

# Case Study:



## Defense from Pythium for Organic Spinach Production



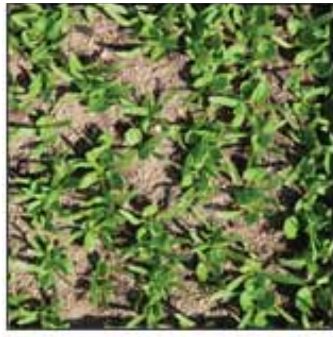




Active *Pythium aphanidermatum* | Yuma, AZ



Early Symptoms of Damp Off due to *Pythium altima*



Raw vs Treated | 13 Days After Planting

## Situation

**Organic spinach growers may experience significant crop loss due to *Pythium* spp.**

Damping off is a common problem for organic spinach growers. Soil born fungus such as *Rhizoctinia*, *Pythium*, *Phytophthora*, and *Fusarium* are all diseases that cause symptoms of “damping off” which is characterized by the rotting of plant stems below ground and in some cases in the plant stems above ground.

In particular, *Pythium* species can cause substantial damage and crop loss for organic spinach growers. *Pythium* disease outbreaks tend to take place during periods of elevated temperatures and high humidity and can spread rapidly in favorable environmental conditions. *Pythium* infections are identified by loss of seedlings between 0-14 days or by the first true leaf stage of plant growth.

The only options for organic growers are to plant resistant spinach varieties and implement cultural controls. At this time there are no known spinach varieties with 100% resistance to *Pythium*. *Pythium* may cause major crop losses of 10% to 40% resulting in financial losses due to lost yield, disruptions in the supply chain, and may impact product quality.

## Solution

**Organic seed treatment to combat *Pythium***

The key timeframe for *Pythium* damage to take place is 0 to 14 days after planting. Therefore, Germains R&D Team identified that there may be a viable seed treatment solution to protect plants upon emergence and within the first stages of growth. By providing pre-emergence protection, Germains has developed a new innovative certified organic seed technology to protect spinach from *Pythium* upon emergence; ProBio® SafeGuard™.

# Overview

## ProBio® SafeGuard™ for spinach

ProBio® SafeGuard™ is a multi-component ASCO certified organic seed treatment that establishes a barrier around the spinach plants emerging root system so that it may overcome root colonization by soil-borne fungi such as Pythium. ProBio® SafeGuard™ is a non-biological organic seed treatment that contains GST-1000, licensed exclusively to Germain's Seed Technology has no impact on the seed quality and a minimum year shelf life.

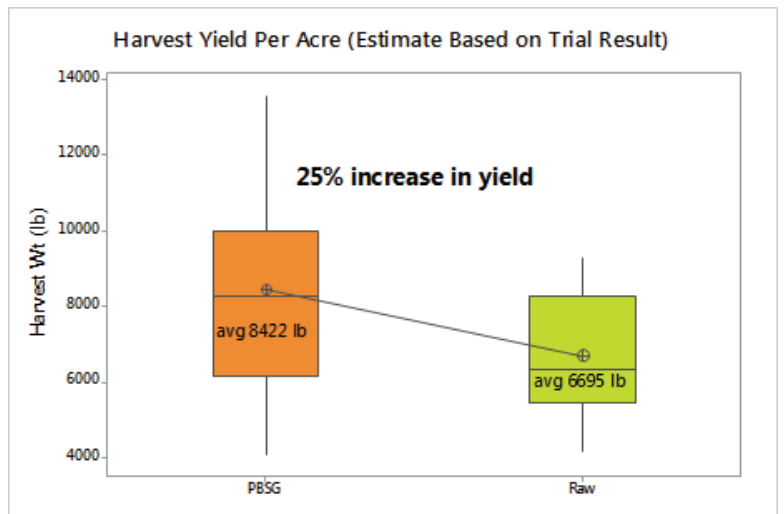
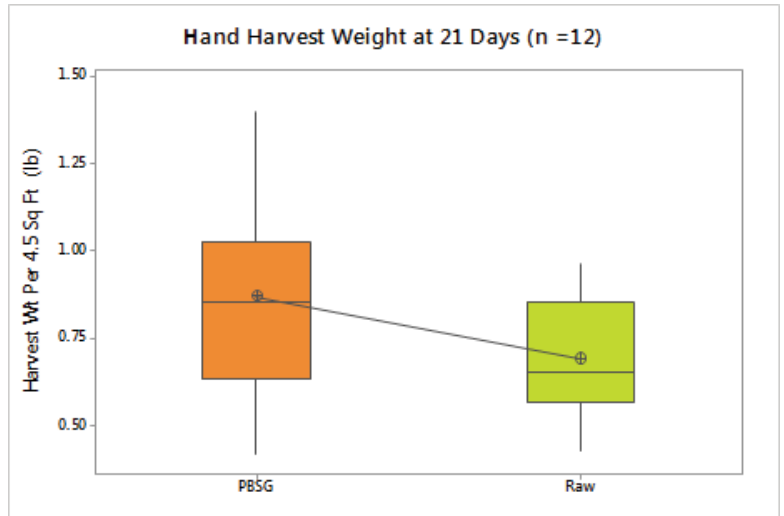
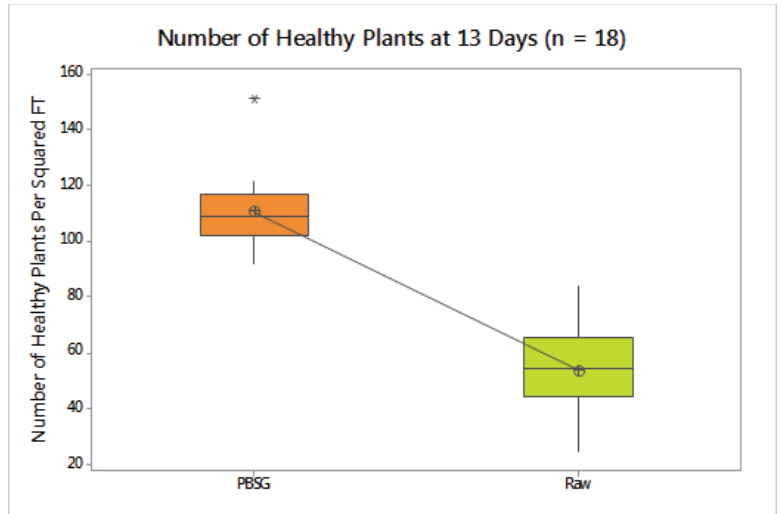
# Field Trials

## Trial Summary & Overview

ProBio® SafeGuard™ was field trialed in five locations in California and one location in Yuma, Arizona. All six trials were managed by independent organic spinach growers. Germain's conducted pathogen analysis soil testing for Pythium, Rhizoctonia, and Fusarium at all six locations. Pythium results ranged from 3,500 to 10,500 Colony Forming Units (CFU) per gram of soil.

ProBio® SafeGuard™ consistently provided more leafy area canopy in the various field soil conditions at all six field trial locations up to 14 days after planting. In comparison to the raw seed, fields planted with seeds treated with ProBio® SafeGuard™ **consistently showed strength against the damping off complex** typically encountered by commercial organic spinach growers.

## Trial Data





# Conclusion

## Proven efficacy against Pythium

Trial data concludes canopy development was significantly faster and larger with treated spinach seed during the first two weeks. The treated fields were less patchy than the fields planted with untreated seeds with a greater number of plants, and improved yield.

# How it Works

## Organic crop protection, 0-14 Days

The early stages of any living organism are vital to its future growth and development. Germain's developed ProBio® SafeGuard™ as a part of our health technology category. This seed treatment for spinach focuses on early plant protection even before the plant emerges. By providing pre-emergence protection, ProBio® SafeGuard™ is a certified organic seed treatment that **establishes a barrier around the emerging plant and developing the root system** that helps protect spinach plants during germination until the first true leaf stage. ProBio® SafeGuard™ is not a systemic.

# Key Benefits

- Organic protection against Pythium, which is commonly observed in the Damping Off Complex
- Protection 0-14 days after planting
- Larger seedlings with increased foliage
- Protect seedling and root development - Better stand and increased yield potential

# How to Order

ProBio® SafeGuard™ is exclusively distributed through **Holiday Seed Company**. Please contact Holiday Seed Company at **(831)796-0504** or via email **info@holadayseed.com** to place an order or for more information.



Treated above vs Untreated below



Treated left vs Untreated Right

