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EPNs and Forest Insects

in Italy

EPNs are used in Italy above all
in greenhouses and nurseries

- Also against xylophagous insects

No registration required at the
moment

Market improving

No producer companies

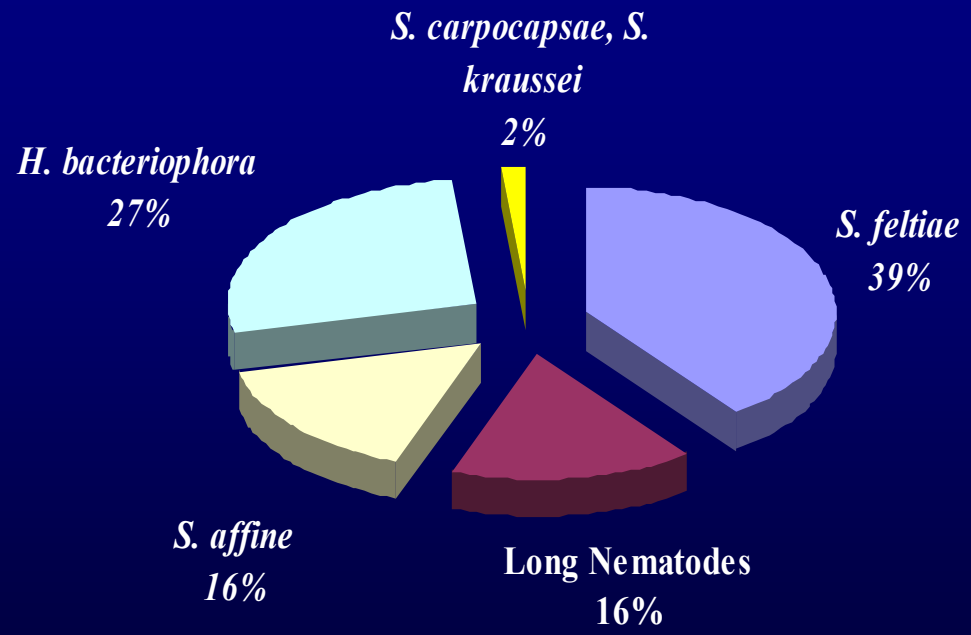
- Only imported EPNs
- Impact of these exogenous EPNs
unknown

Few companies involved



Indigenous EPNs in Italy

% of the total
soil samples were
positive for EPNs

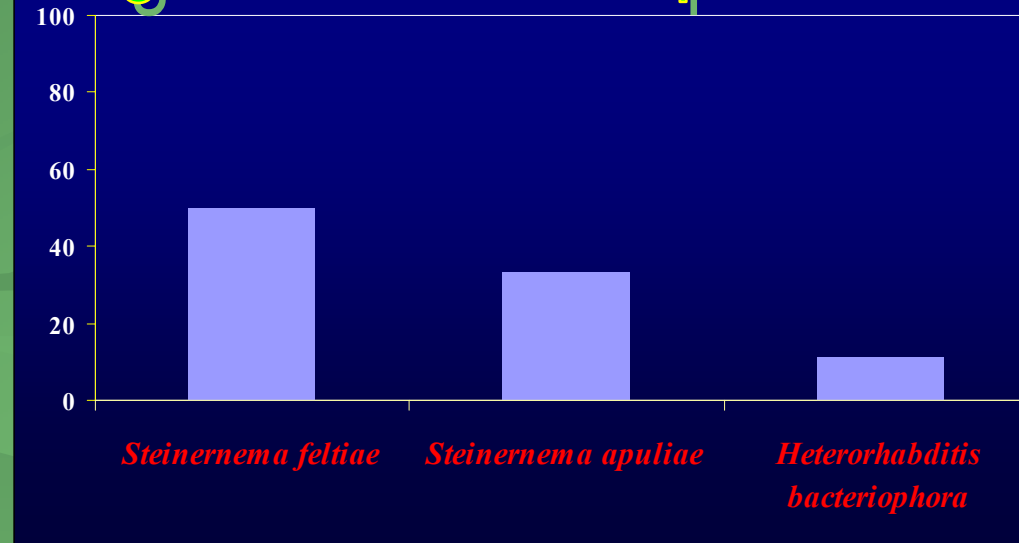


- S. feltiae*
- S. affine*
- S. carpocapsae*
- H. bacteriophora*
- S. kraussei* (ColdActive®)
- “Long Nematodes” (*S. apuliae* and *Steinernema* sp)

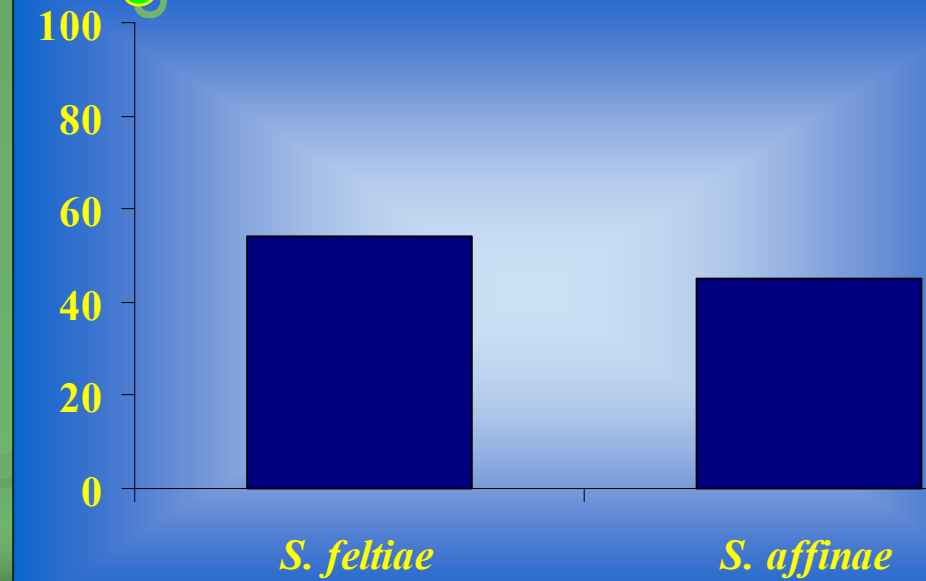
Sixty percent of pine woods and 15.5% of oak woods were positive for the presence of EPNs (Survey related to southern Italian forests).

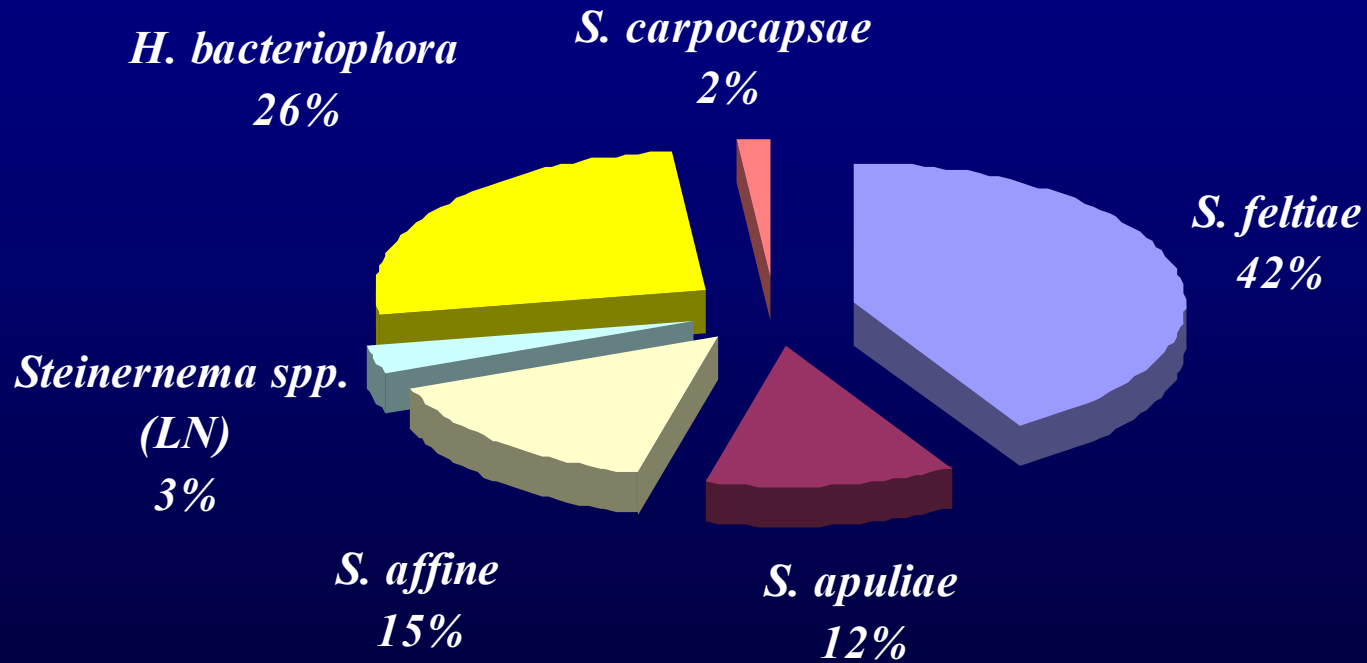
Steinernema feltiae was the most common isolated (42%) species

Indigenous EPNs in pine wood



Indigenous EPNs in oak wood





Indigenous EPNs in oak and pine wood.

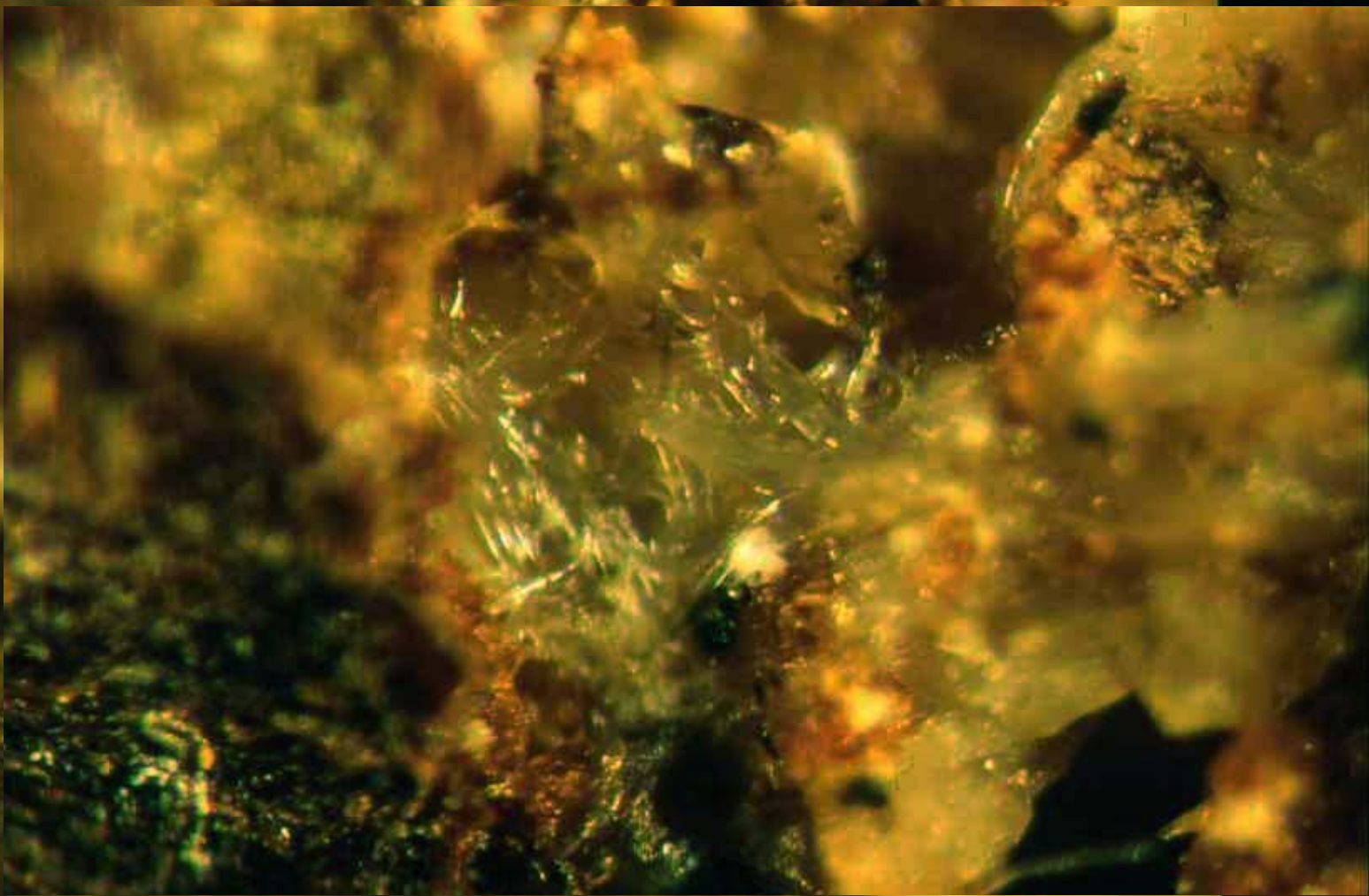
Ecosystems

Xylophagous insects

A *H. bacteriophora* infective juvenile entering a young xylophagous larva of *S. carpocapsae* and *H. bacteriophora* were found reproducing inside all rootborer larvae.



***H. bacteriophora* infective juveniles are able to search for the host larvae inside the roots**



S. carpocapsae e *H. bacteriophora*
used against buprestid larvae



S. carpocapsae e *S. feltiae* used
against *Paranthrene tabaniformis*

EPNs used against xylophagous forest pests



S. carpocapsae used against
Synanthedon rhododendri



S. feltiae used against
Cryptorhynchus lapidis

and test were conducted in the
siago Forest, Venetian Prealps to
evaluate the efficacy of 4 EPN
strains (*Heterorhabditis* sp. HL 81,
krausseii SK, *S. feltiae* IS 389 and
carpocapsae IS 230) against the
brood web-spinning sawfly
Cephalcia arvensis (pest of *Picea*
excelsa, fir-tree)

EPNs adaptation to low temperature
Ichneumonid parasitoids (*Xenoschesis*
fulvipes and *Ctenopelma lucifer*)
strongly affected by *S. feltiae*

Hymenoptera Pamphiliidae



Cephalcia arvensis

Coleoptera, Curculionidae

Curculio elephas and
Curculio propinquus

Field trials in chestnut and oak woods in Lazio, Apulia and Sicily with different EPN species: *Heterorhabditis bacteriophora*, *H. megidis*, *Steinernema kraussei* and *S. feltiae*

Infectivity and persistence



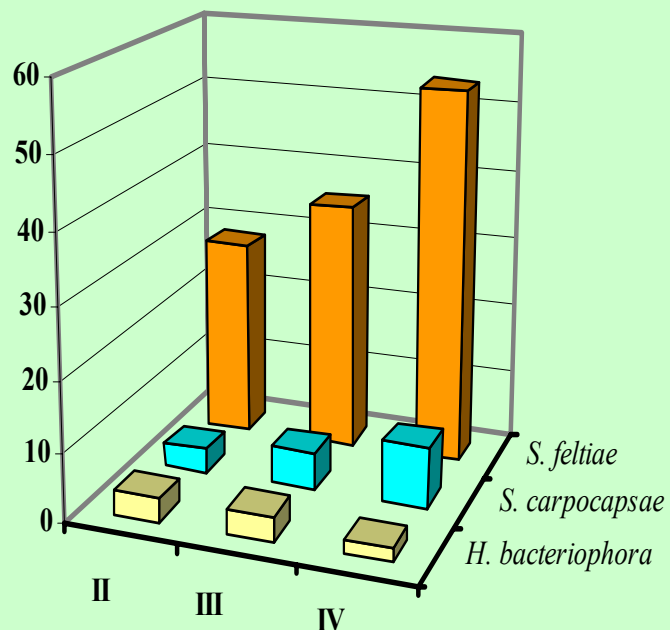
PNs against Processionary caterpillars

✓ Gel suspensions with *Steinernema feltiae* to control overwintering larvae of *Thaumetopoea pityocampa* in southern Italian pinewood reforestations



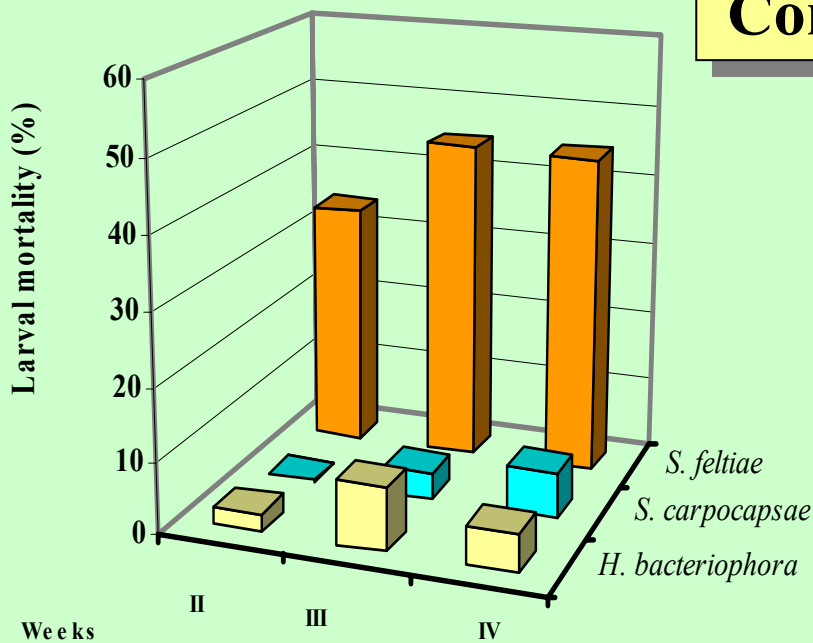
Field test in Apulian pinewood reforestations

Idrosorb gel



mortality (%) of *T. pityocampa* larvae

Compe



A real feasibility to reduce the overwintering larval populations of *T. pityocampa* injecting EPN in their nests

Capacity of the nematode gel suspension is to not percolate and adhere to the excrements and larvae in the nests

S. feltiae showed better results: > 50 % mortality after 28 days

Capability of nematodes to reach the adult stage and complete their life-cycle

No effects on the parasitoid *Phryxe caudata* (Diptera Tachinidae)

Adult *S. feltiae* in *T. pityocampa* larva



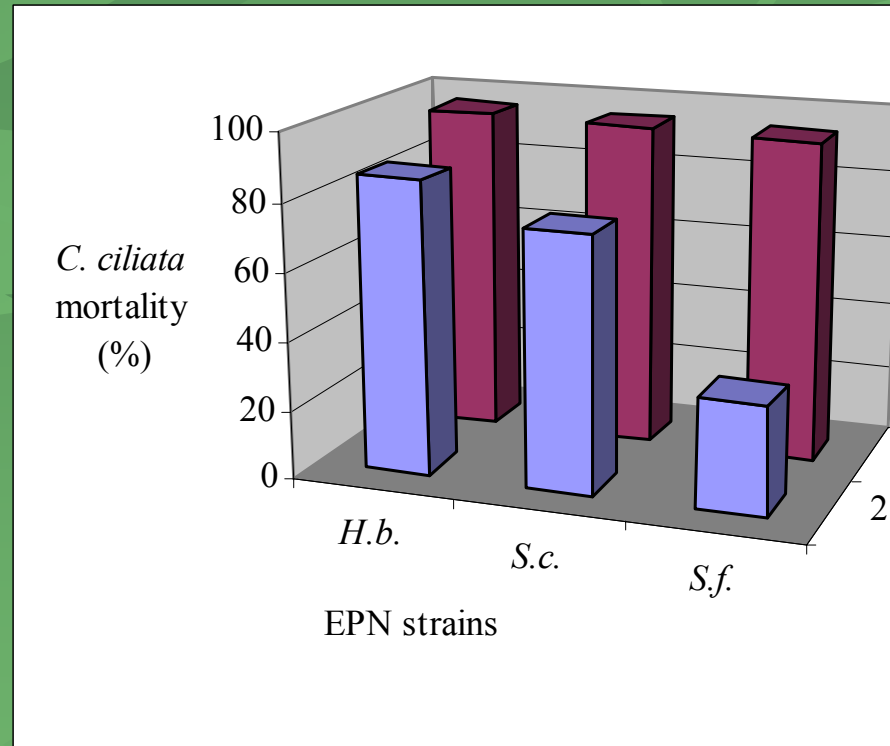
PNs against pests in urban forests

H. bacteriophora, *S. carpocapsae* and *S. feltiae*
against *Galerucella luteola* (pest of elm-tree) and
Corythucha ciliata (pest of plane-tree)



Adult Corythucha ciliata

The potential of 3 Italian EPNs as biological control agents for control of *Corythucha*, was evaluated through both laboratory and field experiments. In the laboratory *Steinernema feltiae* (ItS-CL2), *S. carpocapsae* (ItS-R7) and *Heterorhabditis bacteriophora* (ItH-CE1) were compared in Petri dishes with filter paper, against overwintering adults of *Corythucha*. All nematodes produced high levels of mortality. *S. carpocapsae* and *H. bacteriophora* produced significantly greater adult mortality than *S. feltiae*.



The efficiency of these EPNs was then evaluated in field trials, spraying EPN suspensions on tree trunks, where the adults of *Corythucha* usually spend the winter under the bark.

The mortality percentages in field conditions were quite low if compared with lab bioassays.

Among the nematodes *H. bacteriophora* produced significantly greater adult mortality in *S. carpocapsae* and *S. feltiae*

Even though more studies and experiments are needed to improve the EPN potential in field conditions, these preliminary results showed that EPNs, and *H. bacteriophora* in particular, are good candidates for further evaluation as biological control agents against *Corythucha* overwintering adults.

