

FAIR CT97-3686

“Coordination in Europe of integrated control of *Varroa* mites in honey bee colonies”

Final Consolidated Report

from 98-01-01 to 99-12-31

Type of contract: Concerted Action

Total cost: 70.000 **EC contribution:** 70.000

Commencement date: 98-01-01 **Duration:** 2 years

Completion date: 99-12-31

EC contact: DG VI/F.II.3
Fax: (+32-2) 296 30 29

Coordinator: Dr. Ingemar Fries, Associate professor
Entomology Department, Swedish University of
Agricultural Sciences,
Box 7044,
750 07 Uppsala, Sweden
Tel: +46 18 67 20 73 Fax: : +46 18 67 28 90
e-mail: ingemar.fries@entom.slu.se

Partners:

Ralph B uchler, Hessische Landesanstalt fur Tierzucht, Abt. fur Bienenzucht,
Erlenstrasse 9, DE-35274 Kirchhain (Germany)
Tel: +49 64 22 94 06 13, Fax: +49 64 22 94 06 33,
e-mail: buechler@mail.uni-marburg.de

Johan Calis, Wageningen Agricultural University: Department of Entomology,
POB 8031, NL-6709 PD Wageningen (The Netherlands)
Tel: +31 317 482320, Fax: +31 317 484821,
e-mail:Johan.Calis@MEDEW.ENTO.WAU.NL

Marc Colin, INRA, Station de Zoologie, Domaine Saint-Paul, Site Agroparc,
FR-84914 Avignon (France)
Tel: +33 4 90 31 60 30, Fax: +33 4 90 31 62 70, e-mail: colin@avignon.inra.fr

Henrik Hansen, Danish Institute of Agricultural Science, Research group Apiculture
Research Centre Flakkebjerg, DK-4200 Slagelse (Denmark)
Tel: +45 58 11 34 31, Fax: +45 58 11 33 05, e-mail: henrik.hansen@agrsci.dk

Partners (continued):

Mariano Higes, Centro Apicola Regional, San Martin s/n,
SP-19180 Marchamalo Guadalajara (Spain)
Tel: +34 49 25 00 26, Fax: +34 49 25 01 76, e-mail: Mariano.Higes@sanidad.carcn.es

Anton Imdorf, Forschungsanstalt für Milchwirtschaft, Sektion Bienen
CH-3003 Bern (Switzerland)
Tel: +41 31 323 82 12 / 82 02, Fax: +41 31 323 26 02,
e-mail: anton.imdorf@fam.admin.ch

Seppo Korpela, Agricultural Research Center of Finland Institute of Plant Protection
FIN-31600 Jokioinen (Finland)
Tel: +358 3 4188 576, Fax: +358 3 4188 584, e-mail: seppo.korpela@mtt.fi

Norberto Milani, Dipartimento di Biologia Applicata alla Difesa delle Piante (DBADP),
Università degli Studi di Udine, Viale delle Scienze, 208, IT-33100 UDINE (Italy)
Tel: +39 0432 55 85 03, Fax: +39 0432 55 85 01,
e-mail: Norberto.Milani@Pldef.Uniud.it

Franco Mutinelli, Istituto Zooprofilattico, Sperimentale Della Venezie Via Romea 1,
IT-35020 Legnaro (PD) (Italy)
Tel: +39 049 80 84 261, Fax: +39 049 80 30 277
e-mail: fmutinelli.izsv@interbusiness.it

Antonio Nanetti, Istituto Nazionale di Apicoltura, Via di Saliceto 80
IT-40128 Bologna (Italy)
Tel: +39 051 35 31 03, Fax: +39 051 35 63 61, e-mail: istnapic@alinet.it

Eva Rademacher, Freie Universität Berlin, Institut für Zoologie,
Königin-Luise-Str. 1-3, DE-14159 Berlin (Germany)
Tel: +49 30 83 83 945 / 3915, Fax: +49 30 83 83 916
e-mail: agbienen@zedat.fu-berlin.de

Wolfgang Ritter, Tierhygienisches Institut, Abteilung Bienenkunde
Am Moosweiher 2, DE-79018 Freiburg (Germany)
Tel: +49 761 16011, Fax: +49 761 150 22 99
e-mail: dr.wolfgang.ritter@T-ONLINE.DE

Peter Rosenkranz, Landesanstalt für Bienenkunde, Universität Hohenheim 730
DE-70593 Stuttgart (Germany)
Tel: +49 711 459 2661 / 2659, Fax: +49 711 459 2233
e-mail: bienenro@uni-hohenheim.de

Aad de Ruijter, Ambrosiushoeve, Ambrosiusweg 1
NL-5081 Hilvarenbeek (The Netherlands)
Tel: +31 13 5425 888, Fax: +31 13 5439 155, e-mail: ambrosiushoeve@wxs.nl

FINAL CONSOLIDATED REPORT

Objectives

Specific objectives of CA3686 were to:

- * Establish a European network of scientists for efficient exchange of information on methods that minimize the use of pesticides for control of the parasitic mite *Varroa jacobsoni* in honey bee colonies.
- * To harmonize efficacy evaluation methods.
- * To highlight future research needs in this field and to initiate new collaborative research.
- * To compile information about integrated control of *Varroa* in a format suitable both for publication in national beekeeping journals and as a separate publication, and to initiate seminars on this subject.
- * To make available a bibliography on ecological control of *Varroa* mites.

Description of work (January 1 - December 31, 1999)

Initial preparatory work:

A survey was prepared by the coordinator and filled out by the participants on the current activities and passed experience of integrated control of *Varroa*. The material was compiled and distributed to all participants as a background material for the first CA meeting to be held in Uppsala, Sweden. Preparations were initiated to establish a web site for the CA.

There have been four scheduled CA meetings and one sub-coordinator meeting. Following preparatory compilation of background partner information, the first CA meeting was held in Uppsala, Sweden March, 13-14, 1998.

The second CA meeting was held in Udine, Italy, November 27-28, 1998

The sub-coordinator meeting was held in Hohenheim March 24-25, 1999

The third CA meeting was held in Hohenheim, Germany May 7-8, 1999

The final CA meeting was held in Merelbeke, Belgium November 13-14, 1999

Meeting in Uppsala March 13-14, 1998:

The meeting was located at Hotell Hörnan, Bangårdsgatan 1, Uppsala, Sweden. The meeting participants were:

Ralph Büchler, Germany
Johan Calis, The Netherlands
Marc Colin, France

Ingemar Fries, Sweden
Henrik Hansen, Denmark
Camilla Brødsgaard, Denmark
Toni Imdorf, Switzerland
Seppo Korpela, Finland
Preben Kristiansen, Sweden
Norberto Milani, Italy
Franco Mutinelli, Italy
Antonio Nanetti, Italy
Sanna Nordström, Sweden
Eva Rademacher, Germany
Peter Rosenkranz, Germany
Wolfgang Ritter, Germany
Aad de Ruijter, The Netherlands

The only partner not present at the meeting was Mariano Higes from Spain who had notified he was unable to participate.

The same information is also available on the web site prepared for the CA (www.entom.slu.se/res/proj16b.html).

The initial meeting in Uppsala contained valuable discussions on participant background experience and possible developments of integrated control concepts and information dissemination.

The progress of the Uppsala meeting can be briefly summarized in the working groups formed for various aspects of the CA. These were:

Working group	Participants	Task
Harmonization of experimental protocols	Milani Norberto Büchler Ralph Imdorf Anton Fries Ingemar	Suggest a "minimum standard" for documentation requirements on methods to be advised to beekeepers for <i>Varroa</i> control
Oxalic acid trickling	Nanetti Antonio de Ruijter Aad Korpela Seppo Charrière J.D. Rosenkranz Peter	Description of experiments needed to safely advise beekeepers how to use oxalic acid trickling. Distribution of experimental plans to participants for possible inclusion in 1998 field work
Etheric oils	Imdorf Anton Ritter Wolfgang Colin Marc	Collaboration for development of application systems of components of etheric oils
Biotechnical control	Büchler Ralph de Ruijter Aad Fries Ingemar	Testing control concept using biotechnical control (queen trapping on drone comb) combined with lactic acid spraying
Procedure on approval of natural substances used for <i>Varroa</i> control within different EU countries	Mutinelli Franco and all partners	Collecting and compiling regulations on use of natural substances from the EU countries
Integrated control concepts	North Europe Fries Ingemar de Ruijter Aad Central Europe Ritter Wolfgang Rosenkranz Peter Imdorf Anton South Europe Mutinelli Franco Nanetti Antonio Higes Mariano	Define and later run experiments on integrated control concepts and verify their usability under various climatic conditions.
Bibliography on <i>Varroa</i> and <i>Varroa</i> control on internet	Fries Ingemar Mutinelli Norberto Imdorf Anton	Compilation of existing databanks in Udine and Liebfeld with complements from partners into a comprehensive databank on <i>Varroa</i> and <i>Varroa</i> control

Meeting in Udine November 27-28, 1998:

The meeting was arranged by Norberto Milani and located at Hotel Ambassador, via Carducci 46, Udine, Italy. The meeting participants were:

Medwin Bew, UK
Ralph Büchler, Germany
Willem Boot, The Netherlands
Camilla Brødsgaard, Denmark
Jean-Daniel Charrière, Switzerland
Ingemar Fries, Sweden
Henrik Hansen, Denmark
Mariano Higes, Spain
Toni Imdorf, Switzerland
Seppo Korpela, Finland
Jesús Llorente, Spain
Norberto Milani, Italy
Franco Mutinelli, Italy
Antonio Nanetti, Italy
Francisko Nazzi, Italy
Peter Rosenkranz, Germany
Wolfgang Ritter, Germany
Aad de Ruijter, The Netherlands

The only partners not present at the meeting was Marc Colin from France and Eva Rademacher from Germany who both were unable to participate.

Detailed notes from the meeting have been distributed electronically to all participants and to EU-DG VI. (Appendix II). The same information is also available on the web site prepared for the CA (www.entom.slu.se/res/proj16b.html).

Sub-coordinator meeting in Marburg March 24-25, 1999

The meeting was arranged by Peter Rosenkranz and was located at Hotel Europäisher Hof in Marburg, Germany. The meeting participants were:

Ingemar Fries, Sweden
Toni Imdorf, Switzerland
Norberto Milani, Italy
Peter Rosenkranz, Germany

The purpose of this meeting was to structure content of the two following meetings.

Meeting in Hohenheim, Germany May 7-8, 1999:

The meeting was arranged by Peter Rosenkranz and was located at "Tagungs- und Bildungsstätte "Bernhäuser Forst", Leinfelden-Echterdingen, Germany. The meeting participants were:

Medwin Bew, UK
Ralph Büchler, Germany
Jean-Daniel Charrière, Switzerland
Marc Colin , France
Jean-Daniel Charrière, Switzerland
Ingemar Fries, Sweden
Henrik Hansen, Denmark
Toni Imdorf, Switzerland
Seppo Korpela, Finland
Norberto Milani, Italy
Franco Mutinelli, Italy
Antonio Nanetti, Italy
Eva Rademacher, Germany
Peter Rosenkranz, Germany
Wolfgang Ritter, Germany
Aad de Ruijter, The Netherlands

The only partner not present at the meeting was Mariano Higes from who was unable to participate.

Detailed notes from the meeting have been distributed electronically to all participants and to EU-DG VI. (Appendix III). The same information is also available on the web site prepared for the CA (www.entom.slu.se/res/proj16b.html).

Meeting in Merelbeke, Belgium November 13-14, 1999:

The meeting was organized by Octaaf van Laere and was located to the Agricultural Research Centre-Ghent, Merelbeke, Belgium. All CA partners attended this meeting which also included invited representatives from scientists, beekeepers, administrators and product developers throughout Europe. The Merelbeke meeting included one day of talks on specific subjects and a second day where all participants could contribute and discuss using a work shop format. Notes from this meeting have been distributed to all participants (Appendix IV). The participant list of this meeting has likewise been distributed (Appendix V). Proceedings of the meeting including all presentations were distributed to all participants at the meeting (Appendix VI). The same information is also available on the web site prepared for the CA (www.entom.slu.se/res/proj16b.html)

Results and deliverables

Harmonization of experimental protocols

The working group for “Harmonization of experimental protocols” was chaired by Norberto Milani. A preliminary version of the final document from this group was included in the Merelbeke meeting proceedings (Appendix VI). The final version of this document (Appendix VII) will be sent to an international journal for publication.

Oxalic acid trickling

Field experiments during the 1998 and 1999 field seasons based on joint protocols developed by Antonio Nanetti, chairman of the “Oxalic acid working group”, has been used to develop effective field applications for mite control that do not jeopardize bee safety. Seppo Korpela in Finland, Ingemar Fries in Sweden and Janne Vaeringstad/Stine Helland in Norway (not partners but included in experimental work), Ralph Büchler in Germany, Antonio Nanetti, Franco Mutinelli in Italy, Aad de Ruijter in The Netherlands and Toni Imdorf in Switzerland has participated in this work. The results will be used nationally by the individual partners but the aim is also to have Antonio Nanetti to compile some of the material into a publication in an international forum. Results from the field season 1998 were included in the Merelbeke meeting proceedings (Annex VI)

Etheric oils

Toni Imdorf, chairman of the “Etheric oils work group” has compiled current knowledge in this field of research and this material has been published in an international journal (Apidologie). A summary of this material is available in the Merelbeke meeting proceedings (Annex VI). More than 150 different essential oils have been screened for effects on *Varroa* mites. Only a few oils have been interesting enough to warrant field tests.

Components of essential oils present a different picture. Several substances such as thymol, menthol, camphor, paracymol, alfa-thujon, pinocamphon and possibly others are highly effective against the mite. Although effective in the laboratory, there still remains to be developed suitable application systems for most substances. The only exception to this is thymol, where results are available, and commercial products already on the market or in the pipeline of being marketed.

There are plans among some of the CA partners (Eva Rademacher, Toni Imdorf, Mariano Higes) to develop collaborative work on essential oils.

Biotechnical control

Ralph Büchler, chairman of the “Biotechnical control work group” has initiated testing of biotechnical control (queen trapping on drone comb) combined with lactic acid spraying. This protocol, with amendments for local conditions, has been used for experiments carried out by him in Germany, by Aad de Ruijter in Holland and by Ingemar Fries in Sweden. The current state of biotechnical control options has been summarized by Aad de Ruijter in the Merelbeke meeting proceedings (Annex VI).

Procedure on approval of natural substances used for Varroa control within different EU countries

Current regulations within the union on varroa mite control has been discussed in depth throughout the project period. The rules that govern the use of products for varroa control in Europe has been compiled by Franco Mutinelli, chairman of the "Rules and regulations work group", and is available in the Merelbeke meeting proceedings (Annex VI). This material has been submitted for publication in an international journal.

Eva Rademacher has worked on MRL and registration issues, in particular relating to the recently published the EU regulation (1804/1999) which allows use of organic acids in organic beekeeping without registration as a veterinary product.

Each CA partner has contributed information on national regulations concerning registration procedures and use of chemicals for mite control. This information has been compiled by Franco Mutinelli along with information from other European countries where information has been made available. The compiled information is available in Appendix VI.

Integrated control concepts

Integrated control concepts for North Europe (Preben Kristiansen, Sweden), Central Europe (Jean-Daniel Charrière, Switzerland) and South Europe (Mariano Higes, Spain) was presented at the Merelbeke meeting (Annex VI). The material will be used under national conditions, and translated where needed, to reduce the use of acaricides in European beekeeping.

Bibliography on Varroa and Varroa control on internet

As a result of the CA a bibliographic database on varroa mites and mite control will be made permanently available on the World Wide Web. Currently, a first version of the bibliography is available on a server at the Entomology Department, Swedish University of Agricultural Sciences (<http://varroa.entom.slu.se>) based on records supplied by Norberto Milani. This bibliograhly is a continuation of the work already published by him (Milani, N. 1992. Analytical bibliography on *Varroa jacobsoni* Oud. and related species. *Apicoltura* no. 8, 1-147). To have the database at a permanent site where it can be updated and running after the termination of the CA, Toni Imdorf will merge the database with other material and place it on a Swiss server. This work is ongoing.

Dissemination of research results

The process of result dissemination from the CA activities commence with the last meeting in Merelbeke and with the termination of the project. The Merelbeke meeting proceedings are now spread throughout Europe through the meeting participants. Some of this material is already submitted for publication while other material is pending publication. The use of the compiled information at largely is beyond control of the CA partners, but national initiatives for seminars and advisory adjustments will result from the

activities. To date, the following materials describing the activities or relating to the CA has been published by CA partners or are in manuscript/submitted for publication:

- Bogdanov S., Imdorf A., Kilchenmann V. (1998) Residues in wax and honey after Api Life VAR treatment. *Apidologie* 29 (6) 513-524.
- Bogdanov S., Kilchenmann V., Fluri P., Bühler U., Lavanchy P (1999) Influence of organic acids and components of essential oils on honey taste. *American Bee Journal* 139 (1) 61-63.
- Bogdanov S., Kilchenmann V., Imdorf A. (1998) Acaricide residues in some bee products. *J. Apicult. Research* 37 (2) 57-67.
- Bogdanov S., Kilchenmann V., Imdorf A., Fluri P (1999) Residues in honey after application of thymol against varroa using the Frakno thymol frame. *Bee Biz* (9) 29-30.
- Büchler, R. (1998) Überprüfung der Bienenverträglichkeit von Oxalsäure an Kunstschwärmen. *Die Biene* 134(11) 21-23.
- Büchler, R. (1999) Versuchsergebnisse zur Varroatose Bekämpfung durch Aufträufen von Oxalsäurelösung auf die Wintertraube. *Die Biene* 135(10) 5-8.
- Charrière J.D., Imdorf A. (1999) Varroa treatment by oxalic acid trickling. Field trials 1998/99. *Mitteilungen der Sektion Bienen* (34) 1-11.
- Charrière J. D., Imdorf A., Bachofen B. (1998) Fünf Ameisensäure-Dispenser im Vergleich. *Schweizerische Bienen-Zeitung*. 121 (6) 363-367.
- Charrière J. D., Imdorf A., Bachofen B., Tschan A. (1999) Ausschneiden von Drohnenbrut - eine wirksame Massnahme zur Reduktion des Varroabefalls. *Schweizerische Bienen-Zeitung* 122 (3) 132-138.
- Fries, I. 1998. Europeiskt nätverk för att koordinera forskning kring ekologisk bekämpning av varroakvalster. *Bitidningen* 97: 20-23.
- Hansen, H., Brødsgaard, C.J. 1998. Europæisk samarbejde om Varroa. Særnummer av *Tidsskrift for Biavl* 132(12): 28-29.
- Imdorf A. (1998) EU-Projekt zur Förderung der integrierten Varroabekämpfung. *Schweizerische Bienen-Zeitung* 121 (7) 436-437.
- Imdorf A., Bogdanov S., Ibanez Ochoa R., Calderone N. (1999) Use of essential oils for the control of *Varroa jacobsoni* (Oud.) in honey bee colonies . *Apidologie* 30 (2-3) 209-228.
- Imdorf A., Charrière J.D. (1998) Wie können die resistenten Varroamilben unter der Schadensschwelle gehalten werden? *Schweizerische Bienenzeitung* 121 (5) 287-291.
- Korpela, S. (1998) Orgaanisten happojen sekä eteeristen öljyjen käytöstämehiläisen loispunkkien torjuntaan. *Mehiläinen* 15: 148-153.
- Korpela, S. (1998) Varroan torjuntanäkymiä lähitulevaisuudessa. *Mehiläinen* 15: 164-165.
- Korpela, S. (1999) Tutkimus etsii vaihtoehtoja synteettisille torjunta-aineille. *Mehiläinen* 16: 51.
- Korpela, S. 1999. The use of the "Beltsville formic acid gel" against *Varroa jacobsoni* during autumn feeding and in spring in Finland. Poster presentation. Abstract in: *Proceedings, Apimondia '99 Congress, Vancouver*, p. 264.
- Kristiansen, P. & Fries, I. 1999 Fältförsök med olika bekämpningsmetoder. *Bitidningen* 98, april 1999: 12-16.
- Mutinelli, F., Nanetti A., Milani, N. (1999) Azione concertata dell'Unione Europea per il coordinamento della ricerca sul controllo integrato della varroasi. *Il Progresso Veterinario* 54, 123-124.

- Mutinelli, F., Nanetti A., Milani, N. (1999) Azione concertata dell'Unione Europea per il coordinamento della ricerca sul controllo integrato della varroasi. Apitalia 26, 45.
- Mutinelli, F., Nanetti A., Milani, N. (1999) Azione concertata dell'Unione Europea per il coordinamento della ricerca sul controllo integrato della varroasi. L'apis 7, 8.
- Mutinelli, F. (1999) Rules governing the use of products for *Varroa* control Bee World: submitted

Future actions

After discussions among the CA partners at the last CA meeting in Merelbeke it was decided to continue the established network and to extend it further if there is an interest from other European colleagues to participate. The name of the group is not yet established, but the first meeting to establish this activity permanently will be organized by Toni Imdorf in Switzerland and held in Bern in June 16-17, 2000.

The varroa bibliography will be moved and continuously updated after the termination of the CA. The tentative location will be at <http://www.apis.admin.ch>.

The material presented in the Merelbeke meeting proceedings (Annex VI) will be used where appropriate by partners at the national level. This includes translation and publishing in national bee journals and initiating seminars on integrated control of varroa based on the compiled material.

Eva Rademacher will continue to work on registration issues to facilitate the use of organic acids as mite control agents. This includes procedures for inclusion of oxalic acid on the EU MRL list and related issues.

Action requested from the Commission

None.