

THE OCCURRENCE AND ACTIVITY THE THYSANOPTERA VECTORS OF TOMATO SPOTTED WILT TOSPOVIRUS IN THE CARPATHIAN BASIN

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ABSTRACT

Among the Thysanoptera species known as vector of tomato spotted wilt virus *Thrips tabaci*, *Frankliniella intonsa*, *Frankliniella occidentalis* occur in the Carpathian Basin. According to the our present-day knowledge the TSWV hibernates in perennial herbaceous wild growing plants and weeds and in the adults of *Th. tabaci* under the climatic conditions of the Carpathian Basin. The latter is able to transmit this virus among the cultivated and wild plants, as well as is able to cause epidemic in the tobacco fields in spring. *Frankliniella occidentalis* has an important role in the TSWV epidemic in the greenhouses. As *Fr. occidentalis* spreads in the Carpathian Basin, the greenhouses. The populations of *Fr. intonsa* frequently occur in high density in the flowers of various wild growing plants and weeds, notwithstanding their specimens are seldom present in the flower of cultivated plants endangered by TSWV. Its role in the spread of TSWV requires further clearing up.

IZVLEČEK

POJAV IN AKTIVNOST RESOKRILCEV (THYSANOPTERA) KOT PRENAŠALCEV VIRUSA PARADIŽNIKOVE PEGAVOSTI IN UVELOSTI (TOMATO SPOTTED WILT VIRUS/TSWV) V KARPATSKEM BAZENU

Med vrstami resokrilcev (Thysanoptera), ki so znane kot prenašalci virusa paradižnikove pegavosti in uvelosti (TSWV), so v Karpatskem bazenu predvsem *Thrips tabaci*, *Frankliniella intonsa* in *F. occidentalis*. Kolikor vemo do sedaj, TSWV v klimatskih razmerah Karpatov prezimuje v zeljnatih trajnih samoniklih rastlinah in plevelih ter v odraslih osebkih *Thrips tabaci*. Ta vrsta lahko tudi prenaša virus med gojenimi in samoniklimi (divjimi) rastlinami, kot zmore povzročiti epifitocije na tobačnih poljih spomladi. *Frankliniella occidentalis* ima pomembno vlogo pri nastanku epifitocij TSWV v rastlinjaku. Ta vrsta se v Karpatskem bazenu širi namreč le v rastlinjakih. Velike populacije *Frankliniella intonsa* so pogoste v cvetovih različnih samoniklih rastlin in plevelov, kljub temu pa so osebki te vrste redki v cvetovih gojenih rastlin, ki jih okužuje TSWV. Pomen *F. intonsa* pri širjenju TSWV bo potrebno še preučiti.

1 INTRODUCTION

Although the presence of tomato spotted wilt tospovirus (TSWV) has been known in Central- Eastern- and Southern Europe for a long time (Razvyazkina 1953, Todorovski 1969, Gajos 1972), the frequency of the occurrence and the epidemics of this virus have been increasing in the last decades in the Carpathian Basin (Ligeti and Nagy 1972, Gáborjányi et al., 1994, Jenser et al., 1996).

The TSWV is wide spread in tropical, subtropical and in the temperate zone, endangering the growing of tobacco, pepper, tomato, lettuce, peanut as well as different ornamental plants. In addition it can survive in many different wild growing plant species and weeds.

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Only Thysanoptera species can transmit this virus. The larvae of the vector species are able to acquire the virus and they can harbour them until the end of the lifetime of the adults (Pittman 1927, Razvyazkina 1953, Sakimura 1963). In addition the virus can reproduce in the body of Thysanoptera (Goldbach 1993). Under tropical and subtropical climatic conditions the vector species can transmit the TSWV through the year. The possibilities of the spreading and the outbreak of the epidemics of this virus are different from the former under temperate climatic conditions.

2 MATERIAL AND METHODS

The virus isolates deriving from infected tobacco, pepper tomato, as well as from wild growing plants were investigated by biological and serological (DAS ELISA) methods (Gáborjányi *et al.*, 1955).

The host range, the frequency of the occurrence of the Thysanoptera species on wild growing and cultivated plants as well as on ruderal fields were investigated by Priesner (1928), Knechtel (1951) Pelikán (1977), Jenser (1982), Jenser and Czencz (1992), Péntzes (1994). On the bases of collection by suction and coloured traps many data are known about the flight period and flight activity of the vector species (Jenser, 1993, Jenser and El Ghariani 1994). Virus transmission experiments were carried out in laboratory with Thysanoptera specimens collected from cultivated and from wild growing plants on the tobacco fields, in the greenhouses and in their surroundings (Jenser *et al.*, 1996).

3 RESULTS AND DISCUSSION

On the background of DAS ELISA the isolates were identical with the BR-01 isolate (Serogroup I) (Gáborjányi *et al.*, 1995).

Compliance with host range, phenology and hibernation the theletokous *Thrips tabaci* populations have significant role in the outbreak of the epidemics of TSWV in the tobacco fields. Since the TSWV is not transmissible by seed and its cultivated host plants, tobacco, pepper, tomato, letuce die in winter, it could hibernate only in the infested *T. tabaci* adults and in biennial and perennial herbaceous reservoir host plants. The *T. tabaci* females spend the winter in litter and parched grass and on the green parts of overwintering plants, e.g. *Lamium purpureum*, *Stellaria media* and *Trifolium repens* in the ruderal fields.

Positive vector transmission was made with the females of *T. tabaci* collected in the surroundings of tobacco fields, from *Galinsoga parviflora*, *Lamium purpureum*, and *Trifolium repens* in September, October, and April (Jenser *et al.*, 1996). The above mentioned plants were not infected by TSWV. The infected females harbouring the TSWV in their body could migrate in spring to hotbeds or to the tobacco fields immediately following the planting. They might infect the seedlings which are very susceptible to this virus in this period. According to this early infection the tobacco plants become dwarf. Although the individual number of hibernating populations is relatively low, nevertheless they are able to cause considerable infections. Many details of the way of this infection requires further clearing up in the near future.

The population density of the summer generations of *T. tabaci* increase, they are present in high number on cultivated plants and in the flower of many wild growing plants. *T. tabaci* is the dominant species in the flowers of *Atriplex tatarica*, *Galium verum*, *Melilotus officinalis* in ruderal fields in this period (Jenser *et al.*, 1994). They can cause serious direct damage on tobacco, onion and cabbage (Jenser 1982, Jenser and Czencz 1992, Péntzes 1994). If the larvae of the summer generations are feeding on infected plants they can acquire the virus again and their females transmit the TSWV to the cultivated and wild growing plants. Since the susceptibility of the well grown tobacco plants decrease, the significance of the virus transmission continuously diminishes in summer.

Thrips tabaci specimens living in the flower of biennial or perennial wild growing plants being host of TSWV, are able to spread this virus in the vegetation of ruderal fields, in summer and in autumn, thereby the infection of TSWV would increase in the surroundings of cultivated plants.

Frankliniella occidentalis is known as the most active vector of TSWV. It was introduced in 1985 in Europe (zur Strassen 1986) and it spread in the following years in the greenhouses in Europe. The specimens cannot hibernate in the fields under temperate climatic conditions. At the same time it can survive during the vegetation period in the field in the flowers of different plants. Some of these plant species like *Chenopodium album*, *Convolvulus arvensis*, *Galinsoga parviflora*, *Melilotus officinalis*, *Stellaria media* and *Trifolium repens* are hosts of this virus. Therefore it serves as vector of TSWV and is able to transmit this virus from cultivated to weed plants and vice versa (Jenser 1990). It has significant role in the spreading of this virus in the greenhouses under our climatic conditions.

Frankliniella intonsa has been recorded as a non-vector of TSWV by Bonnemaïson (1937). According to the recent experiments of Wijkamp *et al.*, (1995) the specimens of *Fr. intonsa* transmit this virus. The populations of *Fr. intonsa* occur frequently in the flower of different wild growing plants and weeds like *Asclepias syriaca*, *Galium verum*, *Lathyrus tuberosus*, *Medicago sativa*, *Melilotus officinalis*, *Trifolium pratense*, *Vicia sativa* (Jenser *et al.*, 1994), and in the flowers of some ornamental plants but its specimens are seldom present in the flower of cultivated plants as tobacco, pepper, tomato endangered by TSWV. Presumably transmits the TSWV in the vegetation of ruderal fields. Its role in the spreading of TSWV requires further study.

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