

Honeybees and Pollen as Indicators of Alien Plant Species in Two Native Forest Ecosystems of an Oceanic Island (La Palma, Canary Islands)

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Abstract: *Apis mellifera* L. is a generalist pollinator present in most of the Canary Islands. When foraging, honeybees transfer pollen grains to honey, and presence and abundance of pollen from different species can be interpreted as a sign of local flora, and a cue to spread of aliens. The relative use of alien vs native species by honeybees could influence island pollination mutualisms and/or favour alien species. Analyzing pollen content data from honey samples an approach can be made to the relative foraging intensity on different plant communities and identify the importance of alien plant species in nearby areas.

Based on published information on pollen contents of honeys from beehives in La Palma, we made an indirect evaluation of the use of endemic, native and alien species by honeybees in two native forests of the island (evergreen laurel forest and Canarian pine forest).

Some of the most pervasive alien plants in the Canary Islands were represented in these pollen samples. The most frequent species in pollen counts was *Castanea sativa*. Proportion of alien species' pollen was significantly higher in the laurel forest, while the most visited group in the pine forest was that of endemics ($p < 0.05$). Specific composition of pollen samples analysed with Detrended Correspondence Analysis revealed (61.3 % variance explained) a pattern related to species distribution in each forest type.

Pollen content has revealed the presence of alien species in forests of La Palma, some of them considered invasive. The laurel forest is the most threatened of both ecosystems, mainly affected by the proximity to urban areas and the presence of intersperse arboreal plantations. The overall prevalence of aliens in the evaluated pollen data suggests that honeybees are prone to exploit exotics, and that the selection of plant species by honeybees in this oceanic island is not random. This may have serious consequences for island pollination systems and favour the spread of some exotic species.

INTRODUCTION

Conservation of native ecosystems on islands is threatened by several factors: habitat loss, degradation or fragmentation, introduction of alien species and predation by humans [1]. The presence of alien species in such ecosystems is the first step in the process of invasion [2-4] and these species are often used as indicators of the level of disturbance of natural areas and homogenization of biotas (i.e. [5, 6]). In the Canary Islands, one of the most diverse regions in Europe, vascular plants are the most abundant taxonomic group of aliens, accounting for 46% of the total alien pool; from these, 79 plants species are considered invaders because they compete with native ones, transform their habitats or hybridize with them, favouring their own spreading over large areas [7]. La Palma, the second highest island of the Archipelago (2425 m a.s.l.), has been also the less studied regarding alien plant invasions in comparison with other high islands (i.e. [8-10]).

Apis mellifera L. (Hymenoptera, Apidae) is a generalist pollinator and when introduced on islands it is considered one of the most relevant invaders interfering with native ecosystems [11]. Introduced bees compete with native pollinators for floral resources, are vectors for pathogens to the native fauna, and pollinate both native and introduced plants modifying seed output, transferring pollen between species, disrupting the native pollination systems [12], and affecting the spread of alien plants [13]. *A. mellifera* in the Canary Islands is recorded as native [14]. Phylogenetic analyses indicate that the Canarian honeybees are a well-defined subset of the African evolutionary lineage of *A. mellifera*; nonetheless in some islands the introduction of foreign subspecies of honeybees by beekeepers (mainly from East European lineages) is causing a recent genetic introgression [15, 16]. Many authors still consider the honeybee as an alien species in the Canaries or at least in certain zones of the Archipelago, studying its effect on plant-animal networks [17-20]. *A. mellifera* in La Palma constitutes a genetically differentiated group from those of the remaining islands [15, 21]. In fact, beekeepers from La Palma confirm that their colonies are formed by "black bee" which is the common name used for the Canarian honeybee, and that importation of foreign bees is a rare practise in the

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Island [22]. For these reasons, the possible role of populations of honeybees affecting the establishment and spread of alien plant species should be measured by its character of generalist pollinator but not considering bees as a recent introduction, at least in La Palma.

Many examples exist of bees visiting mainly introduced plants [13, 23-25]. The generalist use of pollen sources by honeybees may provide useful information on the presence of alien species that may be, otherwise, detected at a higher cost or pass unnoticed. Honeybees often move relatively short distances on their areas of origin [26]. The exact foraging distance seems to depend on the abundance of profitable forage [27, 28], i.e. a foraging radius of only a few hundred meters was observed in agricultural areas. Given the distance over which bees can develop their food foraging (from <1 km to 10 km; [26, 29]), or water foraging activity [30], plants visited by honeybees might not be strictly limited to the vicinity of the beehives. Pollen spectrum is a reflection of the local flora, although the amount of pollen grains transferred to honey by bees depends inversely from the distance to the source of nectar [22].

Based on published information on pollen contents of honeys from beehives in La Palma [22], we aimed to make an indirect evaluation and explore possible consequences of the relative use of alien vs native flowering plants by honeybees in two different forest types in La Palma. The hypotheses tested are: 1) honeybee makes a differential use of alien and native species when foraging in forested areas of La Palma, 2) the proportion of pollen content and therefore the relative presence of native vs alien species will vary between both forest types and 3) the pool of species visited in each ecosystem would be different.

MATERIALS AND METHODS

Study Site

La Palma is located in the north-west of the Canary Islands. With a surface of 707 km² is the fifth island in size being however the second highest one. Its size allows the existence of the main ecosystems present in the Islands, from small and fragmented stands of coastal shrubland in the western and north coast, to the summit scrub in the centre of the Cumbre Vieja massive and the border of La Caldera de Taburiente National Park. Two native forests are the most extended in the island: the evergreen laurel forest covers an almost continuous belt on the windward slope, varying in size depending on the level of disturbance; the pine forest occupies the largest area in the central part of the island and reaches low altitudes in the leeward slope (see Fig. 1). Both forests differ not only in their distribution but also in climate conditions and therefore in their floristic composition. The laurel forest ranges between 450 and 1500 m a.s.l., with a mean annual temperature of 13-18 °C and a mean annual rainfall of 500-1200 mm. Several tree species could be found in this forest with typical representation of elements of the Lauraceae, such as *Laurus novocanariensis*, *Persea indica*, *Ocotea foetens*, *Apollonias barbujana*, *Ilex canariensis*, *Picconia excelsa* and *Viburnum rigidum*. The understory is mainly compound by ferns, some lianas and several shrubs. The laurel forest is bordered by the *Erica-Myrica* woody

heath mainly in the transition to upper communities of pine forest, but also growing in areas where clear-cutting has been done for human uses. The pine forest ranges from 1500 to 2000 m a.s.l. in windward, and 900-2200 m.a.s.l. in leeward, although the pine forest in this island reaches lower altitudes when colonizing recent volcanic soils. Its mean annual temperature is 11-15 °C and the mean amount of annual rainfall is 450-550 mm. In contrast with laurel forest, the pine forest has only one arboreal species, the Canarian pine (*Pinus canariensis*) and its understory is poor in species, mainly leguminous shrubs (*Chamaecytisus proliferus* or *Adenocarpus spp.*) and leguminous herbs such as the endemic *Lotus hillebrandii* [31].

Methods

From the 20 beehives used in the study of La Serna *et al.* [22], data from only eight were chosen with the criterion of their location in forested areas. We selected four beehives in the pine forest and four beehives in the laurel forest (Fig. 1). Pollen data from 1992 to 1994 were qualitatively and quantitatively analyzed. Pollen extraction procedures are described in detail by La Serna *et al.* [22], who used an optical microscope to count and identify a minimum of 700 pollen grains in each sample. The process included obtaining pollen sediment by mixing the honey with sulphuric acid to dissolve sugars and colloids; after centrifuging, the sediment was processed with acetolysis eliminating polysaccharides and making grains more visible, which were finally preserved and mounted in glycerine jelly. The level of identification was species whenever possible; genus, family or pollen types were determined when species could not be assigned. Scientific names of plant species detected from pollen were reviewed following the check list of wild species of the Canary Islands [32]. According to this list the status of each taxon was assigned differentiating three categories: native, endemic or alien. Taxa identified only to the family or genus level were assigned to the most common status for the species belonging to the taxa present in La Palma. The percentage of pollen content by taxa was taken from the data recorded in La Serna's honey files [22] corresponding to the selected beehives.

When interpreting our results, some aspects of pollen dispersal by honeybees should be taken into account. There are some species that might be overrepresented in the honey; these are mainly species that produced high quantities of pollen of low size (i.e. *Castanea sativa*, *Eucalyptus sp.*, *L. hillebrandii*); other species could be underrepresented because they produce less pollen (i.e. *Lavandula canariensis*) or because their pollen grains are too fragile and do not resist the acetolysis process, such as Lauraceae species. Other factors affect the contribution of pollen in honeys: distance to the source plant, shape of flowers, pollination type, size of pollen grains or methods used for the extraction of honey from honeycombs, are some of them [33].

Statistical Analysis

Mean pollen percentage of each taxon from the three years of sampling was calculated for each beehive. Mean values were grouped in endemic, native and alien categories and tested for normality with Kolmogorov-Smirnov test,

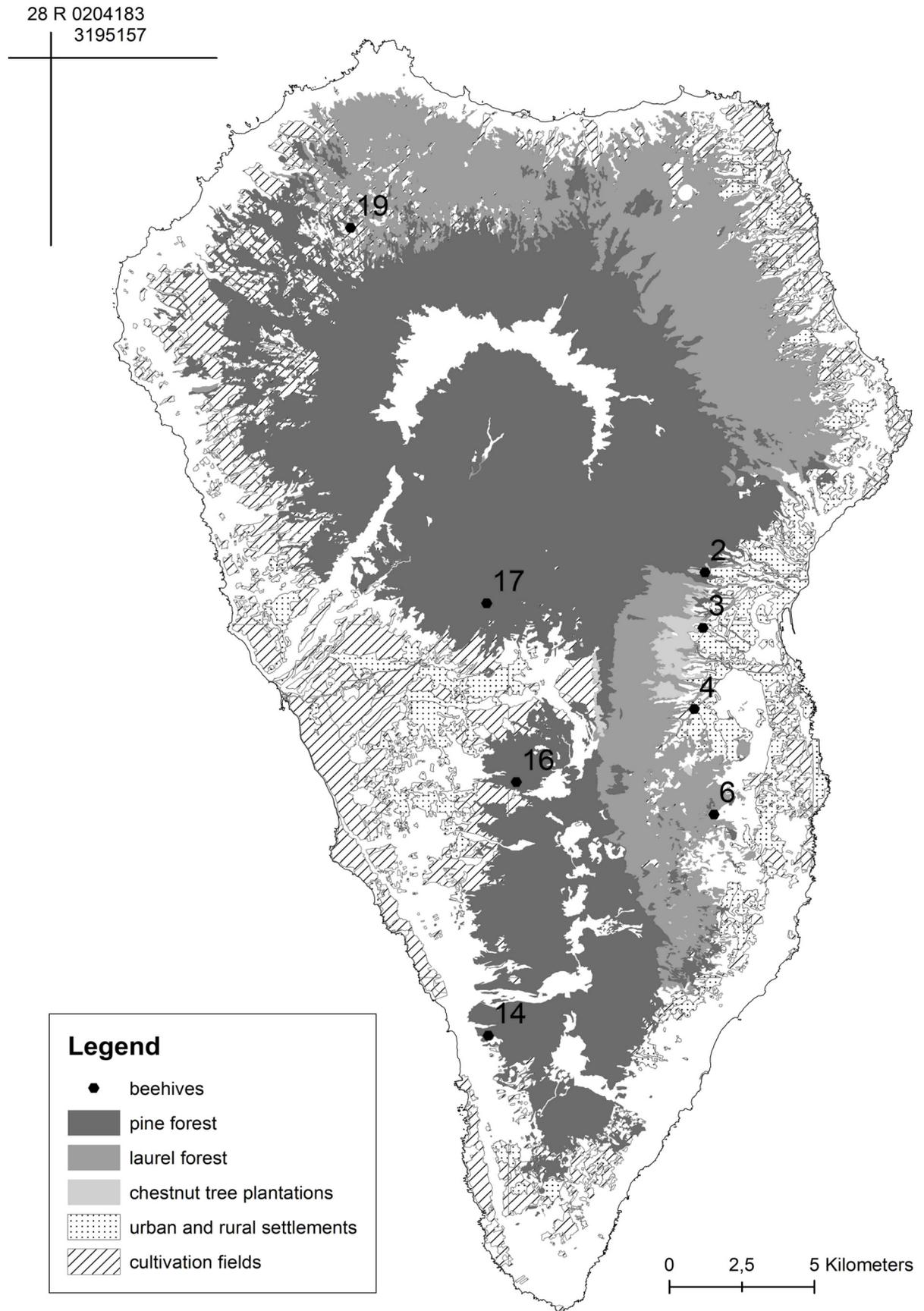


Fig. (1). Location of beehives and distribution in the two main forest types of La Palma (laurel and pine forest). Anthropogenic areas (chestnut tree plantations, urban areas and rural settlements, cultivation fields) are drawn.

showing a non-normal distribution ($p < 0.05$). Mean percentages of each status were compared between both forests types by nonparametric Mann–Whitney U test, verified with the Monte Carlo method with 10000 iterations for $p < 0.05$. Within each ecosystem (laurel forest and pine forest) differences among the three statuses were analysed using Kruskal–Wallis test, estimating p -values using Monte Carlo sample iteration (10000 iterations for $p < 0.05$). Monte Carlo bilateral significance was used to avoid erroneous significance values in nonparametric tests due to the low number of samples analysed ($n=8$). When differences were detected a pair wise comparison was done using the nonparametric Tukey test to find out which categories showed significant differences in each forest type. As *C. sativa* percentage accounts for more than 50% in the total pollen content (see results), all tests were repeated excluding pollen of *C. sativa* from the total sum and recalculating percentages for the remaining taxa.

Ordination techniques were used to explain the variation in species composition of beehives. We applied a Detrended Correspondence Analysis (DCA) [34] with the beehives as samples ($n = 8$) and the pollen proportions of all the species found ($n = 59$). Coefficients of Spearman rank-correlations were calculated between the sample coordinates from the DCA and spatial variables: altitude of beehive location and distances to anthropogenic areas (urban areas and rural settlements, cultivation fields and plantations of chestnut trees), which could be affecting the presence of alien species in the samples. Distances were calculated with the proximity toolset of ArcGIS 9.0 [35] based on the vegetation map and the topographic map (1:5000) of La Palma [36]. Nonparametric tests were performed with SPSS 15.0 [37],

except for Tukey test calculated following Zar [38], ordination analysis was done using the CANOCO package [39].

RESULTS

More than 50% of the pollen obtained from honey samples belonged to chestnut (Fig. 2). *C. sativa* is clearly overrepresented in the data set because it is not only anemophilous but also an entomophilous species, and produces high amounts of pollen. From the 59 species used for foraging by honeybees (see Appendix), four species were the most visited. *C. sativa* is the only introduced one, *Reseda luteola* is native and the other two are endemic species from La Palma *L. hillebrandii* and *Carlina falcata*. If we attend to the species contributing with less than 5 % and more than 0.5 % of pollen we could find a set mainly compound by native species (Fig. 2). Finally, there is a group with a lower contribution of pollen (< 0.5 %) formed by 20 natives, 17 aliens, and 6 endemics (see also Appendix).

Grouping species by their status as endemics, natives and aliens we could detect some differences in their pollen content depending on the forest type (Table 1). When we considered pollen of *C. sativa* in the total contribution, there were significant differences in the pollen contribution of endemic and alien species, endemics being more abundant in the pine forest and aliens more represented in the laurel forest. However, when excluding the *C. sativa* pollen from the total sum, significant differences arises in the proportion of pollen from endemic and native species. Endemics again have a higher contribution in the pine forest whereas natives are higher in the laurel forest.

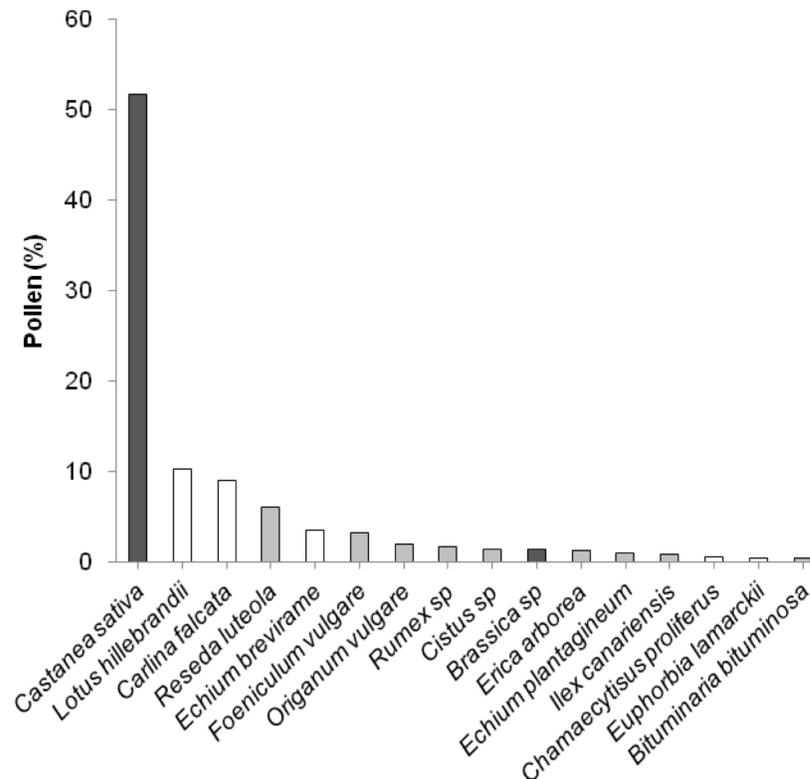


Fig. (2). Total percentage of pollen of species present in honey samples of La Palma. Only species with more than 0.5 % of pollen are shown. Alien species coloured in dark grey, native species in light grey and endemic species in white.

Table 1. Percentage of Pollen for Endemic, Native and Alien Species in the Laurel and Pine Forests of La Palma. Significant Differences Between the Two Forests were Examined Using Mann–Whitney *U* Test

Percentage of Pollen	Forest Type		<i>U</i>	<i>p</i> Values
	Laurel Forest	Pine Forest		
Including <i>C. sativa</i> pollen				
Endemic species (E)	1.63±1.96	44.90±32.24	18.50	0.004
Native species (N)	30.55±27.06	16.45±13.25	47.00	0.471
Alien species (A)	68.68±27.99	40.82±30.62	24.00	0.035
Excluding <i>C. sativa</i> pollen				
Endemic species (E)	8.16±6.10	58.75±33.82	16.00	0.003
Native species (N)	85.81±9.96	38.00±31.02	17.00	0.004
Alien species (A)	6.03±5.41	3.52±3.18	41.00	0.390

Values are means (\pm Standard Deviation), significant differences are shown in bold (significance of Monte Carlo bilateral method for $p < 0.05$).

Significant differences appeared as well when comparing the contribution of each status within each forest type (Fig. 3). When considering *C. sativa* pollen in the total sum, significant differences were found only in the laurel forest ($\chi^2 = 19.83$, $df = 2$, $p < 0.05$), where the contribution of alien and native pollen was similar but significantly higher than endemic pollen ($p < 0.05$). In the second case, excluding pollen from *C. sativa*, we obtained significant differences within both forest types (laurel forest, $\chi^2 = 17.61$, $df = 2$, $p < 0.05$; pine forest, $\chi^2 = 19.71$, $df = 2$, $p < 0.05$). The proportion of native pollen in the laurel forest was significantly higher ($p < 0.05$) than the two other groups (endemic and alien) that did not show significant differences between them. In the pine forest endemics and natives had the higher proportions and both groups differed significantly compared with the low proportion of alien pollen ($p < 0.05$).

Ordination analysis explained a cumulative percentage of variance of 61.3 % with the first two axes (Fig. 4). The first axis revealed a pattern of species composition related to the location of beehives (samples) in different forest types. Beehives located in the pine forest had higher values in the first axis (except for beehive number 2) (Fig. 5). Representative species from the pine forest had also high values in the first axes such as *L. hillebrandii*, *P. canariensis*, *Cistus sp.* or *C. proliferus*. Other species with high values in this axis are more common in the coastal shrubland (*Euphorbia lamarckii*, *Kleinia neriifolia*, *Echium brevirame*, *Rumex sp.* or *L. canariensis*) which might be indicating its proximity to the border of the pine forest, especially in the leeward slope where this community forms a belt of substitution of the potential thermophilous communities. Also, with high values in axis I, were ruderal

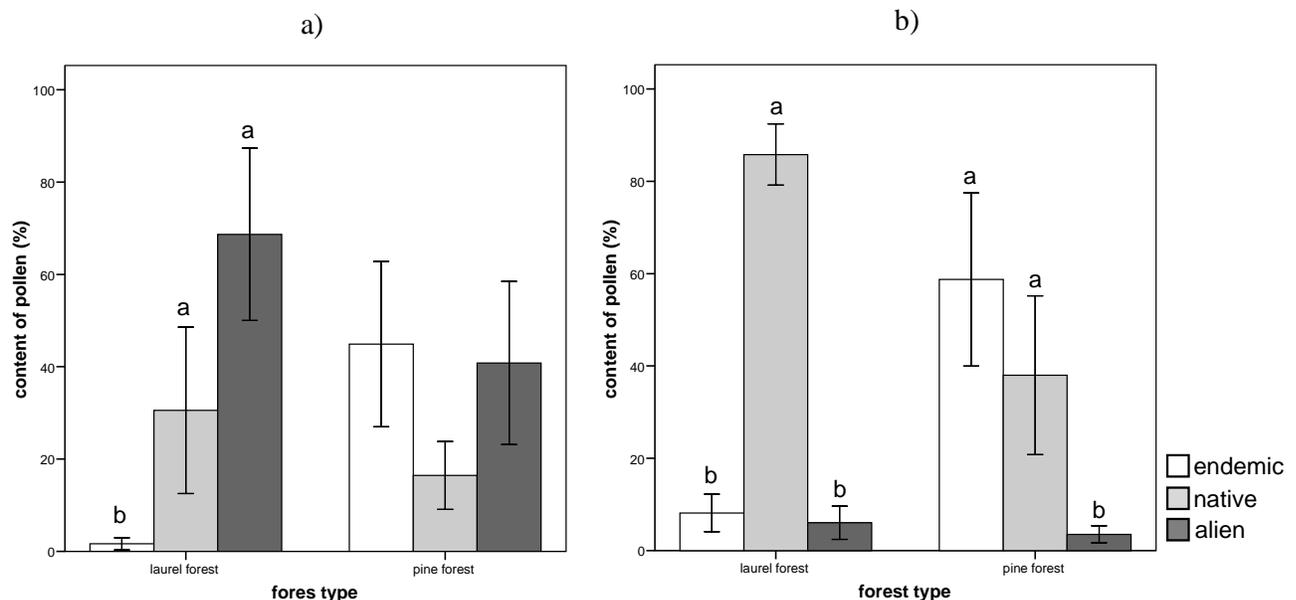


Fig. (3). Comparison of endemic (E), native (N) and alien (A) species within each forest type, a) including pollen from *C. sativa* and; b) excluding pollen from *C. sativa*. Differences among status were tested with Kruskal–Wallis test ($p < 0.05$) and the post hoc non parametric Tukey test (significant differences are shown with letters $p < 0.05$). Error bars show 95% confidence interval.

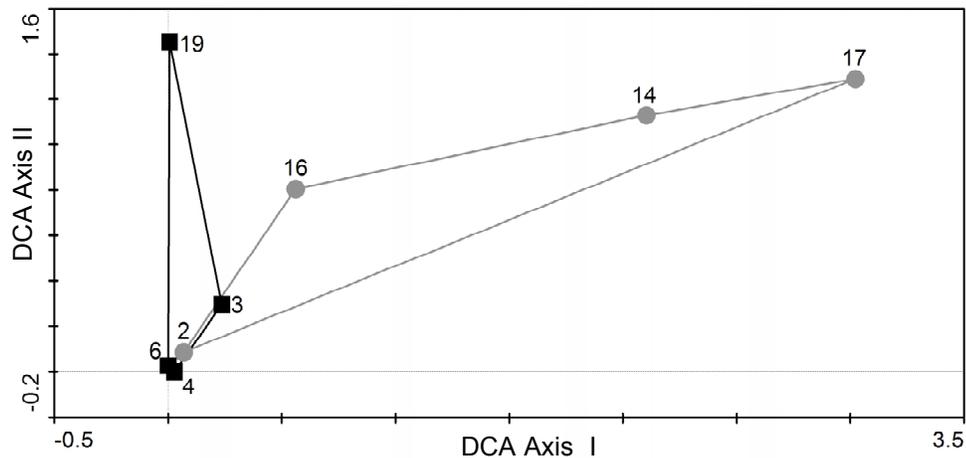


Fig. (5). Scatter plot of DCA with samples (beehives). Envelopes enclose two groups, beehives located in pine forest (grey circles) and beehives located in laurel forest (black squares).

Whilst the first axis was not correlated with any of the spatial variables, the second axis showed a significant and positive correlation with distances to urban areas and rural settlements and to chestnut tree plantations (Table 2). The second axis evidenced the level of disturbance of the flora around the beehives. Higher values of the second axis show locations that are at farther distances from human settlements and from chestnut tree plantations. In fact most of the alien species had negative values in the second axis (Fig. 4). Species composition around the beehives in the pine forest indicates less disturbed vegetation whereas composition in the laurel forest samples would be more influenced by human activities. Two exceptions could be observed in the scatter plot with beehives (Fig. 5). Beehive number two is mixed with the laurel forest group because, although located in the pine forest, it is very close to chestnut tree plantations and the contribution from *C. sativa* pollen is very high (around 80%), but also because it is near to urban areas and stands of the laurel forest and it appears to have an important contribution of ruderal species and species more typical of the laurel forest. Beehive number 19, located in the laurel forest, is separated from this group in the second axis, probably because it is very far from *C. sativa* plantations and had a lower contribution of this species (around 30%) and it is also the most distant from disturbed areas determining a low contribution of ruderal species, besides this beehive had a high content of pollen from *R. luteola* (around 50%).

DISCUSSION

The alien species, *C. sativa*, was the most frequently or intensely foraged by honeybees, although when excluding this overrepresented species from the samples the frequency of native plus endemic species visited was higher than that of alien species. Alien species visited by honeybees in the forested ecosystems of La Palma are mainly planted trees such as chestnut and almond trees or eucalyptus (*C. sativa*, *Prunus dulcis*, *Eucalyptus spp.*) or the prickly pear (*O. maxima*), all cultivated in the last centuries for their feed or wood values [40, 41]. Other less represented might be introduced as ornamental plants as *Acacia cyanophylla*, *Ligustrum sp.*, *T. majus* or *S. molle*. Two alien species detected by their pollen, *Passiflora edulis* and *Yucca*

elephantipes, are not quoted in the Canarian check list [32] and we assume that their distribution might be still limited to gardens. *Eucalyptus spp.*, *S. molle*, *Ligustrum spp.* and *Sechium edulis* are not quoted for La Palma but appear in other islands of the Archipelago as introduced [32]. Some of the alien species detected are considered as invaders because of: 1) having an evident invasive behaviour in the Canary Islands, this is the case of *A. adenophora*, *T. majus*, *C. grandiflorum*, *Eucalyptus sp.* and *O. maxima*, 2) showing invasive behaviour that is incipient or restricted to low-value ecosystems as *A. cyanophylla* or *S. molle*, 3) presenting invasive behaviour in another temperate and tropical insular regions as *Ligustrum sp.* and *Passiflora sp.* [42]. Attending to ecosystems, *A. adenophora*, *A. cyanophylla* and *T. majus* have been since long considered invasive alien species of natural and potential areas of laurel forest [43].

Honeybees in the laurel forest forage mainly on alien and native species, whereas in the pine forest the presence of alien pollen is significantly lower. This result is influenced by the presence of chestnut tree plantations in the area where beehives were located and because of the high production of pollen by *C. sativa*. But if we ignore the contribution of this overrepresented species, the most visited group in the laurel forest would be that of natives. In the pine forest, however honeybees always prefer endemic species for foraging. On the contrary alien species would be the less frequently visited in both forest types. This apparent election of different groups of species might have different consequences for each forest. Alien species can affect the pollination success in natives, either through reduced pollinator visitation rates or through increased heterospecific pollination of native flowers [44]. Chestnut trees might be sharing pollinators with other insect-pollinated species in the laurel forest, such as Lauraceae. This competition affects pollination and reproductive success of natives, in this case reducing their seed production [45]. However, the effect of alien species could be the opposite; increased floral resources provided by aliens may have facilitative effects on natives, through increased pollinator densities resulting in increased visitation rates and seed production to native plant species [44]. Honeybees could be also favouring pollination and seed set of chestnut trees in the laurel forest, as shown

Table 2. Elevation and Distances from Beehives to Anthropic Areas Measured in Meters. Spearman Correlation Coefficients Between Each Spatial Variable and DCA Axes were Calculated ($*p < 0.05$)

Beehives	Elevation (m)	Distance to Urban Areas and Rural Settlements (m)	Distance to Fields (m)	Distance to Chestnut Trees Plantations (m)
<i>Laurel forest</i>				
3	500	7.5	728.8	14.4
4	520	40.5	11.6	556.6
6	800	592.2	252.0	90.9
19	1030	4016.4	7.5	4816.2
<i>Pine forest</i>				
2	580	38.4	1005.9	7.0
14	700	3542.0	414.7	6287.4
16	1040	1318.7	279.8	3288.9
17	1160	1908.8	599.0	3504.8
<i>Spearman's rho</i>				
Axis I	0.286	0.167	0.548	0.357
Axis II	0.619	0.762*	-0.048	0.714*

by many cases of introduced or native pollinators which favour pollination of alien species (see examples in [2]). In the pine forest, pollination of endemic species by honeybee could have a direct effect on seed production (as explained above) or modifying pollen flow and favouring inbreeding when bees visit flowers of the same plant repeatedly [45].

Floristic differences were detected between both forest types based on the pollen content of honey samples. Species composition in the region around beehives located in both forests share little species in common. The pine forest was the less invaded by both alien and ruderal species. A previous study on the distribution of alien species on two altitudinal gradients in Tenerife (0-2300 m a.s.l.) and Gran Canaria (0-1950 m a.s.l.) shows how alien plants presented a unimodal distribution pattern along the altitudinal gradient, with less species and lower abundance at low and high altitudes, and higher abundance at intermediate altitudes [8]. However, we did not find any correlation between the altitude and the species composition around beehives, probably because our study sites do not embrace the whole altitudinal gradient of the pine forest in La Palma [31] and altitudinal ranges analyzed in this study coincide in both ecosystems (500-1160 m a.s.l.). Altitudinal correlation with alien species richness was not found either in an altitudinal gradient (0-650 m a.s.l.) studied in Tenerife [10], suggesting that altitudinal ranges need to be larger in order to show correlation with alien species richness. Another reason explaining the absence of many alien species could be the thick layer of litter commonly accumulated in the Canarian pine forest which prevents from colonization of both alien and native species [8]. Floristic composition, however, is significantly related with distance to urban areas and rural settlements and distance to chestnut tree plantations. This gradient could be observed from sites which are less invaded by alien and ruderal species mostly coinciding with beehives in the pine forest, to more disturbed sites, where alien and

ruderal species are best represented, in the laurel forest. This inverse correlation between alien species richness and distance to urban areas was also found in Tenerife and Gran Canaria [8, 10], explained by the increase of "propagule pressure" near to anthropogenic areas [46]. The proximity of chestnut tree plantations to laurel forest sites is well detected in honey samples; other alien species with a lower contribution are mainly detected in this forest indicating that this community is richer in alien species. Laurel forests in La Palma have been subject to exploitation (at least during the last 500 years) for timber and fodder [47]. These traditional activities have been maintained until present, making this forest the most exposed to alien plant invasions in La Palma. The effects of these invasions in the laurel forest should be studied so that control and other management efforts could be done efficiently and when necessary [48]. But special attention might be paid also to the less known alien invasive species that were detected in this study.

APPENDIX

Species names and abbreviations used in the DCA biplot. Status (A = alien, E = endemic, N = native) and scientific names follows Acebes *et al.* [32]. Pollen content indicates the mean percentage of each species in all samples analysed.

Species Name	Abbreviation	Status	Pollen Content (%)
<i>Acacia sp</i>	<i>Acac sp</i>	A	0.02
<i>Achyranthes aspera</i>	<i>Achy as</i>	A	0.17
<i>Aeonium sp</i>	<i>Aeon sp</i>	N	0.30
<i>Ageratina adenophora</i>	<i>Ager ad</i>	A	0.03
<i>Allium sp</i>	<i>Alli sp</i>	N	0.04
<i>Asparagus sp</i>	<i>Aspa sp</i>	N	0.13
<i>Asphodelus ramosus</i>	<i>Asph ra</i>	N	0.27

(Appendix) contd.....

Species Name	Abbreviation	Status	Pollen Content (%)
<i>Bidens pilosa</i>	<i>Bide pi</i>	A	0.36
<i>Bituminaria bituminosa</i>	<i>Bitu bi</i>	N	0.50
<i>Brassica sp</i>	<i>Bras sp</i>	A	1.40
<i>Bryonia verrucosa</i>	<i>Bryo ve</i>	E	0.02
<i>Cardiospermum grandiflorum</i>	<i>Card gr</i>	A	0.08
<i>Carlina falcata</i>	<i>Carl fa</i>	E	9.00
<i>Castanea sativa</i>	<i>Cast sa</i>	A	51.64
<i>Chamaecytisus proliferus</i>	<i>Cham pr</i>	E	0.67
Chenopodiaceae-Amaranthaceae	<i>Chen Amar</i>	N	0.14
<i>Cistus sp</i>	<i>Cist sp</i>	N	1.44
<i>Convolvulus sp</i>	<i>Conv sp</i>	N	0.01
<i>Datura innoxia</i>	<i>Datu in</i>	A	0.01
<i>Ditrichia viscosa</i>	<i>Ditt vi</i>	N	0.09
<i>Echium brevireme</i>	<i>Echi br</i>	E	3.51
<i>Echium plantagineum</i>	<i>Echi pl</i>	N	1.00
<i>Ephedra fragilis</i>	<i>Ephe fr</i>	N	0.00
<i>Erica arborea</i>	<i>Eric ar</i>	N	1.34
<i>Eucalyptus sp</i>	<i>Euca sp</i>	A	0.28
<i>Euphorbia lamarckii</i>	<i>Euph la</i>	E	0.51
<i>Foeniculum vulgare</i>	<i>Foen vu</i>	N	3.21
<i>Galactites tomentosa</i>	<i>Gala to</i>	N	0.20
<i>Geranium sp</i>	<i>Gera sp</i>	N	0.02
<i>Ilex canariensis</i>	<i>Ilex ca</i>	N	0.84
<i>Jasminum odoratissimum</i>	<i>Jasm od</i>	N	0.00
<i>Kleinia neriifolia</i>	<i>Klei ne</i>	E	0.03
<i>Lavandula canariensis</i>	<i>Lava ca</i>	E	0.31
<i>Ligustrum sp</i>	<i>Ligu sp</i>	A	0.02
Liliaceae	<i>Lili</i>	N	0.02
<i>Lotus hillebrandii</i>	<i>Lotu hi</i>	E	10.34
<i>Malva sp</i>	<i>Malv sp</i>	N	0.00
<i>Myrica faya</i>	<i>Myri fa</i>	N	0.32
<i>Opuntia maxima</i>	<i>Opun ma</i>	A	0.21
<i>Origanum vulgare</i>	<i>Orig vu</i>	N	1.97
<i>Passiflora edulis</i>	<i>Pass ed</i>	A	0.02
<i>Phoenix canariensis</i>	<i>Phoe ca</i>	E	0.26
<i>Pinus canariensis</i>	<i>Pinu ca</i>	E	0.01
<i>Plantago sp</i>	<i>Plan sp</i>	N	0.01
Poaceae	<i>Poac</i>	N	0.12
<i>Prunus sp</i>	<i>Prun sp</i>	A	0.36
<i>Reseda luteola</i>	<i>Rese lu</i>	N	6.04
<i>Rumex sp</i>	<i>Rume sp</i>	N	1.77
<i>Scabiosa atropurpurea</i>	<i>Scab at</i>	A	0.06
<i>Schinus molle</i>	<i>Schi mo</i>	A	0.02
<i>Sechium edule</i>	<i>Sech ed</i>	A	0.01
<i>Silene sp</i>	<i>Sile sp</i>	N	0.12
<i>Sonchus sp</i>	<i>Sonc sp</i>	N	0.36
<i>Tropaeolum majus</i>	<i>Trop ma</i>	A	0.09
<i>Tuberaria guttata</i>	<i>Tube gu</i>	N	0.10
<i>Viburnum rigidum</i>	<i>Vibu ri</i>	E	0.02
<i>Vicia sp</i>	<i>Vici sp</i>	N	0.11
<i>Yucca elephantipes</i>	<i>Yucc el</i>	A	0.00
<i>Zea mays</i>	<i>Zea ma</i>	A	0.02

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