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DESCRIPTION OF SOME VIRUSES THAT INFECT THE SWEET PEPPER (*CAPSICUM ANNUM*) PLANT

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Annotation. *In Uzbekistan, satisfying the needs of the population for food and industry for raw materials is one of the most pressing tasks facing agriculture and science today, and much attention is paid to this area in the republic. Sweet pepper belongs to the Solanceae family and has the scientific name Capsicum annum. The homeland of sweet pepper is considered to be Central America. It turns out that at the moment 45 viruses affecting sweet pepper have been registered. Examples of such harmful viruses include PMMOV, BPEV, PEPLCBV, CHilCV, TVCV, ALPV, PMV, TMV, PVY, CMV, PepLCBV and other viruses. This study notes information on the symptoms of the disease specific to viruses affecting the Capsicum annum plant.*

Keywords: *Capsicum annum, Solanceae*, PMMOV, BPEV, PEPLCBV, ChilCV, TVCV, ALPV, PMV, TMV, PVY, CMV, PepLCBV.

ОПИСАНИЕ НЕКОТОРЫХ ВИРУСОВ ПОРАЖАЮЩИХ РАСТЕНИЕ СЛАДКИЙ ПЕРЕЦ (*CAPSICUM ANNUM*)

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Аннотация: *В Узбекистане удовлетворение потребностей населения в продовольствии и промышленности в сырье является одной из самых актуальных задач, стоящих сегодня перед сельским хозяйством и наукой и в республике этому направлению уделяется большое внимание. Сладкий перец относится к семейству Solanceae и имеет научное название Capsicum annuum. Родиной сладкого перца считается Центральная Америка. Оказывается, на данный момент зарегистрировано 45 вирусов поражающих сладкий перец. Примерами таких вредоносных вирусов являются PMMOV, BPEV, PEPLCBV, CHilCV, TVCV, ALPV, PMV, TMV, PVY, CMV,*

PepLCBV и другие вирусы. В данном исследовании собрана информация о симптомах заболевания, характерных для вирусов, поражающих растение Capsicum annum.

Ключевые слова: *Capsicum annum, Solanceae*, PMMOV, BPEV, PEPLCBV, ChilCV, TVCV, ALPV, PMV, TMV, PVY, CMV, PepLCBV

Introduction. Sweet pepper (*lot. Capsicum annuum*) is an annual herbaceous plant native to Central America. The STEM is herbaceous, grows erect, branching, growing varieties from 25-30 cm to 80 cm in height, in a greenhouse even taller than 2 meters. Sweet pepper fruits of different shapes (cylindrical, Square and round) and weight (100-190 grams), biologically ripe fruits can be red, reddish, yellow, pink, light green and even dark purple. In addition to being susceptible to many other diseases, Capsicum annum is also considered very susceptible to viral diseases. According to the data given in this direction so far, more than 45 viruses have been recorded in the sweet pepper (*Capsicum annum*) plant, with 22 known to have been infected tabiously and the rest by artificial inoculation [2, 3, 9, 10]. Viruses that infect the plant *Capsicum annum* have been grouped into 8 genera, including *Potyvirus, Tospovirus, Begomovirus, Kukumovirus, Tobamovirus, Pelerovirus, Alfamovirus,* and *Potexvurus*. To the main viruses that infect the plant Capsicum annum; Pepper veinal mottle virus (PVMV), Chilli veinal mottle virus (ChiVMV), Potato virus Y (PVY), Tobacco etch virus (TEV), Tobacco mosaic virus (TMV), Tomato mosaic virus (ToMV), Pepper mild mottle virus (PMMoV), Pepper leaf curl virus (Pepplcv), Tomato yellow leaf curl virus (TYLCV), Cucumber mosaic virus (CMV), alfalfa mosaic virus (AMV) and tomato spotted wilt virus (Tswv), among others, and other viruses of minor importance; Pepper vein yellows virus (pevyv) and potato virus X (PVC) may be introduced. These viral diseases significantly limit the yield and quality of the plant. In addition, viruses are the main diseases that damage plants, and agronomic measures designed to prevent them, such as selecting virus-resistant varieties, maintaining plant sanitation, and promptly destroying infected plants, are important. [1, 2, 8, 9, 10].

Literature analysis. As mentioned above, representatives of some virus families in this plant are more common than, for example, potiviruses, i.e., (PMV), (PVMV), (PepMoV), (ChiVMV), (PVY) and tobamoviruses (TMV), (PMMoV), (ToMV) [2, 3]. Below we link information about the characteristics of some viruses listed in scientific sources.

- The causative agent of the Cucumber mosaic virus is the cucumber mosaic virus. The disease is very dangerous in the summer months. Symptoms of the disease: stunting, discoloration of the plant, blistered leaves on mature plants, and crumbling of the fruits are some of the main symptoms of the virus. There are three types of disease development;

a) green wilting form - the plant wilts in a green state and dries slowly;

b) stunted growth - the plant lags in growth, and its fruits remain small and undersized.

c) in a brown form - the leaves and stems wither, the diseased tissues darken and wither;

d) yellow mosaic – its leaves and buds turn yellow, deform, flowers and fruits shed.

The authors studied the symptoms of viral diseases in *Capsicum annum* plants, including: mosaic patterns on leaves, leaf brittleness, leaf curling, linear spots along veins, yellowing of veins, and shrinkage of leaf plates [9].

Also, tomato spotted wilt virus (ToMMV) is the causative agent of tomato spotted wilt mosaic virus (ToMMV). The virus is transmitted by aphids (small insects that feed on plant leaves and flowers and spread the virus), the disease is rare in open and closed areas, as it is not a widespread pest. Tobacco thrips are also carriers of this disease virus. Symptoms of the disease: slow growth and yellowing of its leaves, twisting, necrosis at different levels, chlorosis, mosaics, leaf deformity and other forms are manifested. These symptoms are directly related to the process of metabolism that occurs in the plant. The upper part of the plant grows slowly, the leaves and side branches of the plant in the upper part become bronze, over time, lines and signs of necrosis begin to appear on them. Chloritic and necrotic spots are also observed on its fruits. The Virus is preserved in weeds and cultural plants, especially potato nodules and tomatoes, that is, the same plants were considered the foci of the virus. To prevent the disease, it is necessary to ensure soil sterilization and maintain field hygiene before sowing seeds [1, 2, 6, 9].

The disease can be transmitted through aphids *(aphis gossypii),* the insect myzus persicae, and humans during plant care, through plant seeds and parasitic weeds. To combat the virus, it is necessary to create virus-resistant pepper genotypes, use certified seeds and plants and disinfect Tool Equipment, hands [1, 2, 6, 7, 9].

Research results and their discussion. In this work, the determination of the bioecological characteristic of viruses infecting the sweet pepper plant was taken as the main goal. To do this, the symptoms of a virus-specific disease presented in the literature data were studied (figure).

Figure 1. Symptoms of a virus-specific disease in the Capsicum annum plant. a) the appearance of mosaic patterns on the leaves; b) the fragility of the leaves; C) the twisting of the leaves; d) linear spots along the veins; e) the yellowing of the veins; f) the shrinkage of leaf size [Olawale Arogundade et al. 2020].

In our study, monitoring work was carried out in the fields of the Tashkent region planted with sweet pepper, and the plant showed signs of the disease characteristic of the virus. As a result of the follow-up, some of the following symptoms of the disease were observed:

- leaf veins-Inter-yellow chlorosis and contraction of the veins and curling of the plate;

- yellow local chloritic stain on the leaf plate;
- green mosaic on leaf paste;
- linear darkening necrosis along the stem of the plant;
- large dark spot on the Leaf Palatine and the fruit of the plant.

Samples were collected and withdrawn for further research to further investigate whether the symptoms of this disease were specific to the virus.

a)  b) 

b) **Figure 2.** a) symptoms of tobacco mosaic virus in Sweet Pepper; b) symptoms of tomato spot wilting mosaic virus in sweet pepper plant[Aydinay Abdugapparovna Makhatova, Vahid Bakhromovich Fayziev. 2022].

Conclusion. As a result of the analysis of scientific sources as well as the research carried out, it is possible to conclude as follows. The sweet pepper (*Capsicum annum*) plant has been found to be infected by more than 40 viruses as well as some of them being spread in the mamalakatimiz area depending on the symptoms of the virus-specific disease. Therefore, in our three subsequent studies, it is required to carry out more in-depth research on the separation and study of the properties of these viruses. This provides the basis for learning more about viruses and developing measures to combat them.

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