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Metawhite Beauveria for Biological Control of Soil-Dwelling Pests

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20.10.2025, ABIM 2025

BTU STRIVES TO KEEP THE EARTH ALIVE!

MANUFACTURER OF MICROBIAL AND ENZYME PREPARATIONS SINCE 1999

Bioproducts for farming

7 dietary supplements and 1 prescription drug

Pollution destructors and biopolymers for the oil and gas industry

- 60 biologicals for agribusiness
- 15 biologicals registered in the EU countries
- 20 countries of presence
- > 4 000 000 pcs are sold in agroshops annually
- >20 scientists gathered in Institute of Applied Biotechnology

> 500 employees

10 000 t/year

4 000 000 ha/year

> 2 300 trials

> 300 million $/year
agri-companies earn

Healthy Land BIOPREPARATIONS

LET'S GROW biogarden

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DAMAGE BY SOIL DWELLING PESTS IN EUROPE

ANNUAL ECONOMIC LOSS

€1+B

Across all EU crops from soil pests

TYPICAL YIELD LOSS

5–10%

Per affected field; up to 50%+ in outbreak hotspots

TARGET SOIL PESTS

Soil-dwelling pests

Agriotes sputator

Diabrotica virgifera virgifera

Melolontha melolontha

MAIN CROPS AFFECTED

- Maize (Diabrotica: 10–15% typical loss)
- Potatoes (Wireworms: ~10%, up to 50% in severe cases)
- Wheat (Zabrus, wireworms: 20–40% stand loss)
- Sugar beet (weevil, wireworms: 5–15% stand loss)
- Nematodes (20–80% loss on affected crops; €1+ B alone in EU)

Tropinota hirta

Gryllotalpa gryllotalpa l.

✗ Neonics (banned 2018)
✗ Fipronil (banned 2013)
✗ Chlorpyrifos (banned 2020)
✗ Ethoprophos (banned 2019)
→ EU Target: -50% pesticides by 2030

CHEMICAL OPTIONS WITHDRAWN

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METAWHITE, SC/AP

Beauveria bassiana
119/LT IMB F-100141

Bioproduct of insecticidal action to protect plants from soil pests

Bioproduct is based on viable cells of fungi: *Beauveria bassiana.* Entomopathogenic fungi infects pests by adhering to their cuticle, producing enzymes that breach the exoskeleton, and colonizing internal tissues. Toxins produced during infection contribute to host death. Afterward, the fungus sporulates on the cadaver, spreading new spores and enabling persistence in the pest population. The organism is highly host-specific and does not impact beneficial non-target soil organisms

Preparative form: AP; SC.
Application methods: drip irrigation, seedbed or row application, soil treatment;
Titer: 1×10^8 CFU/ml (g);
Shelf life: AP – 12 months; SC – 3 months at + 4 °C to +10 °C.

INCORPORATION INTO SOIL TROUGH TILLAGE, 1-15 l(kg)/ha

APPLICATION IN-FURROW DURING CROP SOWING

1-5 l (kg)/ha

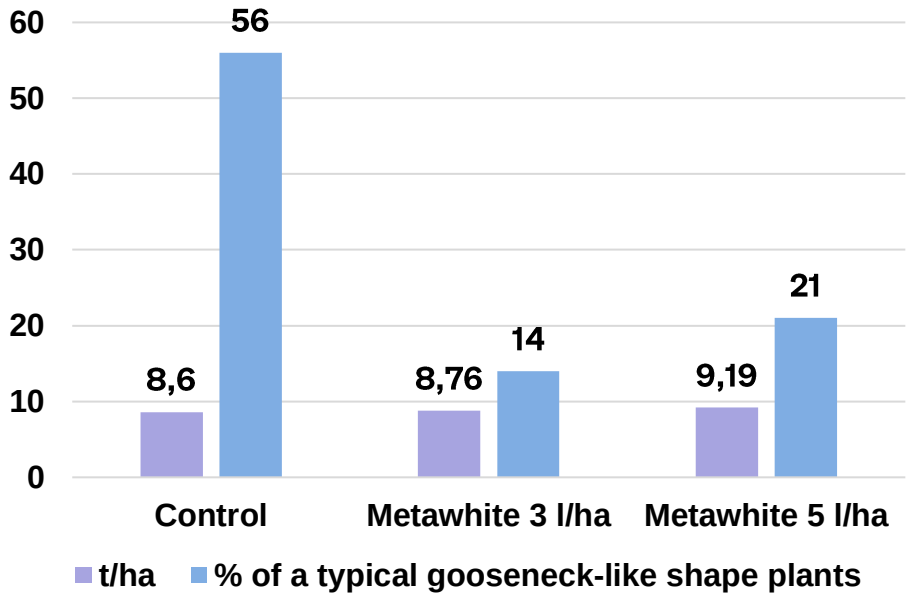
WITH DRIP IRRIGATION

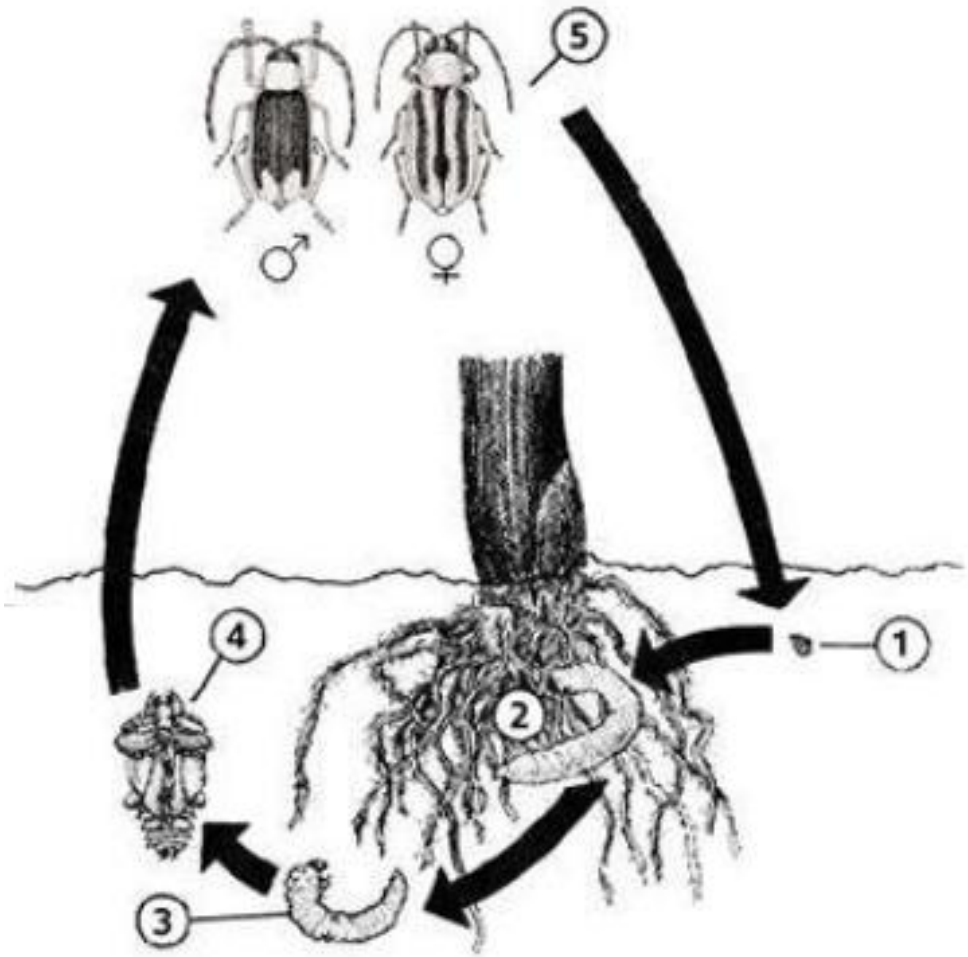
3-10 l (kg)/ha

METAWHITE VS DIABROTICA, 3 YEARS STUDY BY KERNEL

Location: Ukraine
Crop: maize DKS 3939
Previous crop: maize
Years of study: 2020-2022
Method: in-furrow application

Improving yields and reducing of plants damage by Western corn rootworm (*Diabrotica virgifera virgifera*) in maize





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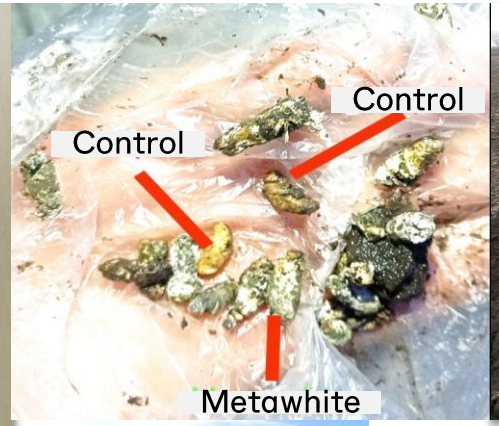
METAWHITE VS BEET WEEVIL (BOTHYNODERES)

FIELD TRIAL 2021 (#1)

Trial location: Astarta-Kyiv LLC
Crop: sugar beet, hybrid Bison
Fore-crop: Corn (2021)
Soil type: low humus chernozem
Study product: Metawhite - application before soil cultivation
Date of trial: 8.10.21
Date of the survey №1: 5.06.2022
Date of the survey №2: 3.11.2022
Trial scheme:
1. Control
2. Metawhite 10 l/ha, 8.10.21 (300 l spill/ha for 10 ha)
3. Metawhite 5 l/ha, 8.10.21 (400 l spill/ha for 10 ha)

**Conclusions: during the survey, adults of beet weevil were found, but their number does not exceed the threshold of harmfulness.*



FIELD TRIAL 2023 (#2)

Trial location: Astarta-Kyiv LLC (Poltava Zernoproduct LLC)
Crop: Sugar beet
Study product: Metawhite

Trial location	Region	Company	Crop	Product	Application method	Rate	Yield, t/ha		
							Trial	Control	Increase t/ha
Poltavazern oprodukt	Poltava	BTU	Sugar beet	Metawhite *Beauveria*	With irrigation water	5,0 l/ha	58,40	49,00	**+9,40**

PESTCONTROL

METAWHITE VS AGRIOTES SP. - WIREWORMS

Variants	Reduction of pests amount compared to the control			Reduction of damaged plants comparing to control, %	
	On the 5th day after treatment	On the 3rd day after germination	On the 14th day after germination	3rd day	14th day
	Wireworms				
Sunflower					
Control, individuals per m^2	4,5	4,75	4,25	-	-
Metawhite 5 l/ha, %	72,2	79,0	76,5	74,2	79,7
Metawhite 10 l/ha, %	83,3	89,5	88,2	83,3	88,4
Metawhite 15 l/ha, %	88,9	94,7	88,2	84,9	91,3
Corn					
Control, individuals per m^2	4,75	5,25	4,50	-	-
Metawhite 5 l/ha, %	73,7	76,2	77,8	73,2	80,5
Metawhite 10 l/ha, %	84,2	90,5	88,9	81,7	89,6
Metawhite 15 l/ha, %	89,5	95,2	94,4	85,9	93,5

Trial #1
Location: Moldova, 2021

Trial #2
Location: Ukraine, UkrSRSPQ IPPNAAS, 2020
Crop: Corn **Hybrid:** Kremin
Soil type: chernozem podzolic
Soil pH: 4,8-5,0
Sowing date: 16.04.2020
Dynamics of the Agriotes sp. larvae number in corn: 15.04.20, 12.09.20

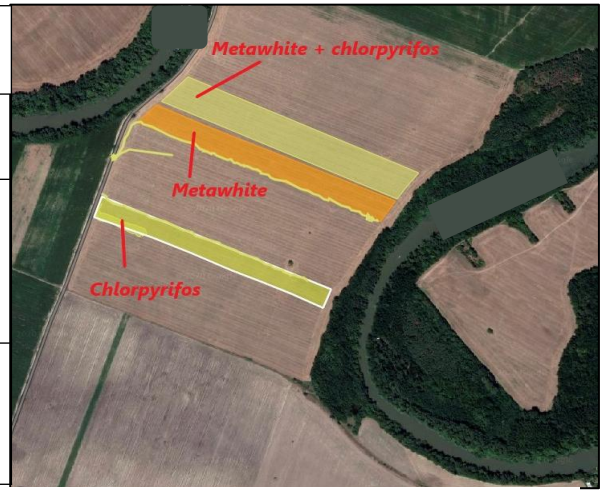
Application method	Product	The number of pest specimens/ m^2		Efficiency, %
		before sowing	before harvest, 12.09.	
Without treatment	Control	16	18	-
Pre-sowing soil treatment	Metawhite mono Metarhizium	16	11	31,3
Pre-sowing soil treatment	Metawhite mono Beauveria	16	6	62,5
LSD_{05}			0,58	

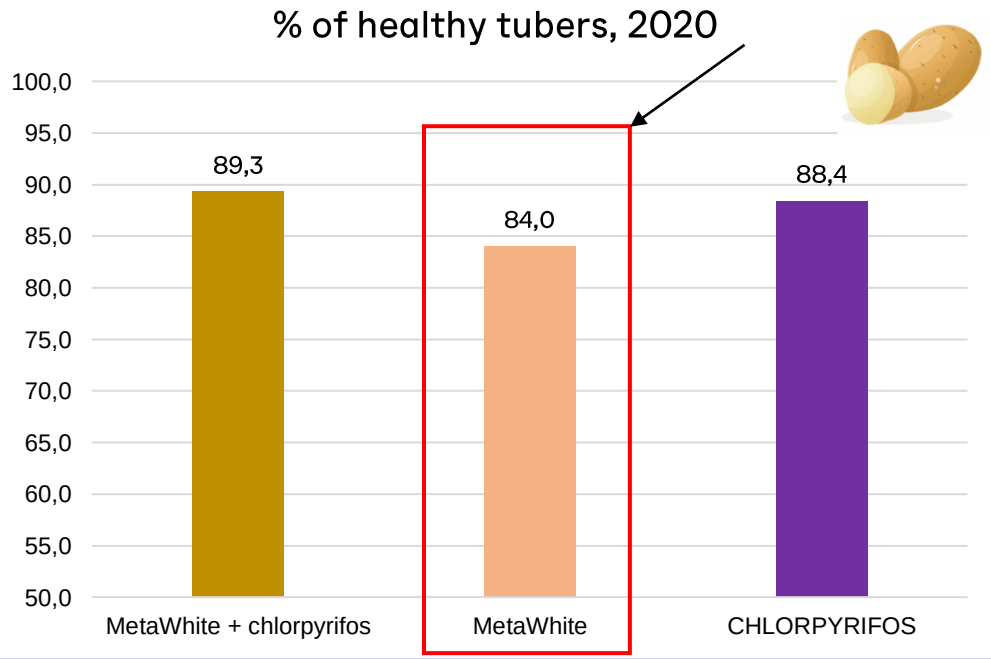
METAWHITE VS CHEMICALS AGAINST WIREWORMS

Location	Central Europe	№	Treatment variants	Total - weight (kg)	Affected %	Healthy %
Plants (flowers)	*Gladiolus Frieslandii*	1	Without treatment	2,03	22	78
Product	Metawhite	2	Nemathorin 7,5/Tercol	2,13	14	86
Pest control	Wireworms	3	Exp/Tercol	2,03	11	89
Variety:	Flevo Eskimo	4	Nemathorin 20/Tercol	2,00	7	93
Planting date	end of April 2022	5	Tercol	2,06	10	90
Trial location	Central Europe	6	A21765A	2,10	10	90
Plants (flowers)	*Gladiolus Frieslandii*	7	MW (Metawhite)	2,00	8	92
Trial #1			p-significance	0,979	<0,001	<0,001
			LSD	n.s.	4	4

Location	Central Europe	№	Treatment variants	Total - weight (kg)	Quantity		Total number	Quantity
					heavy damage	mild damage	Total damage	healthy plants
Plants (flowers)	*Gladiolus Frieslandii*	1	Without treatment	6,38	22	135	157	34
Product	Metawhite	2	Nemathorin 7,5 kg /Tercol	6,73	13	134	147	49
Pest control	Wireworms	3	Nemathorin 20 kg /Tercol	6,73	11	123	134	65
Variety:	Adrenalin	4	A21765A	7,20	9	142	151	65
Planting date	end of April 2022	5	MW (Metawhite)	7,14	11	121	132	81
Trial #2			p-significance	0,092	0,516	0,896	0,710	0,205
			LSD	0,55	n.s.	n.s.	n.s.	n.s.

Location	East Europe
Crop	Potato
Product	% of healthy tubers
Target pest	Wireworms





METAWHITE VS *MELOLONTHA MELOLONTHA*

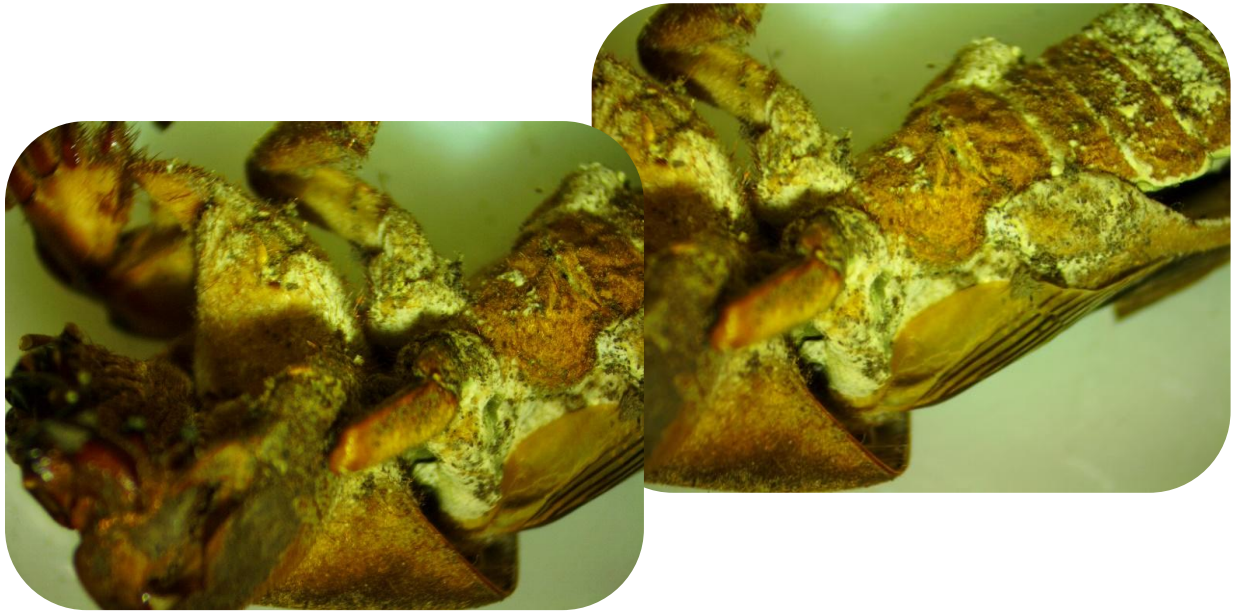
Field and greenhouse trials
Location: Moldova 2021
Pest to control: *Melolontha Melolontha* (**Cockchafer\May beetle**)

Control of May beetle larvae (Melolontha spp.) in greenhouse-grown tomatoes				
Variant of the experiment	**Biological efficiency**			
Days after application	**3**	**7**	**14**	**21**
Larvae of the 1st and 2nd instar				
Control, individuals per m^2	15,0	15,0	15,0	15,0
Metawhite 3 l/ha, %	13,86	20,68	34,54	37,95
Metawhite 6 l/ha, %	18,14	30,80	45,43	54,57
Metawhite 10 l/ha, %	26,22	38,14	52,61	63,19
3rd instar larvae				
Control, individuals per m^2	15,0	15,0	15,0	15,0
Metawhite 3 l/ha, %	9,37	18,74	28,12	31,30
Metawhite 6 l/ha, %	13,86	24,20	34,54	41,37
Metawhite 10 l/ha, %	23,07	30,80	42,33	50,06

Variants	Reduction of pests amount compared to the control			Reduction of damaged plants comparing to control, %	
	On the 5th day after treatment	On the 3rd day after germination	On the 14th day after germination	3rd day	14th day
	Melolontha grubs				
Sunflower					
Control, individuals per m^2	2,75	3,00	2,25	-	-
Metawhite 5 l/ha, %	72,7	75,0	77,8	74,2	79,7
Metawhite 10 l/ha, %	81,8	83,3	88,9	83,3	88,4
Metawhite 15 l/ha, %	81,8	83,3	88,9	84,9	91,3
Corn					
Control, individuals per m^2	2,75	2,75	2,00	-	-
Metawhite 5l /ha, %	54,6	63,6	75,0	73,2	80,5
Metawhite 10 l/ha, %	72,7	81,8	87,5	81,7	89,6
Metawhite 15 l/ha, %	81,8	90,9	87,5	85,9	93,5

METAWHITE VS *GRYLLOTALPA GRYLLOTALPA*

Control of Gryllotalpa gryllotalpa in greenhouse-grown tomatoes				
Variant of the experiment	Biological efficiency			
Days after application	3	7	14	21
Biological effectiveness, %				
Control, individuals per m^2	13,00	15,00	18,00	20,00
Metawhite 3 l/ha, %	13,37	30,56	37,50	33,47
Metawhite 6 l/ha, %	27,73	54,21	70,42	73,83
Metawhite 10 l/ha, %	36,95	59,62	76,84	78,59



Field Trial #1
Trial location: Moldova, 2021
Greenhouse crop – tomatoes
Pest to control: Gryllotalpa

Field Trial #2
Trial location: Ukraine, UkrSRSPQ IPPNAAS, 2020
Crop: Corn
Dynamics of the imago of the *Gryllotalpa sp.* number in corn

Application method	Product	Number of pest, specimen /plant	Efficiency on the 7th day,%	Efficiency on the 14th day,%	Efficiency on the 21st day,%	Efficiency on the 28th day,%
Without treatment	Control	5	-	-	-	-
Pre-sowing soil treatment, 10 l/ha	Metawhite Metarhizium	5	10,5	40,9	58,9	58,9
Pre-sowing soil treatment , 10 l/ha	Metawhite Beauveria	5	15,6	60,8	70,2	74,5

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METAWHITE EFFECT ON NEMATODES, UKRAINE

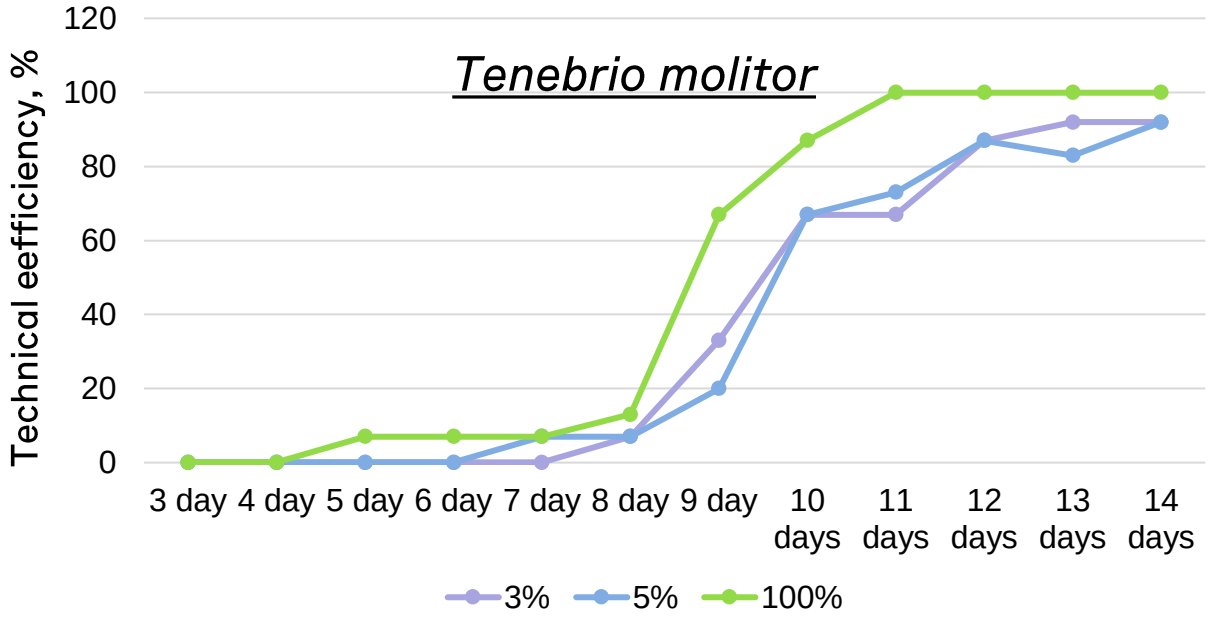
Growing season: December 2024 – March\February 2025

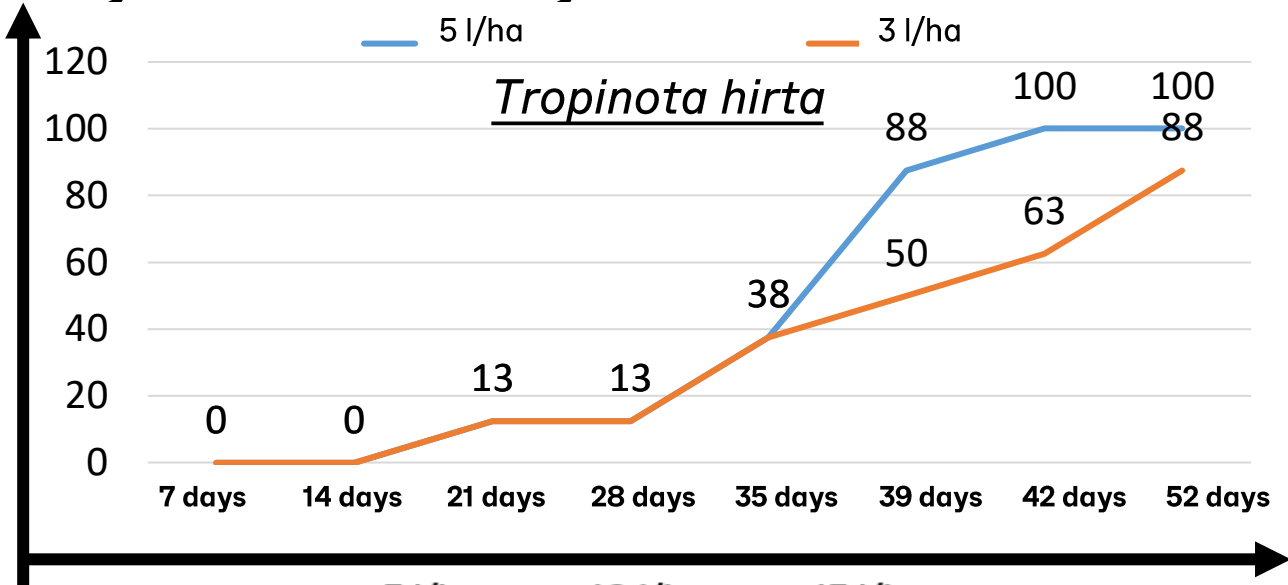
Study pest - potato golden nematode		Before planting	After the formation of the 1st generation	Growth rate of pests to the initial level	Ratio of population decline relative to control
Variants		number of larvae + eggs/ 100 cm^3 of soil	number of larvae + eggs/ 100 cm^3 of soil		
Control	Average	540	**1853**	3,4	
Trichoderma, 5,0 l/ha	Average	540	**803**	1,5	**2,3 (56%)**
Metawhite, 15 l/ha	Average	560	**531**	0,9	**3,5 (71%)**

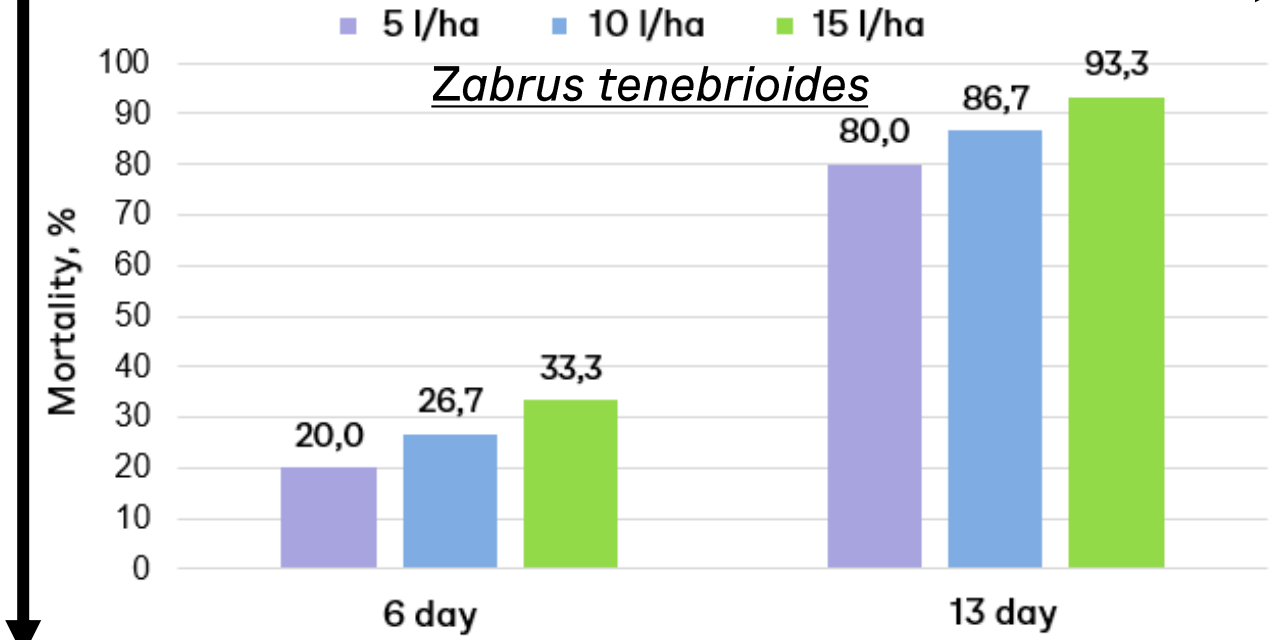
№	Nematode species and eco-groups	Average number, individuals/100g of soil		
		Variants/repetition of the experiment		
		Control	Trichoderma, 5,0 l/ha	Metawhite, 15 l/ha
		Av.	Av.	Av.
	Phyto-parasitic nematodes	**440**	**345**	**143**
1	Pratylenchus pratensis	53	50	32
2	Ditylenchus dipsaci	120	92	38
3	Tylenchorhynchus dubius	28	10	7
4	Paratylenchus nanus	180	133	53
5	Helicotylenchus dihystera	15	-	-
6	Criconema sp.	43	60	13
Technical efficiency % vs control		-	21.6%	**67.5%**

METAWHITE VS TENEBRIO, ZABRUS, TROPINOTA

Place of trial	Type of trial	Application method	Binomial name	Common pest name	Technical efficiency %
Ukraine	Phytotron conditions	Spraying	*Tenebrio molitor*	Mealworm beetle	80-93,3
		Pre-sowing tillage	*Zabrus tenebrioides*	Corn ground beetle	88-97
		Drip irrigation	*Tropinota hirta*	Apple blossom beetle	88-100



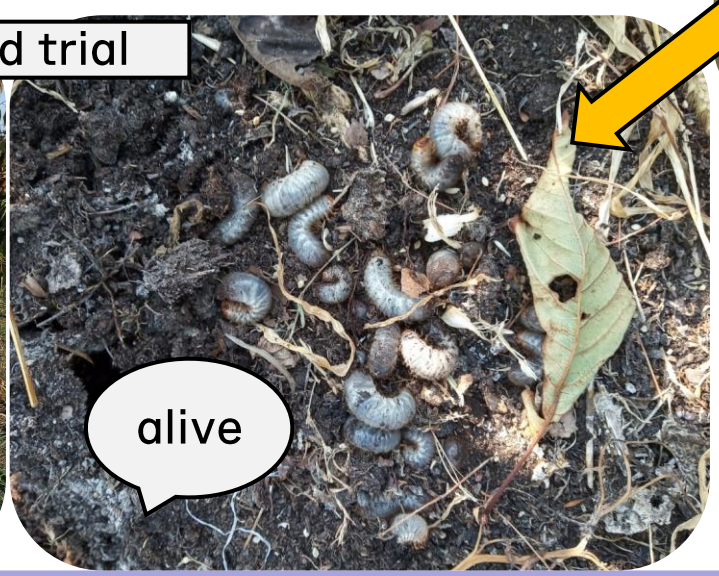




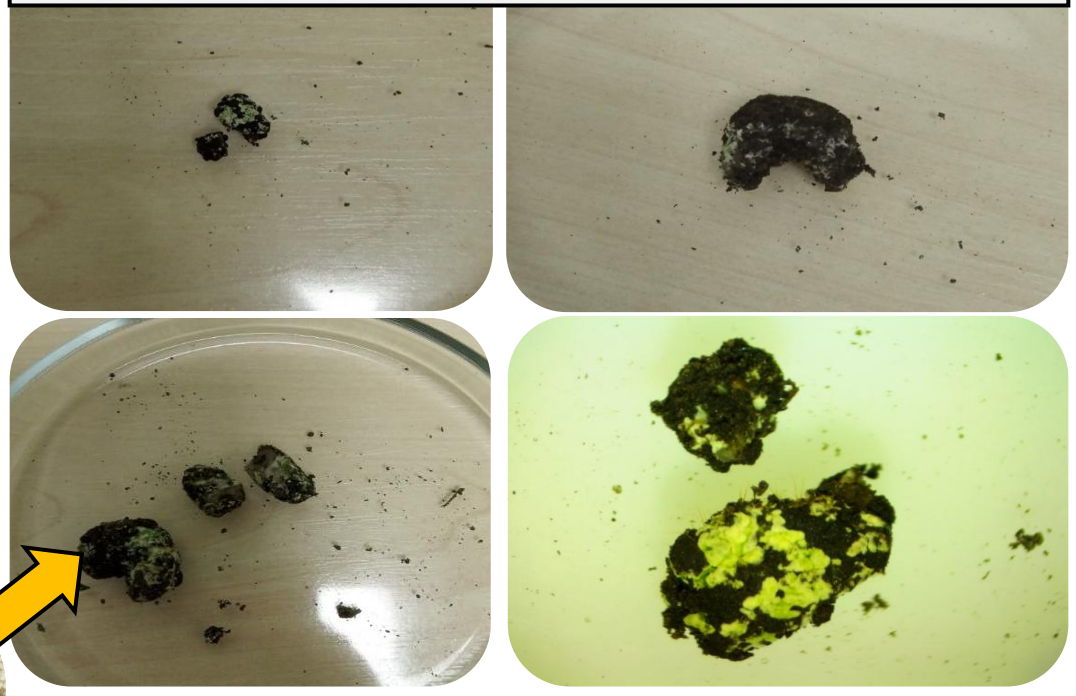
EXTENDED ACTIVITY OF METAWHITE AGAINST *TROPINOTA HIRTA* 2020

Place of trial - HH Artel 1 (Kyiv region, Ukraine)
Trial area - 3-6 ha
Target object - larvae of the Maybeetle (Melolontha), Apple Blossom Beetle (Tropinota hirta)
Crop – cherry; **Variety -** Beilis, Regina
Phenophase of monitoring - end of growth and formation of the apical bud (July)
Method of application - drip irrigation in May
Soil pH: - 6.5
Application rate – 5-10-15 l/ha

Field trial



Infection development on larvae collected from the field with no additional treatment



Alive Tropinota Hirta larvae were collected from test sites and taken to laboratory for further tests. In few weeks without any additional treatments all larvae were affected, resulting in high mortality rates.

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Nature works!

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