

Determination of desiccation and heat tolerance of several local Insect-pathogenic nematode strains in Palestine

**Naim Iraki, Basma Sandouka, and Amani Abu Sa'da**

UNESCO Biotechnology Educational and Training Center at Bethlehem University

P.O.Box 9, Bethlehem, Palestinian Authority.

E.mail: [niraki@bethlehem.edu](mailto:niraki@bethlehem.edu)

# Introduction

- The application of Entomopathogenic Nematodes (EPNs) as biocontrol agents in a certain region could be more successful if local strains are used.
- These strains are usually more tolerant to local abiotic stresses, such as heat, drought, salinity and others.
- In this work we report about the characterization of desiccation and heat tolerance for nine local strains and for reference strains isolated from different regions.

## **Materials and methods:**

- **Desiccation tolerance:**

Samples of about 5000 Daugher Juveniles (DJs) were incubated each in one ml of 25% glycerin in multi-well plate. Survival was recorded after 24, 48, and 72 hours.

- **Heat tolerance:**

Samples of about 5000 DJs in five ml Ringer solution were incubated in a 50 ml flask and maintained at 40°C under continuous shaking. Survival was determined after various periods of time.

- LT<sub>50</sub> values were calculated for each of the above stresses from the collected data.

---

***Steinernema spp.******Heterorhabditis spp.***

| Species/strain             | origin                 | Species/strain                 | Origin    |
|----------------------------|------------------------|--------------------------------|-----------|
| <b><i>S. abbasi</i></b>    |                        | <b><i>H. indica</i></b>        |           |
| PAL-S-08                   | Gaza                   | PAL-H-01                       | Bethlehem |
| PAL-S-09                   | Gaza                   | PAL-H-02                       | Bethlehem |
| Ref                        | Orman,<br>Persian Gulf | Ref                            | India     |
| <b><i>S. feltiae</i></b>   |                        | <b><i>H. bacteriophora</i></b> |           |
| PAL-S-03                   | Bethlehem              | PAL-H-05                       | Gaza      |
| Ref                        | Germany                | Ref                            | Europe    |
| <b><i>S. arenarium</i></b> |                        | <b><i>H. toyseanae</i></b>     |           |
| PAL-S-10                   | Gaza                   | PAL-H-06                       | Gaza      |
| Ref.                       | Russia                 | PAL-H-07                       | Gaza      |
|                            |                        | Ref                            | Egypt     |

---

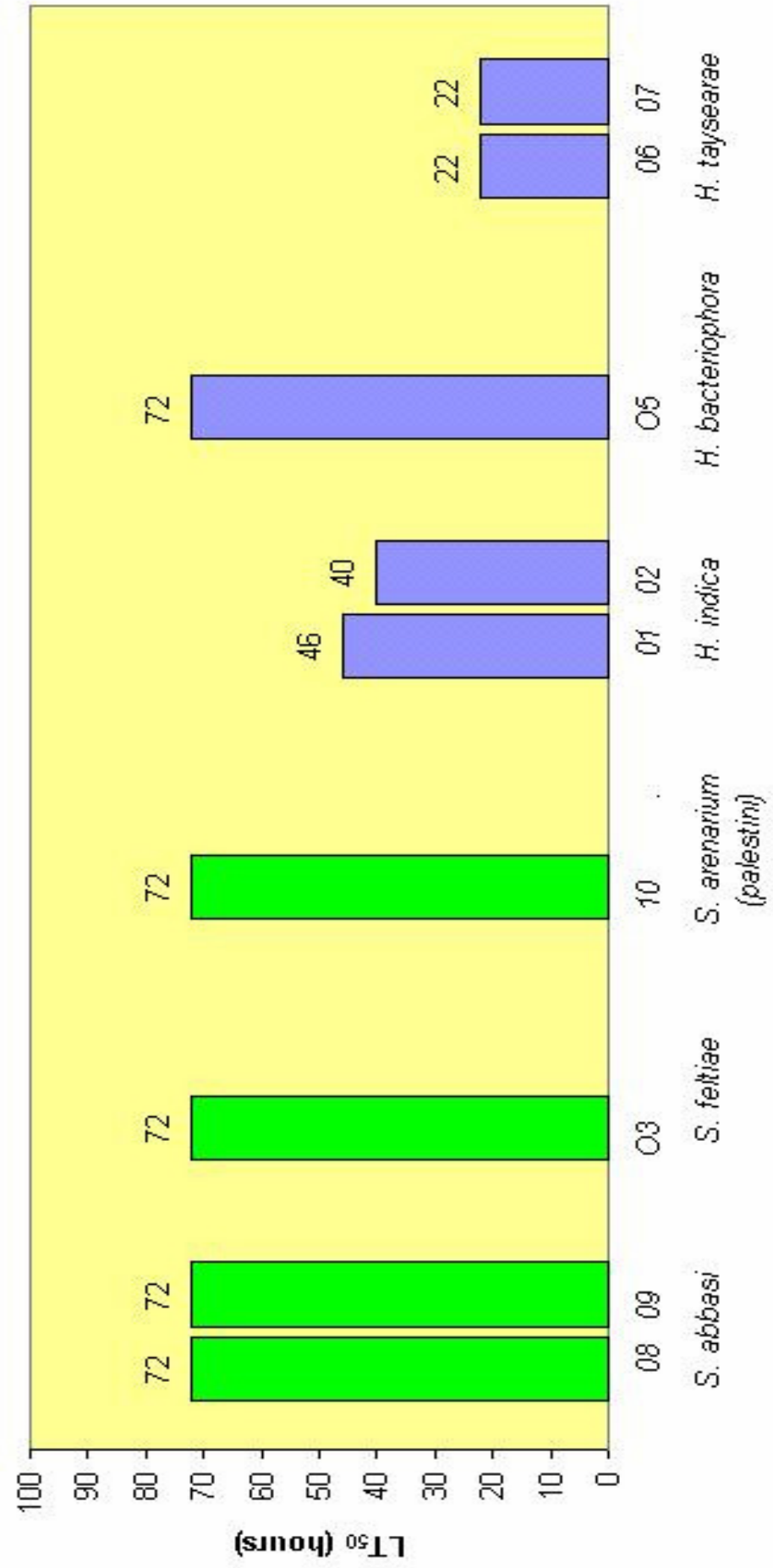




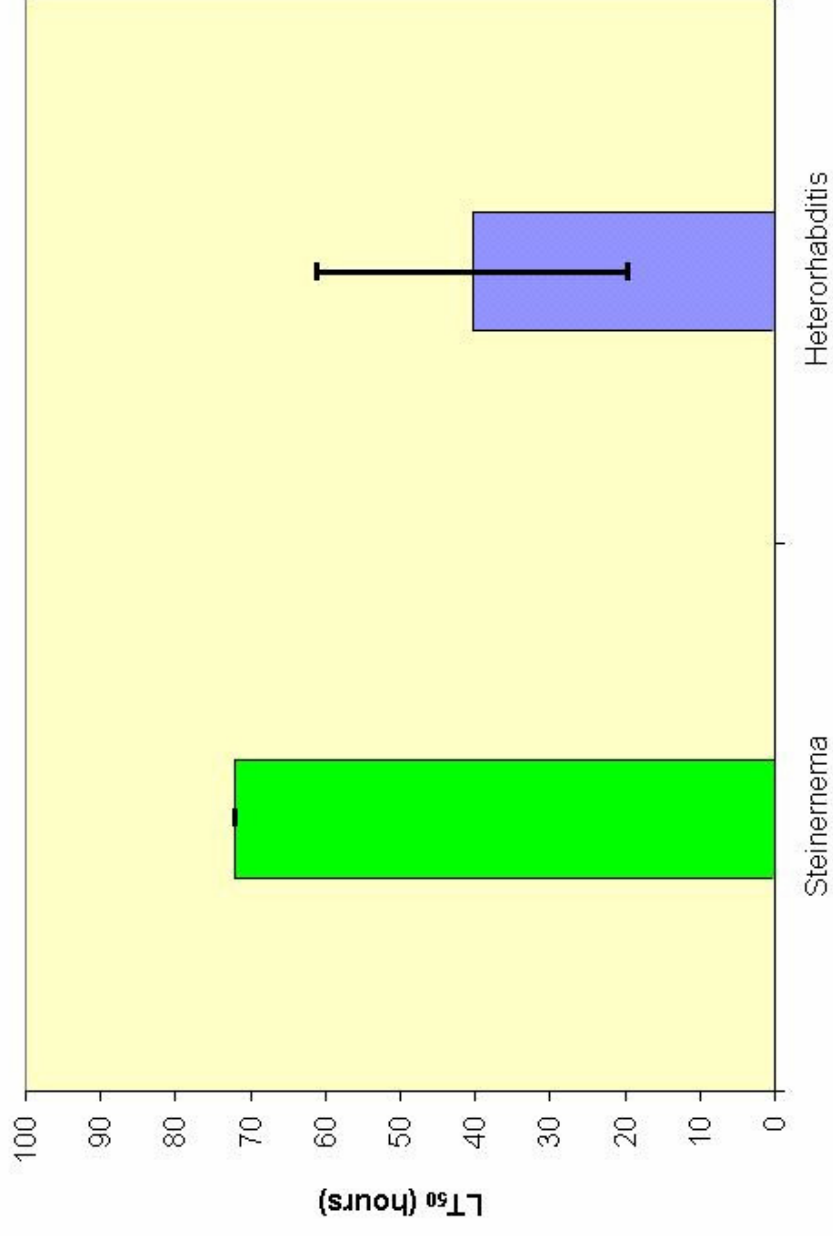
\*Israeli occupied with current status subject to the Israeli-Palestinian Interim Agreement – permanent status to be determined through further negotiation.

# Results

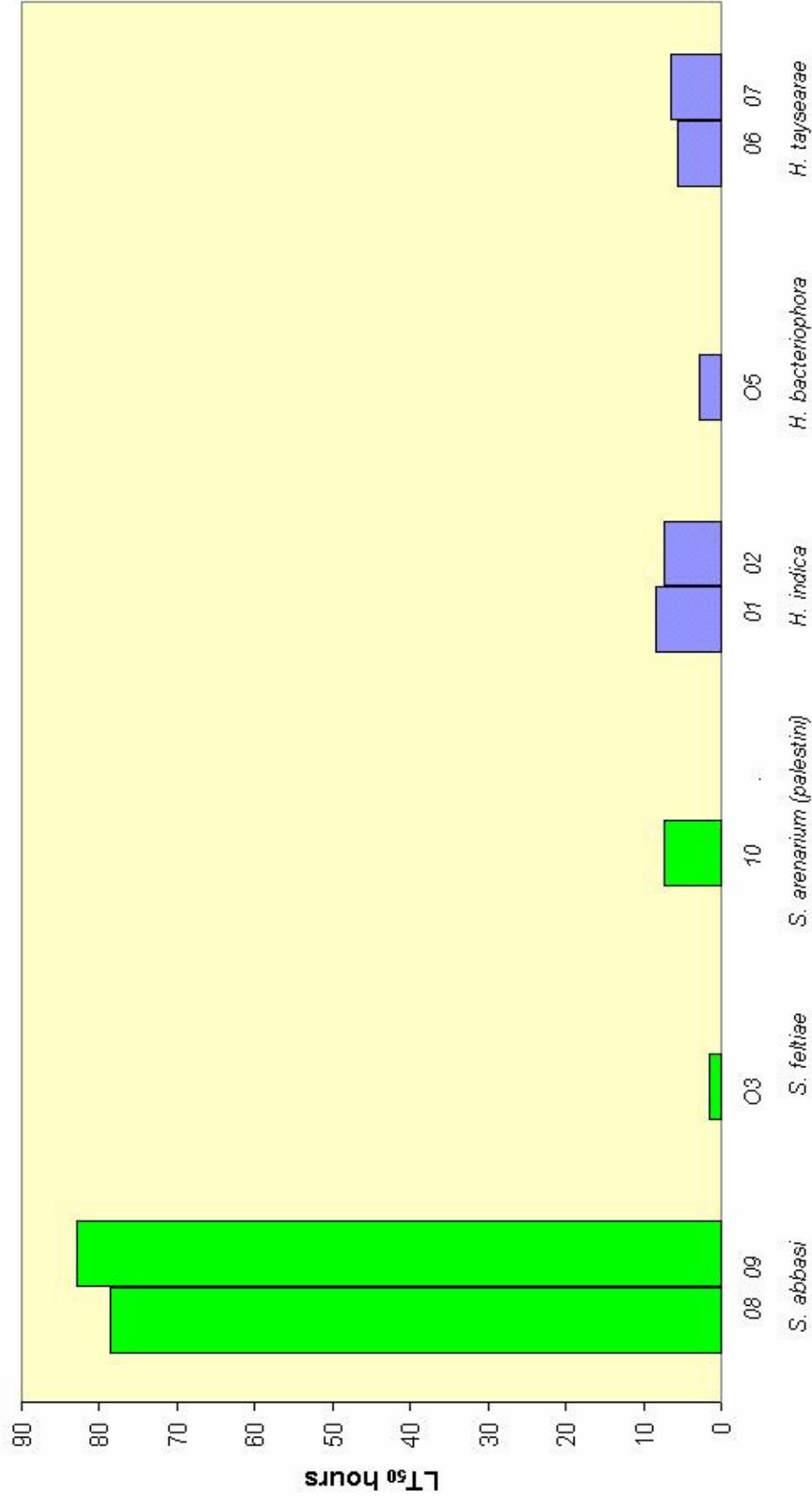
**Desiccation tolerance:  
LT<sub>50</sub> values of local Steinernema and Heterorhabditis strains**



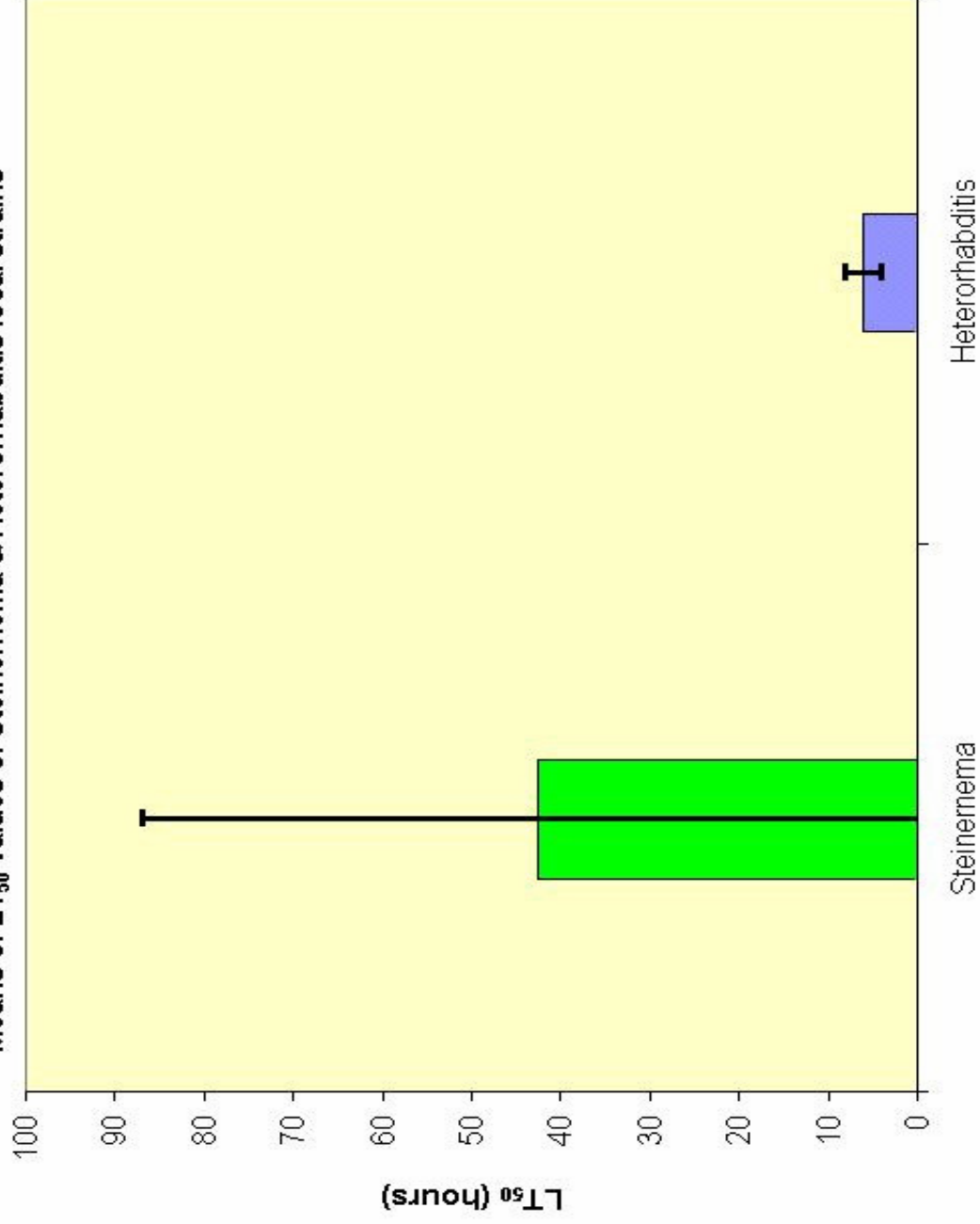
Comparison of desiccation tolerance:  
Means of  $LT_{50}$  values of four *Steinernema* and five *Heterorhabditis* local strains



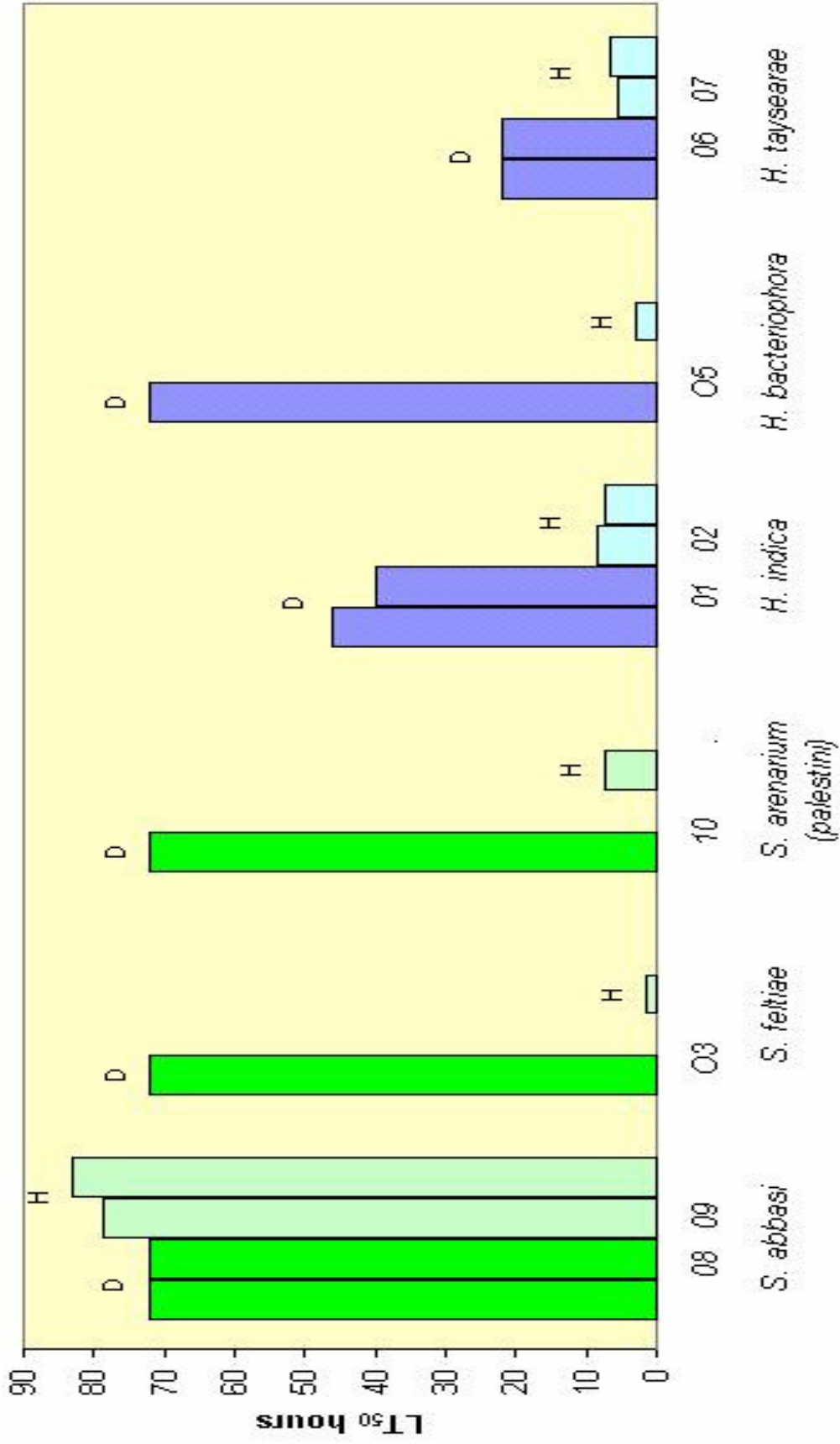
Heat tolerance:  
 LT<sub>50</sub> values (at 40°C) of local Steinernema and Heterorhabditis strains



Comparison of Heat tolerance:  
Means of  $LT_{50}$  values of Steinernema & Heterorhabditis local strains

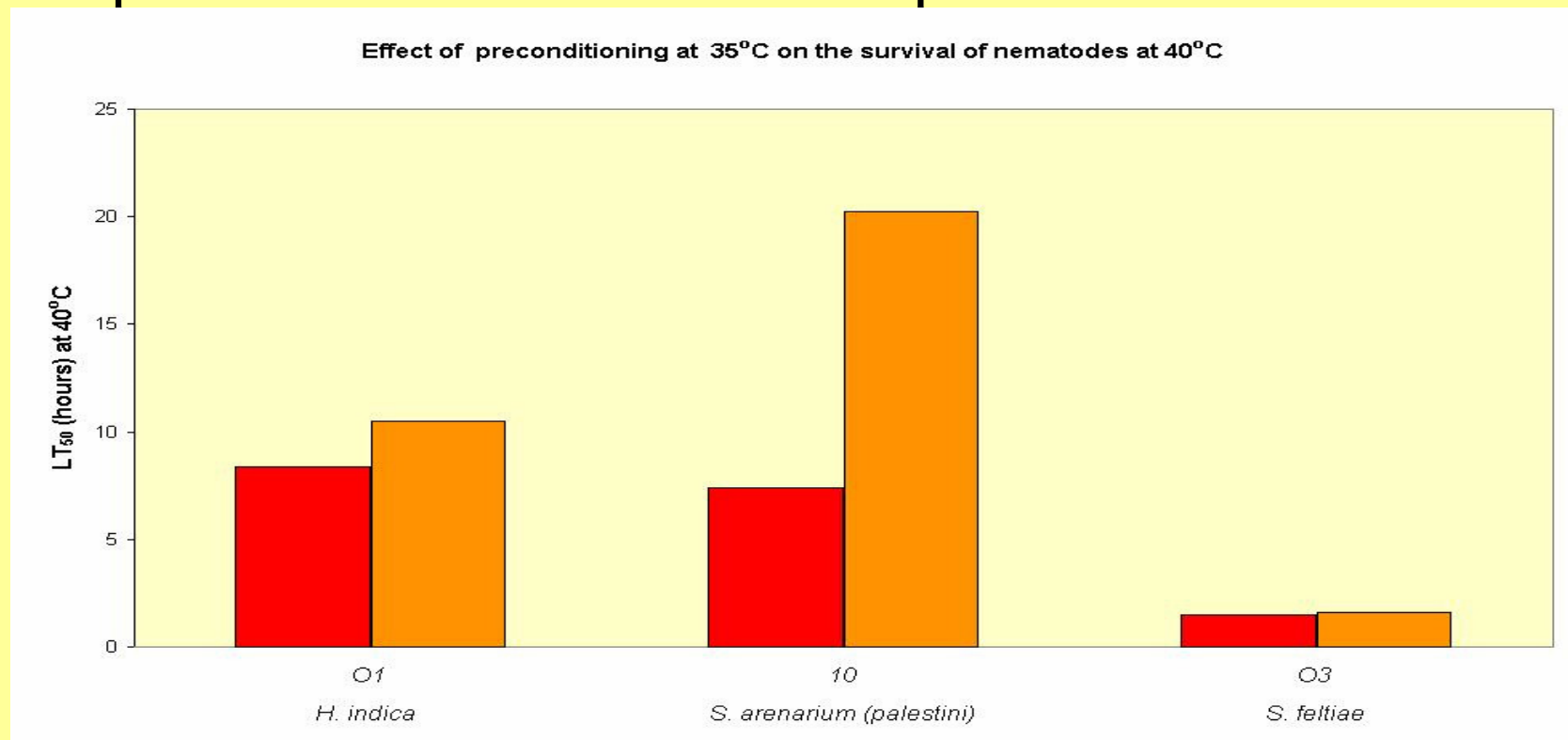


### Comparison of desiccation and heat tolerance among the various local strains



## Mechanisms of heat tolerance

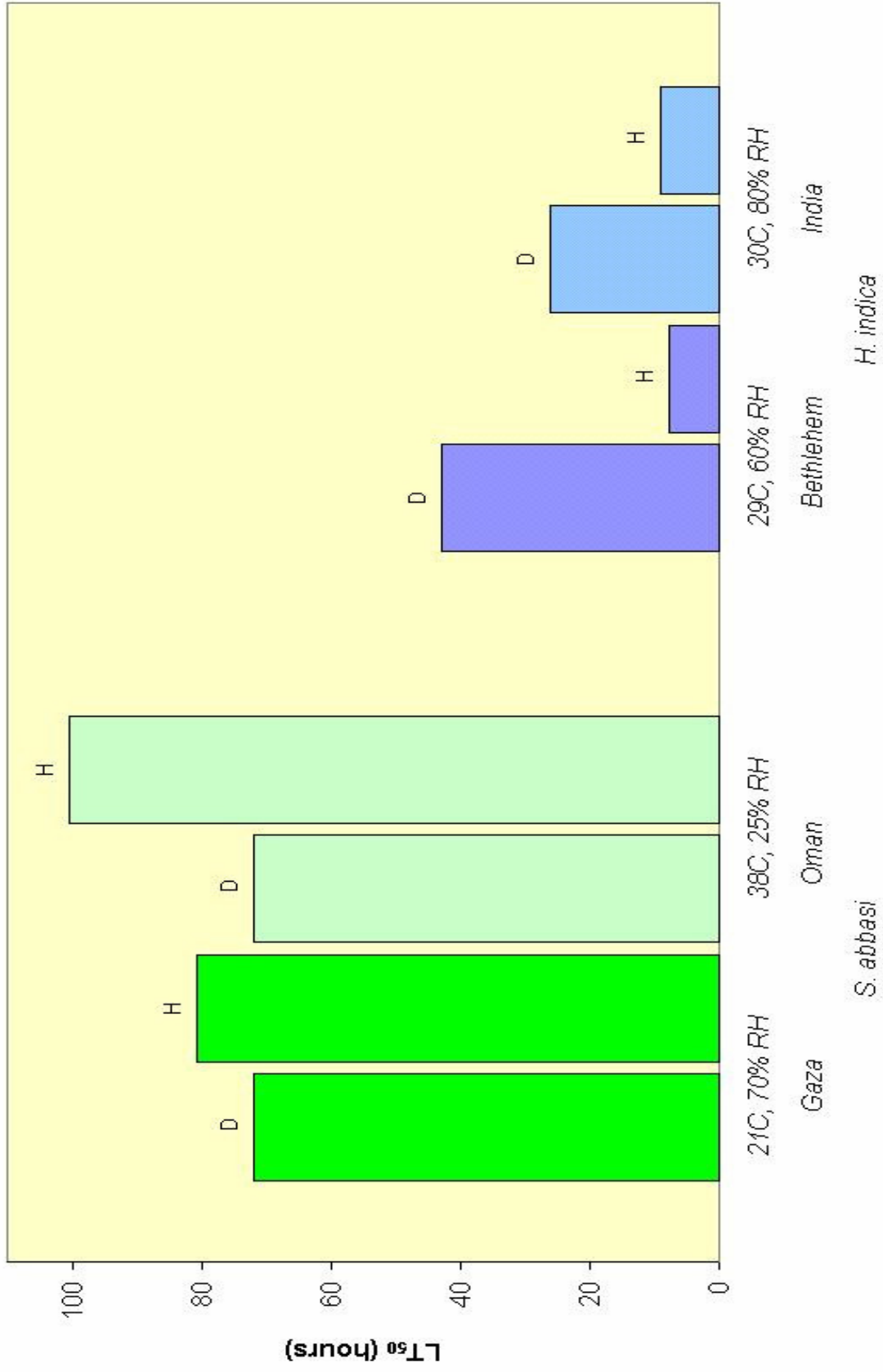
- It is well known that heat shock proteins are involved in heat tolerance.
- Also, the synthesis of these proteins is induced by a treatment at moderately high temperatures.
- Correlations between synthesis of these proteins and an improved heat tolerance was reported in the literature.



# Mechanisms of desiccation tolerance

- Trehalose has long been known to be involved in desiccation tolerance.
- Recently, the involvement of heat shock proteins was also reported in the literature.
- However, our data indicate that desiccation and heat tolerance are not maintained by the same mechanism, where some of the *Steinernema* strains showed high desiccation tolerance and a large sensitivity to heat.

Comparison of desiccation and heat tolerance of local strains with those of their reference strains



## Summary and conclusions

- The desiccation and heat tolerance determined in this work show a large variation among the strains.
- In general, *Steinernema* strains were more desiccation tolerant than the *Heterorhabditis* ones.
- Some of the *Steinernema* strains which exhibited a high desiccation tolerance were relatively heat sensitive. This finding indicates that the tolerance to these two stresses is not maintained by the same mechanism.
- Comparing the desiccation and heat tolerance of the local strains to those of the reference ones reveals phenotypic changes due to changes in environmental conditions.

**Thank you**