Special Research Report #105: Disease Management

Epidemiology and Control of Ranunculus Bacterial Blight

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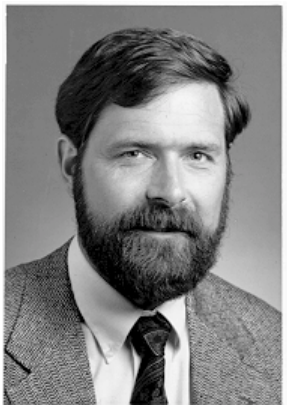
BACKGROUND

A new bacterial blight was identfied in commercial ranunculus fields in California in 1996. Symptoms on several lines included irregular necrotic lesions on leaves and stems, often associated with a chlorotic halo or general leaf yellowing. The causal agent, *Xanthomonas campestris*, was recovered from diseased leaf tissues as well as seed and tuberous-roots, suggesting a means by which the pathogen is spread.



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This project, funded by AFE, investigated sources and spread of inoculum and evaluated practical methods of disinfesting ranunculus seed and tuberous-roots.

MATERIALS AND METHODS

Field plots were established at a commercial ranunculus production site during the 1997-98 and 1998-99 seasons. Beds were planted with naturally-infested seed lots of

Bacterial blight symptoms on ranunculus leaves

two lines that were either untreated, treated with a 1/10 dilution of common chlorine bleach for 30 minutes, with hot water (50^0C for 15 min), or with several experimental chemicals. Approximately 225 plants were grown in each replicate plot, with four replicates per treatment arranged in a randomized

Planting ranunculus field plots

complete block design. The entire design was duplicated to observe disease development under drip and overhead irrigation. Monthly, plant samples were taken for bacterial isolation, and visual disease ratings.

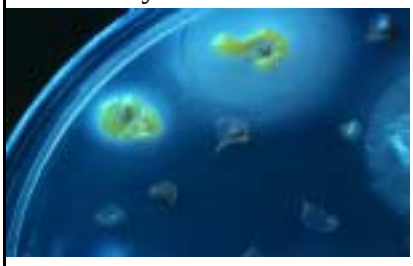
Established field plots within commercial ranunculus field

At harvest, isolations for *X. campestris* were made from seeds and tuberous-roots to enumerate bacterial spread to these propagative materials. Weed species within the field plots were also tested for their

ability to serve as inoculum sources for the ranunculus strain of *X. campestris*.

RESULTS

Chlorine bleach and an experimental disinfectant were the most effective in reducing populations of *X. campestris* on seed and in reducing the establishment of the pathogen in the field plots. Seed viability was not significantly reduced by this treatment.



Detection of X. campestris from ranunculus seed

The hot water treatment, especially when combined with chlorine bleach, was also effective, but the difficulty in maintaining the correct temperature during treatment probably precludes this from practical field use. A slightly higher temperature resulted a significant loss in seed viability. Lower temperatures were not as effective against the bacterium.

Attempts to disinfest the tuberous-roots were not successful. However, infection of tuberous-roots with *X. campestris* was strongly correlated with visible necrotic symptoms. In one lot, sorted by a commercial grower and based on visual inspection, we did not detect *X. campestris* in the "cleaned" group of tuberous-roots,

Sectioned ranunculus root tubers with necrosis caused by X. campestris

while in the original lot, 2.8% of tubers were infected.

Overhead irrigation and wind-driven rains favored disease development on leaves and stems. Systemic infection by *X. campestris* in plants with severe foliar infections was detected within a few weeks after disease onset, and both tuberous-roots and seeds became infested.

Ranunculus plants with severe leaf and stem blight and systemic infections

Of 19 common weed species tested for the presence of *X. campestris*, two grasses harbored significant epiphytic populations of the pathogen. In addition, the bacterium was recovered infrequently on two clovers and on common cheeseweed. These results suggest that weeds can be a significant source of residual inoculum in the field.

CONCLUSIONS

Ranunculus seed that is infested with *X. campestris* can be effectively treated by soaking in a 1/10 dilution of chlorine bleach for 30 minutes. Ranunculus is grown commercially from seed during selection trials for specific lines. Infested seed lots have a lower percentage of viable seeds than noninfested lots, and propagation from infested lots can lead to widespread foliar and systemic infections. These infections can result in infection of the tuberous-roots, which are the main propagative materials distributed commercially. The use of clean seed, coupled with drip irrigation and weed control, can signficantly decrease the incidence of bacterial blight in the commercial production of ranunculus tuberous-roots.

IMPACT TO INDUSTRY

(1). Growers are now treating ranunculus seed with chlorine bleach, and symptoms of bacterial blight have decreased significantly in California.
(2). Both drip irrigation and stringent weed control should be practiced in ranunculus production.