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The extant herbaria from the Sixteenth Century: a synopsis

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Abstract. A synthetic synopsis of the herbaria of the 16th century is provided. The list is in chronological order and resumes the general information on the earliest herbaria from the XVI century facilitating the access by the scientific community to this important source of historical information. Fifteen herbaria are listed, of which the oldest date back to the first half of the 16th century. Nine originated in Italy, three in Switzerland, two in Germany and one in France. For each herbarium, data are provided on chronology, geographical origin, format and extent, current place of conservation, and information on cataloguing and digital accessibility when available.

Keywords: The XVI century, botanical collections, history of botany.

INTRODUCTION

The art of making a herbarium, i.e. preserving pressed dried plants, identified according the best taxonomic knowledge, and assembling them (glued or free) on paper sheets loose or bound in a volume, first arose in Northern Italy in the first half of the Sixteenth Century, having a pioneer in Luca Ghini (Meyer 1857; Camus 1895; De Toni 1907; Chiarugi 1957).

Luca Ghini (1490-1556), native of Croara, a hamlet near Imola in Northern Italy, studied in Bologna, where he probably attended the lectures of Nicolò Leoniceo (1428-1524), a forerunner of modern science who taught in Ferrara for sixty years, and was entrusted with the teaching of medicine at Bologna University for one year, in 1508 (Calvi 1777). Ghini was enrolled in the register of professors of medicine in 1528, and was additionally appointed to the *Lectura simplicium* in 1540 (Bertoloni 1891). His teaching in Bologna lasted until 1544, when he moved to Pisa. During this time Ghini assembled a collection of several hundred specimens, but nothing remains of it, mainly because he used to give his specimens to pupils and colleagues (De Toni 1905; Cristofolini 1992).

Many of the early herbaria underwent the same fate of being lost or dispersed through time: this is the case with the herbarium of the English mer-

chant and botanist John Falconer (d. 1560), as well as of a large part of the collections made by the Swiss physician Felix Platter (1536-1614) and by the Neapolitan botanist Ferrante Imperato (c. 1525-1621). Nevertheless, a conspicuous patrimony has been preserved until the present time.

Although a number of papers have been published about the ancient herbaria unfortunately many of them appeared in comparatively scarce or obscure books or journals, while the few comprehensive studies on this topic (e.g. Saint-Lager 1885; Camus 1895) are obsolete.

The present contribution is intended to bridge this gap, by providing a synthesis of the essential knowledge presently available about the extant herbaria of the Sixteenth Century. The purpose is to facilitate access by the scientific community to this important source of historical information.

In the following synopsis each herbarium has been named either with its traditional denomination, or with a new name congruent with its ascertained or supposed authorship. The herbaria have been ordered chronologically; as several of them (especially the major ones) were assembled over many years, the sequence was based on the *terminus post quem* of the beginning of the composition. Considering that some herbaria have been the subject of a very extensive literature, only the main references have been cited.

SYNOPSIS¹

“Anonimo Toscano” (formerly known as “Herbarium Merini”). (Figure 1)

Dating: 1544 - c. 1545

Author: the former attribution to Michele Merini (Chiovena 1928) has been recently refuted (Cristofolini and Nepi, 2021); the herbarium is now attributed to an anonymous botanist active in Pisa and/or Lucca (Tuscany, Italy).

Format and extent: one unbound volume, with 201 specimens.

Origin of the collection: plants collected around Pisa and from Pisa Botanical Garden.

Stored in the Botanical Section “Filippo Parlatore”, The Natural History Museum, University of Florence, Italy (Herbarium FI).

Catalogue: published in Chiovena (1927).

Digital images: completely digitalized; images available on request through Botanical Section “Filippo Parlatore”, The Natural History Museum, University of Florence, Italy (FI).
Relevant references: Chiovena (1927, 1928), Cristofolini and Nepi (2021).

“Petrollini” (formerly known as “Cibo”, also called “Rome herbarium”) (Figure 2)

Dating: c. 1550 - 1553

Author: Francesco Petrollini (fl. 1550).

Format and extent: one bound volume (herbarium A), with 516 specimens, and four bound volumes (herbarium B), with 1347 specimens.

Origin of the collection: plants mainly from Italy.

Stored in the Biblioteca Angelica, Rome, Italy.

Catalogue: published in Chiovena (1909).

Digital images: not available.

Relevant references: Celani (1902); Celani and Penzig (1907); Chiovena (1908a, b; 1909); Soldano (2002), Stefanaki et al. (2019).

“Imperato”

Dating: c. 1550

Author: Ferrante Imperato (Naples c. 1525 - 1621?).

Format and extent: one bound volume (the only one extant from a set of 80 volumes), with 442 specimens. 170 additional specimens stored in the Cirillo herbarium (Istituto Botanico della Regia Scuola Superiore di Agricoltura di Portici, Napoli), and probably came from the lost volumes of the Ferrante herbarium.

Origin of the collection: plants mainly from Italy.

Stored in the Biblioteca Nazionale, Napoli, Italy.

Catalogue: a species list in Ciarallo (1986).

Digital images: not available.

Relevant references: Minieri Riccio (1863), Giglioli (1903), Ciarallo (1986, 1993), De Natale and Cellinese (2009).

“Aldrovandi” (Figure 3)

Dating: c. 1551 (beginning of the first volume) - 1586 (end of the XV volume).

Author: Ulisse Aldrovandi (Bologna 1522 - ibidem 1605).

Format and extent: 15 bound volumes, 4800 specimens. It includes some plants sent by his teacher Luca Ghini.

Origin of the collection: mainly Italy.

Stored in the Herbarium of the University of Bologna (BOLO).

Catalogue: Soldano (2000, 2001, 2002, 2003, 2004, 2005).

Digital images: Completely digitalized; images available through <http://137.204.21.141/aldrovandi/Explore>

¹ The present survey does not include neither the herbaria viva nor the herbarium H.S.251, the oldest of the Sloane Herbarium (BM), which dates “not later than the early decades of the seventeenth century” (Dandy 1958: 62; 131-132), since there is no factual foundation for dating it back to the late sixteenth century, as suggested by Savage (1958: 13).



Figure 1. Herbarium “Anonimo Toscano” (A) The anonymous author appears to be very keen to use the space on each page efficiently. Many samples consist of a single leaf, occasionally misidentified, as in the case of the leaf of *Acer opalus* subsp. *obtusatum* (Waldst. & Kit.) Gams, named here “*Folium Anemones candidae* Diosch.”; (B) The collection includes relatively uncommon species, like *Notholaena marantae* (L.) Desv. (here named “*Lonchitis aspera similis Cetrach*”), or rare, like *Hottonia palustris* L. (“*Millefolium* Diosc. in aquis nascens”). © Botanical Section “Filippo Parlatore”, Natural History Museum of the University of Florence (FI).

Relevant references: Saint-Lager (1885); Soldano (2000, 2001, 2002, 2003, 2004, 2005).

“Platter”

Dating: 1552 - ?

Author: Felix Platter (Basel 1536 - ibidem 1614).

Format and extent: eight bound volumes (a further ten are known to be missing), with c. 1800 specimens. The specimens were probably ordered at the end of the 16th century according to the system of Caspar Bauhin, then yet to be published, and assembled in the extant binding.

Origin of the collection: the provenance of the plants is not known.

Stored in the Burgerbibliothek of Bern, Switzerland.

Catalogue: available through <https://www.burgerbib.ch/de/bestaende/privatarchiv/einzelstuecke/platter-herbarium>

Digital images: available as above

Relevant references: Rytz (1933), Dauwalder (2013).

“Mendoza” (Figure 4)

Dating: 1539 - 1554

Author: Unknown.

Format and extent: Four bound volumes, with about 950 specimens.

Origin of the collection: Plants from Italy.

Stored in the Real Biblioteca del Monasterio de San Lorenzo de El Escorial, Spain.

Catalogue: not yet available (a compilation of a list of species is in progress).



Figure 2. (A) View of the Biblioteca Angelica, Rome; (B) Herbarium Petrollini, book A; (C) Book “B”, N. 498: *Geranium nodosum* L. © Biblioteca Angelica, Rome.

Digital images: not available.

Notes: The herbarium was bought by Diego Hurtado de Mendoza (1504-1575) during his stay in Italy (1539-1554) as ambassador of Carlos V in Venice and later in Rome, and was incorporated in the El Escorial library in June 1576.

Relevant references: Colmeiro (1858: 154); Andretta and Pardo-Tomás (2019).

“Ratzenberger”

Dating: 1555 - 1592

Author: Caspar Ratzenberger (Saalfeld 1533 - Ortrand 1603).

Format and extent: Three bound volumes, with 746 specimens.

Origin of the collection: plants collected during Ratzenberger’s travels, mainly from France and Italy.

Stored in the Ottoneum Museum, Kassel, Germany (Herbarium KASSEL).

Catalogue: a list of identified specimens (without images) available through <https://naturkundemuseum.kassel.de/wissenschaft/sammlungen/gefaesspflanzen/ratzenberger/index.htm>; a catalogue also in Kessler (1870).

Digital images: not available.

Relevant references: Kessler (1870).

“En Tibi”

Dating: c. 1558

Author: Francesco Petrollini (fl. 1550).

Format and extent: one bound volume, with 473 specimens (39 further specimens are missing).

Origin of the collection: plants from northern Italy.

Stored: Naturalis Biodiversity Center, Leiden, The Netherlands (Herbarium L).

Catalogue: not published.

Digital images: available through: https://bioportal.naturalis.nl/result?theme=en_tibi

Notes: the herbarium was probably made in Bologna. It was intended to be a gift to a yet unknown person, possibly the Emperor Ferdinand I. It was purchased by Leiden University around 1690. The name of this herbarium was derived from the cover inscription: “*En tibi perpetuis ridentem floribus hortum*” [“here is for you a smiling garden of everlasting flowers”].

Relevant references: Stefanaki et al. (2018, 2019).

“Girault”

Dating: 1558

Author: Jehan Girault (Lyon 1538? - 1608).

Format and extent: one bound volume of 81 pages, with 310 specimens.

Origin of the collection: plants mainly from the region around Lyon.



Figure 3. Herbarium Aldrovandi (A) A perfectly preserved specimen of *Orchis simia* Lam. (Vol. 4, fol. 105), collected around Bologna, probably in 1552 (Soldano 2001); (B) *Nicotiana tabacum* L. (Vol. 14, fol. 13), one of the oldest extant specimens of this species. The plant (or, possibly, the seed from which it was grown) was delivered to Aldrovandi by a correspondent from Rome in 1567 (see Soldano 2004). © Herbarium BOLO (SMA, Alma Mater Studiorum - University of Bologna).

Stored at the Muséum National d'Histoire Naturelle, Paris, France (Herbarium P).

Catalogue: not published.

Digital images: completely digitalized; images available through <https://www.mnhn.fr/fr/herbier-jehan-girault>

Relevant references: Saint-Lager (1885).

“Rauwolf”

Dating: 1560 - 1575

Author: Leonhard Rauwolf (Augsburg 1535? - Waitzen 1596).

Format and extent: four bound volumes, with some 832 specimens.

Origin of the collection: The first two volumes contain 441 specimens (plus two missing) collected in southern France between 1560 and 1563. The third contains some 200 specimens collected in the Alps and northern Italy in 1563. The fourth contains 191 specimens (plus nine

missing) collected in southern France, Lebanon, Syria and Iraq from 1573 to 1575.

Stored at Naturalis Biodiversity Center, Leiden, The Netherlands (Herbarium L).

Catalogue: not available.

Digital images of the fourth volume only are available through <http://bioportal.naturalis.nl>

Notes: the herbarium was purchased by Leiden University around 1690. Linnaeus did not have access to Rauwolf's herbarium, but he did use a few of the published drawings (Rauwolf 1583) to describe five species.

Relevant references: Rauwolf (1583), Legré (1900), Ghorbani et al. (2018), Stefanaki (2021).

“Cesalpino” (Figure 5)

Dating: 1563

Author: Andrea Cesalpino (Arezzo 1524 or 1525 - Roma 1603).



Figure 4. (A) Herbarium Mendoza: list of plant names signed below by Diego Hurtado De Mendoza; (B) two sheets: *Lupinus* sp. (left), *Bellis* sp. (right). © Patrimonio Nacional. Real Biblioteca del Monasterio del Escorial. Mesa 25-I-11.



Figure 5. Herbarium Cesalpino (A) Sheet n. 35. N. 90: *Seseli* (Apiaceae), except the left leaf above; (B) Sheet n. 50. N. 119: *Heliotropium europaeum*, N. 120: *Myosotis scorpioides*, N. 121: *Cynoglossum creticum* (Boraginaceae). © Botanical Section "Filippo Parlatore", Natural History Museum of the University of Florence (FI).



Figure 6. Herbarium “Aldrovandi’s School” (A) *Agrimonia eupatoria* L. The handwritten reference is: “Matthioli 1068”, the page number corresponding to the species description in the 1568 edition of Mattioli’s Dioscorides. (B) *Aquilegia* cf. *atrata* Koch. This species, named here “*Aquileia* Matth. f. 665”, is depicted in a full-page table in Mattioli (1568: 665). © Herbarium, BOLO (SMA, Alma Mater Studiorum - University of Bologna).

Format and extent: originally in one bound volume of 266 pages (disbound in 2007), with 768 specimens. The specimens are ordered following the system later published by the author himself (Cesalpino 1583).

Origin of the collection: plants collected mainly in central and northern Italy.

Stored in the Botanical Section “Filippo Parlatore”, The Natural History Museum, University of Florence, Italy (Herbarium FI).

Catalogue: published in Caruel (1858).

Digital images: not available.

Relevant references: Caruel (1858); Saint-Lager (1885); Nepi (2007), Moggi (2009).

“Aldrovandi’s school” (Figure 6)

Dating: 1568 - ?

Author: an anonymous pupil of Ulisse Aldrovandi.

Format and extent: one bound volume, with 214 specimens.

Origin of the collection: no indication. Presumably Northern Italy.

Stored in the Herbarium of the University of Bologna (BOLO).

Catalogue: not available.

Digital images: not available.

Notes: all plant names are written in Italian; the only authority cited beside the plant names is Mattioli, with the page numbers corresponding to the 1568 edition of the “Discorsi”.

Relevant references: Cristofolini et al. (1993)

“Ducale Estense”

Dating: 1570 - 1598

Author: unknown.



Figure 7. Herbarium “Bauhin at Bologna” (A) *Capsella bursa-pastoris* L. The concise discussion about the species variability ends with the words “... ut in Phytopinace monuimus”, that indicate Caspar Bauhin as the author. (B) *Gossypium herbaceum* L. The handwritten comment includes the words: “...quod in horto doctoris Zwinger vidimus - cuius iconem Historia nostra exhibebit”. In fact, in the first volume of J. Bauhin’s posthumous *Historia plantarum* (Bauhin and Cherler 1650) we find a description of this species, with reference to the garden of Doctor Zwinger in Basel. © Herbarium BOLO (SMA, Alma Mater Studiorum - University of Bologna).

Format and extent: One volume of 149 pages, containing 181 specimens.

Origin of the collection: Probably around Ferrara (Italy), both from the wild and in gardens.

Stored in Biblioteca Estense, Modena, Italy.

Catalogue: Camus and Penzig (1885).

Digital images available at <https://www.asmo.beniculturali.it/progetti/carte-verdi-nellarchivio-di-stato-di-modena/erbario-estense>

Relevant references: Saint-Lager (1885), Camus and Penzig (1885), Cremonini (2016, 2021+).

“Bauhin”

Dating: c. 1577

Author: Caspar Bauhin (Basel 1560 - ibidem 1624).

Format and extent: 20 boxes with 3352 specimens, free on the sheets (unmounted), collected by Bauhin or sent

by his correspondents. The original order is unknown.

Origin of the collection: Plants from many parts of Europe.

Stored in University of Basel, Switzerland (BAS).

Catalogue: not published.

Digital images: Digital images are available through <https://herbarium.unibas.ch/index.php/en/herbaria>

Notes: this herbarium is the basis of the outstanding *Pinax* by Caspar Bauhin (1623) and the other publications of this author.

Relevant references: Saint-Lager (1885); Stech et al. (2018).

“Bauhin at Bologna” (Figure 7)

Dating: 1596 - 1597

Authors: Caspar Bauhin (1560 - 1624), presumably Jean Bauhin (1541 - 1613), and possibly other coworkers.

Format and extent: one bound volume, with 273 specimens.

Origin of the collection: plants from Northern Italy and the Alps.

Stored in the Herbarium of the University of Bologna (BOLO).

Catalogue: Baldacci (1907).

Digital images: not available.

Notes: the volume seems to have been sent by one or other of the Bauhin brothers as a present to Ulisse Aldrovandi. A research about origin and history of this herbarium is in progress.

Relevant references: Baldacci (1907); Cristofolini et al. (1993); Mossetti et al. (1993).

DISCUSSION

Fifteen herbaria of the XVI Century are presently known, which include some 16,000 exsiccata. Making accessible all of this precious patrimony would represent an unrivalled source of historical and scientific information.

The size of these collections ranges from very comprehensive herbaria (Aldrovandi, with 4800 specimens, Bauhin with 3352) to others that are quite small (“Ducale Estense”, with 181 specimens, “Anonimo Toscano” with 201). The authors of ten of the collections are either known (or at least confidently presumed) while those of five herbaria remain unknown.

The geographic distribution of the herbaria is as follows:

- nine herbaria were assembled in Italy by Italian botanists: seven of them are still preserved in Italy (“Anonimo Toscano”, Petrollini, Imperato, Aldrovandi, Cesalpino, “Ducale Estense”, “Aldrovandi’s School”), while the remaining two have been later transferred abroad (“En Tibi”, now stored in Leiden, the Netherlands, and “Mendoza” at the Escorial, Spain);
- two herbaria were made by Swiss botanists, with plants collected in different parts of Europe (Platter and Bauhin, both from Basel); a third (“Bauhin at Bologna”) originated in Switzerland to be delivered to Aldrovandi in Bologna;
- two herbaria were authored by German botanists (Rauwolf and Ratzenberger), with plants collected in France and Italy;
- one was made by a French botanist (Girault) with plants collected in Southern France.

The geographical distribution of the collections and the biography of their authors reflects the importance of the teaching of Luca Ghini, and the centrality of the Ferrara school.

Indeed the unknown author of “Anonimo Toscano”, Aldrovandi, and Cesalpino were all pupils of Luca Ghini, and the collections by Petrollini (“Petrollini” and “En Tibi”) as well as the “Ducale Estense” originated in the area between Bologna and Ferrara (Stefanaki et al. 2018, 2019).

The English botanist John Falconer also lived in Ferrara from 1540 to 1547 (Jackson 1885) when he assembled the first English herbarium of which are aware (Amatus Lusitanus 1558), a collection that was mentioned by William Turner (1551) but is today lost.

A further centre of diffusion of herbaria was in Montpellier: this centre is obviously connected to the Bologna-Ferrara core: indeed Guillaume Rondelet (1507 - 1566), the founder of the Montpellier botanical school, had been a pupil of Luca Ghini, as were his disciples Leonard Rauwolf, Felix Platter and Johan Bauhin (Stefanaki et al. 2021). All of them, as well as Caspar Bauhin, were familiar with Ulisse Aldrovandi and the school in Bologna. To the Montpellier school belonged also Jehan Girault, a disciple of Jacques Daléchamps (1513–1588), who was in his turn a pupil of Rondelet. Camus (1895) maintained that J. Falconer was the first botanist to compose a herbarium, during his stay at Ferrara. As a matter of fact, Falconer’s stay at Ferrara lasted from 1540 or 1541 to 1547, and Amatus Lusitanus, the earliest witness of his herbarium, lived in Ferrara in the same years; however, the “Anonimo Toscano” was composed between 1544 and c. 1545, and the lost herbarium by Luca Ghini also dates back to the same span of time. Hence, the claim by Camus is possible but unproved.

In conclusion, it seems impossible, and indeed immaterial, to ascertain who was the individual botanist who first composed a herbarium. Nevertheless, one can state with some confidence that this innovation, that was destined to imprint plant science during the following centuries, had its inception in the early forties of the sixteenth century, and had its cradle in the school of Luca Ghini and in the cultural milieu of Ferrara and Bologna, from where it spread in just a few decades through all Europe.

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