Survey of Suspended Solids in Irrigation Water of Ornamental Plant Nurseries and Effects of Filtration

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Summary of research findings:

- Filtration to remove particles from irrigation water is a key first step underlying other aspects of water treatment, to remove pathogen spores, material that can clog irrigation lines, and reduce demand for sanitizing chemicals.
- Objectives for this research included characterizing the particle size distribution and amount of suspended solids in irrigation water sources from a survey of plant nurseries, before and after filtration.
- Total suspended solids (TSS) varied greatly in different water sources, which would affect the amount of filtration required to remove particles. The average TSS was 3.3±0.4 mg/L (mean ± std. error, with a range of 2.5 to 4.5 mg/L) for well water, 4.7±1.2 mg/L (range of 1.6 to 9.9 mg/L) from uncovered catchment basins and 40.0±14.8 mg/L (range of 2.0 to 301.0 mg/L) from ebb-and-flood subirrigation return water, respectively. Across all water sources, TSS ranged from 1.6 to 301 mg/L, averaging 28±10.4 mg/L. Water testing of TSS and evaluating the type of particle (organic material such as peat, microbes, or minerals) is a recommended step to help decide the appropriate filter types and number of filters required in series. A typical target is to have below 5 mg/L of TSS if you are using fine emitters such as in mist irrigation.
- The suspended particle diameter in the 10th percentile, 50th percentile (or median) and 90th percentile by total particle volume was 28 microns (µm), 116 µm and 347 µm, respectively. This is relevant when considering the amount of suspended solids that are likely to be removed by filters of different micron sizes. For example, if a 100-mesh (149 micron) filter was working at 100% efficiency, about half the suspended particles would be removed from many irrigation water sources. The finer your irrigation emitters, the smaller the final filter pore size should be in order to reduce clogging.
- Fiber media and screen filters reduced TSS by an average 57.9±7.4% of the pre-filtration TSS. In other words, about half the TSS was removed with the first filter stage. The higher the initial TSS, the more filters you would need in series in order to finish with water that has an acceptable TSS for your use. Use a coarse filter first, followed by finer filters. That reduces the amount of backwashing that is required, and labor and material cost required to clean fine filters if they are clogged with large particles.
- Microscopy analysis of several fiber media filters showed that the pore sizes reported by vendors were smaller than the observed particle pore sizes. Overall, expect filters to allow larger particles than the reported filter micron size to squeeze through a filter when under high commercial water pressure and flow rate.
- Multiple filtration stages would be ideal for ebb-and-flood water, because of the high and variable TSS levels observed in recirculated ebb-and-flood water samples, the wide range in particle sizes and shapes, and the average removal of approximately half the TSS by a single stage of screen or fiber media filtration.
- This research study was funded by the CleanWateR3 USDA Specialty Crops Research Initiative project (cleanwater3.org), the USDA Floriculture and Nursery Research Initiative and industry partners in the Floriculture Research Alliance (floriculturealliance.org).