

Pathogen Control in Recycled Irrigation Water

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Water runoff from commercial nurseries and greenhouses can pollute the environment. Fertilizers and pesticides in the water can cause algal blooms in coastal waters and can endanger marine and human life. Regulations aimed at reducing runoff have necessitated water recycling in many commercial nurseries and greenhouses. However, when water is recycled, plant pathogen populations can increase, creating the potential for substantial crop losses due to diseases. The California Association of Nurserymen and Garden Centers (CANGC) is funding a project aimed at identifying sources of plant pathogens in recycled water, identifying the pathogens, evaluating efficacy of the various disease control methods growers are using, and developing IPM strategies to mitigate plant pathogens in recycled water. The following pathogens were isolated from various water sources at a commercial nursery: *Fusarium*, *Phytophthora cryptogea*, *P. citrophthora*, and *P. capsici*. Sampling from commercial nursery and greenhouse operations that recycle water in Southern California is ongoing. Because i) pathogen control measures in water recycling systems may not be 100% efficient, and ii) pathogens can be introduced from sources such as fresh water and plant material, it is necessary to apply disease management strategies at the point of water reuse. The CANGC project is evaluating various IPM strategies for management of diseases in containerized nursery production. One strategy under evaluation is the use of coir as a container medium. Anecdotal evidence suggests that plants grown in coir are less prone to pathogen attack than plants grown in peat based media. Experiments are ongoing to determine antifungal properties of coir. An acetone-soluble portion of a methanol coir extract incorporated into half-strength potato dextrose agar ($\frac{1}{2}$ PDA) reduced mycelial area of *P. capsici* by 56% after 8 days. An *Aspergillus* species associated with coir inhibited or suppressed mycelial growth of *Pythium*, *Fusarium*, *Rhizoctonia*, *Sclerotinia*, *Cylindrodadium*, *Verticillium*, *Botrytis*, and six species of *Phytophthora* by up to 74%. Antibiosis by *Aspergillus* was observed in many of these cases, but in a few cases the mechanism appeared to be competition. A coir water leachate incorporated into PDA inhibited growth of *P. capsici* by 71 % after three days of leaching and by 77% after 12 days of leaching. Microbial populations in the leachate appeared to play a major role in inhibiting growth of *P. capsici*. The results from these studies indicate that coir has antifungal properties that can play a role in inhibiting or suppressing plant pathogens. Attempts are under way to identify the antifungal substances in coir and the inhibitory substances produced by microorganisms associated with coir and whether these substances are fungistatic or fungicidal. Experiments are planned in which plants grown in coir and peat based media will be challenged with water borne pathogens. Disease development and progression will be monitored to determine if coir can suppress disease, in which case it should be possible to reduce the number of fungicide applications. Other disease management strategies that will be evaluated at the point of water reuse include use of fungicides including reduced risk fungicides and biocontrol agents, fungicide rotation schemes, and cultural practices. The ultimate goal is to combine disease control measures applied to recycled water, such as chlorination, UV irradiation, ozone treatment, and slow-sand filtration with management strategies at the point of water reuse into an IPM program that will reduce crop loss due to diseases and reduce reliance on conventional fungicides. The fungicide rotation portion of the IPM program is aimed at reducing or preventing fungicide resistance buildup in pathogens.