Differentiation of Strains of Sugar Beet Yellows Virus on
* Tetragonia expansa *Murr.* and Other Indicator Plants

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Abstract. Five different isolates of beet yellows virus were maintained without any changes in their properties on *Tetragonia expansa* Murr. syn. *T. tetragonoides* Pall. for a long period of time. According to their characteristics and different properties especially in a diploid inbred line of sugar beet the isolates are considered to be strains of BYV and are classified into three groups: group of mild strains (the mild masked and mild strains), normal strains (the common strain) and necrotic strains (the severe necrotic and necrotic strains). The necrotic strains of BYV were relatively easily transmissible manually to sugar beet plants and other indicator species. The common strain can be transmitted to sugar beet, *Chenopodium quinoa* Willd., but not to *C. capitatum* L. Asch. Mild strains are transmissible with difficulty and *C. quinoa* is the only species which develops a larger number of local lesions after inoculation. In contrast to the mild masked and common strains it is manually transmissible to *C. capitatum*. The mild masked strain can not be transmitted to sugar beet. *Nicotiana quadrivalvis* Pursh. is not susceptible to mechanical inoculation with BYV. Aphid transmission with *Myzus persicae* (Sulz.) was positive in experiments with necrotic strains only. Mechanical transmission of BYV was successful also to *C. foliosum* (MöNCH) Asch., *C. murale* L. and *Claytonia perfoliata* Donn. The last two species were susceptible to inoculation by aphids as well. Attempts to transmit the virus manually to *T. expansa* Murr. and *C. giganteum* Donn. failed.

The sources of beet yellows virus isolates were described in our previous paper (Polák 1970). The isolates were classified into three groups according to the symptoms developed in the tetraploid line of 99,248 sugar beet: mild, medium and severe groups. Two mild, two severe and one medium isolate were chosen for further differentiation.

Watson (1952), BIEBERG (1952), RUSSELL (1958), BURGHARDT and BERCKS (1959) etc., used mostly sugar beet seedlings for their experiments with BYV or differentiation of BYV strains. It was found later that sugar beet is not an ideal plant species for such studies and researchers tried to find some other more useful indicator plants or to use certain types of sugar beet such as inbred lines. Björkling (1961) carried out more detailed studies on differentiation of BYV isolates in sugar beet with respect to their genotype and classified them — in accordance with McKINNEY and GREELEY (1960) — as BYV strains.
BJÖRLING (1958) proposed to use *Tetragonia expansa* Murr., *Claytonia perfoliata* Donn., *Chenopodium foliosum* (Moench) Asch. and *Nicotiana clevelandii* A. Gray as indicator plants for differentiation of BYV strains. BENNETT (1960) used sugar beet *C. murale* L., *C. giganteum* Donn., *C. capitatum* L. Asch., *Nicotiana clevelandii* A. Gray and *T. expansa* Murr. Out of these differential host plants sugar beet, *T. expansa* and *C. capitatum* reacted with the widest range of symptoms. Also BRÖK (1960, 1964) showed *T. expansa* to be a useful differential host. In our experiments BYV strains were differentiated by long-lasting passages on *T. expansa* by means of aphid inoculations.

Beet yellows virus is manually transmissible with difficulty (KASSANIS 1949, COONS 1952, COSTA and BENNETT 1955, BENNETT 1960). MUNDRY and ROHMER (1958) succeeded in mechanical transmission to sugar beet and *C. foliosum*. In addition to darkening of plants before inoculation these authors used a special buffer. RUSSELL (1963a) reisolated BYV strains from a mixed infection by means of a local lesion technique on *Claytonia perfoliata* plants. POLÁK and KLÍR (1969) succeeded in manual transmission of BYV to *C. quinoa* and *C. foliosum* and attempted to discover the possibilities of BYV transmission to sugar beet and some other differential host plants.

The aim of our effort was to differentiate chosen isolates of BYV and characterize them as strains of BYV on different indicator plants.

**Material and Methods**

**Inoculation of Plant Species by the Green Peach Aphid Myzus persicae (SULZ.)**

Single BYV-strains (as isolates described by POLÁK (1970)) were maintained for a long period of time on *T. expansa*. The plants were inoculated at a stage of two to four immature leaves. Usually 12 plants were inoculated with one strain in each transfer. As the source of virus infection *T. expansa* plants inoculated 3—5 weeks previously were used. Inoculation of healthy plants was carried out with adult wingless females of *M. persicae*. The acquisition feeding lasted 6 or 18 hrs; the inoculation feeding was 18 or 24 hrs before the aphids were killed with an insecticide. Five aphids were used per one plant. In each experiment the number of infected plants and length of incubation period were investigated. The plants were watched for 6 to 10 weeks after inoculation. The length of incubation period among plant species tested was statistically evaluated to find out if significant differences between BYV-strains exist. Syndromes of BYV-strains were characterized on *T. expansa* and a diploid line of sugar beet number 13,050 which was inoculated in the same way. Check back transmissions were performed on *T. expansa*.

**Manual Inoculation of Plant Species Tested**

The indicator plants and inocula were prepared as described by POLÁK and KLÍR (1969).

The plants were put in a dark chamber 4 days before inoculation. At the time of inoculation sugar beet plants as well as *C. capitatum*, *C. foliosum* and *T. expansa* were at a stage of two to four true leaves, *N. quadrivalvis* had six leaves; two immature leaves of each plant were inoculated. *C.