# Pioneers in European Ethnobiology

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# Pioneers of Spanish Ethnobotany

## From Andrés Laguna (1510–1559) to Pío Font Quer (1888–1964)

*Manuel Pardo-de-Santayana, Javier Tardío and Ramón Morales*

Our ancestors had such excellent plant knowledge that they deserve to be named the first ethnobotanists. They did not record their wisdom in writings, drawings or videos to make it available for the future generations but transmitted it orally to their acquaintances. Long before the terms Ethnobotany or Aboriginal Botany had been coined, they devoted their lives to learning how to master the local environments on which they depended for their livelihoods. They knew methods of gathering, preparing and preserving food and medicinal plants, differences and properties of the different kinds of wood, and how to select and domesticate plants.

A small part of this knowledge has reached us, thanks to the writings of ancient Chinese, Mesopotamian, Egyptian, Greek, and Roman authors. They reported the knowledge of doctors and lay people of their time about medicinal and other useful plants. Plant science began with descriptions of these useful plants. Unfortunately, lack of accuracy sometimes prevents us from knowing precisely which botanical species they refer to. Although these authors had such knowledge on plants, only Theophrastus, the famous 4th century BC Greek author who wrote 'Enquiry into Plants' and 'On the Causes of Plants', has been named the father of Botany, as he was interested in plants themselves and not only in their uses.

In the case of the Spanish territories, the first written records of local plant uses came from Roman authors. For instance, they reported the importance of acorn bread for the Cantabrian tribes, the use of medicinal species such as *herba vettonica* (*Stachys officinalis*) and the use of yew (*Taxus baccata*) for committing suicide (González Echegaray 1997). In the Middle Ages, we can start mentioning Saint Isidore of Seville (c. 556–636), who wrote *Etymologiae* (c. 634). His encyclopaedic essay was divided into 20 volumes and aimed to compile the uni-

versal knowledge of his era (Theology, History, Literature, Natural History, etc.). However, the most relevant contributions to historical ethnobotany in Spain were written by Al-Andalusian authors. Ibn Al-Baytar (c. 1180–1248), for instance, wrote the 'Compendium of Simple Drugs and Food' (*aljami' li-mufradat al-adwiya wa'l-aghdhiya,* c. 1235), based on his own observations and many other sources including Dioscorides. In this work he described more than 1400 medicinal drugs, 300 of which had not been previously described (Abu-Rabia 2005). Another noteworthy author is the physician Arnau de Vilanova (c. 1235–1311) who is credited as being the first author to publish a description of the distillation of a true essential oil (Demyttenaere and Poppe 2004).

The European Renaissance renewed interest in plants, and many herbals appeared in different European languages. They were pharmaco-botanical works that described medicinal plant uses and improved the science of plant description, classification, and botanical illustration. Although they made important contributions to the field of Ethnobotany, they cannot be called proper ethnobotanists in a modern sense (see Svanberg et al. 2011), as they did not systematically record traditional lore or conceptualise the importance of folk botanical studies. They were mainly interested in recording plant uses independently of their cultural contexts.

In this chapter, we review the works of some of the most relevant botanists and authors from related fields who have written about Spanish plants in the last five centuries and who can be acknowledged as pioneers of modern Spanish Ethnobotany. Their legacy is very useful for understanding the historical evolution of local plant uses in Spain and the interactions between folk lore and written transmitted knowledge. Thus, we have mainly focused on the importance of four pharmaco-botanical works written between 1550–1650 (Laguna 1555, l'Écluse 1576, Monardes 1574, Cienfuegos c. 1630) and then reviewed the contributions of some later authors.

Although we have focused on the role of botanists and other related scholars in this chapter, the importance of other areas of study must be highlighted. Medical Anthropology surveys of Folk Medicine have been very inspiring for modern Spanish ethnobotanists. These surveys began at the end of the nineteenth century (e.g. López Dóriga 1890), and were developed during the twentieth century (e.g. Barriola 1952, Lis Quibén 1980, Kuschick 1995). They usually have a strong medico-historical and anthropological point of view and are mainly interested in the cultural and social aspects of folk culture. Ethnobotanical knowledge is also scattered in other anthropological and ethnographical works of the twentieth century. These works studied the symbolic and material importance of plants, including social ceremonies and festivals (e.g. González Turmo 1997; Hualde et al. 2004). Nor can we forget researchers interested in folk material culture

(e.g. Gil Albarracín 1992, Gónzalez-Hontoria 1998). Some of them are linked to ethnographical museums and have done extensive research on popular technologies such as handicrafts or architecture. Finally, linguists have contributed to recording plant vernacular names in linguistic atlases on regional (e.g. Alvar 1961–1973, 1999) or local scales (e.g. Griera 1973). However, these works lack precision in plant identification.

## Laguna and Dioscorides' *Materia Medica* (1555)

According to Alvar-Ezquerra (1991), Andrés Laguna (c. 1510–1559) was born in Segovia in 1510, although other authors following the chronicler Diego de Colmenares consider 1499 to be the correct year. He was the son of a converted Jewish physician. He began his studies of Arts in Salamanca and finished them in Paris, where he also graduated in Medicine. There, he published his first medical works. He returned to Spain in 1536, where he worked at the University of Alcalá de Henares and was the personal doctor of Charles V. Three years later, he travelled throughout different European countries such as England, the Netherlands and Germany. He lived in the Imperial city of Metz for five years and became a doctor in the city. In 1545 Laguna moved to Italy, where he received a doctorate from the University of Bologne. He lived in Rome for nine years and during this time became the personal doctor of Pope Julius III. He moved to Venice for a short time and then to the Netherlands where he lived for three years and published some of his most renowned works. At the end of 1557, he returned to Spain, where he was named the physician of Philip II and created the Botanical Garden of Aranjuez. He died in Guadalajara on the 28th of December 1559, during a trip to Roncesvalles with the welcome committee for Elisabeth of Valois who was going to be the third wife of Philip II (Alía Alberca 2010).

As a typical man of the Renaissance, in addition to medical works, he also published on historical, philosophical and political subjects. A noteworthy example is his famous discourse on Europe (*Europa heauten timorumene* 'Europe the Self-Tormentor') which, following the humanist thoughts of Erasmus of Rotterdam, contributed to forging the modern idea of European civilization as opposed to barbarism (Rodríguez Sánchez 2001). Although some of his works were translations or comments of Greek and Latin texts, he also published some original works. Most of them were written in Latin and only a few in Spanish, like his most famous work, the translation into Spanish of Dioscorides' *Materia Medica* which he completed with his own interesting commentaries and additions (Annotations).

The book, entitled *Pedacio Dioscorides Anazarbeo, Acerca, de la materia medicinal y de los venenos mortíferos* ('Pedacio Dioscorides Anazarbeo on *materia medica* and deadly poisons'), has been a milestone for the disciplines related to

healing and plants. As commonly known, the work of Dioscorides, a Greek doctor of the first century who travelled around the Mediterranean with the Roman legions, was the most influential pharmacopoeia during the Middle Ages, and it was copied and versioned countless times. Its translation into popular languages other than Latin or Greek was a big step in the dissemination of all of this botanical and medicinal knowledge.

The first edition of the book was published in Antwerp in 1555. It was dedicated to Prince Philip II, for whom a special hand-painted copy was produced. Many other editions were published in Spain in the sixteenth and seventeenth centuries, and in the sixteenth century it was also reedited several times. One of these is the facsimile edition of the coloured copy for Phillip II that we have reviewed (Laguna 1991 [1555]). The original is conserved at the Spanish National Library and is available online (http://bibliotecadigitalhispanica.bne.es).

This book begins with the translation of Dioscorides' foreword and Laguna's annotations, where he presents the fundamentals of medical practice of his time. He founded his knowledge on his own first-hand observations and experiments and not only on the opinions of other scholars. He aimed to divulgate medical and phytotherapeutical knowledge while accurately identifying and describing simples. He tried to be in direct contact with the simples, mainly live plants, and had a collection of preserved plants (herbarium) as he explained on page 7:

> »*ansi las plantas, como los hombres, si se tienen perfectamente de conocer, jamas se deven perder de vista* (plants, like men, if you want to know them well, should never be lost sight of)... *Aprovecha... tener las yervas mesmas pegadas con cola en algunos cartones, como yo tengo infinitas exquisitas y raras: con la qual industria se conservan en su figura y color muchos siglos, como si fuessen embalsamadas*. (It is convenient to glue the plants to cardboard, as I have a lot of delicate and rare plants, preserved in their shape and colour over the centuries, as if they were embalmed)«

The work is structured in almost 900 chapters grouped in 6 books in which he described medicinal plants, animals and minerals. More than 70% of the chapters (633, Table 1) are devoted to medicinal plants or plant products. Although the book is dedicated to presenting medicinal simples, many food or technological uses are also mentioned. As the botanical identification of many species is problematic, we only considered it plausible to identify 529 taxa.

Each chapter begins with the official Spanish name, sometimes adapted by Laguna, and the chapter number in Roman numerals. This is followed by the Spanish translation from Greek of *Materia medica* by Dioscorides. He then included a list of names in different languages, such as Greek, Latin, Arabic, Castilian, Catalan, Portuguese, Italian, French and German. The list of names

Table 1. Books of Laguna's translation of Dioscorides' *Materia Medica,* number of chapters, pages and botanical illustrations (chapters and pages dedicated to plants are shown in brackets).

| Book | N. of chapters (about plants) | N. of pages (about plants) | Botanical illustrations | Content |
|---|---|---|---|---|
| 1 | 147 (all) | 1–122 (122) | 102 | aromatic herbs, oils, ointments, resins and other vegetal products, trees and shrubs |
| 2 | 177 (101) | 123–260 (80) | 124 | animals, animal products and herbs |
| 3 | 170 (all) | 261–374 (113) | 165 | roots, juices, herbs and seeds |
| 4 | 194 (all) | 375–501 (127) | 191 | herbs and roots |
| 5 | 140 (6) | 502–568 (6) | 1 | vine, wines and minerals |
| 6 | 69 (15) | 569–616 (7) | 0 | poisons |
| **Total** | **897 (633)** | **616 (455)** | **583** | |

is followed by his annotations, that include his original comments and observations on Dioscorides' text. The names of all the medicinal species mentioned in the annotations are handwritten in the margins. The annotations usually begin with a discussion about the identity of the plant, doubts about its determination and comments about other related species or species with the same name or use. He also gave the opinion of different classical authors and he finished with his own judgment. His additions almost double the original size of the translation itself.

As mentioned above, his knowledge was based on experimentation. In addition to his direct knowledge of plants, he liked to test plant uses not only on his patients but also on his own body. For instance, in the chapter on *chamaeleon albus* (*Carlina acaulis*), he described his own experience when he lived in Lorraine in 1542. He crushed the root in wine and drank it against the plague that killed so many people at that time. Another interesting example is when he could not sleep for two weeks, and an alleged witch helped him. She filled a pillow with henbane leaves and he slept for six hours straight. Finally, another anecdote deserves mention. He tested a witch's ointment on a frantic woman that could not sleep. It was prepared with hemlock, mandrake, henbane and *solano* (probably nightshade). She fell into a deep wonderful sleep that lasted 36 hours, and when she woke up, she was very upset and asked: *¿Por qué en mal punto me despertastes, que estaba rodeada de todos los placeres y deleites del mundo?* ('Why did you wake me up at such a bad moment, when I was surrounded by all the pleasures and delights of the world?') (IV book, chapter 75: p. 422)

Other remarkable comments are the local folk uses he observed during his life. Unfortunately, it is not always possible to know where or who practiced the uses he mentions. He seldom mentions if they were only practiced locally, were very common in the countries he travelled to, or if they were home remedies or prescribed by doctors. He reported, for instance, that aubergines were very important in Castile, especially in Toledo (IV, 77: 425) and that common hawthorn fruits were very common everywhere especially in Valle de Tejadilla near Segovia, and he commonly ate them as a child (I, 102:75).

Some of these uses have been practiced until recently or are still applied. For example, he mentions that many cooks used to boil milk with pennyroyal mint leaves to flavour it and prevent milk-borne infectious diseases (III, 32: 287). Several *Mentha* species were used for this purpose in the north of Spain until recently (Pardo-de-Santayana 2004; Menendez-Baceta et al. 2012). Similarly, he reports the use of holly tree bark as birdlime for hunting little birds (I, 101: 74), which was still common a few decades ago (Font Quer 1962; Blanco 1998; Pardo-de-Santayana 2008).

Among the new plants that appear in the annotations, American species are of special interest. Erroneously, he says that Plinius knew maize (*Zea mays*) (II, 88:186). The error came from its name, *Milium Indicum Plinio,* which made people think that maize was originally from India, and not from the West Indies. Other American species mentioned are *Liquidambar styraciflua* (I, 64: 49), *Guajacum officinale* (I, 109: 81) and *Anacardium occidentale* (I, 141: 115).

There are nearly 600 plant illustrations in the book (Table 1). As mentioned by Andrés Laguna, most of them were taken from the works of Andrea Matthioli (González Manjarrés 2000). The drawings in the special edition we have used for this study are coloured and of very high quality, and most of them are quarter-page size.

At the end, there are several non-paged appendices, such as a conversion table of ancient Greek units of measurement into sixteenth century units, and plant name indexes in ten different languages, including about 800 Spanish plant names. Some of them are direct translations from Latin names, but he also provided a considerable number of local names that can be regarded as one of the Laguna's most relevant contributions to Spanish Ethnobotany. These local names, together with his annotations have even been considered of great importance in the history of the Spanish language (Alvar 1991).

## Charles l´Ecluse's journey through Spain 1564–1565

The Flemish botanist and horticulturalist Charles l´Ecluse (1526–1609), also known by his Latin name Carolus Clusius, was born in the bosom of a distinguished family in Arras (Artois), in the northwest of the present-day France. He

studied Humanities, Law, Philosophy and Botany in many universities including Louvain and Montpellier. Other notable botanists, such as Jacques Dalechamps or Jean Bauhin, were his classmates in the latter university. After that, he lived in Paris, Antwerp and Louvain. In 1564, the prominent banker Anton Fugger entrusted him to accompany his two sons on a trip through Spain and Portugal. He then lived in Antwerp and Bruges (1566–67). He travelled to Paris and London again in 1571. In 1572, he moved to Austria, where he worked for Maximilian II in the court of Vienna, and then he moved to Güssing, Austria. He also lived in Frankfurt, where he worked for William II of Hesse, and finally in 1593 he moved to Leiden, where he was the *praefectus* of the Botanical Garden of the University (*Hortus Lugdunum-Batavorum*). He died there on the 4th of April 1609.

As mentioned above, Clusius travelled throughout the Iberian Peninsula for almost two years (1564–1565). More than ten years later in 1576, he published the book entitled *Rariorum aliquot stirpium per Hispanias observatarum historia* ['History of the rare species observed in Spain and Portugal']. This work, written in Latin, included 323 plant species and 225 drawings and can be considered the first flora of the Iberian Peninsula. A commented Spanish translation has recently been published (Ramón-Laca and Morales 2005) in which almost all the species described are identified. The work is pocket size (15 x 10 cm) and has two parts or »books«. The first one, with 244 pages, 65 chapters and 100 figures, describes trees and shrubs. The second book is about herbaceous and bulbous plants and has 264 pages, 102 chapters and 125 figures. The author describes one species and other related plants in each chapter, precisely indicating plant characteristics, collection sites, popular names and sometimes its uses. The work is very well documented and many Spanish plants, such as *Dracaena draco* (I, 1: 11), *Lavandula dentata* (I, 60: 232), *Lavandula multifida* (I, 61: 234) or *Sternbergia lutea* (II, 1: 251) were described for the first time.

Although his work was mainly devoted to describing plants, Clusius also mentioned many uses taken from ancient or contemporary authors and the local uses of fifty species he observed during his travels. A compilation of these plant uses and the places where they were recorded has recently been published (Ramón-Laca 2005). He reported the folk medicinal uses of 12 plants. For instance, *Ajuga iva* was used as a blood tonic, *Globularia alypum* against syphilis (*Scabie gallica*), *Pallenis spinosa* against inguinal tumours, *Gnaphalium luteo-album* was boiled in wine as an excellent remedy against intestine ache, and a *Lycium europaeum* decoction was used to alleviate gout pain (*podagra*). Some of the uses mentioned in the book have been practiced until recently and are registered in modern ethnobotanical surveys, like the use of *Thymelaea tinctoria* as purgative in Valencia (Pellicer 2004), where it even has a very similar modern local name (*merda cruix*). In other cases, the medicinal use has been forgotten and has not been recorded in

recent ethnobotanical works. That is the case of *Santolina rosmarinifolia*, whose decoction was considered useful in Castile against scabies or *sarna* according to Clusius. Only the local name of this species (*tomillo perruno*, literally 'dog thyme') seems to remain in the region (Aceituno-Mata 2010; Blanco 1998).

Regarding food plants, he mentioned the consumption of at least nine species, including three wild vegetables, *Atriplex halimus*, *Lycium europaeum*, and *Scolymus hispanicus*. The latex of the latter species was also used as a vegetal rennet and its flowers as a saffron substitute. He also says that the eating and selling of the acorns of *Quercus ilex* subsp. *ballota* was as common in Spain as eating chestnuts or hazelnuts in Flanders. Moreover, he mentioned that eating strawberry tree (*Arbutus unedo*) fruits was very popular among poor people, and they were even sold in markets. Their use has remained important in Spain until recently. They can be eaten raw or cooked to prepare home-made compotes or jams, and they are fermented or distilled to elaborate alcoholic beverages (Molina et al. 2011). He also reported the importance of some cultivated food plants such as olive tree (*Olea europaea*) and sweet potato (*Ipomoea batatas*), an American food plant that was already important at that time.

Below is a selection of other useful plants mentioned, grouped by their uses:

- Ornamentals: *Canna indica, Cercis siliquastrum, Iris xiphium, Melia azedarach, Myrtus communis, Philadelphus coronarius*.
- Timber: *Juniperus oxycedrus, J. phoenicea*, *Quercus ilex* subsp. *ballota*
- Firewood and charcoal: *Quercus ilex* subsp. *ballota, Cistus ladanifer, Flueggea tinctoria, Thymelaea lanuginosa*.
- Torches: *Quercus pyrenaica* young shoots.
- Wick: *Phlomis lychnitis* leaves.
- Cork: *Quercus suber*, for beehives, cork bungs and footwear.
- Basketry: *Lygeum spartum* and *Stipa tenacissima* leaves.
- Brooms: *Chondrilla juncea, Flueggea tinctoria, Mantisalca salmantica, Retama sphaerocarpa, Helichrysum italicum* and *H. stoechas*.
- Birdlime to hunt little birds: *Chondrilla juncea* roots.
- Fibre: *Agave americana* cultivated for its fibres that were used as thread to make hairnets or other woven materials and whose terminal thorns were used as needles.

## Monardes and Medicinal Plants from the West Indies (1574)

According to José María López Piñero (1989), Nicolás Monardes (1508–1588) was born in Seville in 1508. He studied Medicine, Arts and Philosophy at the University of Alcalá de Henares. After his studies, he returned to Seville and worked with the physician García Pérez Morales for 3 years. In 1537, he married his master's

daughter and became the doctor of almost all of his patients. In 1547 he received his doctorate in Medicine at the School of Santa María in Seville. Although he was considered the most important expert on American medicinal products, he never travelled to America. He obtained American products from people who arrived in Seville from the New World. Seville was of strategic importance at that time, since all the goods imported from the West Indies had to pass through the *Casa de Contratación* before being distributed throughout the rest of Spain.

Like modern ethnobotanists, Monardes used to interview all the travellers who arrived at the harbour of Seville. Many were eager to tell him about their adventures and findings and he was especially keen on interviewing those that sold him the »healing treasures« of the American Indians (Lozoya 2008). After 1553, he created a company for importing and selling American medicines. He had a garden where he cultivated many medicinal plants, including some of these recently introduced plants, such as sunflower and tobacco. He also acquired experience with these new medicines by using them on his patients for over 40 years in Seville (López Piñero 1989).

Although Monardes published several important books, his most significant and famous work was first published in its complete form in 1574. This book compiled the three parts of his medicinal history (the first two parts were previously published in 1569 and 1571, respectively), and included three other shorter items. It was entitled *Historia medicinal de las cosas que se traen de nuestras Indias Occidentales* ('The medicinal history of the things brought from our West Indies'). The book was based on his medical experiences with the recently arrived American medicinal products, mostly plants and plant products. It was soon translated into several European languages, such as Latin and English. The Latin translation was done by Charles de l'Écluse, whereas the English version, entitled *Joyful News out of the New Found World*, was written by John Frampton. This made Monardes the most important figure in all of Europe in the dissemination of knowledge about the American *materia medica*, especially plant species, and their therapeutic and clinical effects spread quickly.

Due to the relevance of his works, Monardes has been considered one of the fathers of pharmacognosy, as he always tried to give a detailed description of medicinal plants, which is a rule in modern pharmacognosy (López Piñero 1989). For instance, in the case of Michoacan root (probably *Convolvulus mechoacan*), Monardes was not satisfied until he obtained the plant in order to write a precise description. In fact, he wrote the first major description of several plant species like tobacco, coca or sunflower (Gunn 2003). He also described animals, such as armadillo, and some minerals.

The book is 20 x 15 cm and about 260 pages, some of which are unnumbered, are devoted to American products. It only includes 13 simple drawings. The first

Table 2. Selection of American species that are currently global commodities mentioned in Monardes (1574).

| Scientific name | English/ original Spanish name* | Use | Page** |
|---|---|---|---|
| Ananas comosus | ananas/ piña | Edible fruits good for the stomach, aperitive and heart tonic. | 100b |
| Arachis hypogaea | peanut/ fruta que se cria debaxo de tierra | Underground fruits taste similar to hazelnuts, usually roasted. | 104 |
| Capsicum annuum | pepper/ pimienta de las Indias | Vegetable and condiment, better and cheaper than black pepper. Some medicinal properties are described. Well known throughout Spain at that time. | 24b |
| Erythroxylum coca | coca/coca | Stimulant, leaves chewed with ground shells, sometimes together with tobacco. | 114 |
| Helianthus annuus | sunflower/ yerba del sol | Ornamental | 109b |
| Ipomoea batatas | sweet potato/ batata | Nutritious edible root, consumed cooked or roasted, widely cultivated in the South of Spain at that time. | 117 |
| Manihot esculenta | cassava/ caçavi/ yuca | Staple food. Some varieties are deadly toxic and need to be previously cooked. | 115b |
| Nicotiana tabacum | tobacco/ tabaco | Multipurpose medicinal plant (heals wounds, asthma, etc.) and ornamental. | 41 |
| Psidium guajava | guava/ guayaba | Pleasant fruit, very common in America. | 101 |
| Tropaeolum majus | Indian cress/ capuchina | Ornamental plant for pots and gardens. | 102b |
| Zea mays | maize/ mayz | Bread-making flour, as nutritious as wheat. | 117 |

*Spanish name that appears in Monardes (1574).

**Since the front and back side of each page have the same page number, the letter b indicates the back side.

part has 77 pages and 21 unnumbered chapters, most of which are dedicated to one main product. The second part has 114 pages and 14 longer chapters, while the third part has 54 pages and 35 short chapters. There is a two-page index that lists all 70 chapters at the end of the third part.

Sixty-two American plants are described in the whole work. Table 2 presents a selection of some of the most relevant examples. As mentioned above, many species of the American pharmacopeia first became known in Europe through him. He introduced many important medicinal species such as Michoacan root used as a purgative and American sarsaparillas (*Smilax* spp.), used against syphilis. Another interesting medicinal plant is paico or Mexican tea (*Chenopodium ambrosioides*), which Monardes mentioned as helpful in treating stomach aches (*dolor de ijada*). Interestingly, Mexican tea can still be found in many Spanish home gardens, especially in western Spain where its infusion has been commonly drunk for treating digestive disorders (e.g. Pardo-de-Santayana et al. 2005; Criado et al. 2008; Velasco et al. 2010). Nevertheless, he also mentioned other non-medicinal plants, both edible (e.g. maize, cassava, pepper) and ornamental (e.g. sunflower, Indian cress). (Table 2)

Some of the most important food plants of America are mentioned in the chapter called »Del caçavi«. The first one is cassava or yucca (*Manihot esculenta*), »the bread of the Indians and many of the Spanish settlers of that time«. Nowadays, it is the world's fourth most important staple after rice, wheat and maize and is an important component in the diet of over one billion people, especially in tropical regions (FAO 2000). He explained that the root must be peeled, grated, washed and cooked to prepare a kind of cake used as bread. He also warned that the uncooked juice of the cassava is poisonous, although there were some non-toxic varieties. For these reasons, he said that he preferred maize (*Zea mays*), another very abundant species in America. He reported that maize was as nourishing as wheat and was also used to make a kind of bread that had to be eaten fresh. Monardes mentioned that sweet potato (*Ipomoea batatas*) was habitually consumed and cultivated in Spain at that time, as reported by Clusius. Finally, a specific chapter is devoted to pepper (*Capsicum annuum*), another food plant that was commonly cultivated in Spain. It was used as a vegetable and condiment and, according to Monardes, it was better and cheaper than black pepper. Some medicinal properties are also described.

A 15-page chapter is devoted to tobacco (*Nicotiana tabacum*) and includes a detailed description of the plant and its uses. Monardes explained that this plant was first brought to Spain as an ornamental but later began to be used for its wonderful medicinal virtues, such as healing wounds, or against headaches and chest pains. In most cases, whole or crushed leaves were heated and applied on the affected part of the body. He also reported that Indians used to smoke it as a kind

of stimulating drug and that this habit was incipiently spreading among black slaves as well as among some Europeans.

Finally, a brief chapter was dedicated to coca (*Erythroxylum coca*), a very popular stimulant plant among the Indians. Monardes explained how they chewed the leaves of the plant with burned and ground shells when they wanted to fight against weariness, hunger and thirst and how they chewed them with tobacco when they wanted to get drunk.

Another Spanish physician that studied the useful American plants might have been considered the most important figure in Spanish ethnobotany had it not been for his complicated fate. Francisco Hernández was sent by King Phillip II to New Spain (Mexico) to compile all possible information about medicinal plants and other resources. Thus, from 1570 to 1577 he interviewed many Indian healers and some Spanish colonists settled in Mexico. He described more than 3,000 different species and their uses in more than 30 volumes and conducted experiments on his Mexican patients. Unfortunately, his bad health did not allow him to publish these volumes, and his work was only partially available (Pardo Tomás 2005). Nowadays, he is considered as one of the pioneers of the Mexican ethnobotany (McClung-de-Tapia 1990).

## History of Plants by Bernardo Cienfuegos (c. 1630)

Bernardo Cienfuegos (c. 1580–c. 1640) was one of the most important Spanish botanists of the seventeenth century. Son of an alchemist, he was born at the end of the sixteenth century in Tarazona, a town located in the western part of the province of Zaragoza, Aragon. He studied Medicine in Alcalá de Henares, where he taught Humanities in 1599. At the end of the seventeenth century, he left the University and devoted the rest of his life to the study of plants. He travelled throughout Spain (Aragon, Castile, Murcia, Valencia and Catalonia) and he finally settled in Madrid, where he died around 1640 (Arévalo 1935; Blanco et al. 1994).

His unpublished work *Historia de las Plantas* ('History of plants') was written in the first half of the seventeenth century. These manuscripts (mss 3357 to 3363, see Table 3) are conserved at the National Library of Spain in Madrid, and the first volume is available online at bibliotecadigitalhispanica.bne.es. This work has never been published and much of its botanical and ethnobotanical information remains virtually unknown. Nevertheless, the work of Cienfuegos was well-known by several famous botanists in the following centuries, such as José Cavanilles and Ignacio Jordán de Asso (Colmeiro 1858). Cavanilles even dedicated the genus *Cienfuegosia* to him.

Cienfuegos' work was an effort to summarize the botanical knowledge of his time in a widely documented treatise. He used the many works which he had in-

Table 3. Volumes and manuscript number of *Historia de las Plantas* [History of plants] by Cienfuegos (c. 1630), number of pages, botanical illustrations and main content.

| Volume (manuscript number) | N. of pages (folios + numbered pages) | Botanical illustrations | Main content |
|---|---|---|---|
| 1 (3357) | 49f + 887 | 126 | Cereals |
| 2 (3358) | 36f + 1200 | 1 | Bulbous plant |
| 3 (3359) | 494f | – | Different species (many Labiatae) |
| 4 (3360) | 40f +1079 | 140 | Legumes and related plants |
| 5 (3361) | 535f | 323 | Only pictures |
| 6 (3362) | 35f +1178 | 238 | Pastures |
| 7 (3363) | 34f + 681 | 99 | Garden vegetables |
| **Total** | **1223f + 5025** | **927** | |

herited from his father and grandfather about medicinal plants and herbals written by the most important authors of his time. The result was more than 4,700 handwritten pages including 847 chapters that are divided into seven volumes that somehow follow the botanical families or groups: cereals, bulbous plants, legumes and pastures. He considered some of them to be completed, while others were only provisional (mss 3359, 3360 and 3361). They contain almost 1,000 colour and black and white plant drawings. Some of them are original, while others were inspired in other authors. He refers to about 700–800 different species, about only 300 of which can be easily identified. [Insert Table 3 approx. here]

The name of each plant is given in several languages, such as Castilian, Portuguese, Catalan, English, French, German and Arabic, and a very detailed description is provided of the plants, their habitats, uses and applications. As customary at that time, he compared his plant descriptions with those of other authors, both classical (e.g. Teophrastus, Dioscorides, Plinius) and contemporary (e.g. Carolus Clusius, Hieronymus Bock, Rembertus Dodonaeus). He also mentioned many plants which had been recently introduced from the New World. Regarding American plants he said: »[many plants of the West Indies] are so widely introduced in Spain and in almost all Europe [...] that they cannot be called strangers but ours, because they grow very abundantly in Spain. One of them is the sweet potato«. Like Monardes, he cultivated plants to make pharmaceutical preparations, such as calamint (*Calamintha nepeta*) for making calamint-oil.

A lot of medicinal plant uses are cited following the Hippocratic medicine of the humours. Most of this pharmacopoeia was inherited from classical authors, and it is not clear if these plants were used at that time in Spain. He mentioned

the digestive medicinal use of penny royal (*Mentha pulegium*) and closely-related Hart's penny royal (*Mentha cervina*), saying that the latter is more efficient than the former, according to the opinion of the physicians of Montpellier (ms 3359, 140b).

The consumption of the fruits of the nettle tree (*Celtis australis*, »*almez*« in Spanish) is a good example of uses that were clearly practiced in Spain in the seventeenth century. He observed that they were given to children in Aragon as a medicinal food when they overate and had a stomach ache to aid in their digestion (ms 3363: 129). Cienfuegos also reported many original data about food, preservatives, fodder, fertilizer and ornamental plants. For instance, regarding the local consumption of some wild vegetables, he mentioned the use of the rounded-leaved sorrel (*Rumex scutatus*) as a raw vegetable in Aragon and even it being sold in the city of Zaragoza in spring (ms 3359: 51). He also cited the local consumption in stews of other wild vegetables, such as *Allium ampeloprasum*, *Rumex pulcher*, *Anchusa azurea* and *Silene vulgaris*, particularly important in times of scarcity (ms 3358: 521). Moreover, he mentioned the consumption and marketing of several wild mushrooms, such as *Terfezia* spp., *Lactarius deliciosus*, *Morchella esculenta* and *Pleurotus eryngii* in the city of Madrid (Ramón-Laca and Tardío 2005).

## From the 17th Century to Current Research

Many other Spanish authors were interested in plant uses, and their works have inspired modern Ethnobotany. José Quer (1695–1764) was born in Perpignan, where he studied Medicine and Surgery. He worked as a military surgeon of the Spanish army and travelled along the Mediterranean through Spain, France, Italy and northern Africa. He was the first director of the Royal Botanical Garden of Madrid (1755–1764) where he grew more than 2,000 plants collected during his travels (Colmeiro 1858). In 1762 he published the first volume of his work *Flora española o historia de las plantas que se crían en España* ['Spanish Flora or history of the plants that grow in Spain'], but he died in 1764, after having published only four volumes. The last two volumes were published 20 years later in 1784 by Casimiro Gómez Ortega, a renowned botanist who directed the Botanical Garden for nearly 30 years (1772–1801), after Quer's successor, Miguel Barnades.

As Quer was a fervent defender of Joseph Pitton de Tournefort and Carl Linnaeus's system prevailed, his work did not achieve the renown it deserved. The work described 2,355 species, one third of which are included in the four volumes written by Quer, and was illustrated with more than 200 botanical drawings. The description of each species includes its botanical name, synonyms, vernacular names, a description of the plant, its ecology, a list of places where it grows and its uses. Some species have a section called *Analysis Chymica* that reports Quer's

own chemical analyses and the medicinal uses of the species. This section was very modern and innovative for his time, and his chemical analyses were pioneer in Spain at a moment when there was no official chemistry laboratory in Madrid and the construction of one was only in the planning phase (Quintanilla 1999: 278). It is a vast and encyclopaedic work in which the authors compiled and discussed the opinions of the most important authors of their time, previous authors and their own knowledge and experiences.

Although Quer's Flora mainly compiled the uses mentioned by other authors, it also includes many interesting uses that were practiced in Spain at that time. Unfortunately, in many cases it is not possible to know whether the uses were practiced at the time of writing or not. For instance, he reported that pepper (*Capsicum annuum,* volume 4: p. 1) was popularly cultivated in the south of Spain (Extremadura, La Mancha, Valencia, Murcia and Andalusia), and he described 14 different varieties. He explained that the dried fruits were ground in special mills to produce paprika. This work also reported that safflower *(Carthamus tinctorius,* 4: 51) was commonly marketed and cultivated in La Alcarria (Guadalajara, Central Spain), since its inflorescences were used for dying silk and feathers, and women used it as a cosmetic to add a red colour to their cheeks that was called Spanish Red outside Spain. Many other interesting data are mentioned, such as the popularity of chicory (*Cychorium intybus,* 4: 246). It was sold in the markets of Madrid all year long, even though people appreciated it the most in Zaragoza. They ate it raw, boiled or drank its infusion (4: 250).

Another outstanding author was the Valencian botanist Antonio José Cavanilles (1745–1804) who also directed the Royal Botanical Garden of Madrid (1801–1804). He studied Philosophy and Theology in Valencia and was ordained a priest in Oviedo in 1772. He lived in Paris from 1777 to 1781. There he contacted Antoine-Laurent de Jussieu and began his botanical carrier. He travelled through Spain studying its flora, especially in his home region of Valencia (Colmeiro 1858). In his work *Observaciones sobre la Historia natural, Geografía, Agricultura, población y frutos del reíno de Valencia* ['Observations on the Natural History, Geography, Agriculture, population and fruits of the Kingdom of Valencia'] (1795–1797), he described the landscapes and main agrarian and forestry resources of the villages he visited. The book provides details on the production of each crop (e.g. wheat, grapevine, olive, mulberry and carob trees) in each locality and gives complete ethnobotanical descriptions, such as the antidote against viper bites (volume 1, p. 79) prepared with *Alyssum spinosum, Eryngium campestre, Echium vulgare*, and *Micromeria fructicosa*, or how the fibre of maguey (*Agave americana*) was obtained from its leaves (1: 226). He also made sharp comments about the inappropriate and unsustainable exploitation of trees and the unsatisfactory selection of crops for certain soils. For instance, he criticized the way

mulberry trees were pruned in the Huerta of Valencia since it produced wounds which could kill the trees. He also censured the excess cutting of trees to obtain firewood or timber and the inappropriate cultivation of rice fields in places without enough water. He even wrote many interesting articles devoted to the importance of the cultivation of *chufa* (*Cyperus esculentus*) (Cavanilles 1801: 234) and peanut (*Arachis hypogea*) (Cavanilles 1804: 206).

At the beginning of the nineteenth century, Spanish botanists began to focus their attention on plants of economic interest. Thanks to the surveys of Mariano Lagasca (1776–1839) and Simón de Rojas Clemente (1777–1827), important collections of the plants cultivated in Spain at that time are kept in the Royal Botanical Garden of Madrid (Téllez Molina 1976). The herbarium collection called *Herbario de la Ceres Hispanica* gathered from 1803–1837 includes 3,000 vouchers of wheat, 175 of oats, 190 of grapevine and 100 of olive tree (Real Jardín Botánico 2011). Lagasca (1817) also wrote an interesting book about the plants used to obtain soda and potash ash.

Spanish wild plants also received attention during this century. They attracted prestigious European botanists, such as the Swiss Pierre Edmond Boissier (1810–1885) and the German Heinrich Moritz Willkomm (1821–1895) who travelled through Spain and published their findings (Boissier 1839–1845; Willkomm and Lange 1861–1880). Although their works were mainly devoted to the description of Iberian flora, they also compiled the vernacular names and some plant uses learnt during their voyages.

For instance, Boissier, who first described the Sierra Nevada endemic *Artemisia granatensis*, wrote that this species was sold in the city of Granada and nearby areas in his *Voyage botanique dans le midi de l´Espagne pendant l´année 1837* ['Botanical travel to the South of Spain during the year 1837'] (1839–1845). He also said that it has a similar, but stronger aroma than other alpine species of the same genus which were called *genipi* and used similarly (Boissier 1839–1845). Interestingly, modern ethnobotanical surveys have shown that these species are still highly valued in both the Alps and the Sierra Nevada region (González-Tejero 1989; Pieroni and Giusti 2009). *Artemisia granatensis* has been illegally marketed even though the species became officially protected in Spain in 1982 (Pardo-de-Santayana and Morales 2010). Furthermore, Willkomm (1844) reported the great importance and versatility of esparto grass (*Stipa tenacissima*) that was used for weaving mats, baskets, mule packsaddles, seats, ropes and sandals.

The work of the Galician botanist Miguel Colmeiro (1816–1901) also deserves a few lines in the history of Spanish ethnobotany, since the five volumes of his work *Enumeración de las plantas de la Peninsula Hispano-Lusitana é Islas Baleares, con la distribución geográfica de las especies, y sus nombres vulgares, tanto nacionales como provinciales* ('Enumeration of the plants of the Spanish-Lusitanic

Peninsula and Balearic Islands, with the geographical distribution of the species, and their popular names, at both the national and provincial scale'] (1885–1889) are a very useful tool. He compiled all the available information on the plants that grew in Spain including their vernacular names. As he always mentioned which author reported each name, this work can lead us to the original sources to check the origin of the names and, in some cases, the local uses of these species.

The work of José Pardo Sastrón (1822–1909), an Aragonese botanist and pharmacist born in Torrecilla de Alcañiz (Teruel), should be highlighted as well. In fact, he has been acknowledged as a pioneer of Aragonese and Spanish ethnobotanical studies (Saénz Guallar 2000) since his catalogue of the plants of his home village (Pardo Sastrón 1895, 1901) could be considered the first Spanish systematic ethnobotanical survey. He recorded the folk uses and names of more than 400 species, probably influenced by the Folk-lore Societies that arose in Spain at that time (Saénz Guallar 2000).

Finally, the Catalan botanist Pío Font Quer (1888–1964), who has been called the father of Spanish ethnobotany (Blanco and Morales 1994) must be mentioned. He studied chemistry and pharmacy in Barcelona, where he combined an academic career as a botanist with a professional career as a pharmacist. He was a professor of Pharmacy and Botany in Barcelona and worked in the Natural History Museum of Barcelona where he became the director in 1921. In 1911 he became an army pharmacist and was stationed in several places including Morocco. After the Spanish civil war (1939), he was accused of not joining the military rebellion as he was a military pharmacist and was imprisoned for a year. He lost his position and all of his honours, but still continued a fruitful scientific production. In fact, he published his most relevant works: the *Diccionario de Botánica* ('Botanical Dictionary') (Font Quer 1953), which is the main reference of scientific botanical terminology in Spanish, and *Las plantas medicinales. El Dioscórides renovado* ('Medicinal plants, the renovated Dioscorides'), a best-seller that has been published and re-edited several times (Font Quer 1962). Although it was published 50 years ago, this work is still a reference for people interested in Iberian medicinal plants.

Fig. 1. Pío Font Quer (1888–1964).

The book was devoted »not only to physicians and pharmacists, but to everyone interested in the study of plants and their virtues« (Preface). He described the medicinal plants that grow in the Iberian Peninsula, indicating their vernacular names, where they grew, their medicinal uses and active principles and their history, including Laguna's translation of Dioscorides and his annotations,

and the opinions of many other authors. It includes over 680 medicinal plants grouped in families that are ordered taxonomically, and almost all of them are illustrated with a drawing.

He showed an unusual interest in local knowledge at a time when it was generally denigrated in Spanish universities and academic environments. When he went on botanical trips, he used to speak with the local people, registering local plant names and uses. He published an article called 'The science of a wild goat hunter' (*sovatger* in Catalan) (Font Quer 1916) whose title pioneers the idea of ethnoscience. His treatise on medicinal plants gathered many of his original ethnobotanical observations including many medicinal uses reported by the *sovatger,* such as the febrifuge and aperitive properties of gentian (*Gentiana lutea*). The book includes more than 1300 names in Spanish, Portuguese, Galician, Catalan and Basque, many of which were local names compiled during his field trips (Bolòs and Bolòs 1968). Interestingly, the first Spanish publication in which we found the term *etnobotánica* (ethnobotany) is in the biography of Font Quer written by Bolòs and Bolòs (1968), when they refer to his interesting original ethnobotanical observations.

However, the first modern ethnobotanical work, i.e. a systematic survey of local plant knowledge and practices with reliable botanical identification, did not appear in Spain until the 1980's (Villar 1997). In 1982, José María Palacín defended his degree thesis called 'The plants in the folk medicine of High Aragon'. He later published several works in collaboration with Luis Villar (e.g. Palacín et al. 1984; Villar et al. 1987). In 1985, M. Reyes González-Tejero defended her degree thesis called »Ethnobotanical investigations in the municipality of Güejar-Sierra (Granada)« mainly devoted to the local use of medicinal plants for human medicine. Two years later Luis Mulet (1987) published a book on the pharmaceutical ethnobotany of L'Alt Maestrat (Castellón).

Since then, Ethnobotany has grown rapidly in Spain. A key event was the First Congress of Ethnobotany in 1992. It was held in the Botanical Garden of Córdoba where an ethnobotanical museum was inaugurated during the event. This interest has led to the creation of research groups in universities and research centres in many cities (e.g. Albacete, Alicante, Badajoz, Barcelona, Granada, Madrid and Murcia). More than 30 PhD theses and a number of surveys throughout the country are good examples of the great interest evoked by this discipline in Spain in recent decades (Morales et al. 2011). Graduate, postgraduate and courses at all levels are being conducted in universities (e.g. Universidad Autónoma de Madrid, Universitat de Barcelona, Universidad de Murcia), schools and other places. Great interest has been shown in developing instructive material on ethnobotanical knowledge for schools (Verde and Fajardo 2003), and it is a common tool used in environmental education.

## Conclusions

In Spain, as in many countries, botanists have been precursors of modern ethnobotanists, since Botany was originally devoted to plant uses. Plants were first classified to organize the knowledge about their uses. However, much of the Iberian local plant knowledge of the past will always remain unknown, as it became lost before researchers could record it. Thus, we cannot know what portion of this knowledge has reached our era. We only have brief glimpses, scattered through herbals, works of botanists, ethnographers and travellers.

These authors mainly compiled the uses mentioned in ancient, medieval or contemporary texts with the aim of spreading the knowledge about plant uses. Unfortunately, when they reported their original information, they seldom indicated precisely where or by whom the uses were practiced or from which author they took the information. In fact, we can seldom be sure, as shown by several examples in this chapter. Interestingly, we found that Clusius is one of the authors who recorded more local uses practiced in Spain in the sixteenth century. It seems that as he travelled through a foreign country, the differences and similarities with his previous experiences attracted his attention. The same can be said about Monardes or Hernández when they speak about American plants.

Although historical texts provide only brief glimpses of past plant uses, they are very helpful for understanding the historical development of human plant use. This chapter shows many examples of how local practices have evolved. Local knowledge is not static, but adaptive and open to experiences with new species as shown with the fast adoption of some American plants. This chapter also shows examples of plant uses that have remained invariable throughout centuries. Many have only been abandoned recently, due to social and economic changes.

Even though most of this knowledge is no longer put into practice, it is essential to record it before it is too late. Both this knowledge and the practices concerning nature and the universe are recognized as an important part of our cultural heritage since they are inextricable components of culture, and therefore, worthy of being protected and sustained (Pieroni et al. 2006).

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