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was evident in all long-term (48 h and 72 h) treatments. Low-time imidacloprid treatment (24 h) induced Hsp70 activity in nuclei and cytoplasm while in the treatment of 48 h the activity in nuclei was not present. The activity of both Hsp-s was more intensive in untreated workers. Hsp90 was found intense in most cell cytoplasm and glands ducts 48 h and 72 h after treatment. Hsp-s activity was more intensive and preserved in HPG of coumaphos-treated than imidacloprid-treated workers. Coumaphos triggered increased level of programmed cell death in HPG while imidacloprid induced extended necrosis in comparison to coumaphos. Both treatments had influence on the reduced size of HPG and also on the extended expression of cell death level. When honeybee colonies were treated with rotenone, capped brood and young larvae were removed from combs at a greater rate than after the oxalic acid (OA) treatment. Rotenone (1%) caused 75.2% of capped brood removal, OA (3%) 18.7% and the control treatment, 13.3%. Caged worker bees treated with rotenone or OA or with a control solution had mortality rates of 10.9%, 5.1% and 1.9% respectively. Rotenone significantly affected the mortality of brood and adult bees. Increasing concentrations of OA in sucrose solutions applied to adult bees resulted in decreased consumption.

Why honeybees are heterozygote for Pgm (Phosphoglucomutase) in winter?

Z. Gulduren, S. Banerjee, M. Kence

Department of Biology, Middle East Technical University 06531 Ankara, Turkey
Email: mkence@metu.edu.tr

We previously found that Pgm genotype frequencies fluctuate seasonally, Pgm75/100 heterozygotes being at significantly ($P < 0.001$) high frequencies in winter in all colonies studied. We further looked into the presence of any correlation between the Pgm genotypes and enzyme activity and glycogen content. Biochemical analysis of different Pgm genotypes have revealed that heterozygotes (Pgm75/100) have significantly higher levels of enzyme activity than the homozygotes (Pgm75/75) ($P < 0.0001$). There is also a significant correlation between glycogen content and Pgm heterozygosity. These findings together with the finding that correlation between Pgm heterozygosity and winter survival in honeybees suggest that heterozygotes are more efficient in energy metabolism at times of decrease of both temperature and pollen supply. Winter bees having longer life span secure the survival of the broodless colony during the winter.

Morphometric analysis of *Apis florea* including new data from Jordan and Sudan

Nizar Haddad, Stefan Fuchs, Randall Hepburn, Sara Radloff

Bee Research Unit, National Center for Agricultural Research and Extension, Jordan
E mail: drnizarh@yahoo.com

The worker honeybees used for the analyses of *A. florea* in this study derive from raw data from Southern India (1 colony), Sri Lanka (6 colonies), Iran (19 colonies), Pakistan (3 colonies), Saudi Arabia (1 colony) and Oman (3 colonies) from the Institut for Bienenkunde database at Oberursel; new material collected from Aqaba

golf of Jordan (9 colonies) and Sudan (8 colonies). Morphometric analyses were performed on 870 individual worker bees from 50 colonies representing 29 localities. Twenty-seven morphological characters of worker bees related to size or angles of venation were measured using the methods of Ruttner (1988). A cluster analysis using the complete linkage procedure was carried out on colony mean character values combined for the 8 countries. Cluster analyses show the first group linked colonies from Pakistan and Sudan, then Oman and Jordan and then Saudi Arabia and finally Iran; while the second cluster linked colonies from S. India and Sri Lanka. Results show a clear relationship between the new data from Jordan with the samples from Oman, which can be a direct indication of the introduction of the *A. florea* bees into Jordan with commercial ships.

The first detection of honey bee viruses in Jordan using RT-PCR methods

Nizar Haddad, Joachim R. de Miranda

Bee Research Unit, National Center for Agricultural Research and Extension, **Jordan**
Email: drnizarh@yahoo.com

Mortality of honeybees is a serious problem that beekeepers have to face periodically in Jordan and worldwide. The Ajlun province is the second most important region in Jordan for beekeeping, in terms of the number of beekeepers and managed colonies. Adult worker bees collected from thirteen colonies in seven widely dispersed apiaries from the Ajlun province were assayed for the presence of six honeybee viruses (ABPV, BQCV, CBPV, DWV, KBV and SBV) using RT-PCR. The results are shown in Figure 1. Out of the 13 colonies examined, 92% were infected with DWV, 8% with SBV and 16% with ABPV. None were infected with CBPV, BQCV or KBV. Several colonies were infected with more than one virus. This indicated that DWV is the most common virus in collapsing bee colonies in Jordan, These data are similar to comparable surveys conducted elsewhere (Tentcheva *et al.* 2004). Nearly all the samples from colonies that presented bee mortality were infected with at least one virus or co-infected with more than one virus. These preliminary results show the presence of several bee viruses, in particular DWV, in dying Jordanian bee colonies. This is similar to surveys conducted in other countries (Todd *et al.* 2007; Cox-Foster *et al.* 2007). Further research is needed to determine which other factors are also differentially associated with colony mortality, such as infestation with parasitic mites (*Varroa destructor*, *Acarapis woodi*), *Nosema apis* and *N. cerana*, bacterial diseases and any possible effects of chemical treatment of colonies or foraging resources.

Septicaemia induces colony losses

Ulrike Hartmann, Jean-Daniel Charrière, Alexandra Roetschi, Peter Neumann

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Forschungsanstalt Agroscope Liebefeld-Posieux, Schwarzenburgstrasse 163, CH 3003 Bern,
Switzerland
Email: hartmann.ulrike@alp.admin.ch

The investigation concerned the question whether colony losses can be traced back on septicaemia. Haemolymph of individuals of affected hives was examined for bacteria