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**Pest, disease and weed
management in strawberry –
progress and challenges for the
Nordic production**

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***Gliocladium catenulatum* as an antagonist against grey mould on strawberry**

Marja-Leena Lahdenperä

Verdera Oy, Luoteisrinne 2, P.O. Box 5, FI-02271 Espoo, Finland

e-mail: marja-leena.lahdenpera@verdera.fi

Gliocladium catenulatum strain J1446, well-known of its ability to control soil-borne fungal pathogens, has also shown efficacy against certain foliar diseases like grey mould caused by *Botrytis cinerea*. After intensive research on both biological properties and process development, the antagonistic strain, originally isolated from Finnish field soil, was developed by Verdera Oy into a commercial biofungicide, Prestop.

Control of grey mould was first demonstrated on vegetables and ornamentals in seedling production, where the antagonistic microbe can be targeted to the infection site at the appropriate time. Preliminary *Botrytis* trials conducted with strawberry in a greenhouse indicated the potential of *Gliocladium* strain J1446 to control grey mould that infects via flowers. Later field studies showed that this kind of control works also in practical circumstances.

In these trials the strawberry crop was sprayed three times with an aqueous suspension of *G. catenulatum* at flowering time, whereas in the future the delivery of the antagonist via bumblebees or honey bees will be tested. The potential of *G. catenulatum* as unformulated fungal powder and as formulated products (Prestop WP and Prestop Mix) was evaluated. In addition to biological control, *Gliocladium* was also applied in integrated control together with chemical treatments.

When monitored with a plate counting method, the survival of *G. catenulatum* was clearly observed in the flower surroundings of the treated strawberry plants, especially on the stamens, which act as the infection route for the pathogen to the fruit. The antagonist was able to survive to a limited extent up to harvest, although the amount of the microbe decreased with the time. It seems that the colonization of stamens is the major mode of action in the control mechanism of *G. catenulatum* J1446 on strawberry.

G. catenulatum gave excellent control of *Botrytis* on strawberry in several field trials in Finland. In biological control the product based on this antagonist increased the amount of total yield from 5 to 21% and increased the marketable yield as well, but in integrated control even better results were obtained. A combined use of one *Gliocladium* treatment and two chemical applications turned out to be an especially effective control program.

G. catenulatum J1446 seems to affect also the shelf-life of strawberries in storage. *Gliocladium* treatments applied at the time of flowering resulted in a better preservation of strawberry fruits than untreated or chemical applications.

The application of *G. catenulatum* J1446 on strawberry is accepted by the EU only in an integrated management of *Botrytis* where the first spraying is made by *Gliocladium* and the two subsequent treatments with chemical fungicides. The national sales permits for different Prestop formulations have to be applied separately. Prestop Mix was finally registered in Finland in 2006, while the submission of Prestop WP is still in progress.