the Alhambra gardens. Two characteristics are clearly evident: the very compact foliation and the arrangement of the leaves in six rows (“senis foliorum uersibus” in Pliny’s description). The first is a peculiarity typical of our taxon, as is the second. Each trimerous whorl turns from those adjacent at an angle of 60°, giving six rows of foliate insertion.

In ancient botanical treatises, from Pietro Andrea Mattioli (1500-1577) onwards, the myrtle Pliny was describing is referred to as *Myrtus exotica* (Mattioli, 1583). However, in the various editions of Pliny that we have consulted (Pline, 1851. Pline, 1877. Pline, 1960) we have not found references to *Myrtus exotica*. Everything appears to indicate that the denomination *exotica* derives from a distorted interpretation of the term *hexasticham* used by Pliny. The error is attributable to Mattioli, or to the existing editions of Pliny he consulted.

### **Myrtle in andalusian agronomical texts**

Although in the Arabic countries of the West (al-Andalus and Maghreb) the usual term of reference for myrtle is *al-rayham* (arrayán in Spanish), in classical Arabic the name of myrtle is *al-as*. Outside the Andalus- maghrebi world the term *al-rayhan* is used,

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<sup>1</sup> Translation: “The topiary gardeners distinguish among cultivated myrtles, the tarentina myrtle with small leaf, the country myrtle and the *hexasticam* myrtle, very dense, with leaves arranged in six rows, that is not being used. It is very branched and not too tall.

above all, for naming various species of *Ocimum*. The majority of Andalusian agronomical treatises, from the 11th (Ibn Bassal, 1995) to the 14th century (Ibn Luyun, 1988) treat myrtle from an agricultural perspective, allowing us to suppose the plant was widely cultivated. It belonged to cultivated nature, *bustan-bustani* in Arab language. Ibn Luyun offers instructions for its positioning within the garden; for example in clumps beside the property's (*bustan*) central pavilion (*qubba*) suggesting a decorative role of the myrtle in gardens. There even exist references to topiary in the shape of humans as in a poem by the 11th century Andalusian poet Ibn Jafaya about a myrtle clipped into the form of a beautiful slave (Gallega, 2004:548).

The treatises mentioned above describe the variability of the species. Ibn Luyun indicates the existence of three types of *al-rayhan*: eastern, wild and cultivated but provides no information about its morphology. The Andalusian agricultural treatise paying most attention to myrtle is that of Ibn al-Awwan written in the 12th century. The text combines the use of *al-as* and *al-rayhan*, stating that “the myrtle (*al-as*) is the foremost of the *arraihanes*” (Ibn al-Awwan, 1988: 248).

It is difficult to assign these descriptions to current varieties. However, among the myrtles described by Ibn al-Awwan, some with broad and long leaves could be those Clusius called *arraihan morisco*, s.l., in Spain. Besides these agricultural treatises, the *al-rayhan* is also cited in the botanical treatise known as *Umdat* written in Andalusia at the end of the 11th century. The *Umdat* describes five varieties of myrtle and distinguishes between wild plants, of which it describes three<sup>2</sup>, and two cultivated varieties (*bustani*). The cultivated *hasimi* has large leaves of a deep green colour, depressed, growing along the entire length of a tree stem pressed one above another and close together, being known and grown in homes and vegetable gardens (*bustan*). The eastern has very small leaves (Abu l-Jayr, 2004:227-229). The first of the cultivated coincides with the morphology of the *Myrtus baetica* described by Clusius, and the second corresponds to *Myrtus tarentina*. The text of the *Umdat* is the oldest and clearest Andalusian testimony to the presence of “arrayán morisco”, Moorish myrtle, in al-Andalus.

In the “Sala de los Reyes” in the Alhambra “Patio de los Leones” there is one of the extremely scarce pictorial representations of an Andalusian garden. Among the plants represented one can identify specimens of the “arrayán morisco” (Fig.1, C) which constitutes an exceptional evidence of its use in medieval al-Andalus.

### **The appearance of *Myrtus baetica***

The visit of Carolus Clusius to the Iberian Peninsula took place between 1564 and 1565, more than ten years before of the publication of *Rariorum aliquot stirpium per Hispanias observatarum historia*. In his work Clusius provides information about some 300 plants collected during his journey through Spain and Portugal. For each one he described its habitat, gave the reason for its name, and in some cases made sketches.

The work is divided into two books. The first book is subdivided into 65 chapters, the second into 102, each chapter dedicated to one single plant species. In Chapter XXXIII on myrtle, Clusius discusses the variability described by Cato and Pliny, adding that he has observed many more forms of this plant. He groups those observed in the Iberian Peninsula into four categories: the “arrayhanes moriscos” (*myrtus baetica latifolia domestica* 1 and 2, *myrtus baetica exotica latifolia*, *myrtus baetica exotica angustifolia*); the wild forms (*myrtus baetica silvestris*); the myrtle with white fruit (*myrtus domestica fructo albo*) and the *myrtus tarentina*. The denomination *exotica* that Clusius applies to some “arrayhanes moriscos” indicates that he himself identified the Spanish plants with those described by Pliny. Although he states that, unlike the plants observed and described by Pliny, the myrtles he calls *exotica* have leaves arranged in groups of three instead of six: “Latini poterit esse Exotica tametsi ad summum ternis foliorum versibus distinctam

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<sup>2</sup> Eastern one (*masriqi*), with small leaves. Mountain one (*gabali*) with short and broad leaves. And *hasimi* one, which is like the cultivated *hasimi* myrtle but it differs with that one by not having the leaves depressed.

viderim myrtum, cùm Plinius senos versus suae exoticae tribuat” (“Could be the exotic myrtle of the Latins, although I have seen that it differs because the top has three rows of leaves, while Pliny attributed to its exotic myrtle six rows”. Clusius, 1576:133). As we already pointed out, Pliny does not in fact say that the myrtle *hexasticham* had whorls of six leaves but that the leaves were arranged in six rows. A morphological aspect that is perfectly compatible with the 60° rotation of the trimerous whorls common to *Myrtus baetica*.

The specimens localized in the Alhambra, and those we subsequently found in Spain and Morocco, correspond above all to the description of *Myrtus baetica exotica latifolia* by Clusius. The differences Clusius established between the four cultivated types of *Myrtus baetica* are so subtle that, at times, they can be observed within the same plant, and can be due to differences in cultivation (orientation, watering and pruning). Therefore, the popular denomination given by Clusius is the same for all of them: “arrayhan morisco”. Clusius wrote what he saw at the Alhambra is the *myrtus baetica latifolia domestica* type 2: “Nusquam id genus vidi, nisi in monasterio quodam Hispalis, & laetissimis Mauritanorum Granatae viridariis secundum piscinas & lacus, omnibus sepibus ex illo Myrti genere constantibus” (“I have never seen this kind of myrtle in any place except in a monastery in Seville and in the splendid Moorish gardens of Granada, next to pools and lakes where all hedges are always made from this type of myrtle”. Clusius 1576:127-128).

To his description, Clusius adds some interesting information which testifies the widespread of the “arrayhan morisco” outside the Iberia Peninsula: he wrote that, at the time his *Rariorum aliquot stirpium per Hispanias observatarum historia* was published (ten years after his visit to Spain), the main varieties of myrtle he described were growing in Belgium, in the garden of Jean Boissot and others<sup>3</sup>. This is probably because of the seeds that Clusius despatched to them during his journey.

Mattioli (in the *Commentarii in VI libros Pedacii Dioscoridis Anazarbaei de Materia medica*, written between 1544 and 1560, a book with more than 60 editions (Magnin-Gonze, 2004: 59) and different illustrations, describes the three types of myrtle that correspond to those identified by Pliny: *Myrtus romana*, which is the basic type of *Myrtus communis*; *Myrtus tarentina* and *Myrtus exotica (hexasticha)*. Of the latter Mattioli says he has only seen it in gardens and that it originates from outside Italy. The illustrations of *Myrtus exotica* in the editions that we have been able to consult (1565, 1596, 1583 and 1569) although different (those of 1565 and 1583 coincide), are similar to the *Myrtus baetica exotica angustifolia* described and depicted by Clusius. They correspond perfectly to the Andalusian myrtles that currently exist in the Alhambra, from which it can be inferred that these myrtles were used in Italy in the 16th century.

Mathias de l’Obel (1538-1616), also known as Lobelius, knew the myrtles cultivated in Belgium described by Clusius, and included them in his *Plantarum sev Stirpium historia*. It was published in 1576, the same year as Clusius’s work, by the same editor, and utilises some of the same engravings. In the text, Lobelius equates the majority of the “arrayhanes moriscos” with Pliny’s *Myrtus exotica*: “Exotica Myrtus Plin. pluribus foliorum versibus, sive Myrtus Mauritanica amatoria Veneriq; sacra, Arayhan Morisco maior Hispanice vocan” (Lobelius, 1576:560)<sup>4</sup>. Also, he maintains *Myrtus baetica latifolia domestica* as an independent taxon, probably as it is the only one Clusius did not call *exotica* because it has opposite leaves. Lobelius’ interpretation will be the line followed in the majority of botanical treatises written and published after the 16th century. Knowledge of the taxon will be spread by authors like Jacques d’Alechamps (1586)

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3 Jean Boissot was “a great studios of Herbs” (Clusius, 1576:132). He lived in Brussels and published a catalogue of the plants cultivated in the Leyden botanical gardens (Raven, C. E. 2010. *English Naturalists from Neckam to Ray: A Study of the Making of the Modern World*. Cambridge University Press. Cambridge:238). Besides to Boissot, Clusius mentioned other Belgian amateurs gardeners, who cultivated myrtle in their gardens.

4 Translation: “The *Myrtus exotica* of Pliny with numerous turned leaves, which is *Myrtus mauritanica*, conjugal consecrated to Venus, or Arayhan Morisco maior as it is called in Spain”.

who transcribes Clusius' text and copies his illustrations, and Caspar Bauhin (1671), who is the first to write *Boetica* in place of *Baetica*. Given the dissemination of Bauhin's work this will introduce a new confusion in scientific literature.

Joseph Pitton de Tournefort (1656-1708) who visited the Alhambra in 1689 (Henriques, 1898: 108) includes the myrtles described by Clusius in his *Institutiones Rei Herbariae* (1700) although without descriptions or depictions. After Lobelius, Abraham Munting (1626-1683) in his *Phytographia curiosa* (1696) (consulted edition 1702) offer a new image clearly attributed to *Myrtus baetica*. (Sub *Myrtus boetica pumila latifolia* fig. 26). It is curious that Spanish writers like Alonso de Herrera (*Agricultura General*, 1513:186-189), who had learnt horticulture in Granada and who detailed the use of clipped myrtles in the Alhambra, or like Gregorio de los Ríos (*Agricultura de Jardines*, 1620:252-253, in Ríos 1991) and Andrés Laguna (*Pedacio Dioscorides Anazarbeo a cerca de la Materia medicinal*, 1677: 99-100) do not distinguish between the different myrtles cultivated in their country.

### **The evolution of the name *Myrtus baetica* after the 18th century**

The turning point in botanical treatises is the *Species plantarum* written by Linnaeus (1753). Prior to this work he published *Hortus Upsalensis, exhibens plantas exoticas* (1748) in which he includes the list of plants cultivated in the botanical garden of Uppsala University. The nomenclature, still polynominal, indicates a single species of *Myrtus* with four types, for which he gives seven nominal combinations, synonymising the 4th *Myrtus baetica latifolia* 2 described by Bauhin (1671) with the *Myrtus baetica latifolia exotica* described by Clusius (1576).

The first edition of Linnaeus's *Species plantarum* (1753) includes seven different species of myrtle of which only the first, *Myrtus communis*, is European, the other six are from Brazil, Ceylon and India. For *Myrtus communis*, eight types are included: 1. *communis*; 2. *baetica* (synonymous with the *Myrtus baetica latifolia* again referring to Bauhin and Clusius); 3. *tarentina*; 4. *mucronata*; 5. *acutifolia*; 6. *angustifolia* (synonymous with *Myrtus angustifolia baetica Bauhin*); 7. *belgica*; 8. *romana*. Linnaeus maintains the criteria elaborated by Clusius to describe types 2, 6 and possibly 7.

The second edition of *Species plantarum* (1762) is more precise and, in addition to *Myrtus communis*, includes 12 species of non-European myrtles from Ceylon, Brazil, America, Surinam, Jamaica, Amboina and India. The text incorporates an essential characteristic: the size of the floral peduncle. An aspect that allows to distinguish the wild types (*romana*) with a very long peduncle from the cultivated ones with a short peduncle. Excluding the *flore pleno* and variegated forms, which Linnaeus undoubtedly did not identify as true species, the text follows the criterion established by the *Gardener's Dictionary* by Philip Miller (1735), chief gardener of the Chelsea Physic Garden. In spite of Miller's unwillingness to use the binomial system, which he did not incorporate until the 1768 edition, his dictionary was highly respected by Linnaeus who said of it: "Non erit Lexicon Hortulanorum, sed etiam Botanicorum" ("It is not a dictionary for gardeners, but rather for botanists". Paterson, 1986:140). Miller provided precise information about the cultivation of myrtles, including the "arrayanes moriscos" in England. This confirms that, at the beginning of the 18th century, those myrtles described by Clusius had already be imported into England.

In the new classification elaborated in the 1762 edition of *Species plantarum*, Linnaeus divided the *Myrtus baetica* of Clusius in two different types: *Myrtus communis baetica* (corresponding to *Myrtus latifolia baetica* of Clusius), and *Myrtus communis lusitanica* (corresponding to *Myrtus baetica silvestris*, the only *Myrtus baetica* that was not called "arrayán morisco" by Clusius), whereas *Myrtus baetica angustifolia* disappeared. This disappearance heralds the future loss of the "arrayán morisco" from the scientific bibliography.

A comparison of Linnaeus' works with the specimens of his herbarium<sup>5</sup> shows that he possibly never saw a specimen of the typical "arrayán morisco" with trimerous whorls and crowded leaves. This absence is a clear sign of the loss of knowledge of the taxon. The nominal combination was preserved for a short period of time but assigned to other varieties of myrtle. It was also forgotten in Spain.

In 1784, Casimiro Gómez Ortega (1741-1818), one of the first Spanish followers of Linnaeus, published volume V of the *Flora española*, in which he discusses the genus *Myrtus*. Gómez Ortega presents myrtle as a quite commonly cultivated plant in Spain, where, he says, gardeners use it in topiary "they [Spanish gardeners] form designs and diverse shapes using shears, very pleasing to the eye" (Gomez Ortega, 1784:472). The text does not cite even the existence of *Myrtus baetica*, probably because the plant was already very rare in gardens. Gómez Ortega only describes two types, "major" and "minor." He concludes his description with the sentence: "I omit many other varieties that are grown in our Peninsula" (Gómez Ortega, 1784:473). However, he must be familiar with *Myrtus baetica*, as in his *Curso elemental de Botánica* (1795), in the section about different leaf types, when describing "crowded leaves" he writes: "Hojas amontonadas (folia conferta): leaves are disordered and so numerous they occupy and almost completely cover the stem or the branches, as in the Arrayán morisco or *Myrtus communis Baetica*" (Gomez Ortega, 1795: 32). This description could only come from direct observation and knowledge.

The disappearance of Spanish citations shows that, already at the beginning of the 19th century, the *Myrtus baetica* was a plant unknown to local botanists. Antonio José Cavanilles (1745-1804) in his *Descripción de las Plantas* wrote: "Also cultivated in said garden [Madrid botanical garden] is the Murta común, or *M. baetica*; that Linneo saw as a variety of the *M. communis*; but its leaves are undoubtedly smaller" (Cavanilles, 1802: 142). A reference that leads without citation to Claudio Boutelou (1774-1842) and his *Tratado de las flores*, published in 1827, in which he writes: "Of myrtle and 'arrayán' (*M. communis* et *M. boetica*). The arrayán (*M. boetica*) is thought of as a variety of the murta; but its leaves are undoubtedly smaller" (Boutelou 1827: 376) The specific character both Cavanilles and Boutelou associate to the plant they call *M. boetica* – that of having smaller leaves than the *M. communis* – proves that both the authors were incorrect in their botanical identification: the subsp. *boetica* actually has larger leaves than the subsp. *communis* (Fig. 1, D).

The "arrayán morisco" which, Clusius suggested, was the plant par excellence in the Alhambra gardens and, in accordance with our research, was most common in the south and eastern coasts of Spain until the 17th century, was not even recognised by Spanish botanists in the 19th century. The last proof of this disappearance of the *Myrtus baetica* from Spanish botanical treatises is found in *Flora fanerogámica de la Península Ibérica* (1873), written by Mariano del Amo (1809-1896) when he was Director of the botanical garden of Granada. Amo does not even mention the existence of the "arrayán morisco". 25 years earlier he had described the "variedad boetica" as one of the plants cultivated in the outskirts of Madrid (Cutanda and Amo, 1848).

The last Spanish citation of *Myrtus baetica* is in *Enumeración y revisión de las plantas de la Península Hispano-Lusitana e islas Baleares* written by Miguel Colmeiro (1816-1901) and published in 1886. To the already known citations (Clusius and Bauhin) Colmeiro adds 2 more references from manuscripts: the *Ensayo de la Historia Natural y Médica de España* written by Fernández Navarrete in 1742 (found by us in the Biblioteca de la Real Academia de la Historia, Madrid), and the *Chloris hispanica*, now lost, written by Pedro Andrés Pourret in 1796-1818 (Colmeiro, 1858:82). In all probability these authors knew *Myrtus baetica*. Fernández Navarrete provides an extensive list of

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<sup>5</sup> Which can be consulted on line in the Department of Phanerogamic Botany Swedish Museum of Natural History (<http://linnaeus.nrm.se/>) and The Linnean Society of London (<http://www.linnean-online.org/4655/>) (both visited on 09/02/2010),

especially descriptive common names: “Arrayán de Andalucía, Arrayán poblado andaluz, Arrayán granadino, Murta remendada de Granada” (Colmeiro, 1886:407).

Abbé Pourret’s brief description uses the name *Myrtus aurantifolia*, reflecting the similarity between the leaves of *Myrtus baetica* and those of the orange tree. This denomination will be later used also by John Claudius Loudon (1854). Pourret localises the plant in the Alhambra, a place he visited, and distinguishes it from the *Myrtus lusitanica* he saw in Carmona, Écija and Córdoba. (Colmeiro, 1886: 407).

The last known reference to *Myrtus baetica* in Andalucía is found in *Voyage botanique dans le Midi de l’Espagne* written by Edmond Boissier (1810-1885) and published in two volumes between 1839 and 1845; Boissier uses the binomial as synonymous with *Myrtus communis* L.

### The twisted myrtle in the English gardens

We can contend that in the middle of the 19th century knowledge of the existence of *Myrtus baetica*, and probably its cultivation in gardens, had been lost in continental Europe. However it will be gardeners, especially English ones, who will continue using the name *Myrtus baetica*, or one of its English denominations: “orange myrtle”, “Jewish myrtle” or “twisted myrtle”. The evidence of the plants in cultivation maintained the validity of the taxon in England.

Loudon, in his *Arboretum et fruticetum Britannicum* (1854) provides us with valuable information about the use of the plant in English gardens: “The first cultivation of the myrtle in England is assigned, in the Hortus Kewensis, to the year 1629; when Parkinson informs us that he had three sorts in his garden; viz. The broad-leaved, and two varieties of the box-leaved. Gerard, however, in 1597, says that «myrtles never bear any fruit in England»; which, surely, implies the cultivation of it in this country before that period. Bradley states that myrtles were introduced by Sir Francis Carew and Sir Walter Raleigh, in 1585. When they returned to England, after a residence in Spain, just before the invasion of the Spanish armada, one of these myrtles was planted by Sir F. Carew at Bedington. Evelyn, in 1678, says, «I know of one (a myrtle) near 80 years old, which has been continually exposed, unless it be that, in some exceeding sharp seasons, a little dry straw has been thrown upon it»; and it is supposed that he alluded to the tree at Beddington, which was of the Spanish broad-leaved, or orange-leaved, variety, and which Miller and Bradley report, in 1724, to have been above 18 ft. high, and to have a spread of about 45 ft. However, this tree must have been older than the age assigned to it by Evelyn, and is supposed to have been killed by the severe frost of 1739-40, when it was 160 years old. Johnson, in his edition of Gerard, states that the broad-leaved and narrow-leaved varieties were, in 1633, «nourished in the garden of Mistress Tuggie, in Westminster»” (Loudon, 1854:961-964).

Loudon, in the same publication lists the varieties of myrtle known to him, amongst others: “M[yrtus] c[ommunis] 4 baetica; the Andalusian, or Orange-leaved, Myrtle” (Loudon, 1854:963). He mentions another close to the “morisco”: “2. Broad-leaved Jews’ Myrtle. This variety has its leaves frequently in threes, on which account it is said to be in esteem among the Jews in their religious ceremonies” (Loudon, 1854:963). Jewish myrtle is a recognised plant, probably a form of *Myrtus communis*, which has slightly broader leaves, arranged in three whorls, although not crowded or carinated as in *Myrtus baetica*. Its use is linked to the Feast of Tabernacles<sup>6</sup>, and wild myrtle collected from the mounts in Israel is sold mail order to Jewish communities throughout the world. In 1963 it even became celebrated on a postage stamp. For a long time the distance of western Jewish communities from Israel prevented them using Jewish myrtle in their rites, and they substituted it with the plant *Ruscus aculeatus*. In the *Encyclopedia Britannica* and in numerous bibliographic resources “Jew’s Myrtle” even appears as a synonym of *Ruscus aculeatus* (Cf. Griffiths, 1994:1020).

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<sup>6</sup> The Feast of Tabernacles is one of the major feasts of the Israelites. In the celebration they use various vegetables such as myrtle and willow branches, palm leaves and citron fruit (*Citrus medica*).



### ***Myrtus baetica* today**

The most recent citation of our plant is that of Susyn Andrews (1992:32), who identifies a myrtle localised in Cape Town with Clusius's *Myrtus baetica*. A search of historical references is included together with a hypothesis of the Moroccan origins of the specimen. Susyn Andrews suggests that this would be the only living specimen of the taxon, which confirms the loss of knowledge of the plant in Europe.

Our work has enabled many more living specimens to be localised in Spain and Morocco. Although in Spain the plant is not actually found in nurseries and is unknown to growers and gardeners, we have found many living specimens. They are always very old specimens or young plants cultivated from them. In the main they are of exceptional size, situated close to inhabited areas or in old abandoned gardens.

### **The specimens located in the Alhambra and Generalife (Fig. 2)**

Paseo de las Adelfas (Generalife): A plant of some 5m in height, originating from the ancient hedge that ran alongside the access road to the palace (Casares and Tito, 2007).

Terrace at the foot of the Escalera del Agua: An old bole from an ancient hedge. Although no longer in existence today the hedge is documented in photographs from 1860 onwards.

Bastion beside the Explanada de los Aljibes (Alhambra): A 3m high specimen possibly introduced in the remodelling works of 1930.

In addition several specimens of a certain size exist in the Generalife that were planted in the last decade. The Patronato de la Alhambra y el Generalife, which has supported this study, has established a policy of conserving, as well as propagating, these specimens. The Council is conscious of the heritage value signified by the fact the monument still conserves the ancient and rare taxon that characterised its medieval gardens.

### **Specimens away from the Alhambra**

Murtas (Granada, Spain). Some notable specimens exist in this small municipality, whose Spanish name means myrtle. Of particular relevance are the specimens in the Cortijo Balauta, a farmstead with an old 5m high tree whose bole has a circumference greater than 250 cm at ground level. The Cortijo Diétar conserves the largest specimen that we have been able to locate, being a tree with multiple trunks, more than 8m high and a crown of 6m in diameter.

Of significant interest is the presence of this myrtle in Los Guarros (Almería), where the remains an ancient mansion house garden documented ca. 1725 (Cressier, 1988) are conserved. Four parterres still remain surrounded by an abandoned hedge of this *Myrtus*, today reaching a height of 3m. This is the only remnant of a complete garden whose hedges were formed with this taxon.

The "Arrayán of the Bañizuela" (Torredelcampo, Jaén), is found beside a semi-abandoned house in the countryside. Reaching a height of 7.50m it has several trunks, the largest of which has an 85cm perimeter.

In Morocco we have verified the existence of the plant in Fez where this myrtle is the only type used in the city, even in newly created gardens. There exist some specimens notable as trees in the garden of Dar Batha palace (end of the 19th century). In Marrakesh it is also sold commercially in nurseries. We have not been able to detect its presence in the north of Morocco. In some parts of the Rif (Chefchaouen) *Myrtus* is not considered a garden plant and branches of wild myrtle are used to adorn graves.

### **The myrtle in the Americas**

Curiously the ornamental use of *Myrtus communis* subsp. *baetica*, practically forgotten in Europe, is relatively well known in the U.S. (Graf, 1963; Dufield and Jones, 1981). We do not know how the plant came to arrive in America, although Loudon's text leads us to believe it could have been from specimens taken to England from Spain. Another possibility is offered by the review of American Myrtaceae (Berg, 1854).

It describes 39 species of *Myrtus* today located within other genera or synonymised with *Myrtus communis* (Burret, 1941; McVaugh, 1968). One of them, *Myrtus sparsifolia* described from a specimen collected by Anders Sandoe Oersted on the island of St. Cruz (Panamá), coincides with the characteristics of *Myrtus baetica* (Berg, 1854:103). This could mean the plant was cultivated in Central America in the 19th century and possibly arrived directly from Spain.

## DISCUSSION

*Myrtus communis*, is a species as variable in the wild as in cultivated forms, however we consider that it is possible to clearly distinguish three decidedly different typologies (Table 1):

1. *Myrtus communis* subsp. *communis* is the common form of the species in the wild and more rarely that of some specimens cultivated in gardens.

2. The so defined in the botanical literature *Myrtus communis* subsp. *tarentina*, which is characterised by small leaves. It is the predominant form in modern gardens and commercial nurseries. Within the plants of this group exist forms having white or blue fruit, single or multiple flowers and with slight variations as to the shape and size of the leaves, which can even be variegated.

3. The “arrayán morisco”, “Moorish myrtle”, clearly distinguished by its appearance, foliar morphology and phyllotaxis. Despite having been confused and forgotten by post-Linnean authors, it is clearly a taxon sufficiently different from the other two, with consistent characteristics and with a geographical spread of use sufficient for it to be considered on, at least, the same taxonomic level as *Myrtus comunis* subsp. *tarentina* (L.) Nyman (Tutin, 1968; Griffiths, 1994), and should therefore be denominated *Myrtus communis* L. subsp. *baetica*.

We hope the publication of this article will stimulate knowledge of the natural populations of *Myrtus* and that some can be found which can be considered a progenitor of this taxon.

## Diagnosis

*Myrtus communis* L. subsp. *baetica* Casares & Tito, subsp. nov.

*Frutex fere arboreus [nonnumquam 8 m altus], subcylindricus [nec ± hemisphaericus], ramis ± adpressis [nec subpatentibus]. Folia densissime disposita, (26)40-50(57) × (10)14-20(24) mm longa lataque, plerumque triverticillata [nec saepe tetraverticillata vel opposita decussataque], primum adpressa denique reflexa, ovato-lanceolata, carinata. Florum pedunculi potius breves, (5)8(20) mm longi, multo breviores quam axillantia folia. Petala 5-9, (4)6-8(10) × (5)6-11(13) mm longa lataque.*

*Holotypus:* España, Granada, loco dicto explanada de los Aljibes, la Alhambra, ubi legerunt Casares & Tito, 24/06/2009 (GDA, nº 56746).

## Key for distinguishing the subspecies of *Myrtus communis*

- |   |  |
|---|--|
| 1, Floral peduncles > 15mm                    | <i>Myrtus communis</i> subsp. <i>communis</i>  |
| 1a, Floral peduncles < 15mm.                  | 2  |
| 2, Leaves always < 30mm in length, decussated | <i>Myrtus communis</i> subsp. <i>tarentina</i> |
| 2a, Leaves > 30 mm in trimerous whorls        | <i>Myrtus communis</i> subsp. <i>baetica</i>   |

## CONCLUSIONS

The identification of *Myrtus baetica* as the plant used to construct the majority of the Alhambra gardens in the Middle Ages changes the image currently held of these gardens. It allows us to understand some garden artifices such as those detailed by Navajero (1563:20r) in 1526 who describes a garden formed with “arrayanes” clipped to form a 4m high hedge; a garden feature impossible to achieve with any other type of myrtle. In addition, there is the heritage value signified by the identification of a forgotten medieval taxon, that five hundred years later is still growing in the monument; an unprecedented occurrence in the gardens’ history.

The survival of singular specimens in several locations in Southern Spain after centuries of neglect proves its hardiness, making it easily cultivated and suitable for adverse conditions. The study contributes a subjective value difficult to quantify: the aura of legend surrounding the taxon; planted in classical Rome, characteristic of the gardens of Al-Andalus, found in the Alhambra by Clusius; the most influential botanist of the 16th century, taken to America by the English and forgotten by European botanists for three hundred years.

Knowledge of myrtle's history can serve to enhance its present use by landscape gardeners in the United States. The emotional value of its rarity, ancient origins and complex trajectory adds to its visual and aesthetic worth. This knowledge provides an important stimulus for the recuperation and popularisation of the cultivation of myrtle and for its economic potential in Europe. To this effect the Alhambra itself has already begun marketing a line of products; soaps, essences, seeds, reproductions of historic icons, etc., of *Myrtus baetica*.

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## **Table**

Table 1. Differences between the subspecies of *Myrtus communis*

subsp. <i>communis</i>	subsp. <i>tarentina</i>	subsp. <i>baetica</i>
<b>Appearance</b>		
Semispherical	Semispherical	Cylindric
<b>Size (m)</b>		
maximum 6m	maximum 4 m	maximum 8m
<b>Ramification</b>		
Secondary branches ± patents	Secondary branches patents	Secondary branches ± adpressed
<b>Leaf phyllotaxis</b>		
Decussated, rarely trimerous or tetramerous	Decussated, rarely trimerous or tetramerous	Trimerous whorls, rarely decussated or tetramerous
<b>Leaf size</b>		
Medium	Small	Large
<b>Leaf length (mm)</b>		
(20)31-35(48)	(10)13-18(29)	(26)40-50(57)
<b>Leaf width (mm)</b>		
(8)12-14(19)	(4)5-11(13)	(10)14-20(24)
<b>Leaf arrangement</b>		
Patents	± Adpressed	Crowded, completely covering the stem. Adpressed on young branches and reflexed on old branches.
<b>Leaf lamina</b>		
Flat	Flat	Carinated
<b>Foliar tomentum</b>		
Scarce. Present, above all on the adaxial surface, towards the base and on the midrib.	Abundant. On the petiole and on the lower half of the lamina.	Very scarce. Above all present on the adaxial surface, towards the base, of the petiole and the lower half of the midrib.
<b>Floral peduncle (mm)</b>		
(14)19(26)	Short, (2)9(18)	Short, (5)8(20)
<b>Number of petals</b>		
5(6)	5-9	5-9

The measurements given in the table correspond to observations performed on fresh material; for each specimen studied at least 10 measurements of representative parts have been taken. Source of the specimens of *Myrtus communis* subsp. *communis*: wild specimens collected in Río Chillar (Málaga, Spain) and cultivated ones in the Alhambra (Patio de la Carpintería). *Myrtus communis* subsp. *tarentina* cultivated specimens in the Alhambra. *Myrtus communis* subsp. *baetica* all known specimens in Spain and Morocco are detailed in the text.

**Figures**

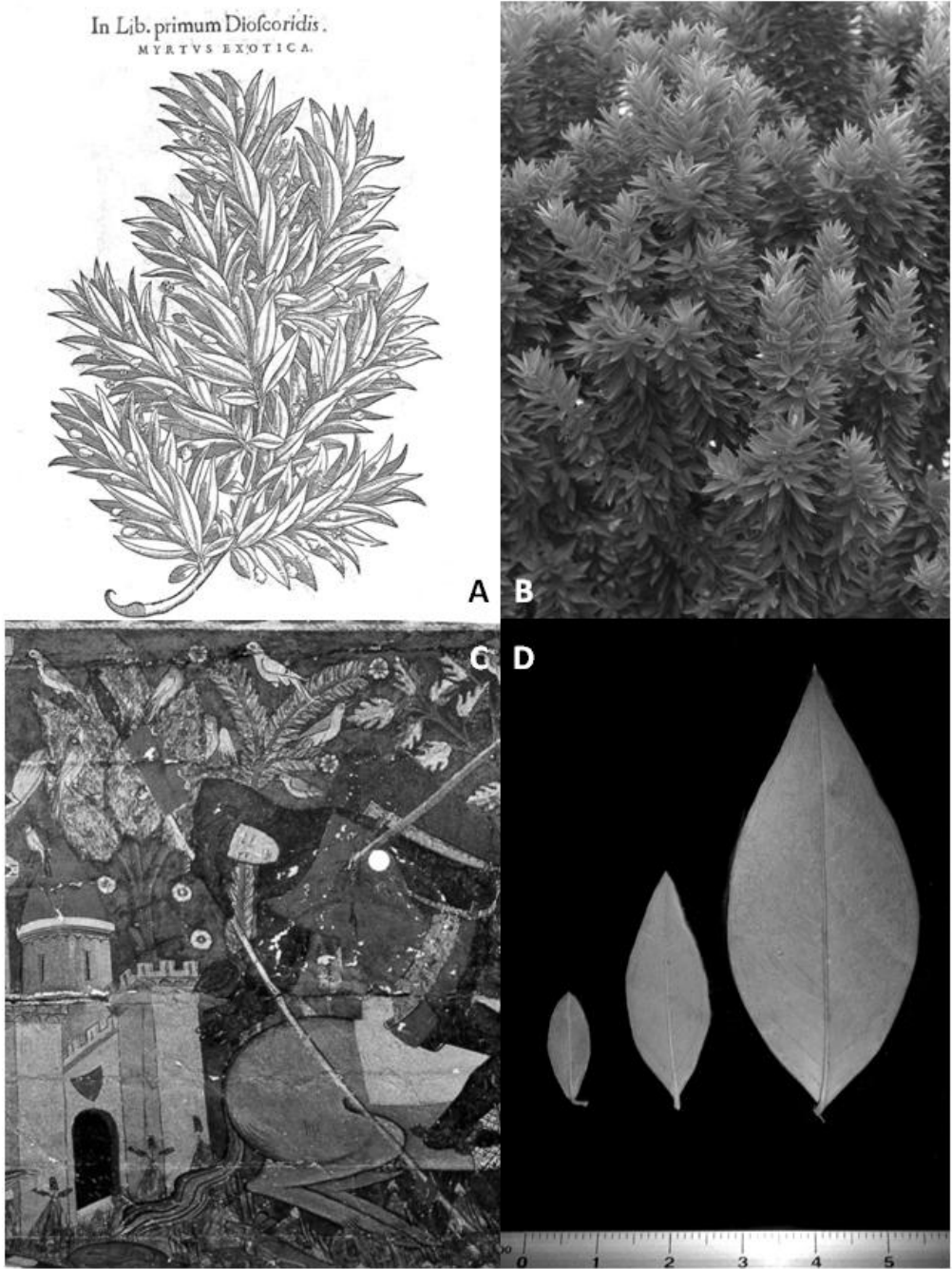


Fig. 1. A, *Myrtus exotica* icon from Mathioli 1583. B, *Myrtus communis* subsp. *baetica*, the plant's appearance. C, Painting from the "Sala de los Reyes" in the Alhambra. D, Leaf comparison of three subspecies of *Myrtus*, from left to right: subsp. *tarentina*, subsp. *communis* and subsp. *baetica*.

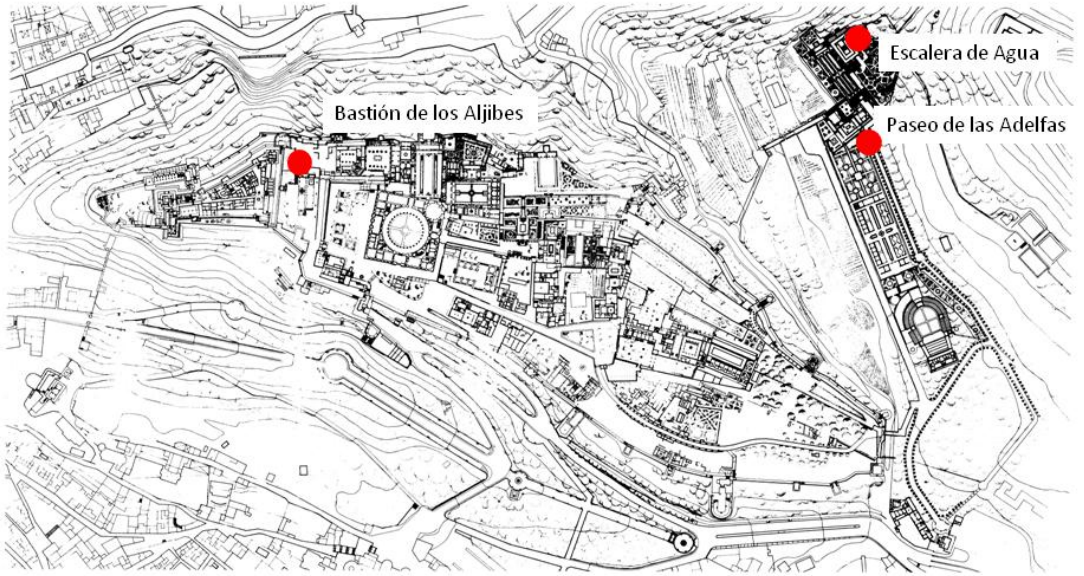


Fig. 2. Location of the *Myrtus communis* subsp. *baetica* specimens in the Alhambra and Generalife.