

# Review: Management strategies F root rot disease of soybean plants caused by *Fusarium oxysporum*

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**Abstract:** Soybean is one important crop and infection by several fungal diseases. Root rot disease is a major impendence to global agriculture, decreasing crop production. This disease can wipe out entire fields depending on the environmental condition and causal agent. Root and stem lesions can progress to dark black lesions, stunting, and death. Root rots disease of soybean plants is caused by *F. oxysporum*. Current management strategies for pathogens include the use of pesticide seed treatment, crop rotation, seed selection, and fertile fields.

**Keyword:** Fusarium, oxysporum, Soybean ,root rot

## Introduction

Soybean plant is a main legume crop in Iraq and several countries around the world. It is widely cultivated for its high amount of oil and protein seed content, which is used as food to human and in medicine (Sinclair and Backman, 1989). Soybean is susceptible to fungal, bacterial, and viral diseases, as well as nematode and physiological disorders (Perez-Brandán *et al.*, 2014). However, fungal diseases are the most constraining factors affecting seed production quality and quantity (Carling *et al.*, 2001).

Several studies have found that diseases restrict soybean production (Allen *et al.* 2017). The pathogen type and environmental conditions in the field, and also plant growth stage all influence the extent of economic plant damage caused by disease (Hartman, *et al.*, 2015). Also found other abiotic factors can able limiting soybean production include photoperiod response, salinity and nutrient availability of the soil (Hartman *et al.* 2015).

## Root rot disease

Pathogens that cause root rot are responsible for serious plant diseases in several countries the world, affecting a variety of crops (Gonzalez, *et al.*, 2011, Nzungize, *et al.*, 2011). It is difficult to detect root rot symptoms because the damage occurs below ground. When symptoms appear on the plant's surface, yield and survival are already compromised. Root rot disease is caused by a variety of pathogens, some of which are host-specific. Root nematodes and other parasites also contribute to root rot by plant wound and allowing pathogens in. Fungi are important factor of root-rot disease (Bergm *et al.*, 2014).

The symptom of root rot disease different in size, color (reddish to brown), and also yellowing of leaves (Bergm *et al.*, 2014). The disease triangle determines infection progression and success. There are many factors that contribute to root rot, such as constant or frequent cropping (Abdel-Monaim., *et al.*, 2012).

## Characterization of *Fusarium oxysporum*

Because most Fusaria have unknown telomorphic stages, taxonomy relies on anamorphic features like colony color, , conidiophore structure, microconidia and chlamydospore presence or absence, and macroconidia size and shape (Windels,1992). According to previous reports, pathogenic *F. oxysporum* targets only one or a few plant species, and often only specific cultivars of those plants.

To identification and evolutionary relationships between many species were needed taxonomy system, most researchers have used to molecular tools. The EF-1 and mtSSU ribosomal RNA genes have been used to identify Fusaria species (Baayen, *et al.*,2000;Skovgaard, *et al.*,2001).

### **Fusarium-related diseases of the soybean plant**

Soybean diseases include *Fusarium* blight/wilt, *F. virguliforme* sudden death syndrome, seedling disease caused by many of *Fusarium* species (Okello and Mathew,2019). *Fusarium* root rot infected plants emerge slowly or never. Symptoms include brown to dark discoloration of the roots and lower stems. Severe root infections cause stunting, leaf chlorosis, wilting, and defoliation. Early season cool temperatures and moist soil favor infection by *Fusarium* species that cause root rot, while late season dry conditions favor infection by *Fusarium* that cause root rot disease (Malvick,2018). there are several factor effect on *Fusarium* root rot disease such as pH , soil compaction, soil type and crop rotation.

### **Management Strategies for Root Rot**

Several management options are suggested for root rot.

**1- Crop rotation:** In field with infection *Fusarium* root rot disease mast to be used planting non-host plants or seed treatment by fludioxonil which act to lower damage caused by root rot disease (Zhang et al. 2013).

**2- Cultural practices:** seeds of soybean are planting in well-drained soil (Hartman, et al.,2015; Malvick, 2018).

**3- The resistance of the host:** when using *Fusarium* root rot resistant cultivars are also considered a cost-effective method. But no found cultivars resistant to disease.

**Date of planting:** Soybean infection risks increase with early planting. Soybean seedlings are more susceptible to *Fusarium* infection when planted in cool, wet soils. *Fusarium* species interact with biotic factors.

Abiotic soil components, such as nutrients, can contribute to root rot disease development (Malvick, 2018). Organic soil amendments can kill pathogens (Lazarovits, *et al.*,2005). However, adding soil amendments can increase disease incidence by promoting disease development.

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