

Effect of reduced tillage on suppressiveness of soil-borne diseases

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Experiment

Broekemahoeve (BASIS)

- PPO-agv: Derk van Balen, Wiepie Haagsma
- Clay soil
- Winter carrot: (organic cropping system)
 - conventional = ploughing
 - reduced = no ploughing
- Onion: (integrated cropping system)
 - conventional = ploughing
 - reduced = no ploughing
- Many researchers measure different parameters

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Measurements:

- Soil suppressiveness:
 - *Rhizoctonia solani* AG2.2IIIb in sugar beet
 - *Streptomyces scabies* in radish
- Potential beneficial MO:
 - streptomycetes (plate counts)
 - *Lysobacter* spp. (Taqman)
- Microbial activity, biomass (Jaap Bloem, Alterra)
- Mycorrhiza (Olga Scholten, Plant Breeding)

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Undisturbed soil samples for soil suppressiveness

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Rhizoctonia solani in sugar beet

Sample Type	Tillage System	Disease spread (cm)
Onion Disturbed	Conventional tillage	~20
	Reduced tillage	~19
Carrot Disturbed	Conventional tillage	~18
	Reduced tillage	~13
Onion Undisturbed	Conventional tillage	~20
	Reduced tillage	~20
Carrot Undisturbed	Conventional tillage	~22
	Reduced tillage	~12

- Carrot: reduced tillage is healthier than conventional tillage
- Onion: no difference between tillage systems
- No difference between disturbed & undisturbed samples

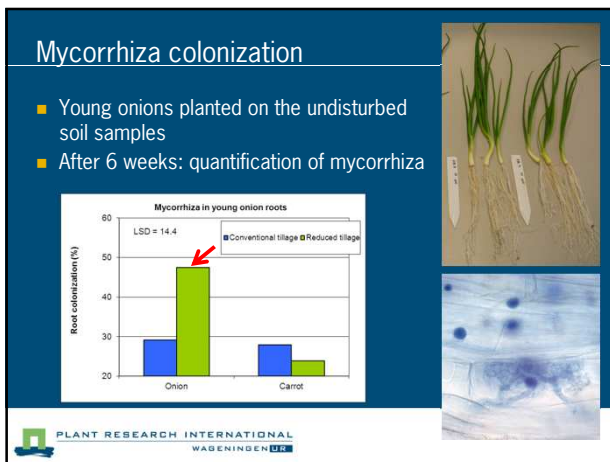
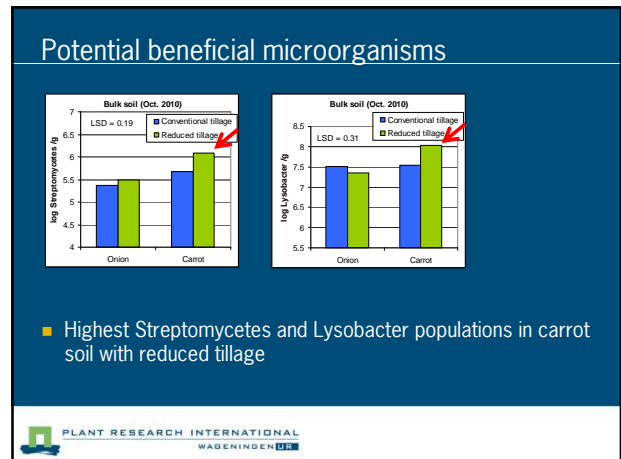
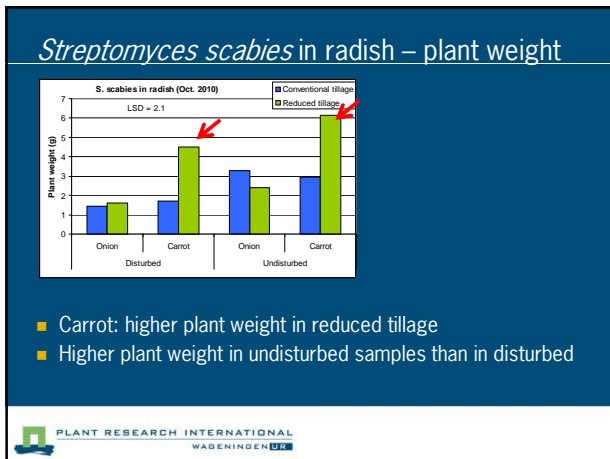
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Streptomyces scabies in radish - scab

Sample Type	Tillage System	Disease index (0-5)
Onion Disturbed	Conventional tillage	~2.1
	Reduced tillage	~1.2
Carrot Disturbed	Conventional tillage	~2.8
	Reduced tillage	~2.4
Onion Undisturbed	Conventional tillage	~2.7
	Reduced tillage	~1.9
Carrot Undisturbed	Conventional tillage	~3.6
	Reduced tillage	~3.8

- Onion: reduced tillage is healthier than conventional tillage
- Carrot: no sign. difference between tillage systems
- More disease in undisturbed samples than in disturbed

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	onion		carrot		LSD
	conventional 1A	minimal 1B	conventional 2A	minimal 2B	
Fungal biomass	15.0	18.8	17.9	33.2	6.1
Active fungi	1.0	1.9	7.4	1.6	ns
Bacterial biomass	8.3	5.9	5.5	7.9	ns
Potentially Mineralizable N	8.9	18.4	12.9	56.5	9.3
Hot Water extractable C	54	167	127	372	98
Bacterial number	0.1	0.09	0.09	0.13	ns
Cell volume	0.2	0.19	0.19	0.19	ns
Length/Width	2.2	2.16	1.96	2.10	ns
FDC: Freq. of Dividing Cells	7.0	4.37	1.09	7.31	ns
Unstained fungi	33.9	15.1	10.7	24.9	ns
Fungi/Bacteria	2.6	4.7	3.4	4.5	ns

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2010 - BASIS	integrated onion minimal-st.	organic carrot minimal-st.
Rhiz disease spread D	0	<
Rhiz disease spread UD	0	<
scabies disease D	<	0
scabies disease UD	<	0
radish, growth in pots (g) D	0	>
radish, growth in pots (g) UD	0	>
log Streptomyces	0	>
log Lysobacter	0	>
mycorrhiza colonization UD	>	0
onion, growth in pots UD	0	>
Fungal biomass	0	>
Active fungi	0	0
Bacterial biomass	0	0
Potentially Mineralizable N	>	>
Hot Water extractable Carbon	>	>

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Conclusions – 2010 analyses

In reduced tillage system:

- Disease suppression Rhizoctonia > (carrot)
- Disease suppression S. scabies > (onion)
- Plant weight radish & onion in pots > (carrot)
- Streptomyces >, Lysobacter > (carrot)
- Mycorrhiza colonization > (onion)
- Fungal biomass > (carrot)
- Pot Mineralizable N > (carrot, onion)
- Hot water extractable C > (carrot, onion)

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