



## **Pesticide residues in honey bees, pollen and beeswax.**

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Honey bees visit sprayed crops with pesticides during pollen and nectar collecting process. Pesticides are transported inside the hive, where both, agrochemicals from agriculture and compounds used in-hive against varroosis by beekeepers are accumulated in wax, pollen and honey bees.

In order to study the distribution of pesticide residues in beekeeping matrices, 166 samples of beeswax, fresh stored pollen and live in-hive honey bees were collected in June and July during 2016-2017 from 45 apiaries in 39 locations in Spain that covered a wide range of landscapes, from intensive farming areas to grasslands, holm oak woodlands, mountainous and urban surroundings. The samples were extracted by a slightly modified QuEChERS procedure and screened for 63 pesticides and its degradation products by liquid chromatography mass spectrometry (LC-MS/MS).

Beeswax revealed high levels of miticides used in beekeeping such as coumaphos, chlorfenvinphos, fluvalinate and acrinathrin, which were detected in more than 75% of samples. Beeswax is the most contaminated hive compartment regarding quantities of pesticides detected, whereas pollen samples revealed the highest number of different pesticide residues detected in the samples. Pollen was predominantly contaminated by miticides but also by insecticides used in agriculture such as chlorpyrifos and acetamiprid, which showed concentrations significantly higher in apiaries located in intensive farming contexts. Pesticides residues were less frequent and at lower concentrations in live honey bees. However, it should be taken into account that the study was based in the sampling of apparently healthy bees. So residues found in honey bees analyzed in the present work are not reliable nor representative of the full exposure of bees to pesticides.

Assessing pesticides content in these three different apicultural matrices at the same time is a useful tool to understand the magnitude of honey bee colonies exposure to toxic compounds, which is one of the main causes of the progressive decline in honeybee colonies around the world.

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### **References:**

[1] Calatayud-Vernich, P., Calatayud, F., Simó, E., and Picó, Y. (2018). Pesticide residues in honey bees, pollen and beeswax: Assessing beehive exposure. *Environmental Pollution* 241, 106-114.