C.S.I. Pollen: Citizen Scientist Investigation on pollen diversity forage available to honey bees

Prevention of Honey Bee COLony LOSSes — COLOSS

C.S.I. Pollen: How to investigate pollen diversity available for honey bees

1. Choose 3 colonies for study.

Ideally you should choose: non migratory colonies, all in the same apiary. Give numbers 1-3 to the colonies; preferably always sample the same colonies. Get three honey jars and label the jars and the lids with „1", „2", „3".

2. Install pollen traps.

Note that the bees need to get used to pollen trap for some days before use and the traps need to fit exactly (if there are any gaps the bees will find these and avoid using the trap as intended).

3. Close pollen traps <u>before</u> sampling date.

You will receive an email a few days before the target sampling date. The pollen traps should preferably be closed for 24 h within the suggested sampling period (Thursday to Sunday).

Provide a clean paper towel in the tray. Pollen traps can be closed for up to 3 days if weather or personal timing demands it. Please note how long the pollen traps were closed for (see 9.3).

4. Collect content of pollen trap.

Ideally after the trap has been closed for 24 hours. Collect the pollen in the labelled honey jar or analyze at the apiary. Remove paper towel. Do not mix up the pollen collected from the 3 different colonies!

5. Open pollen trap <u>after</u> collecting samples.

To ensure sufficient pollen collection by colonies, do not keep pollen traps closed longer than needed.

6. Determine amount for colour analysis.

We do not need the whole amount of pollen in the trap, about 20 gram per colony are analysed. This is the amount that fits in an inverted jar lid („Twist Off" diameter ca. 63 mm, height 8.5 mm). Mix the sample and then fill the lid. If there is not enough pollen to fill the lid, please make a note and then enter this later (see 9.6): "The required amount was not reached (less pollen than an inverted jar lid)".

7. Determine number of colours of pollen pellets.

We are interested in the number of different coloured pollen loads in the 20 g sample. Therefore sort the pollen pellets on white paper or a white tray (e.g. using a match) preferably during daylight, but not in direct sunshine.

Classification of number of pollen loads per colour is as follows:

> ABUNDANT colours in the sample (>20 pollen pellets)
> RARE colours in the sample (3-20 pollen pellets)
> VERY RARE colours in the sample (1-2 pollen pellets)

A typical result could therefore look like this:

> Colony 1: The required amount (full inverted jar lid) was reached. 1 VERY RARE colour in the sample, 2 RARE colours in the sample, 2 ABUNDANT colours in the sample.

> Colony 2: The required amount was not reached (less pollen than an inverted jar lid). 0 (zero) VERY RARE colour in the sample, 7 RARE colours in the sample, 1 ABUNDANT colour in the sample.

> Colony 3: The required amount (full inverted jar lid) was reached. 0 (zero) VERY RARE colour in the sample, 1 RARE colour in the sample, 4 ABUNDANT colours in the sample.

Note that a remarkable number of people have difficulties in colour vision. If you know of this, please let you help by someone with good colour vision. We will therefore also place a colour vision test on our website.

8. Use for the pollen.

You can use the pollen as you wish, eat yourself, discard, store for pollen analysis, or feed the pollen to colonies as a patty (water plus icing sugar). Note that diseases might be spread when feeding pollen to other colonies than harvested.

9. Data entry.

With every invitation to collect samples you get a unique internet link that can only be used once and will be online for 2-3 weeks. If you have any problems contact: national.coordinator@honey.xx. If you do not receive invitation email, please check spam box or contact national coordinator.

On the website, you will be asked the following:

9.1. Please choose your country

9.2. On which date did you collect your samples from the traps??

9.3. How many days were the pollen traps closed?? (1, 2, 3, more days)

9.4. Where are your monitoring colonies located. Please specify exact location!

Note: Zoom in and out to find location. Determine location with right mouse click! Switch to Satellite-mode to identify the location! From this we can determine the GPS coordinates and sea level. For example, in the picture you can see the trees underneath the colonies from Graz University are located. Your data will be used for scientific purposes / research only. No other party will be informed about your personal data.

9.5. How would you characterize your Apiary location within 2km radius?

Possible answers: Arable, Urban, Village, Grassland, Heathland / Moorland, Salt marsh, deciduous woodland = broad-leaved forest, coniferous woodland, mixed forest, Riparian forest.

Note: 9.4 and 9.5 allow comparison of different habitats, and will not be asked at every sampling date.

9.6. What amount of pollen pellets have you analysed from colony 1?

Possible answers: I did not collect pollen from this colony / The required amount (full inverted jar lid) was reached / The required amount was not reached (less pollen than an inverted jar lid)

9.7. How many different pollen colours did you identify in the sample from colony 1?

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	More than 15	No answer
Abundant colours (>20 pollen pellets)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◉
Rare colours (3-20 pollen pellets)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◉
Very rare colours (1-2 pollen pellets)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◉

9.8. What is the total number of different pollen colours from all of the three colonies?

This allows us to learn about pollen availability of your location. We therefore add the number of "new" colours from sample of colony 2 and 3 to the number of colours in the sample of colony 1. One Example: We find 5 colours of pollen loads in the sample of colony 1 (white, bright yellow, dark yellow, brown, blue). The first four colours can also be found in the sample of colony 2, but additionally we find orange pollen loads. So we have 6 different colours in total of the two colonies. In the sample of colony 3 we find colours that we have already seen in the previous samples, but also grey pollen loads that we have not seen before. Hence, the total number of different pollen load colours on this location is: 7 (although in every single colony there were 5 different pollen colours identified).

10. Confirmation email.

After you have successfully transmitted results, you within a few minutes receive a confirmation email. If you did not transmit results, you will get a reminder email.

Contact of national coordinator