Rootstocks for organically grown fruit vegetables *(Meloidogyne spp)*

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Root-knot nematodes (RKN)

- World-wide RKN are a very big problem
- In Dutch organic greenhouses most common RKN are:
  - *Meloidogyne incognita (Mi)*
  - *M. hapla (Mh)*
  - *M. javanica (Mj)*

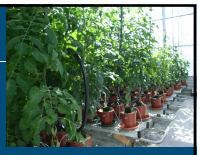
Methods of control of RKN:

- Soil steaming
- Biological soil disinfection
- Grafting
- .....

Objective of research:

- Find rootstocks
  - with high resistance against *Mi* and *Mh* (and *Mj*)
  - combine this with a high yield and quality

5 experiments in Bleiswijk



- 2005 to 2009:
  - Cucumber 1 - 5 (16 rootstocks)
  - Tomato 3 - 5 (28 rootstocks)
  - Sweet pepper 3 - 5 (17 rootstocks)
- Inventory among seed companies in several countries
- Started with a wide range of rootstocks → continued with most promising ones

- In 10 L pots filled with sand
- Duration: 10 to 14 weeks
- Spring / autumn
- Average temperature ± 22 °C

Inoculation with *Meloidogyne spp*

- ± 1 week after planting
- # J2/plant: 4 - 20.3 * 10^3
- *Mi* in experiment 1 - 3
- Mixed populations in experiment 4 and 5:
  - Exp. 4: *Mi* and *Mh* 1 : 1
  - Exp. 5: *Mi, Mh* and *Mj* 64 : 33 : 3

Root-knot index (RKI) 1-10 (cucumber, all exp.)

Rootstock	Parental species	RKI
*Aviance**)	*Cucumis sativus*	± 7.5
'several'	*C. maxima x C. moschata*	± 6 - 7
Harry	*Sycios angulatus*	3.1
RZ 64-10	*Benincasa hispanica*	2.7
RZ 64-12	*Benincasa hispanica*	3.8

*)standard cultivar

Reproduction of *Meloidogyne* spp (exp. 4)

Rootstocks	RKI	*Mi* (*10^3)	*Mh* (*10^3)
Harry	3.6	25.4	0.2
RZ 64-10	3.6	2.3	0.06
RZ 64-12	3.9	2.1	0.01

Cucumber rootstocks are more susceptible to *Mi* than to *Mh* (and *Mj*)

Cucumber rootstocks

- Seeds of *RZ 64-10* and *RZ 64-12* are no more available
- *Harry* seems to be the only 'suitable' rootstock
- *Harry* has some disadvantages:
  - Variability in germination
  - Susceptibility to rot at grafting place during growing
  - Ongoing reproduction of *Meloidogyne* spp

Tomato rootstocks

In 3 experiments 28 tested rootstocks:

Seed company:	# rootstocks
Monsanto	6
Rijk Zwaan	5
Green Seeds	4
Enza seeds	3
Nickerson-Zwaan	3
Syngenta	2
Gautier	2
Uniseed	1
Hazera	1
Western Seed	1

Experiment 3 - spring 2008 (21 x)

Measurement	Minimum - maximum
Root-knot index	0 - 6
# RKN/50 g roots	2.3 - 990 * 10^3
Root weight (g)	32 - 228

Root-knot index and # *M.* spp tomato

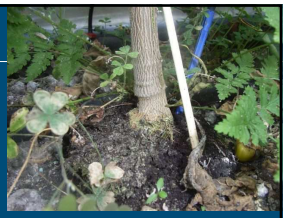
Rootstock	Seed company	RKI	# *Mi*	# *Mh*	# *Mj*
Maxifort	Monsanto	2.2	137	716	0
Emperador	Rijk Zwaan	1.6	77	799	4
Brigéor	Gautier	1.0	23	841	2
PG 76	Gautier	0.3	31	127	0
'several'	Green Seeds	5.0	4119	2444	191
Mecano[*)]	Rijk Zwaan	6.0	4977	819	0

Rootstocks and yield (1 grower, 15-9-2010)

Rootstock	Kg/m^2
Emperador	40.1
Brigéor	42.7
PG 76	42.8

Production of *PG 76* and *Brigéor* is not lower than of standard rootstock

Sweet pepper rootstocks



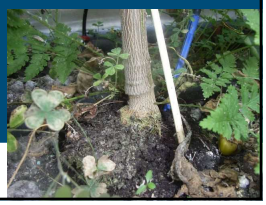
- 3 experiments
- 17 rootstocks of 7 different seed companies

Root-knot index and # *M.* spp sweet pepper

Rootstock	Seed company	RKI	# *Mi*	# *Mh*	# *Mj*
Capital	Monsanto	1.1	61	4993	0
DRO 3413	Monsanto	3.9	34	3582	0
Snooker	Syngenta	1.8	23	3020	0
PR 131	Rijk Zwaan	2.4	23	2515	0
07zs102	Uniseeds	1.2	30	11089	0
Ferrari[1)]	Enza	2.9	11085	3032	0

Sweet peppers

- Sweet pepper rootstocks are more susceptible to *Mh* than to *Mi* (and *Mj)*
- *Snooker* (and *Capital)* are more or less suitable rootstocks in relation to RKN



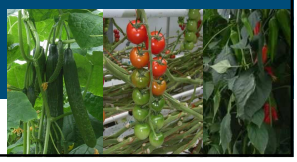
Yield sweet pepper (3 experiments ½ Sept '10)

Rootstock	Kg/m^2
not grafted (3 cultivars)	16.2
Capital	15.4
Snooker	15.5
DRO 3413	15.8

Soils had a relatively small amount of RKN

Conclusions (1)

- Most cucumber rootstocks are more resistant against *Mh* (and *Mj)* compared to *Mi*
- Most tomato and sweet pepper rootstocks are more resistant against *Mi* (and *Mj)* compared to *Mh*



Conclusions (2)

- Most promising rootstocks in relation to RKN and yield:
  - Cucumber : *Harry (+ RZ 64-10)*
  - Tomato : *PG 76 (+ Brigéor)*
  - Sweet pepper : *Snooker (+ Capital)*

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Innovations for and with Horticulture