
Cocksfoot streak virus in Lithuania

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For the first time *Dactylis glomerata* L. plants showing symptoms of light green streaks on leaves were found in the district of Vilnius in 2000. The agent of viral disease was transmitted by mechanical sap inoculation to *Avena sativa* L., *Hordeum distichon* L., *Lolium perenne* L., *Phleum pratense* L. The electron microscopy investigation revealed the presence of flexuous filamentous particles measuring 750 nm in length. The virus has been identified as *cocksfoot streak potyvirus* (CSV).

Key words: viral diseases of gramineous plants, cocksfoot, cocksfoot streak virus

INTRODUCTION

Cocksfoot (*Dactylis glomerata* L.), a perennial gramineous plant belonging to the family *Poaceae*, is a valuable forage grass species. Four viruses have been isolated and identified from cocksfoot: *cocksfoot alphacryptovirus*, *cocksfoot mild mosaic sobemovirus*, *cocksfoot mottle sobemovirus* and *cocksfoot streak potyvirus* [1].

The cocksfoot streak disease was described and its agent identified first by Smith and Storey in 1952. [1]. The agent of the disease (CSV) belongs to the genus *Potyvirus* and has filamentous flexuous particles with a clear modal length of 750 nm and 13 nm wide. The properties of the particles in sap *in vitro* were established as follows: thermal inactivation point 55 °C, dilution endpoint 3×10^{-3} and longevity *in vitro* at 20 °C 16 days [2].

CSV is transmitted by mechanical inoculation with sap, in non-persistent way by aphids (*Myzus persicae*, *Macrosiphum avenae*, *M. euphorbia*, *Metopolophium dirhodum* and *Hyalopteroides humulus*) and is not transmitted by seed [2]. The virus spreads in England, Holland, Denmark, France, Germany, Sweden, USA [2] and Russia [3].

CSV is an economically important plant pathogen. It infects a number of grass species and, depending on the host, can cause forage yield losses of 10 to 60% [2].

Dactylis glomerata plants showing symptoms of light-green or yellow streaks on leaves were found in the district of Vilnius in 2000. The cocksfoot streak disease agent was identified by mechanical inoculation of host-range and investigation of the morphological properties of virus particles.

MATERIALS AND METHODS

Material for investigation was collected at the Vilnius Experimental Station of Plant Cultivars. The experimental work was carried out at the greenhouse and Laboratory of Plant Viruses at the Institute of Botany. Virus isolates inducing streaks on leaves of cocksfoot were selected for experimental work. Viruses have been identified by test-plant reaction [4] and the morphology of virus particles. Virus particles were visualized in negatively stained preparations on a JEM-100 S electron microscope [5, 6].

Fifteen species of plants were inoculated with CSV: *Agrostis stolonifera* L. – ‘Guoda’, *Avena sativa* L. – ‘Jaugila’, ‘Edit’, ‘Jak’, ‘Jovar’, *Dactylis glomerata* L. – ‘Asta’, *Festuca pratensis* L. – ‘Dotnuva’, *Hordeum distichon* L. – ‘Anni’, ‘Ula’, ‘Rataj’, *Lolium perenne* L. – ‘Sodre’, ‘Žvilgė’, *Phleum pratense* L. – ‘Vėlenis’, *Poa palustris* L. – ‘Švelnė’, *P. pratensis* L. – ‘Lanka’, ‘Danga’, *Secale cereale* L., *Triticum aestivum* L., *Zea mays* L. – ‘Pionier’, *Chenopodium quinoa* Wild., *C. amaranticolor* Coste et Reyn., *Gomphrena globosa* L., *Nicotiana debneyi* Domin.

Monocotyledonous test-plants were inoculated at the stage of one or three leaves and dicotyledonous test-plants at the four-leave stage. The inoculum for mechanical sap inoculation was prepared by grinding infected leaves in 0.1 M phosphate buffer (pH 7.0).

RESULTS AND DISCUSSION

The ability of the cocksfoot streak disease agent to be transmitted by mechanical sap inoculation to test-

plants was investigated in greenhouse conditions. A number of cultivars of the cultivated species of test-plants were included (Table). The infection was successfully transmitted to test-plants of five species: *Avena sativa* 'Jaugila', 'Edit', 'Jak', 'Jovar', *Hordeum distichon* 'Anni', 'Ula', *Dactylis glomerata* 'Asta', *Lolium perenne* 'Sodré', 'Žvilgė', *Phleum pratense* 'Vėlenis'. Test-plants from another 10 species did not react to inoculation. The symptoms appeared in 2–4 weeks after inoculation and the severity of their expression depended on test-plant species and the temperature in the greenhouse.

Most susceptible to virus infection from the monocotyledonous plants tested were *Avena sativa* and *Dactylis glomerata*. First symptoms as chlorotic (yellowish green) streaks on oat leaves appeared in 18 days after inoculation (Fig. 1). Later necrotic and chlorotic streaks appeared on the leaves and stems. Sometimes necrosis started from the tip and extended to the basal part of leaves, leading to their premature death. Virus infection was transmitted to *Dactylis glomerata* 'Asta' plants, which showed yellowish-greenish streaking and chlorosis on leaves. Virus infection was transmitted to *Hordeum distichon*, *Lolium perenne* and *Phleum pratense* plants. *Lolium perenne* developed a light yellowish-greenish streaking on leaves, and chlorosis of va-



Fig. 1. Cocksfoot streak potyvirus symptoms on *Avena sativa* L. 'Jaugila' leaves; (left) healthy two leaves

Table. Reaction of test-plants to inoculation by the virus isolate from cocksfoot

No	Test-plant	Symptoms
1.	<i>Agrostis stolonifera</i> L. cv. 'Guoda'	0
2.	<i>Avena sativa</i> L. cv. : 'Edit'	S: Le, St Y-Gr Str, NStr
	'Jak'	S: Le, St Y-Gr Str, NStr
	'Jaugila'	S: Le, St Y-Gr Str, NStr
	'Jovar'	S: Le, St Y-Gr Str, NStr
3.	<i>Chenopodium amaranticolor</i> Coste et Reyn.	0
4.	<i>C. quinoa</i> Willd.	0
5.	<i>Dactylis glomerata</i> L. cv. 'Asta'	S: Le, St Y-Gr Str, Chl
6.	<i>Festuca pratense</i> L. cv. 'Dotnuva'	0
7.	<i>Gomphrena globosa</i> L.	0
8.	<i>Hordeum distichon</i> L. cv. : 'Anni'	Le Chl Sp, Str
	'Ula'	Le Chl sp, Str
9.	<i>Lolium perenne</i> L. cv. : 'Sodré'	Le Y-Gr Str
	'Žvilgė'	Le Y-Gr Str
10.	<i>Nicotiana debneyi</i> Domin.	0
11.	<i>Phleum pratense</i> L. cv. 'Vėlenis'	Chl
12.	<i>Poa palustris</i> L. cv. 'Švelnė'	0
13.	<i>P. pratensis</i> L. cv. : 'Lanka'	0
	'Danga'	0
14.	<i>Secale cereale</i> L. cv. 'Owid'	0
15.	<i>Zea mays</i> L. cv. 'Pionier'	0

Abbreviations: S – systemic reactions, Chl – chlorotic, Y – yellow, Gr – greening, Le – leaf, St – stem, Str – streak, Sp – spotting N – necrotic, 0 – no reaction.

rying intensity appeared on the leaves of *Phleum pratense*. *Hordeum distichon* developed yellowish diffused spotting and streaking on leaves.

Electron microscopy of negatively stained leaf dip preparations made from naturally infected cocksfoot plants and infected test-plants revealed the presence of flexuous filamentous particles measuring 750 nm in length (Fig. 2). Such a particle morphology is characteristic of *cocksfoot streak potyvirus* [1].

According to test-plant reaction and particles morphology, the agent causing cocksfoot streak disease was identified as *cocksfoot streak potyvirus*.

Virus infection has a negative influence on plant

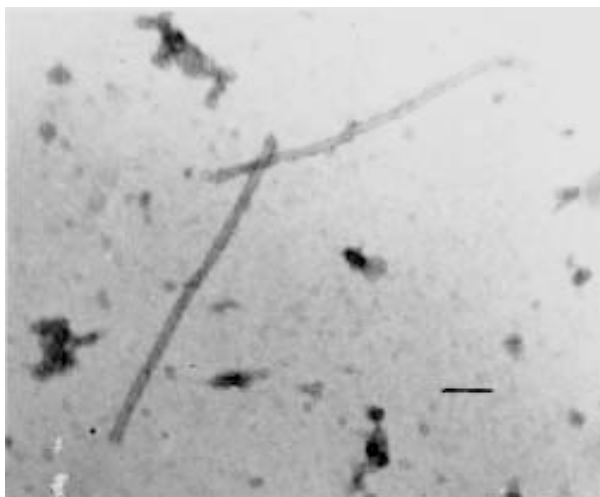


Fig. 2. Virus particles in preparations of naturally infected cocksfoot plants. Bar marker represents 100 nm

growth and yield. The most important plant protection measure is to control aphid vectors, particularly in cultivated cocksfoot fields. Reduction of infection sources can be achieved by spatial isolation of cocksfoot crops from other susceptible plants. The elimination of the sources of infection by rogueing diseased plants is a most useful protection method [2].

References

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ŠUNAŽOLĖS DRYŽLIGĖS VIRUSAS LIETUVOJE

S a n t r a u k a

2000 m. Vilniaus apylinkėse pirmą kartą aptikti pavieniai laukinės šunažolės (*Dactylis glomerata* L.) augalai su šviesiai gelsvai žalsvais dryželiais lapuose. Augalų-indikatorių ir elektroninės mikroskopijos metodais buvo identifikuotas šunažolės dryžligės virusas (*Cocksfoot streak potyvirus*). Virusą – ligos sukėlėją mechaniniu būdu sergančio augalo sultimis pavyko perduoti *Avena sativa* L., *Dactylis glomerata* L., *Hordeum distichon* L., *Lolium perenne* L., *Phleum pratense* L. augalams. Peržiūrėtuose elektroniniu mikroskopu preparatuose aptiktos ilgos siūlinės, apie 750 nm ilgio, dalelės.