



IC<sup>2</sup> INSTITUTE—GLOBAL COMMERCIALIZATION GROUP

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## CTC36 BIOREND R Biological Insecticide [www.biorend.com](http://www.biorend.com)

### Market need

Each year, producers of berries lose 10% to 40% crop yield as a result of pest and insect infestation. Grape producers, greenhouse owners, golf courses and home gardens experience this problem, as well., These pests are increasingly resistant to chemical applications, resulting in more frequent applications and increased costs.

In addition, consumers and government regulators are becoming more skeptical of chemical residue on products, and the associated pollution caused by chemical run-off. New biological insecticides offer an attractive solution to improved efficacy, lower cost, and increased yields without harmful environmental side effects.

Biorend R is a Biological Insecticide created to control insects. It can reach areas in plants where chemicals or other biological products cannot control. It effectively controls 40% to 80% of harmful insects and improves crop yields by up to 30%.

### Benefits

Biorend R provides producers the following benefits:

- Avoids partial or total loss of their plantation investments caused by insect damage
- Heals wounds caused by insects, inducing the regeneration of new tissues and increase in root mass.
- Reaches areas in the plant (for example, inside roots) where other biological insecticides cannot.
- Faster in comparison to other biological control agents, with observable results in 30 days versus 90 days with current solutions on the market, in blueberry plantations in Chile and date palms and greenhouses in Spain.
- Decreases damage to crops due to pests by 40% to 80%, based on studies conducted with blueberry producers at plantations at both Vitalberry and Hortifrut, in Chile, as well with palm trees as at the Instituto Valenciano de Investigaciones Agrarias in Spain.
- Can be included in an Integrated Pest Management Program and is compatible with other entomopathogenic agents.
- Can extend productive crop life from 8 to 15 years, based on standard crop lifecycles and observable data from field trials.
- 2-3 applications per year, compared with 5-6 applications per year of chemical solution.
- Does not destroy beneficial organisms in the environment.

### Technology description

The Biorend R biological insecticide is based on a combination of a chitosan formulation and agents (entomopathogenic nematodes), used to control insects that affect agricultural plantations. This biological insecticide combines the immunostimulant effect of chitosan, and biological control provided by entomopathogenic nematodes. Entomopathogenic nematodes are simple roundworms, are natural enemies of target insects in the environment, are non-harmful to the plants treated, and are used extensively for biological control of a wide range of harmful insects.

The biological insecticide stimulates a synergistic reaction which includes the following processes:

- Entomopathogenic nematodes carry symbiotic bacteria that kill and eliminate insects in their larvae state



WHAT STARTS HERE CHANGES THE WORLD



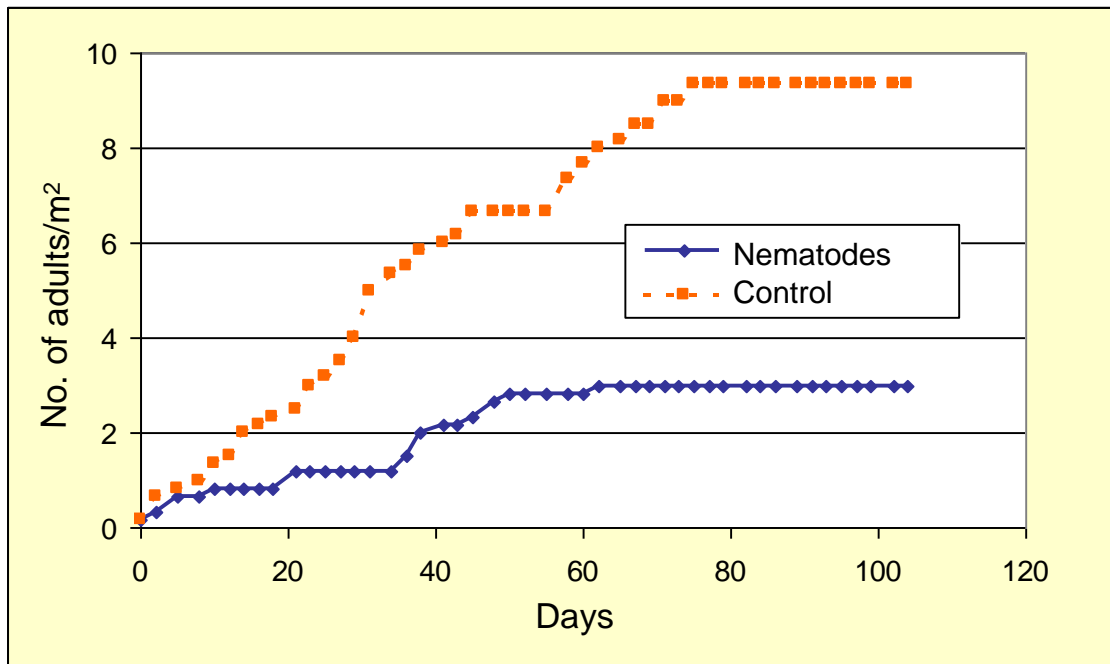
- Chitinolytic action of enzymes released by symbiotic bacteria accelerates the plant's assimilation process of chitosan
- The activity of antibiotic compounds released by bacteria inhibits proliferation of pathogenic microorganisms in insects
- The Chitosan immunostimulant effect regenerates damaged tissues and favors root growth.

Although this biological insecticide was developed mainly for berry crops in Chile, and for greenhouses, date palms, stone fruit and olives in Spain, it also can be use in vineyards, vegetables, golf courses, home gardens, as well as on citrus and virtually any fruit trees. This biological insecticide has exhibited no residual effects; Currently, Biorend R has organic certification in Spain, and Chile, and it is anticipated that organic certification will be granted in other markets, as well.

### Development status

At the present time, the technology is fully implemented in prototype stage. Successful trial testing has been performed on crops in Chile and Spain.

#### 1. Trial in Chile: Control *Aegorhinus superciliosus* in blueberries.



Effects during the emergence of adults of *Aegorhinus superciliosus* from plants of blueberries dealt with entomophagogenic nematodes *Steinernema* sp.  
Trial La Unión. INIA Quilamapu. Chillán.Chile.

#### 2. Trial in Spain: palm trees.

Trial consisted of infesting palm trees with larvae of *Rhynchophorus ferrugineus* and subsequently applying Biorend R to control the insect. Eight palm trees, diameter between 25 to 30 centimeters and sixteen palm trees, diameter between 40 to 50 centimeters, were used for the trial and 50% of them were control. All the palm trees were implanted with 9 larvae, and results were evaluated 14 and 27 days after the application.



Table 1: Results application of Biorend R in palm tree. Dead and live larvae 14 and 27 days after the application of Biorend R.

Day 14					
Biorend R			Control		
Palm tree	Alive <sup>1</sup>	Dead	Palm tree	Alive	Dead
1	0	4	1	6	0
2	1	3	2	4	0
3	1	3	3	4	0
4	2	4	4	8	0
<b>Total<sup>1</sup></b>	<b>4</b>	<b>14</b>	<b>Total</b>	<b>22</b>	<b>0</b>
<b>% efficiency</b>		<b>81,8%</b>			

Day 27					
Biorend R			Control		
Palm tree	Alive	Dead	Palm tree	Alive	Dead
1	1	2	1	5	0
2	0	1	2	7	0
3	0	3	3	6	0
4	0	4	4	3	0
5	1	1	5	4	1
6	0	1	6	7	0
7	2	1	7	3	0
8	0	3	8	6	0
<b>Total</b>	<b>4</b>	<b>16</b>	<b>Total</b>	<b>41</b>	<b>1</b>
<b>% efficiency</b>		<b>90,2%</b>			

In Spain, where the product was initially implemented (2004), sales totaled US\$883,000 in 2008. The annual growth in sales from 2004 to 2008 was 30% per year. These sales include applications in greenhouses, date palms, stone fruits and olives. In Chile, sales of this Biological Insecticide are just beginning, mainly in blue berries. Sales in Chile were approximately US\$50,000 in 2008, to five large producers who have so far implemented this technology in field trial environments.

Patent has been granted in Europe, Spain and Chile. In the United States, patent was filed in 2004 and is in approval process, and we expect the patent to be granted end 2009.

There is no unique manufacturing process required to produce this product.

For additional information, please contact:

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<sup>1</sup> Observations: the total number of larvae per plant (dead plus alive) does not total 9 net after trial, due to the fact that some larvae die naturally before entering the plant. The efficacy % is calculated in terms of the relation between live larvae in treated plants versus untreated plants:  $(1 - (\text{Infestation in treated plot after the processing} / \text{Infestation in plot control after the processing})) * 100$ .