

Optimization of metam sodium application by rotary spading injection

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Nematode control strategy (NCS) in the Netherlands

NCS based on:

- Crop rotation including green manure crops with focus on potato as one of the most profitable crops
- Sequence and frequency of crops
- Certified plant material and resistant varieties
- Additional measures
 - Catch crops (*Tagetes patula*)
 - Biological and **chemical control** methods



Chemical nematode control by metam sodium (MS)

- Fumigant metam sodium is converted into a.i. methyl isothiocyanate (MIT)
- Application in the Netherlands since 1972
- Initially **shank injection** of MS against PCN
 - or dichloropropene
- Application every other year before starch potato
 - 1:2 crop rotation potato, cereal
- After decade reduced efficacy due to adaptation



Efficacy shank injection

- Shank injection: poor distribution in upper soil layer with MS
 - On average 50% efficacy against PCN (NEMADECIDE)
- Dichloropropene more volatile, better distributed than MS



Rotary spading injection metam sodium (MS)

- 1989 development of rotary spading injection
- Advantage: equal distribution MS through furrow
 - On average 70% efficacy against PCN (NEMADECIDE)
- 1993 Application MS once per four years
- 2001 Application MS once per five years
- 2007 MS only chemical fumigant allowed in NL



MS dosages in the Netherlands

- Arable crops 300 l Monam /ha
 - 510 g MS/l
- Open field vegetables, fruits, bulbs and weeds
600 – 750 l Monam/ha

Research question: which combination of **dosage/injection depth** for optimal disinfestation result ???



Trial set-up MS with rotary spading injection

- *Meloidogyne fallax* (Mf) infested field
 - Preceding crop perennial ryegrass; host for Mf
- Randomized block design; 4 replicates
 - Gross plots 6 m x 12 m, net plots 3 m x 1.5 m
- Application date May 3 2006
 - Soil temp. 10-12°C
 - Soil humidity: 10% (w/w)



Trial set-up Monam (510 g MS/l)

Objects

- Untreated control
- 300 l Monam/ha
 - Injection depth 14 cm, spading depth 28 cm (standard)
- 600 l Monam/ha
 - Injection depth 14 cm , spading depth 28 cm
 - Injection depth 20 cm , spading depth 40 cm



Rotary spading injection device

Suitable for
soils up to 35%
silt content



Rotary spading injection device - front

Dosage tank;
tubes run to
backside;
attached to
goose feet,
each with flow
meter



Rotary spading injection device - back

A heavy roller seals the soil after MS application



Trial set-up MS

Observations

- yield carrot crop
 - sowing date May 24, harvest September 13 2006
- Carrot assessment on Mf symptoms
- Soil analysis for plant parasitic nematodes
 - before (Pi, May 3), directly after MS application (Pf1, May 24) and after carrot crop (Pf2, September 13)
 - Samples 0-30 cm depth (furrow)
 - Samples 30-50 cm depth (under furrow)

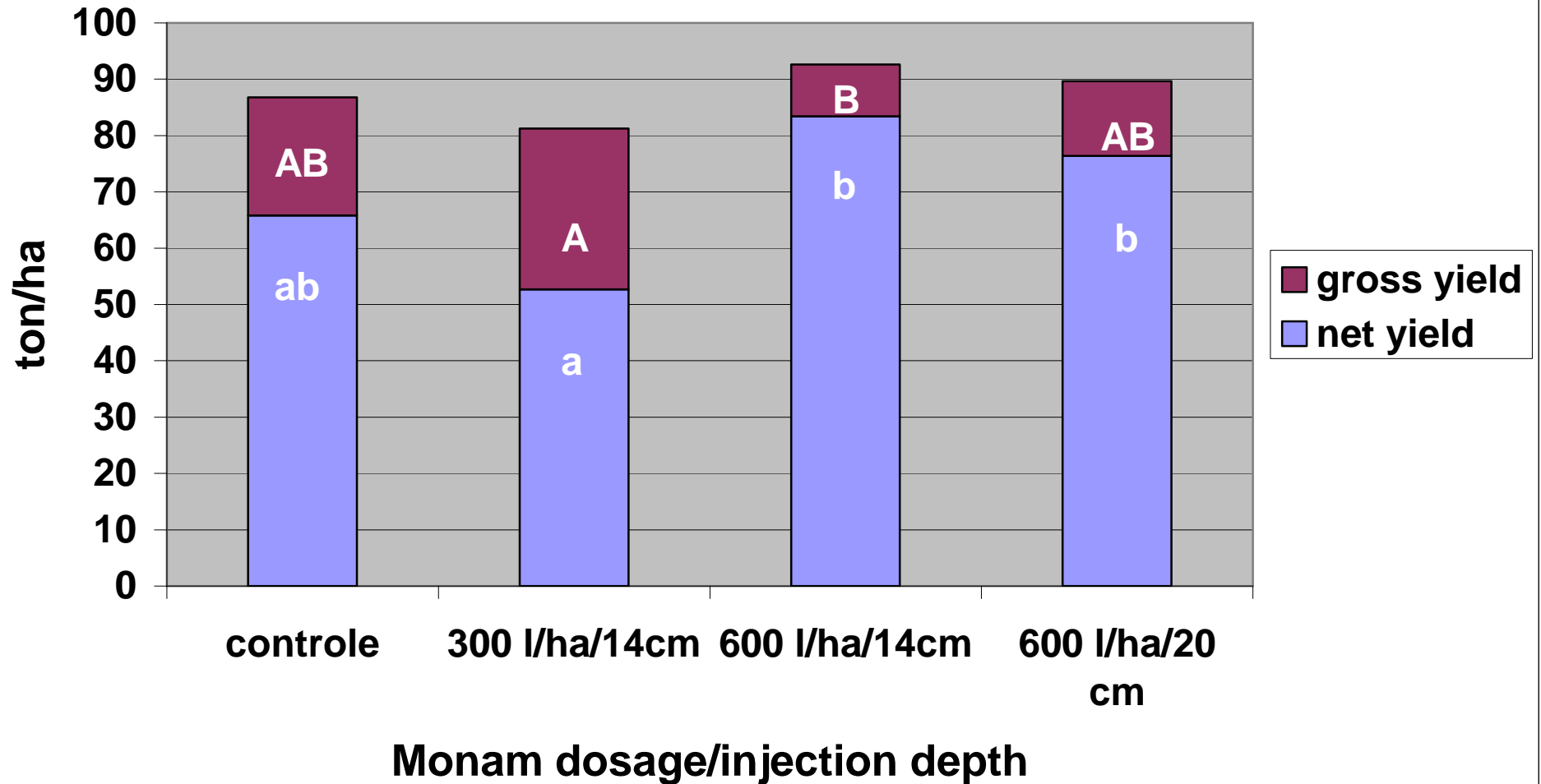


Carrot trial field



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Carrot yield



Carrot yield conclusions

■ Gross yield

- 600 l significant higher gross yield than 300 l Monam at injection depth 14 cm
- MS objects (+, - 7% additional gross yield) not significant different from untreated control
- Different injection depths not significant different yield



Carrot yield conclusions

■ Net yield (carrots without Mf-symptoms)

- 600 l (both injection depths 14 & 20 cm) significant more marketable carrots than 300 l Monam per ha
- Affection rate MS objects not significant different from untreated control
- Different injection depths not significant different affection rates



Swollen lenticels on carrot, caused by *Meloidogyne chitwoodi* or *M. fallax*



Results soil analysis nematodes

<i>Meloidogyne fallax</i>	soil depth 0-30 cm		
Metam sodium	Before	After	After
Object	Pi	Pf 1	Pf 2
	May 3	May 24	Sept 13
Untreated control	1578 ab	593 b	1062 b
300 l Monam-14 cm	2932 b	341 b	658 b
600 l Monam-14 cm	840 a	1 a	368 ab
600 l Monam-20 cm	1239 ab	9 a	166 a
<i>F.prob.</i>	0.212	< 0.001	0.040



Results soil analysis nematodes

<i>Meloidogyne fallax</i>	soil depth 30-50 cm		
Metam sodium	Before	After	After
Object	Pi	Pf 1	Pf 2
	May 3	May 24	Sept 13
Untreated control	703 a	356 bc	1811 a
300 l Monam-14 cm	1525 b	929 c	2099 a
600 l Monam-14 cm	1306 b	43 a	1238 a
600 l Monam-20 cm	1460 b	56 ab	492 a
<i>F.prob.</i>	<i>0.017</i>	<i>0.021</i>	<i>0.186</i>



Results soil analysis

<i>Meloidogyne fallax</i>	Mortality (%)	
	0-30 cm	30-50 cm
Metam sodium Object		
Untreated control	62 ...d	49 .b..
300 l Monam-14 cm	88 ..c.	39 .b..
600 l Monam-14 cm	99.99 a...	97 a.
600 l Monam-20 cm	99 .b..	96 a.
<i>F.prob.</i>	< 0.001	< 0.001



Conclusions

- Monam applied by rotary spading injection
 - high efficacy rate against *M. fallax*
- 600 l Monam/ha higher efficacy than 300 l/ha
- Injection depth 20 cm no added value
- Application of Monam improves carrot quality but even 600l/ha still cannot guarantee a product free from symptoms.
- **Metam sodium application by rotary spading injection fits in Nematode Control Strategy.**



Thank you for your attention !



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