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Final report for the project 78p8

## **Application of geoinformatical and biochemical approaches for analysis of honey bee colony losses.**

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### **Main project outcomes**

- The results on honey bee colony losses in Austria and in the Czech Republic were published on national levels, a scientific publication with international results is under peer-review (state on 27<sup>th</sup> February 2018) in the Journal of Apicultural Research, journal is listed on WoS
- We have been developing collaboration with the Department of Geoinformatics, Faculty of Science, Palacký University Olomouc. Preliminary results of Czech results were published in beekeeping journal. We prepared maps of crops and monitored hypothetical issues of early end of crops. The map of losses was a part of a poster published on COLOSS conference in Athens in November 2017.
- We collaborated on experimental layout of studying effects of nutrition on honey bee health. It will be a part of diploma thesis of Petra Wenzelová, defence is planned on June 2018.
- Scientific manuscript is under preparation with comparison of beekeeping in Czechia and Austria. It will be submitted in 2018 with acknowledging the AKTION projects.

### **Additional project outcomes and achievements**

- Students were involved in this project. The project has an impact on student education. This bilateral cooperation tends to improve knowledge on honey bee science and language skills of student of both project partners.
- The project also aims on a public, mainly beekeepers, who have an opportunity to increase their knowledge about problems in beekeeping and honey bee science, e.g. in Waidhofen / Thaya on 21.10.2017, VÚVeL fest in Brno on 26<sup>th</sup> October 2017 or planned event in Nasavrky on 14<sup>th</sup> March 2018.
- The collaboration results have international impact – cooperation with the association COLOSS.

### **Final report**

The Czech and Austrian cooperation has been continuing thanks to the program AKTION for four years now. We have been annually monitoring honey bee colony losses as core part of our collaboration. The satellite aims of our research were focused on honey bee nutrition, economic impacts of colony losses and education students as well as beekeepers.

The monitoring of honey bee colony losses is a core project for the international association COLOSS, which leads the monitoring in participating countries including the Czech Republic and Austria. The association organizes conferences for presentation up to date results and also workshops for planning new updates on particular projects.

### **Travels between project partners**

On our Czech and Austrian national level we also make annually updates on the questionnaire and we discuss new ideas and hypothesis on new factors suitable for monitoring. Jiri Danihlik as a Czech team leader, then Silvie Dostalkova and Petra Wenzelova travelled to Graz for scientific consultation and discussion in June 2017. Jiri Danihlik and Robert Brodschneider were working on data analysis of the survey 2016/17. Silvie Dostalkova and Petra Wenzelova were studying a laboratory approach for *in vitro* rearing honey bees and a protocol for honey bee feeding with commercial syrups. Petra Wenzelova was working on preparation of concept of her diploma thesis – feeding honey bees with

different syrups and syrups enriched with essential amino acids. Based on this consultation she carried out experiments in Olomouc, measured gene expression of genes involved in honey bee immunity and longevity. The results will be summarized in her master thesis. The thesis defence is planned for June 2018.

Robert Brodschneider travelled to Olomouc in July. His visit in Olomouc was important for the geoinformatical part of this project. He and Jan Brus worked on data preparation, map outcomes interpretation, results were discussed. Graphs and maps were prepared for further scientific manuscript which summarizes findings of four years collaboration of the Czech and Austrian team.

Jutta Vollmann from Graz visited Olomouc and was introduced into PCR method for gene expression quantification. Her visit was a part of the know-how exchange. Whereas Czech participant go to Graz to learn rearing bees in in vitro conditions, colleagues from Graz go to the biochemical laboratory to get the knowledge on molecular methods such PCR or chromatography. Jutta Vollmann also participated on sample processing and analysis performed by Petra Wenzelova.

Jiri Danihlik and Jan Brus travelled to Graz for further work on maps and graphs. Those maps visualise colony losses, report crops important for honey bees etc. Monitoring of sufficient crop sources is linked to honey bee nutrition and colony wellbeing. Then occurrence of robbing between colonies, symptoms of deformed wing virus has been monitoring as a high risk factor for increased colony losses.

Then Jana Biova – Czech master student - travelled to Graz for short study visit. Her master thesis is focused on honey bee pathogen *Paenibacillus larvae*, which causes American Foulbrood. She is monitoring two strains of this pathogen in the Czech Republic, thus she went to Graz to get to know the situation in Austria. She will use this information in her master thesis, the defence is planned in June 2018.

### **Project information dissemination and results presentation**

Traditional event – seminar for the survey participants, students and all interested people – was organized in Olomouc on 11<sup>th</sup> November at the Palacký University. Rudolf Moosbeckhofer (AGES, Austria) gave a speech on honey bee health problems in Austria, his visit was supported by AKTION. Jiri Danihlik and Jan Brus presented new findings from the monitoring core project. The results were discussed with seminar participants and then published in the Czech beekeeping journal *Moderní včelař* (12/2017). Jiri Danihlik and Robert Brodschneider visited Waidhofen an der Thaya for giving a talk about problems with colony losses and also about practical results coming from the project, e.g. differences in *Varroa* treatment in the Czech Republic and in Austria. Both researches spent a day in Vienna during their way to Waidhofen an der Thaya, the aim was to work on a scientific manuscript, which will be submitted in early 2018.

### **International presentation of project results**

Thanks to several projects supported by AKTION we developed long term collaboration on the core topic honey bee colony losses and honey bee nutrition. The results were presented in international conferences, namely Apimondia in Istanbul (September 2017) and COLOSS conference in Athens (November 2017). Association COLOSS organized workshop in Nitra in February 2018. Both project partners actively participate. New finding from CZ-AT collaboration were presented to the international group. Participation on these events outside Austria or Czech Republic was covered by other sources, not by AKTION.

The popularity of the monitoring project is growing up and we have been developing in data evaluation. We also educate students, increase their knowledge, language skills and helping them to be able to work on a research topic. We are going to continue in monitoring colony losses and research on honey bee immunity and physiology. The Czech and Austrian collaboration developed new

connections and network. Up to date, we are discussing further common research together with colleagues from Masaryk University in Brno and South Bohemian University in Ceske Budejovice.

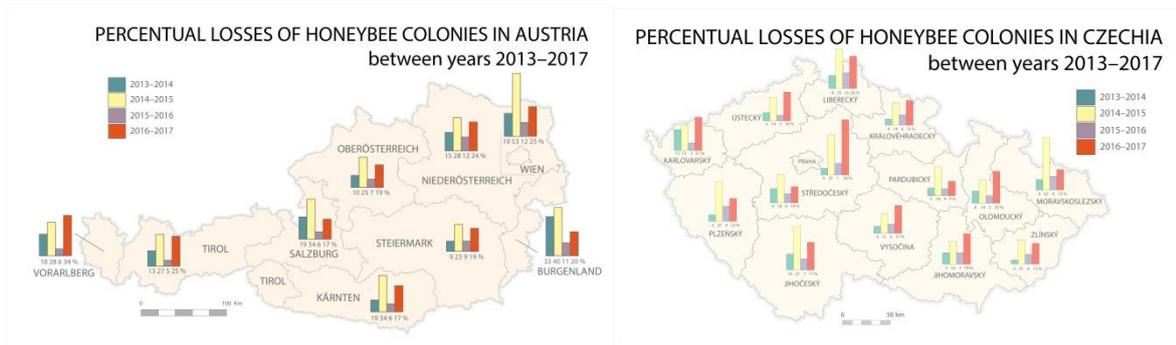


Fig. 1: Honey bee colony losses in Austria (left) and Czechia (right) since the beginning of the project.

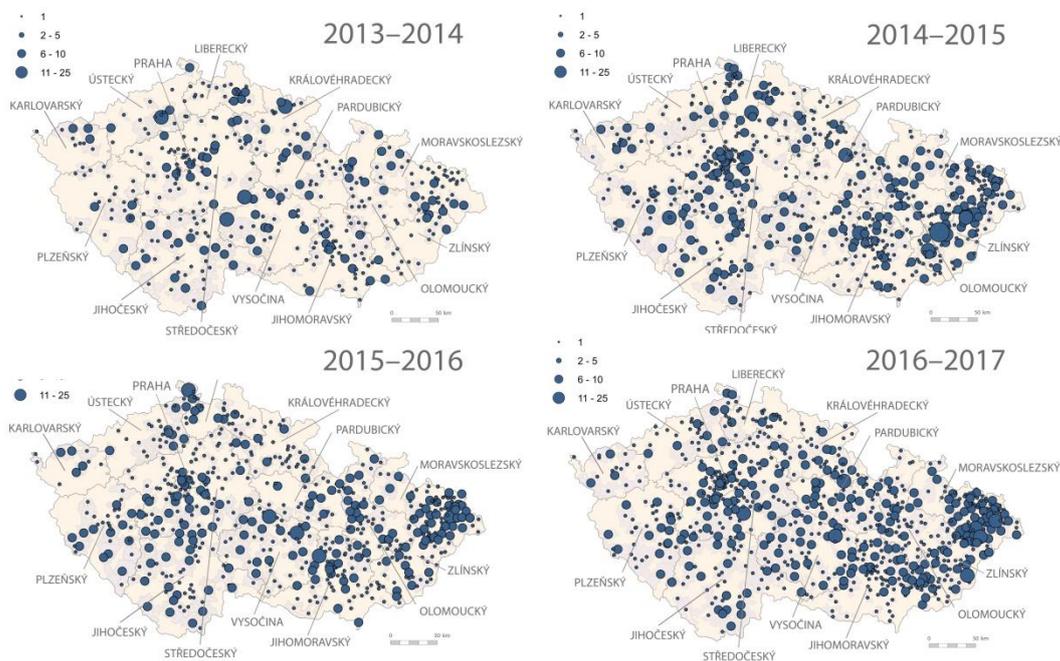


Fig. 2: Visualisation of response rate in the Czech Republic since 2014.

During the spring time 2017 we also registered new webpage [www.coloss.cz](http://www.coloss.cz) where all information regarding this project are summarized for Czech beekeepers and scientists. The web page is sponsored by Czech Beekeeping Association, which closely cooperates with us. The Austrian website [www.Bienenstand.at](http://www.Bienenstand.at) informs the Austrian public about the project activities.

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