



Distribution of *Castanea* pollen in Galician honeys (NW Spain)

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Abstract

With the aim to know the importance of the *Castanea* pollen in the Galician honey (N. W. Spain), the interannual oscillations within the areas of production and the most active phenological period for the bees, we have made the melissopalynological analysis of: 599 samples of honey collected during the period 1990–1999 in Galicia, the production of 40 beehives during three consecutive years (1990, 1991, 1992), the partial production during 1990 of two beehives situated at distant points in our geography.

1. Introduction

The chestnut tree has existed for about 40 million years. There are 13 species of chestnut trees distributed throughout the warm areas of the Northern Hemisphere. *Castanea sativa* Miller is the most abundant in Europe.

The largest area of chestnut trees in Spain is found in the north-west of the country. Nowadays, the mono-specific masses of chestnut trees in Galicia, occupy almost 28.000 acres, which are mainly distributed in traditional forests in the mountainous areas of the provinces of Ourense and Lugo, as well as in the area of Deza in the province of Pontevedra (Fernández and Pereira, 1993). In the rest of Galicia, it is often found forming mixed groves together with *Quercus*. It can also be found alone, next to the crop growing areas, since it is an important producer of fruits and wood. For this reason, chestnut trees are ecologically, socially and economically very important for our region (Vieitez et al., 1996).

In Galicia Chestnut trees blossom from the end of May (in the coast) until July (inland). This difference depends on the weather. It is possible to find an oscillation of two or three weeks in relatively close areas. It is an excellent bee resource, since it has a high

quantity and quality of nectar and pollen (Ricciardelli and Persano, 1978; Crane et al., 1984; Gómez, 1985; Simonetti et al., 1989) at the time when the colony of bees has the ideal biological conditions for a good collection. The production of honeydew from these species is not very important in Galicia (Jato et al., 1991; Seijo, 1994).

Different bibliographic references (Crane et al., 1984) show that the production of honey by hectare oscillates between 50–100 kg. and the production of honey by beehive between 25 and 28 kg. The *Castanea* pollen is overrepresented in honey (Louveaux et al., 1978). The average content is higher than 100 000 grains per 10 grams of honey.

In Galicia beekeeping is an amateur and semi-professional activity. The average amount of colonies of a beekeeper is over 20. Honey production is mainly dedicated to self-consumption and direct selling. The data of the last apicultural register show that there are 120 000 beehives with a production that oscillates between 12 and 18 kilos per beehive. The total production of honey in Galicia is about 2 000 tons. The *Castanea sativa* is the most interesting taxa for the production of honey in our land, being the one that produces the highest quantity of monofloral honey.

2. Materials and methods

We have studied the importance of the *Castanea* pollen in the Galician honey. In order to do this we have made the melissopalynological analysis of 599 samples of honey collected in the period 1990–1999.

With the aim to know the variations in the content of this pollen type in different consecutive growing season obtained from non-transhumant apiaries, we have studied and made the palynological analysis of the production of honey of 40 apiaries situated in Galicia. This research was conducted in 1990, 1991, 1992.

Finally, with the aim to know the moment when *Castanea sativa* is favourable for the bees, we have collected partial samples of honey from two apiaries in Galicia during the growing season of 1990. One of the beehives is situated near the coast, so the flowering, in general, takes place earlier, and the other one is inland, where the flowering takes place later.

The studied area is the whole Galician territory of about 29 575 km². The samples were taken directly from the beekeepers, indicating for each of them: the date of the collection, the total quantity of honey collected, the number of beehives in the apiary and its geographical origin.

The methodology that has been used is the one proposed by Louveaux et al. (1978). The qualitative analysis has been made from a minimum of 1 200 grains of pollen. The quantitative analysis and the honeydew index have been made from 10 grams of honey. Some microscopic slides of the pollen palynology of the Universities of Vigo and Santiago de Compostela have been used as reference material for the identification of the types of pollen.

3. Results

Figure 1 shows the types of honeys identified in the studied samples. Out of the 599 samples the highest quantity was polyfloral honey. *Castanea* unifloral honey was the second one.

We have found a total of 144 different pollen types in the studied samples. Besides *Castanea* pollen, other pollen of interest in Galicia honey were the following: *Rubus*, *Cytisus*, *Erica australis*, *Eucalyptus*, *Erica arborea*, *Lotus*, *Erica umbellata*, *Echium*, *Campanula*, *Trifolium repens* and *Quercus*.

In the quantitative analysis we can see that 78 samples contain at least 2 000 pollen grains per gram

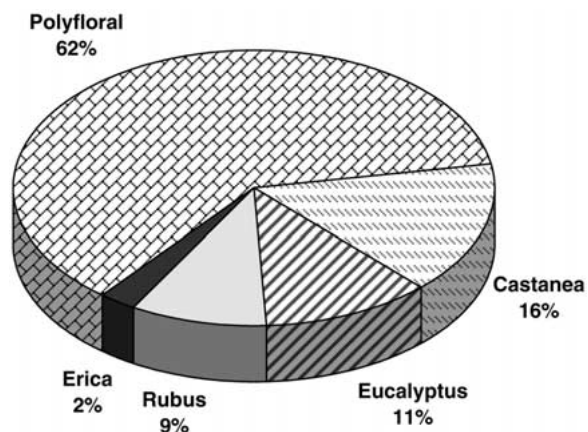


Figure 1. Honey types in the samples studied.

Table 1. Frequency classes of *Castanea* pollen in the honeys studied

<90%	90–70%	70–40%	40–20%	<20%	Not present
8	84	159	123	219	6

of honey, 337 between 2 000 and 10 000, 141 between 10 000 and 50 000, 25 between 50 000 and 100 000 and 18 more than 100 000 pollens per gram of honey. The presence of certain elements indicating honeydew was nil or very low ($HDE/P < 0.1$) in all the samples.

Table 1 shows the classes of frequency of *Castanea* pollen and the number of samples included in each class. *Castanea* pollen is present in 99% of the samples studied. Its value varies between 0.2% and 92.7% of the pollen spectra.

Subsequently we show the variation in the content of *Castanea* pollen in the honey of each of the 40 apiaries selected in the harvest of 1990, 1991, 1992 (Figure 2). In the apiaries situated near the coast, the major quantity of *Castanea* pollen in honeys was in 1990. In 1992 the flowering of *Eucalyptus* limited the abundance of these pollen in honey. In inland areas the taxa is the most important bee source, consequently its pollen content in honey was more constant in the three years. Generally in both areas this genus presents less importance in the honeys collected in 1992.

Related to the intrannual variation of pollen of *Castanea* we present in Figure 3 the percentage of representation of this pollen during May, June and July in an apiary on the coast and one inland. The two apiaries showed a difference of about one month in the attractiveness of *Castanea* for bees.

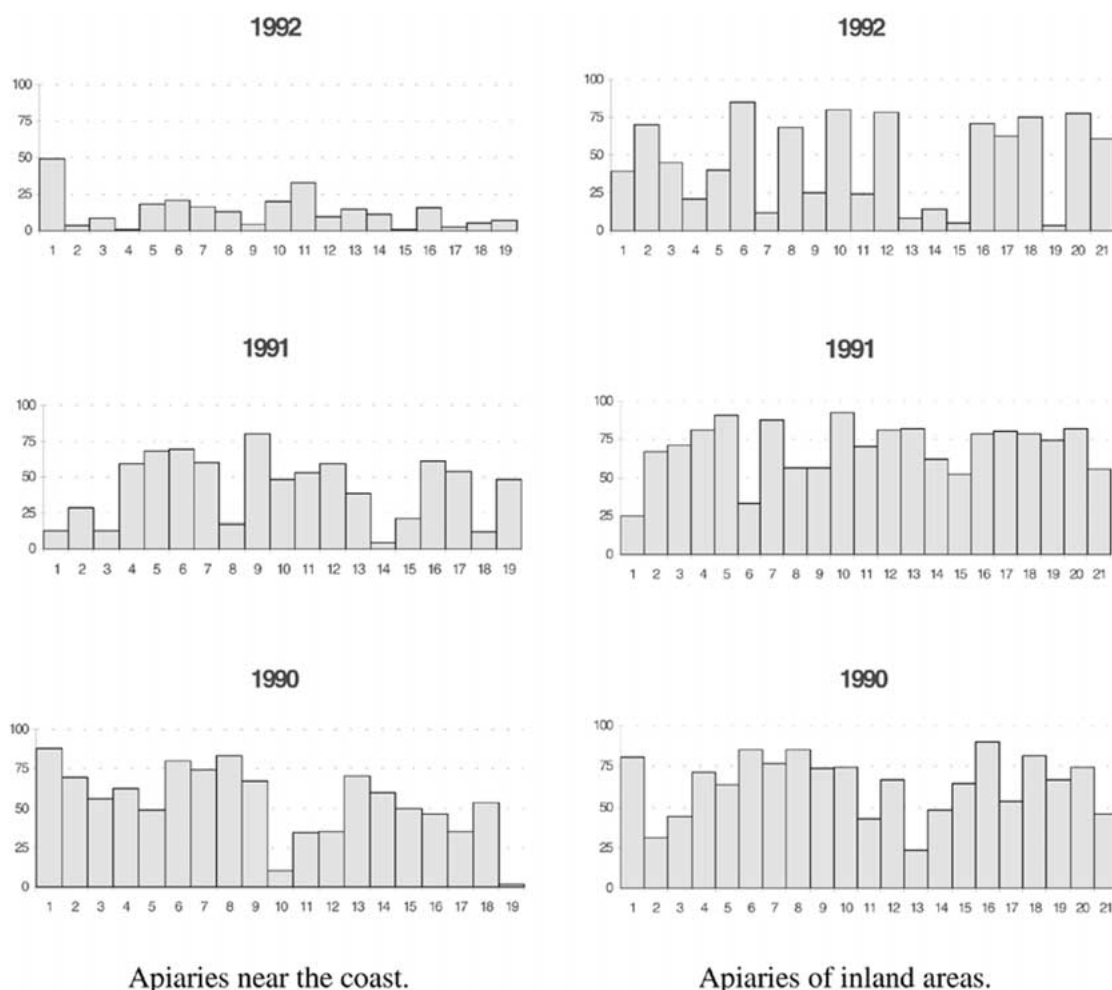


Figure 2. Percentage of *Castanea* pollen in honeys in the apiaries studied during 1990, 1991, 1992.

4. Discussion and conclusions

Map 1 shows the areas of honey with high level of the taxa in dark. These are the main areas of the province of Lugo and the centre and east of Ourense, the area of Deza in Pontevedra and the North of A Coruña. These areas mostly coincide with the areas of distribution of chestnut groves traditionally cultivated in Galicia, except some areas in the centre-west of the province of Ourense, where the abandonment of the agricultural activity has produced large areas with *Rubus* as a plant with major bee value. These areas strongly determine the kind of honey that has been produced in the apiary. The areas which have an abundance of *Castanea*, yet its pollen is not predominant in the pollen spectra of honeys, are the surrounding dark ones. The white colour indicates areas where this pollen has small

interest. In these area *Eucalyptus* is the most important taxa for honey production.

The study of pollen has shown that *Rubus* is the second important element in honeys with high level of *Castanea*. The blossoming of these species takes longer than that of the *Castanea sativa* and at the beginning, the flowering is overlapped by the latter. If the blossoming of *Rubus* is very abundant, it produces multifloral honeys whose floral origins are both *Castanea* and *Rubus*.

The other secondary elements have, in general, little importance in honeys with high level of chestnut pollen (always with values lower than 2%), except the *Erica* genus (*E. australis*, *E. umbellata*, *E. arborea* and *E. cinerea*) which is very abundant in the Galician bushwoods and which normally are in bloom from the beginning of March to September.



Map 1. Geographical situation of the area studied and the importance of *Castanea* pollen in honey.

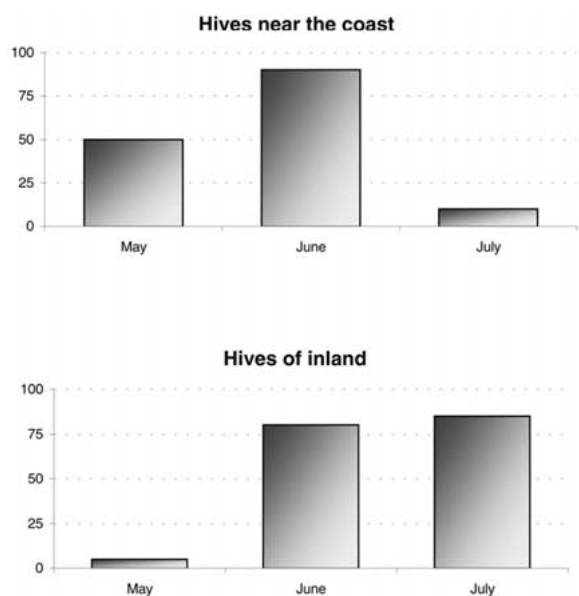


Figure 3. Percentage of *Castanea* pollen in honey collected by bees in both apiaries.

There is an important interannual variation of the percentage of *Castanea* pollen in honeys from areas where there are other taxa of high bee value, such as *Rubus* and *Eucalyptus*. This is due to the meteorological conditions, which affect bee activity and the phenological behaviour of the plants. In the coastal areas the intensive reforestation with *Eucalyptus globulus*, that took place overall by the middle of the 20th century, have originated a radical change in the vegetation of the environment as well as in the floral distribution of the honeys as we can see when

we compare the present studies and those made by the middle of the century (Vieitez, 1950). However, the meteorological conditions are very important in the decision of the floral origin of the honeys, since they suit both the activity period of the bees and the quality and quantity of the nectar secreted by the plants. When *Castanea* does not secrete nectar, the foggy periods coincide with high temperatures hence if their flowering period coincide with these climatic circumstances, the bees will not take advantage of it. In this case, other sources of nectar will attract the attention of the bees thus creating important variations in the production of honey in different years in non-transhumant apiaries.

As a conclusion, we may say that the chestnut pollen is the most important of the pollen spectrum for the honeys from Galicia. This pollen often goes together with the following pollen types: *Rubus*, *Erica*, *t. Campanula*, *t. Cytisus*, *t. Trifolium repens*, *Quercus*, and to a lesser extent, *Echium* and *Eucalyptus*. We may also underline the low presence of pollen from *Cistaceae*, *Helianthus annuus*, *Olea europaea*, *Lavandula stoechas*, etc., which are frequent in honeys from other geographical origin with predominance of *Castanea* pollen.

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