

Final report for the project 71p6

Honey bee colony losses in Austria and the Czech Republic and relation to the bee immune system.

Written by Dr. Jiří Danihlák (Czech Republic) and Dr. Robert Brodschneider (Austria)

Main project outcomes

- 1) Actual data about honey bee colony losses in the Czech Republic and Austria were obtained directly from beekeepers using the COLOSS standardized questionnaire.
- 2) Honey bee physiology research started with the project focused on bee nutrition and immunocompetence.
- 3) The results from the nutrition experiment were summarized and a manuscript has been prepared for publication in an impacted scientific journal. Working title: Danihlák J., Šmehilová M., Lenobel R., Šebela M., Omar E., Petřivalský M., Crailsheim K., Brodschneider R. Does the pollen diet influence the production and expression of antimicrobial peptides in honey bee body parts?
- 4) The Czech and Austrian cooperation continues and grew up from epidemiological study to honey bee physiology.
- 5) We exchanged experiences from *in vitro* maintaining bees (Austria) and biochemical methods in bee research (Czech Republic).

Additional project outcomes and achievements

- 1) Beekeepers are involved into international research, applying Citizen Science approach.
- 2) The monitoring project is of interest for both, Czech and Austrian media, which published several articles with our results coming out from the Czech and Austrian cooperation.
- 3) The Czech Republic is participating in the core project of the COLOSS organization.

Thanks to the program AKTION we were able to extend the Czech and Austrian cooperation, what has been very helpful for our common areas focused on honey bee research and dissemination of the honey bee knowledge to beekeepers. Our cooperation will be continued in the 2016 with the project 74p4: Economic impact of winter losses of honey bee colonies and research on honey bee immunity.

Final report

The Czech and Austrian cooperation continued thanks to the program AKTION in 2015. The monitoring of honey bee colony losses in Austria and in the Czech Republic is the basic concept of our common research. We use Citizen Science approach for recording losses in Austria and in the Czech Republic. The COLOSS organisation every year produces a questionnaire for beekeepers with approximately 20 questions focused on honey bee colonies and their health to record winter mortality. An integral part of the project was honey bee physiology study focused on honeybee nutrition and immune system – key factors suspicious of colony losses.

The questionnaire was translated from English to German and Czech languages. The survey was in both countries performed from 13th March to 31st May 2015. The results in both countries showed higher response rate than in the previous year. Especially the Czech Republic had a 75% increase in answering beekeeping operations compared to the pilot study in 2014 (see sample sizes in Fig. 1). We disseminated information about this survey via internet, beekeeping journals, beekeeping newsletters, Czech press and at beekeeping seminars and lectures. During the phase 1 of the project we received data about colony losses in both countries. The Czech team (Jiří Danihlák and Marek Petřivalský) travelled to Graz at the beginning of May to set up the evaluation of the data because at this point it was already evident that both countries faced higher colony losses. Jiří Danihlák gave a lecture for students and staff at Karl-Franzens University in Graz at 6th May, about 80 participants listening to the speech entitled “Honey Bee Immunity: A Trendy Science”. Also the layout and timing of honey bee physiology studies (nutrition and immunocompetence) was prepared for further work during the summer time.

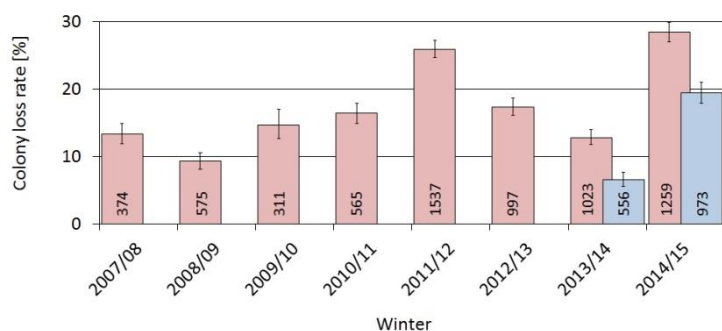


Figure 1: Winter loss rates (and 95% confidence intervals) of honey bee colonies in Austria (red) and the Czech Republic (blue) for the last eight and two years, respectively. Sample size = number of beekeeping operations. Differences among the countries are a subject of further studies.

In general, the monitoring project is of great interest for the media. Czech newspapers published several articles indirectly describing results of Czech and Austrian cooperation supported by the program AKTION:

- Lidové noviny 5. 1. 2015: [Největší masakr včel v českých dějinách](#) (The biggest bee massacre in the Czech history) – commented results from the pilot study we did in 2014 (also thanks to AKTION program).
- Lidové noviny 24. 4. 2015: [Je tu občanská věda. Přidáte se?](#) (Citizen Science is here. Do you join?) – This article summarizes the Citizen Science concept in the world and also in the Czech Republic.)
- Lidové noviny 28. 7. 2015: [Pětina českých včelstev uhynula](#) (A fifth of Czech colonies died) – Information about high colony losses in the Czech Republic in 2014/15 and its relation to other countries involved in the COLOSS project.)
- Palacký University in Olomouc published a [press release](#) with results of honey bee losses on 28th July 2015. This news was published in many Czech media, e.g. public Czech TV Channels, TV Prima, Czech National Radio etc.)

The Czech team had also an opportunity to visit a seminar for Graz students focused on honey bee physiology and behaviour during the visit in May.

During the phase 2 Jiří Danihlík travelled to Graz to work on the laboratory experiments for 10 days. Honey bees were maintained in cages and fed with monofloral diets. Thereafter bee samples were taken to Olomouc to analyse the concentration of antimicrobial peptide apidaecin and to measure the relative gene expression of peptides apidaecin and abaecin (phase 3). For this particular analysis it was essential to buy a kit for RNA isolation and some laboratory consumables, e.g. plastic tips, microtubes etc. Other chemicals and plastic were paid from other University sources. The visit in Graz was also helpful for analysing results from the winter survey; we prepared preliminary graphs and tables for final journal article for Czech beekeepers. We prepared a follow up study focused on honey bee livestock renewal during the beekeeping season of the previous. We also upgraded this survey during the stay in Graz for the year 2015.

The international organization COLOSS organized a conference in Ljubljana (Slovenia), where the comparison between Czech and Austrian honey bee livestock renewal was presented. The participation and travelling to the conference was financed from other Palacký University and Czech Beekeeping Organization sources. The presented poster is attached to this report.

Robert Brodschneider visited Olomouc in November 2015. We were working on the follow up study for beekeepers to be able to trigger it in the autumn. Robert Brodschneider gave a lecture for students and staff from Palacký University in Olomouc. The speech was attended by about 40 listeners. The Citizen Science concept and honey bee research stimulated long discussion after the end of the lecture. We also organized a seminar for beekeepers – some respondents from the winter survey. The seminar had two parts – lectures and workshop. Jiří Danihlík presented the Czech results from honey bee colony losses monitoring and Robert Brodschneider had a speech focused on surveys troubleshooting and on global and Austrian monitoring results. The workshop involved participants, which had

opportunity to discuss the future and the practical outcomes of the monitoring project for beekeepers in the Czech Republic. Robert Brodschneider is the international project coordinator and his presence was important for answering beekeepers question. On the other hand, we got several incentives for further years. The bulleting of Czech Beekeeping Organization published the news from this event (attached).

One planned visit in Olomouc was postponed from the phase 3 to phase 4. Anika Libor is a Ph.D. student from Robert Brodschneiders laboratory. She came to Olomouc to learn molecular biology methods focused on honey bee sample processing and polymerase chain reaction. We analysed several honey bee samples employing the equipment of Palacký University in Olomouc. Anika Libor had also the opportunity to cooperate on the Czech research of antimicrobial peptides and she also participated in a seminar for Czech students, held by Jiří Danihlík.

Jiří Danihlík, Ph.D.

Palacký University, Olomouc

Robert Brodschneider, Ph.D.

Karl-Franzens University, Graz

List of attachments

- Czech version of COLOSS questionnaire
- Detailed financial report from Palacký University
- Photos from common events

Czech press:

- Lidové noviny 5. 1. 2015: Největší masakr včel v českých dějinách
- Lidové noviny 24. 4. 2015: Je tu občanská věda. Přidáte se?
- Lidové noviny 28. 7. 2015: Pětina českých včelstev uhynula

COLOSS press release

- Published on 24th July of 2015: <http://www.coloss.org/announcements/press>

Czech Beekeeping Journal

- Moderní včelař 2015(2): 26-27 COLOSS: ze zákulisí přípravy dotazníku
- Moderní včelař 2015(4): 14 COLOSS: Předběžné výsledky letošního monitoringu
- Moderní včelař 2015 (6): 34-38 Úspěšnost zimování včelstev po zimě 2014/15. Studie pokračuje
- Bulletin of the Czech Beekeeping Organization informing about the seminar and workshop in Olomouc (page 5)

Peer review journal

- Danihlík J., Petřivalský M. Aktuální vědecké poznatky o imunitě a zdraví včel (Actual knowledge on the bee immunity and health). Veterinářství 2015;65:434-431.

Conference - poster presentation

- Brodschneider R., Danihlík J., Kobza R., Crailsheim K. (2015) Winter losses of honey bee colonies and renewal of livestock in Austria and the Czech Republic, COLOSS conference, Ljubljana (Slovenia), 21st-23rd of October 2015.