

Vernon H. Heywood

The cultural heritage of Mediterranean botanic gardens*

Abstract

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Mediterranean botanic gardens represent a rich and diverse cultural heritage, both tangible and intangible. They include spectacular landscapes and the plantings include many important introductions of both ornamental and economically important species. The gardens also contain many buildings of great architectural merit, some historic, some modern. Also important are the historic glasshouses and shade houses. Many of these gardens contain important herbarium collections that have served a key role in the preparation of Floras and major botanical libraries containing historical works of great value as well as works of art, sculptures paintings, drawings, and other illustrations and invaluable historic archives. The intangible cultural heritage of these gardens is represented by the impact that they have had the inhabitants of the cities and towns in which they are located and on generations of visitors – students, professionals and the public. With the decline of teaching and research in botany as a university discipline, some of these collections are at risk of dispersal or an even worse fate. In the face of these uncertainties a series of proposals to help safeguard this invaluable heritage is given, including the compilation of an inventory of these historically important buildings, libraries, works of art and archives and the use of the latest scanning and imaging techniques so that a visual record is prepared.

Key words: landscapes; herbaria; museums; libraries; inventory.

Introduction

For nearly 700 years, Mediterranean botanic gardens in their various manifestations have not only been important centres of botanical knowledge and research but have also had a major influence on social and cultural life though the gardens themselves, their buildings, museums, libraries herbaria and collections, all of which represent a rich and important heritage (Heywood 2015).

Landscapes, trees and plantings

Although many of the older Mediterranean botanic gardens are small and located in towns and cities where space is at a premium, some of them are noted for their spectacular

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landscapes and vistas. This is especially true of gardens located on the coast offering views down to the sea, such as the Giardino botanico Hanbury, La Mortola, Italy (Fig. 1) with its spectacular views from the upper terraces and the New Vista walk interrupted at intervals by steps and fountains, leading all the way down to a short stretch of the Via Aurelia at the bottom of the Garden. Another example is the Jardin Exotique de Monaco (Fig. 2) where the views, are so outstanding that I once heard Prince Rainier remark that he envied the Director because the views from his office were the finest in the Principality.

As well as such vistas, some spectacular plantings can be found, include the avenue of *Ceiba speciosa*, in the Orto Botanico, Palermo, the *Wisteria sinensis* covering the great iron gazebo in the Jardín Botánico-Histórico La Concepción, Malaga, Spain, the choreographed plantings and topiary in the Jardim Botánico da Madeira, the avenue of plane trees (*Platanus*) in the Jardín Botánico-Histórico La Concepción, Málaga, Spain, the vividly colourful Passeig [staircase] de Font y Quer in the Jardí Botànic Marimurtra, Blanes, Spain.

Mediterranean botanic gardens contain hundreds of examples of monumental trees both native and exotic such as the specimens of *Taxus baccata* planted in 1720 and of *Quercus suber* dating from 1805 in the Giardino dei Semplice, Firenze, the Sweet Gum (*Liquidambar styraciflua*, a swamp cypress (*Taxodium distichum*) and *Pistacia atlantica* in the Orto Botanico, Bologna, the Cedar of Lebanon (*Cedrus libani*) planted in 1734 in the Jardin des Plantes, Paris by the botanist Bernard de Jussieu, *Celtis australis* in the Jardin Botanique, Montpellier, to name but a few. Publications documenting such trees have been prepared by some of the Gardens as in the case of the Jardí botànic, Valencia, Spain (Costa & Plumed 2016).



Fig. 1. Giardino botanico Hanbury, La Mortola, Italy.



Fig. 2. Jardin Exotique, Monaco.

Buildings and architecture

Many of the buildings in historic botanic gardens are of considerable architectural merit, such as:

- The emblematic Pabellón de Villanueva in the Real Jardín Botánico de Madrid, which was originally constructed in the 18th century as an ‘invernáculo’ or glasshouse to shelter tender plants in the winter (in effect an orangery) and also housing the cátedra (professorial chair) where Antonio José Cavanilles taught his classes. A second floor was built in in the 1930s which later housed the herbarium and then removed in 1981. Today it is an exhibition centre.
- The Orangerie La Gardette, Jardin des Plantes, Montpellier built by the celebrated architect Claude Mathieu de la Gardette in 1801–06 to replace and in effect complete an earlier hothouse in 1759 (Verdier 1997);
- The iconic building of the Orto Botanico di Pisa is the shell-covered façade of the Palazzo delle Conchiglie, the old Fonderia (Foundry), a laboratory for the preparation of medicaments derived from the medicinal plants grown in the Garden, set up at the end of the 16th century. Current plans are to restore the Fonderia, and house in it an exhibition on the history of the garden;
- The trio of neo-classical buildings dating from 1789 of the Orto Botanico di Palermo, Sicily, designed by the French architect Léon Dufourmy – the Gymnasium, which originally housed the Schola Regia Botanices (school of botany), the Herbarium, the library and the director’s office, and the Calidarium and Tepidarium which grew plants from warm and temperate zones respectively (Raimondo & Mazzola 1992);

- Il Castello, Real Orto Botanico di Napoli built between the sixteenth and seventeenth centuries. It has been restored and now houses administrative offices and the museum of Palaeobotany and Ethnobotany.

Glasshouses and shade houses

Although not usually comparable with the great palaces of glass that are a common feature in more northern countries, a wide diversity of glasshouses and shade houses are to be found in Mediterranean botanic gardens, including some architecturally important examples. In fact, the origin of the glasshouse is to be found in the *orangeries*, *stanzoni degli agrumi*, *arancieri* and *limonaie* that were introduced in the 16th century to protect citrus trees from the winter cold. Some of these original structures may still be found and some have been restored and adapted for new uses, while others have fallen into disrepair or have been demolished.

Notable examples are the Estufa de Graells, Real Jardín Botánico, Madrid (1856), the Serra Carolina (1823, rebuilt 1857), Orto Botanico di Palermo, Les Grandes serres (1877–82), Jardin botanique de Lyon, France, the Serra Merola, Real Orto Botanico di Napoli (1809/1820), L'Umbracle [shade house] (1897–1900), Jardí botànic, Valencia (Fig. 3), the Serre Scopoliane, Orto Botanico di Pavia, Italy, and more recent examples such as the



Fig. 3. L'Umbracle, Jardí botànic, Valencia, Spain.

Invernadero de Bordeaux Bastide, France, the Nuova Serra Biosfera dell'orto Botanico di Padova, Italy. Although not in a botanic garden as such but in a public park, mention should be made of what Santiago Castroviejo Bolivar in the Real Jardín Botánico, Madrid, les serres, Jardin botanique hat is probably the largest shade house known, the Estufa fria, located in the Parque Eduardo VII, Lisbon, Portugal. It was originally a temporary shelter in an old basalt quarry for delicate plants that were to be introduced into municipal gardens but the project was put on hold and the plants started taking root. In 1933 the architect Raul Carapinha, designed the space as the Estufa fria, later complemented in 1975 with the addition of the Estufa Quente (Hot Greenhouse) and the Estufa Doce (Sweet Greenhouse).

Herbaria and Museums

Since the first recorded herbaria (*hortus siccus* as opposed to the *hortus vivus*, the botanic garden) were created in the 16th century, over 200 herbaria have been established in the Mediterranean region (Heywood 2003a), many of them in botanic gardens, with the bulk of herbaria and specimens (some c.34 million) found in only three countries, France, Italy and Spain. Although the Italian botanist Luca Ghini reputedly created the first herbarium in Pisa in 1544, an English merchant and botanist John Falconer (fl. 1547) who lived for some time in Italy and an apprentice surgeon Jean Girault in Lyon, France, each formed one in the same period of time as Ghini and it is likely that other botanists did so as well. Probably the key factor was the availability of paper as a mounting material for plants following the development of simpler and cheaper methods for the manufacture of continuous sheets of paper after the invention of printing in the in the mid-15th century: it has been suggested that the appearance of herbaria coincides with the technological improvements which allowed the manufacture paper at a low price (Saint-Lager 1886)¹. The herbarium of Girault is dated 1558 in his own hand and is reportedly preserved in the Muséum nationale d'histoire naturelle in Paris. The oldest known extant herbaria are those of Gherardo Cibo (alias Ulisse da Cingoli) (1512-1600) which he began in 1532 and is preserved in Rome in the Biblioteca Angelica and those of Ulisse Aldrovandi (1552-1605) conserved in the University of Bologna and Andrea Caesalpino (1525-1603) in the Museo Botanico dell'Università di Firenze (Moggi 1986).

It should be noted that an earlier use of the term herbarium referred to botanical treatises with engravings facing the text and many examples are conserved in Mediterranean botanic gardens along with other examples of botanical iconography (Montaccchini 1986), especially those concerning medicinal plants known as Herbals.

Although botanists from outside the region have played a major role in writing Floras of some Mediterranean countries and many of their important herbarium collections (including types) of Mediterranean plant specimens are located in countries such as Switzerland (Geneva), Austria (Vienna), Czech Republic (Prague), Hungary (Budapest), Germany (Berlin), Sweden (Lund), the UK (Edinburgh, Kew, Natural History Museum) and even in

¹ This extensive if somewhat wordy review of the origin of herbaria by St-Lager is an important source of information. See also Anon. Bull. Torrey Bot. Club, 12(12): 129-131 (Dec. 1885) for a brief English summary.

the United States (Heywood 2003), the herbaria of Mediterranean botanic gardens, notably those of Bologna, Firenze, Madrid, Montpellier, Paris and Palermo, contain substantial collections and type material of vital importance for Mediterranean plant taxonomy.

Botanical museums, on the other hand, are usually no longer held in great esteem, and many have suffered a lack of funding and a loss of confidence in the value of the collections (Clifford & al. 1990). Nonetheless, many botanic garden museums still contain many important collections of artefacts of both historical significance and importance for research in ethnobotany which is currently undergoing a marked revival of interest and development of techniques.

Much of the material in these museums is documentary or artistic rather than museological although with new sampling and analytical techniques biocultural collections can now be used more effectively as source material for research in various disciplines (Salick & al. 2014). However, with changing fashions, many important objects and even whole collections have been disposed of or destroyed and many of the collections are at risk as many of the artefacts are, incorrectly, no longer considered relevant. As regards displaying the materials, the emphasis today is on thematic exhibitions and on the use of interactive media, both indoors in exhibits and in the garden itself. Some new museums have been created, for example the ethnobotanical museum in Córdoba and the Pabellón del Bioma Boreal Europeo Carlos Linneo in the Jardín Botánico Atlántico, Gijón.

Plant introductions

For over 500 years Mediterranean botanic gardens played an important role in role as introduction centres for both ornamental and economically useful plants, although they were created too late to play a role in the initial post-1492 introductions from the Americas. As Raimondo & Garbari (1986) comment one can say that all the botanic gardens, whether university or not, both public and private, ancient foundations or newer creations, have contributed effectively to the introductions acclimation and spread of exotic medicinal, food, forestry and ornamental plants which in many cases have given a boost to the economy as well as having a significant impact on the landscape. An enormous diversity of species has been brought into cultivation and introduced into the economy outside the gardens. Because of the benign climate of the Mediterranean region, the introductions included many tropical and subtropical species. In particular, there were many introductions of *Citrus* species and cultivars to botanic gardens such as Palermo, Florence, La Mortola as well as in many villa and palace gardens. Although much of the emphasis in the past has been on the introduction of exotic species, there is now an increasing focus on the potential of the native flora as a source of new energy crops and ornamentals (Heywood 2003b).

The records of these gardens are an important but neglected archive of information about plant introductions and may be of relevance today to research into the adaptation of plants to climate change. Many gardens published catalogues of the plants they cultivated which are an invaluable source of data on the time and pattern of introductions as are the seed lists (*Indices Seminum*) (Heywood 1976) which many Mediterranean botanic gardens have published, often annually. Seed Lists not only catalogued the species for which seed was available but often contained valuable information about the Garden concerned and in

some cases articles on taxonomy, cultivation requirements, floristics and other topic (Heywood 1964). Many new species have been described in Seed Lists and an online searchable ‘Guide to the plant species descriptions published in seed lists from Botanic Gardens for the period 1800 – 1900’ has been produced by Lut (2017). Seed Lists were published in limited editions and were often not kept so that their availability in botanic garden and other libraries is poor – in fact many of them were retained by the curatorial staff and never reached the library. Because of their historical importance efforts should be made by botanic gardens to seek out and collate any seed lists that can be traced.

Acclimatization (acclimation) and trial gardens

The introduction and successful cultivation of exotic species to botanic gardens was often a difficult process, especially in the case of tropical plants, because of their particular climatic requirements. To face this challenge, many acclimatization gardens which aimed at attempting to adapt the species to the local conditions were developed in the 17th and 18th centuries in the Mediterranean region, especially in France, Italy and Spain and were aimed largely at plants of agricultural or other economic importance. Some of these were within, or associated with, botanic gardens while others were private, in gardens belonging to the nobility. Such acclimatization gardens and acclimatization societies were quite common in some regions such as Tuscany in Italy (Moggi 2013). Many acclimatization gardens were established in Spain to cater for the plants brought from various parts of the then Spanish colonial territories. Examples are those that existed in Cartagena, Cordoba (although short-lived), Barcelona, Aranjuez, Madrid, Malaga, Burgos, Sevilla, Carmona, Cádiz, and La Orotava (Tenerife), Valencia (Puerto Sarmiento 2002). In France, acclimatization of plants was widely practised in Provence and various gardens for this purpose were established (Potron 1995) and the Jardin botanique de la villa Thuret, France has been engaged in the introduction and acclimation of plants for over 150 years (Ducatillion & Blanc-Chabaud 2010).

A number of trial gardens were established in the Mediterranean region, especially in France, Italy, Portugal and North Africa to assess and introduce plants of economic interest from mainly tropical countries. When linked to colonial development, they were termed Colonial Gardens as in the case of the Giardino Coloniale di Palermo and Jardim Colonial in Lisbon (now the Jardim Botânico Tropical). In North Africa, the 16 ha Jardin d’Essais Botaniques (JEB), Rabat (Morocco) which opened officially in 1928 was an experimental garden that undertook trials on fruit trees and ornamental species. The gardens were created between 1914 and 1919, under a joint initiative of the sultan Moulay Hafid and the French Protectorate and were designed by Jean-Claude Nicolas Forestier. They fell into disrepair and have recently been restored and with a broader remit, including the conservation of Moroccan endemic species. The Jardin d’Essais was classified a national heritage site in 1992 and in 2012, it was recognized by UNESCO as a World Heritage Site. In Egypt, the experimental garden of El Saff about 50 km south of Cairo was of major importance for plant introductions as were the experimental gardens of Zohriya (today the Zohira Trial Gardens) Gezireh west of Cairo, in which Delchevalerie in 1870 established the first station for acclimatization of plants.

Today as we are facing the impacts that global and in particular climate change is having on all aspects of our life, the need for research into plant acclimation and adaptation has a new resonance. This will be essential if we are to be able to develop and grow crops adapted to the new climatic regimes and thereby safeguard our food supply. Mediterranean botanic gardens have played an important role in the past in introducing and disseminating new agricultural and horticultural crops, trees and ornamental plants and are well placed to resume such vital work to meet today's challenges.

Art and sculpture

Mediterranean botanic gardens contain a great wealth of paintings and drawings, some of which are displayed although the majority are in kept in storage or in the archives. When they are used in exhibitions, they attract considerable public interest. Also, a great diversity of sculptures, many of them hidden in the undergrowth, is found in the Mediterranean's botanic gardens (Fig. 4). A number of tombs are found in the gardens, usually of the founder of the garden as in the case of the Orto Botanico Hanbury in Las Mortola where Sir Thomas Hanbury is buried.

Libraries – books, journals, archives

The libraries and archives of Mediterranean botanic gardens are a treasure house of material about the history of botany, plant exploration and introduction, economic botany and taxonomy, which is not only of regional but of global importance. The libraries and



Fig. 4. Example of sculptures found in the Mediterranean's botanic gardens.

archives of the early Italian *Orti botanici* such as Pisa, Padova, Firenze and Bologna contain materials are essential resources for understanding the early development of botany and botanic gardens. The Library of the Real Jardín Botánico, Madrid contains 32,000 books, 2,084 journals, 2,545 maps, 30,000 pamphlets and reprints. Its general Archive contains 4,865 historic documents from 1762 to 1900 and 169 boxes of contemporary documents. It includes 4000 drawings and engravings (Papiol 2005). In addition, the Archive contains documents and graphic material from important expeditions such as those of Loeffling to South America, José Celestino Mutis to New Granada, Sessé & Mociño to Mexico and Central America, and Ruiz & Pavón to Peru.

A serious problem is that with the decline in the teaching of botany and the closure of botany departments or their merger with other departments, the libraries of university botanic gardens are being transferred to the universities' main library or even dispersed and then lose the necessary dedicated curatorial attention.

History and historical figures

Many celebrated botanists were directors or worked in Mediterranean botanic gardens, such as Antonio José Cavanilles, Augustin Pyramus de Candolle, Andrea Cesalpino, Mariano Lagasca, Luca Ghini, Michele Tenore, Pierre Magnol, Joseph Pitton de Tournefort, Antoine Laurent de Jussieu, Agostino Todaro, Filippo Parlatore, Pietro Andrea Mattioli, Pier Andrea Saccardo, Gustave Thuret to name just a few. One of the most celebrated was Luca Ghini who instituted the first botanic gardens in Pisa and Florence between 1543 and 1545 at the behest of Cosimo I de' Medici. He also created the plant press and one of the first herbaria and instituted the formal teaching of medicinal botany and laid the foundations for modern pharmacognosy.

Social impacts

The intangible heritage of the Mediterranean's botanic gardens is of enormous and incalculable social and cultural importance and influence. The relationship between the gardens and their patrons, students and the general public is an important dimension of their social impact. This interaction has changed over the centuries as the gardens themselves have occupied different roles. The impact on the life of the citizens of the towns and cities where they are located has been major factors in the evolution of their civic, social, economic and cultural development. Although many botanic gardens today tend to emphasise their role in the conservation of plant diversity, most visitors are motivated more by the aesthetic and recreational opportunities they afford. This is especially true of the large number of Mediterranean botanic gardens that are located in an urban setting. Public attitudes and expectations of the services that botanic gardens should offer, have changed and have in many cases affected policy. As Rakow & Lee (2015) note '... many are finding that the plants themselves are not enough to attract the size or diversity of audiences that they need to survive. More and more, gardens are embracing entertainment options to attract young professionals,

families, and members of specific ethnic groups'. Although the general public visiting the botanic garden can appreciate the plants collections, the landscapes and vistas, the displays in the greenhouses and shade houses, and the statues, fountains and other features they are unaware of the riches to be found in the museums, libraries and archives as they are not normally accessible. Many botanic gardens put some of this material on display in occasional exhibitions and perhaps more effort should be invested in such events if they are to obtain public support for their work: one cannot expect such much-needed support if the rich heritage material is kept hidden. Regular open days and guided tours allowing the public to visit the herbaria, museums, libraries and the scientific, technical and conservation activities should be considered.

Two botanic gardens in the region have been recognized by UNESCO as World Heritage Sites – the Orto Botanico di Padova and the Jardin d'Essais, Rabat. It is perhaps surprising that so few have achieved such a status.

Safeguarding the heritage

The Mediterranean botanic garden estate is one of the most important in the world. It has seen the origin and development of the dominant western model of the botanic garden as we know it today and collectively the gardens contain an invaluable store of irreplaceable materials both in the living collections and their records, in their rich libraries and archives and in their herbaria and museums. Yet, much of the material is not fully documented, catalogued or recorded, and a considerable part of it is still poorly studied if at all.

As we have noted above, as a consequence of changes in the perception of the value of botany by university administrators and even by other biological scientists, and with falling numbers of students, departments of botany or plant biology are being closed or merged and university botanic gardens also face reduction in funding or even closure. As a result, some of the important collections in Mediterranean botanic garden are at risk of neglect or dispersal. The tragic destruction by fire of the Brazilian National Museum in Rio de Janeiro which housed one of the richest collections of natural history artefacts in the world, most of which were lost² should serve as a wake-up call to all natural history museums and botanic gardens to review the security of their collections in terms of fire and water damage risk, sprinklers, insurance (or as in the case of the Brazilian museum, lack insurance), documentation, duplicates, etc. As Zamudio & al. (2018) comment, 'Museum collections are timeless national treasures that represent our histories, cultures, and scientific achievements. Every institution and government should reflect and take heed at this sad moment. We must invest in and safeguard our museums and collections for the benefit of science and society worldwide'. Indeed, it would be tragic, if the public were to learn of the treasures that a botanic garden contained only after they had been lost by fire, flood, neglect or ignorance. The time for action to avoid such tragedies is now.

² Fortunately not the herbarium which had been removed to a separate building.

Conclusions

This brief overview of the diversity of the living, preserved and artistic collections contained in the botanic gardens of the Mediterranean region has highlighted the major contribution that they have made to our understanding not only of the origin and development of botanical science and related disciplines such as herbal medicine, ethnobotany and ethnopharmacology, but of many of the crops we grow, the food we eat and the trees, shrubs and herbs that adorn our streets, parks and gardens. There are few areas of human life and wellbeing that have not been impacted by botanic gardens: from medicine and pharmacology to health and nutrition, from gardening and horticulture to exhibitions, recreation and enjoyment and social gatherings. Yet, the rich diversity of resources in the Mediterranean's botanic gardens is generally poorly known and little studied. Unless prompt action is taken, many of these unique resources risk falling into neglect, dispersal or even loss as is already happening in some gardens.

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Address of the author:

Vernon H. Heywood,

School of Biological Sciences, University of Reading, Whiteknights, Reading RG6 6AS, UK. Email: v.h.heywood@reading.ac.uk