

TECHNICAL NOTES

AGRONOMY TECHNICAL NOTE NO. 71

Section 9 of 22 (9r - FERTILIZER "JAR TEST")

Before you inject a new fertilizer solution into your drip system, always perform a "jar test". This will help you avoid annoying and unnecessary line or emitter clogging due to fertilizer incompatibility.

Whether you begin with water-soluble or liquid fertilizers, dissolved chemicals such as phosphates, calcium, and magnesium can react together or with the irrigation water. This can lead to insoluble chemical combinations precipitating in the water. These precipitates can clog the emitters. There are also fertilizer compatibility charts available, such as the one below. However, they may not list the fertilizers you are considering to use.

The "jar test" is easy. If you can prepare a half-decent shaken-not-stirred-Bond martini, you are well on your way. The key is to approximate the dilution rate that you expect to be injecting through the drip system. This jar test method comes from the Irrigation Training and Research Centre fertigation manual

To get started you will need:

1. the injection rate (gal per hr)
2. the drip system delivery rate (gal per hr)
3. the stock fertilizer or fertilizer combinations that you will be using (stock solution to water applied ratio)
4. a jar with a sealing lid
5. the water that you use for irrigating (use the buffer (6.5pH) irrigation water)

For example, a fertilizer stock solution is injected at a rate of 30 gallons per hour and delivered at a rate of 1200 gallons per minute.

Step one:

Convert system delivery rate from gallons per minute to gallons per hour.

$$1200 \text{ gallons per minute} \times 60 \text{ minutes} = 72,000 \text{ gallons per hour.}$$

Step two:

Calculate the dilution ratio. This is ratio of the injection rate to the delivery rate.

$$30 \text{ gallons per hour} : 72,000 \text{ gallons per hour} = 1:2,400 \text{ (72,000 divided by 30 = 2,400)}$$

Step three:

Add fertilizer stock solution and irrigation water into the jar at the same dilution ratio, 1:2400. Do this by adding 1 mL of fertilizer stock solution to 2400 mL or 2.41- of the irrigation water. Hopefully your jar wasn't too small. Always wear protective clothing and safety glasses when performing any jar test.

Step four:

Tighten the lid and shake it up!

Step five:

Watch what happens. Does any precipitate form on the bottom of the jar? Does the water become milky or cloudy? If this happens within one or two hours after mixing, there is a chance that the fertilizer solution or combination of fertilizers could cause line or emitter plugging.

Whether you begin with liquid or dissolved water-soluble fertilizers, you need to be aware of fertilizer compatibility. So before you mix it up, give it a shake.

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<http://www.nm.nrcs.usda.gov/technical/handbooks/iwm/nmiwm.html>

Fertilizer compatibility chart (B.C. Trickle Irrigation Manual, 1999)

	urea	Ammonium nitrate	Ammonium sulphate	Calcium nitrate	Potassium nitrate	Potassium chloride	Potassium sulphate
urea							
Ammonium nitrate							
Ammonium sulphate							
Calcium nitrate			XX				
Potassium, nitrate							
Potassium chloride							
Potassium sulphate			X	XX		X	
Ammonium phosphate				XX			
Iron, zinc, copper, manganese sulphate				XX			X
Iron, zinc, copper, manganese, chelate				X			
Magnesium sulphate				XX			X
Phosphoric acid				XX			
Sulphuric acid				XX			X
Nitric acid							

Fully compatible - y
 Reduced solubility - X
 Incompatible - XX

Fertilizer compatibility chart (B.C. Trickle Irrigation Manual, 1999)

	Ammonium phosphate	Iron, zinc, copper, manganese sulphate	Iron, zinc, copper, manganese chelate	Magnesium sulphate	Phosphoric acid	Sulphuric acid	Nitric acid
urea							
Ammonium nitrate							
Ammonium sulphate							
Calcium nitrate							
Potassium nitrate							
Potassium chloride							
Potassium sulphate							
Ammonium phosphate							
Iron, zinc, copper, manganese sulphate	XX						
Iron, zinc, copper, manganese chelate	X						
Magnesium sulphate	XX						
Phosphoric acid			X				
Sulphuric acid							
Nitric acid			XX				

Fully compatible - y
 Reduced solubility - X
 Incompatible - XX