



# Fungal Threats to Agave Health: Identification and Management

## *Amenazas Fúngicas para el Agave: Identificación y Manejo*

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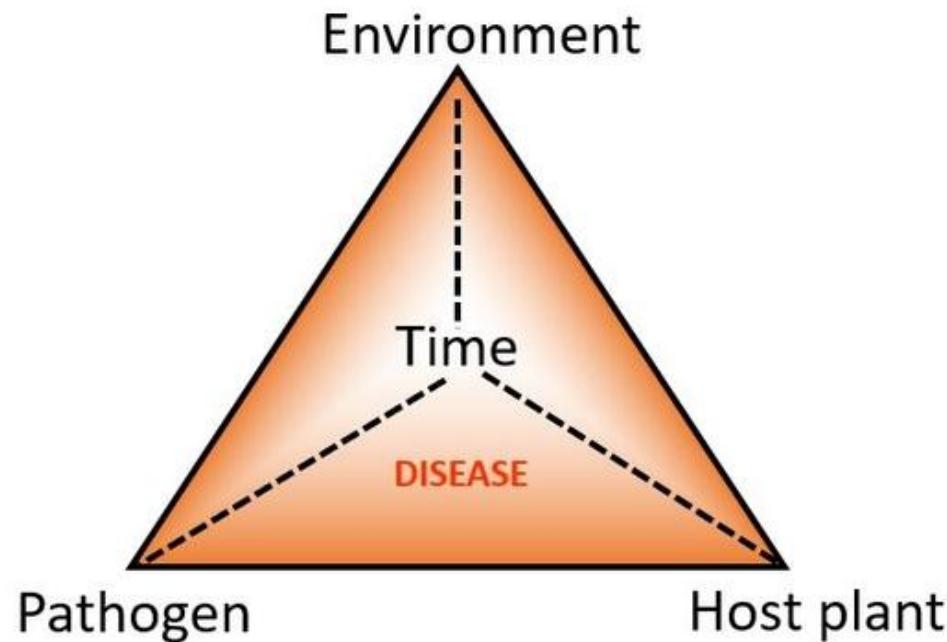
# Topics

❖ **Introduction to Plant Disease / Introducción a la Patología Vegetal**

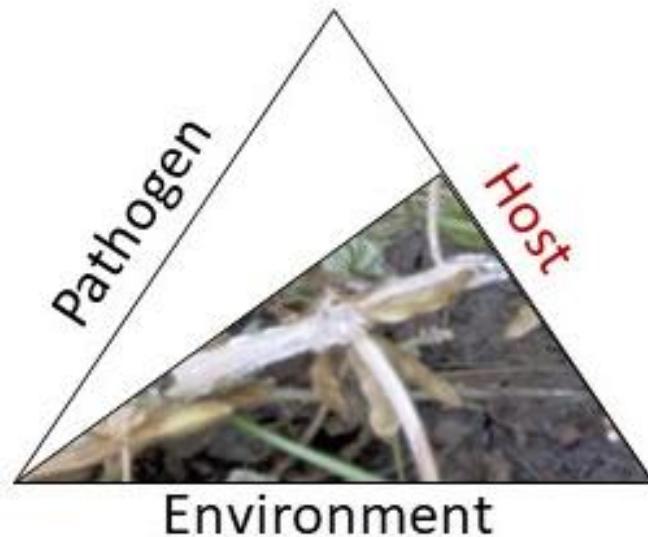
❖ **Common Diseases / Enfermedades Comunes:**

- ✓ **Agave Wilt / Marchitez del Agave / Fusariosis**
- ✓ **Anthracnose / Antracnosis**
- ✓ **Gray Spot / Mancha Gris o Tizón Foliar**

# Disease Triangle



# Disease Triangle



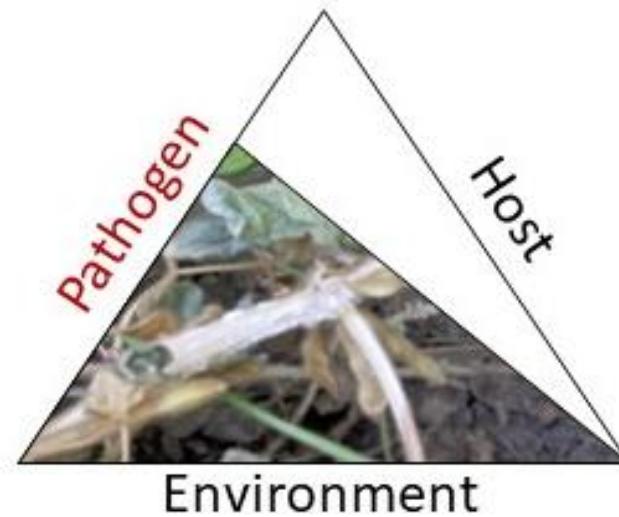
- Choose the appropriate agave for the location /  
*Elige el agave adecuado para la ubicación.*
- Choose species that offer certain advantages over drought/salinity tolerance or other growing conditions that could happen in the area /  
*Selecciona especies que ofrezcan ciertas ventajas, como mayor tolerancia a la sequía/salinidad u otras condiciones de crecimiento que puedan presentarse en la zona*

# Disease Triangle

- Use proper irrigation techniques
- *Usa técnicas de riego adecuadas.*
- Apply specific fertilizer according to the needs/instructions
- *Aplica fertilizantes específicos según las necesidades del agave y siguiendo las instrucciones recomendadas.*
- Maintain it free of weeds
- *Mantén el cultivo libre de malezas*



# Disease Triangle



# COMMON DISEASES

# ENFERMEDADES COMUNES

# Agave Wilt / Marchitez del Agave / Fusariosis

## **Primary Pathogens:**

- ✓ *Fusarium oxysporum*
- ✓ *Fusarium solani*
- ✓ *Fusarium moniliforme*
- ✓ *Thielaviopsis paradoxa*

## **Hosts:**

- ✓ *Agave tequilana* var. azul
- ✓ Other agave species may also be susceptible

## **Symptoms:**

- ✓ Curling and dehydration of the basal and intermediate leaves surrounding the agave heart
- ✓ Discoloration, turning from green to a brownish-green hue
- ✓ Loss of root anchorage due to root rot, leading to plant collapse and death



López-Bautista et al., 2019

Ramirez-Ramirez et al., 2017



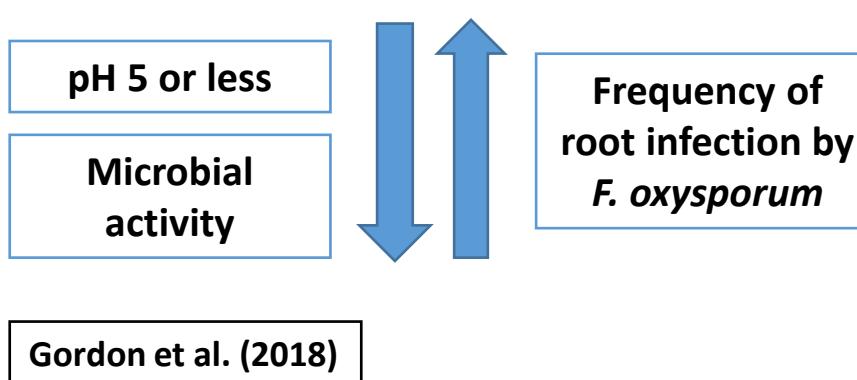
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# Management Strategies / Estrategias de manejo

## Agave Wilt / *Marchitez del Agave* / Fusariosis

- High temperatures and humidity favor fungal development → **Avoid planting in poorly drained or compacted soils.**
- Planting infected suckers increases the risk of infection → **Use healthy suckers from certified nurseries.**
- Root damage facilitates fungal entry → **Avoid aggressive herbicide use and protect roots from insects or other animals that may feed on or injure them.**



# Management Strategies / Estrategias de manejo

## Agave Wilt / *Marchitez del Agave* / Fusariosis

- Plant in pathogen-free soils or in soils previously treated through fumigation.
- Avoid cross-contamination with infected soil or plant material from other areas.
- Remove and destroy infected plants to reduce the source of inoculum.
- Apply antagonistic fungi such as *Trichoderma* spp. and *Bacillus* spp. to seedlings and during transplanting, as they have shown effectiveness in suppressing *Fusarium* spp.
- The use of chemical fungicides after plant establishment is largely ineffective, as the issue originates in the roots rather than the foliage.



# Anthracnose / Antracnosis

## Primary pathogens:

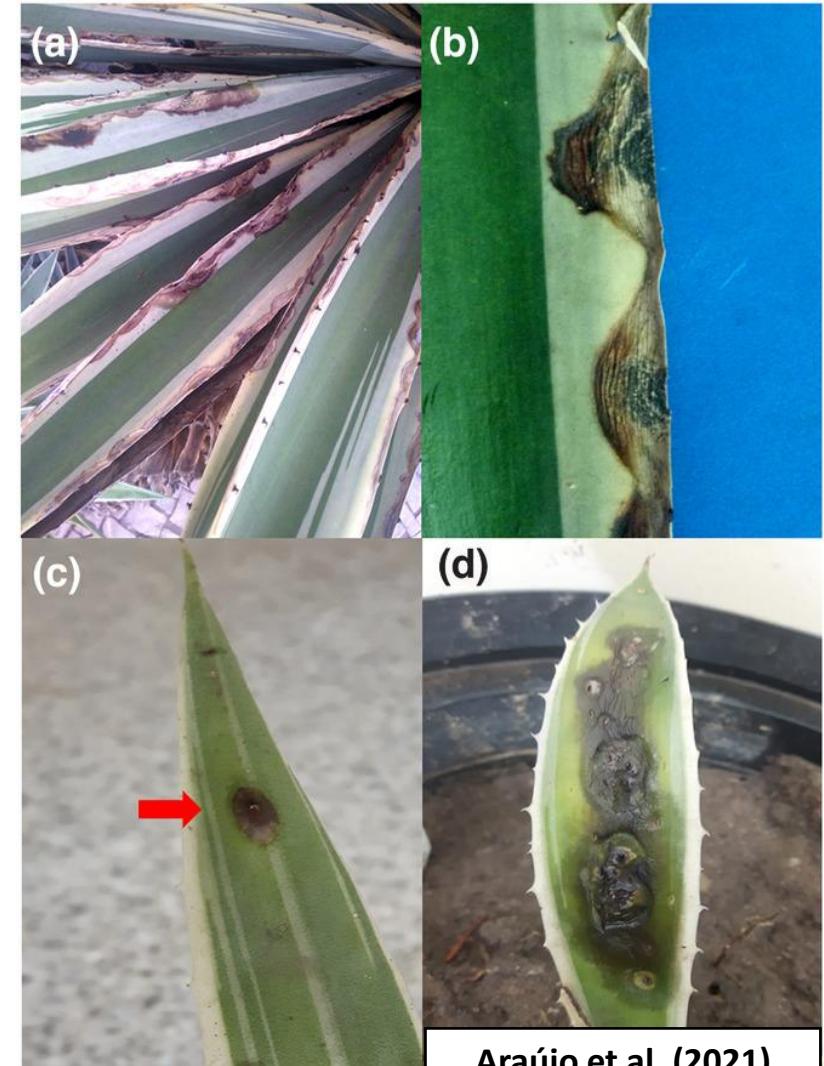
- ✓ *Colletotrichum agaves*
- ✓ *Colletotrichum gloeosporioides*

## Hosts:

- ✓ *Agave tequilana* var. azul
- ✓ *Agave angustifolia*
- ✓ *Agave salmiana*
- ✓ Other agave species may also be susceptible

## Symptoms:

- ✓ Irregular leaf spots ranging from brown to dark brown/black, often with well-defined edges
- ✓ Sunken lesions, frequently showing concentric rings or pink/orange spore masses under humid conditions
- ✓ In severe cases, rot at the leaf base, loss of the central shoot (apical meristem), and total plant collapse



# Management Strategies / Estrategias de manejo

## **Anthracnose / Antracnosis**

- Can become problematic in agaves during humid periods or when plants are grown in shaded conditions with overhead irrigation → **Avoid overhead or excessive irrigation and promote good air circulation, especially in areas with a history of the disease.**
- The pathogen enters more easily through wounds or mechanical injuries → **Disinfect tools between plants and work from the healthiest to the most affected plants.**
- Monitor frequently to detect early symptoms and take immediate action → **Remove and destroy infected plant debris to prevent further spread.**



# Management Strategies / Estrategias de manejo

## **Anthracnose / Antracnosis**

- Apply preventive fungicides before rainy periods or when high humidity is expected → **Fungicides only protect healthy tissue; they do not eliminate established infections.**
- To protect new growth, repeat applications every 10–14 days if humid conditions persist.
- The most effective protective fungicides include chlorothalonil (e.g., Daconil), copper-based products (e.g., Liquicop), propiconazole (e.g., Banner Maxx II), and thiophanate-methyl (e.g., Cleary's 3336, for professional use)  
→ **These are not validated on agave in California.**

When choosing a pesticide, consider information related to the pesticide's properties, the timing of application, honeybees, and environmental impact. Always read the label of the product to be used and ensure that you comply with the law.



# Gray Spot / Mancha Gris o Tizón Foliar

## **Primary pathogens:**

- ✓ *Cercospora agavicola*
- ✓ *Cercospora* spp.

## **Hosts:**

- ✓ *Agave tequilana* var. azul
- ✓ Other agave species may also be susceptible

## **Symptoms:**

- ✓ Elliptical or irregular leaf spots, ranging from grayish to light brown, often surrounded by a chlorotic halo, appearing on leaves near the central head.
- ✓ Lesions start small but expand and can merge, especially under humid conditions.
- ✓ Generalized chlorosis develops, progressing toward the center until it reaches the central head.
- ✓ Progressive loss of leaf tissue, which reduces photosynthesis.
- ✓ In severe cases, partial defoliation occurs, leading to plant weakening and potentially plant death.



# Management Strategies / Estrategias de manejo

## Gray Spot / Mancha Gris o Tizón Foliar

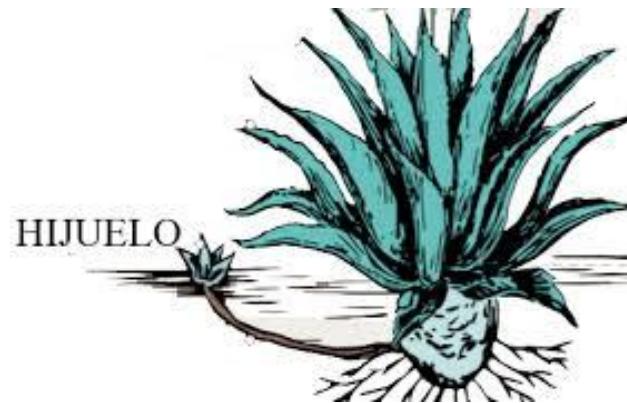
- The disease occurs more frequently in areas with high relative humidity, fog, or constant rainfall → **Avoid overhead irrigation in disease-prone areas and provide adequate plant spacing.**
- The presence of weeds or plant debris promotes moisture accumulation → **Reduce these elements and improve air circulation between plants by pruning dead leaves.**
- Excessive nitrogen fertilization can worsen the disease → **Avoid over-application of nitrogen and maintain a proper nutritional balance.**



# Management Strategies / Estrategias de manejo

## Gray Spot / Mancha Gris o Tizón Foliar

- Use healthy suckers from certified nurseries to avoid introducing the disease.
- Conduct regular monitoring and remove affected leaves to reduce the inoculum.
- Remove and burn plants with advanced symptoms outside the field; apply lime at the removal site.
- Apply preventive fungicides during the critical period (end of rainy season and beginning of cold season) if there is a risk of disease presence.





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