

# CAUSE AND TIMING OF RED STAIN ON TREASURE VALLEY ONIONS

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## Goals and Objectives

Growers are concerned about the occurrence of red stain on white onions grown in the Treasure Valley. The causal organism was unknown and the timing of the development of the red stain was thought to occur just before harvest. Consequently, at the request of the Onion Research Committee we sought to (1) determine the cause of red stain on white onions in the Treasure Valley, and (2) determine when red stain develops during the season.

## Methods

### ***1999 Field Observations and Laboratory Evaluations***

White onions were collected from each of six commercial fields representative of white onion production in the Treasure Valley (Table 1) and examined for the presence of red stain. Collections were made on four dates, July 31, August 6, August 13, and August 23. Ten bulbs from each field were scored for the proportion of the bulb covered with red stain. Four or more stained bulbs from each field at each date were forwarded to the Plant Clinic, Department of Botany and Plant Pathology, Oregon State University, Corvallis, Oregon.

Table 1. Location of commercial fields sampled and white onion variety, 1999, Treasure Valley.

1. SW of golf course near Ontario, 'Blanco Duro'
2. South of old packing plant south of Ontario, 'White Keeper'
3. Near Airport Rd. south of Weiser, 'Blanco Duro'
4. Near Crystal Lane south of Weiser, 'Blanco Duro'
5. Near Crystal Lane south of Weiser, 'Gladstone'
6. Near Olds Ferry Rd. NW of Weiser, 'Blanco Duro'

### ***2000 Koch's Postulates, the Re-creation of Symptoms***

Koch's Postulates, proves that an organism causes disease: the organism needs to be isolated from diseased onions, grown in pure culture, innoculated into healthy onions, create the disease symptoms, and be reisolated again. White onion sets from the Treasure Valley were planted in sterile media and grown in a greenhouse to determine

if inoculation with *Phoma terrestris* would reproduce the red stain symptoms observed in the field. On July 18, when the onion sets were 4 months old, 10 onions were inoculated with a suspension of mycelium from 2 week old broth cultures of *Phoma terrestris*. The mycelium was derived from a single spore culture and had been harvested from the broth, washed free of the medium, macerated with a homogenizer for 10 seconds, and resuspended in 100 ml of deionized water. The mycelial suspension was then applied to the onions, both directly on the onion bulbs themselves and to the surrounding soil. Five onions were mock inoculated with the same volume of deionized water. All onions were maintained under ambient greenhouse conditions for an additional 2 months, then all plants were unpotted and the roots and bulbs were examined for the presence of pinkish red discoloration of the bulb scales and infection of the roots. Isolations were made from all inoculated and uninoculated onions.

## Results and Discussion

### **1999 Field Observations and Laboratory Evaluations**

Red stain was found, at least to some extent, on over 80 percent of the onions sampled at all four sampling dates (Fig. 1) but varied by field. Red stain colored on average 6.7-15.8 percent of the outside dead scales on the bulbs. The staining was common on the outer scales and did not appear just before harvest as was presumed by some growers.

*Phoma terrestris* was either isolated from or observed fruiting on symptomatic onion bulbs (Fig. 2). *Phoma terrestris* was not observed infecting live onion bulb tissue. Pure cultures of *Phoma terrestris* were grown from single spores and maintained for inoculation purposes.

### **2000 Koch's Postulates, the Re-creation of Symptoms**

The pink root fungus, *Phoma terrestris*, was recovered from only 1 of the 10 inoculated onions, but this onion showed red stain symptoms identical to those that were present on the commercial onions that had been sent from the Treasure Valley. No *Phoma terrestris* was recovered from any of the control plants.

The poor inoculation efficiency was disappointing but not unexpected, as greenhouse conditions varied greatly from those conditions in the field under which natural infection occurs. Completing Koch's postulates, which establishes pathogenicity of an organism, depends on being able to develop the symptoms and recover the inoculated organism, which was accomplished.

It is clear that the red discoloration of the white onion scales that was experienced in the field was caused by *Phoma terrestris*, which was isolated from infected onions, grown in pure culture, inoculated onto onions, and was successfully reisolated from symptomatic inoculated material. This fungus also causes onion pink root.

**Control of Red Stain**

Control of red stain was not examined. Presumably, control measures that limit pink root such as fumigation, variety selection, and crop rotation might also help to limit red stain on white onion bulbs.

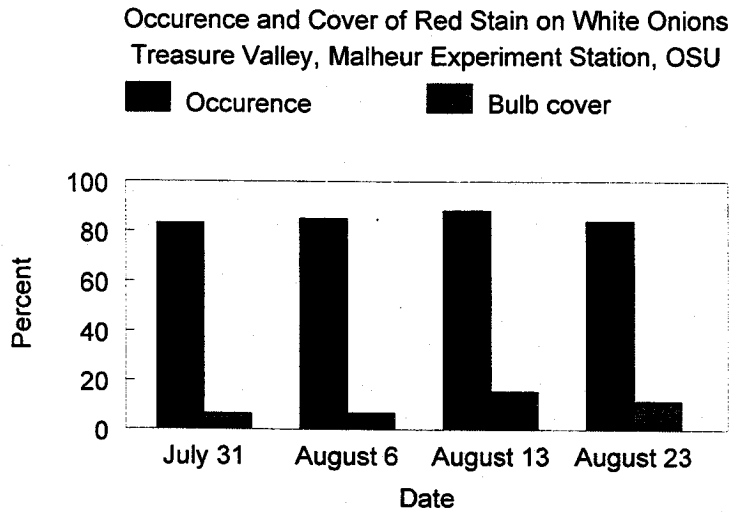


Figure 1.

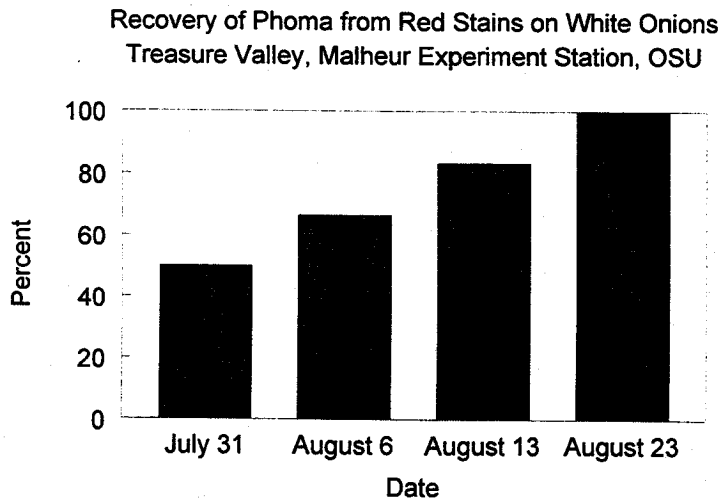


Figure 2