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Using Slow Sand Filters to Remove Plant Pathogens From Irrigation Runoff©

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INTRODUCTION

What Is Slow Sand Filtration? Slow sand filtration (SSF) is an old water treatment technology that is reappearing in horticultural applications in Europe, but isn't yet in widespread use in the U.S.A. A common misconception is that SSF and rapid sand filtration are the same but with different flow rates. Though they use the same type of substrate they are quite different in that SSF is a biological treatment method that can remove pathogens (Wohanka, 1995), whereas rapid sand filtration is a physical filtration process.

Rapid sand filtration systems have the following characteristics:

- Utilize coarse sand grains larger than 1 mm in diameter
- Remove larger particles only
- Do not remove pathogens
- Do not remove pollutants
- Have a high treatment capacity of 18–180 gpm/yd^2 of bed surface area
- Are relatively low maintenance, which can be automated

In comparison, slow sand filtration systems:

- Can remove pathogens
- Can remove pollutants
- Are also low maintenance
- But have low treatment capacity of 2–4 gpm/yd^2 of sand bed area

Some physical filtration in SSFs occurs when particulates in the water become lodged in the sand surface, thereby decreasing the effective pore size. In order to delay this fouling, pretreatment may be desirable for turbid waters. As water moves through the sand bed, a biofilm develops on the surface of the sand grains and can become relatively thick at the surface of the sand bed. This thickened layer, also known as the "schmutzdecke," is primarily responsible for the treatment. The biofilm is a diverse and dynamic community of microorganisms and its composition depends on the contents of the water and changes in response to variations in that content. Most of the biological activity occurs at the surface and in the 15 cm just below the sand surface. Organisms that have been identified in the biofilm include algae, bacteria, diatoms, and zooplankton (Calvo-Bado et al., 2003; Joubert and Pillay, 2008). However, the specific mechanisms of treatment are not fully understood.