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Drip Irrigation Must Apply Water Uniformly to be Efficient

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In order to be efficient, a drip system must apply water uniformly throughout the vineyard. This is accomplished by having little variation in flow rate among drippers (high emission uniformity). Dripper plugging and uneven pressure distribution are the major factors contributing to system inefficiencies. The emission uniformity of a drip system can easily be measured. It is used to evaluate system design and maintenance. Emission uniformity should be considered when scheduling irrigations.

A stop watch, measuring cup, pressure gauge with attachments, and a little time is all that is needed to evaluate a drip system. The flow rate from at least 20 drippers should be measured from various locations in the system. Check drippers at the beginning and end of hoses and select hoses from the high pressure and low pressure end of the underground manifold. One minute is all the time needed to measure the flow from a dripper. Dripper flow rates can then be expressed as gallons per hour.

Pressure distribution is evaluated by measuring pressure at the first and last drip line inlets on several manifolds as well as the high and low pressure end of hoses. Also, note the pressure at the pump and pressure loss across the main filter.

To determine the emission uniformity of a drip system, divide the average discharge of emitters with the lowest 25% flow rates by the average flow rates of all emitters. For example, after measuring the flow of 20 drippers, it was found that the average flow rate of all drippers was 1 gallon per hour; whereas, the average flow from the five with the lowest discharge was 0.8 gallons per hour. The calculated emission uniformity in this example is 80% (0.8 divided by 1).

Grading of emission uniformity is given in the table. A system with an emission uniformity of 90% or greater is operating efficiently; therefore, if irrigations are scheduled properly, irrigation efficiency will be high. When emission uniformity drops, the ability to irrigate efficiently also drops. For example, an emission uniformity of 50% would require over irrigating (2X) to satisfy water requirements of vines that have drippers with low discharge. This can reduce yields and waste water and energy. It is a no-win situation, and the only solution is to improve the emission uniformity of the drip system.

Drip systems should be evaluated once a year. An effective evaluation will detect poor performance and then pinpoint the problem. Remember to document operation pressure when measuring emitter flows; otherwise, valid comparisons with past and future evaluations will be difficult (dripper flow rates change

with pressure). It is a good policy to evaluate a newly installed drip system to establish a baseline for future evaluations.

The majority of the systems we have tested were operating with an emission uniformity of 80% or greater. Systems with poor emission uniformity had drippers that were plugged or problems with pressure regulation.

When plugging is a problem, the variation in dripper flow rates tend to be randomly distributed throughout the vineyard. However, when pressure regulation is the culprit, drippers with low flow rates are located at the ends of hoses (excessive drip line length) or at the low pressure end of the manifold (manifold pipe too small).

In our system evaluations, a high emission uniformity was evident in systems that were maintained properly, which includes servicing filters, flushing drip hoses, and using appropriate chemical treatments. In a very few instances, poor system design was the culprit, requiring major changes in underground pipe or drip lines to improve emission uniformity.

Drip systems having good to excellent emission uniformity indicate that water and injected fertilizer are distributed evenly throughout the vineyard.
Emission Uniformity Rating 90 - 100% Excellent 80 - 90% Good 70 - 80% Fair Less than 70% Poor

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