

Natural Occurrence of Tobacco Mosaic *Tobamovirus* (TMV) on Common Milkweed (*Asclepias syriaca* L.) in Hungary

G. KAZINCZI¹, J. HORVÁTH¹, J. MIKULÁS²,
A. ALMÁSI³, M. EKÉS⁴ and †K. HUNYADI¹

¹Institute for Plant Protection, Pannon University of Agricultural Sciences,
H-8361 Keszthely, P.O. Box 71, Hungary

²Research Institute for Viticulture and Enology, Ministry of Agriculture and Rural Development,
H-6001 Kecskemét, Hungary

³Plant Protection Institute, Hungarian Academy of Sciences, H-1525 Budapest, P.O. Box 102, Hungary

⁴Department of Plant Anatomy, Eötvös University, Budapest, Hungary

Tobacco mosaic *tobamovirus* (TMV) was isolated in Hungary from wild-growing *Asclepias syriaca* L. plants showing leaf deformation, vein clearing, chlorotic-necrotic rings and mosaic symptoms. The virus isolate was identified on the basis of test plants, serology and electron microscopy. This is the first report of the natural occurrence of TMV on *Asclepias syriaca* in Hungary.

Key words: tobacco mosaic *tobamovirus*, *Asclepias syriaca*

Common milkweed (*Asclepias syriaca* L.) is an adventive weed in Hungary originated from North-America. On the basis of the first national weed survey (1947–1953) it has not yet occurred in Hungary. In the second national weed survey (1969–1971) it occurred with a cover of average 0.003% (Tóth et al., 1989). It is the 113rd and the 76th most important weed in Hungary on the basis of the third (1987–1988) and the fourth (1996–1997) national weed survey, respectively (Tóth and Spilák, 1998). At present the infected arable area is about 32,000 ha. It mainly occurs on the southern part of Hungary between Danube and Tisza rivers on sandy soils and on Transdanubian part in Tolna county (Kőrösmezei, 1983; Varga, 1983, 1986). It belongs to association of plants of roadsides and waste lands. Recently this weed has spread into cultivated lands, especially corn, cereals, soybean, sorghum, sunflower and forage crops, causing considerable yield losses (Evetts and Burnside, 1973a, b). *A. syriaca* propagates by seeds and by underground rootstocks bearing adventitious buds which are capable of sprouting in a favourable environment (Bhowmik and Bandeen, 1976). Three weeks after germination the plants are capable to become perennial because seedlings can produce buds on the main root close to the soil surface (Hunyadi and Kazinczi, 1992). The rapid distribution of this weed is due to its considerable reproductive capacity (Evetts and Burnside, 1973a; Bhowmik and Bandeen, 1976) and allelopathy as well (Cramer, 1981; Kazinczi et al., 1998; Béres and Kazinczi, 1999).

A. syriaca influences the quality and quantity of crops not only in direct way (e.g. nutrient and water uptake), but is very important as alternative hosts of different insects (Doyon, 1960) and fungi (Seymour, 1929; Shaw, 1958; Connors, 1967) as well. Due to its perennial habitat *A. syriaca* is considered to play important role in the epidemiology

Table 1Viruses pathogenic to *Asclepias syriaca*

Viruses	Literature
Alfalfa mosaic <i>alfamovirus</i> (AMV)	Schmelzer et al. (1973), Schmelzer and Wolf (1977)
Cucumber mosaic <i>cucumovirus</i> (CMV)	Doolittle (1916), Doolittle and Walker (1926), Koch (1942), Kochman and Stachyra (1960), Kovachewsky (1965), Salamon (1978, 1986), Horváth et al. (1983), Mamula et al. (1986), Nasser and Basky (1988), Rist and Lorbeer (1989)
Prunus necrotic ringspot <i>ilarvirus</i> (PNRSV)	Schmelzer and Wolf (1977)
Strawberry mottle virus (SMoV)	Thornberry (1966)
Tobacco mosaic <i>tobamovirus</i> (TMV)	Schmelzer and Wolf (1977)
Tobacco streak <i>ilarvirus</i> (TSV)	Thornberry (1966), Schmelzer and Wolf (1977)

and overwintering of different viruses, therefore this weed may be primary infection source at the beginning of the vegetation period (Table 1). The majority of these reports is about *A. syriaca* as natural host of the polyphagous cucumber mosaic *cucumovirus* (CMV) possessing more than 1000 hosts (Horváth, 1979; Edwardson, 1991).

In 1997 individuals of *A. syriaca* showing severe virus symptoms (stunting, leaf deformation, mosaic, vein-clearing, chlorotic-necrotic rings) have been found near Kecskemét in Hungary. Regarding that formerly CMV was isolated from *A. syriaca* showing similar symptoms in Hungary and Yugoslavia (Salamon et al., 1989), the aim of our study was either to confirm the natural occurrence of CMV on *A. syriaca* or to identify a new virus from this species.

Materials and Methods

In the summer of 1997 leaf samples of *A. syriaca* showing typical virus symptoms (leaf deformation, mosaic, vein clearing, chlorotic-necrotic rings) were collected near Kecskemét in Hungary (Fig. 1). The following test species were mechanically inoculated with the tissue sap of diseased *A. syriaca*: *Chenopodium quinoa*, *Datura stramonium*, *Gomphrena globosa*, *Nicotiana benthamiana*, *N. clevelandii*, *N. glutinosa*, *N. sylvestris*, *N. tabacum* cv. Samsun, *N. tabacum* cv. Xanthi. DAS ELISA serological method was used to test the leaf samples for the presence of nine viruses [alfalfa mosaic *alfamovirus* (AMV), carnation mottle *carmovirus* (CarMV), cucumber mosaic *cucumovirus* (CMV), Petunia asteroid mosaic *tombusvirus* (PeAMV), potato X *potexvirus* (PVX), potato Y *potyvirus* (PVY), tobacco mosaic *tobamovirus* (TMV),

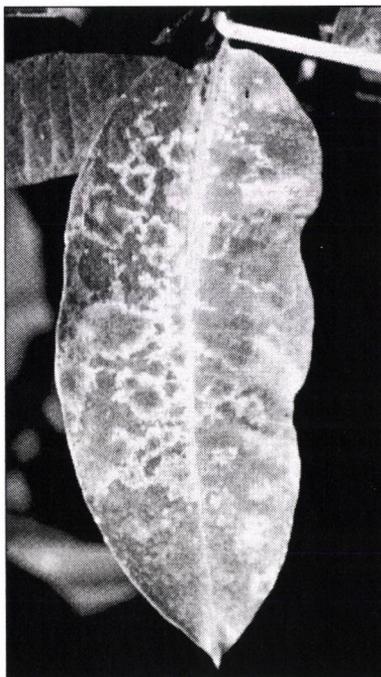


Fig. 1. Symptoms on the leaf of *Asclepias syriaca* naturally infected with tobacco mosaic *tobamovirus*

tomato mosaic *tobamovirus* (ToMV), tomato spotted wilt *tosspovirus* (TSWV)] after Clark and Adams (1977). In order to identify the virus isolate electron microscopy was used as well. Samples were negatively stained by the Brandes leaf-dip method (Brandes, 1957; Milne, 1984). Upper leaves of *A. syriaca* – showing symptoms – were cut and drawn through a drop of negative stain (1% uranyl acetate solution) placed on a formvar (0.25%) coated grid (400 mesh). Then excess solution was removed with a filter paper, and the grid was dried. The samples were examined in a Hitachi H 7100 transmission electron microscope.

Results and Discussion

The results of biotest are in Table 2. Visible symptoms on test plants (Figs 2–5) suggested the presence of TMV in the leaf samples. It was confirmed by DAS-ELISA serological method as well. Out of the nine antisera used only antiserum to U1 strain of TMV gave positive result. The rod-shaped particles of TMV can be seen on electron microscopical photos (Fig. 6). This is the first report of the natural occurrence of TMV on *A. syriaca* in Hungary. Nevertheless future investigations are necessary to prove that the virus particles can transport toward the underground rootstock together with assimilates by the end of vegetation period and – in this way – this weed plays important

Table 2

Symptoms of Asc-isolate of tobacco mosaic *tobamovirus* (TMV-Asc) from naturally infected *Asclepias syriaca* L. on test plants

Species	Symptoms*
<i>Chenopodium quinoa</i>	Chl/-
<i>Datura stramonium</i>	NI/-
<i>Gomphrena globosa</i>	Chl/-
<i>Nicotiana benthamiana</i>	-/Mo, Led
<i>N. clevelandii</i>	-/N
<i>N. glutinosa</i>	NI/-
<i>N. sylvestris</i>	-/Mo, Led
<i>N. tabacum</i> cv. Samsun	-/Mo, Led
<i>N. tabacum</i> cv. Xanthi	NI/-

*Local/systemic symptoms; Chl, chlorotic lesions; Led, leaf deformation; Mo, mosaic; N, necrosis, NI, necrotic lesions

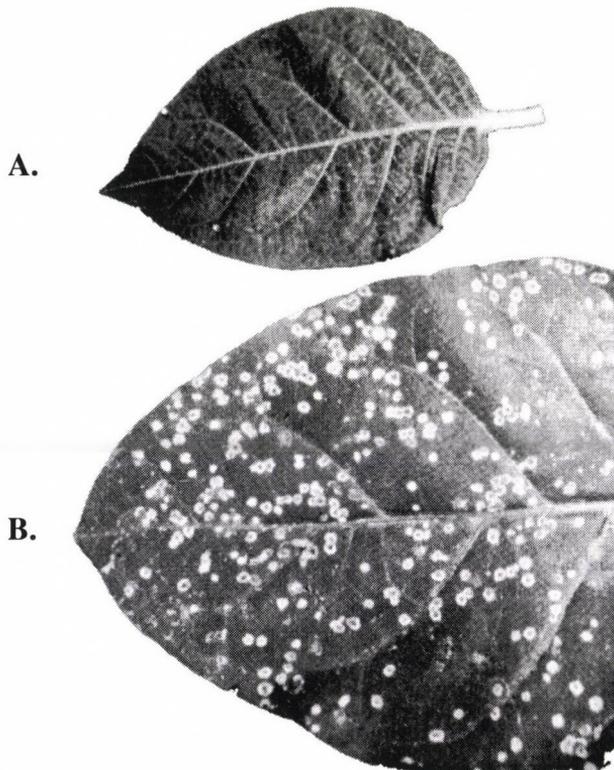


Fig. 2. Local lesions on the leaves of *Nicotiana tabacum* cv. Xanthi infected with tobacco mosaic *tobamovirus* (Asc isolate). A. control; B. infected leaves

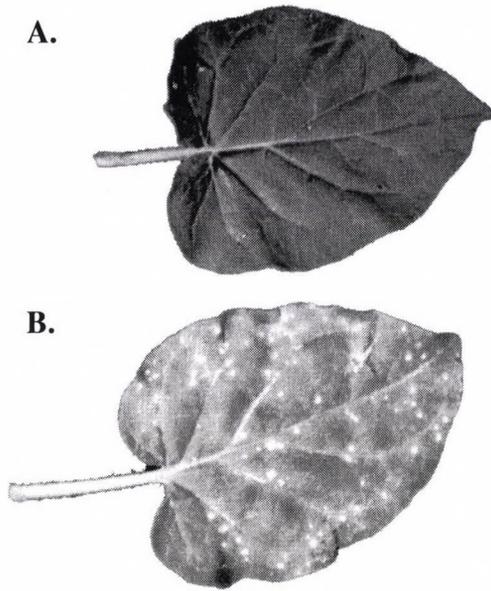


Fig. 3. Local lesions on the leaves of *Nicotiana glutinosa* infected with tobacco mosaic *tobamovirus* (*Asc* isolate). A. control; B. infected leaves

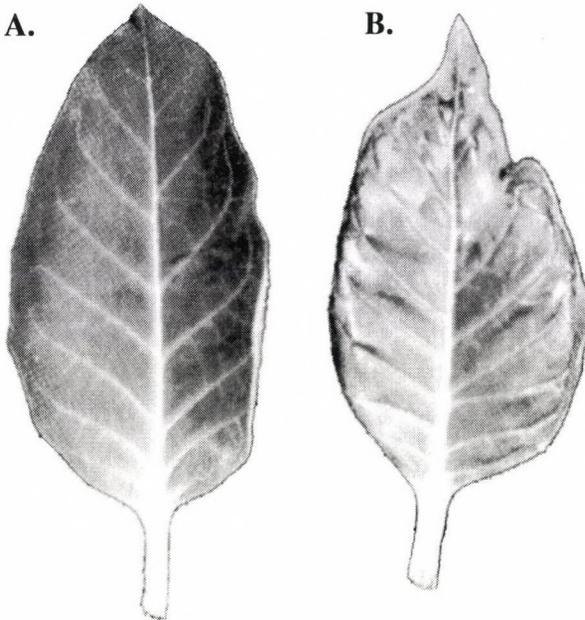


Fig. 4. Systemic symptoms on the leaves of *Nicotiana tabacum* cv. Samsun infected with tobacco mosaic *tobamovirus* (*Asc* isolate). A. control; B. infected leaves

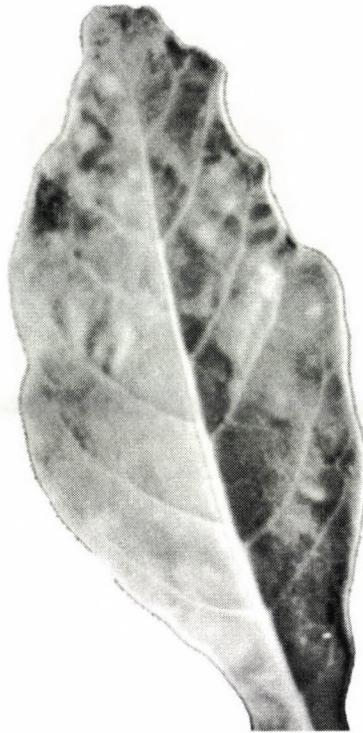


Fig. 5. Systemic symptoms on the leaves of *Nicotiana sylvestris* infected with tobacco mosaic *tobamovirus* (Asc isolate)

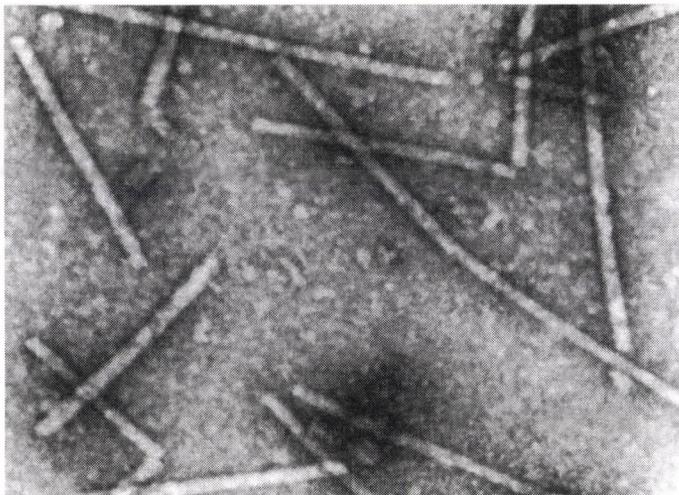


Fig. 6. Electron micrograph of leaf-dip preparation of tobacco mosaic *tobamovirus* infected *Asclepias syriaca* plants (80 000x magnification)

role as winter reservoir of different viruses. From the point of integrated weed management it would be very important to study the biological decline of *A. syriaca* due to virus infection.

Acknowledgement

This work was supported by the Grant Agency of OTKA (Budapest, Hungary), grant number F022803.

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