

Fertigating Field Grown Nursery Crops

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Fertigation is the process of applying water soluble fertilizers to plants through a drip or trickle (low volume) irrigation system. Drip or trickle is the only irrigation system available that applies fertilizer solutions efficiently enough to be used in field nurseries. While it is possible to inject fertilizer into overhead systems, fertilizing areas other than crop root zones and potential nutrient runoff make fertilizing through overhead systems impractical. Because drip irrigation systems depend upon tiny openings for the delivery of water to plants, totally soluble fertilizers must be used as well as fertilizers that will not precipitate to form solids in the irrigation lines. Otherwise lines will become clogged. All irrigation systems through which any chemical is applied must be equipped with proper backflow prevention and is required by law in most states..

Injectors: Almost any system that can inject a solution into a water line can be used to inject fertilizer into a drip irrigation line. However, the injectors that have become most popular are those that are operated by water pressure rather than electronically. For smaller systems, a Venturi-type system can be used which draws fertilizer solution from a tank by differential pressure. The most common of these is the "hozon." Nurseries larger than 0.5 acres will probably be better served by systems that use water to drive a piston pump or hydraulics to draw fertilizer solution from a tank because of their far greater capacity and dependability.

Fertilizers: Little research is available as a guide in determining how much or how often fertilizer should be applied to woody field grown nursery crops. Soil tests should be conducted and nutrients including minor elements, calcium, magnesium, phosphorous and potassium is best applied during field preparation when tilling the soil for planting. By doing this, the only fertilizer needed is nitrogen. In areas where soils or special needs of the crop dictate application of additional nutrients, they may be injected if soluble formulations are available. Nitrogen and potassium can usually be applied at the same time while phosphorous solutions should be applied alone, following the application of other nutrients, then lines should be flushed thoroughly, leaving no fertilizer solution in the irrigation lines.

Ammonium nitrate and urea have both been used successfully for fertigation. Both are highly soluble in room temperature water. Calcium nitrate has been used when calcium needed to be applied via fertigation. Potassium nitrate and nitrate of soda potash have been used when sources of potassium were required. Phosphoric acid has been used as a source of phosphorous. Chelated micronutrient fertilizer solutions are available when minor elements are needed. With all of these fertilizers, it is important that they be fully dissolved before injection begins. Any non dissolved fertilizer should be removed by filtration or decanting so it can not enter and block irrigation lines. If you have problems dissolving fertilizers, check with your fertilizer dealer to be sure you have the right grade. Some fertilizers will normally have non-dissolving materials or coatings that must be removed before you can safely use them for fertigation. The injection

point should always be located before filtration so that any impurities can be filtered out before they enter the system.

Calculating fertilizer needs: Each grower will need to determine their own rates and time of fertilizer application. Our research has shown good results by beginning to fertigate about two weeks before first bud break in the spring and continuing to fertigate weekly for at least eight weeks. In areas with longer growing seasons, fertigating for twelve weeks or longer may provide good results. However, do not fertigate with nitrogen within six weeks of the expected first fall frost or plants may fail to adequately winter acclimate or go dormant.

The amount of fertilizer to use when fertigating is determined by applying one-half what would be applied top-dressed with granular fertilizers. Less fertilizer can be used produce more growth due to increased efficiency of fertigation compared to application of granular fertilizers spread on the soil surface.

For example: If the planting density is 1200 plants per acre and the rate of granular fertilizer would normally be 0.5 oz. of nitrogen per plant, the fertigation rate would use half this (0.25 oz N/plant). Further calculations are as follows:

1. The number of plants per acre multiplied by the amount of fertilizer needed equals the amount of fertilizer needed per acre.

$$1200 \text{ plants/acre} \times 0.5 \text{ oz. (14.2 grams) N/plant} = 600 \text{ oz. (21 grams) N per acre.}$$

2. One-half of 600 oz (21 g). is 300 oz. (10.5 grams) of Nitrogen ($600/2 = 300$). If the source of nitrogen is ammonium nitrate (34-0-0), approximately 900 ounces (31.7 g) of ammonium nitrate per acre (300 oz [10.5 g]of N divided by .34N in ammonium nitrate equals 882 oz [31 g]) is required.
Since there are 16 oz./pound (454 g/ pound), that's about 56 pounds (25.4Kg) of ammonium nitrate ($900/16=56$) are required to fertigate 1200 plants.
3. Fifty-six pounds (25.4 Kg) of ammonium nitrate is to be applied over a period of eight weeks. Therefore, $1/8$ is applied each week. To determine how much to apply, divide the total by the number of times fertilizer is to be applied. Therefore 56 pounds (25.4Kg) divided by 8 applications equals 7 pounds (3.6Kg) per fertigation event. Consequently, dissolve 7 pounds (3.6 Kg)of ammonium nitrate in water then inject this nitrogen stock solution through the irrigation system.

Fertigation Procedures:

1. Fully charge the irrigation system. When the system is fully charged, water should be coming out of the emitter farthest from the injection point. Record the amount of time required from when the irrigation is turned on until water is flowing from the farthest emitter, then add a couple of minutes safety margin. Using this figure each time you fertigate can save time walking to the end of the system each time you fertigate.

2. Begin injection. The length of time required to inject the fertilizer should be at least as long as it took to fully charge the system.
3. After all fertilizer solution is injected, run the system for at least as long as it took to charge the irrigation system so you are sure all fertilizer solution has been flushed from the system. This is a good time to walk the system to make sure emitters are not clogged.