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Short communication

First record of A and B type *Beet necrotic yellow vein virus* in sugar beets in Sweden

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Abstract

Natural infections of sugar beet with *Beet necrotic yellow vein virus* (BNYVV), the causal agent of rhizomania, have been detected for the first time in Sweden in two small areas, one on the island of Öland and one in the Southeastern part of Scania. Single strand conformation polymorphism analyses of PCR products revealed that the infections on Öland were produced by A type BNYVV, whereas those in Scania were caused by the B type. This suggests that BNYVV has been introduced into Sweden at least twice. Alternatively, the virus may have invaded sugar beet from unknown native hosts. BNYVV RNA 5 was not detected in the samples investigated.

Rhizomania is one of the most economically important diseases of sugar beet. It is caused by the *Polymyxa betae*-transmitted *Beet necrotic yellow vein virus* (BNYVV) which contains four to five genomic RNA species. Rhizomania was first reported from Italy where it had caused severe damage in sugar beets since 1952 (Canova, 1959). One decade later the disease started to become a severe problem in Japan (Tamada et al., 1971) and in the 1970s heavy outbreaks were reported in many Southern and Central European countries, e.g. Yugoslavia, Greece, France, Southern Germany, Czechoslovakia and Austria (for review see Asher, 1993). In the Netherlands, the disease was first recorded in 1983 (Heijbroek, 1984) and in the United Kingdom in 1987 (Asher, 1987). It thus seemed that the disease was gradually spreading from Southern to Northern Europe. In Sweden, surveys of soil samples and sugar beet roots for the presence of rhizomania and tests for *Polymyxa*-transmitted beet viruses have been done since 1986. Both, *P. betae* and *Beet soil-borne virus* (BSBV) are widespread in sugar beet-growing areas in Sweden (Lindsten, 1989; unpublished), but definite proof for the occurrence of BNYVV was obtained for the first time in 1997 (K. Lindsten, unpublished).

Molecular studies have revealed two major strain groups of BNYVV in Europe, the A and the B types (Kruse et al., 1994; Koenig et al., 1995a,b). The A type is widely spread in Southern Europe, but surprisingly also in the Netherlands, whereas the B type is prevalent in Germany and France. This suggests that the original source of the virus in Central Europe may be different from that in Southern and Northwestern Europe. In the United Kingdom, both the A and the B types and also mixed infections were found, suggesting that the disease may have been introduced to Britain from various parts of Europe (Koenig et al., 1995a,b). Around the French town of Pithiviers a third type of BNYVV has been detected which was named P type. It contains a fifth RNA species which is possibly the reason why in this area rhizomania is especially severe (Koenig et al., 1995a,b; 1997). In this paper, the occurrence of A and B type BNYVV at two different sites in Sweden is described.

During a survey in 1997, rhizomania-like symptoms were seen on sugar beets in Sweden and the occurrence of the disease in a small area in the Southeastern part of Scania and on one farm on Öland (Figure 1) was verified by means of double antibody sandwich ELISA (Koenig et al., 1984). Soil samples from infected fields were planted with seeds of the highly susceptible sugar beet variety, Accord. Four weeks later the roots were harvested and ELISA revealed that they were heavily infected with BNYVV (K. Lindsten, unpublished). The roots were dried at room temperature for about two weeks and were cut into small pieces which were stored in Eppendorf tubes at +4 °C. Single strand conformation polymorphism (SSCP) analyses were done with primers specific for BNYVV RNAs 1 and 4 as described previously (Koenig et al., 1995a).

SSCP analyses of the BNYVV RNA 1- and 4-derived PCR products revealed that the bait plants grown in the soil from Scania contained B type BNYVV, whereas those grown in soil samples from Öland contained the A type (Figure 2).

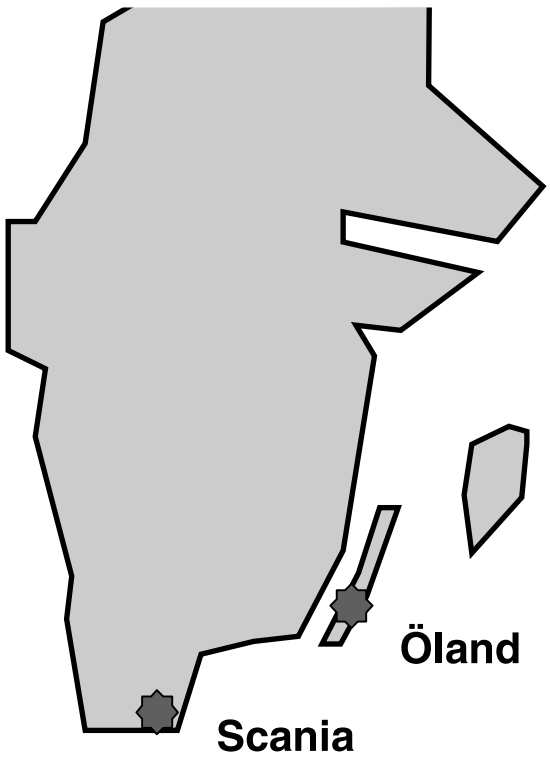

Figure 1. Sites in Sweden where BNYVV was detected for the first time in 1997.

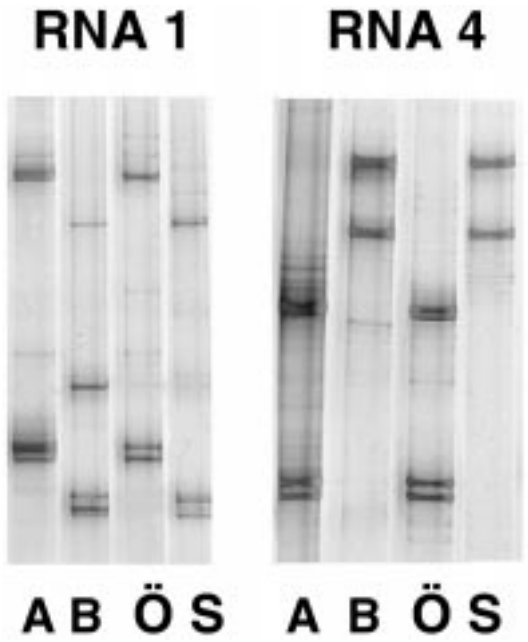

Figure 2. SSCP patterns of BNYVV RNA 1- and 4-derived PCR products. Lanes A and B contained standard A and B type samples from Yugoslavia and Germany, respectively. Lanes Ö and S contained PCR products from beets grown in soil samples from Öland and Scania, respectively.

BNYVV RNA 5 was not found in the bait plants grown in either of the soil samples when PCRs were done using a primer pair derived from nucleotides 1–26 (sense) and 260–243 (antisense) of this RNA species (accession No. D63759; Kiguchi et al., 1996) (results not shown).

The identification of A type BNYVV in Öland and B type BNYVV in Scania indicates that the virus has been introduced to Sweden from different places abroad. Both Swedish places where rhizomania is now found are centres of vegetable and fruit growing. The virus may have been introduced with *P. betae*/BNYVV-contaminated soil adhering to imported plant material, e.g. seed potatoes or onions. Alternatively, BNYVV may have invaded sugar beet from unknown native hosts.

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