MICROIRRIGATION IN GARDENS AND LANDSCAPES

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Irrigation is used extensively for the production of high cash value crops typical of vegetable and ornamental industries. In addition, the desire for attractive landscapes using a variety of turf, woody ornamentals, and flowering annuals has resulted in strong interests in turf and landscape irrigation for the homeowner and commercial property markets.

The objective of this paper is to present information on the use of microirrigation in gardens and landscapes. Advantages and disadvantages of the different systems and devices currently available will be discussed with an emphasis on their use under different conditions.

MICROIRRIGATION SYSTEMS

Microirrigation products have generally been developed for use in commercial agricultural. Support stakes for micro-sprayers (or sprinklers) may be orange, yellow,or red in color for high visibility to avoid potential damage by grove or orchard maintenance crews. Drip tape (common for row crops) typically comes in rolls that have 3000 to 8000 feet of product, a much greater quantity than the typical small garden or home or business landscape area could use. However, some companies are now providing tape on 1000 foot rolls. In general, most microirrigation products are not available to the retail purchaser through the local hardware store or "Do-It-Yourself" outlet and the retail choices do not represent the true market of microirrigation products. However, some manufacturers have made efforts in recent years to provide homeowner oriented microirrigation products in reasonable quantities, with conversion fittings to change over from sprinkler systems, and have provided some installation guidelines. In addition, landscape oriented colors are used such as olive green spray stakes or brown drip tube which blend-in with existing plant and mulch material.

Garden and landscape uses of microirrigation have also drawn the interest of commercial landscape development and maintenance companies as well as by the nursery production industry. Producers of garden and landscape oriented plants sometimes feel the impact of water-use restrictions through decreased sales of products. However, adoption of microirrigation systems could result in sales increases of these plants. This situation prompted one large producer of bedding plants to develop a microirrigation demonstration garden at his commercial nursery. The demonstration garden was designed to display several types of the producers plants as well as a variety of microirrigation products and uses.

DRIP IRRIGATION CONSIDERATIONS

Most homeowners and landscape contractors think of drippers when they hear the term microirrigation (or drip irrigation). Drip systems work very well for vegetable gardens and some landscape systems. However, spray-jets (micro-sprayers and micro-sprinklers) may be more desirable for many other landscape applications and will be discussed in the next section.

Sands and loose granular planting media are generlly desirable for many landscape plants, but are sometimes difficult to manage from an irrigation standpoint. Lateral water movement on sands and other looses media from point-source drip emitters is generally limited to 10 to 12 inches on from the point of application (the dripper) as shown in Fig. 1. Most of the applied water may be within a 6-inch radius of the dripper, and will result in the need for close emitter spacings. Turf applications of drip tape or tubing have not been extensively researched, but generally require lateral line spacings of at most 18 to 24 inches. In addition, close emitter spacings are generally recommended because many landscape and vegetable plants are shallow-rooted and are planted on relatively close spacings.

Drippers allow precise, point-source applications of water and are well suited for narrow strip plantings, such as garden rows or along hedge rows using one or more lines of drip tubing (or tape), or in commercial landscaped or garden areas where wind drift of water from sprayers would be a problem. Drippers may be placed under mulch or buried in the soil to minimize exposure for either aesthetic purposes or to minimize damage through plant maintenance activities. However, such positioning does not provide easy access for visual inspection of operation or replacement of damaged items and places the dripper in a location susceptible to root intrusion. Some dripper manufacturers have incorporated root deterrent chemicals into the emitters as an effort to stop root intrusion. The quiet and controlled application action of drippers is also an advantage for many indoor garden locations. Yet, without timers and control clocks, it is difficult for the operator to know when these systems are operating and excessive irrigation is possible. A similar situation can occur with the homeowner by leaving the house or going to sleep while drippers are running without the aid of a time-clock to stop the system. Sprinklers and micro-sprayers can generally be seen and heard while operating.

MICRO-SPRAYERS AND MICRO-SPRINKLERS

Because spray-jets cover greater areas (diameters of coverage from 3 to 20 feet), fewer emission devices are required than drippers to irrigate a certain size of garden or landscaped area. A variety of spray application patterns are available (Fig. 2) depending on the type of spray-jet used and allows easy accommodation to differing landscape designs. Because flow rates of spray-jets are greater than drippers, 10 to 20 gallons per hour (gph) versus 0.25 to 2.0 gph, these devices have larger flow paths and would thus be less susceptible to clogging, the primary problem associated with many microirrigation

systems. Spray jets can be easily observed while operating, thus allowing inspection for clogging, misting, proper spray orientation, or some other distortion of the water application. However, plant branches and foliage can easily distort spray patterns, possibly necessitating placement of the sprayer above the canopy on a stationary or pop-up riser.

Spray-jet devices are available with many different flow rates (from less than 10 to over 20 gph) and several distribution patterns (shape and radius). Spray-jets may be classed as micro-sprayers and micro-sprinklers. Micro-sprayers emit water from an orifice onto a deflector plate which results in a fan type of water distribution pattern (fan-jet) with fine water droplets which can be easily distorted by wind or plant foliage. Wind distortion is generally not a problem in mature grove or orchard operations, but may be a significant concern in landscaped areas with little or no windbreaks. Fan-jets perform well when used for directional sprays and confined area applications.

The addition of shaping vanes (spokes) to the deflection area creates streams of water (Fig. 2B) which are less susceptible to wind distortion, and result in spoke-shaped application patterns (spoke-jets). These work well as single tree emitters and can be fitted with deflection caps to confine the application to smaller diameter areas (3 to 5 feet). Use in the landscape may be limited to large trees and shrubs. Applications on sandy soils and loose media can result in dry areas between the "spokes" which could result in poor growth of small plants in those areas.

Some manufacturers have added spinner devices to create a sprinkler effect (Fig. 2C). These "micro-sprinklers" have more uniform water distribution than the fan-jets or spoke-jets. However, under commercial grove and orchard conditions the spinner mechanisms tend to malfunction and stick in place either due to accumulation of precipitates from mineral elements in the water, dust and dirt, or insect associated debris (nests or spider webs) accumulating on or adjacent to the spinner device. Thus, regular inspection and maintenance are necessary.

WATER TREATMENT AND SYSTEM MAINTENANCE

Because microirrigation devices have very small water flow passeges, proper water treatment and filtration are necessary to ensure continued operation of any microirrigation device. It is not wise for any homeowner to consider injecting any treatment chemical into their system for maintenance or cleaning. In general, an appropriately sized water filter in addition to the water treatment provided by the municipal water supply should be sufficient to keep most homeowner microirrigation systems in proper operational condition. Private wells may require some chemical treatment to eliminate or at least minimize biological or chemical clogging. However, this is discouraged unless performed by trained individuals and with proper back-flow prevention equipment installed to avoid contamination of the water supply.

Use of municipal treated water sources and easily inspected emitter devices with a small supply of back-up units (whether drippers or spray-jets) would provide the safest and easiest maintenance program for homeowners and commercial businesses. Clogged devices could be easily replaced with clean units. The clogged emitter are placed into a small container of acid or chlorine for cleaning, depending on the nature of the clogging problem.

Acid is used for dissolving chemical precipitates (such as calcium carbonate) or for cleaning severely clogged emitters. Acidic solutions will generally not harm any of the plastic components used in irrigation systems. Pool acid (muriatic acid) is acceptable and relatively available at most hardware stores or pool supply centers. Start with a dilute acid solution by adding 2 to 4 ounces of acid to a gallon of water and then placed the plugged drippers into the container and leave overnight.. If that concentration does not appear to clean up the drippers overnight, then add 2 to 4 more ounces of acid to the container. Remember, always add acid to water, and never add water to acid.

Chlorine is used to break down and dissolve organic growths (algae or slimes). Periodic flushes of poly pipe laterals should remove accumulated precipitates and biological growths. Generally very small amounts of chlorine are needed to clean up algae or bacterial growths. To clean plugged emitters in a container, add one or two ounces of household bleach to a gallon of water and place the plugged emitters into that solution for several hours. Remove the drippers and try flushing them with clean water. If they are still plugged, soak them for a few more hours or try a mild acid solution as described above.

SUMMARY

Public interest in using microirrigation in gardens and the landscape is increasing. Most microirrigation devices have been designed and developed for use in commercial agriculture necessitating some changes in colors to blend in with the landscape as well as the need for marketing and packaging changes for access by the general public. Special considerations are necessary when selecting microirrigation devices for use in gardens and landscapes. Drippers may work well for vegetable gardens, small shrubs or plant hedge rows with limited root zones, or for indoor garden areas where possible over-spray from a spray-jet would not be acceptable. Spray-jet devices are more appropriate for large trees or large areas of small flowering annuals. In addition, spray-jet devices are less susceptible to clogging than drippers and may be placed above the plant canopy for inspection during operation and knowledge that the system is operating. Quietly operating drippers without the use of a time-clock may be left on for extended periods of time without full knowledge by the operator.

Water filtration and system maintenance are essential for proper operation of these systems. Clogged devices should be replaced with clean ones and then soaked in a container of chlorine solution for biological growths or in a container of acid solution to dissolve accumulated precipitates. In general, water from municipal sources requires no

additional chemical treatment. If chemical treatment is required, proper training of the operator and back-flow prevention equipment are necessary. With proper use and selection of equipment, garden and landscape applications of microirrigation systems will provide marketing, design, and installation opportunities. Particular market areas are those with high water costs or competition for use of limited supplies.

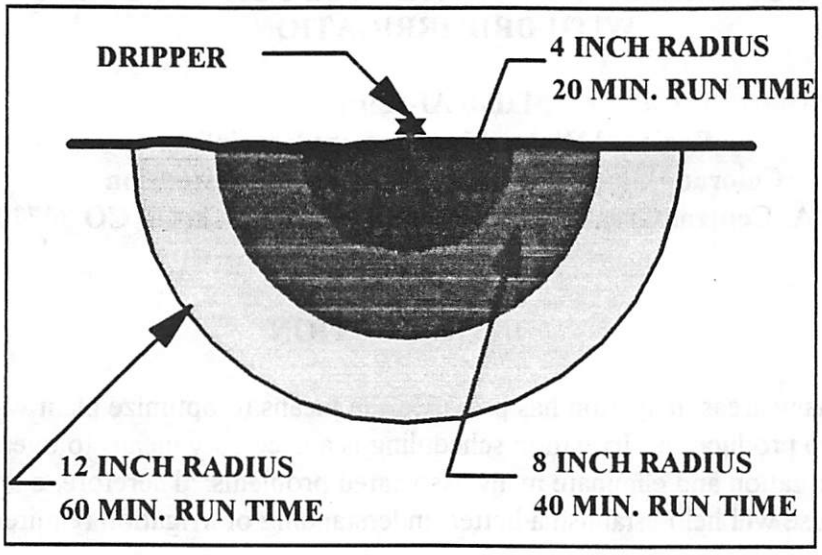

Fig. 1. Example of a drip irrigation wetting pattern.

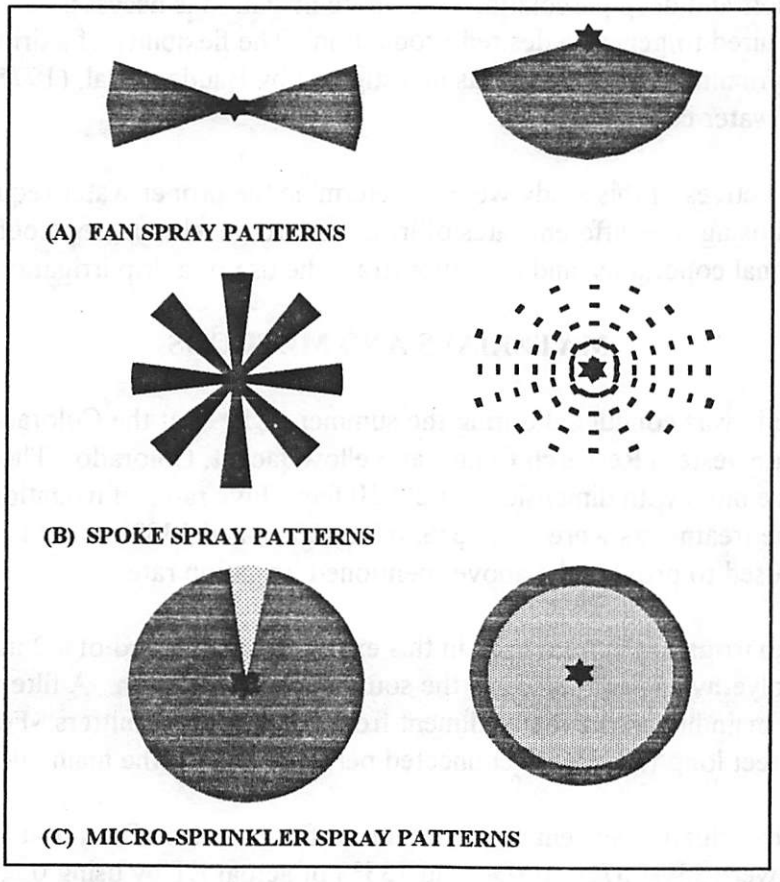

Fig. 2. Spray-jet distribution patterns.