Our bees are dying, do we know why?

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Introduction

Apis mellifera, the honey bee, has important economic value among farmers due to its high pollination capacity[1]. The past several years have seen a decline in the population and this has caused a great concern in the scientific community. In 2006, this phenomenon was named **Colony Collapse Disorder** (CCD)[2].

The aim of this study is to determine and explain the main factors that may cause CCD:

Anthropological Factors

Malnutrition

An increase in monocultures reduces the diversification of nutrients and a lack of abundance of floral resources at certain times of the year[3].

DDT

Organochlorine long acting insecticide and poor biodegradability. Banned since 1972 for agricultural use. Nonselective action causes immediate and massive death on bees.

Organophosphate

Pesticide with high toxicity and rapid degradation acting both through direct contact and systemically. At low concentrations, affects the physiology and the motor activity of the bees.

Phenylpyrazol

Neurotoxic pesticide with systemic action with restricted use. Alters the nervous system and causes death or sublethal effects such as reduced mobility and decline in olfactory ability.

Neonicotinoid

Neurotoxic pesticide with systemic action[4] with restricted use. The bees are exposed orally. The sublethal effects are: reduction in olfactory memory and bad orientation.

Natural Factors

Nosemosis

Contagious disease caused by *Nosema Apis* and *Nosema ceranea* microsporidiums. It's transmitted orally. It produces an energy decrease, a reduction in lifetime and paralysis in the bees[5].

Asian predatory wasp

Vespa velutina, an invasive species native to Asia, attacks bee workers, in flight or in front of the hive in order to feed on their larvae. The honey bee attack is ineffective to defend themselves.

Varroosis

Disease caused by the mite *Varroa destructor*. The parasite hides where the bee cannot access with its limbs. The parasite eats hemolymph of either larvae or adult bees[6].

Deformed wing virus

Infection characterized by deformities in bee wings. Produces an incapacity to flight and a reduced lifetime. *Varroa destructor* is an important transmission vector.

American foulbrood

Disease caused by the bacterium *Paenibacillis larvae*. The spores are ingested by the larvae and thrive in the hemolymph, causing death. It is difficult to eradicate because of the endospore's resistance.

Importance of the factors

- There has been a significant increase in publications about the bee population decline since 2006.
- The mite *Varroa destructor* and the microsporidium *Nosema* are the most studied throughout history.
- The use of pesticides, especially the Neonicotinoids, concerns the scientific community because of their effects on the wildlife.

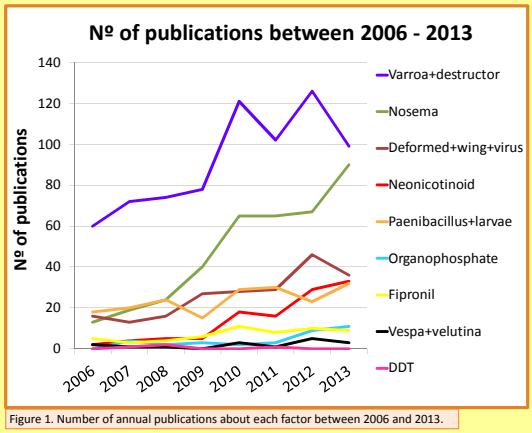

Figure 1. Number of annual publications about each factor between 2006 and 2013.

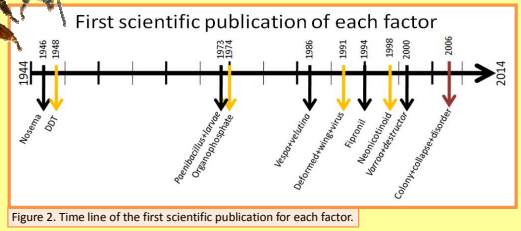

Figure 2. Time line of the first scientific publication for each factor.

Discussion

- No single factor causes the CCD.
- We need more information to find solutions.
- *Varroa destructor* has more importance every day between the scientific community and could be one of the most relevant factors causing de CCD.
- Population, especially farmers, should reduce the use of chemical pesticides.
- Good environmental educations should be provided from childhood in order to try to prevent future environmental problems.

References

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