

Efficacy of *Steinernema carpocapsae*
against the cockroach *Periplaneta*
australasiae

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Periplaneta australasiae



Periplaneta americana



Pygnoscelus surinamensis (nymph)

Hiding places



Conditions

The cockroaches have been imported with plants and can find best conditions in greenhouses:

- Tropical and subtropical climate
 - all year -
- Food and hiding places
- No natural antagonists
- Less use of chemical products

Development



Maximum of 13 nymphal stages,
under good conditions about 5
stages

Nymphal development 6 - 12
month



Living time of the adults belongs to
6 month

Reproduction of 20 - 30 oothecae
with 26 eggs per egg capsule

Bait station

How does a bait station containing nematodes has to be constructed?

- A bait station must lure the cockroaches
- The nematodes have to infect the cockroaches
- The cockroaches have to leave the bait station

Lure

Experiments with different food in cages

pieces of

a) bread, rusks, rolled oats

b) apples, bananas, tangerines, sweets

c) fish food, vitamin powder, bananas

d) rusk, dry dog food, coffee, bananas



Experiments with different food in the main tropical greenhouse

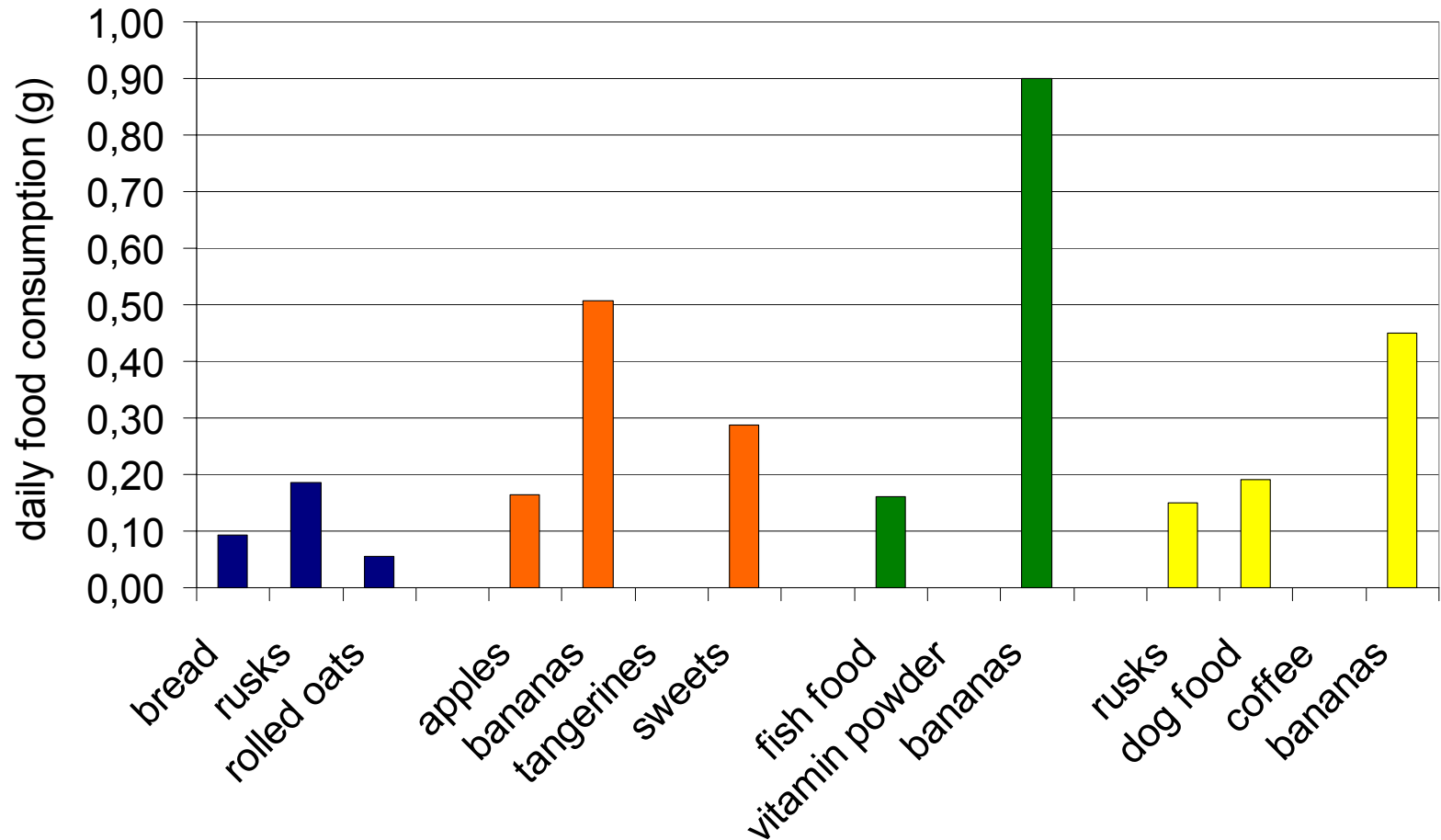
- banana, coffee, commercial pheromone tablet and bait tablet
+ control



Lure

Experiments with different food in cages

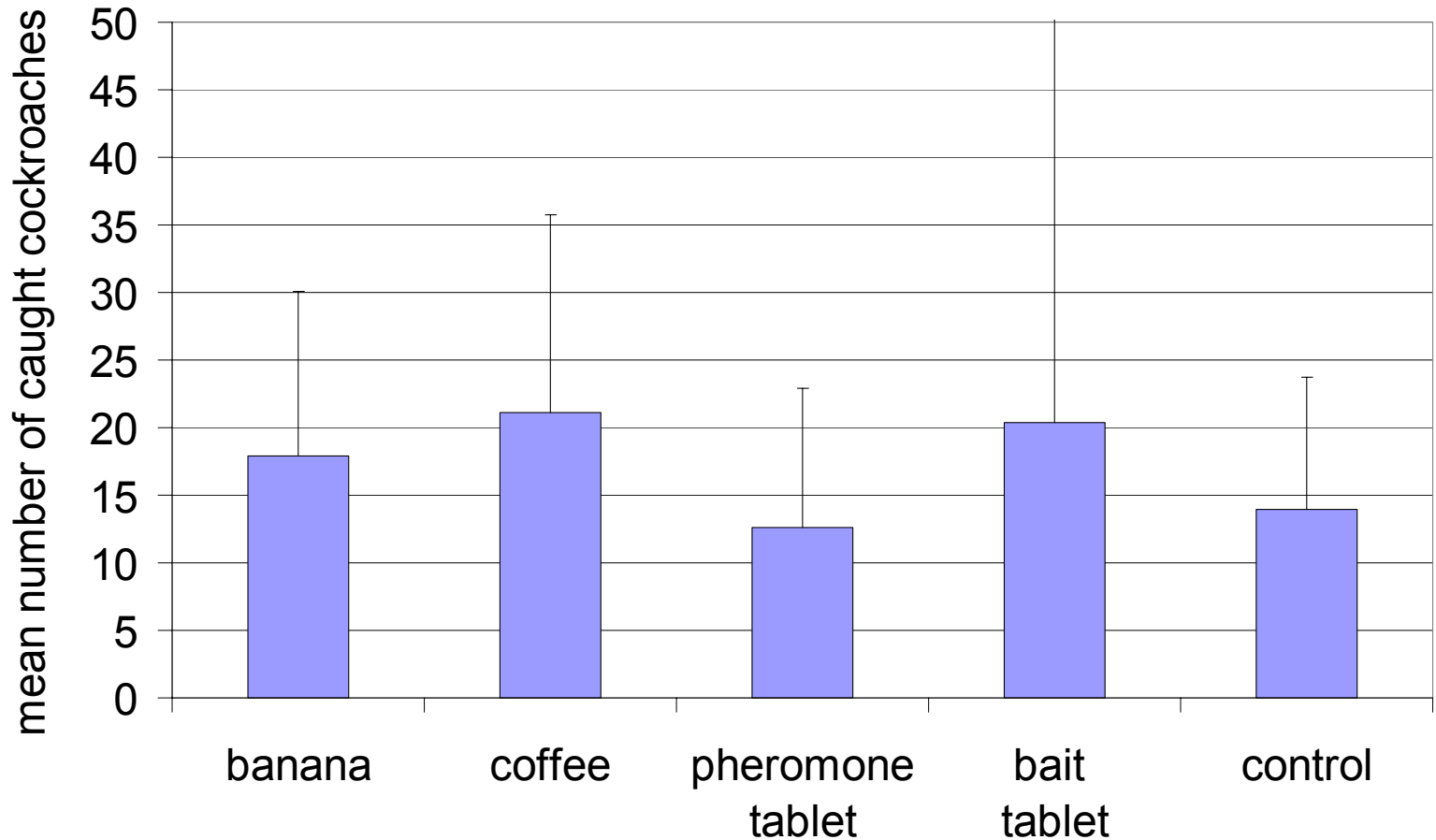
(30 cockroaches per replicate - 5 replicates)



Lure

Experiments with different food in the main tropical greenhouse

(20 replicates for each bait)



Form

	station	nematodes
1.	dish	bottom, top
2.	labyrinth 1	bottom, top
3.	labyrinth 2	side, top
4.	tube	all over



dish



labyrinth 1



labyrinth 2



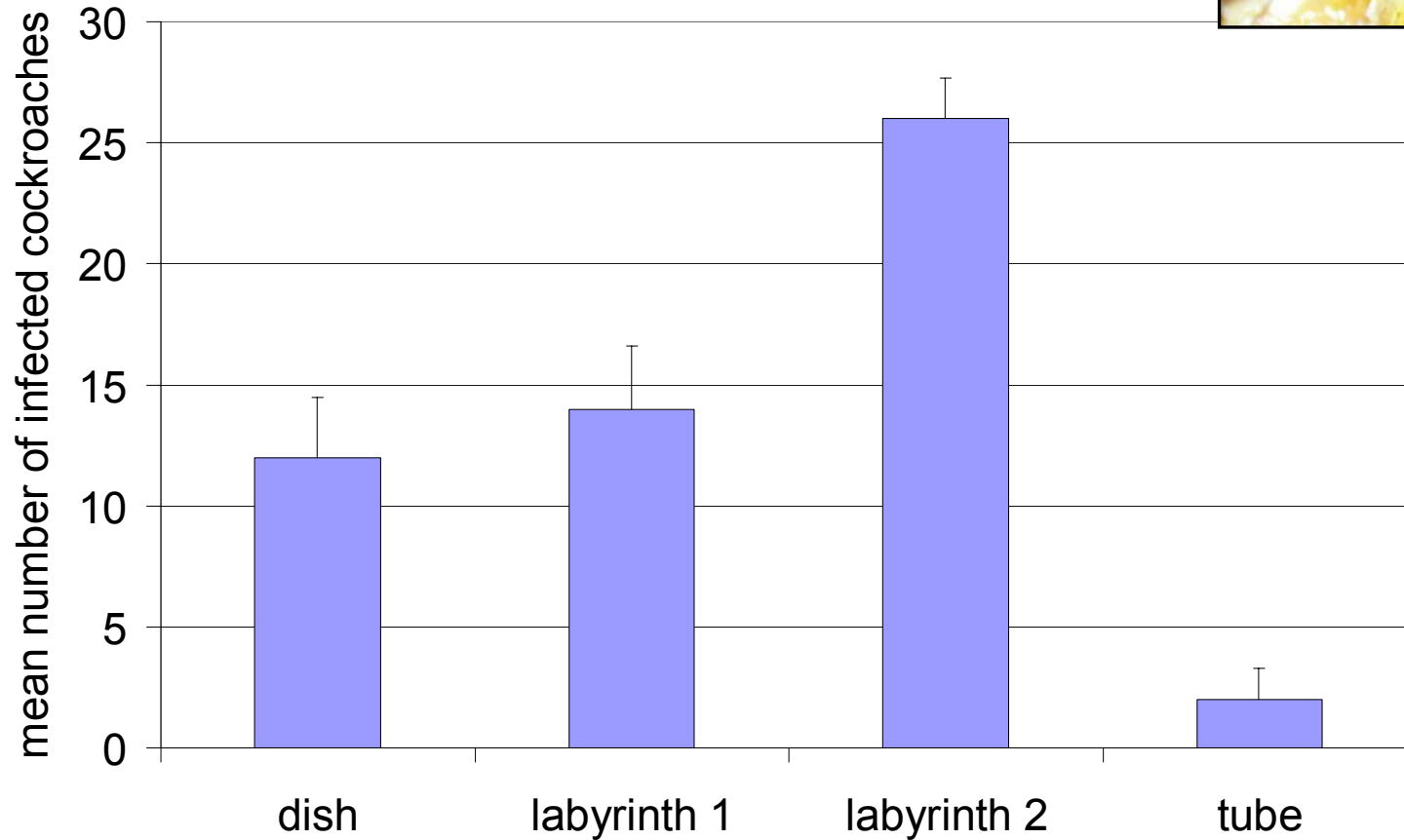
tube

Form

(30 cockroaches per replicate - 5 replicates)



nematodes



Duration of infection

Cockroaches were added to nematodes for

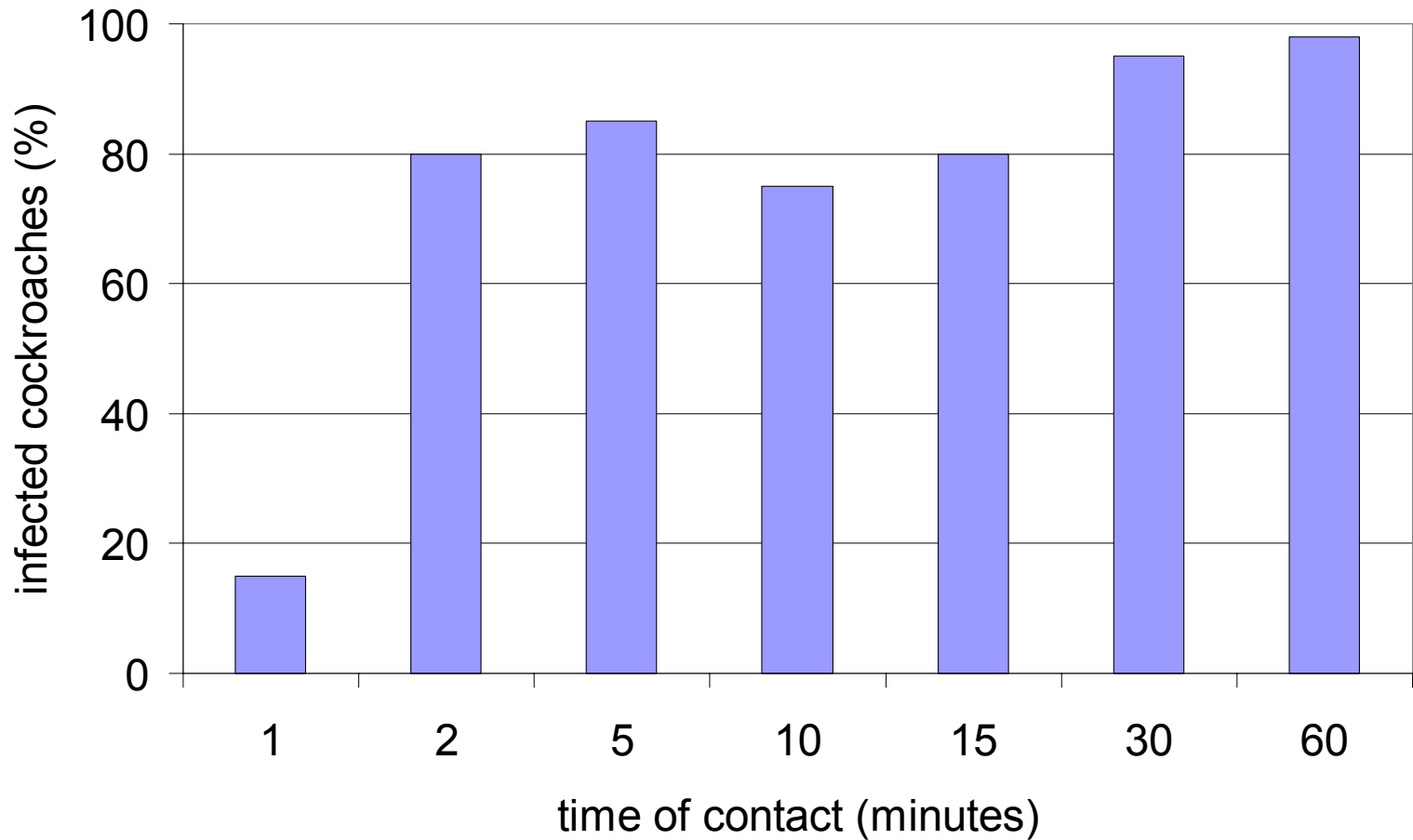
1
2
5
10
15
30
60 minutes



and after it they were isolated.

Duration of infection

(40 cockroaches for each treatment)



Number of nematodes on the cockroach's body

Cockroaches were confined in nematodes for
10 minutes.

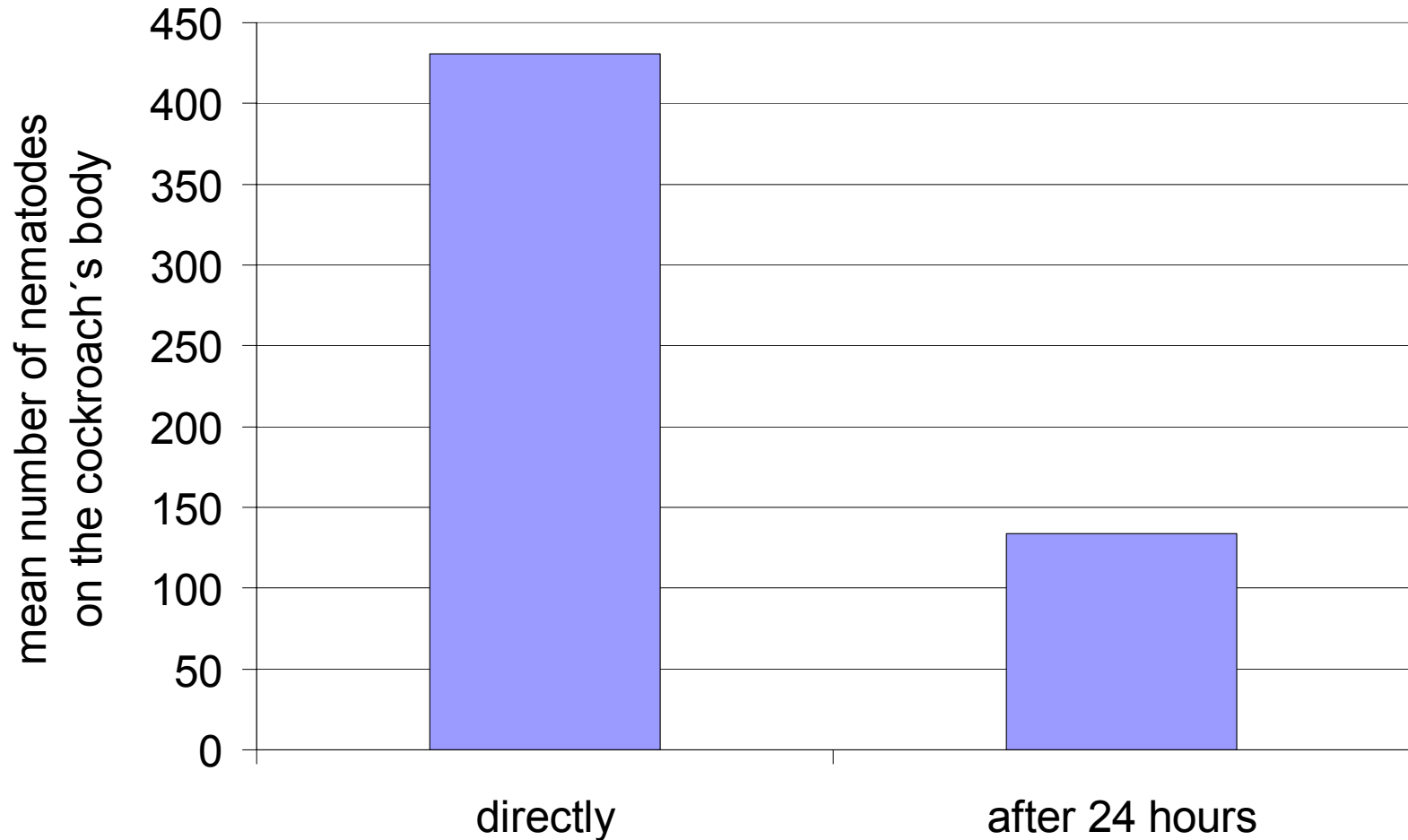
After it they were killed and rinsed with water

a) directly

b) 24 hours later (so they had time to clean themselves)

Number of nematodes on the cockroach's body

(20 cockroaches for each treatment)



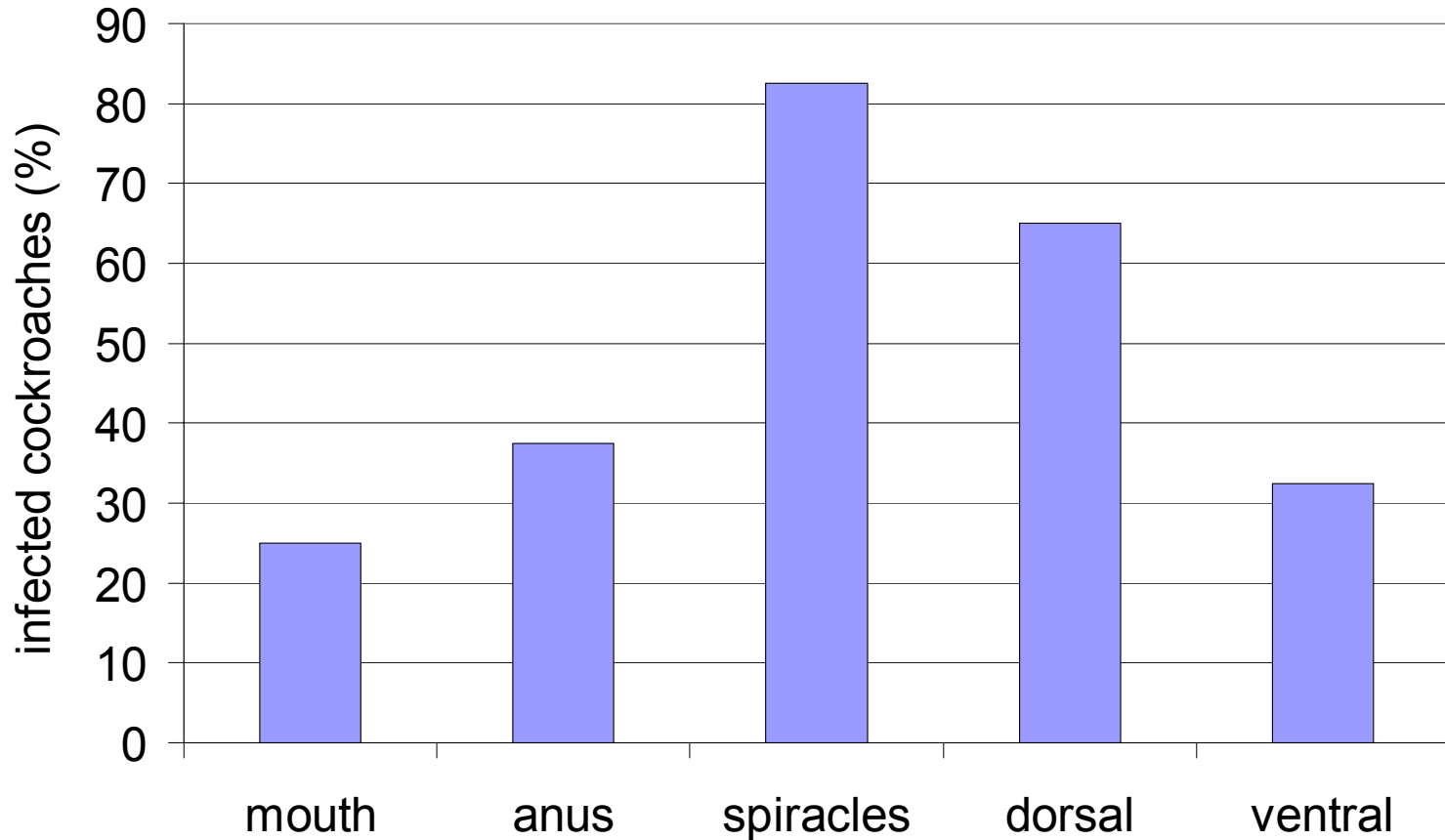
Possibilities to enter the host

Nematodes were added to different places on the cockroach's body

1. mouth
2. anus
3. spiracles
4. dorsal
5. ventral

Possibilities to enter the host

(40 cockroaches for each treatment)



Treatments in greenhouses

1. experiment

a) bait stations

b) watering can

+ control



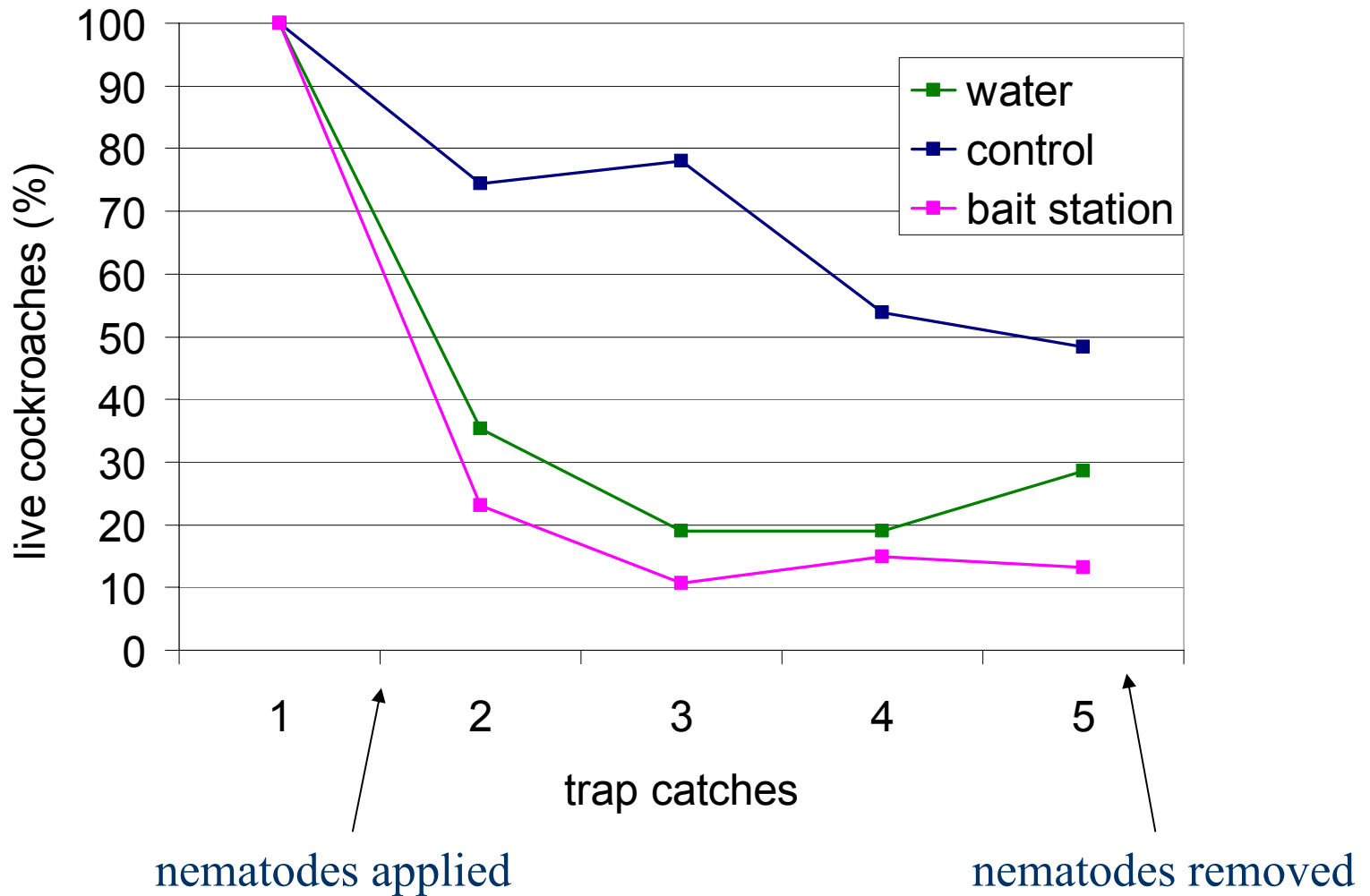
2. experiment

a) bait stations

+ control

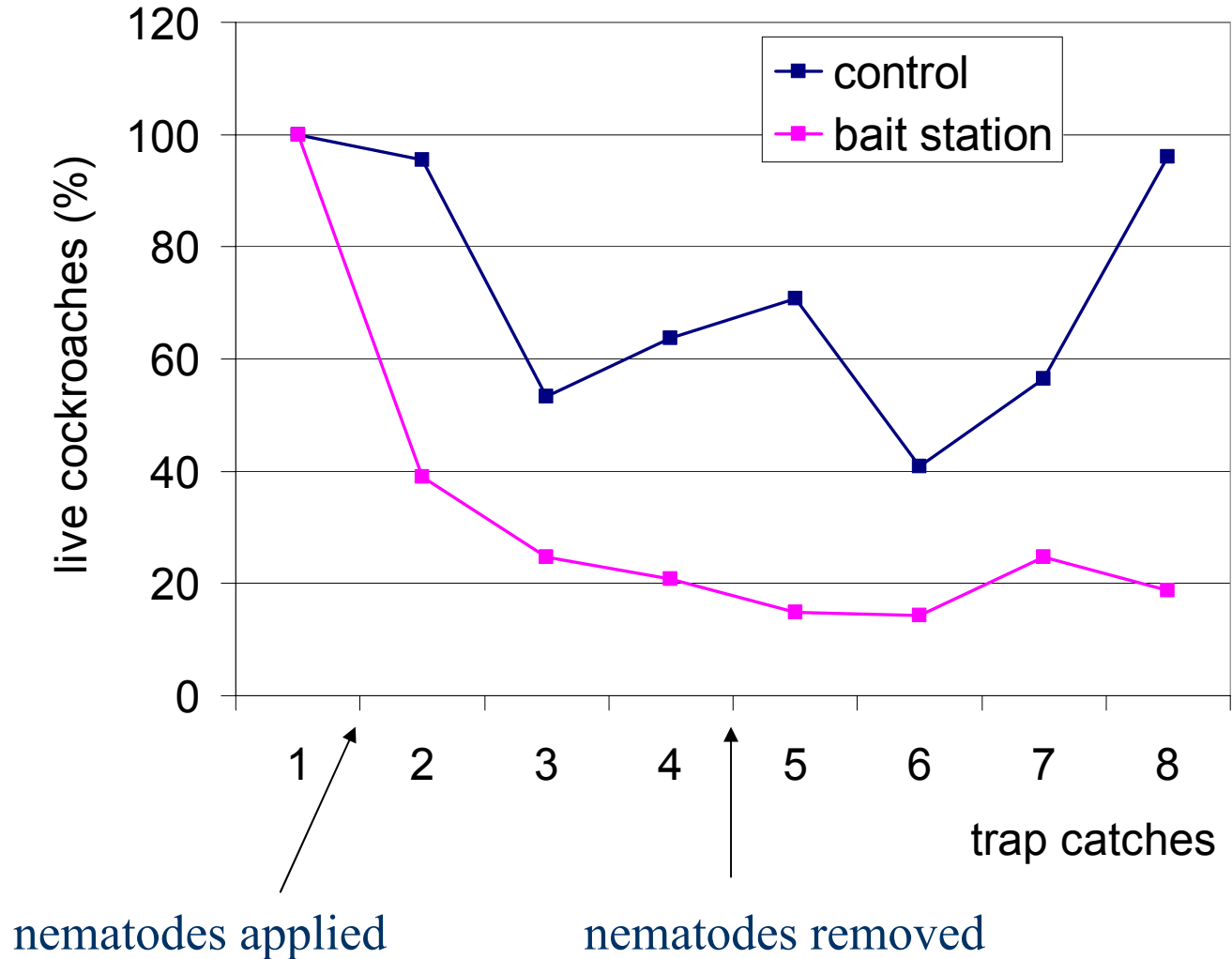
Treatments in greenhouses

1. experiment



Treatments in greenhouses

2. experiment



Summary

- *S. carpocapsae* is able to infect and to kill cockroaches.
- The nematodes were found in high numbers on the cockroach's bodies.
- Banana was the preferred food. To lure the cockroaches banana and coffee were as good as commercial products.
- Contact with nematodes for two minutes is sufficient that 80 % of the cockroaches died.
- We suppose that the nematodes have to enter the host through the spiracles.
- With a bait station, where the nematodes infect the cockroaches from the side and from above, a mortality of 85 % was reached.
- Tests in greenhouses confirm the efficacy of *S. carpocapsae*.