DARCOFenews

Newsletter from Danish Research Centre for Organic Farming • June 2004 • No. 2

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Orchard testing of new, alternative fungicides against apple scab

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Apple scab, caused by the fungus *Venturia inaequalis*, is the disease that most often decreases yield and causes loss of fruit quality in organic apple production. Damage to the fruits consists of brown to black spots, but in some years and on some varieties attacks can result in small misshapen fruits, that are totally unsuitable for fresh consumption.

Scab control in organic apples

Although is not very effective, sulphur is the only fungicide permitted to control apple scab in organic growing in Denmark. In contrast, other European countries allow the use of compounds such as copper, which is very effective against scab and several other diseases. However, the use of copper as a fungicide has been withdrawn from the Danish market for nearly ten years. And in the rest of the EU the use of copper will be phased out from 2006. Therefore, there is an urgent need for effective alternatives to control apple scab.

In the DARCOF-project StopScab the effects of plant extracts, essential oils and resistance inducers (see separate article in this issue) on apple scab are under investigation. The project is a collaborative effort between The Royal Veterinary and Agricultural University (KVL) and The Danish Institute of Agricultural Sciences (DIAS).

The selection of potential alternative compounds with efficacy against the apple scab fungus is carried out on apple seedlings in growth-rooms at KVL. The most promising of these compounds are tested in orchards at DIAS under natural infection levels. The first of the promising alternatives were tested in the orchard in 2003.

Potential new compounds

Three new compounds were tested on apple trees of the variety 'Delorina'. The trees had been growing under unsprayed organic conditions since 1998. The new materials were Bion(TM), Quiponin(TM) and C-pro.

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Quiponin was supplied by Nor-Natur ApS and Bion by Syngenta Crop Protection AG. Timing of application was decided by using the apple scab-warning programme, RIMpro.

The three products have different modes of action. The main ingredient of Bion is Acibenzolar-S-methyl. Bion is a synthetic material and therefore unsuitable for use in commercial organic production systems. It was included in the trial because it is known to activate the natural defence mechanisms of the plant. Quiponin is an extract of the plant Quillaja saponaria and has a potential natural fungicidal effect. C-pro is an extract of grape fruit seeds.

Elemental sulphur, which is a contact fungicide, was used as the standard treatment. The control treatment was unsprayed. Sulphur, Quiponin and Bion were used preventively while C-pro was used curatively, after apple scab infections had occurred.

Less effective than sulphur

The year 2003 was a year with severe apple scab infections. Treatments with the materials stopped at the end of the primary infection period and infections were assessed two weeks later on July 2nd. Although the best disease control was achieved with sulphur (table 1), the three new potential compounds also reduced apple scab infections compared to the untreated trees. Bion showed a slightly better effect than Quiponin and C-pro, but it also increased the amount of russeting on the fruit skin.

The reduction of apple scab infections was greatest on the rosette leaves, which are the leaves that emerge first from the buds, close to the fruits. These leaves stop growing and become age- resistant to the apple scab fungus earlier than the leaves produced from the new shoots.

The importance of an effective apple scab control becomes very clear from a look at the yield figures (table 1). Apple scab control using sulphur doubled the yield although sulphur is less than 100 percent effective in the control of apple scab.

In 2004 we are repeating the orchard trial with the three potential compounds to control apple scab and, additionally, we are testing new compounds from the growth-room screenings.

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