

Insecticide soil treatment efficacy trials on *Agriotes* spp. wireworms

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Outline of the talk

- Wireworm damage in practice
- Laboratory trials:
 - Contact efficacy
 - Attractiveness/feeding efficacy
- Advantages wireworm control with Goldor Bait

Wireworm damage

- Arable crops:
 - Potato crop
- Maize
 - Cereals
- Vegetable crops:
 - Onions
 - Carrots
 - Brassicas
 - Tomatoes
- Tropical crop:
 - Sugarcane



Wireworm damage in Western Europe

- Fields with high population density:
 - April – November
- Activity of wireworms undependent:
 - Temperature
 - Soil moisture, except of water saturated soil
- Attractant:
 - CO₂-production by:
 - seed germination
 - roots
 - potato tubers
- Long life cycle: 2 – 6 years

Laboratory trials: Contact efficacy

- Aim: testing the efficacy of insecticides applied as a soil treatment against different wireworm species:

- *Agriotes obscurus*
- *Agriotes lineatus*
- *Agriotes sputator*
- *Agriotes sordidus*



Treatments (g a.i. per ha)

- Untreated : 0
- Chlorpyrifos (480 EC) : 600
- Thiamethoxam (350 FS) : 50, 100, 200, 300
- Imidacloprid (350 FS) : 50, 100, 200, 300
- Fipronil (500 FS) : 50, 100, 200, 300
- Clothianidin (250 FS) : 50, 100, 200, 300

Materials & Methods

- Soil type : sandy
- Soil characteristics : 5 % clay, 1.7 % o.m.
- Soil humidity : 15 %
- Soil layer : 5 cm soil depth
- Amount of water at spraying : 400 l/ha
- Air temperature : 20°C
- No. of replicates : 3 (two subplots A and B)
- No. of wireworms/subplot : 3

Materials & Methods



Stew box for spraying



Trial boxes containing soil and wireworms

Materials & Methods



Spray cabinet with nozzles



Broadcast soil treatment

No. of dead *A. obscurus* 3 w.a.t., 13 March 2009

Treatments	Dose	0	50	100	200	300	600
Untreated		0.7					
Chlorpyrifos							2.0
Thiamethoxam			0	0	0	0.3	
Imidacloprid			0.3	0	0	0	
Fipronil			3.0	3.0	3.0	3.0	
Clothianidin			0.0	0.3	0.7	0.0	

No. of dead *A. lineatus*, 3 w.a.t., 13 March 2009

Treatments	Dose	0	50	100	200	300	600
Untreated		0					
Chlorpyrifos							2.7
Thiamethoxam			0.3	0.3	0	0	
Imidacloprid			0	0.3	0	0.3	
Fipronil			3.0	3.0	3.0	3.0	
Clothianidin			0	0	0	0	

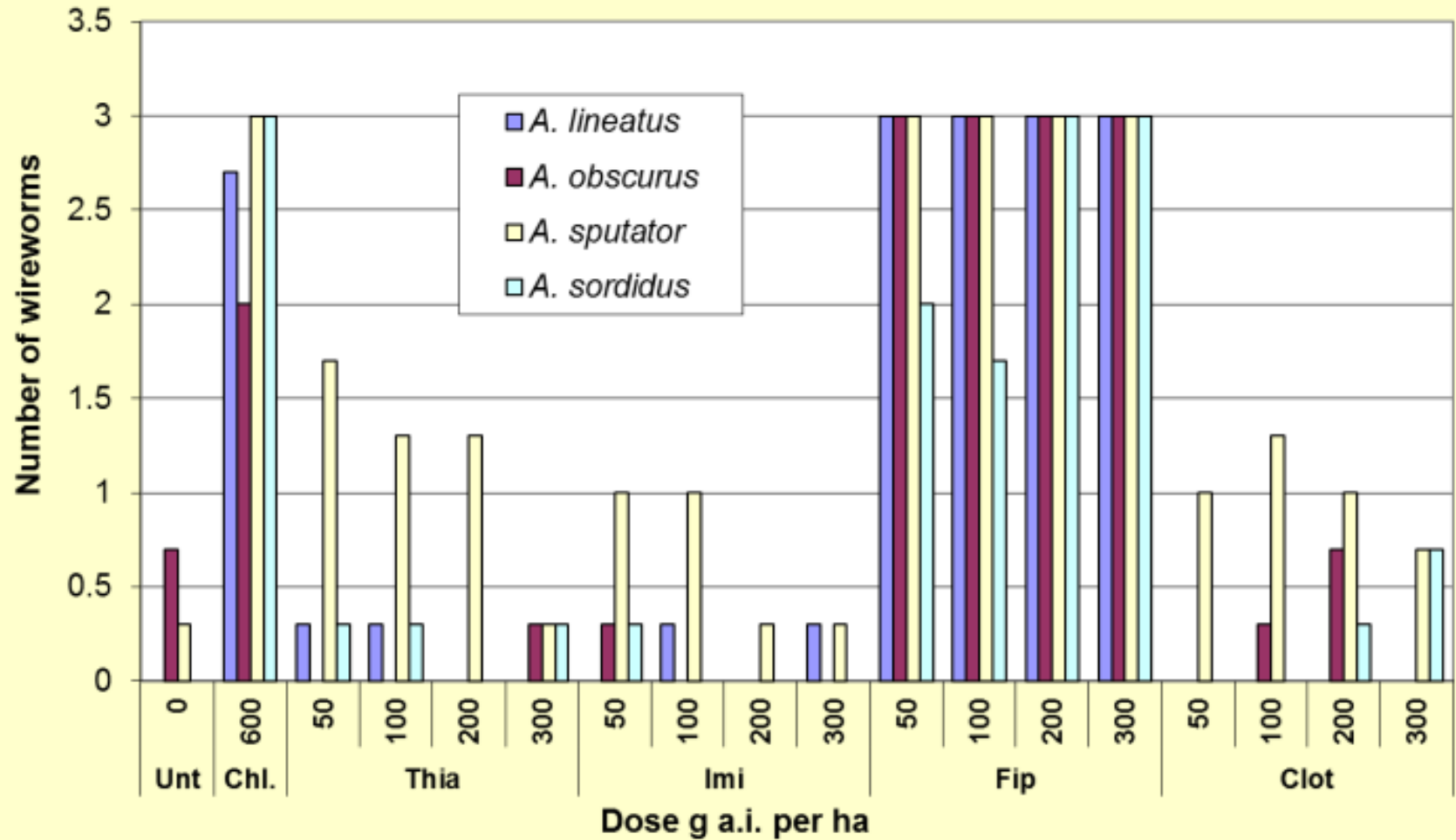
No. of dead *A. sputator* 3 w.a.t., 1st Sep. 2009

Treatments	Dose	0	50	100	200	300	600
Untreated		0.3					
Chlorpyrifos							3.0
Thiamethoxam			1.7*	1.3	1.3	0.3*	
Imidacloprid			1.0	1.0	0.3	0.3	
Fipronil			3.0	3.0	3.0	3.0	
Clothianidin			1.0	1.3	1.0	0.7	

No. of dead *A. sordidus* 3 w.a.t., 19 Oct 2009

Treatments	Dose	0	50	100	200	300	600
Untreated		0					
Chlorpyrifos							3.0
Thiamethoxam			0.3	0.3	0	0.3	
Imidacloprid			0.3	0	0	0	
Fipronil			2.0	1.7*	3.0*	3.0	
Clothianidin			0	0	0.3	0.7	

Wireworm mortality after three weeks



Conclusions after 3 weeks exposure

- Fipronil at doses of 50, 100, 200 and 300 g a.i. / ha is 100 % lethal against the wireworm species tested.
A. sordidus at 50 and 100 g a.i. / ha not!
- Chlorpyrifos 600 ml a.i. / ha is as lethal as fipronil at a dose of 50 g a.i. / ha
- Imidacloprid, clothianidin and thiamethoxam in the doses of 50, 100, 200 and 300 g a.i. / ha are not lethal to the tested wireworm species
 - *A. sputator* may be more susceptible!
- The results are generally similar for all four species

Mode of penetration of fipronil?

1. Body contact by movement through soil.
2. Intake by feeding on small amounts of soil or organic matter
3. Insect can not indentify the active ingredient

Lab. trials attractiveness/feeding efficacy

- Aim: establishing the control effect of four insecticides – formulated as baited pellets – on mortality through oral uptake on four wireworm species:

- *Agriotes obscurus*
- *Agriotes lineatus*
- *Agriotes sputator*
- *Agriotes sordidus*



Treatments

Treatment	Formulation	Dose kg/ha formulated
Untreated	-	-
Thiamethoxam	Id 4005652	10
Clothianidin	Id 1712130	10
Imidacloprid	Id 275792	10
Fipronil	BAS 350 BA/AZ/AY/AX I	10

Treatments

Content & formulation
insecticides

Application rate g a.i. / ha

0.0001% GB

0.01

0.001% GB

0.1

0.01% GB

1

0.1% GB

10

Materials and methods

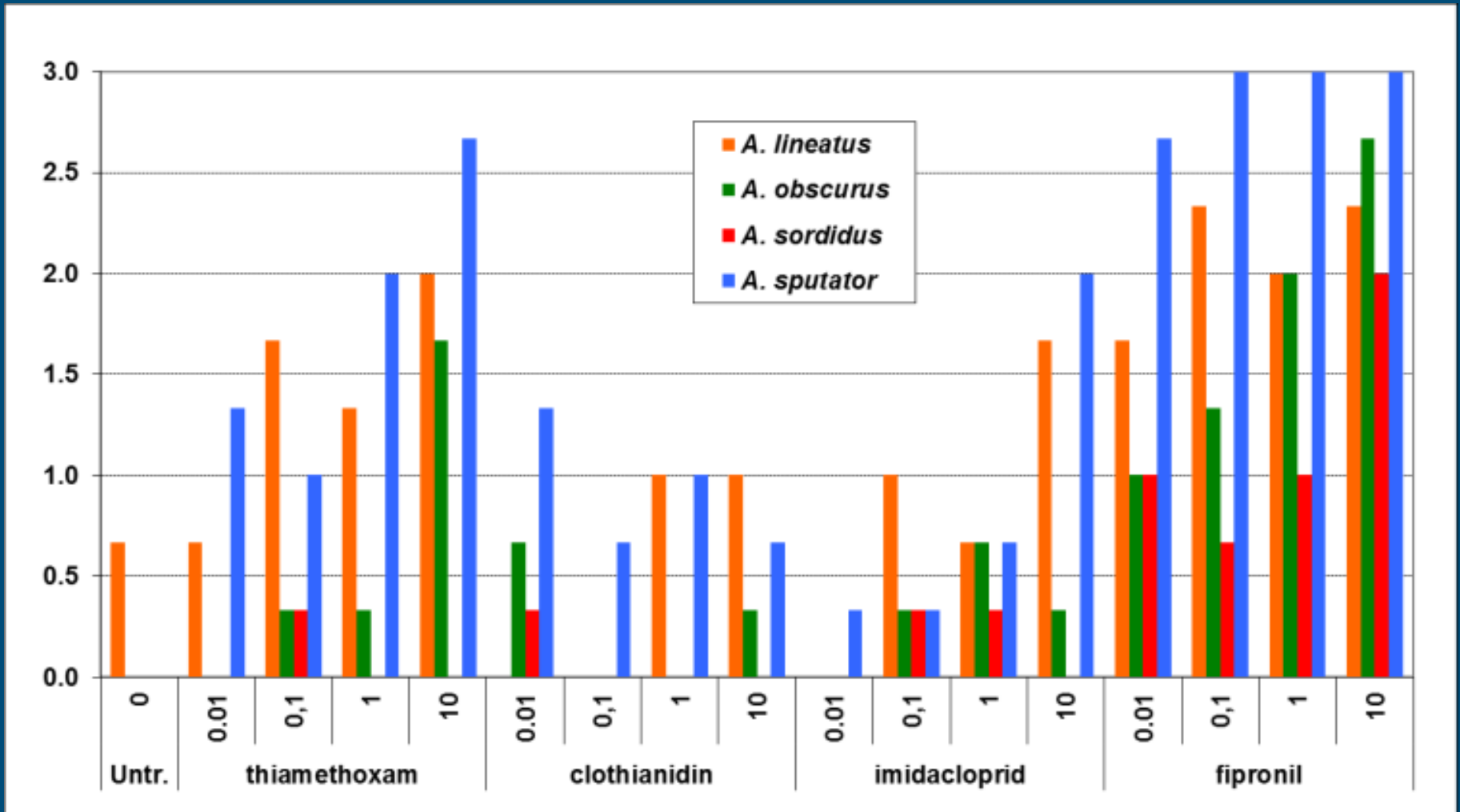
- Soil type : sandy
- Soil characteristics : 5 % clay, 1.7 % o. m., pH 7.8
- Soil layer : 5 cm soil depth
- Amount of soil/tray : 900 g
- Soil humidity : 15 %
- Air temperature : 20°C
- Trial design : 3 replicated block design
2 subplots per plot
- Wireworms : three / subplot

Materials and methods



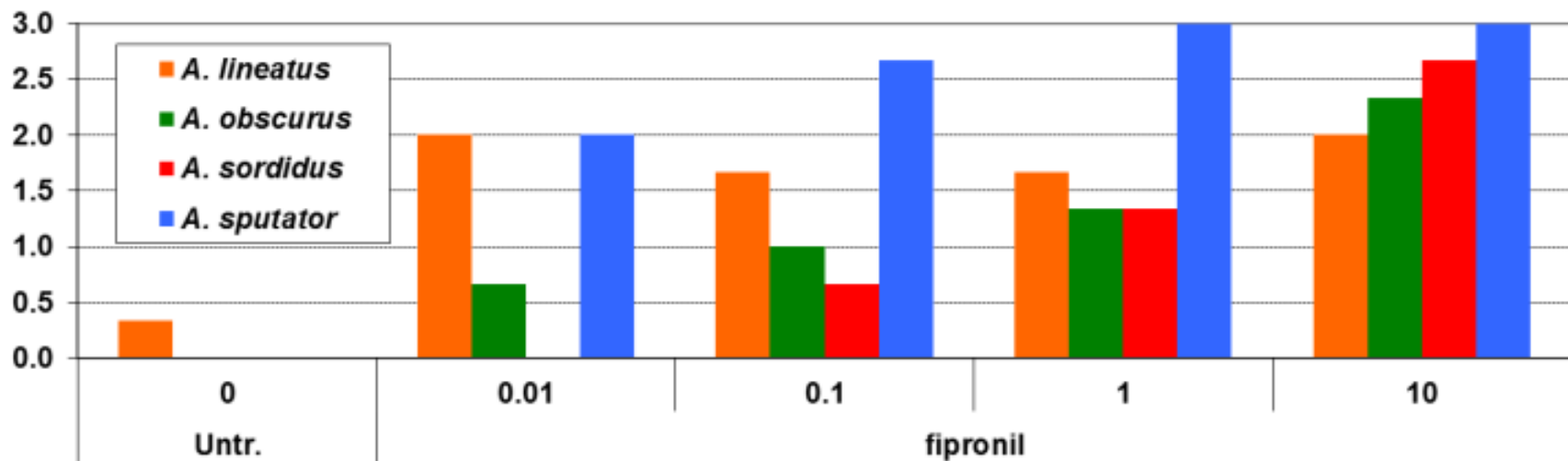
Trial boxes with wireworm activities

Wireworm mortality (g a.i./ha) after two weeks

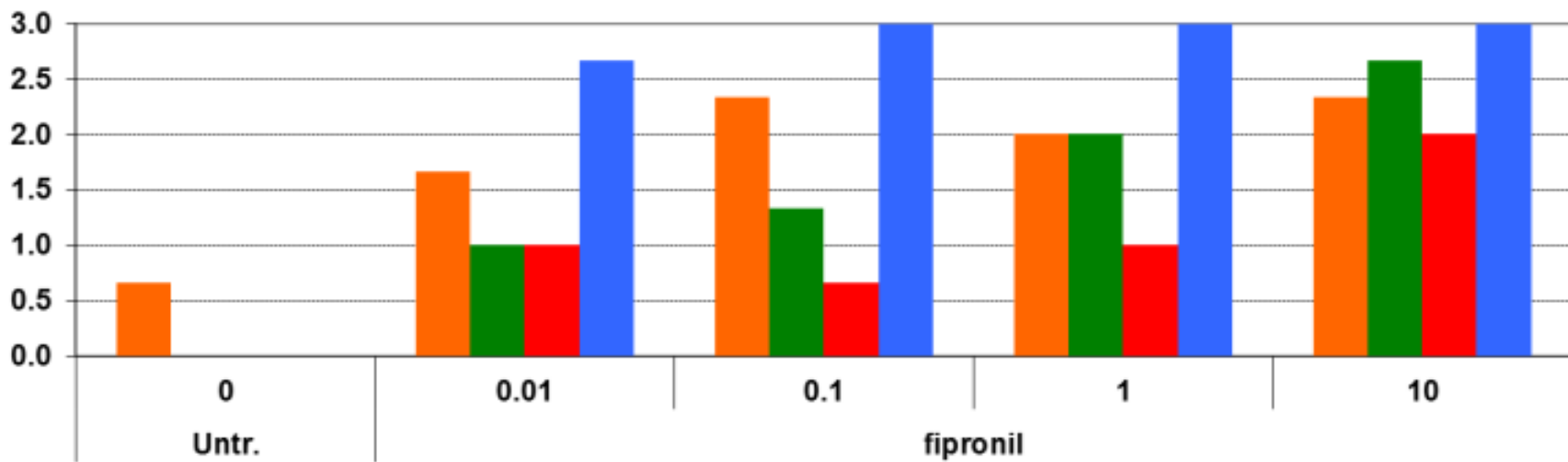


Wireworm mortality, Fipronil g a.i./ha

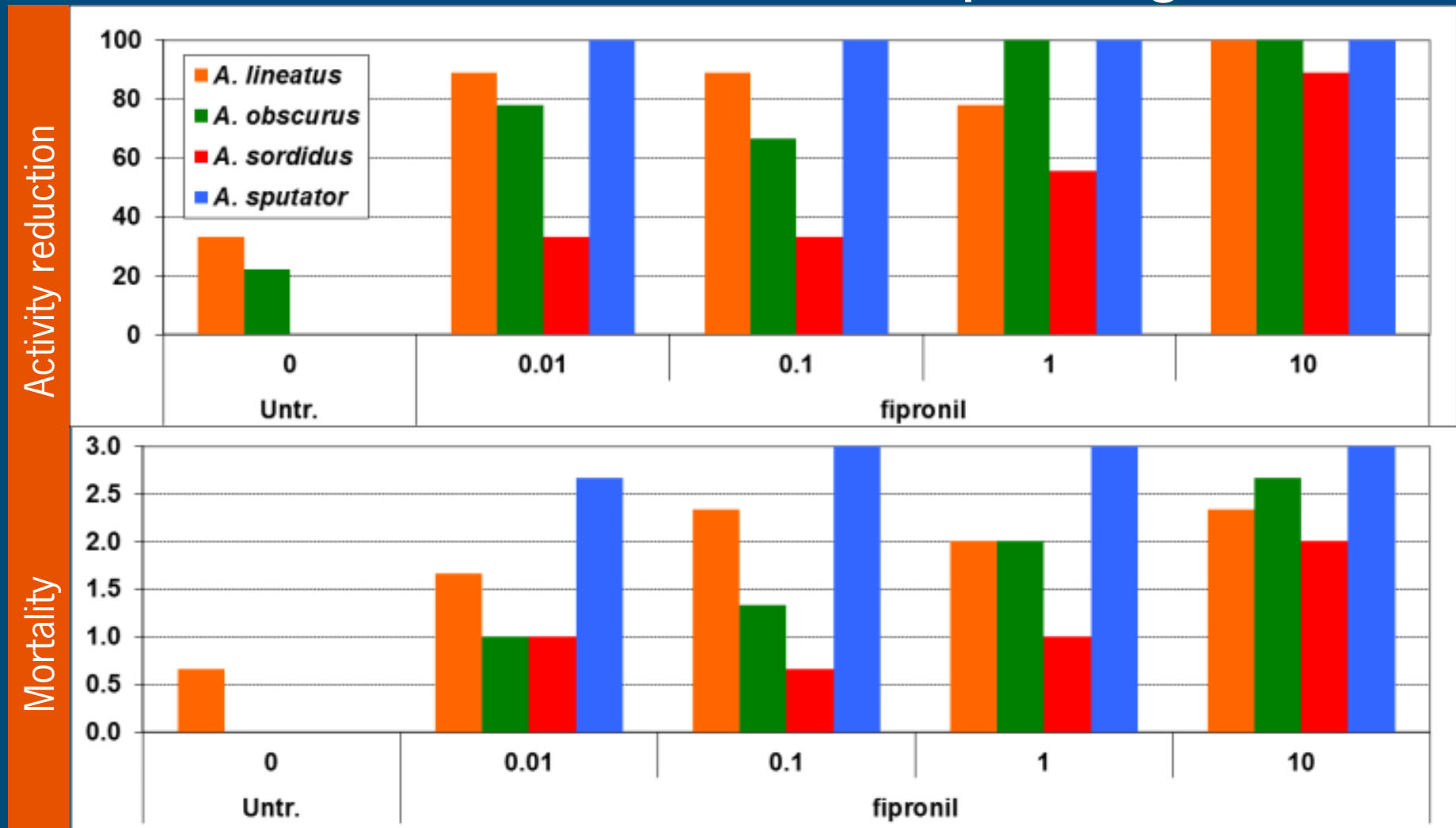
1 week



2 weeks



Overview: After two weeks, Fipronil g a.i./ha



Conclusions bait

- Fipronil at 10 g a.i./ha highly effective and high mortality
- Lower Fipronil rates also effective – mortality and activity reduction
 - Except 0.01 and 0.1 g a.i./ha at *A. sordidus*
- Efficacy thiamethoxam depending on target species
 - Least effective at *A. sordidus*, highest efficacy *A. sputator*
 - In general considerably less effective than fipronil
- Clothianidin and imidacloprid equally effective
 - No efficacy at *A. obscurus* and *A. sordidus*
 - Limited efficacy at *A. lineatus* and *A. sputator*

Practical use and advantages of the Goldor Bait

- At high wireworm densities after several years of grassland production
- Fipronil bait formulation results in a reduction of a.i. for at least 95 % compared to chlorpyrifos.
- Fipronil kills the wireworms immediately, while the neonicotinoids does not.
- Substantial reduction of the wireworm population at high population densities in the following years
- Sufficient protection of the crop against wireworm damage e.g. maize and potatoes



Thank you for your attention.

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For more information:



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