

Center rot disease in onion can lead to considerable yield loss in the field and during storage (Figure. 1 and 2). Center rot can be caused by several species of a bacterium in the genus *Pantoea*. In Southeastern US, *Pantoea ananatis* is the predominant cause of center rot and is known to survive in several crops and weed species distributed around onion farmscapes in Georgia. Organic onion growers have limited center rot management options besides OMRI-labeled copper-protectants.



Figure 1. Center rot symptom in onion leaves



Figure 2. Center rot symptom in onion bulbs

### Problem statement

Biocontrol agents (BCAs) such as *Bacillus subtilis* and *Pseudomonas fluorescens* are alternative disease management options; however, their efficacy could be compromised in part due to their inability to colonize the foliage better than the pathogen.

### Rationale

Organic peroxide has antimicrobial activity against several fungal and bacterial plant pathogens. Peroxide pre-application could lower the pathogenic microbial population in onion foliage promoting the colonizing ability of the subsequently applied BCA.

### Hypothesis

Pre-treatment with peroxide enhances the colonizing ability of the subsequently applied BCA leading to effective center rot management.

### Field research

Treatments:

#### Peroxide

**OxiDate® 2.0** (0.94 L/ha): One application 2 h prior to first BCA application

#### BCAs

*P. fluorescens*: **BlightBan® A506®** (374.7 g/ha)

*B. subtilis*: **Serenade ASO®** (9.35 L/ha)

Three applications at 2-3 weeks interval

### Foliar microbial analysis

Microbial composition of onion foliage analysed in *P. fluorescens* treated plots in 2021 study

Note: Two independent studies conducted in 2020 and 2021 onion growing seasons (Figure. 3)



Figure 3. Experimental onion plots

## Findings

1. Any combination of peroxide and BCA reduced center rot severity in onion foliage better than no treatment (Figure 4).
2. Peroxide pre-treatment before *P. fluorescens* did not reduce foliar disease severity as compared to *P. fluorescens*-only treatment.
3. Peroxide pre-treatment before *B. subtilis* did not show consistency in reducing foliar disease symptom as compared to standalone *B. subtilis* treatment.
4. Peroxide pre-treatment before either *P. fluorescens* or *B. subtilis* had no effect on incidence of bulb rot as compared to their standalone application.
5. Overall, peroxide pre-treatment before BCA did not show consistency in improving the efficacy of BCA in managing center rot.

### Foliar microbial analysis

1. Comparatively higher *P. fluorescens* retained in peroxide pre-treated onion foliage just after *P. fluorescens* application.
2. Later in the growing season, *P. fluorescens* reduced drastically and was virtually non-existent.
3. *Pantoea* species was found to be most predominant on onion foliage from beginning to the late onion-growing season in all onion plots.
4. Reduced *P. fluorescens* population on onion leaves with the progress of growing season could explain the insignificant effect of peroxide on the efficacy of *P. fluorescens* in managing center rot.

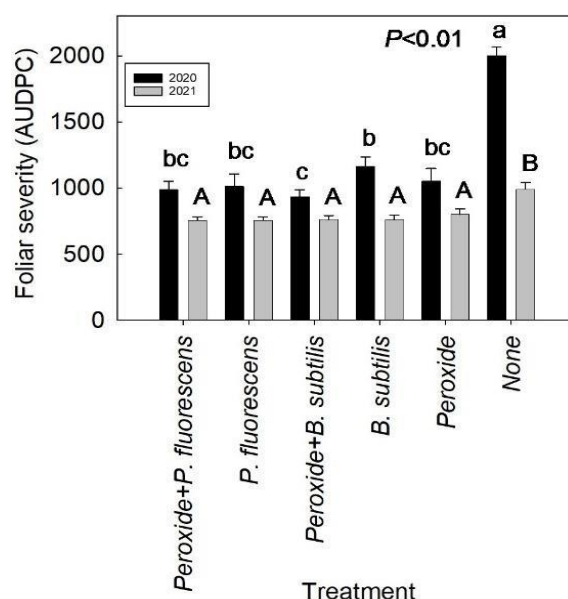


Figure 4. Evaluation of bio-control agents and peroxide on center rot foliar severity

### Should you apply peroxide prior to BCA?

1. Peroxide pre-treatment may not necessarily improve the efficacy of BCAs to manage center rot severity in onion.
2. Peroxide and/or BCA application seems to reduce center rot severity on onion foliage better than non-treated check.
3. Even if peroxide pre-treatment improves the foliar colonizing ability of BCA, *Pantoea* species may outcompete BCA over time and re-establish itself in onion leaves.

### Other Critical Thinking Points

1. Stand-alone peroxide treatment might have a similar ability to reduce center rot as BCAs with or without peroxide pre-treatment.
2. Increased frequency of BCA application after peroxide may favor higher niche occupation by beneficial microbes and prolong their survival in the foliage.
3. For better center rot management, further investigation is required to identify novel beneficial micro-organisms that could establish well on onion foliage and outcompete the growth of *Pantoea* species.

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**IMPORTANT:** Before using any pest control product in your organic farming system:

1. Read the label to be sure that the product is labeled for the crop and pest you intend to control, and make sure it is legal to use in the state, county, or other location where it will be applied,
2. Read and understand the safety precautions and application restrictions, and
3. Make sure that the brand name product is listed in your Organic System Plan and approved by your USDA-approved certifier. If you are trying to deal with an unanticipated pest problem, get approval from your certifier before using a product that is not listed in your plan—doing otherwise may put your certification at risk.
4. Note that, although OMRI and WSDA lists are good places to identify potentially useful products, all products that you use must be approved by your certifier.