



## Drip Irrigation and Fertigation Systems and Needs for Analysis

Drip irrigation systems deliver water and nutrients very effectively however because of the small volume of water and small openings of each emitter clogging problems can decrease uniformity of application.

The potential for clogging problems is often related to water quality. The principal physical, chemical and biological contributors to clogging problems are summarized in the table below. Often times these factors are interrelated and the severity can be worsened by a combination.

It is recommended that a complete water analysis be conducted before a system is designed in order to allow for treatment to improve water quality before it reaches the small openings. It should be kept in mind that there can be large fluctuations in water quality throughout the season or even within an irrigation schedule therefore a series of analysis should be taken.

**Table 1 Physical, Chemical and Biological Contributors to Clogging of Drip Irrigation Systems as Related to Water Quality**

Physical (Suspended Solids)	Chemical (Precipitation)	Biological (Bacteria and algae)
1. Sand	1. Calcium or Magnesium carbonate	1. Filaments
2. Silt	2. Calcium Sulfate	2. Slimes
3. Clay	3. Heavy metal hydroxides, oxides, Carbonates, silicates and sulphides	3. Microbial depositions:
		(a) Iron
		(b) Sulphur
4. Organic Matter	4. Fertilizers	(c) Manganese
		4. Bacteria
		(a) Phosphate
(b) Aqueous ammonia	5. Small aquatic organisms	
(c) Iron, copper, Zinc, Manganese		
		(a) snail eggs
		(b) Larva

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**Table 2 Standard Water Quality Tests Needed for Design and Operation of Drip Irrigation Systems**

- |                                   |                               |
|-----------------------------------|-------------------------------|
| 1. Major Inorganic Salts          | 8. Micro-organisms            |
| 2. Hardness                       | 9. Iron                       |
| 3. Suspended Solids               | 10. Dissolved Oxygen          |
| 4. Total Dissolved Solids (TDS)   | 11. Hydrogen Sulfide          |
| 5. BOD (Biological Oxygen Demand) | 12. Iron bacteria             |
| 6. COD (Chemical Oxygen Demand)   | 13. Sulfate Reducing Bacteria |
| 7. Organics and Organic Matter    |                               |

For surface water, particular attention should be give to test 1-4 as the major problems usually occur from suspended material or chemical deposits. It is recommended, however, that tests 5 -8 be included as a check, especially if wastewater is suspected in the water supply. When groundwater is used, test 1-4 and 9-13 are considered to be a minimum, especially if EC<sub>w</sub>> 1.0 dS/m.

There is not enough experience with drip irrigation systems to predict with precision if or when clogging will occur with a given water. However experience so far does provide a relative scale for situations when clogging problems may occur due to water quality.

**Table 3 Influence of Water Quality on The Potential for Clogging Problems in Drip Irrigation Systems**

Potential Problem	Units	Degree of Restriction on use		
		None	Slight to Moderate	Severe
Physical				
Suspended Solids	mg/l	<50	50-100	>100
Chemical				
pH		<7.0	7.0-8.0	>8.0
Dissolved Solids	mg/l	<500	500-2000	>2000
Manganese <sup>2</sup>	mg/l	<0.1	0.1-1.5	>1.5
Iron <sup>3</sup>	mg/l	<0.1	0.1-1.5	>1.5
Hydrogen Sulfide	mg/l	<0.5	0.5-2.0	>2.0
Biological				
Bacterial populations	Maximum number/ml	<10,000	10,000-50,000	>50,000

Adapted from

Nakayama (1982)

- While restrictions in use of drip irrigation systems may not occur at these manganese concentrations, plant toxicities may occur at lower concentrations
- Iron concentrations >5.0 mg/l may cause nutritional imbalances in certain crops.