

FUTURECO NOFLY™ A NEW TOOL AGAINST WHITEFLIES IN IPM

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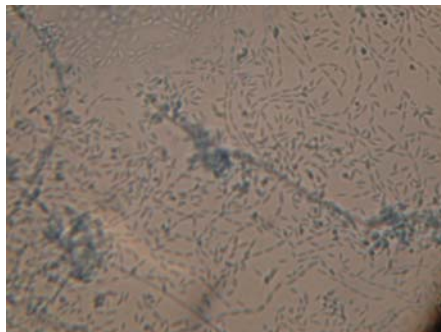
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BIOPESTICIDE NOFLY

1. Active Ingredient Identification

Paecilomyces fumosoroseus strain FE9901:

- Isolated in India in 1992 from an adult of *Bemisia tabaci*
- Deposited at USDA – ARS collection of entomopathogenic fungi
- Hosts include whiteflies, mealy bugs, beetles, caterpillars and flies
- Intended for biological control of whitefly IPM



BIOPESTICIDE NOFLY

2. Active Ingredient Risk Assessment



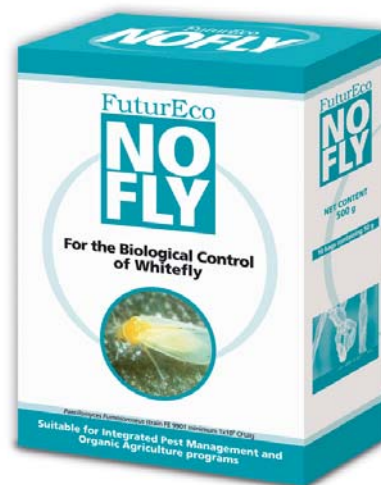
- No acute toxic effects (studies on rats and ferrets)
- No antibiotic activity (*Bacillus subtilis* and *Micrococcus luteus*)
- No antiproliferative or cytotoxicity activity in cell lines (H60 like)
- Beauverolides M and I were identified in a still culture
- No ADI, AOEL or drinking water limit needed
- It is not plant pathogenic

BIOPESTICIDE NOFLY

3. Characteristics of Formulation



- Wettable powder formulation (WP) for spray application
- Applied with conventional spraying equipment
- Innundative treatments directed to both sides of the leaves
- Minimum 3 applications per season
- Applications at first symptoms at any stage of the crop



NOFLY: SUITABILITY FOR IPM

1. Efficacy Assays *in vitro*



Target pest	Treatments	Test system	Findings (% Efficacy)		
				FS	IS
<i>Trialeurodes vaporariorum</i> <i>Bemisia tabaci</i>	Fresh spores Incubated fungus (12h) (PI)	Bean plants		FS	IS
			Eggs	90	34
			N1 nymphs	100	30
<i>Trialeurodes vaporariorum</i> <i>Bemisia tabaci</i>	5 doses of NOFLY	Tomato leaf discs		DM	NS
			Eggs	80	80
			N1	100	100
			N4	100	100
<i>Aleurodicus dispersus</i> Eggs, N1, N4	Low and high commercial dose NOFLY	Guava leaf discs		Lw	Hd
			Eggs	36	48
			N1	93	100
			N4	93	98
<i>Lecanoideus floccissimus</i> eggs, N1 and N4	Low and high commercial dose NOFLY	Banana leaf discs	Eggs	40	40
			N1	98	99
			N4	100	100

NOFLY: SUITABILITY FOR IPM

2. TGAI Field Efficacy Trials



Target pest	Treatments	Test system	Findings (% efficacy)		
				TGAI	Standard
<i>T. vaporariorum</i> and <i>Bemisia tabaci</i>	TGAI Pyriproxyfen	Greenhouse Natural Infestation IPM	Adults	63	85
			Eggs	71	0
			Larvae	62,5	63
			Pupae	84	94,5
<i>Bemisia tabaci</i>	TGAI Pyriporxyfen	Greenhouse Artificial Infestation IPM	Adults	50	76
			Larvae	77	77
			Pupae	24	23

NOFLY: SUITABILITY FOR IPM

3. Commercial Field Trials



Crop	Year	Site	Treatments	% Efficacy	
				Adults	Pupae
Tomato	2003	Barcelona	Pyriproxyfen	22	89
			Low Dose NF	5	81
			High Dose NF	39	83
Tomato	2004	Tenerife	Pyriproxyfen	63	16
			Low Dose NF	31	85
			High Dose NF	47	100
Tomato	2008	Granada	Buprofezin	31	39
			½ Low Dose NF	33	48
			Low Dose NF	23	50
			High Dose NF	35	62

NOFLY: SUITABILITY FOR IPM

3. Commercial Field Trials



Crop	Year	Site	Treatments	% Efficacy	
				Adults	Pupae
Zucchini	2007	Seville	Buprofezin	33	56
			½ Low Dose NF	20	8
			Low Dose NF	26	47
			High Dose NF	39	40
Melon	2008	Murcia	Buprofezin	0	29
			½ Low Dose NF	0	28
			Low Dose NF	0	43
			High Dose NF	0	40
Pepper	2008	Granada	Buprofezin	21	21
			½ Low Dose NF	27	25
			Low Dose NF	32	29
			High Dose NF	20	62

NOFLY: SUITABILITY FOR IPM

4. Side Effects on Natural Enemies – *in vitro*



Effects on parasitoid wasp *Encarsia formosa*

TREATMENT	% MORTALITY	% LOSS PARASITISM
Control (C)	3.8 ± 2.39 a	
Cypermethrin	77.5 ± 3.73 b	58.7 ± 1.88 a
NOFLY	0 ± 0 a	11.4 ± 4.71 b

Harmless at the commercial dose

Effects on parasitoid wasp *Eretmocerus mundus*

TREATMENT	% MORTALITY	% LOSS PARASITISM
Control (C)	11.3 ± 3.15	
Deltamethrin	12.5 ± 5.53	74.7 ± 4.38 a
NOFLY	16.3 ± 4.27	41.7 ± 6.09 b

Harmless at commercial dose

NOFLY: SUITABILITY FOR IPM

4. Side effects on natural enemies – *in vitro*



Effects on predatory bug *Macrolophus caliginosus* (N1)

% Mortality (cumulative)

Treatment	Day 1	Day 2	Day 7	Day 9
Control (C)	0 ± 0a	1.4 ± 1.39a	8.3 ± 2.41a	13.9 ± 1.39a
Deltamethrin TS	22.2 ± 1.39b	33.3 ± 8.67b	44.4 ± 7.35b	55.6 ± 7.35b
Pyriproxyfen SS	2.8 ± 2.78a	6.9 ± 2.78ab	11.1 ± 2.78a	20.8 ± 0c
NOFLY	2.8 ± 2.78a	4.2 ± 4.17a	40.3 ± 5.01b	75 ± 2.41d

Dangerous at commercial dose

Effects on predatory bug *Orius laevigatus* (N1)

Treatment	% Mortality at day 8 th
Control (C)	23.93 ± 1.92 a
Toxic standard (deltamethrin)	96.70 ± 1.92 c
Selective standard (pyriproxyfen)	46.70 ± 2.72 b
NOFLY	41.70 ± 3.69 b

Harmless at commercial dose

NOFLY: SUITABILITY FOR IPM

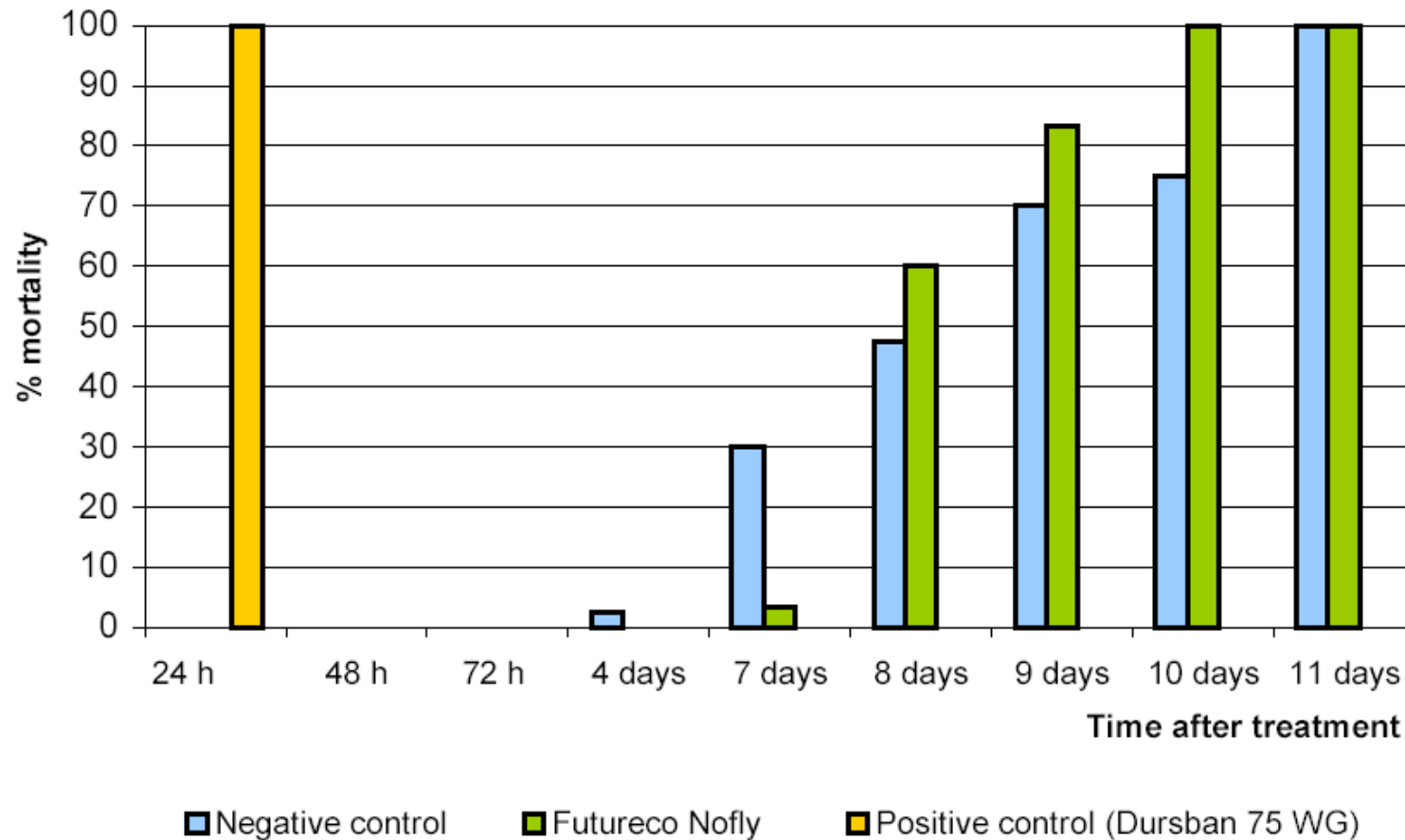
5. Side effects on natural enemies - field

Item tested	Natural Enemies	Effects of NOFLY		
TGAI field (Tenerife)	<i>Eretmocerus mundus</i> <i>Encarsia sophia</i>	Treatment	% Parasitism	% Emerged
		Control	33,17	46,09
		Chemical	39,36	51,41
		NOFLY	47,33	24,73
NOFLY field (Barcelona)	<i>Macrolophus caliginosus</i> <i>Encarsia formosa</i>			
NOFLY field (Tenerife)	<i>Encarsia sophia</i> <i>Orius laevigatus</i>	Treatment	% Predated	% Parasited
		Control	0,0	33,61
		Chemical	0,0	26,39
		NF LD	1,92	42,75
		NF HD	19,17	34,74

NOFLY: SUITABILITY FOR IPM

Side effects on beneficials

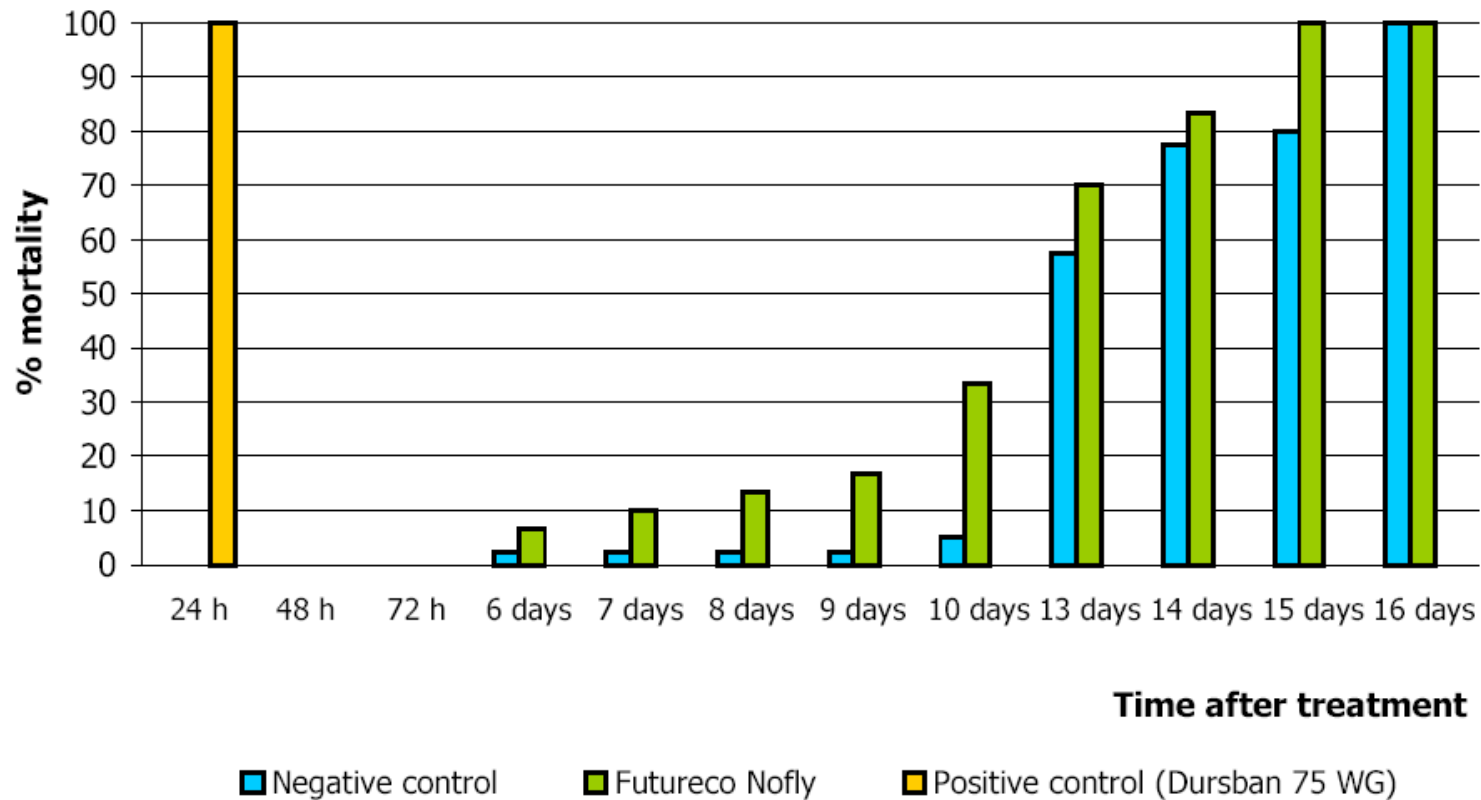
Effects on *Aphis mellifera* working bees by ingestion (oral test)



NOFLY: SUITABILITY FOR IPM

Side effects on beneficials

Effects on *Aphis mellifera* working bees by contact



NOFLY: SUITABILITY FOR IPM

6. Compatibility with PPPs



Tank mix compatibility with fungicides and insecticides

- % Compatibility = % Viability mixture / % Viability control

- Mixtures using commercial doses

Active substance	Formulations	Doses (%)	Compatibility
Copper oxychloride	CUPRAGEX 50 CUPROFLOW	0,15 - 0,60	100%
Procymidone	DRIZA	0,05 - 0,2	0%
Pyrimethanil	SCALA	0,075 - 0,2	0%
Fenamirol	RUBIGAN 12	0,01 - 0,04	100 %
Iprodione	ROVRAL	0,05 - 0,02	0%
Natural pyrethrins	PELITRE-HORT	0,1 - 0,4	0%
Pirimicarb	APHOX	0,05 - 0,2	100%
Imidacloprid	CONFIDOR	0,05 - 0, 15	100%
Acrinathrin	OSYRIS	0,02 - 0,08	100%
<i>Beauveria bassiana</i> strain GHA	BOTANIGARD	0,2 - 0,6	100%

CLOSING REMARKS



- Effectiveness of NOFLY is at least the same as the standards
- Immature stages of whitefly are most susceptible than adults
- NOFLY is safe for Natural Enemies and Beneficial Organisms
- NOFLY can be applied in tank mixtures with other PPPs, even some synthetic fungicides

NOFLY is a suitable tool for IPM programs in horticultural crops

THANK YOU FOR YOUR ATTENTION

