RHIZOCTONIA SOLANI KÜHN AS A COMPONENT OF THE STRAWBERRY ROOT ROT COMPLEX IN BRITISH COLUMBIA[1]

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Abstract

Root rot of strawberries is estimated to cause an average loss of 20 per cent of the plants in the strawberry-growing areas of British Columbia. The typical symptom is a sudden collapse of the plants just before or during the early part of the fruiting season. Rhizoctonia solani Kühn was isolated frequently from such plants, and inoculations with this organism produced a severe root rot condition in British Sovereign strawberry plants. Petiole and crown infection also occurred, In controlled temperature studies the root rot symptoms were more severe at 35° - 60°F while petiole and crown infection was more pronounced at 60° - 90°F.

Introduction

During the past few years losses due to "summer dying" of strawberry plants, caused by root diseases, have averaged about 20 per cent of the plants in the main strawberry-growing areas of British Columbia. The heaviest loss observed was on a Vancouver Island plantation where 80 per cent of the plants died in a few weeks at the beginning of the 1958 picking season. Rhizoctonia solani Kühn has been reported to be a serious pathogen of strawberries in California (5), Ontario (1, 2, 4), Oregon (6), and Quebec (3).

Symptoms

In the early stages of "summer dying" the undersides of the leaves become purple and tend to curl upwards. The petioles turn brown and may become frayed at the base in the latter stages of plant wilt, The original crowns are frequently dead and numerous side crowns may develop.

Internal brown discoloration extending upwards is usually present in the basal tissues of living crowns. Young adventitious roots of these plants show dark-brown lesions which are typically most severe at the necks of the roots. Feeder rootlets in the lesioned areas are almost invariably killed and the steles of the roots are sometimes necrotic in the lesioned areas. Within a few weeks, plants killed by Rhizoctonia may be scattered throughout the plantation.

Isolations of R. solani were made from plants in all stages of wilt, and from young runner plants in spring. The varieties from which the isolations were made included Agassiz, British Sovereign, Northwest, Perle de Prague, and Siletz.

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Experimental Results

Inoculations were made with five different isolates of R. solani. Young, unrooted runners of the variety British Sovereign, still attached to the mother plant, were rooted into 5-inch pots filled with steam-sterilized greenhouse compost which was inoculated by mixing one Petri plate of actively-growing mycelium with the soil in each pot. Five pots were used for each isolate and five as controls.

An isolate from the crown of the variety Northwest was the most pathogenic. It caused severe root rot, discoloration of the petioles, and a brown discoloration in the cortical regions in the bases of the crowns. All the other isolates produced milder symptoms of root rot and petiole infection.

Further tests with the Northwest isolate were made and the following method of inoculation was used. The fungus was grown in 500 ml Ehrlenmeyer flasks, half filled with a cornmeal-sand medium, until it had completely penetrated the medium. One flask was used to inoculate a 6-inch-deep flat filled with steam-sterilized soil. Ten young runner plants of the variety British Sovereign were planted to a flat. One flat each of inoculated and uninoculated soil was then placed in the following temperature ranges: 35-45°F, 50-60°F, 60-70°F, and 70-90F. An artificial light period of 15 hours was provided by fluorescent lights.

Dark-brown lesions appeared on the petioles of the plants in the inoculated series after 8 days at 70-90°F (Fig. 1). Petiole infection was most severe at the higher temperatures. Many plants had all leaves infected or killed in the 60-70°F and 70-90°F ranges. The lesions completely girdled the petioles and often extended into the leaf blades. When these leaves were pulled off the plants they showed a typically frayed base.

Three weeks after inoculation the plants were lifted and examined for root and crown rot. Root rot was present at all temperature ranges, (Fig. 2), but it was more severe at the lower temperatures. Some root systems were completely rotted, while others showed the typical lesions on the necks of the roots and also along the root surface (Fig. 3). In severely affected plants the feeder rootlets had dropped off giving the roots a rat-tail-like appearance, Browning was observed in the internal crown tissues of most of the plants, starting in the region of root initiation and gradually discoloring the entire crown tissues (Fig. 4). This crown discoloration was most pronounced in plants set relatively deep in the soil. In some instances the terminal bud was killed and new side buds had started to develop (Fig. 5).

These studies show that R. solani is an important component of the strawberry root-rot complex, and is capable of causing severe losses in strawberry plantations under the climatic conditions of the coastal regions of British Columbia.

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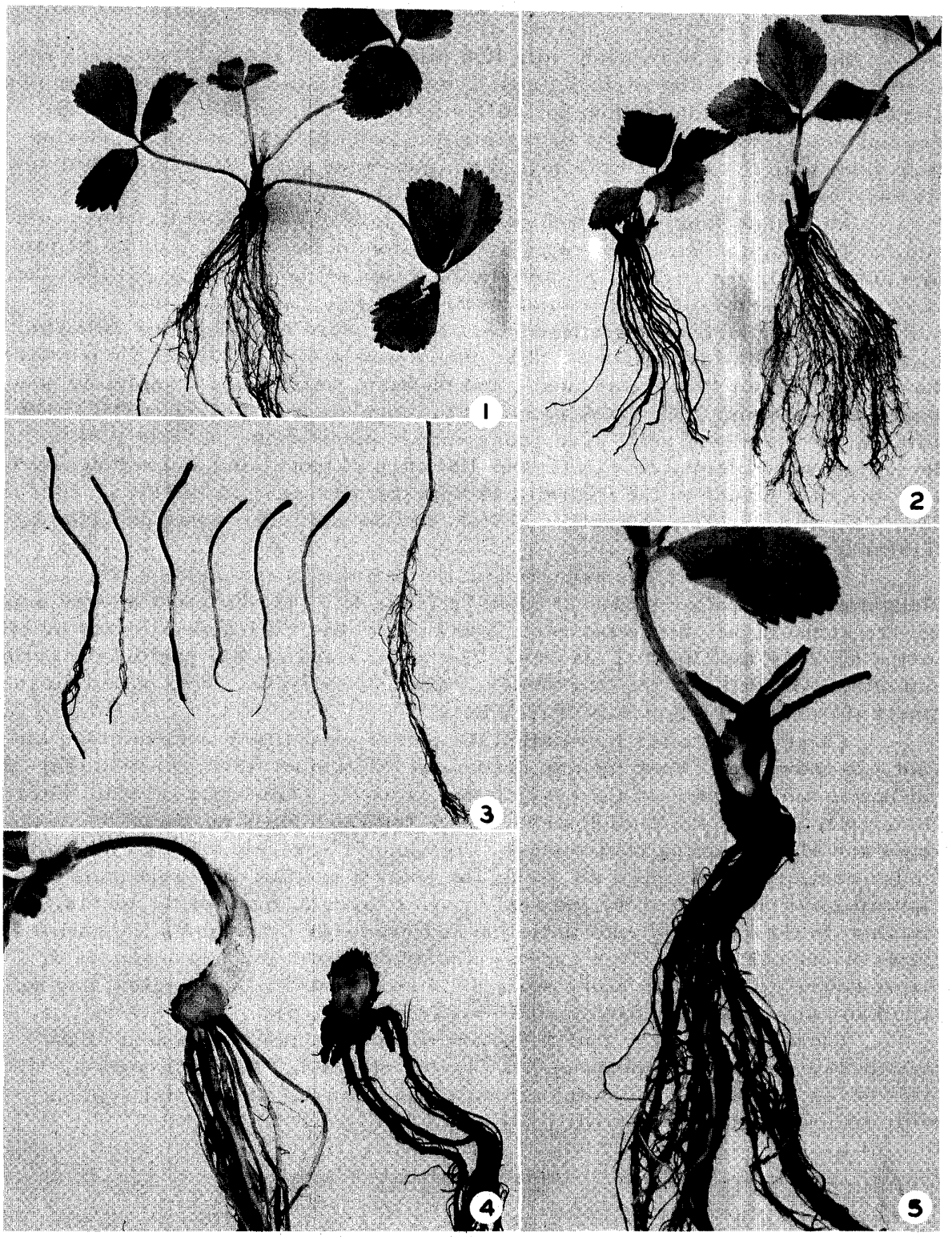

FIG. 1 BRITISH SOVEREIGN STRAWBERRY PLANT, 8 DAYS AFTER INOCULATION, IN THE 70-90°F TEMPERATURE RANGE. THE PETIOLES SHOW DARK BROWN LESIONS ON THE BASES. FIG. 2. BRITISH SOVEREIGN PLANT THREE WEEKS AFTER INOCULATION, SHOWING SEVERE ROOT ROT. PLANT ON RIGHT NON-INOCULATED. FIG. 3. ROOTS FROM INOCULATED PLANTS ON THE LEFT, CONTROL ON THE RIGHT, NOTE THE TYPICAL LESIONS ON THE NECKS OF THE ROOTS. FIG. 4. HEALTHY PLANT ON LEFT, INOCULATED PLANT ON THE RIGHT. INTERNAL BROWNING IS MOST PRONOUNCED IN THE REGION OF ROOT INITIATION. NOTE THE ABSENCE OF LEAVES, FIG. 5. TERMINAL BUD WAS KILLED AND NEW SIDE BUD IS DEVELOPING ONTHECROWNOF INOCULATED PLANT.

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