

# The assessment of the effect of entomopathogenic nematodes on bulb mites, pests of garlic and onion

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Bulb mites of the genus *Rhizoglyphus* are among the most serious pests of garlic and onion but also tulips, hyacinths and other plants. Females of these soil dwelling mites lay their eggs into the underground parts of many plants and their larvae altogether with the adult stages cause damage to plant tissues that are, consequently, more sensitive to bacterial and fungal pathogens. What more these mites also transmit many of plant pathogens, e.g. *Fusarium* sp. The damage mostly occurs in the fields, but under favourable conditions, these mites can continue with their harmful activity also in stored products. As the females of *Rhizoglyphus echinopus* and less common *R. robini* are relatively large organisms that spend the whole life in the soil environment, the management by using entomopathogenic nematodes could be very promising. In the present study the screening of entomopathogenic nematodes in the fields of onion and garlic specialized farms in the Czech Republic and Israel was performed and more than thirty strains of *Steinernema* and *Heterorhabditis* nematodes were isolated. Selected strains were tested for infectivity and pathogenicity against garlic and onion pests, both insect (*Ephestia*) and mites (*Rhizoglyphus*) and the potential of the use of EPNs against bulb mites of the genus *Rhizoglyphus* was assessed.

## Bulb mites - *Rhizoglyphus echinopus* and *R. robini*

- Cosmopolitan mites
- Damage variety of crops:
  - Allium* species, *Lilium*, *Hyacinthus*, and other vegetables, cereals, and ornamentals
- in storage, greenhouses and fields



## Entomopathogenic nematodes - *Steinernema* and *Heterorhabditis*

- Ubiquitous in soils throughout the world
- lethal insect pathogens
- able to attack other invertebrates
- mass reared
- used in biocontrol
- Symbiosis with bacteria

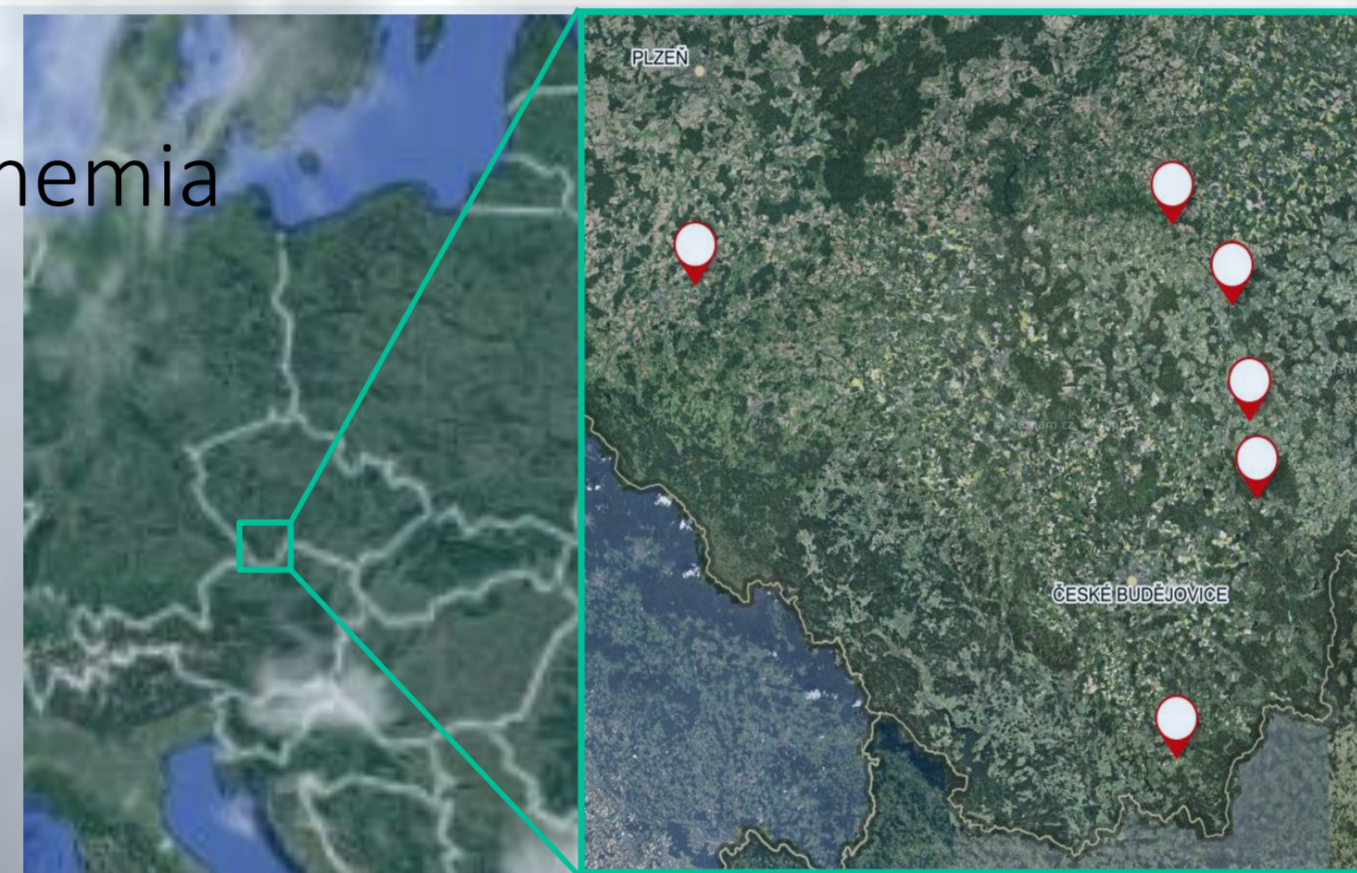


## Survey for EPN strains:

Soil samples taken in 6 organic farms in South Bohemia  
Galleria baiting method

## Virulence assays:

model host *G. mellonella*  
four doses (5, 10, 20 and 40 IJs)  
two temperatures (15°C and 20°C)



23 out of 46 samples positive (50%)  
*Steinernema feltiae* (14x), *S. affine* (2x), *S. krausseii* (1x),  
*S. carpocapsae* (1x)  
*S. feltiae* strain 20 and *S. carpocapsae* (1418) selected as the most virulent

## Virulence against *Rhizoglyphus*:

Mites propagated in plastic boxes on artificial diet  
Tested nematode strains (Table 1) propagated using *Galleria mellonella* larvae  
96 well plates, half filled with sand, each well with a piece of food  
300 IJs and 1 adult *Rhizoglyphus* female added per each well

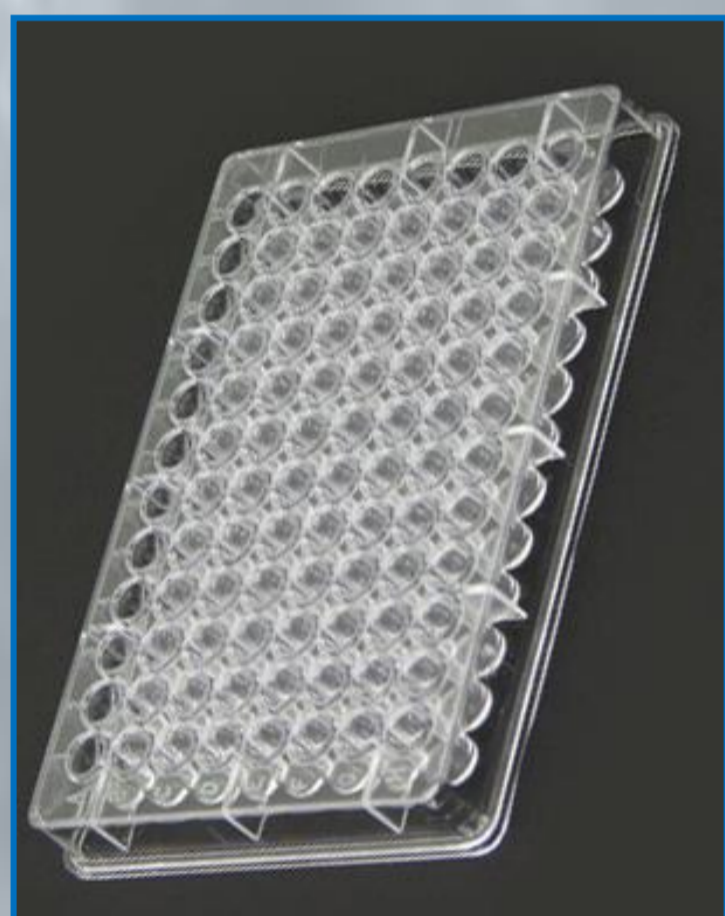
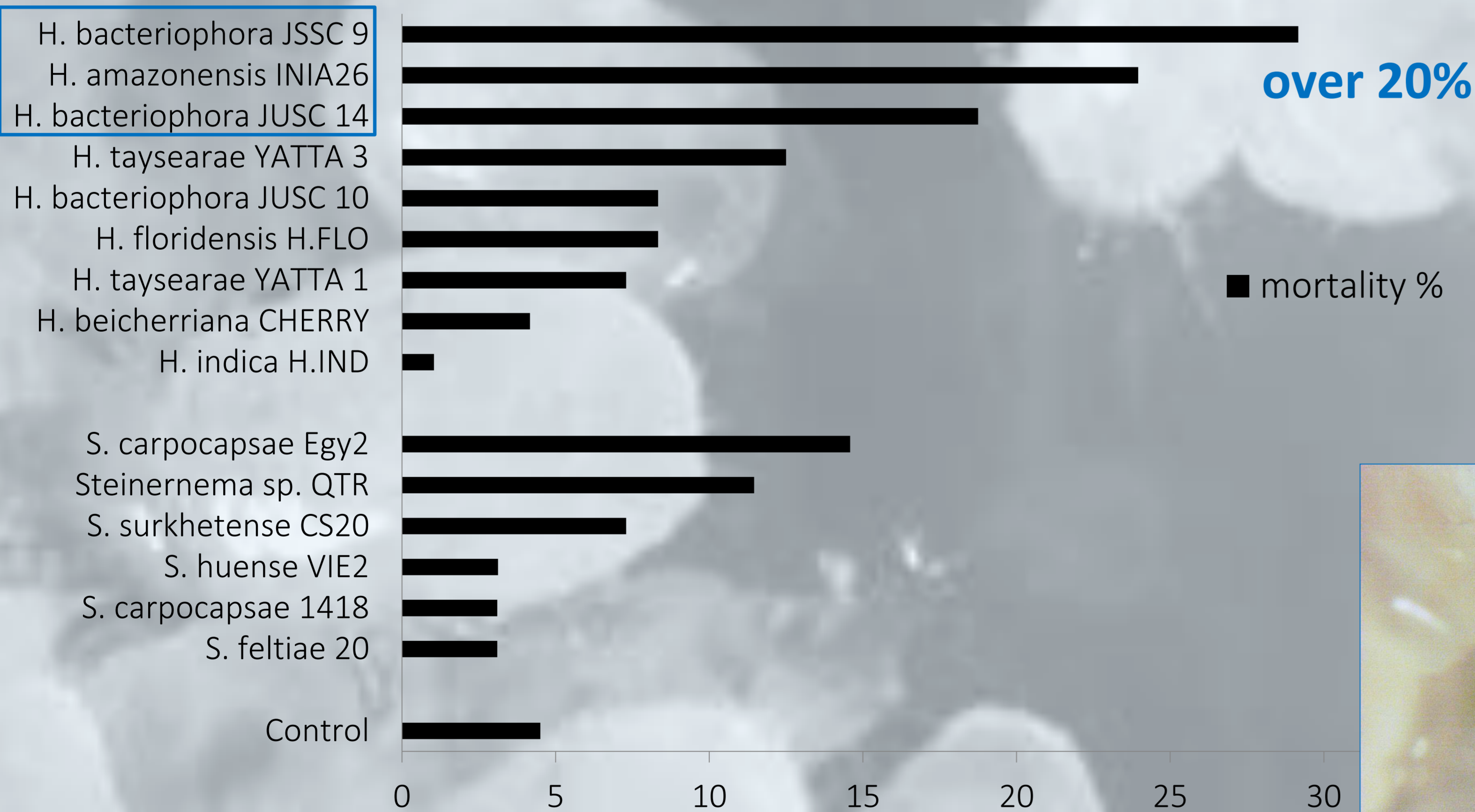
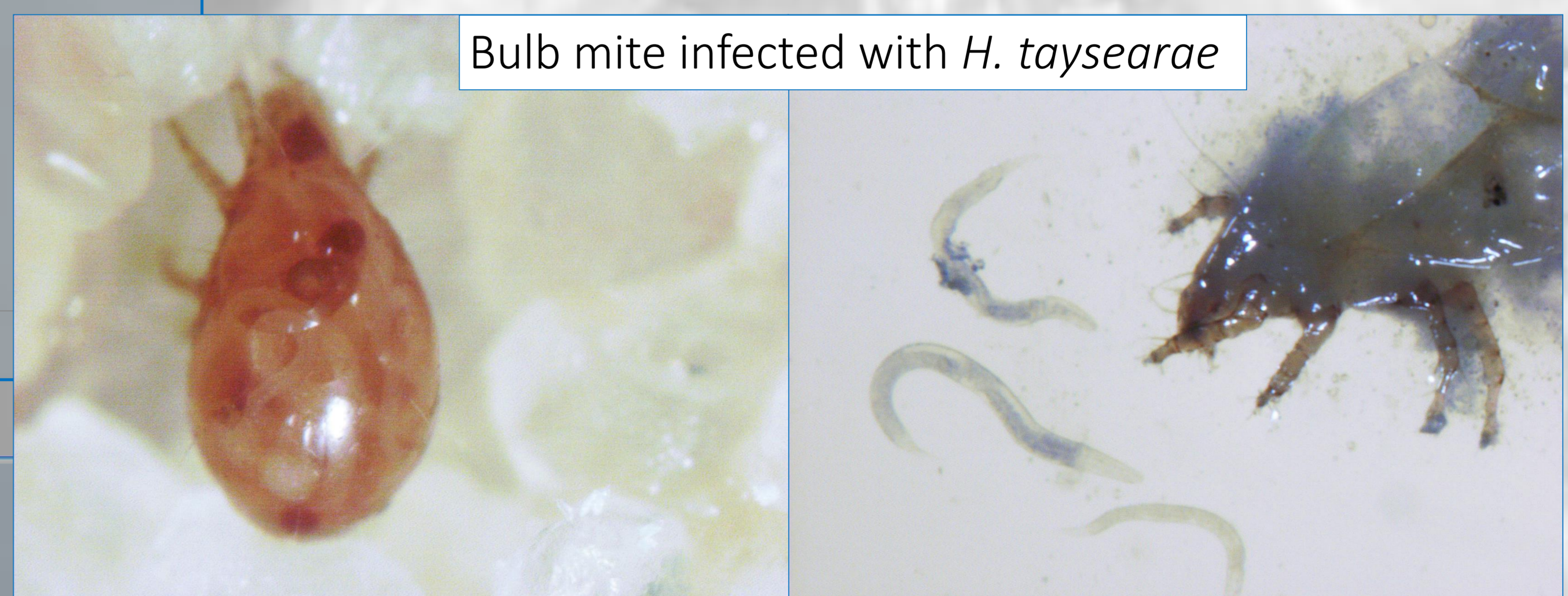


Table 1: Entomopathogenic nematodes tested against *Rhizoglyphus* mites and their origin

species	strain	origin
<i>S. carpocapsae</i>	1418	Czech Republic
<i>S. carpocapsae</i>	Egy2	Egypt
<i>S. feltiae</i>	20	Czech Republic
<i>S. huense</i>	VIE2	Vietnam
<i>S. surkhetense</i>	CS20	India
<i>Steinernema</i> sp.	QTR	Vietnam
<i>H. amazonensis</i>	INIA26	Venezuela
<i>H. bacteriophora</i>	JSSC 9	Kenya
<i>H. bacteriophora</i>	JUSC 10	Kenya
<i>H. bacteriophora</i>	JUSC 14	Kenya
<i>H. beicherriana</i>	CHERRY	China
<i>H. floridensis</i>	H.FLO	USA
<i>H. indica</i>	H.IND	China
<i>H. taysearae</i>	YATTA 1	Kenya
<i>H. taysearae</i>	YATTA 3	Kenya



Average load – 2.5 larvae per mite  
Highest load – 34 larvae (*H. bacteriophora* J-USC 14)  
*Heterorhabditis* species cause higher mortality



## Conclusions:

- Some entomopathogenic nematodes are able to kill *Rhizoglyphus* mites and develop to adults
- *Heterorhabditis* species are generally more virulent (some strains cause 20-30% mortality)

## Future prospects

- Testing more EPN strains and lower nematode doses
- Assessment of the EPN reproduction within mites