Establishing Some Qualitative Connections at the Pollen Collected by Bees and Produced by Spontaneous Flora in Different Moments of the Day

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Abstract
Based on the bibliographic study it has been observed the fact that poleniferous plants have diverse blooming, depending on the time of the day. Temperature and humidity are climatic factors with a special influence in opening the corolla of a flower and production of pollen for bees. Also, every species has different needs for temperature degrees in order to bloom. The bees start collecting the pollen from the early hours in the morning if the temperature is over 14^0C, and the collection lasts until the evening. During this activity, the bees visit a large number of flowers, as the blooming of some poleniferous plant species depends very much on the moment of the day. This process is easy to track by watching the entrance of the beehive for the bees that enter loaded with pollen clusters on their legs. If observations start from 8 o'clock it can be seen that around midday the colour of the pollen clusters on bees' legs change, so that at 12 o'clock none of the bees that were bringing yellow pollen from the dandelion in that moment brings any more pollen from them because the dandelion has closed its corolla and for the bees it no longer represents a poleniferous source at midday. After 12, fructiferous trees are an important source of pollen. The pollen has different qualitative and nutrient properties depending on the plant species nurturing the bees.

Keywords: bee, flower, poleniferous plant, pollen.

1. Introduction

Pollen is the male element of the flowers, which bees collect it into granules measurable in microns. On one flight, visiting from a few tens and hundreds of flowers, the bee brings pollen grains in baskets on the hind legs. Their weight is between 0.006 and 0.015 g. In the maximum 50 daily flights they make, a foraging bee enriches the "treasure" of the hive with about 0.750 g pollen [1].
The bee pollen is not produced purely a product of the hive, but he is the main protein source of food for these being used lately in the direct human food because of its therapeutic traits. Pollen provides the classical training and development of young bodies of bees, their maturation, and body fat formation of wintering bees. It also ensures the development and functioning of pharyngeal and wax glands to produce the royal jelly and wax [2].
Overall, anemofile plants produce more pollen than entomophilous ones, but whatever the mode of pollination, every pollen species produces more than its demand, reported to the number of female flowers. Pollen maturation and time of his release is a characteristic rhythm of each species, strongly influenced by the development of both plant and meteorological factors. There are plants that release pollen throughout the day and night, others only a few hours or minutes [3].
Weight of pollen grains carried by bees varies between 5-7 mg, reaching even 15 mg. Differences in average grain weight are due to pollenous source and other factors such as different transport capacity of pollen by bees or

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changing weather conditions. On the quantity of pollen collected from families located on the same location there can be important differences.

Pollen colour varies from one species to another, the range of colours ranging from yellow-white to black, predominantly in shades of yellow and green. The colour of pollen grains in the collector may be uniform, when pollen is collected from a single plant species or can be polychrome, with two or more colours when bees collect pollen from many plant species (Table 1) [4, 5].

Table 1. The color of pollen from different bee plants by various authors

Common name	Latin name	Blooming months	Pollen color
Maple	*Acer spp.*	Feb - Apr	light yellow
Manitoba Maple	*Acer negundo*	Feb - Apr	light olive
Grey Alder	*Alnus incana*	Feb - Apr	brownish yellow
American Hazel	*Corylus americana*	Mar - Apr	light green
Hawthorn	*Crataegus spp.*	Apr - May	yellow brown
Apple	*Malus domestica*	Apr - May	yellow white
Plum	*Prunus spp.*	Apr - May	light grey, grey
Wild Cherry	*Prunus avium*	Apr - May	yellow brown, light brown
Cherry Plum	*Prunus cerasifera*	Mar - Apr	light brown to brown
Sour Cherry	*Prunus cerasus*	Apr - May	dark yellow
Peach	*Prunus persica*	Apr - May	reddish yellow
Pear	*Pyrus communis*	Apr - May	red yellow
Blackberry	*Rubus spp.*	May - Jun	light grey
Raspberry	*Rubus idaeus*	May - Jun	white grey
Willow	*Salix spp.*	Feb - Apr	lemon
Canola	*Brassica napus*	May - Jun	lemon
Snowdrop	*Galanthus nivalis*	Mar - Apr	orange, red
White Sweet Clover	*Melilotus alba*	May - Aug	yellow to dark yellow
Sainfoin	*Onobrychis viciifolia*	May - Jul	yellow brown
White mustard	*Sinapis alba*	June	lemon
Dandelion	*Taraxacum officinale*	Apr - May	red yellow, orange
Blueberry	*Vaccínium myrtíllus*	Jun	red yellow, orange
Melons	*Cucumis melo*	Jun-Frost	pale yellow
Fireweed	*Epilobium angustifolium*	Jul - Aug	blue
Buckwheat	*Fagopyrum esculentum*	Jul - Aug	light yellow to light green
Sunflower	*Helianthus annuus*	Jun - Sep	golden
Alfalfa	*Medicago sativa*	July - Aug	khaki
Poppy	*Papaver somniverum*	May - Jun	grey
Alsike Clover	*Trifolium hybridum*	May - Sep	yellow brown
Crimson Clover	*Trifolium incarnatum*	May - Aug	dark brown
White Clover	*Trifolium repens*	May - Sep	caledonian brown

The chemical composition of pollen varies greatly according to origin, geographic region, age, how to harvest and duration of storage. Pollen contains all that the body needs for life, in all species there are present proteins, amino acids, sugars, minerals and vitamins, hormonal substances, fats, flavourings and water, of course [6]. Mixture of pollen originating from entomophilous plants has a higher nutritional value, compared with that of pollen from anemofile plants and ensures all substances necessary for developing a young body. Anemofile pollens are generally poorer than entomophilous pollens in fat, dressed in a fat binder, as the dandelion pollen contains more than 14% fat, while pine pollens barely exceed 2%. The pollen of some species is richer in protein than others. Among the most valuable species are the pollen of fruit trees and clover, and among the poorest we recall *Ranunculaceae* species.

Lipid content of pollen varies according to their botanical origin as follows: 0,16% to hazelnut 0.56% from hornbeam, 0.73% for corn, 1.23% Norway spruce, 1.80% from poppy 2.32% walnut, 2.67% for birch, the willow 3.56%, 11.34% for

chestnut, 12.87% to dandelion, 19.80% bells. On average, on mixtures of pollen, fat lies around 4.5 to 4.8%.

Crude protein content of pollen varies from 13.5 to 41.9% in willow. Most of the pollens used by bees have protein content between 24 and 33%. **(**Table 2)[1].

Table 2. Chemical composition of different varieties of pollen

Species	Crude protein %	Crude fat %	Gross cellulose%	Ash %	Extractive neazotate %
Pollen sainfoin	32.53	2.09	1.49	3.54	60.35
Corn Pollen	28.96	3.24	2.86	5.82	59.12
Dandelion pollen	22.69	3.23	1.04	1.62	71.44
Ranunculus repens L. pollen	17.42	2.40	0.80	2.76	76.62
Pollen Carex sp	9.26	0.94	1.30	1.50	1.50
Pollen Ornithogalum umbellatum	8.66	1.13	0.95	1.36	87.90

Anna Maurizzio classified pollens as follows:

- **pollens with high biological value:** willow, chestnut, grain, poppy, red clover and white clover. Wahl O. includes in this group: fruit trees, rape, horse chestnut, wild radish and mustard field;
- **medium pollens with relatively good value:** sunflower, poplar, dandelions and corn. Wahl O. includes here hazel, birch, beech, oak, elm and maple.
- **inferior pollens:** hazel, alder, birch, aspen mountain, pine and fir. Of this last category, O. Wahl says it brings together the less efficient ones in the bee breeding, such as spruce pollen.

Temperature is one factor that influences the activities related to bees' collection. At low temperatures (below 10 °C) bees don't even leave the hive. In mountainous areas, bees harvest pollen at noon mainly, in warmer areas as the south of the country they prefer to harvest pollen in the morning and afternoon.

The brightness of the environment has an important role. In bright days, the bees begin to fly at lower temperatures than on cloudy days.

Presence or absence of unsealed brood in the family, i.e. the growing brood, influences the pollen crop. Activity level between bees and when they discover a source of pollen plays an important role in collecting pollen. Time of day of pollen collection varies depending on plant species and depends primarily on the time when the flowers open. (Table 3) [7, 8].

Table 3. Hourly evolution the amount of pollen collected

Time	The amount of pollen collected		Share of total (%)
	g/hive	%	
10	137.30	29.67	29.67
12	204.96	44.30	73.97
14	80.93	17.49	91.46
16	28.67	6.20	97.66
18	10.76	2.30	100.00
Total	462.65	100.00	-

Phytotherapeutical effects differ in relation to floral origin. Here are some types of pollen and their therapeutic effects:

- **acacia pollen** - calm;
- **sweet chestnut pollen** - favours venous and arterial circulation, liver and prostate decongestion;
- **decorative chestnut pollen -** is acting on circulatory disorders, especially in the veins, strengthens capillary network;
- **rape pollen -** favourable action on varicose ulcers;

- dandelion pollen - diuretic, acting favourably on the kidneys and bladder, depurative and slightly laxative;
- apple pollen - the beneficial action on the myocardium, general fortifier;
- Sage pollen - action on the digestive and intestinal functions, diuretic, causing sweat;
- thyme pollen - activates circulation, tonic and aphrodisiac, acts as an antiseptic and pectoral;
- tile pollen - calming, sedative [5].

4. Conclusions

• Pollen can't be not picked and eaten according to species, this mix is composed of unifloral qualities which make up pollens.
• When the bees are taken to a place where certain plants prevail (acacia, hawthorn, sage) the honey it is predominantly obtained from pollen of that species.
• It is difficult to guarantee that the pollen is monofloral, for nobody can force the bees to visit only certain flowers.

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