ANNUAL REPORT 1993-1994
AND
PROPOSAL FOR 1994-1995

Tuber Losses in Storage: Leak and Early Blight

Submitted By:

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Introduction

Potato diseases caused by soilborne fungal pathogens are very difficult to manage. The main reason is that the pathogens themselves are persistent and easily disseminated by water, seed, and equipment. Storage rot organisms are difficult to detect and may not even be noticed until considerable losses occur in storage. Management practices such as selecting well-drained planting sites, avoiding excessive nitrogen and irrigation, and delaying harvest so infected tubers express symptoms and can be eliminated before storing the crop can reduce losses. Applications of metalaxyl may reduce infection but excessive use may select for resistant isolates of Phytophthora and Pythium species. The first objective of this project was to determine if the soil could be assayed for these pathogens and a correlation made between pathogen population and storage loss. This would be used to determine a risk level that would justify the use of metalaxyl.

The amount of tuber rot due to Alternaria solani partially depends on the amount of foliar disease and viable spores present at harvest. Tuber skin maturity, wounding, wound healing and subsequent storage conditions also play major roles in managing tuber rot. The second objective of this project was to study the interaction of potato cultivars, pathogen populations, and type of vine desiccation with tuber rot in storage.

This project was initiated in 1994 with funds provided by the Colorado Potato Administrative Committee (Area II).

Materials and Methods

A. Leak and Pink Rot. Five sites in the SLV were selected for soil surveys. Selection was based on information obtained from growers which indicated that tubers with leak symptoms were or may have been harvested from fields in these areas. Soil samples, approximately 1.5 kg in weight taken to a depth of 30-40 cm, were collected near potato plants or in barley fields. The soil and diseased tuber samples were analyzed for the presence of Phytophthora and Pythium species in the plant disease clinic under the direction of Dr. Linnea Skoglund. The soil was thoroughly mixed and diluted with distilled water at approximately 1 to 10 and 1 to 100. The surface of petri dishes containing Phytophthora or Pythium selective media were covered with 1 ml of the soil solution. Plates were incubated for two-three days and pure

cultures were isolated from the colonies onto cornmeal agar. Selective media were prepared by adding various combinations of Pimaricin, Vancomycin, PCNB, and Hymerazol to cornmeal agar. Macerated tissue from tubers exhibiting leak and/or rot symptoms was also placed on these selective media. Infected tubers were obtained at harvest from disease research plots located near the SLV experiment station.

B. Early Blight. An early blight disease field was established near the SLV experiment station on June 7, 1994. The experiment was a randomized plot design with two inoculations, two cultivars, four reps and three vine kill treatments. There were 20 seed pieces per plot (25 feet of row) for a total of 48 plots with 3 blocks of 16 plots each. Cultivars Centennial and A74212-1 were used. Two disease levels were established by inoculating half the treatments with a conidial and mycelial suspension of A. solani. The surface of 4-week-old cultures on cornmeal agar were covered with distilled water and gently scraped with a sterile glass slide. The solution from twenty plates was placed in a 2-liter bottle containing distilled water. The inoculum was applied with a backpack sprayer at the rate of 2 liters per 16 plots. Plots were sprayed approximately the last week of July. Two weeks before harvest, one block was burned down with the commercial rate of sulfuric acid. Plots were harvested the third week of September, 1994. A propane burndown was scheduled but never applied. The applicators failed to show up. Tubers were dug using a one-row harvester and placed in burlap sacks. Tubers were stored under 2-4 C in the cold storage room at the Potato Virus Laboratory at CSU. Ten tubers from each treatment were removed from storage and evaluated for early blight lesions the last week of November, 1994. Shortly after the first sampling, the temperature control failed and all remaining tubers were frozen.

Results

A. Leak and Pink Rot. A few Pythium isolates but no Phytophthora isolates were obtained from soil samples. Phytophthora was routinely isolated from diseased tubers but no Pythium was obtained.

B. Early Blight. Tubers yielded 0-4 relatively small lesions. No significant differences were found among treatments.

Discussion

The rotted tubers found at harvest in the plant disease field near the SLV Experiment Station contained Phytophthora species consistent with pink rot. No Pythium was isolated from any diseased tuber. The "leaky-type" rot found in the disease field was probably caused by pink rot pathogens and not Pythium leak pathogens. The rate of pink rot was not high enough to require treatment with metalaxyl. More rot may have occurred in this field due to stresses caused by other diseases.

The tuber infection rates among the treatments by the early

blight pathogen were not significantly different. Further sampling into the storage season, along with improved techniques, soil sampling, and more vine kill methods may reveal significant differences among treatments. If the amount of disease and spore numbers on the soil can be correlated with subsequent storage rot, a threshold level for tuber treatments may be established. Further studies in this area are warranted.

Proposal for 1994-1995

Objective:

Continue and expand the early blight field experiment with diquat and propane burndown treatments. (A hand-held propane burning tool will be designed and assembled as a backup to the commercial propane treatment). A. solani conidia populations on the soil surface will be determined prior to harvest. Vine kill methods, pathogen populations, and storage rot will be evaluated to determine if vine kill method effects A. solani populations and subsequent tuber loss in storage.

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