California Avocado Society 1970-71 Yearbook 54: 14-16

DRIP, DRIP, DRIP

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A talk presented at the annual meeting of the California Avocado Society, October 17, 1970.

It seems appropriate to start by asking the question "What is drip irrigation?" Drip irrigation is the slow application of water at selected points where it immediately enters the soil.

There are several basic differences between drip irrigation and conventional irrigation that we should examine. With drip irrigation all water movement, after leaving the distributing apparatus, is by capillary flow within the soil. There is no movement of water across the surface of the soil or above the surface of the soil to provide distribution as there is with surface or sprinkler irrigation. Because of this the surface soil tends to remain drier than it does with either sprinkler or surface irrigation methods and lose less water by evaporation. Another basic difference is the greatly reduced area or volume of soil wetted with drip irrigation. It may range from about 1/2 to as little as 1/10 the volume of soil wetted by conventional irrigation methods. A third difference is the frequency of irrigation that will be much greater with drip irrigation and may, in many cases, occur daily. This means that the soil will remain at a more uniform level of wetness and dry less between irrigations. A fourth difference is the distribution of wet and dry soil. In conventional irrigation methods the soil becomes entirely wetted at the time of irrigation and then gradually dries out throughout its volume until the next irrigation arrives. The range of wetness is a function of time. With drip irrigation occurring as often as daily and seldom more than 2 or 3 days apart, the soil maintains a rather uniform degree of wetness with respect to time but varies in wetness depending upon distance from the point of water application and the capillary conductivity of the soil. Near the emitter the soil wetness will be great diminishing with distance away from the emitter until a point is reached beyond which water is unable to move by capillary conductivity through the soil. Thus, at all times, the root zone will contain a range of wetness that provides both a relatively easy uptake of water by the roots from the wet portion and a substantial fraction of the root zone that is always dry enough to insure adequate aeration for the roots.

The next point to be examined is the possible effect of this different irrigation culture on the growth potential of plants. Plants will inevitably have a smaller root zone than with traditional methods of irrigation because a smaller volume of soil will be wetted. This means there will be a smaller reserve of water supply in the root zone, a smaller anchorage for the plants -— important mainly to trees, and a smaller volume of soil in which roots can forage for nutrients. There will be a greater wetness of soil at the point of application providing conditions for easy uptake of water by the roots so that the plant may perform satisfactorily even though its root zone is of smaller extent. Greater soil wetness near the point of application may be a condition that favors development of root diseases but the good soil aeration existing in most of the root zone might counteract this situation.

Because any salt carried in the irrigation water will move with the water as it travels from the point of application in the soil to the wetted perimeter of the root zone, there will be an accumulation of salts at the periphery of the wetted zone. Irrigations can be managed in a way to leach salts downward from the root zone but not from the areas of concentration at the sides of the root zone. As long as most of the root zone is kept relatively wet, plants' roots will not be damaged by salt concentrations at the dry perimeter where roots are relatively inactive, but what might occur when light rains fall to wash some of these salts into the more active root zone is a point about which we need additional information.

The drip method of irrigation will have some effect upon orchard operations. Because surface soil generally remains much drier and some surface soil never becomes wet, there will be fewer weeds and a lesser need for weed control operations. The dry surface soil will also permit general orchard operations to take place at any time desired rather than having to wait for some interval after an irrigation so that the soil can dry sufficiently to sustain the equipment used in orchard operations. Unfortunately there are many cases when orchard operations are conducted without waiting for the soil to dry sufficiently and soil compaction results.

Though maintenance time for emitters is unknown at present, irrigation operations may take less time than with standard methods. While the water will run many more hours, it will probably require less attention. It may be feasible to install remote control valves in pipelines so that the irrigation can proceed more or less automatically. This probably can be done economically because the flow rates for drip irrigation are so small that small pipe lines and small valves will suffice. With drip irrigation, soluble fertilizer will be injected in the irrigation water and will not be applied as a separate orchard operation. The extent to which less soluble fertilizer items such as phosphorous and potassium can be applied by this method is a question yet to be answered.

Drip irrigation will require somewhat different equipment than has been used with other methods. The lateral lines may possibly not be any greater in number than those for permanent solid set sprinkler irrigation systems in orchards but will be greater in row crops. These laterals will generally be of smaller diameter than those used with sprinkler systems and will be equipped with the necessary number of drippers to insure wetting the appropriate soil volume for the trees or other plants to be irrigated. For tree crops estimates range from two to eight emitters per tree and, therefore, require approximately 200 to 800 emitters per acre. To avoid plugging the small orifices in drippers, water will have to be cleaned and will require filtration or screening. The maximum size material that can be permitted to remain in irrigation water will dictate the nature of the filtering apparatus needed. Some commercial manufacturers claim that their emitters can perform satisfactorily with larger particle sizes carried in the water than permissible with other emitters. These are points that will have to be learned with experience.

As indicated above relative to fertilization, there will have to be a fertilizer injector as part of the irrigation system. This can be a relatively simple and inexpensive item so long as liquid fertilizers are used. Because most emitters have a rate of emission dependent upon the water pressure in the laterals, it is important that this pressure be closely regulated and kept uniform throughout the system. This may require various types of flow controls and pressure regulations. Pressures commonly used with drip irrigation range from about 5-15 pounds per square inch. With many of our orchards existing on hilly terrain, elevation differences equal to 10 Ibs. per square inch are commonly found. Adding or subtracting 10 Ibs. per square inch to the low pressures used in these systems would create a substantial variation in the discharge rates of the emitters, more so than would be the case with sprinkler irrigation where higher pressures are used. With higher pressures the elevation differences cause a smaller proportionate change in pressure.

Research and experience will gradually inform us about the capability and potential for drip irrigation with different crops in various soil conditions. As knowledge grows, new or improved rules will be formed.