



EUROPEAN COMMISSION  
RESEARCH DIRECTORATE-GENERAL  
Directorate B : European Research Area : structural aspects  
**COST**



## COST 850 - WG3 Meeting

### „Potential use of EPN to control Hazelnut Weevils“

Bordeaux Merignac, France  
26-27 April, 2002

#### 1. Objectives

- to have for the first time a meeting with the participation of all foreseen programme contributors
- to review the suggestion mid term action programme, especially in view of the WG3, WG4 and WG5 objectives
- to specifically draw up the tasks for 2002 and assign the actions to the different contributors

#### 2. Participants

Ralf-Udo Ehlers	University Kiel	Germany
Didier Rochat	INRA, Versailles	France
Zihni Demi Rbag	University Karadenisz, Trabzon	Turkey
Jean Paul Saraquigne	ANPN, Cancon	France
Merce Rovira	IRTA, Reus, Catalogne	Spain
Bruno Saphy	Unicoque, Cancon	France
Jean Luc Reigne	Unicoque, Cancon	France
Bernard Hennion	CTIFL, Lanxade	France
Martin Andermatt	Andermatt Biocontrol, Grossdietwil	Switzerland
Bernard J. Blum	Agrometrix ICM /IBMA, Basle	Switzerland
Mireille Piron	Koppert SA	France
Simon Piggott	Microbio Ltd	UK
Arne Thies	Payrac	France
Silke Thies	Payrac	France
Roel Mulder (part time)	EU, DG Research, Brusasels	Belgium

#### 3. Lectures

##### a) Objectives of COST 850 ( Ralf-Udo Ehlers)

- markets such as hazelnuts are considered by the large chemical industry as niches . They will not provide nor register products for such markets which are therefore attractive potential for SMEs and biological control agents producers
- EPNs seem to be interesting alternative insect control agents due to the fact that the registration is still not necessary in many countries. They can additionally provide sustainable effects, since DJ are adapted for long term survival in the soil
- The new methods of EPNs production meke it possible to bring to the market high quality products which are related to tangible quality standards: nbr of individuals intha packages, nbr of alive/active individuals, infectivity, fat reserves/dry weight, symbiotic bactreria, storage behaviour

- The lab tests undertaken in 2001 with insect larvae collected in SW France have demonstrated the efficacy of *Steinernema falthiae* against *Balaninus nucum*. The mortality was associated with the action of an entomopathogenic fungus (*Beauveria* sp?)
- Under COST 850, it will be possible to undertake interesting scientific works, which associated with field studies, will lead to practical use of EPNs in the integrated control of *Balaninus nucum*, the most important pest occurring in hazelnut plantations.

b) Description and biology of *Balaninus nucum* (Dider Rochat)

The biology of *B.nucum* has been extensively studied and described by Remi Coutin. It appears that the larvae are monophagus, exclusive to hazelnuts.

The life cycle of the insect has been described and shows that the potential control with nematodes will be restricted to short periods of time: when the larvae fall from the nuts to the soil, or in the spring, when the adults emerge from the soil. It might be possible, but difficult, at the oviposition time.

Many aspects regarding the biology and the behaviour of the insect remain to be discovered.

c) Hazelnuts production and pests control in Turkey ( Zihni Demirbag)

71% of the World hazelnut production ( 335'000 ha) is located in 2 regions of Turkey, along the Black Sea.

The trees are mostly owned by small sized producers ( 450'000) and are located on relatively steep mountains. The average productivity is low ( 950 kg/ha) compared with other regions such as Spain (1666 kg/ha) or France. The methods of production remain traditional, mostly manual.

260'000 tons are exported of which 81% to the EU.

Several actions are recommended in order to improve the production and the potential export such as: selection of better production fields, stop chemicals use, increase biological control of pests.

A large spectrum of pests are recorded in hazelnuts, of which *Balaninus nucum* appears to be the most important.

Several research studies are under way in the field of biological control of the mentioned pests.

Microorganisms, such as bacterial isolates and insect viruses might be preferential control agents due to their efficacy. Neem Azal ( azaradichin) is also an attractive product for insect control in hazelnuts.

d) Hazelnuts production in Spain (Merce Rovira)

Hazelnuts production has taken off following the Phylloxera catastrophe at the end of the 19<sup>th</sup> century.

The production is nevertheless slowly decreasing during the last 10 years: ( 37'000 ha to 20'000 ha).

This is nevertheless the 4<sup>th</sup> production country in the world.

The plantations are located in 2 regions:

- „Prioret“: an hilly region using traditional cultural practices leading to low productivity: 550-800 kg/ha

- „Camp de Tarragona“: modern cultural practices producing 2000-2500 kg/ha

Small holding: average of 2 ha, cultivated for a large extent by part-time farmers.

45% of the production is exported, of which 9'000 t kernel

*Bal. Nucum* is an important pest, but with irregular occurrence, mostly in the humid and cooler zones

In practice *Balaninus* is not considered as a real problem, since endosulfan sprays against

*Phytoptus* ( bud mite) control *Balaninus* simultaneously .

In Spain there is no hazelnuts organic production

e) Hazelnuts in France

Only 180 growers produce 5'000 t shells . The industry supply is not the major target.

Only one cooperative :UNICOQUE with the trade mark „KOKI“.

60% of the production is exported, mainly in EU

The production system is close to the US, using the same methods for planting, plant protection etc.

Average yield: 2000-2500 kg/ha, but the objective is to reach 3000 kg

*Balaninus nucum* is the most important pest, but is effectively controlled with endosulfan

Hazelnuts price: 1-1,5 euro/kg. Highest price for early production

Cost of insecticides: 125 Euro/ha ( 6% of the income, similarly to many other crops)

f) Chessnuts pests in France ( Bernard Hennion)

Compared with a world production of 450'000t, only 9'000 t are produced in France, of which 7'000 t in the departement Ardèche.

Seast region is more traditional, while Swest are modern.

Main pests:

- *Cydia spendana* is the major pest, responsible for up to 50% losses. Different insecticides are able to control this pest, but their application is difficult due to the structure of the production area.
- *Balaninus elevas* is close to *balaninus nucum*, but its specificity is less strong since it occurs also on oaks  
Adult emergence takes place in August-September, and the larvae exit the nuts 40 days later, when the nuts are fallen on the soil  
60% of the larvae enter into diapause and produce adults already the following year.  
The control consists of preventively to collect as fast as possible the parasitised fruits (difficult) and, curatively spray with insecticides (also difficult)
- Other pests occur under the barks (*Pommene fasciana*) or inside the wood (*Xyloborus dispar*)

Most of the production can be considered as „organic“ and biological control will be favoured against chemical control

The selling price of chessnut is about 1,00 euro/kg for the local French production, while, the importation is made at the level of 0,50 euro/kg.

In good maintained plantations, the yield will reach 3'000 kg/ha.

g) Major aspects relative to the control of *Balaninus nucum* ( Didier Rochat)

- Hazelnut weevil is of importance because all feeding stages are harmful and 1 single insect can damage up to 200 nuts.
- The chemical control is impossible on pre-imaginal stages ( pupae). With insecticides, it remains difficult to conciliate efficacy with safety. It remains therefore important to have efficient early detection methods
- Adult detection: the visual detection or the manual searching is impossible. In the future, it will be necessary to find a method which will combine visual, tactile and semiochemical trapping: this means that to develop the basis for chemical ecology.
- Chemical ecology: ranking the different potential semiochemicals, anti-oviposition pheromones are probably the most difficult to define, followed by plant kairomones and sex or aggregation pheromones which can be used for mating disruption.  
Sexual pheromones are known for many beetles, but *balaninus nucum* seems to be particularly non reactive to such stimulations.
- It remains certain that hazelnuts exercise a strong attraction to beetles. „ factors have to be mentioned: the visual attraction and odors. But the smelling of hazelnuts is chemically very complex, and is probably influenced by the development of the nuts.

Several aspects need further scientific investigations:

- 1) ecological conditions of insect emergence from the soil
- 2) correlation between climatic conditions and larvae exit from the nuts
- 3) tactilism of larvae in relation with soil humidity
- 4) mobility and its speed of larvae in the soil
- 5) correlation between irrigation/ soil moisture and the use of EPNs

4. COST 850 Switzerland (Bernard J. Blum)

Switzerland signed in 2001 an agreement in order to be associated to COST Action 850.

Due to internal Swiss administrative procedures, the activities coordinated by Jürg Grunder, Federal research Station Wädenswil, and Bernard J. Blum, Agrometrix ICM Basel, should be approved together with the attached budget by Bern authorities in June-July 2002. The activities will thereafter start during the 4<sup>th</sup> quarter 2002.

COST 850 Switzerland has been divided into 9 projects:

- Project 1: Biocontrol of *Balaninus elevas* ( Chessnuts)
- Project 2: Biocontrol of *Rhagoletis cerasi* ( Cherries)
- Project 3: Biocontrol of *Balaninus nucum* (hazelnuts)
- Project 4: Lab screening symbiotic bacteria
- Project 5: Lab screening wild nematodes from Switzerland and trials area
- Project 6: IPM systems, softwares, modelling, electronic tools
- Project 7: Description new EPNs
- Project 8: Development, production and use of EPN products, including development and registration of new products
- Project 9: Market data, financial aspects, Costs/benefits balance, socio-economic aspects

In the case of Hazelnuts, only lab studies will be undertaken in 2002, while field activities will start in 2003

The industrial part of the project should take place in 2004-2005

#### 5. Products availability

The 4 present producers, E-nema, Koppert, Andermatt and Microbio presented their company as well as the different commercial EPNs products available

#### 6. Brainstorming: Critical aspects for supporting COST action 850 activities relative to hazelnuts

- Due to irregularity of pests occurrence and ecological conditions, the field activities must last longer than 3 years
- Monitoring of insects: a system of monitoring should be able to assist to understand the dynamic and the distribution of insects in the soil in relation with the soil structure, the topography
- Relation with irrigation, water availability, cropping systems
- Timing of EPNs application
- Should EPNs be sprayed on the leaves or the soil
- Interaction larvae/fungus/nematodes
- EPNs dynamic during the winter and vis a vis insects
- Economy of nematodes use
- Cost of nematodes production
- optimisation of commercial formulations
- Mode of application, spray or injection ?
- Efficacy compared with other biological control agents: bacteria, vegetal extracts

The project will have therefore to be splitted into 7 investigation fields

- ① Insects monitoring . monitoring devices, geographical repartition and dynamic of populations
- ② Pest infestation in relation with agronomic systems, irrigation, fertilisation, soil cultivation etc.
- ③ Commercial products: production optimisation, formulation, application systems
- ④ Efficacy: compared with other chemical and biological methods
- ⑤ Economy: market data, costs/benefits,
- ⑥ Safety: environmental aspects, risks assesment, registration
- ⑦ insect and nematodes biology: clarification of biological aspects, interrelation insect/nematode, climatic and micro climatic factors.

**Contributors as well as leaders for each of these domains remain to be nominated**

7. Programme of Coordinated activities for 2002 ( and 2003)

		<b>Activities</b>	<b>Contributors</b>	<b>Timing</b>
1	Balaninus nucum biology Dynamic Forecasting	To collect ecological data (Metos electronic station) in relation with Bn activity	ANPN FAW FiBI Metos Assistance D. Rochat	- As soon as possible - Meeting end of 2002
2	Screening of nematodes	Soil samples with Bn larvae from Spain and Turkey will be sent to Microbio efficacy testing	IRTA Uni Trabzon Microbio	- Starting in august 2002
3	Endemic nematodes population	Soil samples from France, Spain and Turkey will sent to UniKiel and FAW for extraction of wild EPNs	ANPN, IRTA, UniTrabzon UniKiel, FAW	- Starting in Novemeber 2002
4	Semi field trials ( containers in the soil)	50X50X50cm metal containers are placed in the soil and artificioally infected with Bn larvae and treated with EPNs	ANPN ( supply of larvae) A, Thies : conatiners and trials E-nema: EPN product Metos: electronic station	- August/september 2002, until April 2003
5	Field Trials	Trial to be located within an untreated plantation: 5X1 m2 untreated plots 5X 1 m2 treated plots The plots artificioally infected with larvae control of insect semergence with photoeclectors	IRTA: trials layout in 2002 ANPN: lay out in 2003 Nematodes E-nema, Kopert, Microbio: supply of nematodes	- August/september 2002, until April 2003
6	Testing alternative insect control techniques	Alternative biological products will be tested in untreated plantations	Andermatt: trials protocole and alternative products INRA: lab testing, including repellents ANPN: trials layout	Field trials: 2002 La tests: 2003