



DRIP IRRIGATION FUNDAMENTALS

TROUBLESHOOTING A FERTIGATION SYSTEM

Fertilizer injectors (fertigators) allow fertilizer solutions to be applied to crops through irrigation systems, such as drip, surface, and overhead sprinkler systems – a process known as fertigation. When properly installed and maintained, fertigators provide an efficient and uniform way to provide necessary nutrients to crops. However, a fertigator's performance can be impacted by water pressure, quality, flow rate, and general wear. The steps below can help troubleshoot common problems for most small-scale drip fertigation systems.

THE IMPORTANCE OF SYSTEM PRESSURE

Before discussing common issues experienced with drip fertigation systems, it's helpful to understand the importance of pressure within the system.

Most fertilizer injectors operate by creating a pressure difference between the inlet and outlet of the injector. This pressure difference generates a region of negative pressure, or a vacuum, that allows the fertilizer solution, or other chemicals, to be drawn up through the suction hose into the irrigation water. An insufficient pressure differential is one of the most common issues operators experience with fertigation systems. When the inlet pressure (the pressure entering the injector) is too low or the outlet pressure (the pressure exiting the injector) is too high, the injector can't create enough suction to draw in fertilizer effectively, or at all.

Most fertigators need a minimum inlet pressure to operate. Venturi and positive displacement styled injectors will have different requirements to operate (see the pressure specs provided by the manufacturer). Insufficient pressure affects the vacuum required to draw the fertilizer solution into the irrigation water. If the inlet pressure is low, little to no suction will be created and fertilizer will not be pulled into the irrigation water.

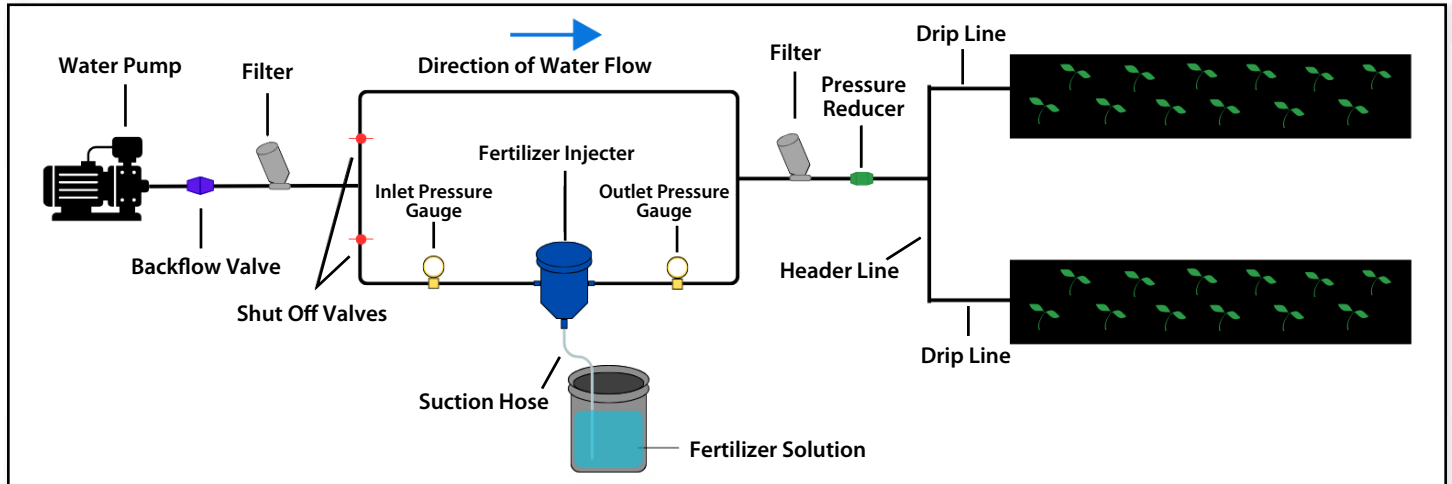
Inlet pressure is too low:

- 1. Check the installation orientation** – Ensure water is flowing in the direction of the arrow indicated on the fertigator.
- 2. Are valves in the correct position** and is water flowing through the fertigator?
- 3. Dirty filters** can affect system pressure. Clean filters regularly.
- 4. Obstruction upstream** – Check for kinks, debris, or valves in the wrong position.
- 5. Clogged suction hose** – Replace or remove and thoroughly rinse hose. Be sure fertilizer is completely dissolved before injection to help prevent clogs in the system.
- 6. Malfunctioning or improperly installed backflow valve** – Ensure water is flowing in the direction indicated by the arrow on the valve. Replace valve if it is damaged or leaking.
- 7. Damaged or worn parts** – Following the manufacturer's instructions, inspect the injector and replace any damaged or worn components.
- 8. Sediment buildup inside the fertigator** – Flush and rinse fertigator thoroughly; some disassembly may be needed depending on the type and model.

HELPFUL HINT:

Installing pressure gauges before and after the fertigator to monitor system pressure can help diagnose pressure-related problems.

Figure 1. Fertigator Schematic.



Outlet pressure is too high:

If the outlet pressure is too high, flow is restricted somewhere in the system. Just like the previous section, if the flow rate is too low, or the outlet pressure too high there will not be enough suction generated for the injector to operate effectively (review the “Helpful Hint” above).

Insufficient outlet pressure or flow, check for:

1. **Improper injector sizing or calibration** - Confirm injector capacity matches the size and flow rate of your system.

With the system running, open the end of one drip tape line to increase the flow; this will lower outlet pressure. If the fertigator begins to inject fertilizer at the appropriate rate, it is likely the injector is incorrectly sized for the system.

2. **Clogged or damaged emitters** - With irrigation on (but the fertigator off) walk the field and look for emitters that are not dripping. Clean or replace damaged emitters.
3. **Clogged lines** - Flush water lines to remove any obstruction. For information on how to flush drip lines, see FSA6178 Maintaining Your Drip Irrigation System.

The fertilizer solution is drawn too fast by the injector:

Fertilizer being drawn up too fast can lead to overfertilizing or uneven application of fertilizer.

1. With the irrigation system on, **check header lines and drip lines for open ends or leaks**. - Ensure appropriate lines are closed and repair any damaged lines.
2. **Calibrate the injector** - Ensure the injector has been correctly calibrated by following the manufacturer’s instructions. Positive displacement style units (such as the Dosatron Dosmatic) have adjustable injection ratios, whereas Venturi style units have a fixed injection ratio.

MAINTENANCE AND PREVENTION

Regular system maintenance can improve irrigation performance and ensure that all components are functioning properly prior to fertilizer injection.

1. **Regularly check and clean filters, hoses, and fittings.** For information on how to clean filters, hoses and flush lines, see FSA6175 Troubleshooting a Drip Irrigation System.
2. **Use high-quality fertilizers** that fully dissolve in water (Table 1). Fertilizer labels typically specify if the fertilizer is water soluble or solution grade. If water solubility is not specified, talk to the distributor or visit the manufacturer’s website for product information. Minerals present in well water and open water sources can interfere with fertilizer solubility. To avoid clogging or uneven application, ensure fertilizer is fully dissolved before injecting.
3. **Run clean water through the injector** after each use to flush out any lingering fertilizer.
4. **Mixing different fertilizers** can be a more efficient way of delivering nutrients, but it is important to avoid mixing incompatible fertilizers that can form insoluble precipitates. Certain fertilizers, when mixed in a solution, cause a chemical reaction that creates solids that are insoluble in water that will clog up the system (Table 1).
5. **When not in use, store fertigators out of direct sunlight** to prevent UV damage. Store indoors in the winter to avoid freezing which can warp and damage parts.

HELPFUL HINT:

For systems with higher sediment levels in the water, flush lines and clean filters before every fertigation event.

Table 1. Fertilizers Commonly Used for Fertigation.

Nitrogen Fertilizers:		
Ammonium Nitrate	34-0-0	
Ammonium sulphate	21-0-0	Never mix with nutrients containing calcium.
Calcium Nitrate	15.5-0-0	Never mix with nutrients containing phosphate or sulphate.
Potassium nitrate	13-0-44	Can be slow to dissolve.
Urea	46-0-0	
Phosphorus Fertilizers:		
Monopotassium phosphate	0-52-34	Never mix with nutrients containing calcium.
Phosphoric acid	0-52-0	
Potassium Fertilizers:		
Potassium chloride	0-0-60	
Potassium nitrate	13-0-44	
Potassium sulphate	0-0-50	Never mix with nutrients containing calcium.

Many types of fertilizers are compatible with fertigation; the products listed above are not exhaustive.

Contact the manufacturer, local irrigation supplier or county Extension agent if issues persist after inspection.

Fertigation can be a helpful tool to incorporate into any drip irrigation system. Performing regular system maintenance and understanding how to troubleshoot common issues will help keep a fertigation system running smoothly.

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