



INSIGNIA



Honey bee colonies as biomonitors of the environment - a guideline

The INSIGNIA Consortium



Monitoring contaminants with honey bee colonies.

The aim of INSIGNIA is to monitor pesticides and pollen diversity in the environment with honey bee colonies. For the detection of pesticides, APISrips are used, and the pollen origin was determined using the ITS2 molecular technique.

Collecting pollen



Each beekeeper uses 2 colonies. Pollen loads are collected with a pollen trap. The time frame for collection is one day per fortnight. After collection the pollen is stored at room temperature with silica-gel for preservation in a dry state.

APISrips – collecting pesticides

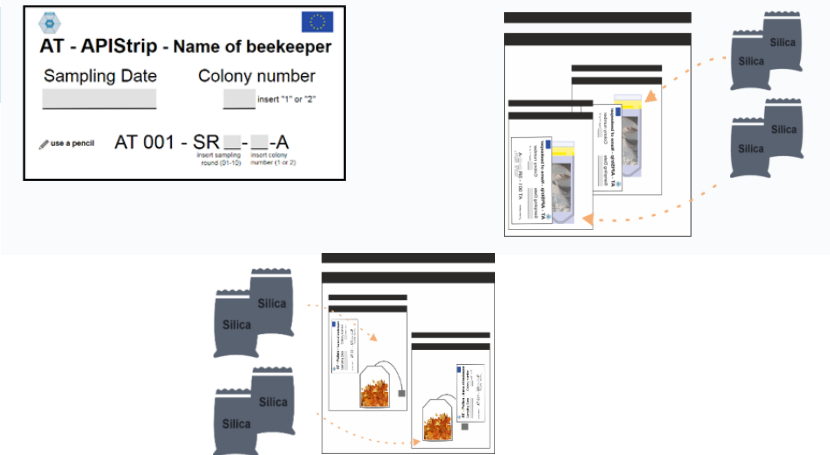


Each Citizen Scientist inserts the APISrips, plastic strips coated with Tenax, to collect substances on the strip. The strips stay in the colony for 2 weeks and are then collected and stored at room temperature with silica-gel to ensure dry conditions.

Pollen clarify the honey bees' foraging radius. APISrips collect pesticides from the surroundings.

Proper labelling – so important

Sample labelling and storage



Within all science, sampling and sample labelling are the backbone of reliable data. Therefore, this has high priority. Consequently, the sequence of steps from sampling, labelling and storage is protocolled in detail.

Shipment

All double-checked labelled samples are shipped to the laboratories. As with labelling, the transportation of the samples is protocolled to ensure quality control.



Without proper labelling and shipment, there are no reliable data.

Analysing

APIStrips are analysed at a very high resolution (LC-MS/MS and GC-MS/M by both liquid and gas chromatography coupled to tandem mass spectrometry) and pollen are analysed via ITS2 metabarcoding, which relies on the genetic fingerprints.

Pesticide residue analyses and ITS2 metabarcoding



Social media: the key communication

Instruction via picture manual, (virtual) meetings, social media and email

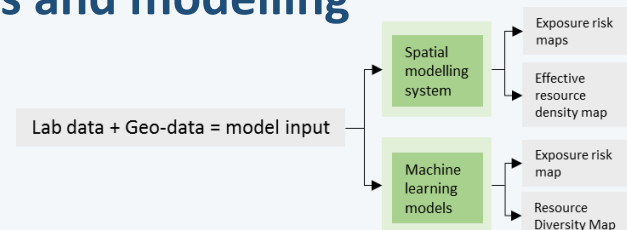


Instruction manuals, video instructions, online meetings and personal visits are the tools to inform, communicate and instruct the Beekeeper Citizen Scientists. These tools were fine-tuned during the Covid-19 crisis, when direct contact with the beekeepers was restricted. Social media were used strongly to communicate with the beekeepers, and also the public.

Strong results

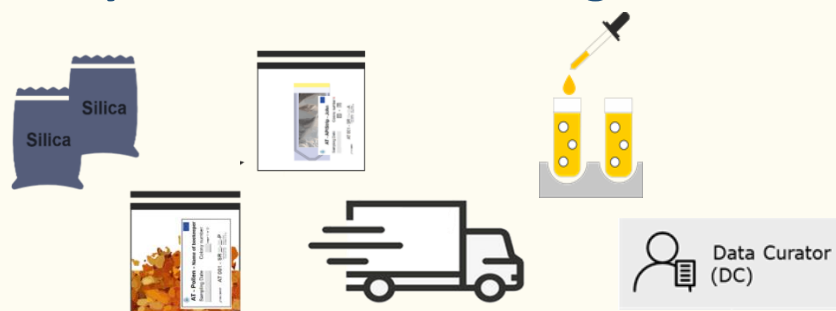
The statistics and modelling team behind INSIGNIA found very exciting results that confirmed the high resolution of the methods for biomonitoring. New models were developed in which lab data, geo-data and food availability are combined to show the spatial and temporal pesticide exposure risk and pollen diversity. This project confirms that honey bee colonies are an important and practical tool for monitoring the environment for pollution and food availability for bees.

Statistics and modelling



Quality control

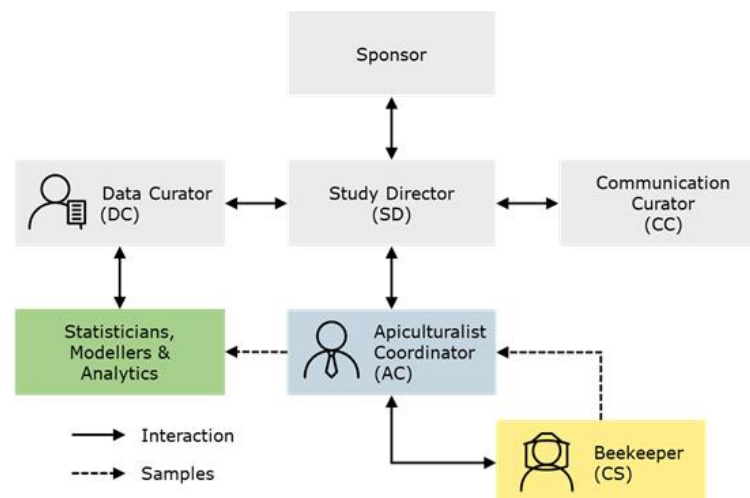
Quality control from sampling to analysis and data recording



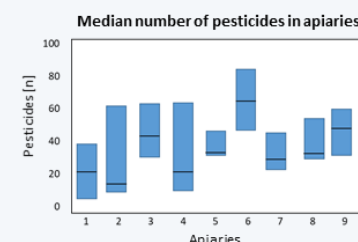
To secure the samples, quality control takes place during the whole sequence of activities. The Beekeeper Citizen Scientists fill out an online survey for each sample. They label it according to the protocol and then quality control themselves via photos of all samples and labels. All data are stored in the online Data Warehouse administered by the Data Curator.

Study organisation structure

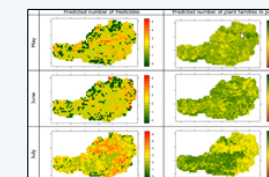
INSIGNIA established a strong structure, so that all participants, from Study Director to the Beekeeper Citizen Scientists, knew their role and responsibilities in the process. Other structures were established as well, but not explained in this leaflet.



Statistics



Modelling



Contact: Jozef van der Steen,
alveusab@outlook.com

The guideline is available on

- Website INSIGNIA <https://www.insignia-bee.eu/>
- Website of EU Pollinator Information Hive
- Website of EU Food Safety Protection of bees

On the INSIGNIA homepage you can find a lot of information, as a blog, videos, articles, publications etc. HAVE A LOOK!

APIStrips turn out to be a useful new tool.

INSIGNIA established a strong structure, with short communication lines and responsibilities.

APIStrips and pollen analysis are strong tools for monitoring the environment.