ONION CULTIVAR TRIAL: EVALUATION OF CULTIVAR RESISTANCE TO *FUSARIUM PROLIFERATUM* STORAGE ROT

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Introduction

In the United States, storage onions are produced on more than 110,000 acres annually. This high-value vegetable crop produces >$900 million in annual farm receipts (USDA-NASS 2004-2014). Storage onion acreage in the western United State comprises about 66% of national onion production, with 18% or more of the production occurring in Oregon and Idaho (USDA NASS 2014). Production costs can be significant ($4,000/acre), making stakeholder losses to onion bulb rots during storage costly (http://www.ipmcenters.org/CropProfiles/docs/WAonions.pdf). More than 20 different bacterial and fungal pathogens cause onion losses under field and storage conditions, resulting in up to 25-50% crop loss (Schwartz and Mohan 2008). In many cases, bulb infection is asymptomatic prior to harvest (Schwartz and Mohan 2008), and the infected bulbs go into storage undetected. These infections can develop into storage rot and when they do, an entire season of production and storage expenses has been incurred and can result in significant financial losses during storage. Accurate diagnosis and differentiation of the pathogens using traditional methods can take weeks to months to complete.

Recently, *Fusarium proliferatum* has emerged as a new pathogen causing bulb rot of onion and is responsible for causing significant losses in the Pacific Northwest. *F. proliferatum* is present in the Treasure Valley and onion growers have reported increased incidence of bulb rot associated with this pathogen during the past three seasons. Bulb rot appears at harvest with limited or no symptoms present in the field prior to harvest. Bulb decomposition may develop in storage. *Fusarium oxysporum* f. sp. *cepae,* a different species of *Fusarium,* is a well-known pathogen and causes rot at the base of the bulb during the growing season. Unfortunately, little is known about the biology of *F. proliferatum*, inoculum sources, vectors, relative resistance of onion varieties, or the impact of curing on disease development.

Growers and shippers requested information about the potential resistance that different onion cultivars may have to *F. proliferatum.* The Oregon State Onion Cultivar trial is an excellent resource providing critical information for onion stakeholders in the Treasure Valley of Idaho.

We sought to assess whether onion cultivars grown in the onion variety trial differ significantly in susceptibility to storage rot caused by *F. proliferatum.*

Materials and Methods

A total of 20 of the onion cultivars grown in the 2017-2018 Onion Variety Trial at the OSU Malheur Experiment Station (Shock et al. 2018) were inoculated with a spore suspension of *F. proliferatum*. The cultivars chosen were recommended by stakeholders because of their use in commercial production. Bulbs were harvested, cured, and stored, then inoculated on October 18, 2017.

A total of 20 bulbs per cultivar from each of 4 replicates were treated in one of three ways as follows:

a. Inoculation with 0.5 ml *Fusarium proliferatum* (1.0×10^6 spores/ml) in sterile water;

b. Inoculation with 0.5 ml of sterile water (negative check);

c. Non-inoculated check.

Spots to be inoculated were wiped with 70% ethanol, inoculated, and the inoculated spot was marked. Bulbs were stored under commercial conditions. Onion bulbs were evaluated on February 7, 2018 by Brenda Schroeder and scored for bulb rot.

The means and standard errors were calculated from 4 replications of 20 onion bulbs. LSD for disease is presented in Table 1. All analyses were performed using SAS (SAS Institute Inc., Cary, NC).

Results and Discussion

Bulbs not inoculated with *F. proliferatum* did not develop the disease. Results of this study indicate that onion bulb cultivars exhibit a range of resistance responses in response to *F. proliferatum* (Table 1). Onion cultivars 'Oloroso', 'Vaquero', 'Tucannon', 'Sedona', 'Pandero' and SV6646 were among those most susceptible to *F. proliferatum* in this assay. Onion cultivars 16000, 'Avalon', and 'Grand Perfection' were among the least susceptible to *F. proliferatum* evaluated in this study. A second year of testing will be needed to demonstrate the reliability of these cultivars to resist *F. proliferatum.*

Knowing how different onion cultivars respond to *F. proliferatum* could provide critical knowledge to stakeholders about cultivar choices. This knowledge could aid in the management of this storage rot problem and reduce onion bulb losses to *F. proliferatum*.

References

Schwartz, H.F., and S.K. Mohan, 2008. Compendium of Onion and Garlic Diseases and Pests, Second Edition. APS Press, St. Paul, MN.

Shock, C.C., E.B.G. Feibert, A. Rivera, K.D. Wieland, and L.D. Saunders. 2018. 2017 Onion variety trials. Malheur Experiment Station Annual Report 2017, Ext/CrS 159:12-31.

United States Department of Agriculture-National Agriculture Statistics Service http://www.nass.usda.gov/QuickStats/PullData_US.jsp

Table 1. Percent bulb rot resulting from inoculation of onion bulbs by 5 x 10^5 spores of *Fusarium proliferatum* at harvest and stored for 4 months, Oregon State University, Malheur Experiment Station, Ontario, Oregon, 2017.

Cultivar	Percent disease*
Oloroso	23.8 A
Vaquero	22.4 AB
Tucannon	21.8 ABC
Sedona	21.1 ABC
Pandero	20.6 ABC
SV6646	20.4 ABCD
Joaquin	20.3 BCD
Hamilton	20.1 BCDE
Swale	20.1 BCDE
Granero	19.9 BCDEF
Montero	18.9 CDEFG
Morpheus	18.5 CDEFG
Arcero	17.2 EFDG
SV6672	16.8 EFGH
Annillo	16.5 FGH
Barbaro	16.4 GH
Scout	13.5 HI
16000	12.6 I
Avalon	12.6 I
Grand Perfection	7.59 J

*Treatments within each effect followed by different letters are significantly different at $P \leq 0.001$.