

STUDIES ON CEREAL SOIL-BORNE VIRUSES IN POLAND

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Abstract: Four soil-borne cereal viruses have been identified in Poland, so far: *Soil-borne cereal mosaic virus* (SBCMV), *Wheat spindle streak mosaic virus* (WSSMV), *Barley yellow mosaic virus* (BaYMV) and *Barley mild mosaic virus* (BaMMV). SBCMV was identified in 1993 as a dangerous pathogen of winter cereals and became the object of special interest. Studies on the virus included its biological and molecular characterization, and investigations of the response of winter wheat and winter triticale cultivars on the SBCMV infection. Results of preliminary experiments aiming at the evaluation of the response of winter barley cultivars on barley yellow mosaic viruses were also presented.

Key words: *Soil-borne cereal mosaic virus*, *Barley yellow mosaic virus*, *Barley mild mosaic virus*, resistant cultivars

INTRODUCTION

Cereal viruses transmitted by the plasmodiophoric soil organism, *Polymyxa graminis* Led., called “soil-borne” viruses, are dangerous pathogens. The longevity of virus particles in spores of their vector enables the persistence of the inoculum in the soil for many years (Adams *et al.* 1988, 1993). This is particularly harmful in view of the limited possibilities of crop rotation in Poland with a definite predominance of cereals.

The first soil-borne cereal virus identified in Poland was the *Soil-borne cereal mosaic virus*, SBCMV, (Jeżewska 1994). The virus was initially identified as a strain of *Soil-borne wheat mosaic virus* (SBWMV) but since 2000 it was classified as SBCMV (Koenig and Huth 2000a, b). According to literature data, SBWMV is considered a very dangerous pathogen (Canova and Quaglia 1960; Vallega *et al.* 1999a, b; Clover *et al.* 2001; Budge *et al.* 2002). For this reason, the virus became the object of our studies. We aimed at characterizing the biological and molecular features of the virus. We also aimed at examining the response of chosen winter wheat and winter triticale cultivars to the infection. In the epidemiology of SBCMV, the seed transmission capacity of the virus may play an important role (Garbaczewska *et al.* 1997; Jeżewska 2006; Budge *et al.* 2008).

In the last years, three other soil-borne viruses were found: *Wheat spindle streak mosaic virus* (WSSMV), *Barley yellow mosaic virus* (BaYMV) and *Barley mild mosaic virus* (BaMMV) (Jeżewska and Trzmiel 2007; Jeżewska and Trzmiel 2009a, b). Surprisingly, WSSMV was isolated from triticale plants showing symptoms of mild leaf mosaic. In the following years, the virus was detected only sporadically in wheat plants, usually accompanying SBCMV. The causal agents of barley yellow mosaic; BaYMV and

BaMMV, were isolated from severely diseased barley plants. Taking into account the potential risk involved in the occurrence of these pathogens (Huth 1989; Plumb *et al.* 1986), investigations were undertaken in order to determine their distribution in the country. Assays were also done to evaluate the response of some winter barley cultivars to BaYMV and BaMMV.

The objective of this paper was to present the results of our investigations on soil-borne cereal viruses in Poland.

MATERIALS AND METHODS

Plant samples with disease symptoms suggesting infection with viruses were collected.

Diagnostics were initially performed by ELISA tests (Clark and Adams 1977). Commercial kits for TAS-ELISA and DAS-ELISA produced by Loewe (Germany) and Neogen (Great Britain) were also used.

SBCMV isolates

Five SBCMV isolates, originating from different locations in Poland, were taken for investigation: SBCMV-Cer (Cerekwica), SBCMV-Ch (Choryń), SBCMV-Chd (Chude), SBCMV-St (Strzelce) and SBCMV-Żab (Żabienko).

The viruses were easily propagated in a glasshouse and climatic chamber, by soil-transmission experiments.

RNA isolation

RNA was isolated from fresh infected plant leaves. Total RNA extraction from about 100 mg of plant material was carried out with the use of the RNeasy Mini Kit (Qiagen), according to the procedure supplied by the producer. The RNA was eluted with 40 µl RNase-free water.

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