Systemic effects of Neem on Western Flower Thrips

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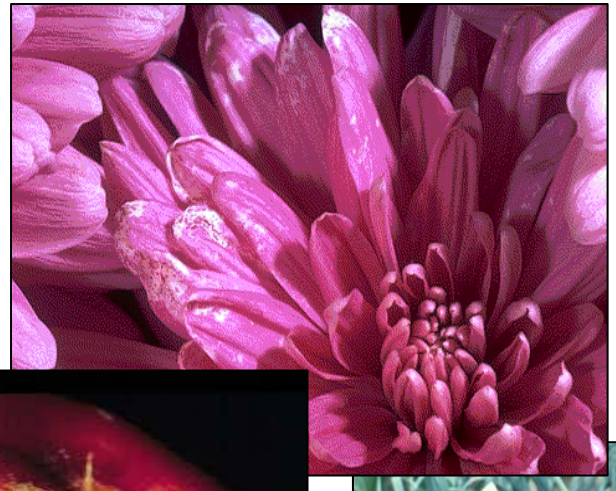
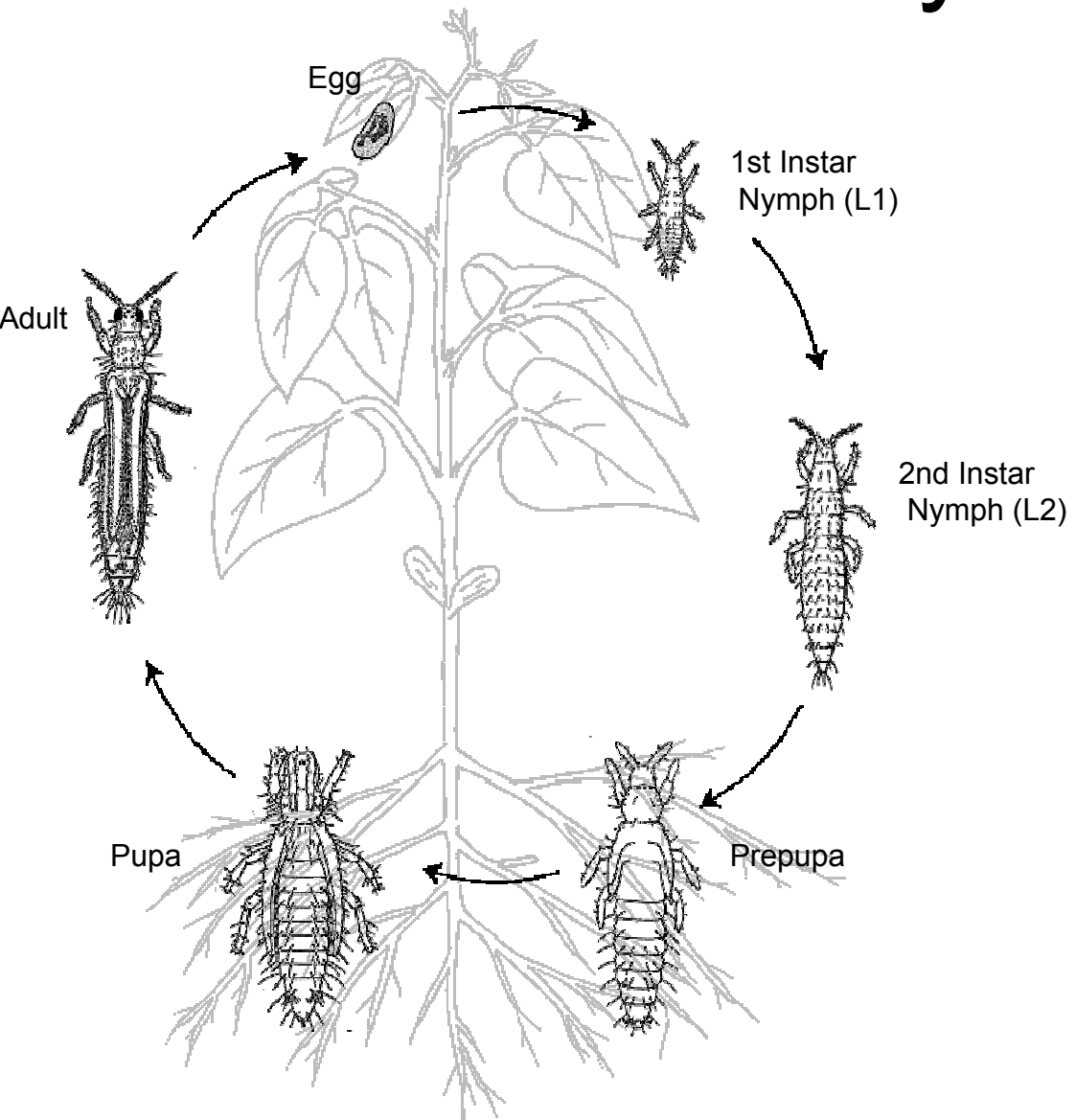
Western Flower Thrips, *Frankliniella occidentalis*



Life Cycle



- Eggs laid on the foliage, leaf axils, buds & flowers
- 1st and 2nd instars suck on plants
- Late 2nd instar move to the ground
- Prepupae & pupae develop in the soil

Control of Western Flower Thrips
A: Use of Insecticides

Chemical control of WFT is difficult because of:

- Cryptic feeding behaviour
- High mobility
- Soil-dwelling life stages
- Short generation time
- High fertility

Thrips
A: Use of Insecticides → Consequences

- Only few efficient insecticides available
- Frequent insecticide applications are required
- Hence development of resistant populations
- Risk to non-target effects

Control of Western Flower Thrips

B: Biological Control 1

- Natural enemies of foliage-feeding life stages
  - Predatory mites e.g. *Amblyseius* spp.
  - Predatory bugs e.g. *Orius* spp.

→ No satisfactory control

Control of Western Flower Thrips

B: Biological Control 2

- Control of soil-dwelling life stages
  - Predatory mites e.g. *Hypoaspis* spp.
  - Entomopathogenic nematodes

→ Still in an experimental stage

Control of Western Flower Thrips
Novel Control Approach

Soil applications of Neem:

– Systemic effects on plant-dwelling life stages

– Contact effects on soil-dwelling life stages

– Minimal effects on non-target organisms

Neem

- Insecticidal active ingredient from seeds of the neem tree
- Efficient as growth regulator, insect repellent, antifeedant
- Ecologically acceptable
- Low risks to humans & non-target organisms
- Inferior problems with resistance

Western Flower Thrips and Neem Current Situation

Thrips are target pests of topical Neem applications

But:

- Frequent applications required for efficient control because of short persistence of Neem and high re-colonisation pressure from non-treated sources
- Negative effects of Neem on thrips predators have been reported

No data available on efficacy of soil application and systemic effects of Neem against thrips

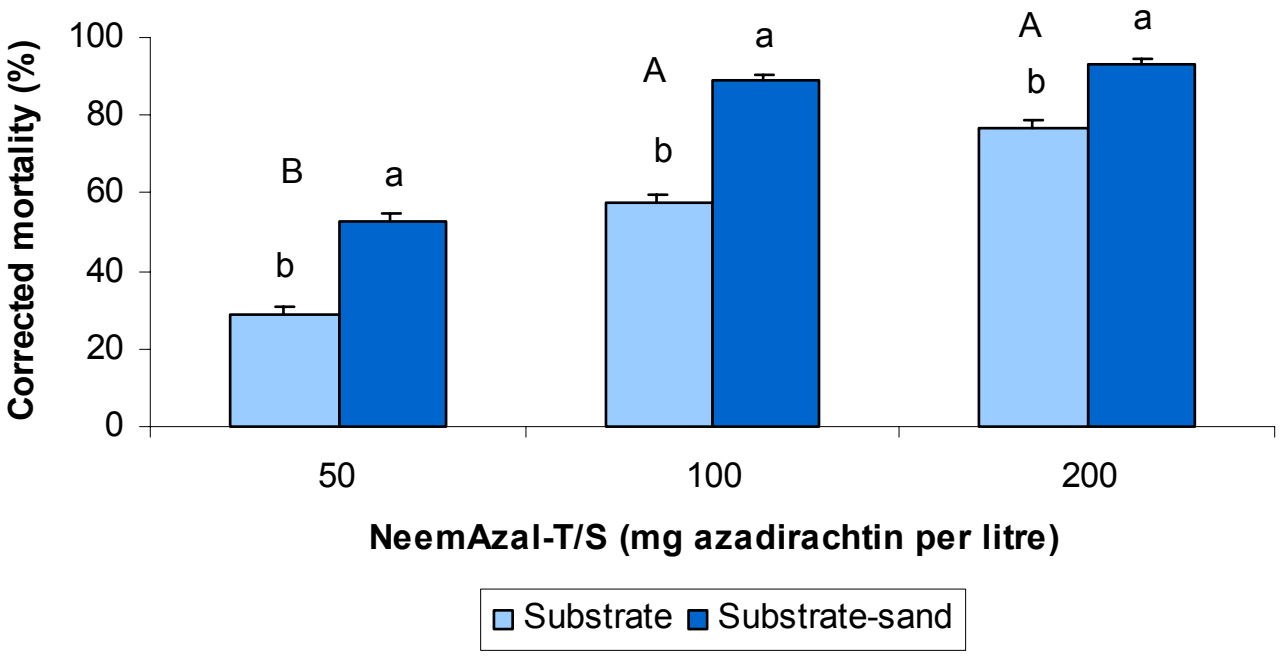
Materials and Methods 1

- Model plant (*Phaseolus vulgaris*)
- Substrates with different amount of organic matter (OM)
- Acrylglas cylinders
- NeemAzal-T/S™ soil application
- Uniform-aged 1st instar of WFT
- Microcosms for 8 d in climate chamber

Materials and Methods 2

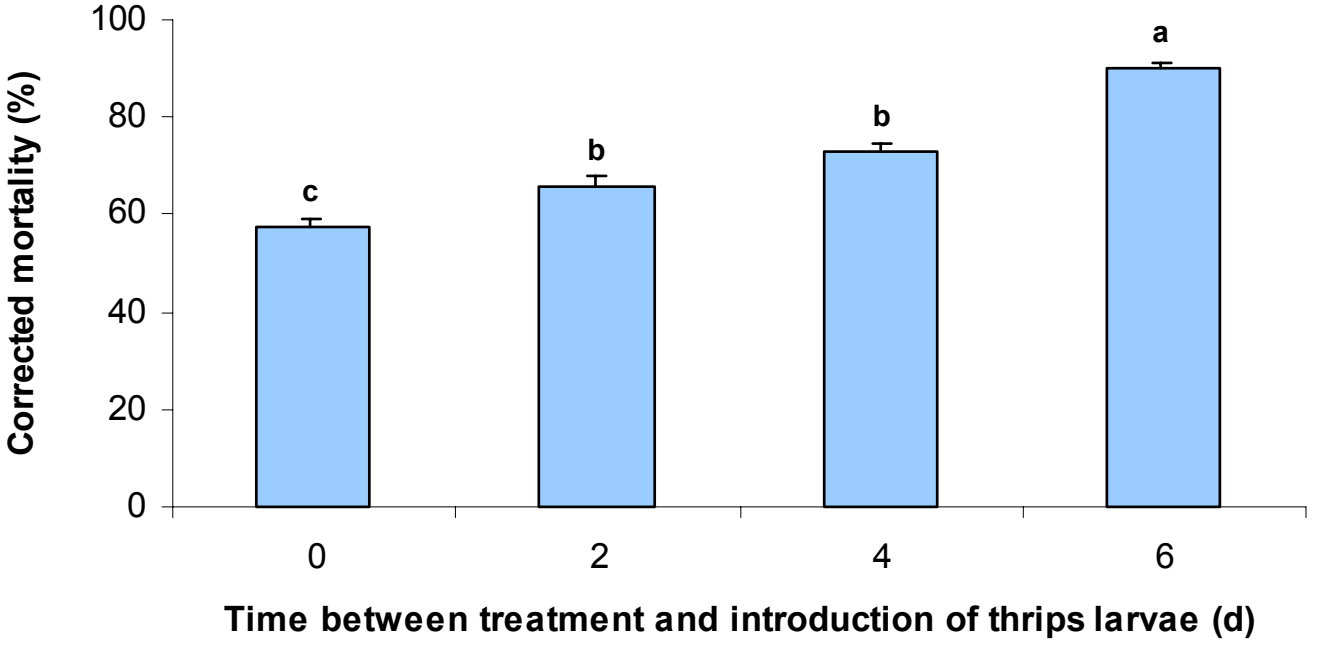
- Plants were cut off
- Pots were covered with photo-ecclectors for 12 d in climate chamber
- Calculation of corrected mortality (Abbott, 1925)

Results: Substrate effect



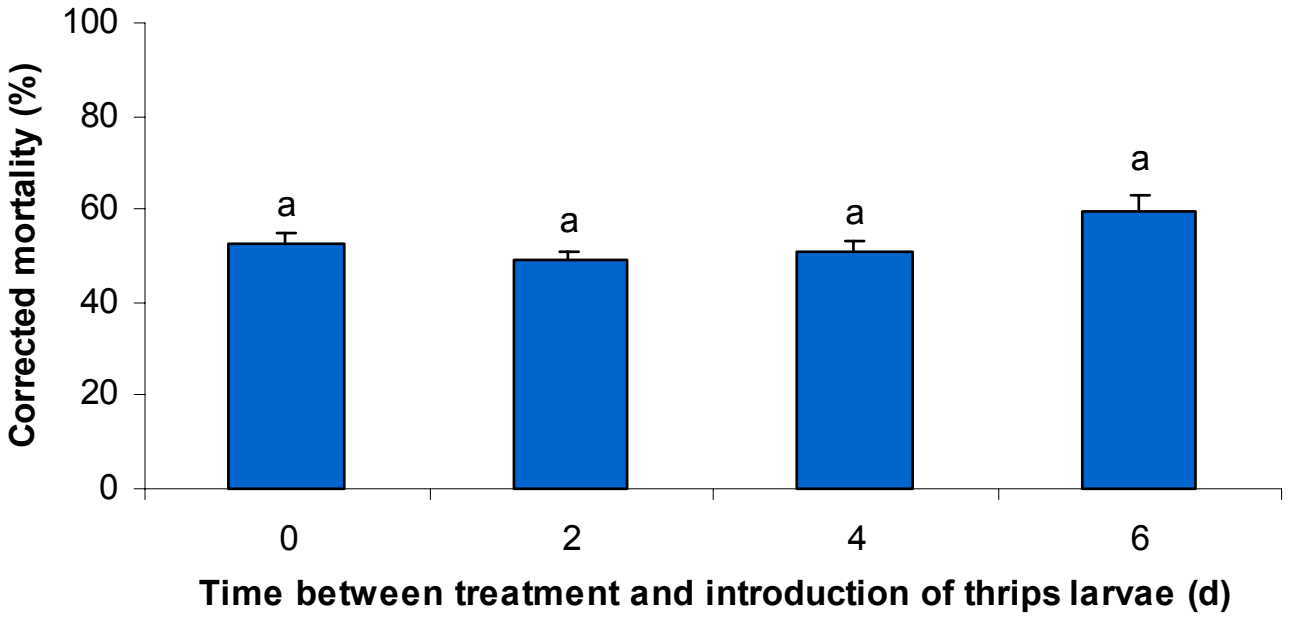
- Higher CM in substrate-sand mixture than in pure substrate
- Increasing AZA rates lead to higher mortality in Thrips

Results: Persistence effect → Pure substrate



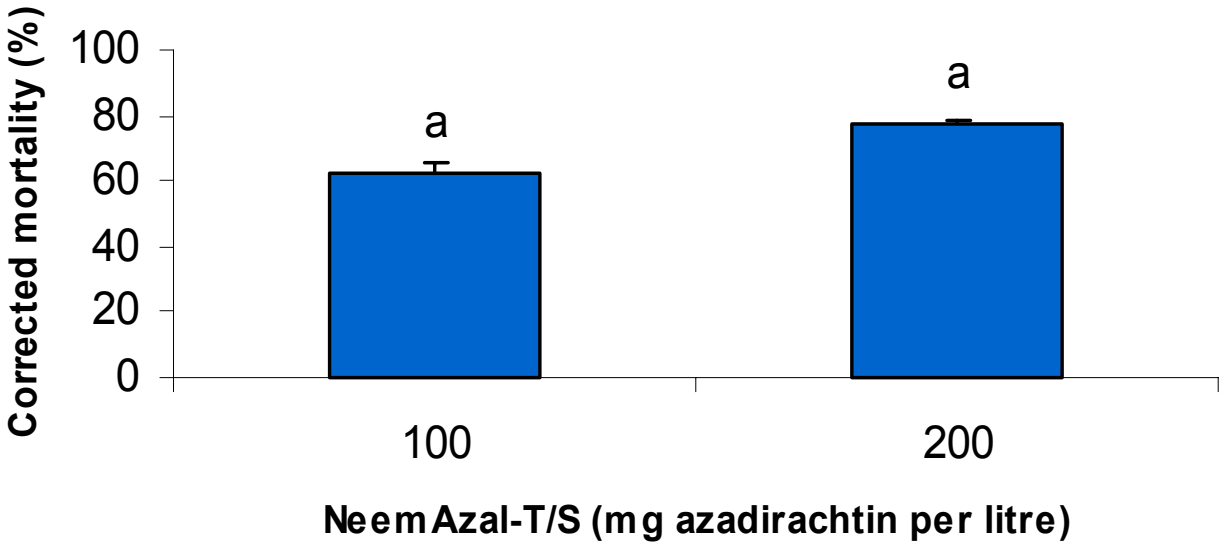
- Mortality increased with time after soil application
- Highest mortality with 90.1% was recorded in 6-d-treatment

Results: Persistence effect → Substrate-sand mixture



- No time effect
- Mortality ranging between 52.4% (0 d) and 59.4% (6 d)

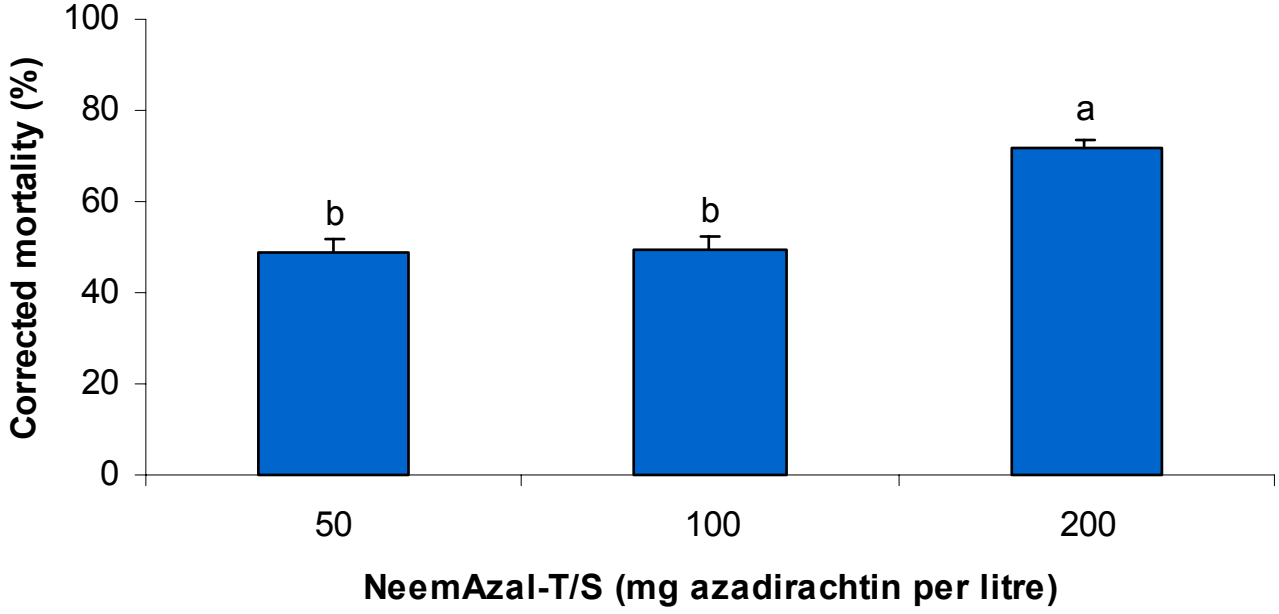
Results: Pre-germination effect



- High mortality of WFT on plants that had been pre-germinated as seeds in Neem

Results: Effects on soil-dwelling stages

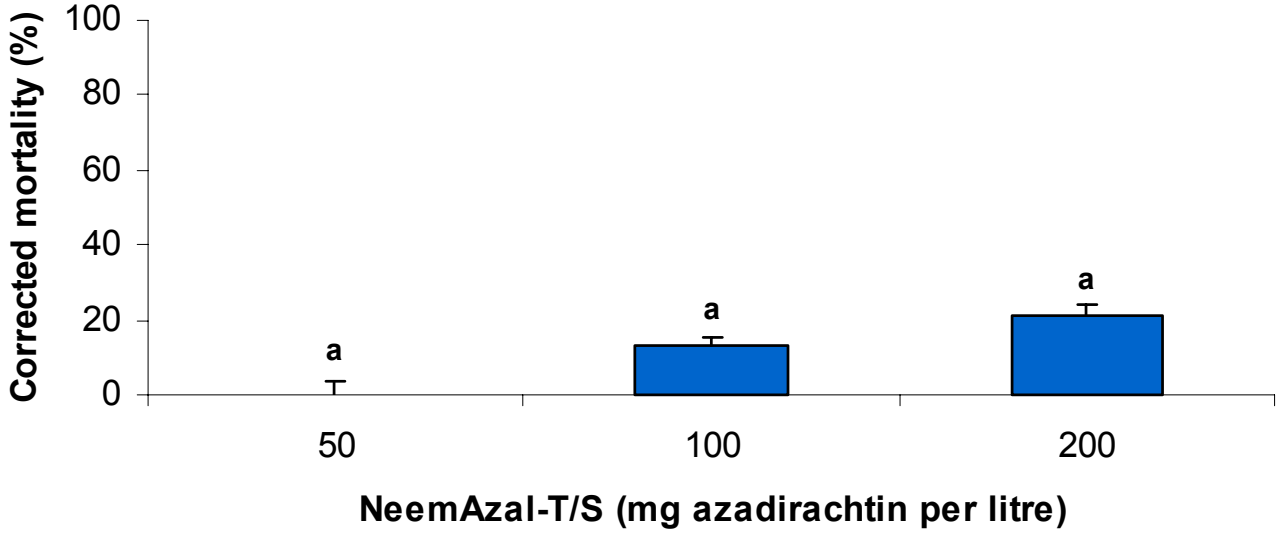
→ Thrips stages in the soil



- Strong contact effects of Neem on soil-dwelling life stages of WFT

Results: Effects on soil dwelling stages

→ Thrips stages move to the soil



- Low mortality
- Higher proportion of WFT in Neem treatment pupated on the plant (50-57%) compared to the untreated control (2.6%)

Discussion 1

- Higher mortality on organic-poor substrate

→Efficacy strongly influenced by OM amount in substrate

→OM absorbs AZA, which reduces efficacy of Neem soil applications

- In organic-rich substrate mortality increases with time

→Suggesting rapid binding of AZA to OM, but continuous slow release and subsequent uptake

- No time effect on organic-poor substrate

→Lower organic content reduced the AZA absorption or higher leaching led to lower AZA retention

Discussion 2

- Pre-germinating bean seeds in Neem caused high thrips mortality

→Active component of Neem translocated from seeds to plant parts feed upon by WFT

- High mortality in soil-dwelling life stages

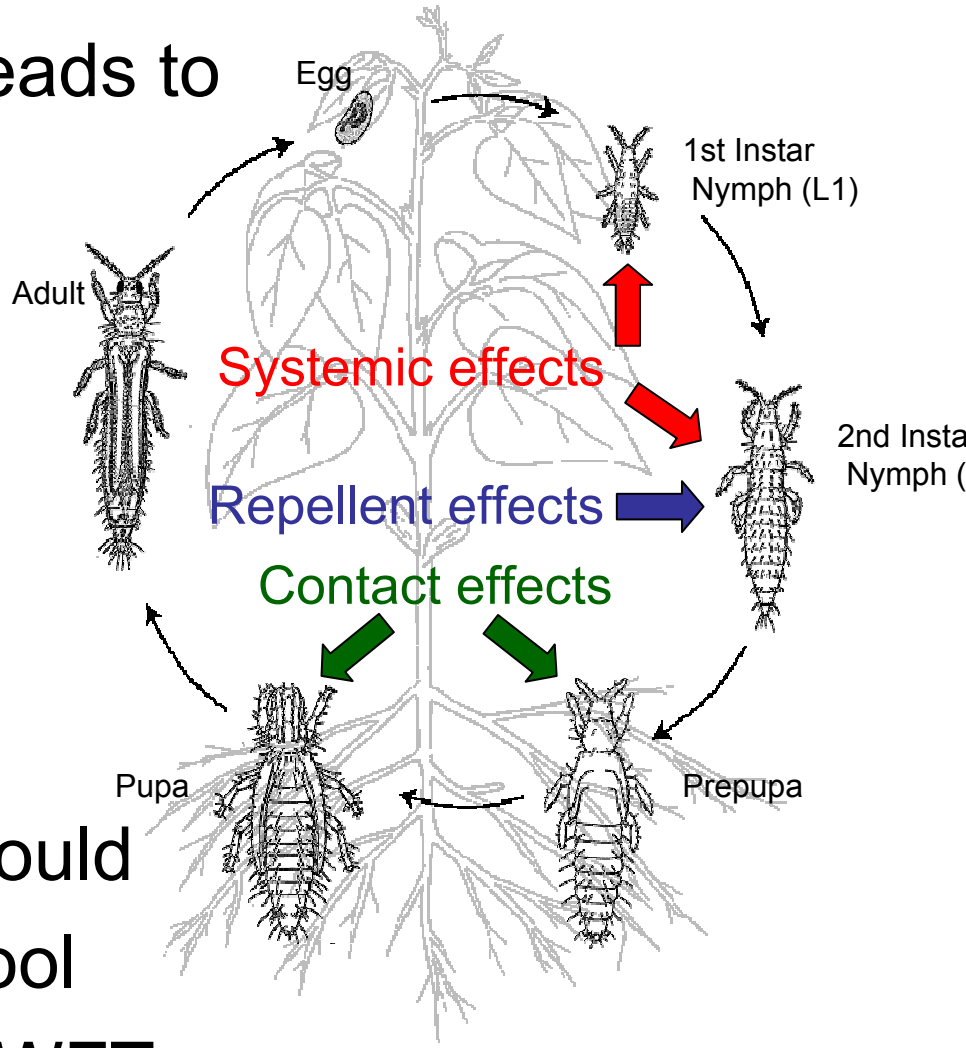
→Neem soil application results in systemic effects on plant-feeding stages **and additionally** in contact effects on soil-dwelling life stages

- Low mortality in soil-migrating stages and higher proportion of pupae on plant compared with control

→ Repellent properties of Neem for late 2nd instar

Conclusion

- Neem soil application leads to
  - Systemic effects on plant-feeding stages
  - Contact effects on soil-dwelling pupal stages
  - Repellent effects on migrating larvae
- Neem soil application could become an important tool in integrated control of WFT



Current experiments

- Investigations on the uptake, translocation, and persistence of AZA in bean plants and soil types
- Ongoing studies on the effect of Neem soil applications in combination with releases of antogonists of WFT
- Trials on the effect of Neem soil applications under practical greenhouse conditions to further study the chances of using Neem in greenhouse IPM

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Herstellung und Vertrieb hochreiner Biosubstanzen