The German bee monitoring (DeBiMo): current status and results 2011/2012

P5.42

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Introduction

The German bee monitoring has been established in 2004 by a board of apicultural State Institutes, beekeeper and farmer organizations and chemical companies. Since 2010 the project is exclusively financed by a governmental and State funding. Field work and laboratory analysis are supervised and performed by seven bee research institutes (Tab. 1). The network focuses on the monitoring of colony winter losses and their correlation with bee diseases, pesticide residues and beekeeping management. The DeBiMo is supplemented by results from specific projects of some institutes on chronic and synergistic effects of pesticides and bee diseases.

Material und Methods

Throughout Germany about 120 beekeepers are participating in the project. Each apiary provides 10 colonies for detailed data acquisition and sampling. Additionally, the beekeepers record specified data about beekeeping management and Varroa treatment during the season. The analysis of the different samples (Box. 1 and 2) and the data evaluation are performed by the bee research institutes.

Box 1: Data acquisition and/ or sampling

Spring: - estimate the population size and condition of the colonies
- take bee samples for disease analyses

Mai/ June: - take bee bread for residue analyses

Summer: - estimate the population size and condition of the colonies
- take bee samples for disease analyses
- take beebread for residue analyses

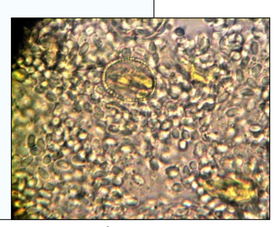
Autumn: - estimate the population size and condition of the colonies
- take bee samples for disease analyses
- take food for American foulbrood analyses

Box 2: Analyses

Bee diseases:
- Varroa infestation rate: bee samples of summer and autumn, 20 samples per apiary per year
- Nosema and Amebae infestation: bee samples of spring and summer, 20 samples per apiary per year
- Tracheal mite: bee samples of spring, 1 pooled sample per apiary per year
- Bee Viruses (DWV, SBV, CBPV, ABPV): bee samples of autumn, 5 samples per apiary per year
- American foulbrood: 2 sample per apiary per year
- Nosema-PCR (*N. ceranae, N. apis*): 2 nosema-positive samples per apiary (if possible)

Microscopic pollen analyses:
- 2 honey samples and 2 bee bread samples per apiary (if available)

Residue analyses:
- 2 beebread samples per apiary (if available)



Intestinal Nosema spores
(400-x optical microscope)

Results

- During the winter 2011/ 2012 we recorded 13.3 % winter losses of the monitoring colonies (n=1,106). This rate was higher compared to the previous year (9.9 %) but similar to the loss rate in winter 2009/ 2010 (13.5 %; Tab. 1). This higher winter mortality was associated with a higher Varroa infestation rate in the previous autumn (Tab. 2).
- In autumn 2011 we recorded an average Varroa infestation rate of 3.6 mites per 100 bees in surviving colonies (N=949) and 15.8 mites per 100 bees in collapsed colonies (N=139) (Fig. 1).
- There is a significant correlation between the infestation of worker bees with the Deformed Wing Virus (DWV) and the Varroa infestation rate (t-Test; P<0.0001).
- Up to now effects of Nosema, Amebae, Tracheal mite and American foulbrood on colony winter losses could not be confirmed.
- *Nosema ceranae* is predominant over *N. apis*. We found *N. ceranae* in 75.2 % of the 2011 with PCR analyzed nosema-positive bee samples (n=210). *Nosema apis* appears more often in Northern areas.
- In 2011 we analyzed residues of pesticides in 189 of 216 analyzed bee bread samples (Fig. 2). Some samples showed up to 19 different compounds. The most frequent compound is the fungicide Boscalid (in 61.6 % of the samples). The most frequent insecticide is Thiacloprid (in 51.3 % of the samples, maximum 130 µg/kg).

Tab. 1: Winter losses of the monitoring colonies

cooperative partners**	N colonies in autumn	N colonies in spring	winter losses %	range %
LAVES Celle	140	121	13.6	0 - 90
MLU Halle	62	55	11.3	0 – 20
LAB Hohenheim	190	167	7.4	0 – 50
LIB Hohen-Neuendorf	251	189	24.7	0 - 90
LLH Kirchhain	120	113	5.8	0 - 30
DIR Mayen	160	143	10.6	0 - 40
LWG Veitshöchheim	183	162	11.5	0 - 70
2011/2012	***1,106***	***959***	***13.3***	
2010/ 2011	*1,131*	*1,019*	*9.9*	
2009/ 2010	*1,115*	*964*	*13.5*	

Tab. 2: Varroa infestation rates in autumn

Autumn	N colonies	Varroa mites per 100 bees	Std.-Dev.
2011	***1,088***	***5.1***	***9.5***
2010	*1,128*	*4.3*	*13.5*
2009	*1,039*	*5.1*	*10.3*

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Bees with Varroa mites

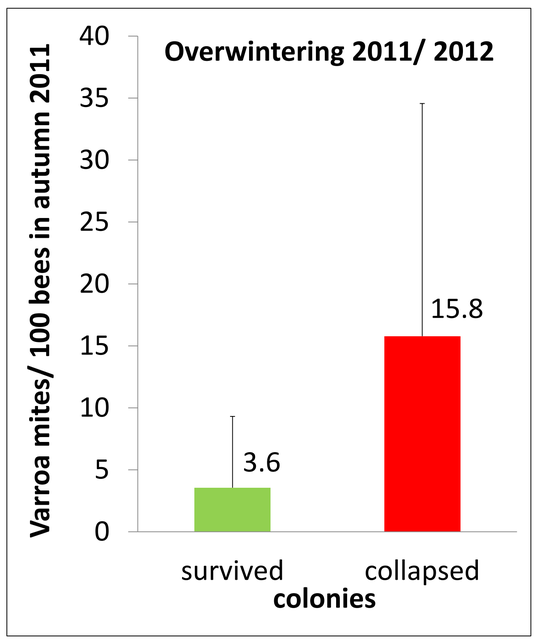

Fig. 1: Varroa infestation rate of survived (N=949) and collapsed (N=139) colonies.

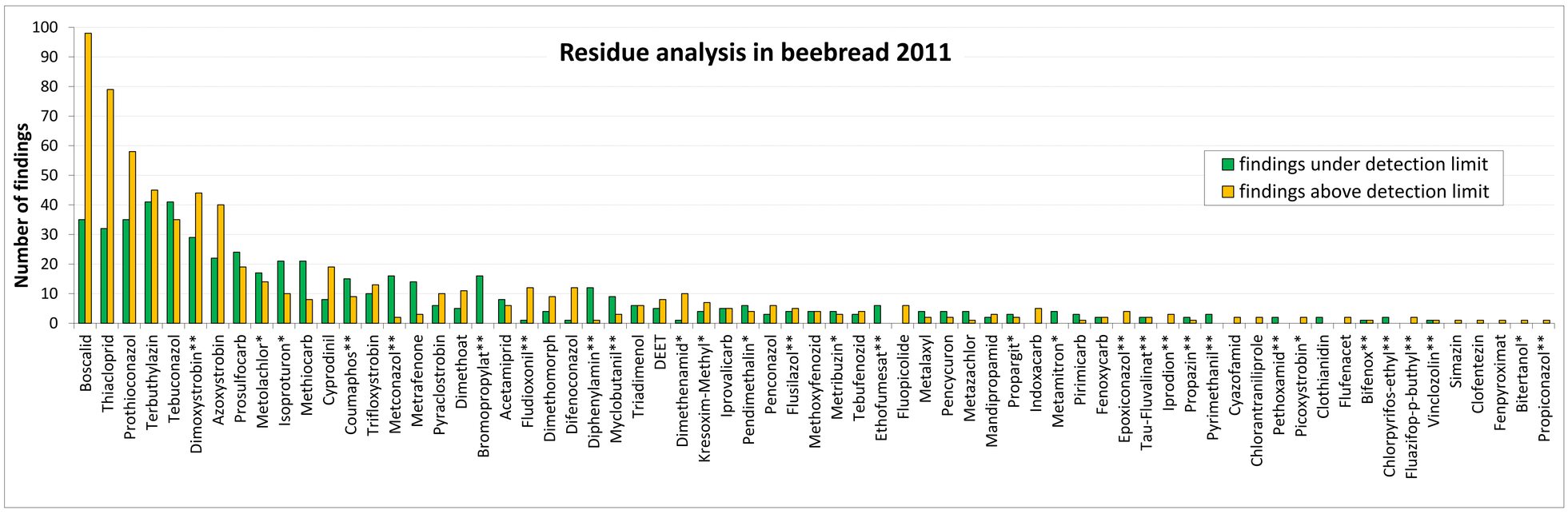

Fig. 2: Residue analysis 2011 with LC-MS/MS at LUFA Speyer; Detection limit: 3, 5* and 10** µg/kg; Investigation of 395 different active substances resp. metabolites. We found 75 of them in bee bread; 1,216 total findings.

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Rape – an important source for nectar & pollen

Conclusions

- The Varroa infestation in autumn is the crucial factor for colony winter losses in Germany.
- Effects of Nosema, Amebae, Tracheal mite and American foulbrood on colony winter losses could not be confirmed.
- Our residue analysis proofed the presence of 75 different active compounds in bee bread. However, most of these compounds are only analyzed in traces and insecticides with high toxicity to honey bees (i.e. Neonicotinoids) are rare (1.3 % of total findings) and also in low concentrations (maximum 20 µg/kg). This is also confirmed by previous analyses (total N=728; www.bienenmonitoring.org)
- An effect of pesticides on the overwintering of colonies is unlikely. However, synergistic and/ or chronic effects cannot be explained only on the basis of these monitoring data.