SCREENING POTATOES FOR FIELD RESISTANCE TO EARLY BLIGHT

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ABSTRACT

A satisfactory method has been developed for screening potato clones for field resistance to early blight. Differences in clonal resistance can be evaluated and have proven to be consistent. Resistance to foliar infection appears to be generally associated with plant maturity. Late maturing selections are generally quite resistant and early maturing selections are usually extremely susceptible. Differences in resistance among named varieties from throughout the world were extremely variable.

INTRODUCTION

Potato early blight, caused by Alternaria solani (Ellis and Martin) Jones and Grout, is economically important in the Pacific Northwest. Although the disease does not usually reach epiphytotic proportions, it can be very destructive, especially where potatoes are grown under sprinkler irrigation.

Much information has been published (2, 3, 6, 7, 8, 10) about the numbers and timing of fungicide applications for early blight control. These control practices have been, for the most part, only partially effective and have applied to particular growing areas.

The most effective method of control would be to use resistant varieties. Field resistant varieties, mostly of foreign origin, were first identified by Stuart (11). LeClerg (5) later selected more useful resistant varieties and attempted to study the inheritance of this resistance through breeding. The actual incorporation of this resistance into commercially desirable varieties has not reached a state of perfection that permits them to replace presently grown susceptible varieties.

Early blight commonly occurs in Southern Idaho, especially on light soils where frequent irrigation is necessary, and can reach epiphytotic proportions if optimum conditions are provided. Much money is spent each year on fungicides to prevent and control this disease. It is not uncommon for a farmer to apply 6 to 7 applications, at a cost of approximately $5/acre/application, during a single season.

The objective of this work was to develop a satisfactory method for evaluating different clones of potatoes for field resistance to early blight in Idaho. The following is a description of this method.

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2Research Plant Pathologist and Research Geneticist, respectively, Potato Investigations, Plant Science Research Division, Agricultural Research Service, U. S. Department of Agriculture, Branch Experiment Station, Aberdeen, Idaho.
Mention of a trademark name or a priority product does not imply its approval by the U. S. Department of Agriculture to the exclusion of other products that may also be available.
Materials and Methods

Producing inoculum:
Isolates of *A. solani* were maintained on potato-dextrose agar (PDA) at 10 C. When inoculum was desired, the fungus was inoculated onto the center of 9-cm petri plates containing 15 ml of adapted PDA. This medium consists of 15 g of instant mashed potatoes, 15 g dextrose, and 23 g flake agar in 1,500 ml distilled water (1). The cultures were grown for 10 to 14 days at 25 C with constant lighting provided by a 15-w cool-white fluorescent tube. After this initial growing period, during which very little if any sporulation occurred, the cultures were transferred to fresh PDA.

For the transfer, an entire culture from one petri plate was cut with a sterile transfer needle into approximately 4-cm strips and placed into a sterile 250-ml flask containing 50-ml sterile distilled water. The flask was shaken vigorously for approximately 1 minute and left to stand for 10 minutes. Fresh plates of PDA were inoculated with 1.5 ml of the liquid from the flask. The plates were rotated so that the added liquid completely covered the surface of the agar. The inoculated plates were placed in an incubator at 20 C with 16 hours of lighting and 8 hours of darkness. The light source was a 15-w cool white fluorescent tube located 25 cm above the cultures. After 6 days, sporulation was abundant over the surface of all the cultures.

Field inoculum was prepared by mixing the 6-day old cultures, including the agar, from 4 petri plates with 400 ml of water in a Waring Blender for 30 seconds. This procedure was completed immediately prior to field inoculation.

Screening for field resistance:
Clones to be tested were planted in 5-hill units in three replicates in the field. Every third row was planted with the variety Pioneer. This is a relatively early maturing variety that is very susceptible to early blight. Pioneer serves as an ideal spreader, because it develops abundant large lesions and its infected leaves do not absciss like those of most other susceptible clones. The seed was planted the third week in May, and the plot was watered by surface (gravity) irrigation at regular intervals (6-8 days) throughout the season.

The plants of the spreader row were inoculated the third week of July. Two liters of the field inoculum were added to water to make 3 gallons. This concentration, approximately 1800 spores/ml, was applied to 200 ft. of row. This appeared to be satisfactory because the resulting infection was heavy. The inoculum was applied to the plants from both sides of the row by a handsprayer operating at approximately 30 psi. Inoculation was started at about 8 P.M. A previously installed sprinkler system was operated for 2 hr prior to inoculation. After inoculation the sprinkler system was started for 2 hr before sunset every evening for 1 week. After this it was operated for 2 hr on alternating evenings for 2 weeks. By this time severe blight lesions were evident on the spreader rows. For the remainder of the season, until blight evaluations were made, the sprinkler system was operated 2 hr an evening twice a week. Approximately .4 of an inch of water was applied during each 2 hr sprinkling period.

Early blight evaluations were made the last week in August. Differ-