Naturalis

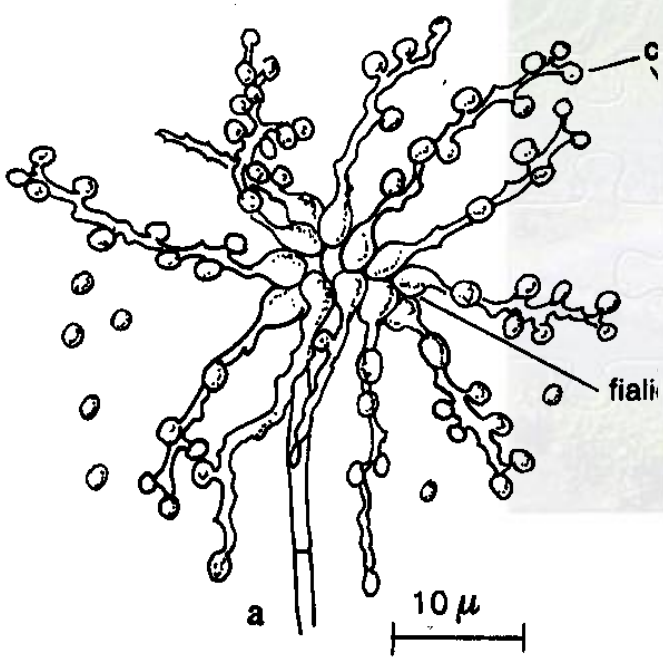
Bioinsecticide based on *Beauveria bassiana* strain ATCC 74040

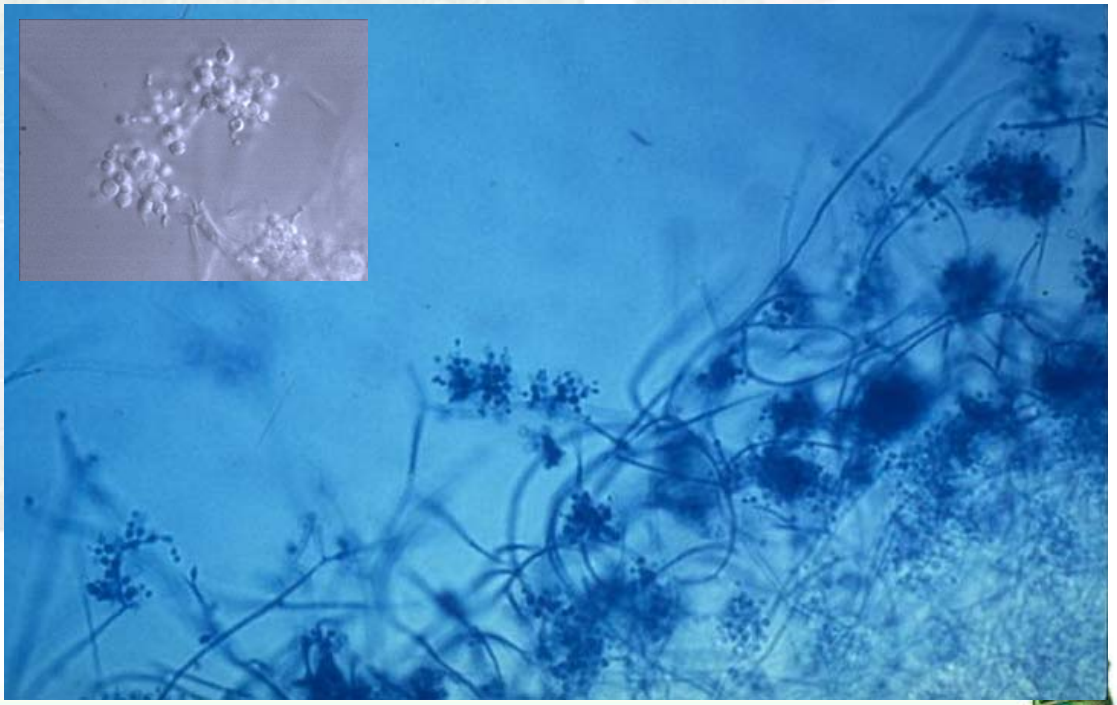





Beauveria bassiana

- *Beauveria bassiana* (Deuteromycetes, Moniliales) was first recognized in 1835 by Agostino Bassi as the causal agent of the white muscardine disease of the silkworm.
- Bassi showed that the disease can be transmitted from one insect to the other.
- *B. bassiana* can affect a wide range of arthropod pests, such as mites, coleopteran and hemipteran pests, and all their developmental stages (eggs, immature stages, and adults). Various strains differ in their host range.





NATURALIS

- **Naturalis** is a bioinsecticide based on living conidiospores of ***B. bassiana*** **strain ATCC 74040**.
- **ATCC 74040** was obtained from the cotton boll weevil, *Anthonomus grandis*, at the USDA-ARS Crop Insect Research Center, Lower Rio Grande Valley, Texas, USA (not genetically modified).
- In 2005 Intrachem Bio International S.A. (Geneva, Switzerland) acquired production and distribution rights from Troy Biosciences Inc.
- Manufacturing occurs under the control of Intrachem Production S.r.l. (Bergamo, Italy).
- **Naturalis** is registered in USA, Mexico, Italy, Spain, Greece, Switzerland, Morocco, and Korea.
- Registration is pending in Hungary, the Netherlands, UK, and Germany.

NATURALIS

- **Naturalis** is a suspension concentrate (SC) containing at least 2.3 x 10^7 viable conidiospores / ml of *B. bassiana* strain ATCC 74040.
- **Naturalis** can be stored for 6 months at room temperature and for 12 months in the refrigerator (4-5°C).
- **Naturalis** can be applied with any conventional spray equipment.
- **Naturalis** can be used in Organic Farming and fits into any other pest management strategy.
- **Naturalis** is safe to beneficials, humans, and the environment.



NATURALIS

MODE OF ACTION

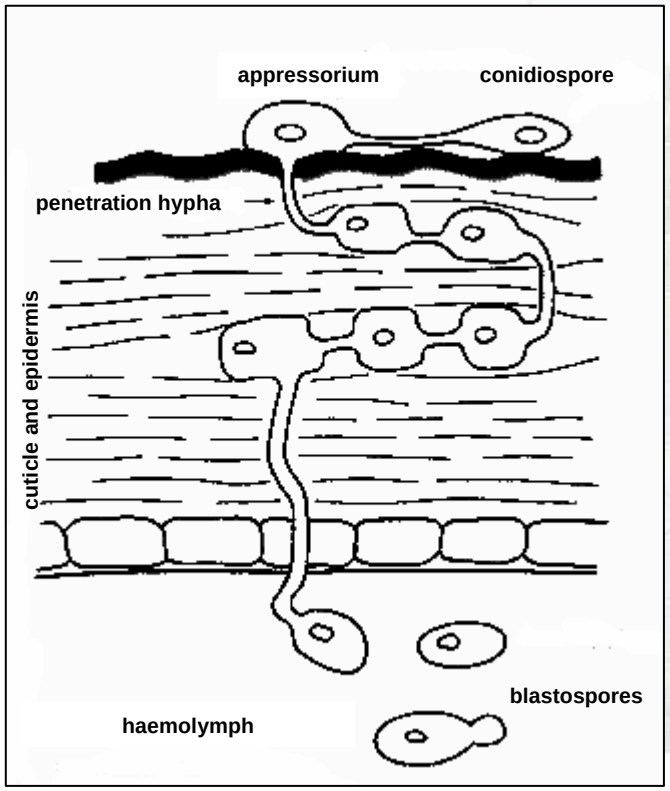
- **Contact bioinsecticide** (primary effect)

Host dies due to depletion of nutrients and dehydration

- **Oviposition deterrent-activity** (secondary effect) on Tephritid flies

NATURALIS

MODE OF ACTION (1) – contact bioinsecticide



- Under adequate temperature and humidity conditions, the conidiospores, in contact with the insect's cuticle, germinate.
- The spores form an appressorium.
- A fine penetration hypha perforates the cuticle, grows, and differentiates into other penetration hyphae.
- At this stage, if lack of humidity and/or insect moulting occur, the penetration process is interrupted; if not, the fungus invades the insect's body.
- The mycelium proliferates by feeding on the host's haemolymph, and blastospores are produced.
- The host dies within 2-3 days due to depletion of nutrients and dehydration.

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MODE OF ACTION (2) – oviposition deterrent activity on Tephritid flies

- Females of the Mediterranean fruit fly, *Ceratitis capitata,* laid a significantly lower number of eggs in treated than in untreated fruits (Ortu *et al.*, in press).
- Females visited both treated and untreated fruits, but laid almost no eggs on treated fruits. The females seem to perceive the surface of treated fruits as not suitable for oviposition.
- Similar observations were made on the olive fly, *Bactrocera oleae,* and on the cherry fruit fly, *Rhagoletis cerasi*.

NATURALIS

Environmental conditions for optimum activity of *B. bassiana* strain ATCC 74040

Temperatures

- Optimum temperature range: 20 - 27°C
- Good activity from 27 to 32°C
- No spore viability at temperatures exceeding 35°C
- Spore germination stops at temperatures below 10°C

Relative humidity

- Optimum R.H. range: > 50%
- Spore germination stops at R.H. levels below 15 %
- The higher the R.H., the more the antagonist is prone to sporulate

Optimum sporulation conditions: temperature 25°C, R.H. ≥80%

NATURALIS

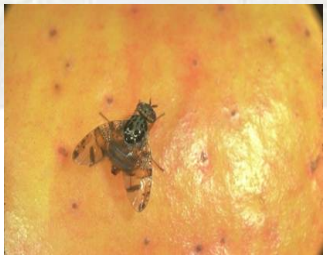
MAJOR TARGETS




White flies, two-spotted spider mites, Thrips, Wireworms



Aphids, Tingids, Leafhoppers

Hazelnut/chestnut weevil, Tephritid flies

NATURALIS

MAJOR TARGET CROPS (1)





pome fruits, stone fruits, vine & table grapes




kiwifruit, olive, citrus fruit, hazelnut, chestnut

NATURALIS

MAJOR TARGET CROPS (2)





solanaceous crops, cucurbits, raspberry, blackberry




leaf, root, and stem vegetables, potato, flowers & ornamentals …

NATURALIS

INSTRUCTIONS FOR USE

- **Application rates**

0.1 - 0.2% v/v (1 - 3 l/ha) depending on crop and target

- **Foliar application**

against white flies, aphids, two-spotted spider mites, tingids, leafhoppers, and Tephritid flies:

- at the very first appearance of target pest on crop
- ensure thorough wetting of vegetation
- repeat applications at 4-7-day intervals if necessary

- **Soil application**

against wireworms, hazelnut and chestnut weevils:

- apply product into soil at transplanting (wireworms) / in autumn (weevils)

NATURALIS

COMPATIBILITY

- **Insecticides & acaricides**

Naturalis can be tank-mixed with numerous insecticides and acaricides

- **Fungicides**

Naturalis can be tank-mixed with copper- and sulphur-based fungicides

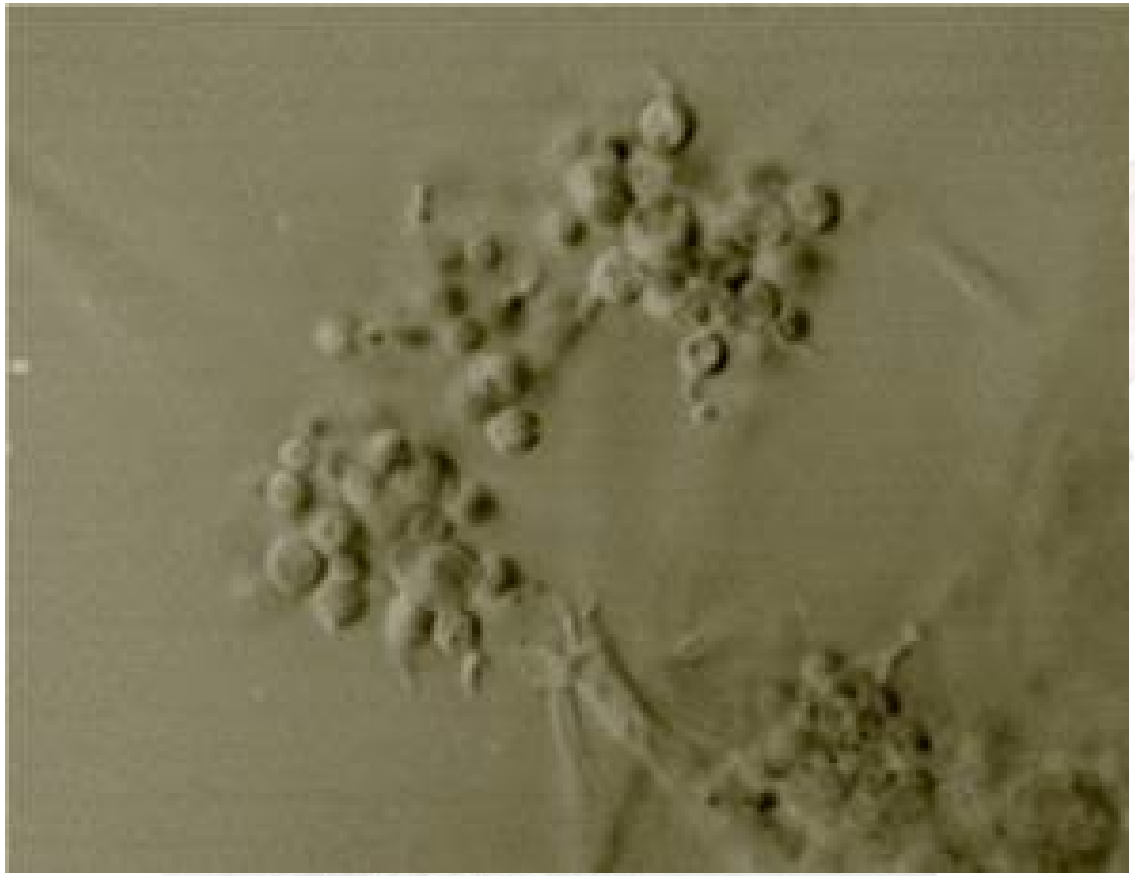
Naturalis can not be tank-mixed with some synthetic fungicides, (recommended time interval between applications: 2-4 days; see Compatibility Chart)

NATURALIS

BENEFITS

- highly effective against a wide range of pests (white flies, spider mites, fruit flies, wireworms, etc.)
- unique mode of action, no phytotoxic effects
- can be used in Organic Farming and fits into any other pest management strategy
- can help to reduce the risk of the development of populations resistant to conventional insecticides (suitable for inclusion in resistance management strategies, also in tank mixture with conventional pesticides)
- can help to reduce the risk of undesired residues of agrochemicals in the final produce
- no pre-harvest interval and no re-entry time
- safe to beneficials, humans, and environment

NATURALIS



Corroborating efficacy trials

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Against two-spotted spider mites on tomato (Italy – greenhouse)

	Treatment	Rate	No. mobile stages/ leaf (%)	Efficacy (%)
1	**Fenazaquin 18.32%** (1 applic.)	100 ml/hl	0.9 b	77.0
2	**Naturalis** (2 applic. at 7-day intervals)	125 ml/hl	0.8 b	83.3
3	**Naturalis** (2 applic. at 7-day intervals)	250 ml/hl	0.7 b	79.8
5	**Untreated control**	-	4.4 a	-

NATURALIS

Against tomato russet mite (*Aculops lycopersici*) on tomato (Italy – greenhouse)

Treatment		Rate	No. adults/ flower	No. nymphs/ flower	No. eggs/ flower
1	**Fenazaquin 18.32%** (4 applic. at 7-day intervals)	50 ml/hl	0.0 b	0.0 c	0.0 b
2	**Naturalis** (4 applic. at 7-day intervals)	125 ml/hl	0.1 b	1.7 b	0.0 b
3	**Naturalis** (4 applic. at 7-day intervals)	250 ml/hl	0.0 b	0.0 c	0.0 b
5	**Untreated control**	-	20.3 a	19.5 a	12.8 a

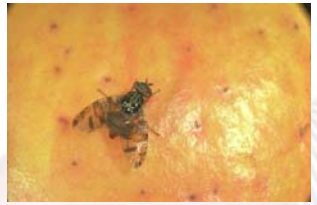
NATURALIS

Against cherry fruit fly (*Rhagoletis cerasi*) on cherry (Italy – open field)

	Treatment	Rate	Infested fruits (%)	Efficacy (%)
1	**Dimethoate 38%** (1 applic.)	**50 ml/hl**	**3.2 b**	**39.0**
2	**Naturalis** (5 applic. at 5-7-day intervals)	**130 ml/hl**	**0.6 c**	**88.6**
3	**Naturalis** (3 applic. at 10-12-day intervals)	**250 ml/hl**	**1.5 c**	**72.9**
4	**Dimethoate 38%** (1 applic.) **+ Naturalis** (2 applic. at 5-7-day interval)	**50 ml/hl 130 ml/hl**	**2.2 c**	**80.4**
5	**Untreated control**	**-**	**6.1 a**	**-**

NATURALIS

Against Med fly (*Ceratitis capitata*) on peach (Italy – open field)



	Treatment	Rate	Infested fruits (%)	Efficacy (%)
1	**Dimethoate 38%** (1 applic.)	**120 ml/hl**	**7.0 b**	**76.0**
2	**Naturalis** (5 applic. at 7-day intervals)	**125 ml/hl**	**7.2 b**	**75.3**
3	**Naturalis** (3 applic. at 14-day intervals)	**250 ml/hl**	**9.1 b**	**68.9**
4	**Dimethoate 38%** (1 applic.) **+ Naturalis** (3 applic. at 7-day intervals)	**120 ml/hl 130 ml/hl**	**3.8 c**	**87.1**
5	**Untreated control**	**-**	**29.1 a**	**-**

NATURALIS

Against wireworms on potato (Italy – open field)

	Treatment	Rate	Damaged tubers (%)	Efficacy (%)
1	**Fipronil 2%** - 1 applic.	**7.5 kg/ha**	**2.1 b**	**79**
2	**Naturalis** - 1 applic.	**3 l/ha**	**3.6 b**	**68**
3	**Naturalis** - 2 applic.	**2 l/ha**	**2.6 b**	**71**
4	**Untreated control**	**-**	**9.0 a**	**-**

Thank you for your attention!