

## ESTIMATING WEALTH OF VISITORS FLORAL (INSECTA) BOTANICAL GARDEN THE FACULTY OF AGRICULTURE, UNLPAM, IN THE PROVINCE OF LA PAMPA, ARGENTINA

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**ABSTRACT:** The arthropods, whole organisms are larger and more diversified biological success of all animals that have occurred in the planet evolutionarily. They get food from various modes, and many of them are that feed on nectar, visiting flowers, contributing to pollination. Currently, particularly in Argentina, the work on the use of floral resources by insects are scarce. The study was conducted in 30 plants of the Botanical Garden of the Faculty of Agriculture, National University of La Pampa (UNLPam) (36° 28" S; 64° 35" W) (Province of La Pampa, Argentina) which conducted a survey of insect floral visitors. Sampling was done every 15 days, between 11 and 14 hours a day for three months: 2011 and 2012. Arthropods were captured trawls and hand harvested, they were fixed in 70% alcohol, and beetles were identified to morphospecies level, the formicids to species and other arthropods collected, to the taxonomic order. The parts of the plant, is herborizaron and identified using dichotomous keys. The order Coleoptera, 150 copies were obtained. The order Hymenoptera, of Fam. Formicidae, recorded 199 specimens belonging to 18 species. Other arthropods collected belong to the following orders: Araneae, Coleoptera, Hymenoptera, Hemiptera, Lepidoptera, Orthoptera, Diptera and Phasmida.

**KEY WORDS:** Coleoptera, Formicidae, biodiversity, *Hyalis argentea*, *Santolina chamaecyparissus* and *Commelina erecta*.

Arthropods constitute the set of broader, more diversified and biological success, of all arthropods.

They are found inhabiting from polar to equatorial peak and from deep sea to the highest mountain peaks, also colonizing the soil media and also dominate the middle air.

Among Insecta are several orders, of which the Coleoptera, were more than 370,000 described species. They have colonized and invaded all media: soil, water and air. This order includes family groups, some of which are aquatic, others include semi-aquatic forms, there are also ways that are closely related to man, living in wool, leather, furniture, libraries or stored products. The Coleoptera are insects of varying size, have two pairs of wings on which the first is not adapted to the flight but is transformed into leathery elytra acting as a protection element. The second pair of wings is the flight body and are membranous. The mouth parts of these insects are chewing type. They have a large and endowed with freedom of movement prothorax, while the mesothorax is greatly reduced. Undergo complete metamorphosis (holometabolous). Their larvae are generally eruciformes campodeiformes or, very rarely legless, and pupae are adécticas or exaradas.

Insecta are located within the Orders Hymenoptera and Coleoptera, among others. The Hymenoptera are economically important for pest control and for pollination and beekeeping. It also includes the Fam. Formicidae, comprising species that use floral resources for their livelihoods.

Floral resources correspond to any derivative of flowers that are used by animals to meet their energy needs. The adult beetles and larvae in some Hymenoptera certain species and use nectar, pollen, oils and fruit exudates.

Currently we began to investigate the presence of floral visitors and potential pollinators in *Opuntia ficus-indica* (L) Mill (Lo Green and La Mantia, 2011).

In Argentina the work on the use of floral resources by insects are scarce: refer to Chaco Serrano de Córdoba (Sosa, Manfrini & Brewer, 2008) and sunflower (Torretta et al., 2010).

Whereas the biological characteristics, considering the richness and abundance of Coleoptera and Hymenoptera on flowers, we expect: 1) the presence of greater wealth of Coleoptera and Hymenoptera plants in the Botanical Gardens, where representatives of other insect orders, as well as, 2) that are more abundant Coleoptera.

Because many species of ants use floral resources for their livelihoods, 3) is expected to find greater wealth of the subfamilies of Formicidae Formicinae and Myrmicinae in the study area.

Therefore, the aim of this study was to survey flower visiting insects (particularly beetles and watching Hymenoptera Formicidae) to estimate biodiversity (richness and abundance) in plants of the Botanical Garden of the Faculty of Agriculture, UNLPam.

## MATERIALS AND METHODS

### Study area:

The study area was the Botanical Garden of the Faculty of Agronomy (36 ° 33 '19.60" S), where the floral visitors of thirty plant species (Table N° 1) were collected.

The Botanical Garden of the Faculty of Agriculture, UNLPam., Was created in 1973 to 1974 in an area belonging to the field of education at the University.

It has an area of 4 hectares. Of which approximately 70% is occupied by the Botanic Garden itself, and the rest dedicated to experimental works.

At present it has an estimated number ranging in 700 copies. As these species distributed in three layers: Arboretum, Garden Educational and Ecological Garden: with native species distributed according to the three phytogeographic provinces of La Pampa grassland and shrubland caldenal.

A total of 30 samples were collected every fortnight during the period between the months of November, December 2011 and February 2012, between 11 am and 14 pm in the Botanical Garden of the Faculty of Agriculture, UNLPam of Santa Rosa, La Pampa, Argentina, relieving five plant sample and to a height of 1.50 m.

The collected samples were taken to the laboratory Invertebrate Biology II lecture for further processing, which consisted fixed in 70% alcohol and separation of biological material in Coleoptera, Hymenoptera and others. Insects were identified beetles to morphospecies (CSIRO, 1991) and Hymenoptera Formicidae, to species level (Bolton et al., 2007). Other arthropods also were fixed in 70% alcohol for later identification to Order level (CSIRO, 1991). Parts of the plants where they held the capture of arthropods for identification to species level is herborized. Environmental parameters were recorded during the days of sampling were: temperature in °C; % humidity, wind direction, sunny, cloudy, whose data are presented in Table 2.

**Data Analysis:**

To determine the diversity among the sampled stakeholders, Coleoptera and Formicidae Simpson Index (Dominance) and Shannon-Wiener Index (Equity) (Moreno, E. C. 2001). For analysis of means between Coleoptera and Formicidae, he made a Test F and variances Student t test.

**Statistic:**

For the review and discussion of the results of the statistical program was used.

**RESULTS**

In the study period 571 arthropods distributed in different orders, of these, 150 belong to the Order Coleoptera Order Hymenoptera and the 258, of which 199 are of the family Formicidae were collected.

Within the Order Coleoptera, the Coccinelidae, Chrysomelidae, Tenebrionidae and Cantaridae families were those that showed a greater number of copies and the Scarabaeidae family that the highest number of morphospecies, whose payroll is presented in Table 3.

Formicidae, Vespidae and Apidae, whose payroll is presented in Table 4. Within the Order Hymenoptera specimens belonging to three families were collected.

The Family Formicidae including the most representative specimens belonging to 199 different species.

The commands identified in the other captured insects are presented in Table 5 and in Fig 2.

The Family Formicidae (Hymenoptera) included representatives of three subfamilies, whose payroll is presented in Table 6 and in Fig 3.

As for the diversity of Family Formicidae, were:

Subfamily Myrmicinae Species ----- 5 = 28%

Subfamily Dolichoderinae Species ----- 5 = 28%

Subfamily Formicinae ----- 8 Species = 44%.

The analysis was carried out to determine dominance ("Simpson index") indicated no significant differences between the mean total populations sampled Formicidae and Coleoptera, but were among the variances:

Test F = 6, 28995433 , p = 0.000290.

Student t test = -0.59776431 ; g . l . = 19 , p = 0.557056.

Regarding Equity (Shannon-Wiener index), the analysis revealed that there were significant differences in mean total between populations of Coleoptera and Formicidae, but there were not between the variances:

Test F = 1 , 2911807 , p = 0.304801.

Student t test = 9.649435863 , sp = 0.01070892 , p = 0.000000.

The most visited plant species was *Hyalis argentea*, with 38 specimens of insects and the number of species collected per plant were: *Santolina chamaecyparissus* and *Commelina erecta*, with 8 taxa (Table 7).

**DISCUSSION**

In the work in the Chaco Serrano (Sosa, Manfrini and Brewer, 2008) 14 families of beetles were obtained, whereas in the present work 9 families were identified, of which the Fam. Cantharidae, Chrysomelidae, Elateridae and Curculionidae match in its finding.

As noted by Torretta et al. (2010) in sunflower, numerous species of insects as day visitors, including the honeybee (*Apis mellifera*) was the main pollinator of this species at all sites surveyed were recorded.

In flowers of *Opuntia* spp., Hymenoptera were always the richest group with more than 100 species, with *Apis mellifera* (Apidae) the most abundant, followed by Coleoptera (Scarabaeoidea, Melyridae and Nitidulidae) and Lepidoptera. (Lo Green & La Mantia, 2011).

## CONCLUSIONS

According to the results it is concluded that there are no significant differences between populations Dominance Formicidae and Coleoptera (Test  $t = -0.59776431$ ,  $df = 19$ ,  $p = 0.557056$ ), while Equity Analysis (Test  $t = 9.649435865$ ;  $sp = 1.03 \times 10^{-1}$ ,  $p = 0.000000$ ) significant difference between them, so that the hypothesis is rejected No. 2 arise.

The order Coleoptera was represented by 150 copies of the following families: Carabidae, Scarabaeidae, Elateridae, Curculionidae, Staphylinidae, Coccinellidae, Chrysomelidae, Tenebrionidae and Cantaridae.

The Order Hymenoptera was represented by 258 copies of the following families: Vespidae, Apidae and Formicinae, allowing accept Hypothesis 1.

The subfamily Formicinae has more species, while Myrmicinae and Dolichoderinae subfamilies, and are approximated with a similar number of both species, the following: *Pheidole bergi* Mayr, *Crematogaster quadriformis* Roger, *Acromyrmex striatus* Roger, *Acromyrmex lobicornis* Emery, *Solenopsis patagonica* Emery, *Dorymyrmex* sp Mayr, *Linepithema humile* Mayr, *Araucomyrmex tener* Mayr, *Conomyrma wolffhügeli* Forel, *Conomyrma carettei* Forel, *Camponotus crassus* Mayr, *Camponotus bonariensis* Mayr, *Camponotus borelli* Emery, *Camponotus rufipes* Fabricius, *Camponotus mus* Roger, *Camponotus punctulatus* Mayr, *Brachymyrmex patagonicus* Mayr and *Forelius minor* Forel; so lets accept Hypothesis 3.

The plant species *Hyalis argentea* (Asteraceae) was the most visited in the number of specimens of insects, while *Santolina chamaecyparissus* (Asteraceae) and *Commelina erecta* (Commelinidaceae) were as in the number of registered species of both groups.

This work represents a contribution to the knowledge of the biodiversity of floral visiting insects of plants of the Botanical Garden, Faculty of Agronomy UNLPam and is an exploratory analysis from which new questions are generated, that will deepen interaction man and his environment.

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Figure 1. Satellite image: La Pampa, Faculty of Agriculture, Botanical Garden ( $36^{\circ}33'19.60''$  S), 2012.

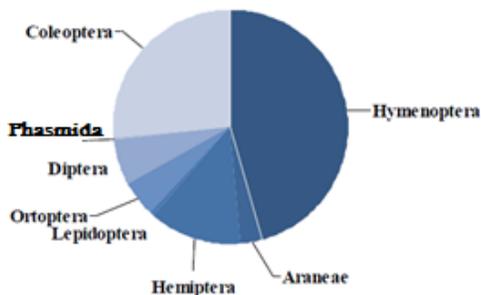


Figure 2. Representation of orders captured in the Botanical Garden, Faculty of Agriculture, UNLPam, November-December 2011 and February 2012.

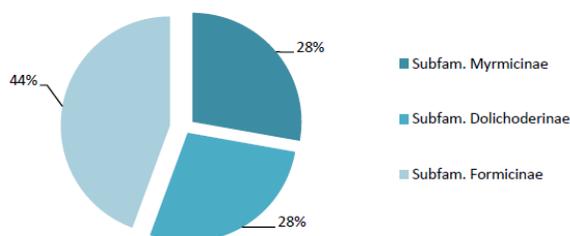


Figure 3. Representation of the different subfamilies of Formicidae Fam the tract.

Table 1. List of plant species in the Faculty of Agronomy, UNLPam Botanical Garden, November-December 2011 and February 2012.

Planta N°	Familia	Especie "nombre vulgar"
1	Liliaceae	<i>Yucca gloriosa</i> "yucca"
2	Rosaceae	<i>Photinia fraseri</i>
3	Fabaceae	<i>Spartinum junceum</i> "retama de españa"
4	Asteraceae	<i>Coreopsis grandiflora</i>
5	Rosaceae	<i>Rosa sp.</i>
6	Brassicaceae	<i>Hirschfeldia incana</i> "mostacilla"
7	Asteraceae	<i>Santolina chamaecyparissus</i> "santolina"
8	Boraginaceae	<i>Echium plantagineum</i> "flor morada"
9	Commelinaceae	<i>Commelina erecta</i> "flor de santa lucia"
10	Oxalidaceae	<i>Oxalis articulata</i> "vinagrillo"
11	Asteraceae	<i>Hyalis argentea</i> "olivillo"
	Caprifoliaceae	<i>Abelia grandiflora</i> "abelia"

12		
13	Apocynaceae	<i>Nerium oleander</i> "laurel de jardín" morado
14	Fabaceae	<i>Prosopis húmilis</i>
15	Cariophyllaceae	<i>Saponaria officinalis</i> "yerba jabonera"
16	Amaryllidaceae	<i>Crinum variable</i> "azucena"
17	Asteraceae	<i>Centaurea solstitialis</i> "abrepuño amarillo"
18	Liliaceae	<i>Bulbine frutescens</i> "bulbine"
19	Bignoniaceae	<i>Campsis radicans</i> "trompeta"
20	--	---
21	Solanaceae	<i>Solanum elaeagnifolium</i> "revienta caballo"
22	Asteraceae	<i>Heterotheca subaxillaris</i> "falsa alcanfor"
23	Amaryllidaceae	<i>Tulbaghia violacea</i> "tulbaghia"
24	Commelinidaceae	<i>Commelina erecta</i> "flor de santa lucia"
25	Asteraceae	<i>Conyza bonariensis</i> "rama negra"
26	Asteraceae	<i>Solidago chilensis</i> "vara de oro"
27	Bignoniaceae	<i>Macfadyena dentata</i> "cometa"
28	Zigophyllaceae	<i>Tribulus terrestris</i> "roseta francesa"
29	Liliaceae	<i>Bulbine frutescens</i> "bulbine"
30	Apocynaceae	<i>Nerium oleander</i> "laurel de jardín" blanco

Table 2. Details of environmental parameters. Botanical Garden, Faculty of Agriculture, UNLPam, November-December 2011 and February 2012, the Meteorological Service of the Faculty of Agronomy, UNLPam.

	T°C	% H	DV	S	N
<b>SAMPLING 1</b> 15/11/2011	14 - 22 °C	37%	northwest	X	
<b>SAMPLING 2</b> 29/11/2011	16 - 30 °C	36%			X
<b>SAMPLING 3</b> 15/12/2011	18 - 32 °C	34%	northwest	X	
<b>SAMPLING 4</b> 27/12/2011	21 - 35 °C	33%	the northern sector	X	partially
<b>SAMPLING 5</b> 06/02/2012	23 - 33 °C	31%		X	
<b>SAMPLING 6</b> 23/02/2012	19 - 26 °C	30%		X	partially

Table 3. Payroll morphospecies of Coleoptera captured in the Faculty of Agronomy, UNLPam Botanical Garden, November-December 2011 and February 2012.

Families de Coleoptera	Morphospecies	Number of individuals
Carabidae	1	2
Scarabaeidae	2	2
	3	1
	4	2
	5	1
	6	6
Elateridae	7	1
	8	4
Curculionidae	8	4
Staphylinidae	9	3
Coccinellidae	10	45
	11	14
Chrysomelidae	12	11
Tenebrionidae	13	32
	14	6
Cantaridae	15	20

Table 4. List of Families collected in the Order Hymenoptera, Faculty of Agriculture, UNLPam, November-December 2011 and February 2012 Botanic Garden.

Orden	Families	Number of individuals
Hymenoptera	Vespidae	37
	Apidae	22
	Formicidae	199

Table 5. Payroll Orders of insects captured in the Faculty of Agronomy, UNLPam Botanical Garden, November-December 2011 and February 2012.

Ordens	Number of individuals
Araneae	18
Coleoptera	150
Hymenoptera	258
Hemiptera	72
Lepidoptera	3
Ortoptera	29
Diptera	36
Fasmida	1

Table 6. List of species of the family Formicidae (Hymenoptera) caught in the Faculty of Agronomy, UNLPam Botanical Garden, November-December 2011 and February 2012.

Subfamilies/ Species de Formicidae	Number of individuals
<b>Myrmicinae</b>	
<i>Pheidole bergi</i>	32
<i>Crematogaster quadriformis</i>	5
<i>Acromyrmex striatus</i>	38
<i>Acromyrmex lobicornis</i>	1
<i>Solenopsis patagonica</i>	16
<b>Dolichoderinae</b>	
<i>Dorymyrmex sp.</i>	3
<i>Linepithema humile</i>	1
<i>Araucomyrmex tener</i>	1
<i>Conomyrma wolffhügeli</i>	9
<i>Conomyrma carettei</i>	19
<b>Formicinae</b>	
<i>Camponotus crassus</i>	7
<i>Camponotus bonariensis</i>	19
<i>Camponotus borelli</i>	1
<i>Camponotus rufipes</i>	13
<i>Camponotus mus</i>	1
<i>Camponotus punctulatus</i>	5
<i>Brachymyrmex patagonicus</i>	22
<i>Forelius minor</i>	6

Table 7. Floral Visitors of the plants of the Botanical Garden, Faculty of Agriculture, UNLPam, November-December 2011 and February 2012.

Plant N°	flower visitors			
	Coleoptera	quantity	Formicidos	quantity
1	Morpho 10	4	<i>Pheidole bergi</i>	4
	Morpho 11	1		
	Morpho 12	1		
2	Morpho 8	1	<i>Camponotus crassus</i>	3
	Morpho 10	1		
	Morpho 13	3		
3	Morpho 8	1	<i>Camponotus bonariensis</i>	2
	Morpho 10	1		
	Morpho 11	2		
	Morpho 12	2		
	Morpho 15	6		
4	Morpho 10	1	<i>Brachymyrmex patagonicus</i>	4
	Morpho 13	1		
	Morpho 15	1		
5	Morpho 6	1		
	Morpho 10	1		
	Morpho 11	3		
	Morpho 12	1		
	Morpho 15	6		
6	Morpho 13	4	<i>Camponotus borelli</i>	1
	Morpho 15	2		
7	Morpho 6	5	<i>Pheidole bergi</i>	1
	Morpho 8	1	<i>Camponotus crassus</i>	4
	Morpho 13	1	<i>Brachymyrmex patagonicus</i>	7
	Morpho 15	1	<i>Dorymyrmex sp.</i>	3
8	Morpho 8	1	<i>Camponotus bonariensis</i> <i>Crematogaster quadriformis</i>	6 3
	Morpho 10	6		
	Morpho 12	2		
	Morpho 13	3		
	Morpho 15	1		
9	Morpho 10	1	<i>Pheidole bergi</i>	3
	Morpho 11	1		
	Morpho 14	3		
10	Morpho 10	2		
	Morpho 12	1		
	Morpho 14	2		
11	Morpho 10	19	<i>Crematogaster quadriformis</i>	1
	Morpho 11	7		
	Morpho 13	10		
	Morpho 15	1		
12	Morpho 13	1		
13	Morpho 10	1	<i>Camponotus bonariensis</i>	1
	Morpho 13	1	<i>Acromyrmex striatus</i>	1
14			<i>Camponotus bonariensis</i>	1
			<i>Acromyrmex lobicornis</i>	1

15	Morpho 10 Morpho 13 Morpho 15	8 1 2	<i>Pheidole bergi</i>	3
16	Morpho 13	1	<i>Camponotus bonariensis</i> <i>Camponotus rufipes</i>	1 3
17	Morpho 7		<i>Camponotus rufipes</i> <i>Forelius minor</i>	1 6
18			<i>Camponotus rufipes</i>	2
19			<i>Conomyrma wolffhügelii</i> <i>Linepithema humile</i> <i>Camponotus rufipes</i>	9 1 7
20				
21	Morpho 9 Morpho 13	1 1	<i>Acromyrmex striatus</i> <i>Pheidole bergi</i> <i>Camponotus bonariensis</i>	7 1 1
22			<i>Acromyrmex striatus</i> <i>Camponotus mus</i> <i>Araucomyrmex tener</i> <i>Pheidole bergi</i> <i>Brachymyrmex patagonicus</i> <i>Camponotus punctulatus</i>	2 1 1 1 1 5
23	Morpho 2 Morpho 13	1 2	<i>Pheidole bergi</i> <i>Conomyrma carettei</i>	9 1
24	Morpho 1 Morpho 3 Morpho 9 Morpho 13	1 1 2 1	<i>Solenopsis patagonica</i> <i>Brachymyrmex patagonicus</i> <i>Conomyrma carettei</i> <i>Camponotus bonariensis</i>	7 2 1 3
25	Morpho 2 Morpho 12	1 1	<i>Pheidole bergi</i> <i>Crematogaster quadriformis</i> <i>Conomyrma carettei</i> <i>Acromyrmex striatus</i>	4 1 1 1
26			<i>Acromyrmex striatus</i>	20
27	Morpho 12	1	<i>Pheidole bergi</i> <i>Conomyrma carettei</i>	2 6
28	Morpho 4 Morpho 5	2 1	<i>Pheidole bergi</i> <i>Acromyrmex striatus</i> <i>Brachymyrmex patagonicus</i> <i>Camponotus bonariensis</i> <i>Conomyrma carettei</i>	2 3 6 2 9
29			<i>Brachymyrmex patagonicus</i> <i>Conomyrma carettei</i> <i>Acromyrmex striatus</i> <i>Pheidole bergi</i> <i>Camponotus bonariensis</i>	2 1 4 2 1
30	Morpho 1 Morpho 12 Morpho 13 Morpho 14	1 2 2 1	<i>Solenopsis patagonica</i> <i>Camponotus bonariensis</i>	9 1