KNPV COLLEGE TOUR

College Tour

Talk show by Twan Huys: Hundreds of students interview famous guests from at home and abroad

A short display of the accomplishments of the guest.

Questions form the audience:
How, why, why not, ...?
Failures, hurdles, regrets, ...?

KNPV COLLEGE TOUR

The biggest success of...

Gera van Os

Wageningen UR - Applied Plant Research

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Applied Plant Research

Problem >>> Research >>> Solution

Sooner in practice than in press

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Dutch flower bulb production

- Area: 24,300 ha
- Export value: 700 million Euro

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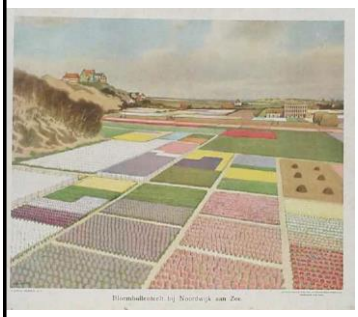
Important cultivation area behind the Dutch dunes



- Dune area has been levelled, resulting in arable land:
- Sandy soil
- pH 7, calcium rich
- Soil organic matter 1%
- Groundwater at -50 cm
- Exclusively bulb crops rotation 1:4

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Soil borne diseases are a huge problem

Rhizoctonia solani

Pythium spp.

Pratylenchus penetrans

Meloïdogyne hapla

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Pythium root rot in iris

Solve this problem and you will get a statue...

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Pythium root rot in iris

General disease suppression: competition for food and space.

Untreated soil *with* natural microflora

Sterilized soil *without* microflora

Destruction of the soil microflora eliminates disease suppression.

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General measures for disease control

Soil-steaming

Injection of fumigants

Flooding

Growers *create* a problem by applying these treatments.

Effect of soil treatments on disease suppression against Pythium root rot

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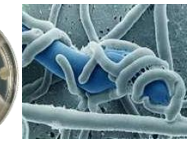
Very unpopular message!

Role of the soil microflora in agriculture

- Availability of nutrients
  - Nutrient cycli (carbon, nitrogen, sulfur)
  - Rhizobium, Mycorrhiza
- Soil structure, aggregate formation
- Soil borne pathogens
- Disease suppression, antagonists
  - Competition for food and space
  - Antibiosis
  - Hyperparasitism
  - Induced resistence





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Additional relevant information...


- Pathogens are susceptible for different mechanisms of suppression
- Naturally, soil is satiated to its microbial carrying capacitiy
- Introduction of antagonists is often *un*successful

Make use of the natural soil microflora!

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Soil organic matter and disease suppression

Addition of organic matter may stimulate the soil microflora:

- ***Stable*** organic matter **>** variation in physical and chemical soil properties
- ***Decomposable*** organic matter **>** food for microflora

And by doing so:

- Increase biodiversity and microbial biomass and improve disease suppression.

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Organic matter and disease suppression

Field trial


3 levels of soil organic matter (SOM)
by incorporation of 95% peat + 5% cattle manure

- 0,7 % SOM
- 1,2 % SOM
- 2,4 % SOM

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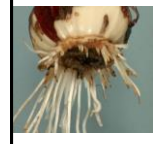
Bioassays for disease suppression




- *Pythium* root rot in Hyacinth
- *Rhizoctonia solani* in Tulip
- *Meloïdogyne hapla* in Lettuce
- *Pratylenchus penetrans* in Narcissus

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Bioassay for disease suppression

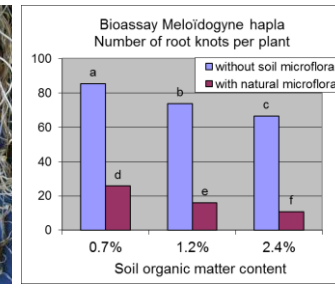
Example: root knot nematode (*Meloïdogyne hapla*)

After 6 weeks:
Count root knots

Susceptible crop (Lettuce)
Add nematodes

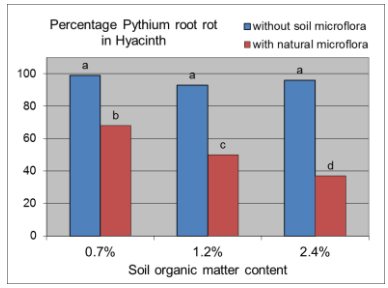
Few root knots >
good suppression

Suppression of *Meloïdogyne hapla*



Less root knots with natural soil microflora
Less root knots at higher % SOM

Suppression of *Pythium intermedium*



No disease suppression without natural soil microflora
Less disease at higher SOM

Summary effects on disease suppression

Pathogen	Soil microflora	Addition of organic matter
Meloïdogyne hapla	++	++
Pythium intermedium	++	+
Rhizoctonia solani	+	-
Pratylenchus penetrans	+	+

\+ = positive effect
\- = no effect

Project GoeddoorGrond 2009-2012

Nice theory,
Nice scientific proof,
But...

Regulations for input of organic matter:
restrictions on N and P.

Field trial at 10 commercial farms:
Does application of additional ***compost*** (anually)
and incorporation of ***green manure crops***
improve the disease suppression?

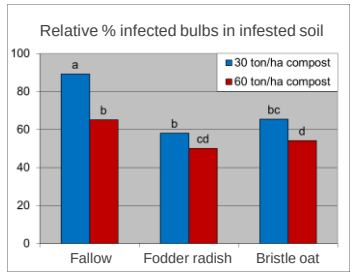
Field trial 2009-2012

Green manure crop	**Conventional** **30** ton/ha compost	**Sustainable** **60** ton/ha compost
Fallow		
Fodder radish *(Raphanus sativus)*		
Bristle oat *(Avaena strigosa)*		

Soil samples for bioassays after 3 three years

Suppression of *Rhizoctonia solani* (AG2-t)

Bulb infection by *Rhizoctonia* causes reduction of bulb quality.

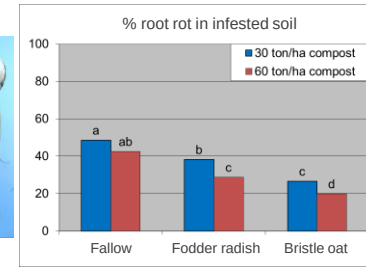


More compost > less bulb infection

With green manure crops less bulb infection

Suppression of *Pratylenchus penetrans*

Root rot by *Pratylenchus penetrans*



More compost > less root rot

Green manure crops > less root rot

Summary effects on disease suppression

Pathogen	Extra compost	Green manure crop
Rhizoctonia solani	+	+
Pratylenchus penetrans	+	+
Pythium intermedium	-	+

\+ = positive effect
\- = no effect

Based on these results growers (consider to) omit fungicide application.

Soil analyses and disease suppression

Relationship between physical-, chemical- and/or biological soil parameters and disease suppression?

Predictive value?
Basis for advice?

- *No target values*
- *No representatieve sampling*
- *Relevant sampling time unknown*

Soil analyses and disease suppression

Chemical (Blgg):
- *pH-water*
- *pH-KCl*
- *N-elementair*
- *Fosfor PAE*
- *Fosfaat Pw*
- *P-Al*
- *K-HCl*
- *P-totaal*
- *C-totaal*

Physical (Blgg):
- *Organische stof*
- *Lutum*
- *Granulair*

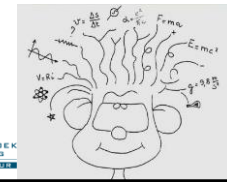
Biological (Alterra, Blgg):
- *Fungal biomass*
- *Bacterial biomass*
- *Potential N-mineralisation*
- *Hot water extractable C*
- *Nematodes (#/spieces)*

Soil analyses and disease suppression

Statistical models:

Equation to explain variation in disease suppression

Disease severity =
constant+ x (parameter a) + y (parameter b) + ...



Different equation for each pathogen

Biggest challenges

- Broad spectrum of expertises and skills necessary
- Funding: combining multiple funds

Alliances

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Collaboration=success

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15:15 h Question-time

How, why, why not, ...?

Failures, hurdles, regrets, ...?

Did I get my statue?