Introduction. *Turnip mosaic virus* (TuMV) is a member of *Potyvirus* genus belonging to the largest *Potyviridae* family of plant viruses [1]. As many potyviruses, TuMV has an extremely wide host range but infects mostly plant species from the *Brassicaceae* family and induces persistent symptoms (mosaics, mottling, chlorotic lesions, etc.). For domesticated *Brassica* plants, TuMV is considered one of the most damaging and economically important viruses [2]. TuMV is mainly transmitted by many aphid species non-persistently as well as mechanically from plant to plant. TuMV probably occurs worldwide and has been found in both temperate and subtropical regions of Africa, Asia, Europe, Oceania and North and South America. In Europe, TuMV was reported from the UK, Spain, Italy, Greece, Germany, The Netherlands, Czech Republic, Hungary, Bulgaria, Poland, and Russia [3-9]. Despite Ukraine’s geographical location and wide cultivation of different *Brassica* crops for centuries, it’s only recently that the authors have registered TuMV in our country (unpublished data). In the study reported here, we describe the importance of preventive measures for the control of wide-spread and damaging pathogen of brassicas.

Materials and methods. Sampling was restricted to crop-producing areas in Kyiv region and different locations in the city of Kyiv where *Brassicaceae* plants were growing/cultivated. In Kyiv, sampling locations included two botanical gardens, the city center, Museum of Folk Architecture and Life of Ukraine (open-air location w/o agricultural activity), and private gardens where different brassica plants were regularly cultivated. Several large fields in Luka and Gorenychi villages used for commercial cabbage cultivation were chosen for sampling in Kyiv region. Brassica plants were visually examined, samples were collected from plants with TuMV-like symptoms typically including mosaics, mottling, vein banding and/or leaf deformation.

Collected samples were tested for TuMV by double antibody sandwich enzyme-linked immunosorbent assay (DAS-ELISA), as described previously by Clark and Adams (1977) [10], using specific polyclonal antibodies purchased from Loewe (Germany). Briefly, 0.5 g leaf tissue was ground to a powder with a mortar and pestle in 10 mL phosphate-buffered saline, pH 7.4, containing 0.05% Tween 20, 2.0% polyvinylpyrrolidone (MW 40 000) and 0.2% bovine serum albumin. In the meantime, microtiter plates (Maxisorb, NUNC, Denmark) were coated with TuMV-specific broad-spectrum polyclonal antibodies (1:200) in carbonate buffer according to the manufacturer’s instructions. Leaf extracts were then added to the plates in duplicate wells and incubated overnight at 4°C. The presence of TuMV in the samples was detected in 200 µL homogenate by TuMV-specific antibodies conjugated to alkaline phosphatase using p-nitrophenyl phosphate substrate (Sigma, USA). Absorbance values at 405 nm were measured using a Multiscan-334 microtiter plate reader (Labsystem, Finland). Absorbance values, measured 60 min after adding the substrate, greater than three times those of the negative controls were considered positive.

Results and discussion. A total of 54 plant samples with TuMV-like mosaic and mottling symptoms were collected in different districts of the city of Kyiv and Kyiv region. Sampling areas included both agricultural sites (two cabbage producing fields and private gardens) and urban locations where no agricultural activity was carried out (different sites in the City of Kyiv, two botanical gardens and open-air Museum of Folk Architecture and Life of Ukraine). Using ELISA, TuMV was detected in samples from cabbage, red radish, mustard, radish, white mustard, gold of pleasure, weed species (hill mustard), etc. (Table 1).

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**SPREAD OF TURNIP MOSAIC VIRUS IN SUSCEPTIBLE CROPS IS STRONGLY EFFECTED BY DIFFERENT CULTIVATION PRACTICES**

*Samples of plants showing symptoms of Turnip mosaic virus (TuMV) were collected from fields planted to *Brassicaceae* crops in Kyiv region and different locations in the city of Kyiv. TuMV was detected in the main brassica-crop fields, private gardens and urban locations of Ukraine, with a high overall incidence of 50%. This paper describes the effects of different cultivation approaches on the incidence rate of viral infection in susceptible crops and confirms the importance of preventive measures for disease control.*

*Key words: Turnip mosaic virus, cultivation practices.*
TuMV has been detected in 27 samples of plants (overall 50% incidence rate in symptomatic hosts) including *B. oleracea* var. capitata, *R. sativus*, *Raphanus* sp., *S. alba*, *B. juncea*, *C. sativa*, *Brassica* sp., and *Bunias orientalis*. On cabbage plants, TuMV typically induced systemic mosaics, vein banding and leaf deformation (Fig.1), whereas systemic mosaics and motting were common for naturally infected radish and mustard plants.

Several sampling sites within the Kyiv city (i.e. where no agricultural activity was carried out) demonstrated even higher incidence rate of TuMV with the minimum value of 33% for symptomatic plants. These results suggest that TuMV is probably widespread in both agricultural and urban locations but remained undetected for a long time.

Expectedly, different locations demonstrated high but varying level of TuMV occurrence. However, several aspects were of special interest in this regard. For the two fields used for commercial cabbage production in Kyiv region and situated in neighboring villages just 5 km apart, the TuMV incidence rate varied from 17% to 42%. This probably reflects the efficiency of the confirmed regular eradication of diseased plants in the former case (field 1) and underpins the significance of long-known simple approach – elimination of virus inocula – for the disease control.

In turn, rather high rate of TuMV infection in private gardens (58%) may be explained by both growing of infected plants and repeated cultivation of susceptible crops, as reported by the landowners. Another approach allowing to limit virus spread – crop rotation – was also missing in this case.

Obtained results clearly demonstrate that trivial measures for crop cultivation (known for decades but often thoroughly disregarded) remain highly efficient in controlling the spread of the mechanically and aphid-transmitted virus and reducing consequential damages.

**Conclusions.** In summary, the survey indicated high occurrence of TuMV in urban and agricultural regions in Ukraine where average infection incidence rate reached 50%. Wide range of infected plant species and high incidence rate in surveyed areas obviously demonstrates both the lack of virus screening and important role of efficient cultivation approaches for disease control in Ukraine. Obtained data suggests a long-term coexistence of the virus and the hosts in Ukraine.

**References**

FORESTS IN THE BASIN OF THE LOWER SULA (UKRAINE)


References


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ПОШИРЕННЯ ВІРУСУ МОЗАІКІ ТУРНЕПСУ У СПРИЙМАЛІВИХ КУЛЬТУРНИХ РАСЛИНАХ СИЛЬНО ЗАЛЕЖІТЬ ВІД РІЗНИХ ПІДХОДІВ ДО ВИРОШУВАННЯ

Зразки рослин з симптомами віруса мозаїки турнепсу (TuMV) відбиралися з промислових полів вирощування хрестоцвітих культур у Києвській області на Юго-Західному передмісті Києва. ТуМВ був знайдений на всіх промислових полях, приємних присадібних ділянках та у міських ділянках, а сумарний рівень інфекції становив 50%. У даній роботі описані наслідки застосування різних агрономічних прийомів для поширення вірусу у сприймаючих культурах та підтверджено важливість профілактичних заходів у боротьбі з вірусними хворобами.

Ключові слова: вірус мозаїки турнепс, вирощування хрестоцвітих культур.

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РАСПРОСТРАНЕНИЕ ВИРУСА МОЗАИКИ ТУРНЕПС У ВОСПРИЯМЛЯЕМЫХ КУЛЬТУРНЫХ РАСТЕНИЯХ СИЛЬНО ЗАВИСИТ ОТ РАЗНЫХ ПОДХОДОВ К ВЫРАЩИВАНИЮ

Образцы растений с симптомами вируса мозаики турнепса (TuMV) отбирались с промышленных полей выращивания цветочных культур в Киевской обл. и на различных участках в городе Киеве. TuMВ был найден на всех промышленных полях, прибрежных приусадебных участках и участках городских участках, а суммарный уровень инфекции составил 50%. В данной работе описываются последствия применения различных агрономических приемов для распространения вируса в цветочных культурах и подтверждена важность профилактических мероприятий в борьбе с вирусными болезнями.

Ключевые слова: вирус мозаики турнепса, выращивание цветочных культур.

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FLORISTIC CLASSIFICATION OF THE FLOODPLAIN ALDER, WILLOW AND POLAR FOREST IN THE BASIN OF THE LOWER SULA (UKRAINE)

The floodplain alder (Alnus glutinosa), willow (Salix alba, rarely S. fragilis) and poplar (Populus nigra, P. alba, outliers of Populus x canescens) forests in the basin of the lower Sula were investigated. Mesohygrophilous forests of European black alder were referred to Alno-Ulmonic alliance Querco-Fagetea class (com. Aegopodium podagraria-Alnus glutinosa, D. C. Acer negundo-Alnus glutinosa). Swamp forests of European black alder of Alnetea class are mostly common in the floodplains of small rivers and are represented by two associations (Carici ripariae-Alnetum glutinosae and Carici acutiformis-Alnetum glutinosae). The floodplain willow and poplar forests were referred to class Populetea albae (order Populaletalia albae). Willow forests of floodplains of the river Sula and its tributaries and also waterlogged gully talwegs and rarely outliers belong to Salicion albae alliance and Salicetum albae association. Lower reach poplar forests of the river Sula floodplain belong to Calamagrostio epigei-Populion nigrae alliance and are divided into two associations that we propose to change in accordance with the requirements of the International Code of Phytosociological Nomenclature for Galio veri-Populetum nigrae and Struphrostio sarsisflorae-Populetum albae. It is emphasized that the studied groups don’t contain the species from the Red Data Book of Ukraine. The alder, willow and poplar forests of each association that are least transformed, largest in area and oldest require the nature reserve creation, that is proved by their significant water conservation role.

Key words: Querco-Fagetea (Alno-Ulmino), Alnetea, Populetea albae, Ukraine, Dnieper left-bank Forest-Steppe, basin of the lower Sula, syntaxonomy.