The new biological nematicide BioAct, its production, application and efficacy

Peter Lüth, Graeme Philip and Massimo Benucci
The Strain (251)

- first isolated from an egg mass of Meloidogyne incognita in 1980 in the Philippines (University of Los Baños)
- deposited with the Australian Government Analytical Laboratories (AGAL) under the Accession No. 89/030550
- patented in: The Philippines, The USA, Japan, Italy, Spain, France, Germany, the UK
- originally registered in the Philippines in 1989
- Prophyta overtook the strain in 2001
Mode of Action

Paecilomyces lilacinus attackes:

• the eggs of plant parasitic nematodes

• the vermiform stages of plant parasitic nematodes
Paecilomyces lilacinus

the fungus is attacking a nematode egg

conidia are germinating
Paecilomyces lilacinus

the fungus has killed an adult nematode of the genus Pratylenchus

conidia are germinating
Requirements to bring a biocontrol agents to the market

- cost effective manufacturing
- registration
- good efficacy and applicability (including shelf life)
Manufacturing
Filling of the fermenter
Sterilising of the fermenter

- 121 °C
- 20 min
- vacuum technology
Incubation of the fermenters
Harvest of the fungus from the fermenter
Separation of the conidia
Registration
Tox and Eco-tox Studies

Tox studies
- oral tox
- inhalative tox
- pulmonary tox
- dermal tox
- intraperitoneal tox
- eye irritation
- skin irritation
- skin sensitization
- genotoxicity on S. typhimirium

Eco-tox studies
- rainbow trout
- Daphnia magna
- Desmodesmus subspicatus
- earthworm (Eisenia fedida)
- Aphidius rhopalosiphi
- Typhhlodromus Pyri
- Poecilus cupreus
- Aleochara bilineata
- soil micro-flora

Physical and Chemical Properties

Influence of the temperature on the germination of the spores
Influence of the Temperature

Study code: 20011290/01-ALPI

*Paecilomyces lilacinus* strain 251
Incubation for 24 h at 36°C

*Paecilomyces lilacinus* strain 251
Incubation for 48 h at 36°C

*Paecilomyces lilacinus* strain 251
Incubation for 72 h at 36°C

*Paecilomyces lilacinus* strain 251
Incubation for 96 h at 36°C

*Paecilomyces lilacinus* strain 251
Incubation for 120 h at 36°C

*Paecilomyces lilacinus* strain 251
Incubation for 144 h at 36°C
Water dispersible granule
Carrier: Glucose
1 x 10^{10} living conidia per gram product
Rate: 0.2 gram per plant
Shelf life: 6 months at +4 °C and 12 months at – 10 °C
Applicable to control: Root-knot nematodes, lesion nematodes, burrowing nematodes, citrus nematodes, sting nematodes and others
The product is manufactured on a pure biological basis.

Wettable powder
Carrier: milk powder
1 x 10^{11} living conidia per gram product
Rate: 0.02 gram per plant
Shelf life: 6 months at room temperature
12 months at +4 °C
24 month at -10 °C
BioAct® WG (MeloCon® WG) is registered in:

- USA (after 21 months)
- Bulgaria
- The Philippines
- New Caledonia
- Italy
- Turkey
- Mexico (Myconema)
BioAct®WG is applied for registration in:

- Europe (not yet granted after 50 months)
- Morocco
- Argentina
- Costa Rica
Efficacy
Results from a pot trial in Japan (Cucumber)

### 2. Sowing at 7th day after drench.

<table>
<thead>
<tr>
<th></th>
<th>Dosage (kg/10a)</th>
<th>Drench volume (L/10a)</th>
<th>Plant growth</th>
<th>Living% of nematode</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Length</td>
<td>Weight</td>
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<tr>
<td>1. BIOACT</td>
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<td>5000</td>
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<td>2. BIOACT</td>
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<td>1.7</td>
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<td>4. NEMATHORIN</td>
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<td>169</td>
<td>2.3</td>
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<tr>
<td>5. Control</td>
<td>-</td>
<td>-</td>
<td>87</td>
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Results from GEP trials in Italy and Greece 2004
Cucumber trial in Bodeica/Patra (Achaia), Greece 2004
Nematode species: Meloidogyne incognita

Application of BioAct: 14 days prior to transplanting, at transplanting and 6 weeks after transplanting.

Disease index (0 – 10)
Cucumber trial in Bodeica/Patra (Achaia), Greece 2004
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Application of BioAct: 14 days prior to transplanting, at transplanting and 6 weeks after transplanting.

Yield (kg/plot)
Tomato trial in Italy 2004 (Agrigeos S.r.l.)
Nematode species: Meloidogyne incognita

Application of BioAct: 14 days prior to transplanting, at transplanting and 4x in a distance of 6 weeks after transplanting.

disease index (0 – 5)

untreated control | BioAct | Nemacur
---|---|---
4.4 | 1.8 | 1.2

Larvae per 100 ml soil

untreated control | BioAct | Nemacur
---|---|---
319 | 119 | 202
Tomato trial in Italy 2004 (Agrigeos S.r.l.)
Nematode species: Meloidogyne incognita

Application of BioAct: 14 days prior to transplanting, at transplanting and 4x in a distance of 6 weeks after transplanting.

yield
Tomato trial in Greece 2004 (GAB)
Nematode species: Meloidogyne incognita

Application of BioAct: 14 days prior to transplanting, at transplanting and 2x in a distance of 6 weeks after transplanting.

Disease index (0 – 10)
Tomato trial in Greece 2004 (GAB)
Nematode species: Meloidogyne incognita

Application of BioAct: 14 days prior to transplanting, at transplanting and 2x in a distance of 6 weeks after transplanting.

Yield (kg/plot)
Directions for Use in vegetable production (via the drip irrigation system)

1st application (14 days prior to transplanting): 0.2 g BioAct/plant

2nd application (at transplanting): drench of the potting soil with 0.01 g per 100 ml soil

3rd application (6 weeks after transplanting): 0.2 g BioAct/plant

4th application (6 weeks later): 0.1 g BioAct per plant
Results on banana
Field trial in Costa Rica

Influence of different nematicide treatments on the yield of banana plants

- Untreated
- 30 g/pl chem. Nematicide 1
- 30 g/pl chem. Nematicide 2
- 30 g/pl N 1 + 30 g/pl N 2
- 1.6 g/pl BioAct WG, 150 ml/pl
- 2.4 g/pl BioAct WG, 150 ml/pl
Root promoting effect of MeloCon®WG
(results from a pot trial in the Philippines)

Banana roots without MeloCon®WG and without any nematodes

Banana roots with MeloCon®WG but without any nematodes
Banana trials in the Philippines
**Results of Demonstration Farm Trials**

BioAct treatment: 1 gram per plant every 6 months

- Magatos: 6x
- Compostela: 4x
- Dacudao: 3x (initial application to the nursery plants)
- Tamayong: 3x (initial application to the nursery plants)

* Differences are statistically significant

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**yield**

**root weight**

* Differences are statistically significant
Conclusions

• BioAct is an effective and user friendly nematicide. It neither endangers the applicator nor the environment.

• It has to be applied with water.

• A WP formulation has been developed with a high concentration of the active ingredient, which can be used at extremely low rates.
Thank you