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PROSPECTS AND KEY TENDENCIES OF SCIENCE IN CONTEMPORARY WORLD

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SECTION 5.

AGRICULTURAL SCIENCES

INCIDENCE OF VERTICILLIUM WILT DISEASE IN STRAWBERRY FIELDS IN TASHKENT REGION

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ABSTRACT

The data on the incidence and severity of verticillium wilt disease of strawberry in the condition of Tashkent region, and on its causative agent *Verticillim dahlia Kleb*. fungus has been presented in the thesis. It was noted that this disease has been found in all strawberry fields of the region. The first symptoms of this disease of strawberry have been observed from the flowering period. It was also noted that this disease infects the entire root structure of the strawberry plant.

Keywords: Verticillium wilt, fungus, varieties, temperature, root crown, infection, necrosis, sterilization.

Strawberry is an important berry fruit crop due to its early maturity, its low demand for growing conditions, delicious taste, and the first satisfaction of people's demand for vitamins and other valuable nutrients after winter.

In the conditions of Tashkent region, its yield does not exceed 4-5 t/ha. The negative impact of harmful insects and diseases on strawberries is among several factors that contribute to such a low yield of strawberries. Among its diseases, verticillium wilt is common with its adverse effects.

Verticillium wilt is one of the common diseases of strawberries in Poland, Germany, France and other countries of Western Europe, in the USA and Canada (Natalina, 1963; Plakidas, 1964; Potalaychuk, Novotelnova, 1967; Filipov, Andreyeva, Bazimlinskaya, 1978; Finn, 1996).

The damage of this disease is high that significantly reduces the yield, at the same time, it was observed that the plant bushes and stems dry and the runners appear less often, and the yield is reduced by 40-70% (Popova,

Konstantinova, 1978). According to information given by G.F. Govorova (1990), verticillium wilt can damage up to 100% of the plant and kill it up to 5-25%. According to this author, in the North Caucasus and the Crimea, plants in strawberry plantations were completely destroyed by verticillium wilt disease. Plant death due to verticillium wilt disease depends on the strawberry variety and soil contamination with pathogen infection. The damage caused by verticillium wilt was great in strawberry fields planted after eggplant, tomatoes, potatoes, and sweet peppers that had been heavily damaged by this disease (Locke, Buck, 1997). If the strawberry plantations were established on the land freed from the fields of leguminous and grain crops, alfalfa, and mustard, due to the reduced infection in the soil of these fields, it was observed that the disease of verticillium wilt was less manifested (Stepanova et al., 1977).

The external symptoms of the disease may vary depending on the strawberry variety, the nature of the soil and other factors. According to E.A. Vlasova and V.I. Krivchenko (1976), a fast infestation form of this disease was observed in light sandy soils, and it was noted that strawberry plants die in 3-4 days.

In the chronic form of the disease, the symptoms of the disease appear gradually, in which the leaves become discolored, stunted and their number decreases. By the end of the growing season, the leaf stems turn red, the plant's development slows down, and it is observed that it dies without development. Some plants may recover and begin growing at the end of the vegetation period and continue to develop, producing new leaves in the spring of the following year. This appearance of the disease was recorded by O.B. Natalina (1963). According to G.F. Govorova and D.N. Govorov (2004), such symptoms of the disease are typical for disease-resistant varieties. These symptoms of the disease are more often noted in plants in natural conditions, first small and then large necrosis appear between the leaf veins of such plants. Due to the disease, first some parts of the leaves, then the leaf itself completely dries up. At first, the lower leaves, and then the plant itself completely die (Vlasova, Krivchenko, 1976).

In 1816, Hienfon Ethenbeck divided the *Verticillium* fungus into a separate genus based on its unique morphological appearance, conidia-group structure. After this idea was used by Wallroth in 1833, *Verticillium* was recognized as a separate genus from 1833 (Govorov, 2011).

V. albo-atrum species was described by Reinke and Berthol in 1879 as a new species of *Verticillium* genus (Smith, 1965).

The fungus *V. dahliae* was first isolated in 1913 by Kleban from a diseased dahlia flower. In contrast to *V. albo-atrum*, this type of fungus formed dormant microsclerotia (Govorov, 2011).

In 1913, Thomas proved for the first time that the fungus *V. dahliae* is the causative agent of Verticillium wilt disease in strawberries. Before that, this fungus was first isolated from a wilted strawberry in Holland by Van Soeteen in 1911 and identified it as *Verticillium sp*., but he did not study its pathogenicity (Govorov, 2011).

The fungus *V. dahliae* forms white colonies in the first days on artificial nutrient media. These colonies are composed of hyphae of 2 μm wide with transverse septa, and the conidia groups grown from the substrate are branched whorled, each of which has 1-5 verticil, with 2-4 phialides, the tips of the conidia bands are wrapped in a mucous membrane which form heads of 1.5-2.5 x 4-7.5 μm size, with one-celled conidia group. When the colony of the fungus is three weeks old, it is estimated that there will be 5 billion conidia on the surface of 50 mm^2 (Azizova, Kasyanenko, 1979). The fungal colony turns black after 5-7 days due to the formation of microsclerotia.

After two weeks, as a result of the formation of a layer of microsclerotia, sparse groups of mycelium and conidia can be seen on the surface of the colony.

Typical biological feature of *V.dahliae* fungus, that is, the presence of a robust reproduction system in the development cycle, resistance to adverse conditions, not only allowed it to spread quickly and widely, but also affected the development of its parasitic nature. The pathogen can survive outside the host's body with the help of microsclerotia in plant debris and soil for up to 14 years (Wilhelm, 1955). Microsclerotia are bundles of segmented fungal hyphae with a thick skin, covered with melanin granules (Smith, 1965). They are the main source of infection of verticillium wilt disease, because the conidia and mycelia of the fungus are quickly destroyed by saprophytic microorganisms in the soil (Borodin, 1978; Yakutkin, 1978; Azizova, Kasyanenko, 1979).

Verticillium wilt affects strawberries through the root system. Through the root, the mycelia of the fungus penetrate into the conductive tissue of the plant and begin to reproduce there.

In the Krasnodar region of Russia, from 1974, G.F. Govorova conducted research on the study of the race of the fungus *V. dahliae*, which was isolated from strawberries and vegetable crops. The author for the first time isolated 6 races of the fungus *V. dahliae* from strawberry varieties “Luch VIRa”, “Rannaya Plotnaya”, “Pamyatnaya”, “Zenga-Zengana” and “Yuzhanka” and studied it deeply (Govorova, 1990).

The records on Verticillium wilt disease of strawberry was conducted twice during the growing season, in late July and late September, using the following scale.

0 score – healthy strawberry plant;

1 score – weakly infected plant, necrosis or other symptoms of disease is observed in lower leaves;

2 scores – significantly infected, wilting symptoms are observed in up to 10% leaves of the plant.

3 scores – strongly infected, necrosis or other symptoms of wilting is observed in up to 25% leaves of the plant;

4 scores – very strongly infected, more than 50% of the leaves of plant wither or the plant completely die (Govorova, Govorov, 2010).

In order to isolate pure culture of the fungus which causes verticillium wilt in strawberry, moisture chamber method was used. For this purpose, a filter paper was placed on the bottom of the Petri dishes and were sterilized in an autoclave at a temperature of 121°C for 30 minutes under a pressure of 1 atm. Then filter paper was wetted with sterile water in a laminar box and moisture chambers were prepared.

Samples of strawberry plants brought from the fields were washed thoroughly in running water and then water was poured over them before planting them in moisture chambers in the laboratory, samples were cut as required, in laminar box they were sterilized by immersing in 0.5% sodium hypochlorite (NaOCl) solution for 30 minutes and thoroughly washed 2-3 times in sterile water Then they were placed in Petri dishes by 5-10 pieces.

Petri dishes with samples planted were placed in thermostats with a temperature of 18-20°C to isolate fungi in pure form. At this temperature, it took 8-12 days for the fungi to grow.

Fungi grown in samples in Petri dishes were planted in laminar boxes in test tubes filled with agar wort and agar potato broth media and then were placed in a thermostat with a temperature of 24-26°C, after that their species was identified.

Verticillimus dahlia Kleb. fungus has been found to cause verticillium wilt disease of strawberry in conditions of Tashkent region. The first symptoms of verticillium wilt in strawberries were observed from the flowering period, the leaves of diseased plants became stunted and slowed down in growth and development. Towards the end of the growing season, the leaf bands turned red and the plant's development lag behind that of healthy plants was clearly visible.

The whole root system and root crown of the strawberry plant was damaged by verticillium wilt disease. Due to the disease, it was observed that the inner tissue of the plant root, especially the part near the root crown, turned brown, and dry rot was formed as a result of the death of tissue cells.

When the infected root of the strawberry plant was observed under a microscope, it was found that first whitish, then grayish mycelia and small dark colored microsclerotia were noted on its surface.

It was also noted that as a result of death of strawberry plants due to the disease in 2-3 years, the number of strawberry bushes and seedlings decreased and the field became sparse.

The mycelia of the pathogenic fungus *V. dahliae* have colorless, transverse septa with thick walls, 2-4 μm wide. Conidia groups are branched verticilled, with transverse septa, colorless, 80-160 μm long, with 1-3 verticils at the tip, and each verticil has 1-5 sterigmas. Stregmas are straight, in some cases slightly bent, with a septum at the base, 14-26 μm long. It was found that the width of the base of the stregmas is up to 2.5 μm, and it narrows to 1 μm towards the tip. The width of stregmas in the tip was equal to 30-40 μm. Conidia are usually one-celled, some of them have one septum, elliptic, sterigmas are united in one head at the tip, 3-5.5 x 1.5-2 μm in size. Microsclerotia have septa, they first turn brown, then black. Microsclerotia with thick cell walls were 30-60 μm in diameter.

As a result of research conducted in strawberry fields in Tashkent region, verticillium wilt disease was noted in all monitored farms. Due to verticillium wilt disease, it was found that not only the productivity is reduced, but also its quality decreased.

Conclusion. Verticillium wilt disease was observed in strawberry fields of all farms in Tashkent region. The entire root system and root crown of the strawberry plant was damaged by verticillium wilt disease.

Due to verticillium wilt disease of strawberry, it was noted that the number of strawberry bushes and seedlings decreased and they became sparse in the field.

It was found that the fungus, which causes verticillium wilt, survives by forming microsclerotia in the affected plant parts.

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