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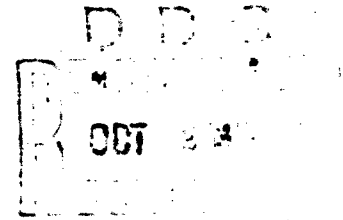
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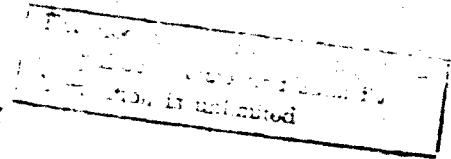
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RED STELE OF STRAWBERRY

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Pages 224-225, V.25, 1964
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V.V. Kotova

Red stele, one of the most harmful diseases affecting strawberry plants, is induced by the fungus *Phytophthora fragariae* Hick, and was first discovered in USSR in 1962 in Krasnodar kray by G.F. Govorova (1964). Judging by their description of the disease, we regard as doubtful the claims published in 1958 by G.F. Maklakova (Sad i Ogorod [Garden and Orchard], No. 5; Zashchita Rasteniy ot Vreditel'ey i Bolezney [Protection of Plants from Pests and Diseases], No. 6, and by N.F. Yurova in 1965 (Zashchita Rasteniy ot Vreditel'ey i Bolezney), No. 1, that they discovered red stele near Leningrad.

Up until recently this disease was known only in England, USA and New Zealand. In 1920 it suddenly appeared in Scotland. It is possible that red stele has existed for centuries, but remained unnoticed because of the insignificant infection rate of strawberries.

The rapid spread of the disease and the cases of mass strawberry loss in subsequent years under conditions in England are attracting the attention of many researchers. However, isolating the fungus in its pure form, and determining its species frequently terminate in failure. It was not until 1940 that C.J. Hickman carried out a detailed study of the disease, isolated the causative agent, and established it as a separate species -- *Phytophthora fragariae* Hick.

Official information about the appearance of

red stele in the USA appeared in 1935. Soon after this discovery it became one of the main reasons for the mass wilting and loss of strawberry crops in the states of Maryland, Michigan, Oregon and others.

It may be assumed that red stele of strawberry plants was imported into the USSR together with some planting materials from abroad. Mass wilting of plants on different farms of Krasnodar kray was already noted in 1958 and even earlier, but its cause was not understood. In 1959, for instance, the soil at the Maykop experimental station had to be replowed because of extensive wilting of young strawberry plants in an area of ten hectares.

In 1962 red stele of strawberry was noted at all plantations of the Maykop experimental station VIR (All-Union Scientific-Research Institute of Horticulture), Sochinsk experimental station, and Labinsk fruit and berry growing sovkhos. On farm sections seeded with the plant varieties of Rannyaya MosVIR, Chernobrivka, Kul'ver, Predgornaya, Musho, and others, 25-51% of the plants were affected by the disease. On the collective sections of the Maykop experimental station the varieties of Krupkaya, Melitopol'skaya, Ukrainka, Chernobrivka, and Sharilez were found non-resistant to the disease. Strawberry varieties of Biryulevskaya rannyaya, Lyubov' Povolzh'ya, Obilnaya, Negritenok, Roshchinskaya, and others planted on the same sections were not affected by the disease.

The disease's causative agent is a soil pathogenic organism carried by zoospores. The latter penetrate into the root hair; during growth the micelium of the fungus fills the vascular tissue of the root. A red coloration of the stele occurs (for this reason the disease is known as "red stele disease"). The coloration is of greater intensity in the vascular tissue; the other tissues of the root remain in a normal condition.

Other microorganisms follow the causative agent of the disease, coloring the affected roots brown, thereby frequently disguising the primary symptoms. The affected secondary roots rapidly die. The so-called "rat's tail" symptom appears; the upper part of the primary root is still in a healthy condition, while the lower part has already turned black and is dying. At

the same time the leaves acquire a purple-green color, and soon begin to turn red and wilt. The new leaves are usually small in size, have short petioles; the plants are dwarfed.

The affection of the root's central cylinder usually stunts the plant growth and discolors them, but does not always kill them. The plants which survive the spring recover from the disease during the summer; new roots grow. By the following spring the causative agent of the disease becomes active again. The depressed plants produce small, poor quality berries; the plants subsequently die. Large quantities of fungus zoospores are formed in the central cylinder of the root's tissues; these spores can exist in the soil for eight or more years.

The parasitic fungus is most active in cold, damp weather. It is transmitted from one field to another in planting materials, by machines carrying soil, by man, domestic animals, and other means. The plants are affected mainly in early spring or autumn at temperatures below 14 degrees. It is during this period that a correct diagnosis of the disease can be made by thorough inspection of the plantations and the condition of the planting materials.

The pathogen is narrowly specialized and is capable of affecting only plants of such varieties as *Fragaria*, *Potentilla*, and *Loganberry* according to foreign authors (McKeen, 1958 and others). Attempts to infect Rosaceae plants and other families were unsuccessful.

The further spread of the disease forms a serious threat to cultivating strawberries under Soviet conditions. It is therefore necessary to carefully select healthy planting material, avoid importing strawberry seedlings from infected areas, and use only resistant varieties. On farms where red stele of strawberry is discovered, it is advisable to create control nurseries to grow healthy planting material, avoid planting strawberries in infected sections, plant only in light soils, cultivate the soil in early spring to provide proper drainage, and avoid excessive application of nitrogen fertilizers in the early spring.

Within the near future it will be necessary to discover the possible foci of red stele Phytophthora in different areas of the Soviet Union. First, it will be necessary to investigate the strawberry plantations in areas adjacent to Krasnodar kray, and also all farms and experimental stations which aid in introducing planting materials.