Establishing and Maintaining a Lettuce Drop Nursery

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ABSTRACT

Troutman, J. L., and Matejka, J. C. 1982. Establishing and maintaining a lettuce drop nursery. Plant Disease 66:415.

Lettuce drop, caused by *Sclerotinia sclerotiorum*, is a destructive, sporadic disease in Arizona. Because natural infection is unreliable for chemical control work, a procedure was developed for establishing a lettuce drop nursery. Sclerotia harvested from a barley grain medium were dried and incorporated into lettuce beds that had been thinned at a predetermined rate. The optimal time for studying chemical efficacy for controlling lettuce drop is during January, February, and March, when air temperatures range from 0 to 20 C. For the past 4 yr, this program has been very successful for determining the efficacy of various fungicides for controlling lettuce drop.

The lettuce season in Yuma County, Arizona, starts about mid-August with planting and ends the following year with the late harvest about mid-April. Thus, the growing season extends through a time when environmental conditions are ideal for lettuce drop, caused by *Sclerotinia sclerotiorum* (Lib.) d By. (3). The disease was first recognized in Arizona (2) in 1925.

Yuma is located at 32°45′ N latitude, 113°37′ W longitude. The elevation ranges from 30 to 90 m, and rainfall averages less than 7.5 cm per year. During the last three production months (February, March, and April), disease incidence can be high. Unfortunately, most production costs have been incurred by this time.

Recently, a new group of systemic fungicides that are particularly effective against *Sclerotinia* (1,4) has been introduced by several chemical companies. To test the efficacy of these fungicides under field conditions, it was necessary to establish a disease nursery and initiate a testing program suitable for conditions in Arizona. We describe a field testing procedure that has been developed over the past 8 yr for testing fungicides for control of lettuce drop. This program has emphasized efficacy rather than a cost-benefit ratio because most of the chemicals are submitted under an experimental label with no information about cost.

Accepted for publication 22 September 1981.

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0191-2917/82/05041501/$03.00/0
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MATERIALS AND METHODS

The medium for producing sclerotia was made by boiling 5.5 kg of barley grain in 15 L of tap water for 1.5 hr. Previous tests had indicated that increasing the salt concentration by adding potassium chloride to potato-dextrose agar enhanced the development of large numbers of sclerotia, although they were smaller than those produced in lettuce (J. L. Troutman and R. T. Williams, *unpublished*). The tap water used for boiling the grain contained 900 μg of total dissolved solids per liter; to this, 7 g of potassium chloride per liter was added.

Boiled grain contained the moisture necessary for fungus growth. After boiling, the grain was sieved to remove liquid, and the moist grain was put into 1,000-ml flasks; flasks were filled to half capacity. Twenty-four hours later, the flasks were autoclaved for 1 hr at 15 lb pressure, cooled for 24 hr, and autoclaved again. After the final cooling, the grain was seeded with a single sclerotium taken from a pure culture, and flasks were incubated at room temperature (about 24 C) for 3 mo under continuous light. Several isolates were used for sclerotial production, because some produced more sclerotia than others. After the incubation period, contents of each flask were removed, spread on a clean surface, and dried with a fan and heat lamp. Dried material contained an average of 2,000 sclerotia per kilogram.

In the 1980 season, about 400 cc of this dried material was distributed evenly in lettuce plots in bands 50 cm wide and 15 m long just before the plot was irrigated after being thinned. At this stage of growth, the young plants had not formed a canopy over the surrounding soil, and the sclerotia could be distributed right next to the plants. Infection under our cultural conditions seemed to occur through old senescent leaves by direct germination, as opposed to carpogenic germination. A high moisture level was maintained throughout the season by frequent irrigation.

RESULTS AND DISCUSSION

After several years of modification, including increasing amounts of inoculum from 250 to 400 cc per plot, the procedures described above have been the most successful for evaluating fungicides for the control of lettuce drop. Within limits, disease development can be regulated by varying the amount of inoculum applied. Nearly all the plants in the test plots were killed during 1980 as a result of the heavy application of inoculum. Inoculum may need to be reduced by 25% in future tests.

Lettuce has been grown continuously in these plots for 12 yr with no residual buildup of inoculum. Soil samples were collected during the fall and sieved; no sclerotia were found after a cover crop was grown. Uninoculated guard rows contained only an occasional diseased plant, which suggested that a substantial reduction of sclerotia had occurred from year to year. Sclerotia may be destroyed during the summer when the nursery is planted to a cover crop. Screening soil from this nursery in any quantity to recover sclerotia is very difficult because of the presence of fine clay and silt.

During the growing season, numbers of plants killed are counted periodically to determine efficacy and residual effect of any fungicide being tested. The methods used in the test duplicate a natural field infestation as nearly as possible under Arizona environmental conditions. Variations in disease severity caused by differing amounts of inoculum applied seemingly do not affect relative efficacy of fungicides being compared.

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