

Study of the beekeeping flora of the department of Fray Mamerto Esquiú, Province of Catamarca, Argentina

Abstract

Each region has its own floristic characteristics relative to its geographical position. The specificity of the vegetation and the particularities of each flora require knowledge of the beekeeping flora to determine the forage supply for bees. Where, beekeeping production in the Fray Mamerto Esquiú department (Catamarca, Argentina) is based on the diversity of plant species of the place, composed of the native beekeeping flora, the natural forest and different types of crops (forage, fruit trees, vegetables and ornamentals). The flora is the only resource that bees have to produce honey and other bee products (wax, mead, propolis, etc.), where the botanical resource gives these products particular physicochemical and organoleptic characteristics. The objective of this work is to determine the beekeeping flora present in the Fray Mamerto Equiú department. Expeditions were made during all four seasons. 58 species with beekeeping aptitude were inventoried and identified, represented by 20 botanical families, the most abundant being Asteraceae, Lamiaceae, Rutaceae, Fabaceae and Rosaceae. A higher percentage of herbaceous plants was observed, mainly due to exotic forage agricultural herbs implanted and domesticated, being able to observe a flowering period that extended throughout the months of March, April, May, June, July, August and September, with a maximum between mid-July to September onwards. The biodiversity of beekeeping flora present in the Department of Fray Mamerto Esquiú establishes a sustained pollen offer throughout the year, and obtaining honey and other beekeeping products with differentiated characteristics according to their botanical origins would add a plus for their commercialization.

Keywords: bee, honey, pollen, mellifera

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Introduction

Beekeeping is a productive activity that man has developed through the years; previously beekeeping was considered as only a secondary activity in peasant production, but today it can be established as an alternative for family farmers; because it can be developed in a small space, requires a minimum investment and what is more relevant is that it can be carried out alternately with other agricultural activities, while providing products of excellent nutritional quality to the daily diet. of families, favors the inclusion of young people and women who are the future multiplier actors of said activity.¹

On the other hand, it is important to remember that bees carry out pollination on their journey to produce honey, a process of fundamental importance for agricultural production.² In addition, with the analysis of the pollen content of honey, it is possible to know what its botanical origin is. In this sense, melissopalynology deals with the study of the pollen contained in honey and transported by bees.³ Knowledge of the pollen of the various plant species in the area where the hives are located is almost always essential as reference material for a good melissopalynological analysis, essential to determine the botanical origin of honey and establish its quality.

In addition, as each region has its own floristic characteristics related to the geographical position. The specificity of the vegetation and the particularities of each flora require knowledge of the beekeeping flora to determine the forage supply for bees. The development of beekeeping in the department of Fray Mamerto Esquiú (Province of Catamarca, Argentina), has had different moments in which its traditional character has always been evident, based mainly on local knowledge and traditional practices. The diversity of plant species in the place where the hives are located imprint particular

physicochemical, organoleptic and botanical characteristics on the honey. The flora is the only resource that bees have to produce it, so its knowledge is of utmost importance for the rational management of the apiary.⁴ Beekeeping production has a transcendental impact on agricultural, livestock and forestry production, by generating significant ecological benefits, such as the pollination of crops and other floral species, which describe it as a primary tool for the conservation, recovery of these resources and makes it a fundamental part of sustainable production systems.¹

The knowledge of the beekeeping flora will allow the generation of management strategies, maintenance and survival of the hives, in the period of greatest floral scarcity. The presence of beekeeping species is essential in the areas where it is intended to have bees, since these require support species that provide pollen or nectar and contribute to the maintenance of the hive, many of them being able to fulfill this function in winter times where the majority of plant species do not bloom. The plants that are used by family farmers on their farms are highly diversified and can include species for fodder, fruit and vegetable, medicinal and ornamental uses that bloom excessively, producing abundant amounts of nectar or pollen, allowing bees to collect surpluses that are they turn into honey and pollen that the beekeeper can harvest. For the conservation of local biodiversity, it is essential to know the beekeeping flora present, for which this work aims to survey the beekeeping flora in the department of Fray Mamerto Equiú (Province of Catamarca, Argentina) and record the species visited by *Apis mellifera* L.

Material and method

Work was carried out in the department of Fray Mamerto Esquiú, which is part of the central region of the Province of Catamarca,

bordering to the east with the Sierras Gracianas, to the west with the Sierras de Fariñango, to the north with the Sierras de Gracianas and Fariñango, and to the south with the Valle Viejo department. The vegetation present in the department corresponds to the Chaco phytogeographic province. Both slopes of the mountains are vegetated by forests of the Chaqueño Serrano District, while at the bottom of the Valley there are expressions of this district and of the Chaqueño Árido de Llanura, which give this area a considerable floristic wealth.⁵

In order to determine the beekeeping flora, expeditions were carried out during the 4 seasons of the year and tours of the farms and public spaces (squares, spas, etc.) in the months of March to September (autumn-winter), and in the native forest throughout the year (January to December). The species with beekeeping aptitude were inventoried, those that were in bloom and were visited by bees were recorded by direct observation, which was later corroborated with the bibliography. The taxonomic identification of the species was carried out and the common names and those assigned to them by

family farmers were recorded. The photographic record of the species and the activities carried out was also carried out.

Results and discussion

The results obtained are presented in Table 1, which indicates the species surveyed, the botanical family to which they belong, scientific name, common name, use and origin of the same.⁶ 58 species were identified, represented by 20 botanical families, being 5 (five) the most abundant families with beekeeping aptitude. The most represented families in the supply of entomophilous flowering were Asteraceae, Lamiaceae, Rutaceae, Amaranthaceae, Fabaceae and Rosaceae (Figure 1), results similar to those obtained by Forcone⁷ in the Lower Valley of the Chubut River, in Argentine Patagonia. The surveyed species coincide with those found in Rafaela, Santa Fe Province.⁸ A higher percentage of herbaceous species (67.2%) was observed, while 24.1% were tree species and 8.6% shrub species.

Table 1 Flora with beekeeping potential of the Department of Fray Mamerto Esquiú, Province of Catamarca, Argentina

Family	Scientific name	Name common	Flowering	Use	Origin
	<i>Alternanthera pungens</i> Kunth	Yerba de pollo	April-June	Medicinal	Central and South America
	<i>Gomphrena boliviana</i> Moq.	Only	April-June	Weed	America
Amaranthaceae	<i>Chenopodium álbum</i> L. Bosc ex Moq.	Quinoa	March-June	Horticultural	Europe
	<i>Chenopodium multifidum</i> L.	Paico	March-April	Weed	South America
Anacardiaceae	<i>Schinus areira</i> L.	Terebinth	May-July	Forest	South America
	<i>Bidens pilosa</i> L.	Dry love	March-July	Weed	Europe
	<i>Cichorium inthibus</i> L.	Chicory	March-May	Horticultural	Europe
	<i>Baccharis salicifolia</i> (Ruiz y Pav.) Pers.	Chilca	March-May	Medicinal	America
	<i>Conyza bonariensis</i> (L.) Cronquist	Mata negra	August	Weed	Central and South America
	<i>Cirsium vulgare</i> (Savi) Ten.	Black thistle	March-Sep.	Medicinal	Europe, Asia and North Africa
Asteraceae	<i>Anthemis cotula</i> L.	False chamomile	May-Sep.	Weed	Europe and North Africa
	<i>Sonchus oleraceus</i> L.	Lock	March-Sep.	Weed	Europe
	<i>Taraxacum officinale</i> (L.) Weber ex F.H.Wigg.	Dandelion	March-Sep.	Medicinal	Europe
	<i>Flaveria bidentis</i> (L.) Kuntze.	Fique	April-May	Medicinal	South America
	<i>Zinnia peruviana</i> L.	Field Chinita	April-June	Ornamental	North and South America
	<i>Verbesina encelioides</i> (Cav.) Benth. & Hook. f. ex A. Gray	Quellosisa - sunflower	August-Sep.	Weed	North America
	<i>Brassica</i> spp. L.	Mostacilla	March-Oct.	Weed	Europe and Asia
Brassicaceae	<i>Eruca vesicaria</i> (L.) Cav.	Arugula	March-Nov.	Horticultural	Europe and Asia
	<i>Raphanus sativus</i> L.	Radish	Feb.- Oct.	Horticultural	Southern Europe, North Africa and West Asia
	<i>Convolvulus hermanniae</i> L'Hér.	Tinker Bell	April-Sep.	Weed	America
Convolvulaceae	<i>Ipomoea alba</i> L.	Lady of the Night	May-July	Ornamental	Central and South America
	<i>Ipomoea indica</i> (Burm.) Merr.	Bluebell	April-Sep.	Weed-ornamental	Hawaii and tropical areas of America
	<i>Trifolium repens</i> L.	White clover	March	Forage	Europe, North Africa and Asia
	<i>Medicago sativa</i> L.	Alfalfa	April-Sep.	Forage	Persian
Fabaceae	<i>Melilotus albus</i> Medik.	White sweet clover	March-April	Forage	Europe and Asia.
	<i>Nasturtium officinale</i> W.T.Aiton	Watercress	May-Sep.	Horticultural	Europe and Central Asia.

Table Continued..

Family	Scientific name	Name common	Flowering	Use	Origin
Lamiaceae	<i>Hyptis mutabilis</i> (A.Rich.) Briq.	Matico	March-April	Weed	America
	<i>Leonurus sibiricus</i> L.	Lion's tail, Four songs	April-June	Weed, medicinal	Asia
	<i>Lamium amplexicaule</i> L.	Mansa Nettle	May-July	Weed	Euroasia
	<i>Rosmarinus officinalis</i> (L.) Schleid.	Rosemary	March-June	Aromatic	Mediterranean and Caucasus
	<i>Tymus vulgaris</i> L.	Thyme	March-June	Aromatic/ medicinal	Africa and Middle East
	<i>Mentha spicata</i> var. <i>Rotundifolia</i> L.	Yerbabuena	June-August	Aromatic/ medicinal	Europe
Lauraceae	<i>Persea americana</i> Mill.	Avocado	July-Sep.	Fruit	Central America
Liliaceae	<i>Aloe maculata</i> All., Forssk., Thunb.	Aloe	July-Sep.	Medicinal	South Africa
Malvaceae	<i>Sida rhombifolia</i> L.	Broom mallow, Thrush	March-July	Weed	Weed Tropical and subtropical zones
	<i>Sphaeralcea bonariensis</i> (Cav.) Griseb.	Malva Blanca	March-May	Weed	Argentina, Bolivia, Paraguay and Uruguay
Moraceae	<i>Morus alba</i> L.	Blackberry	August-Sep.	Fruity	Asia
Myrtaceae	<i>Eucalyptus</i> spp. L'Hér.	Eucalyptus	March-Oct.	Forestry/ Medicinal	Australia and New Guinea.
Oleaceae	<i>Olea europea</i> L.	Olive tree	August-Sep.	Fruit	Mediterranean
Oxalidaceae	<i>Oxalis conorrhiza</i> Jacq.	Yellow vinegar	April-June	Weed	Argentina, Brazil, Paraguay and Uruguay.
Plantaginaceae	<i>Plantago</i> sp. L.	Llanten	July-Sep.	Medicinal	Europe
	<i>Rivina humilis</i> L.	Sangre de Toro	May-July	Weed	America
Portulacaceae	<i>Portulaca confertifolia</i> Hauman	Portulaca	May-June	Ornamental	Endemic
	<i>Portulaca grandiflora</i> Hook.	Purslane	May-June	Weed	South America
Salicaceae	<i>Salix humboldtiana</i> Willd.	Willow Creole	August-Sep.	Forestry	America
	<i>Populus</i> sp. L.	Silver Poplar	Jul-Sep.	Forestry	Temperate regions of the northern hemisphere
Solanaceae	<i>Salpichroa origanifolia</i> (Lam.) Baill.	Rooster egg	April-May.	Weed	Argentina, Brazil, Chile, Paraguay and Uruguay.
	<i>Cestrum parqui</i> L'Hér.	Hediondilla	June-August	Weed	Central and South America.
	<i>Solanum elaeagnifolium</i> Cav.	Horse buster	April-June	Weed	Central and South America.
	<i>Cydonia oblonga</i> Miller	Quince	July-Sep.	Fruit	Caucasus Region
Rosaceae	<i>Prunus pérsica</i> (L.) Stokes, Batsch.	Peach	Aug-Sep.	Fruit	Afghanistan, China and Iran.
	<i>Prunus ceraciferas</i> Ehrh.	Plum	August-Sep.	Fruit	Europe and Asia.
	<i>Eriobotrya japónica</i> (Thunb.) Lindl.	Nispero	April-July	Fruit	China
	<i>Citrus aurantium</i> L. Osbeck	Orange	Aug-Sep.	Fruit	Florida and the Bahamas
Rutaceae	<i>Citrus x limón</i> (L.) Burm., Osbeck	Lemon tree	August-Sep.	Fruit	Himalayas, Burma.
	<i>Citrus reticulata</i> Blanco	Tangerine	Aug-Sep.	Fruit	Southeast Asia and the Philippines.
	<i>Citrus sinensis</i> Osbeck.	Sweet orange	Aug-Sep.	Fruit	India, Pakistan, Vietnam and China
	<i>Ruta chalapensis</i> L.	Rue	July - Sep.	Medicinal	Mediterranean

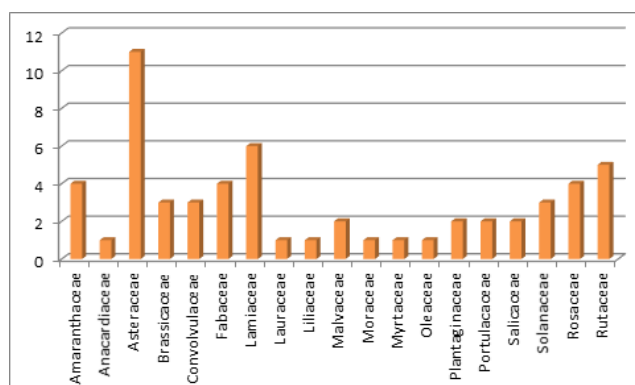


Figure 1 Number of melliferous species present in the Department of Fray Mamerto Esquiú. Campaign 2019-2020-2021.

The honey plants present in the area according to their use, are highly diversified, ranging from cultivated species to native weeds or introduced by agricultural activity, to horticultural, medicinal, ornamental species, etc (Figure 2). This is also due to the fact that the predominant agricultural activities in the Department of Fray Mamerto Esquiú are very varied, ranging from fruit and vegetable production, mostly leafy vegetables (chard, spinach, lettuce, arugula and greens) and to a lesser extent proportion: tomato, pepper, melon, watermelon, carrot, onion, pumpkin, sweet potato, anquín and aromatic plants. Regarding the fruit forest we find citrus (orange trees, limes, tangerines, lemon trees, grapefruit), fig trees, quince, medlar, avocado trees, grapevines, peach trees, plum trees.^{9,10}

Forage crops are also produced, such as alfalfa, corn, sorghum, oats and barley. Since livestock production is extensive with grazing in open fields, where cattle for breeding and goats stand out, in stable form, cattle for dairy farms, pigs, and other farm activities such as poultry and beekeeping.

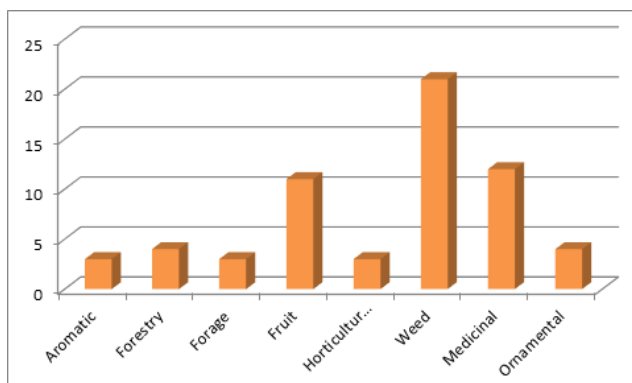


Figure 2 Use of honey species present in the Dept. Fray Mamerto Esquiú. Campaigns: 2019-2020-2021.

According to the results obtained, it is worth highlighting the important role played by weeds and the natural forest as providers of pollen and/or nectar during the months of low flowering. A very characteristic sector of the region was observed, which is the zone of the banks of the Valle river that crosses it, which is made up of aquatic, herbaceous and arboreal species. As the development of beekeeping in the Fray Mamerto Esquiú department is still incipient, it has had different moments in which its artisanal nature has always been evident, based mainly on local knowledge and traditional practices. The fact that, for the most part, beekeeping practices respond to local production processes can be considered an opportunity for the consolidation of differentiated markets characterized by their contribution to the welfare of beekeepers and to the conservation of biodiversity at the landscape scale. Therefore, with the results obtained, a management scheme for the apiaries in the area can be proposed to optimize the use of the beekeeping flora available in the department and maximize beekeeping production. Said scheme would consist of carrying out a transhumance in autumn - winter, where the beginning of the beekeeping season would take place in the area near the river, then in the paddocks planted with forage crops and vegetables, and finally in the fruit-bearing forest, to then continue with native flowering. In addition, another strategy to consider for transhumance would be to focus on obtaining differentiated honeys according to botanical origins (Figure 3).



Figure 3 Species of Brassicaceae visited by *Apis mellifera* L. [A: Arugula (*Eruca vesicaria*); B: Radish (*Raphanus sativus*)].

Conclusion

The beekeeping floristic resource found in the Department of Fray Mamerto Esquiú is mainly represented by herbaceous species, both native and exotic, implanted and domesticated agricultural livestock, where the flowering period extends throughout the seasons of autumn, winter and early spring, between the months of March, April, May, June, July, August and September, with a maximum between mid-July to September onwards. It would be very beneficial to make available to beekeeping technicians and producers an inventory of the main species of native honey plants in the department of Fray Mamerto Esquiú.

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None.

Conflicts of interest

The authors state that there is no conflict of interest.

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