

The Effect of Preceding Crops on the Amount of Seedling Diseases of Sugar Beets¹

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Abstract

Field and greenhouse investigations were conducted to study the effect of continuous fallow and of: Oats, corn, beans, potatoes, beets, and alfalfa on the development of seedling diseases of sugar beets.

Briefly stated, the soil used was from a field cropped for 3 years with alfalfa. Beets were planted in this soil in the greenhouse to test its disease potentialities. They were harvested when the third pair of leaves were developed. The various crops mentioned above were then planted in this soil and harvested in approximately 3 months, after which the soil was again reseeded to beets.

Readings of healthy and diseased beet seedlings were made at frequent intervals during their growth. In each experiment the soil was analyzed 4 times to determine if the growing of different crops produced any changes in the soil micro-organisms which could have any effect on the occurrence of sugar-beet seedling diseases.

The first planting of sugar beets had very high and uniform amounts of diseased seedlings (86.0 to 96.0 percent) in both years. The amount of seedling diseases in the second planting of beets, although varying slightly both years, showed the same trend after each of the crops.

On an average for 2 years, the lowest amount of beet-seedling diseases (23.6 percent) occurred when beets were planted after corn and the highest (87.8 percent) in the check. Seedling diseases of beets occurred in increasing amounts when they were planted after corn, potatoes, oats, alfalfa, beans, beets, and the check, respectively. The changes in the number and kind of soil micro-organisms, due to growing of different crops, did not show significant quantitative variation in the main groups of the soil micro-organisms, viz, bacteria, fungi, and actinomyces. It is possible, however, that a greater change occurred in the qualitative composition of the groups of soil microflora than in the total population; this was not determined.

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The effect of preceding crops on the amount of beet-seedling diseases was also studied under field conditions. Potatoes, beans, beets, and alfalfa had been grown for 5 years on four 1/8-acre plots with a uniform soil. In 1941 sugar beets were planted on all these plots to study the effect of these preceding crops. Seedling diseases of beets were the lowest (11.1 percent) following potatoes and the highest following beets (74.2 percent) and alfalfa (61.2 percent). Beets planted after beans had an intermediate amount of diseases (27.7 percent). Two hundred and fifty sugar-beet seedlings grown on each of these plots were analyzed for nitrogen (N) and phosphorus (P_2O_5). The amounts of nitrogen and P_2O_5 in the beets gradually decreased as the amount of beet-seedling diseases increased. The highest amounts of nitrogen and P_2O_5 were found in the beet crop which grew on the potato plot and the lowest amounts on the beet plot.

Black Root Diseases of Sugar Beet in 1941¹

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Experiments on the control of seedling diseases of sugar beet were conducted in 1941 at Beltsville, Maryland; East Lansing, Michigan; and Holgate, Ohio. The test at Beltsville was planted late and disease incidence was minor; at East Lansing, a seed-treatment test was planted early, but the field experienced severe flooding and needed to be replanted. Loss of seedlings from damping-off in the second planting was considerable. At Holgate, dry weather during the first weeks of growth made seedling diseases less serious than usual, so that all treatments and the check plots had acceptable stands.

In the seed-treatment experiment at Beltsville, significant differences among various treatments and the untreated were not found. At East Lansing, seed treatments involving commonly used mercury and copper disinfectants were significantly better than the check with respect to initial stands, but enough plants still could be saved at thinning time so that the untreated plots gave acre-yields of roots not significantly below those from plots in which the seed used was treated.

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