

From Forest Nursery Notes, Summer 2009

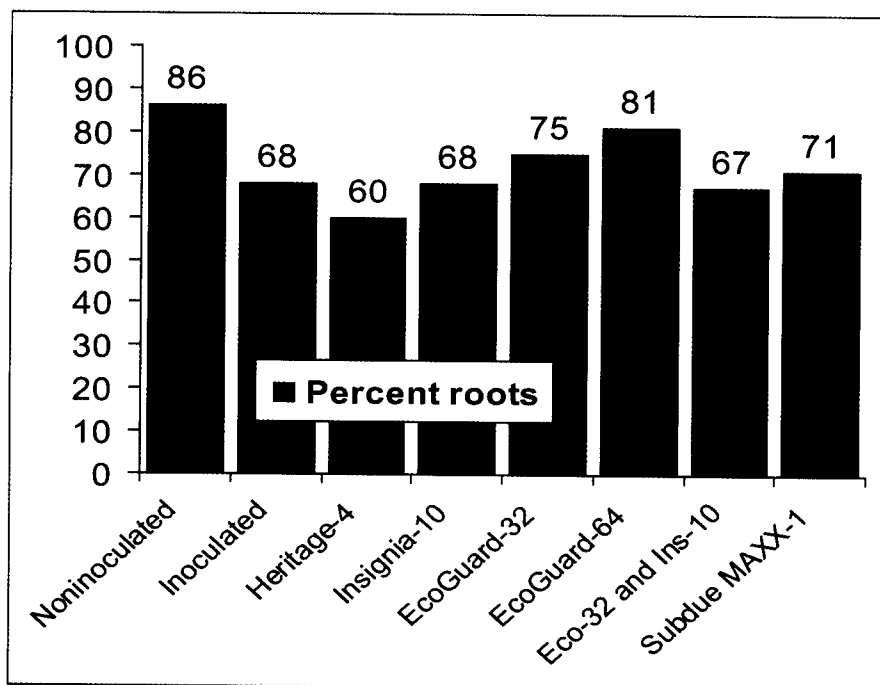
131. Biocontrol agents can provide 'green' disease control. Chase, A. R. Greenhouse Management and Production 29(1):26-28, 30-31. 2009.

Biocontrol agents can provide 'green' disease control

By A.R. Chase

Traditional biocontrol agents need to be used preventively to ensure their success.

During the 30 years I have been working with ornamentals, I have seen trends in disease control come and go. The most recent trend is to use "green" products. Which products fall into this category is not necessarily easy to define. I have selected products most likely to be designated as green. These include phosphonates, oils, bicarbonates, wetting agents, peroxides and true biological controls.



Effect of EcoGuard GN and standard fungicides on percent healthy roots of annual vinca infected with *Phytophthora* root rot.

Traditional biocontrol agents

Traditional biological control is based on living organisms. These products include:

- Bacteria, i.e., Cease (Rhapsody), Companion, EcoGuard, Taegro.
- Fungi, i.e., PlantShield HC, RootShield, SoilGard.

- Streptomycetes, i.e., Actinovate, Actino-Iron and MycoStop.

These organisms may directly attack the target pathogens or colonize specific areas of the root or foliage making it hard for pathogens to compete. They even produce chemicals that hurt the ability of the pathogens to grow, infect or reproduce.

It is usually critical that the biocontrol agent be alive and well-maintained on the host plant in order for maximum benefit. In some cases, however, the biological agents are applied more like a traditional chemical fungicide. In all cases, the products work better when allowed to establish themselves before a pathogen attacks the plant. That means these biocontrols must be used preventively and in a routine manner. Their longevity depends on the specific product, the environment they encounter and the disease pressure. Here is a review of four commonly used products that we have trialed.

Actinovate

We have worked with Actinovate (*Streptomyces lydicus*) from Natural Industries for several years. It has provided different levels of control depending on which plant it was tested.

On foliar diseases, Actinovate provided some to good control of Botrytis blight and powdery mildew, but we did not see any control of downy mildew, Alternaria leaf spot and rust. For soil-borne diseases we have seen some control of *Cylindrocladium*, *Fusarium*, *Phytophthora* and *Pythium*, but no control of black root rot (*Thielaviopsis*) or Rhizoctonia stem rot and damping-off. Growers tell me that



Phytophthora root rot on gardenia.

they use this product to control soil-borne diseases for plug and cutting production.

Cease (Rhapsody)

Bacillus subtilis (Rhapsody) was developed by AgraQuest and is now marketed by BioWorks Inc. as Cease. This bacterial biological product works on a wide variety of diseases with the best results on foliar diseases.

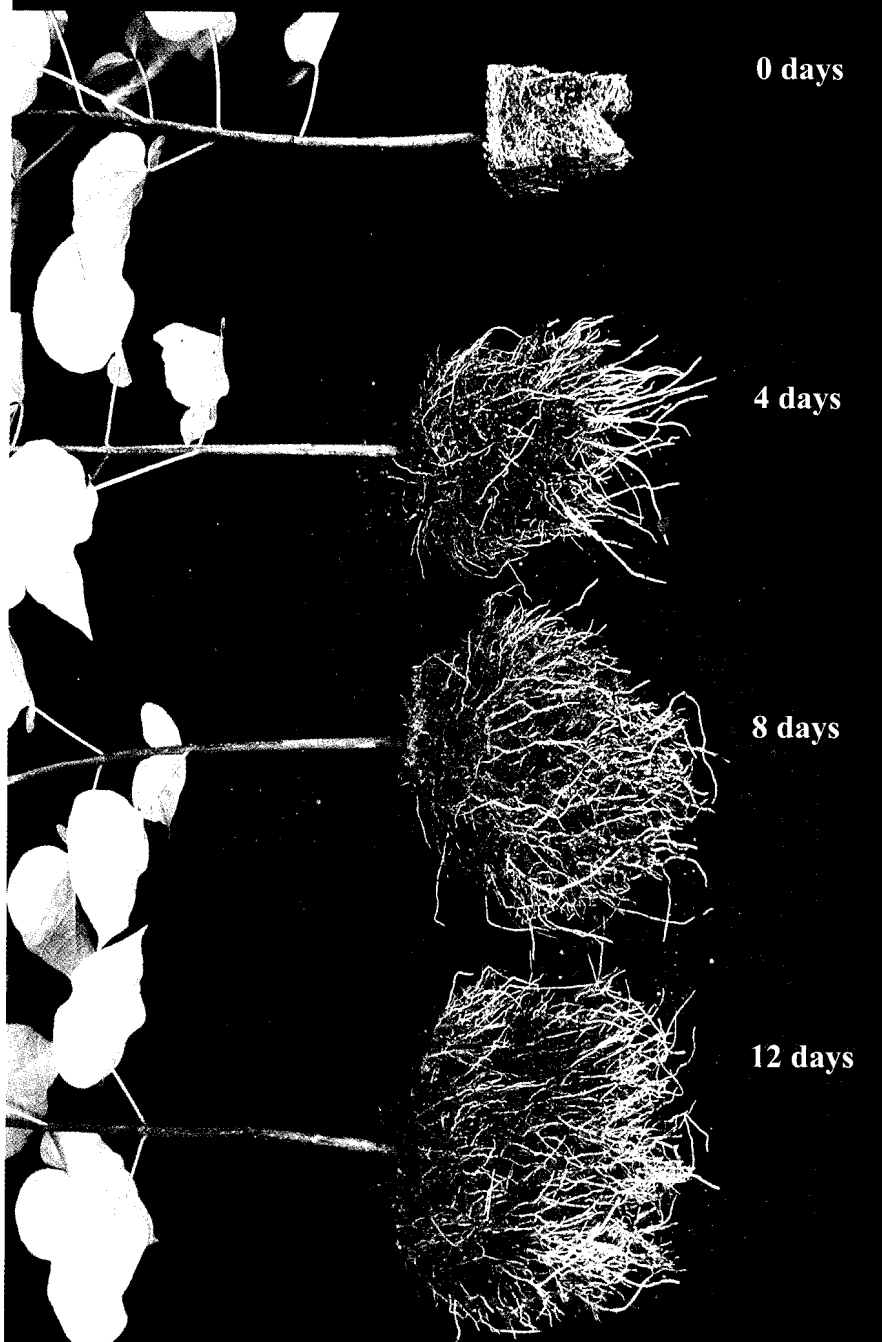
B. subtilis provides good to very good control on downy mildew, powdery mildew, bacterial leaf spots (i.e., *Pseudomonas* and *Xanthomonas*), *Botrytis*, *Cercospora* leaf spot and *Colletotrichum* leaf spot. We have not seen control of *Erwinia* soft rot (*E. carotovora*), fire blight (*E. amylovora*) or crown gall (*Agrobacterium*). Control of soil-borne pathogens is less sure, but we have had good trials with *Pythium* root rot and *Rhizoctonia* root rot at times.

Cease is compatible with the fungicides Banner MAXX, Camelot, Chipco 26GT, Daconil, Dithane, Eagle (now called Hoist), 3336, Heritage, Kocide 101, Maneb, Oxidate and Phyton 27. The only fungicide that Cease was not compatible with in combination was Aliette. It is especially interesting that Cease is compatible with copper products, although we have not seen any benefits to combining the two in overall efficacy against bacterial leaf spots.

EcoGuard GN

We began working with EcoGuard GN (*Bacillus licheniformis* from Novozymes) in 2007 and continued with quite a few new trials during 2008. All trials were performed on a 14-day interval with the best results

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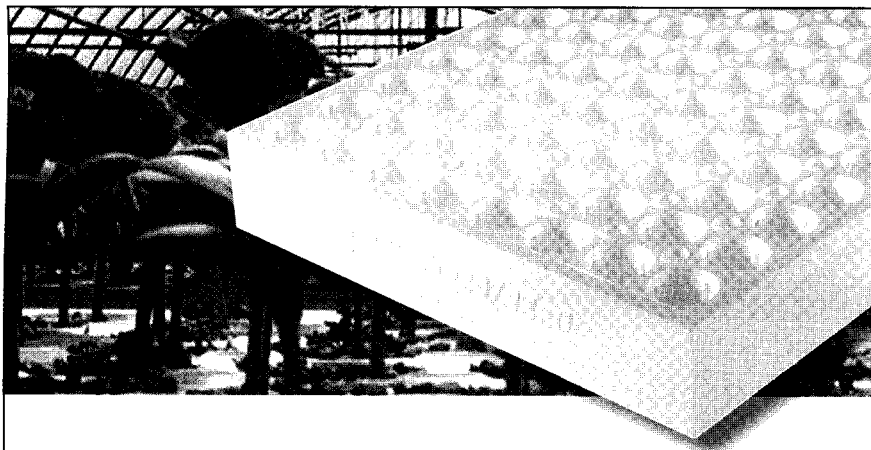
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Pythium root rot on calla lily.

being 64 ounces per 100 gallons applied as a soil drench. EcoGuard provided good control of *Fusarium* on cyclamen in the root rot phase. It provided some to very good control of *Phytophthora* root rot on three crops in 2007 and 2008. For *Pythium* root rot, EcoGuard offered a low level of control on geranium but very good control on gerbera and vinca. Controlling *Rhizoctonia* stem rot and damping-off was not successful in four trials.

PlantShield HC

One of the first biocontrol agents developed commercially was Plant Shield HC (*Trichoderma harzianum* strain T-22 from BioWorks Inc.).

The best uses include soil-borne diseases like *Rhizoctonia* root rot and *Pythium* root rot. We have also seen good results at times on *Cylindrocladium* root rot, *Phytophthora* root rot and *Fusarium* wilt. The use of PlantShield HC on foliar diseases is not as likely to result in a high level of disease control. We did see fair control of downy mildew in one trial, fair control of powdery mildew and fair to very good control of rust. Growers have indicated very positive results from the use of PlantShield HC in plug production as well as poinsettia production.

PlantShield HC is a fungus and its compatibility with many commonly used fungicides is an important characteristic. Only a few fungicides are not compatible with PlantShield, including Terraguard, Fungallor TR, Banner MAXX and Folicur. These are mainly sterol inhibitor fungicides.



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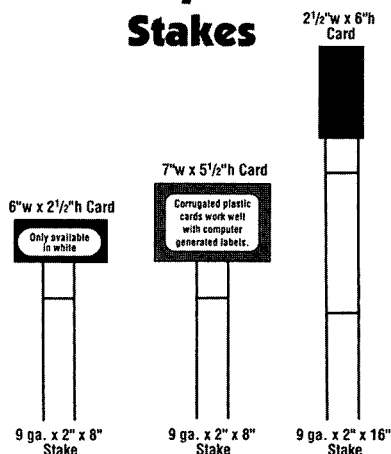
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Summary of trial results on four biocontrol agents at Chase Horticultural Research.

Product	Disease (pathogen)	Efficacy
Actinovate	<i>Botrytis, Cyndrocladium, Fusarium, Phytophthora</i> , powdery mildew and <i>Pythium</i>	Some to good
	Downy mildew, <i>Rhizoctonia</i> , rust	None
Cease (Rhapsody)	<i>Botrytis, Colletotrichum, Fusarium, Peronospora</i> (downy mildew), <i>Pythium</i>	Some
	<i>Phytophthora</i> , powdery mildew, <i>Pseudomonas, Xanthomonas</i>	Good
	<i>Alternaria, Cyndrocladium, Rhizoctonia</i>	None
EcoGuard GN	<i>Fusarium, Phytophthora, Pythium</i>	Some to very good
	<i>Rhizoctonia</i>	None
PlantShield HC	<i>Alternaria</i>	None
	<i>Phytophthora</i>	Poor to good
	<i>Pythium, Rhizoctonia</i>	Some to excellent
	<i>Cyndrocladium, Fusarium</i>	Some to good
	Downy mildew, powdery mildew, rust	Some to very good



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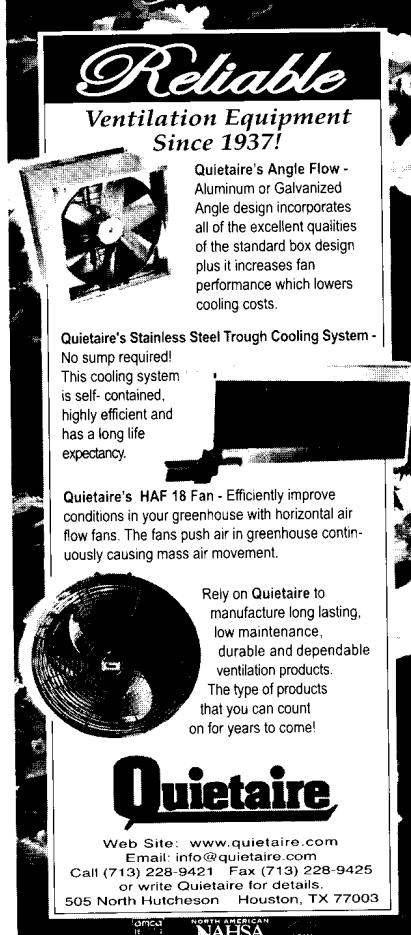
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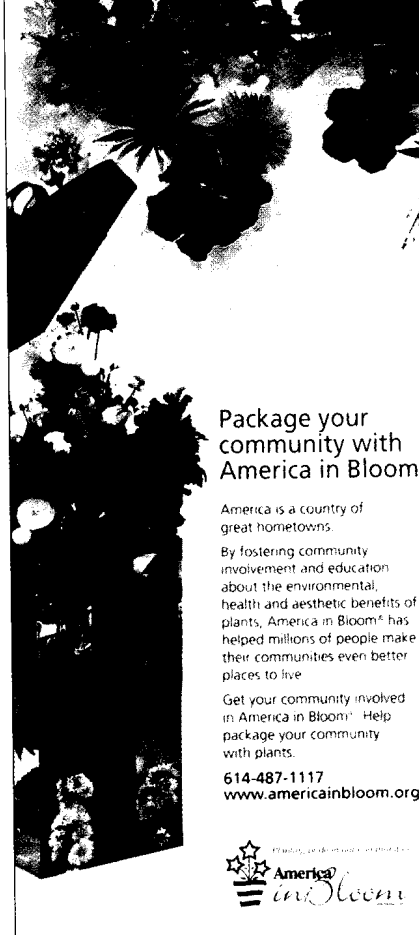
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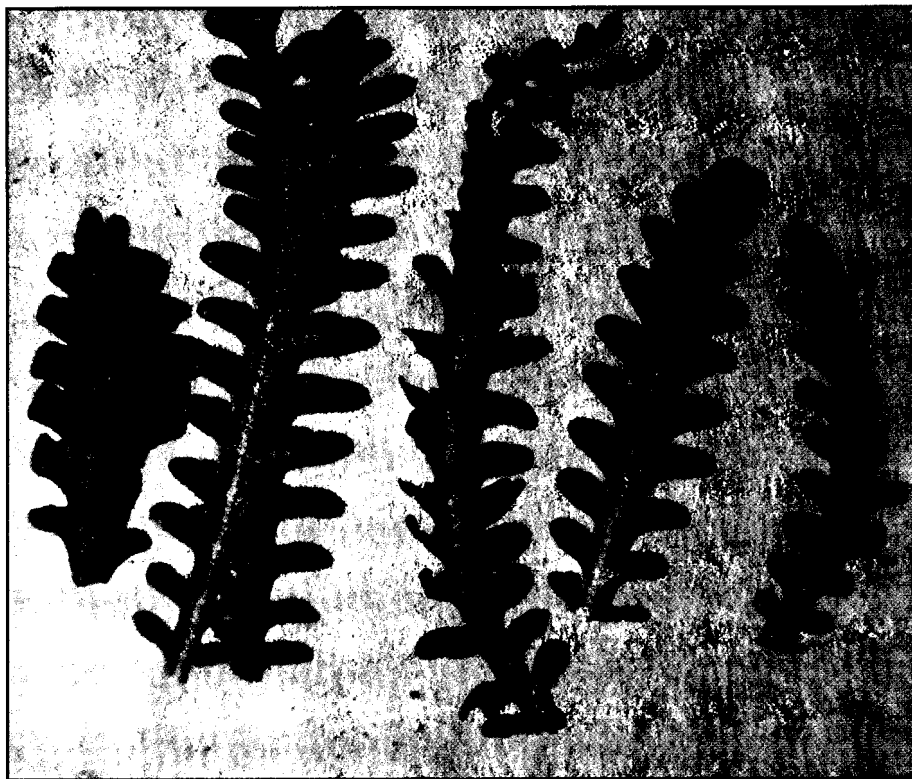
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Xanthomonas blight on lavender.

Ensure effectiveness

The greatest success reported by growers using biocontrol products is preventively for soil-borne diseases during production of poinsettias, plugs and cuttings. If these products are not used preventively, the chances for successful control are greatly diminished.

Keep in mind that the most critical issues in using biocontrol agents is to choose the correct one for the plants you are producing and the diseases you trying to prevent. In some cases, the degree of control is influenced by the exact pathogen species and in other cases the host plant itself is an important factor. There are currently no acceptable alternatives for *Rhizoctonia* cutting rot or damping-off and none for black root rot (*Thielaviopsis*).

A. R. Chase is president of Chase Horticultural Research Inc., (530) 620-1624; www.chasehorticulturalresearch.com.

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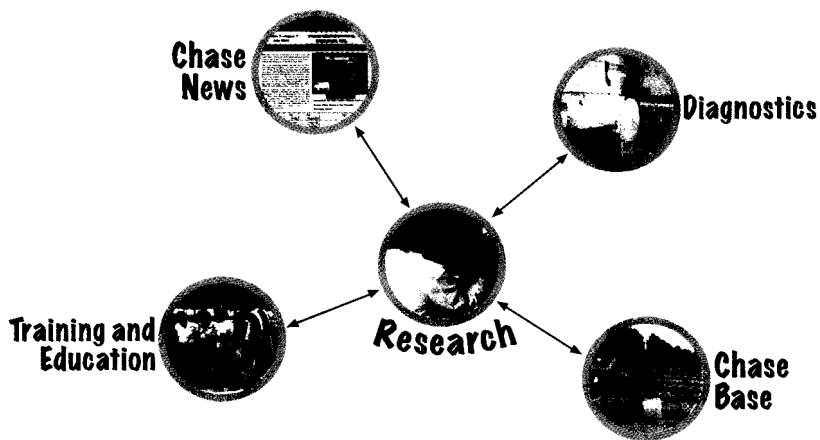
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