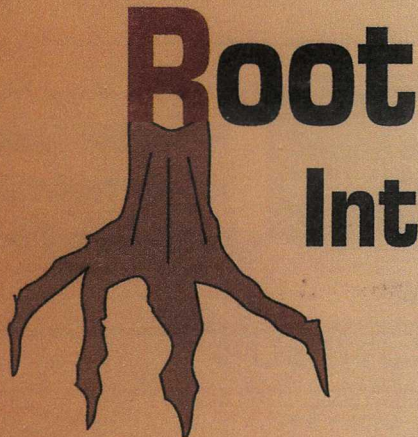




Intrusion Prevention

by David F. Zoldske

Nothing spells the death of a subsurface drip irrigation (SDI) system faster than root intrusion. With more growers placing drip irrigation lines below the soil surface, the need for a better understanding of how to keep roots out of drip emitters has also become more important. Work done at The Center for Irrigation Technology (CIT) over the past 10 years has given us some insight into how to protect emitters from root intrusion.

Chemical barriers have been shown to be an effective method for preventing roots from entering the discharge point of the emitter and traveling up into the tube. The herbicide Treflan™ or Trifluralin™ (a similar formulation) is commonly used (where legal) to provide the chemical barrier. These chemicals stop cell growth at the root tip as it comes in contact with the chemical. The root tip will appear blunt and stubby, with no sign of root hairs.*

Well-watered plants will not typically cause problems with root intrusion. However, sudden weather changes, such as a rise in temperature, or deficit irrigation practices will encourage roots to seek water remaining in emitters. Without some type of protection or barrier, the emission pathway will eventually become plugged with roots.

There are two basic approaches to providing a chemical barrier to the emitter. The first is to inject a registered herbicide on a periodic basis, taking care to follow label instructions on amounts and timing. Generally, you will want to apply these products in relatively dry soil, as a saturated environment may move the herbicide beyond the immediate vicinity of the emitter. The herbicide should be injected over a short period of time, followed by a sys-

tem shut-down to allow time for the material to become bonded to the soil particles. The frequency of application will depend on label instructions, annual water applied, soil type, irrigation strategies, etc..

The second approach to providing a chemical barrier is to purchase products with the herbicide already incorporated in the emitter. The herbicide is combined with the plastic in the emitter during the manufacturing process, similar to the insecticides found in flea collars. This provides small amounts of the herbicide near the emitter outlet. The product is manufactured to provide a minimum of 10 years of protection underground. Care must be taken to ensure the product is not exposed to prolonged, excessive heat prior to installation, as this will shorten the effective life span of the product.

Both of these methods have been

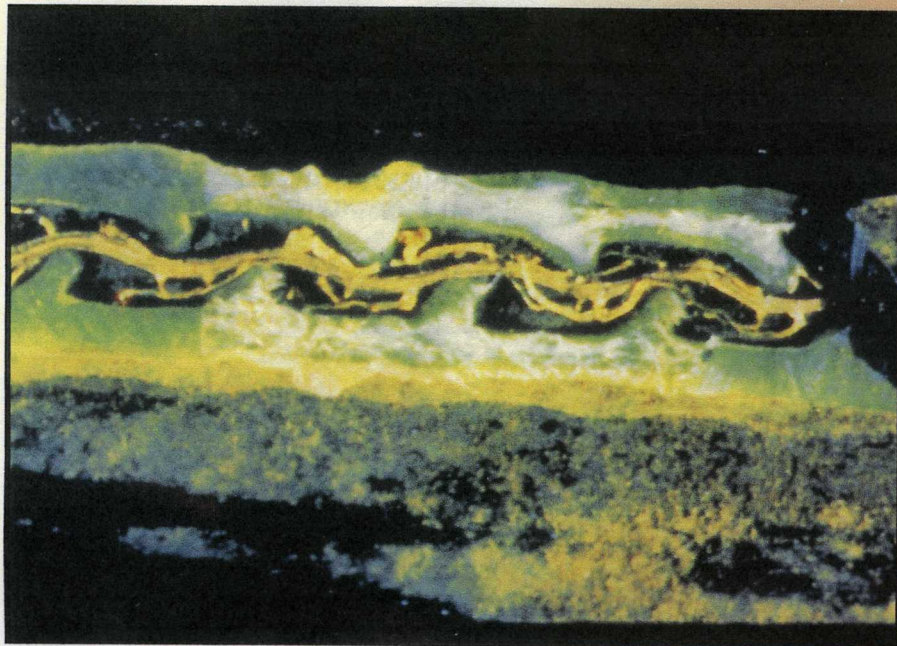
shown to effectively keep roots at a safe distance. Some growers have been known to use both methods to add extra insurance to preventing root intrusion. One way to know if the chemical barrier is working is to periodically dig down and inspect the root activity around the emitters; note the location of roots in proximity to the emitter outlet and whether root hairs are visibly growing near by.

Emitters have traditionally been designed to discharge to atmosphere. Placing the emitter underground causes the emitter to discharge to a saturated environment. This may affect the discharge rate of the emitter in relation to available line pressure. Some pressure-compensating emitters have shown to provide a physical barrier to root intrusion. While this will delay the effects of root intrusion, it has not proved to eliminate the problem by



Photo courtesy of the Center for Irrigation Technology

*Commercial product names are used for the convenience of the reader. This does not imply endorsement by the Center for Irrigation Technology, nor preference over similar products not mentioned.



Cross-section of an emitter showing extensive root growth inside of the labyrinth.

itself. New product designs are emerging which may help extend the physical barrier to roots. Recent changes have included outlet slits, which close down when the system is turned off.

The plugging of emitters by vacuum or suction during system shut-down

can also be a serious problem. This occurs because water draining downhill draws a vacuum behind it. If the system is not properly vented, water and air are drawn back through the emitters at higher elevations. Soil particles near the outlet can be drawn

back with the water into the emitter. They can become stuck and effectively plug the emitter.

While there is still much to be learned about subsurface drip irrigation, many growers are exploring the benefits of placing the drip lines underground. For example, an estimated 4,000 acres of subsurface drip irrigation has been installed in the Lodi, California area on wine grapes. Some of these systems have been operating for eight years or more.

For those growers considering their first subsurface drip irrigation system, I would encourage you to first visit other successful growers using SDI. Then work with an irrigation dealer who has experience with the design and installation of SDI systems. Be sure to include flow meters and pressure gauges in your system, as these are important tools in evaluating system performance. Finally, start small and work your way up to larger acreage.

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