

Progress in EPN

Use and Research in Italy

**Activities carried out by Italian research groups
involved in COST ACTION 850 “ Biocontrol
Symbiosis” from 2001 to 2006.**

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Three main Italian research groups:

1. Department of Biology and Chemistry, Section of Entomology and Zoology, at the College of Agriculture, University of Bari: Triggiani Oreste and Tarasco Eustachio;

2. Phytosanitary Service in the Emilia Romagna Region: Curto Giovanna;

3. BioTecnologie BT. Company located in Pantalla, Todi, Perugia: Ragni Adriano and Ricci Manuele.

Scientific research:

1- Surveys of Nematodes in Italian soils (cultivated, uncultivated, forest soils).

✓ A new species of “long Nematode” was collected, named *Steinernema apuliae* and described in cooperation with Z. Mráček and A. Reid. The results were published in ZOOTAXA (2004).

2- Dealt with Taxonomy, Molecular and biological characterization of long and “not long” Italian Nematodes.

3- Use of EPNs to control insect pests.

✓ Applications of autochthonous *Steinernema* and *Heterorhabditis* spp., were tested in field and semi-field situations.

For example:

-Interesting and reassuring results were gained by injecting DJs in the winter nests of *Thaumetopoea pityocampa* (Pine processionary caterpillar) (Lepidoptera Thaumetopoeidae) to control over-wintering larvae.



✓ Italian strains of EPNs were tested against *Rhytidoderes plicatus* Oliv. (Coleoptera, Curculionidae) larvae in potted savoy cabbage.



✓ Non-authoctonus EPNs in the control of sawfly (*Hoplocampa brevis*) on pear orchard leaves and in soil, were tested by Giovanna Curto *et al.*

✓ Evaluation of entomopathogenic nematodes to control *Corythuca ciliata* (Rhynchota, Tingidae).



✓ Treatment against borer insects:

- *H. bacteriophora* and *H. megidis* against *Saperda carcarias* larvae (Coleoptera Cerambycidae) in field.



- Apulian strains of *S. carpocapsae* (Weiser) and *H. bacteriophora* were tested against 3-4 cm long larvae of *Capnodis tenebrionis*, on potted cherry plum plants (*Prunus mirabolana* Lois) with excellent results in lab and in greenhouse.



- Numerous tests to control the chestnut weevil *Balaninus elephas* (Coleoptera Curculionidea) larvae and data on the persistence of EPNs in the soil of chestnuts were provided.



-Nematodes were also tested against strawberry and ornamental plant weevils.

-As a matter of fact, an interesting market is developing in Italy regarding the use of nematodes to produce biological strawberries.

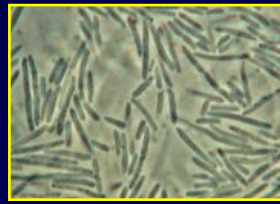


4- Production and formulation of bio-insecticides

✓ Some reports by M. Ricci on EPNs production and formulation of bio-insecticides based on cold-active entomopathogenic nematodes.



5- Symbiotic bacteria



✓ Symbiotic bacteria of EPNs as a source of insecticidal toxins at Pantalla by BioTecnologie BT and the antifungal and antibacterial activities of *Photorhabdus* and *Xenorhabdus* were tested in vitro

-A. Ragni examined the damages caused to the gut of *Mamestra brassicae* larvae by *Photorhabdus luminescens*.

BOOKS

✓ G. Curto was Coauthor in Chapter 13 concerning -Vegetable and Tuber Crops Applications- in “Nematodes as Biological Control Agents”.



SHORT MISSIONS SUPPORTED BY COST ACTION AND OTHER ITALIAN ORGANIZATIONS

✓ In the 2001 E. Tarasco spent about one month in CHRISTINA GRIFFIN's laboratory at the Department of Biology in the National University of Ireland, Maynooth.

✓ In 2002 I was in ZDENEK MRÁČEK's Laboratory of Insect Pathology of at České Budjovice, The Czech Republic.

✓ In 2003 and 2004 E. Tarasco also stayed in RALF-UDO EHLER's laboratory.

ORGANIZATION OF MEETINGS:

✓ In 2002 Giovanna Curto organized a National Meeting called “Entomopathogenic Nematodes and Their Symbionts: Researches and Applications in Organic and Integrated Agriculture”: Bicocca University, Milan.



✓ In 2003 the colleagues M. Ricci and A. Ragni of BioTecnologie BT organized in Perugia the National Meeting “Nematodi quali agenti biologici di controllo su insetti di rilevanza sia per l’agricoltura che per la salute dell’uomo”, (Nematodes as biological agents to control the most common insect pests for agriculture and human health) to spread the knowledge of how to use EPNs among Italians involved in biological control.



✓ In 2005 me and my coworkers acted as local organizers of the 10th European meeting “**Invertebrate pathogens in biological control: Present and Future**” hold at Locorotondo, Bari in cooperation with IOBC/WPRS Working Group, COST ACTIONS 842 and COST ACTION 850.





List of Publications:

2001

- **Paparatti B., Speranza S. and Ricci M. -2001-** Preliminary notes on the control of chestnut weevil *Curculio elephas* Gyll. (Coleoptera Curculionidae) with entomopathogenic nematodes. 34th Annual Meeting of the Society for Invertebrate Pathology, 22-28, August, 2001 Wageningen, NL
- **Ragni A. and Fridlender B. -2001-** Entomopathogenic nematode symbiotic bacteria: a novel source of insecticidal toxins. In proceedings of International Organization for Biological Control/WPRS and COST 819 joint meeting: Vienna Austria March 1999, p. 85-93.
- **Ragni A. and Quattrocchi L. -2001-** Screening of *Photorhabdus* and *Xenorhabdus* for antifungal and antibacterial activities using in vitro tests. In proceedings of the workshop “Development in entomopathogenic nematode/bacteria research” held at the National University of Ireland Maynooth 13 to 15 April 2000. p. 314-318

➤ Ragni A., Romani R., Flek G. and Isidoro N. -2001- Transmission electron microscope (TEM) based studies of *Mamestra brassicae* midgut damage after treatments with *Photorhabdus luminescens* strain XP01. Proceeding of the COST 850 symposium “Bioactive molecules” 31 August, 2001, Wageningen, The Netherlands: in press.

➤ Triggiani O., and Tarasco E -2001- Application of Entomopathogenic nematodes to control overwintering larvae of *Thaumetopoea pityocampa* (Den. Et Schiff.) (Lepidoptera: Thaumetopoeidae). VIII European Meeting IOBC/WPRS Working Group. Atene, Grecia, 29 maggio-2 giugno, 2001

➤ Triggiani O., and Tarasco E -2001- Preliminary attempts to control overwintering populations of *Thaumetopoea pityocampa* (Den. Et Schiff.) in Italy (Lep., Thaumetopoeidae) with *Steinernema feltiae* (Filipjev, 1934) (Nematoda, Steinernematidae). Entomologica, Bari 35, 7-15.

2002

➤ **Curto G., Santi R., Vai N., Barani A., Vezzadini S. and Ricci M. - 2002**
➤ **Preliminary field trial results on the biological control of *Saperda*
carcharias larvae on poplar groves. Fourth International Congress of
Nematology in Tenerife, Canary Islands, Spain. 8-13 June 2002.**

➤ **Ragni A., Valentini F. - 2002 - Photorhabdus e Xenorhabdus: a new
source of useful compounds for biological control. GRIFA International
Congress , Milano 15-16th October 2002. Book of Abstract.**

➤ **Ragni A. – 2002- I metaboliti prodotti da Photorhabdus e
Xenorhabdus (batteri simbiotici dei nematodi entomopatogeni) ed il loro
uso potenziale in agricoltura. Convegno nazionale “Nematodi
entomopatogeni e loro simbiotici: Ricerche e applicazioni in agricoltura
biologica integrata”. Convegno Congiunto della S.I.N. (Società Italiana
di Nematologia) e COST850. Università degli Studi di Milano-Bicocca
31 maggio 2002. In press: Nematol. mediterr.**

➤ M. Ricci, G. Flek, M. Colli, R. Barcarotti, L. Quattrocchi, S. Coranelli, L. Concezzi, A. P. Fifi, R. De Nicola, M. Scribano, M. De Berardinis, F. Citarrei and A. Ragni. -2002- Bioassays for screenings and quality control of products with insecticidal, fungicidal and nematocidal activity based on vegetable extracts, microorganisms and chemical molecules. Convegno GRIFA, Milano 15-16 ottobre 2002; Quaderni GRIFA n° 19

➤ Ricci M., Colli M. . Barcarotti R., Pinotti M. and Ragni A. -2002- Ecotoxicity of the entomopathogenic bacterium-nematode symbiotic complex toward non target organisms Convegno GRIFA, Milano 15-16 ottobre 2002; Quaderni GRIFA n° 19

➤ Ricci M. and Ragni A. -2002- Entomopathogenic nematodes in biological control: reality and perspectives. Atti del convegno GRIFA Milano 15-16 ottobre 2002; Quaderni GRIFA n° 19

➤ Triggiani O. and Tarasco E. -2002- Efficiency and persistence of entomopathogenic nematodes in controlling larval populations of *Thaumetopoea pityocampa* (Den. et Schiff.) (Lepidoptera Thaumetopoeidae) *Biocontrol Sciences and Technology* 12: 747-752

➤ **Triggiani O. e Tarasco E. - 2002- Controllo invernale di *Thaumetopoea pityocampa* (Den. Et Shiff.) (Lepidoptera Thaumetopoeidae) con Nematodi entomopatogeni. Atti XIX Congresso Nazionale Italiano di Entomologia Catania 10-15 giugno 2002. pag. 803-809**

➤ **Triggiani O. and Tarasco E - 2002- Long Nematode strains from Italy COST 850 Biocontrol Symbiosis WG 3 Biotechnology Workshop and Meeting (title: Molecular Identification and Taxonomy of Undescribed Species of Long-dauer Juvenile Phenotype from Europe and Southern Mediterranean Regions). Budapest and Debrecen, Hungary, April 4-6, 2002.**

➤ **Tarasco E. and Triggiani O. - 2002- Desiccation tolerance of Italian Long Nematodes. COST 850 Biocontrol Symbiosis WG 3 Biotechnology Workshop and Meeting (title: Molecular Identification and Taxonomy of Undescribed Species of Long-dauer Juvenile Phenotype from Europe and Southern Mediterranean Regions). Budapest and Debrecen, Hungary April 4-6 , 2002.**

➤ Tarasco E. and Triggiani O. -2002- Entomopathogenic nematodes of forest habitats in Southern Italy and their ecological role in controlling forest pests. International Symposium on Entomological Research in Mediterranean forest ecosystems. Rabat (Marocco), 6-10 Maggio 2002.

➤ Tarasco E. and Triggiani O. – 2002- Biocontrol of *Rhytidoderes duplicatus* Oliv. (Coleoptera, Curculionidae) in potted savoy cabbage with entomopathogenic nematodes. Entomologica, Bari 36, 157-164

2003

➤ Curto G. e Ricci M. -2003- Saperda del Pioppo. Atti del Convegno Nazionale "Nematodi quali agenti biologici di controllo su insetti di rilevanza sia per l'agricoltura che per la salute dell'uomo". Perugia, 20 Settembre 2003

➤ **Curto G., Santi R., Vai N., Barani A., Vezzadini S. e Ricci M. -2003**
Controllo biologico di larve di *Saperda carcarias* in un pioppeto industriale. Atti Convegno Nazionale “Nematodi quali agenti biologici di controllo su insetti di rilevanza sia per l’agricoltura che per la salute.” Progetto MIUR-Cluster C06+07. Perugia, Etruscan Chocohotel 26 settembre

➤ **Marannino P., Tarasco E. and De Lillo E. - 2003 - Biological Notes on Larval Hatching in *Capnodis tenebrionis* (L.) (Coleoptera Buprestidae) and Evaluation of Entomopathogenic Nematodes in Controlling Neonate Larvae: Redia LXXXVI, 101-105.**

➤ **Morea M., Baruzzi F., Urso G., Visconti A. e Ragni A. 2003**
Caratterizzazione molecolare di nematodi entomopatogeni e dei loro batteri simbiotici. Atti del Convegno Nazionale “Nematodi quali agenti biologici di controllo su insetti di rilevanza sia per l’agricoltura che per la salute dell’uomo”, Perugia, 26 Settembre 2003

➤ Ragni. A. -2003- Selezione di ceppi di nematodi entomopatogeni. Atti del Convegno Nazionale "Nematodi quali agenti biologici di controllo su insetti di rilevanza sia per l'agricoltura che per la salute dell'uomo" Perugia, 26 Settembre 2003

➤ Ricci M. -2003- Produzione e Formulazione dei nematodi entomopatogeni. Atti del Convegno Nazionale "Nematodi quali agenti biologici di controllo su insetti di rilevanza sia per l'agricoltura che per la salute dell'uomo" Perugia, 26 Settembre 2003

➤ Ricci -2003- Prove di campo con nematodi entomopatogeni: Oziorinco della fragola e delle piante ornamentali. Atti del Convegno Nazionale "Nematodi quali agenti biologici di controllo su insetti di rilevanza sia per l'agricoltura che per la salute dell'uomo", Perugia, 26 Settembre 2003

➤ Susurluk, I. A., Holmer, S., Mehta, U. K., Han, R., Tarasco, E., Triggiani, O., Peters, A. and Ehlers, R. U.- 2003- Molecular identification of entomopathogenic nematodes from Turkey, India, China, Italy and Germany by PCR-RFLP of the ITS region. 9th European Meeting Growing Biocontrol Markets Challenge Research And Development Schloss Salza, Germany, 23-29 May, 2003

➤ Triggiani O. 2003- Nematodi entomopatogeni. Atti Convegno Nazionale
“Nematodi quali agenti biologici di controllo su insetti di rilevanza sia per
l’agricoltura che per la salute.” Progetto MIUR-Cluster C06+07. Perugia
Etruscan Chocohotel 26 settembre

2004

➤ Clausi M., Curto G. and Vinciguerra M.T.- 2004- Persistence of EPN
in chestnut forest soil in Etna area, after their application for control of
chestnut moths and weevils. 4th WG4 Meeting: “Inundative and
Inoculative Release and Persistence of EPN in Forest and Agriculture
Environments: Aberdeen, Scotland, 21-22 February 2004.

➤ Bélair G., Wright D. J. and Curto G. -2004 - Vegetable and tuber
crops- in “Nematodes as Biological Control Agents”. CABI Publishing
Editors P. S. Grewal, R.-U. Ehler and D.I Shapiro- Ilan

➤ **Ragni A., Quattrocchi L., S. Coranelli and Ricci M. -2004- Selection of entomopathogenic nematodes for heat tolerant and desiccation traits. Management of plant diseases and arthropod pests by BCAs and their integration in agricultural systems. Book of Abstract p. 92. International Meeting: IOBC, S. Michele all'Adige, Italy. 9-13 June 2004**

➤ **Ricci M., Fifi, A.P., De Berardinis M., Colli M and Ragni A. -2004- Development of a bio-insecticide based on a cold-active entomopathogenic nematode. Management of plant diseases and arthropod pests by BCAs and their integration in agricultural systems. Book of Abstract p. 129. International Meeting: IOBC, S. Michele all'Adige, Italy. 9-13 June 2004**

➤ **Scribano M., G. Petesse, S. Coranelli and Ragni A.. -2004- Molecular fingerprint for characterization of micro-organisms. Workshop health and environmental risk assessment by the use of organisms for biological control of pests and diseases. Elsinore, Denmark November 15-16th November 2004. Book of Abstract.**

➤ Tarasco E and Triggiani O. -2004- Use of Italian EPNs in controlling *Rhytidoderes plicatus* Oliv. (Coleoptera: Curculionidae) in potted savoy cabbages. IOBC wprs Bulletin Vol 28 (3) pp. 9-12

➤ Triggiani O., Mracek Z. and Reid A. - 2004- *Steinernema apuliae* sp. n. (Rhabditida, Steinernematidae), a new entomopathogenic nematode from southern Italy. Zootaxa 460, 1-12

➤ Triggiani O. and Tarasco E. -2004- Evaluation of entomopathogenic nematodes for control of *Corythuca ciliata* Say (Rynchota:Tingidae) overwintering adults –preliminary note. XXII International Congress of Entomology. 15-21 August 2004. Brisbane Queensland Australia.

2005

➤ Ricci M. and van der Pas R. -2005- Practical recommendations for end users and extension services. I. M. Grunder (Ed.) COST 819: Quality Control of Entomopathogenic Nematodes. p. 97-103.

➤ **Curto G., Boselli M., Vergnani S., and Reggiani A. 2005 Effectiveness of entomopathogenic nematodes in the control of sawfly (*Hoplocampa brevis*) on pear orchards. 10th European Meeting. Invertebrate Pathogens in Biological Control: Present and Future. Locorotondo, Bari Italy, June 10-15, 2005.**

➤ **Scribano M. and Ragni A. -2002- Isolation of new biological control agents from Umbria Region. GRIFA International Congress , Milano 15-16th October 2002.**

➤ **Tarasco E., Enright M.R., Griffin C.T. -2005- Preferences of Italian *Heterorhabditis* for different *Photorhabdus* bacterial types. 9TH European Meeting IOBC/WPRS, Kiel, Germany, May 24 - 28, 2003. Insect Pathogens and Insect Parasitic Nematodes, IOBC/wprs Bulletin 28(3): 23-26.**

➤ **Tarasco E. and Griffin C.T., -2005- Desiccation tolerance of 6 Italian strains of entomopathogenic nematodes. 9TH European Meeting IOBC/WPRS Kiel, Germany, May 24 - 28, 2003. Insect Pathogens and Insect Parasitic Nematodes, IOBC/wprs Bulletin, 28(3): 27-30.**