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Scientific note

A scientific note on *Varroa jacobsoni* Oudemans and the collapse of *Apis mellifera* L. colonies in the United Kingdom

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***Apis mellifera* / *Varroa jacobsoni* / virus/ colony death / Great Britain**

The mechanism by which the *Varroa jacobsoni* mite causes the *Apis mellifera* colony to collapse is still not understood. Some apparently healthy colonies are able to support large mite populations while others containing a much lower mite population collapse. One possible explanation is the impact of various diseases, particularly certain viruses. Acute paralysis virus (APV) has been associated with colony death in mite infested colonies in Germany [3], Russia [4] and the USA [6].

The aim of this preliminary study was to investigate the role of the mite population and other diseases in the collapse of *A. mellifera* colonies in the UK.

Eight naturally infested *A. mellifera* colonies fitted with screened floors had their debris collected weekly and the number of sealed brood and adult bees estimated monthly, until they collapsed.

Samples of dead bees and live brood were collected at irregular intervals and sent to Brenda Ball at IACR-Rothamsted to be tested against antisera to ten bee viruses [3]. The colonies were also checked for signs of other common bee diseases.

Four colonies survived one full summer, one colony survived two summers while three colonies survived three summers. All colonies died during the winter within 4 years of becoming infected (*table I*). The signs of colony collapse, which were similar in all cases, were a decline in the adult bee population eventually resulting in only a few bees (< 200) and the queen. No, or very few, dead bees were found in the hive.

The mean number of bees and sealed brood produced during the year did not differ significantly from the year preceding either colony collapse or survival. Also, during the year prior to collapse, colonies appeared to function normally, producing comparable honey yields to colonies treated with Bayvarol®.

The number of mites (cumulated total, peak and monthly means) in the debris was found to be a poor indicator of colony survivorship in the following year. The total yearly natural mite drop ranged from 10 000 to 40 000 (mean = 20 000 ± s.e. = 3 800, n = 7) in colonies which lived the following year and from 10 000 to 60 000 (mean = 29 000 ± s.e. = 6 000, n = 8) in those that collapsed in the following year. This corresponds to estimated peak mite populations of 2 500 to 15 000 in surviving colonies and 2 600 to 16 000 mites in collapsing colonies, as indicated by a mite model [8]. Other bee diseases (foulbrood, chalkbrood, *Nosema apis, Amoeba* and the parasite *Acarapis woodi*) were either not detected or at insignificant levels.

Overall, six types of virus were found in adult worker bees and one in brood (*table I*). Three of these, filamentous virus (FV), bee virus X (BVX) and bee virus Y (BVY) are associated

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Table I. Sampling dates and results for samples of dead bee[1] and sealed brood[2] analysed for presence or absence (–) of viruses. *Varroa jacobsoni* associated viruses are given in bold.

Hive ID	Date of colony death	Sampling date											
		Oct.	Mar.	Apr.	May	Jun.	Jan.	Feb.	May	Jul.	Oct.	Jan.	Feb.
11	Mar. 96	–[1]	FV[1]	–[1,2]		–[1,2]		–[1]	FV[1]	–[1]	**CF**–[1]	**DWV**[1]	**DWV**[1]
1	Jan. 96			–[2]	BVY[1]	FV[1] –[2]		–[1]			**SPV**[1] **DWV**[1]	–[1]	
8	Jan. 96			–[2]		–[1,2]	–[1]	**SPV**[1]				**CWV**[1] **DWV**[1]	
6	Feb. 95			–[2]	**SPV**[1] BVY[1]	FV[1] –[2]							
12	Apr. 94		**CWV**[1]										
18	Mar. 94	–[1]	**SPV**[1,2] **CWV**[1] FV[1]										
5	Feb. 94		**CWV**[1] FV[1] BVY[1] BVX[1]										
10	Feb. 94		**CWV**[1] FV[1]										

with *Nosema apis* [2] and their occurrence did not appear to be linked with colony collapse. However, within 1 year of colony collapse one or more of the following viruses, deformed wing (DWV), slow paralysis (SPV) or cloudy wing (CWV), were detected in all colonies (*table I*). Three other viruses thought to be associated with *V. jacobsoni*, chronic paralysis virus (CPV), Kashmir bee virus (KBV) and APV, were not detected in this study.

If the direct feeding behaviour of the mites is a major factor on the survivorship of the colony, a clearer relationship between mite numbers and colony collapse would be expected.

In this study DWV, SPV and CWV have been associated with colony collapse. Both DWV and CWV were associated with colony collapse in colonies in Yugoslavia [7] and Britain [5] while SPV is presently only associated with colony collapse in Britain. The absence of APV and CPV in this study is unexpected since both are known to be present in the UK bee population [1].

The present results, like those of previous studies [7, 9], suggest a close link between the presence of certain viruses and colony collapse.

Note scientifique sur *Varroa jacobsoni* Oudemans et sur l'effondrement des colonies d'*Apis mellifera* L. en Grande Bretagne

Eine wissenschaftliche Notiz über *Varroa jacobsoni* Oudemans und den Zusammenbruch von Bienenvölkern in Großbritanien

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