OCCURRENCE OF VIRUSES OF THE FAMILY *LUTEOVIRIDAE* ON MAIZE AND SOME ANNUAL WEED GRASSES IN THE CZECH REPUBLIC

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Summary

The occurrence of virus of the family *Luteoviridae* on maize and annual grasses was studied in the south region of the Czech Republic during three years. On maize and annual weed grasses no BYDV-MAV and CYDV-RPV pathogens were found in test samples. Out of 246 maize samples taken, BYDV-PAV was found in 50 of them. The occurrence of this pathogen on maize varied with the locality and the year of sampling. In the test annual weed grasses BYDV-PAV was found in *Echinochloa crus-galii*, *Setaria pumila* and *Phalaris canariensis* plants. The occurrence of this pathogen was also dependent on the locality and the year of sampling. This pathogen was not found in *Setaria viridis*.

The present results suggest that maize and some species of annual weed grasses in the territory of southern Moravia may serve as a major source of BYDV-PAV for winter cereals because these species are a „green bridge" for this virus species

Keywords: maize, annual grasses, viruses, *Luteoviridae*

Introduction

In the last years a disease called yellow dwarf has occurred in winter cereal stands covering large areas in the Czech Republic. Owing to strong infection a great number of stands had to be ploughed in. This disease was caused by viruses of the family *Luteoviridae*, predominantly by *Barley yellow dwarf virus* – PAV (BYDV-PAV) and *Cereal yellow dwarf virus* – RPV (CYDV-RPV), which occurred on cereals to a lesser degree; other two viruses *Barley yellow dwarf virus* – MAV (BYDV-MAV) and *Barley yellow dwarf virus* –RMV (BYDV- RMV) have not been detected on cereals in the Czech Republic. (ANONYMOUS, 2001, 2002). These virus species differ in serological properties and also in transmission by different species of cereal aphids (e.g. ROCHOW 1969, REAVY and MAYO 2002).

As for the epidemiology of the viruses, especially their survival in the summer, an important role may be played besides perennial grasses also by maize and some annual weed grasses (HENRY and DEDRYVER, 1989, COMAS *et al.*, 1992). These viruses may also cause some damage to maize. ITNYRE *et al.* (1999) found that in stands infected by BYDV-RMV the yield of corn cobs decreased by 10 – 14 %. BEAUVE *et al.* (1999) reported a grain yield decrease of 15 – 20 %, but they did not find any effects on the vegetative growth of maize plants.

The aim of our study was to find out the spread of some viruses of the family *Luteoviridae* on maize and annual weed grasses in the area of southern Moravia over several years.

Material and methods

In late summer of the years 2001 – 2003, samples of leaves of maize and annual weed grasses with symptoms of alleged infection caused by these pathogens (predominantly

DOI: 10.1556/CRC.34.2006.2-3.242

yellowing, reddening and violet tints of leaves) were taken from commercial and plant breeding areas in different localities. In maize, samples from plants with visible damage by *Ostrinia nubilalis* were not collected because this pest may display symptoms similar to the infection by these virus pathogens. The date of sampling was determined with respect to the fact that maize and annual weed grasses may serve as a so-called „green bridge" necessary for survival of BYDV and CYDV between the harvest of cereals and the emergence of potential self-seeding grain and early sown winter crops. The samples taken were stored in a fridge and the following day they were tested by DAS-ELISA (CLARK and ADAMS, 1977) using BYDV-PAV, BYDV-MAV and CYDV-RPV kits. ELISA assay was carried out in accordance with the manufacturer's instructions (Bioreba). Data about invasions of winged individuals of *Rhopalosiphum padi* were obtained from the Aphid bulletin (ANONYMOUS 2002, 2003), issued by the State Phytosanitary Administration of the Czech Republic in the locality of Chrlice, which is situated in the vicinity of the test localities.

Results

On maize and annual weed grasses no BYDV-MAV and CYDV-RPV pathogens were found in test samples.

Out of 246 maize samples taken, BYDV-PAV was found in 50 of them. The occurrence of this pathogen on maize varied with the locality and the year of sampling (Table 1). A comparison of the years 2002 and 2003, in which a sufficient number of samples from several localities were evaluated, showed a much higher infection of maize with BYDV-PAV in the first year. In the year 2003 many stands of winter cereals were ploughed in because of winter killing (ANONYMOUS, 2003), however, therefore they could not serve as a source of this pathogen. Also, the flight activity of aphids of the species *Rhopalosiphum padi*, which is the main vector of BYDV-PAV, was delayed in the year 2003 and the total number of individuals was smaller than in the year 2002 (Table 2). With regard to weather conditions, maize was also maturing faster in the year 2003 and the physiologically older leaves appeared to be less infected with BYDV-PAV. HAACK *et al.* (1999) reported that maize is more susceptible to infection by this virus at young stages, especially before the 8-leaf stage. During their studies of BYDV-PAV occurrence in Germany, GRUNTZIG and FUCHS (2000) found considerable differences in maize stand infection with these pathogens in different years.

Our results correspond with the occurrence of viruses detected in the Czech Republic on winter cereals (ANONYMOUS 2002, 2003) and perennial forage grasses of the genera *Lolium* spp. and *Festuca* spp. (POKORNÝ and CAGAŠ, unpublished), in which of the species of the family *Luteoviridae* BYDV-PAV prevailed. In Europe, there were more species of viruses of the family *Luteoviridae* infecting maize found, nevertheless, in France BYDV-PAV predominated over BYDV-MAV (HAACK *et al.* 1999). In Yugoslavia the occurrence of BYDV-PAV also predominated over CYDV-RPV. However, in Greece the occurrence of these viruses on maize was almost identical (IVANOVIČ *et al.*, 1995). In Hungary CYDV-RPV predominated over BYDV-MAV and BYDV-PAV (POCSAI *et al.* 1995). In Spain BYDV-MAV was the main virus, although BYDV-PAV and CYDV-RPV were present (COMAS *et al.*, 1992).

In the test annual weed grasses BYDV-PAV was found in *Echinochloa crus-galii*, *Setaria pumila* and *Phalaris canariensis* plants. The occurrence was dependent on the locality and the

year of sampling (Table 3). This pathogen was not found in *Setaria viridis*. In their field studies LAMPTEY *et al.* (2003) found that *Echinochloa cruss galli* plants were infected only

Table 1 – Occurrence of BYDV-PAV on maize on localities of South Moravia in 2001-2003 years

Locality/year	Number of fields	Infected fields	Number of samples	Infected samples
Čejč				
2001	1	1	21	4
2002	1	1	27	11
2003	1	1	33	2
Troubsko				
2001	1	1	7	2
2002	1	1	8	2
2003	3	1	20	1
Přísnotice - Žabčice				
2002	1	1	6	5
2003	1	0	3	0
Ladná-Podivín				
2002	3	1	18	5
2003	4	0	16	0
Šakvice-Popice				
2002	1	1	6	3
2003	3	1	16	4
Vranovice				
2002	1	1	9	1
2003	2	1	11	1
Nedvědice				
2002	3	3	30	9
2003	3	0	17	0

with BYDV-MAV. However, they managed to infect artificially this plant with BYDV-PAV. REMOLD (2002) also reported the infection of the species of *S. pumila* with BYDV-PAV and in her studies she also detected plants of this species infected with BYDV-MAV and CYDV-

Table 2 – Number of individuals of Rhopalosiphon padi in weeks of particular years

	Year		
Week	2001[a]	2002	2003
14	0	0	0
15	0	0	0
16	0	0	0
17	0	1	0
18	9	4	2
19	8	4	8
20	1	176	2
21	nd	nd	2
22	3	56	7
23	18	217	19
24	16	1694	100
25	10	3196	95
26	74	521	115
27	20	32	196
28	121	50	579
29	171	13	668
30	11	6	267
31	43	5	8
32	11	4	39
33	78	3	5
34	17	21	27
35	39	34	19
36	11	60	3

a – catches from Johnson-Taylor suction traps

RPV. In the species *S. viridis*, she diagnosed infection with all these viruses of the family *Luteoviridae*.

The present results suggest that maize and some species of annual weed grasses in the territory of southern Moravia may serve as a major source of BYDV-PAV for winter cereals because these species are a „green bridge" for this virus species between the harvest of cereals and the emergence of potential self-seeding grain or early sown winter crops.

Table 3 - Occurrence of BYDV-PAV on annual weed grasses on localities of South Moravia in 2001-2003 years

Species/year	Number of localities	Infected localities	Number of samples	Infected samples
Echinochloa crus-galii				
2001	2	2	16	6
2002	5	0	14	0
2003	3	1	10	1
Sum			40	7
Setaria viridis				
2001	1	1	2	0
2002	3	0	6	0
Sum			8	0
Setaria pumila				
2002	1	1	1	1
2003	1	0	1	0
Sum			2	0
Phalaris canariensis				
2002	1	1	5	5
2003	1	0	3	0
Sum			8	5

Acknowledgement

The results were obtained within the framework of Project QD 1059 funded by the Ministry of Agriculture of the Czech Republic.

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Received 30 June, 2005, accepted 2 November, 2005