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SPREAD OF VIRUSES IN PEAR ORCHARDS IN SOME REGIONS OF UKRAINE

The diagnostics of pear viruses was carried out in three regions of Ukraine. The infection rates of Apple chlorotic leaf spot virus, Apple stem pitting virus, Apple stem grooving virus and Apple mosaic virus in pear orchards were determined by means of ELISA. The tests revealed that the general infection level of these four viruses in pear orchards is 18.1%. Initial virus free clones of pear cultivars and rootstocks were selected.

Key words: pear viruses, virus free planting material, ELISA.

The economical importance and distribution of pear orchards in the structure of all fruit and berry plantings in Ukraine takes the second place after apple. The reason of this is not only the less popularity of a pear comparing to an apple but, first of all, fastidiousness of a pear to planting conditions that significantly reduces its area. In present time Ukraine takes the last but one place in production of pear fruits and leaves behind only Poland [1]. Among factors that cause decrease of pear areal in Ukraine are negative impact of environment, presence of pests and significant spread of causative agents of fungal, bacterial and viral diseases. These factors decline productivity of pear orchards and its profitability and as a consequence make no expediency to create new gardens.

According to European scheme of certification, which estimates quality of planting material of pome cultures regarding to international normative documents of European Plant Protection Organization, among the viral agents that cause viral diseases of fruit cultures the most harmful for pear and quince are three viruses of *Flexiviridae* family: *Apple chlorotic leaf spot virus* (ACLSV), *Apple stem grooving virus* (ASGV) and *Apple stem pitting virus* (ASPV) [3, 5]. These viruses are rather widespread in *Rosaceae* family especially in apple, pear and quince orchards and have rather wide geographical distribution [6, 7]. The average rate of three viruses of pear plantings in Russia is 20% [2]. It is hard to detect infection in time because ACLSV, ASGV and ASPV belong to the group of latent viruses and most

of commercial varieties and rootstocks don't have any visual symptoms. *Apple mosaic virus* (ApMV) is another one virus frequently infecting pear trees.

In this context immunodiagnostics of varieties and rootstocks become very important. It gives the possibility to conduct not only monitoring of viruses but also to select virus free samples and to create the base of virus free mother plants of economically-valuable pear varieties and rootstocks.

During the last years on the base of Department of Virology and Propagation of Fruit and Berry Cultures of Institute of Horticulture the inspections of pear orchards are regularly conducted in different regions of Ukraine. These surveys enable to reveal in time trees infected with the complex of latent viruses and to use in further gardening only virus free material.

Materials and methods

For detection of viral diseases by ELISA we have collected the samples in productive, collection and nursery orchards of pear in 2006–2008 years in the period of intensive growth during May–July, when concentration of virus in plant tissue is the highest [4]. Altogether 224 samples of perspective cultivars included 47 pear varieties were tested. Also 271 samples of pear rootstocks included 20 traditional and new breeding forms of clone rootstock types were investigated. Surveys were conducted in gardens of Institute of Horticulture UAAS, Crimean Research Station of UAAS and Podil Research Station of UAAS. Immunodiagnostics was carried out by classic ELISA and DAS-ELISA. Certified antibodies for ACLSV, ASGV, ASPV and ApMV produced by Loewe Phytodiagnostica, Germany and Bioreba AG, Switzerland, were used for the investigation purposes. The results of the analysis were registered by microplate spectrophotometer STAT FAX 2100, USA.

Percent of samples infected with virus *i* in the orchards of certain type *k* was calculated according to the equation:

$$F_{ik} = \frac{N_{ik}}{N_k} 100\ \%, \qquad (1)$$

where N_k – number of tested samples, N_{ik} - number of samples infected with virus *i* in the orchards of type *k*.

The general infection level of virus *i* in all types of pear orchards (F_{igen}) was calculated according to the equation:

$$Figen = \sum_{1}^{k} Nik \cdot 100\% \Big/ \sum_{1}^{k} Nk \qquad (2)$$

Results and discussion

The results of the test revealed high rate of pear viruses spread in different types of the orchards in all the regions where surveys were conducted. The most prevailing was *Apple stem pitting virus* which causes incompatibility of rootstock and scion and leads to low quality of planting material. So among the tested samples of pear varieties rate of ASPV infection was 26%, when infection levels of other three viruses were significantly lower: ACLSV – 8.9%, ASGV – 2.7%, ApMV – 5.8% (Fig. 1).

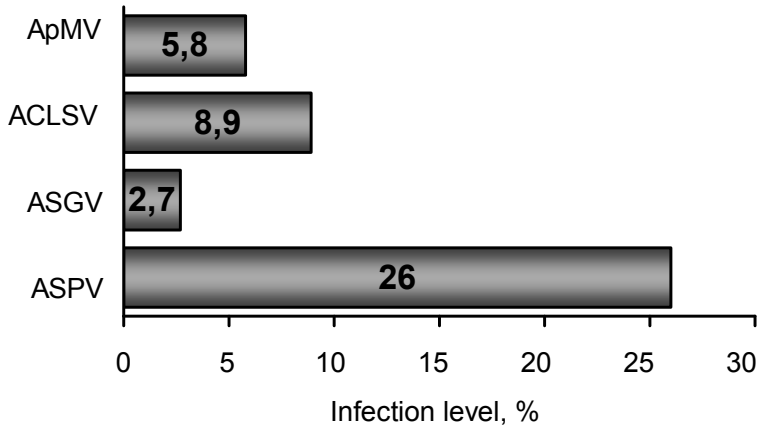

Fig. 1. The level of pear varieties (%) infected with viruses

New varieties of pear intensively propagated in Ukraine were rather frequently infected with the complex of viruses. In these cases the uninspected collection of plantings become the primary source of infection. No samples free from virus infection were found in Zolota Osin', Jack Tel'ye and Dicolor varieties. The high rates of infected samples had varieties Vyzhnitsya and Stryis'ka – 62.5 and 42.1% respectively. The test results gave the possibility to choose the virus free samples of 44 pear varieties, from which all the samples of 21 varieties were not infected by any of viruses. Perhaps, we have obtained such results because not long ago the seedlings were used to cultivate on initially virus free seed rootstocks.

During recent years horticulture in Ukraine has started active use of clone rootstocks which are vegetative propagated and can be a permanent source of viruses if phytosanitary control is not conducted. That's why we should pay not the less attention to testing of pear rootstocks. The diagnostics revealed general lower infection level – 10.0% comparing to 29.5% of variety material. Difference was observed also in infection levels of certain viruses. While cultivars were mainly infected with ASPV, rootstocks were frequently infected with ACLSV – 6.3%. Infection rate of ASGV, ASPV and ApMV was – 1.1%, 3.5% 1.5% respectively (Fig. 2).

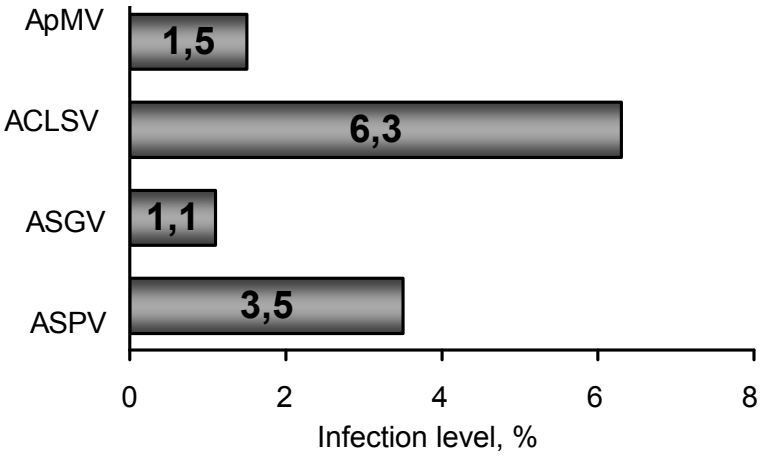

Fig. 2. The level of pear rootstocks (%) infected with viruses

As well as varieties, rootstocks were infected with the complex of two or three viruses. The general lower level of infection can be explained by a short period of use of these rootstock types in Ukraine and planting of their nurseries with tested certified material. In the whole, the virus free clones were selected for all 20 analyzed rootstock types.

Thus we can state the presence of virus infection in all the tested orchards of pear. Viruses ACLSV, ASGV, ASPV and ApMV were detected both in cultivars and rootstocks and composed rather high infection level 18.8% (Fig. 3).

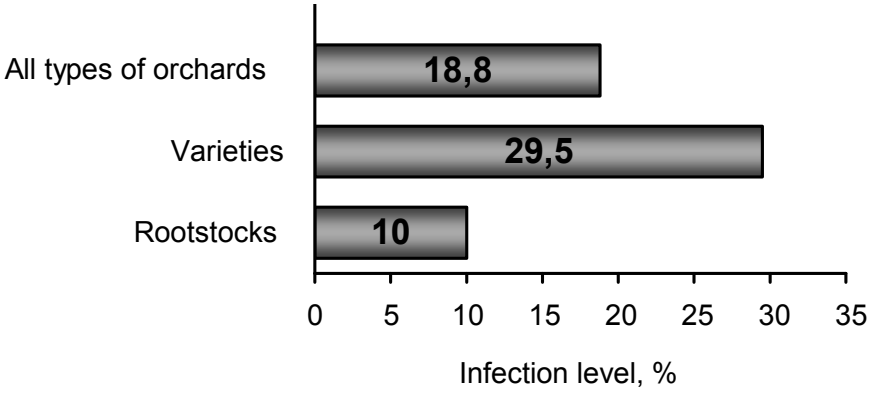

Fig. 3. General phytovirology condition of pear orchards

The results of the tests allowed selecting of 64 virus free cultivars and rootstock types which will be biologically tested on woody indicators and complete fond of virus free pear clones. The tested clones revealed the presence of infection gave us the possibility to continue the investigation of Ukrainian strains of pear viruses. So our further researches will be directed on molecular-biological and phylogenetic analysis of these viruses.

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ПОШИРЕННЯ ВІРУСІВ У НАСАДЖЕННЯХ ГРУШІ ДЕЯКИХ РЕГІОНІВ УКРАЇНИ

Реферат

Проведено діагностику вірусів груші у трьох регіонах України. Методом ELISA (enzyme-linked immunosorbent assay) визначено рівні інфікованості насаджень груші вірусами хлоротичної плямистості листя яблуні, борознистості листя яблуні, ямкуватості деревини яблуні та вірусу мозаїки яблуні. Тестування показало, що загальний рівень інфікування цими чотирма вірусами становить 18,8%. Виділено вихідні безвірусні клони сортів та підщеп груші.

Ключові слова: віруси груші, безвірусний садивний матеріал, ELISA.

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РАСПРОСТРАНЕНИЕ ВИРУСОВ В НАСАЖДЕНИЯХ ГРУШИ НЕКОТОРЫХ РЕГИОНОВ УКРАИНЫ

Реферат

Проведена диагностика вирусов груши в трех регионах Украины. Методом ELISA (enzyme-linked immunosorbent assay) определены уровни инфицированности насаждений груши вирусами хлоротической пятнистости листьев яблони, бороздчатости древесины яблони, ямчатости древесины яблони и вируса мозаики яблони. Тестирование показало, что общий уровень инфицирования этими четырьмя вирусами составляет 18,8%. Выделено исходные безвирусные клоны сортов и подвоев груши.

Ключевые слова: вирусы груши, безвирусный посадочный материал, ELISA.