

Irrigation Management

Water availability has not been a major concern to the nursery industry until recently. Increased urban pressure, recent drought conditions, and climate change concerns have shifted the community and grower focus more to water availability, use, and sustainability.

Irrigation is essential to container production and efficient irrigation scheduling is essential to sustainable nursery production. Scheduling irrigation is often described as 'applying the right amount of water at the right time' and is a crucial tool in good water and irrigation management. Nursery owners and managers typically develop methods of determining how much and how often to irrigate, however improved irrigation scheduling can increase crop production, conserve water, decrease fertiliser requirements, reduce wastewater runoff, decrease pest and disease incidence, and generally improve business profitability.

Preliminary results from a two year scheduling trial at a production nursery in the state of OHIO in the USA that compared traditional time based irrigation with calculated irrigation scheduling (using on-site weather station data and species specific crop factors) found water savings in excess of 300% with no negative impacts on production. Local research trials in Australia have also provided impressive water saving results.

Irrigation management is a complex decision making process that can be complicated by a lack of information on plant water use, ineffective and inefficient irrigation systems, and grower time constraints. Growers are aware that any change to irrigation management practices may affect the nutrient balance and fertiliser requirement in the container. Excess irrigation can leach water and dissolved nutrients from the growing media and insufficient irrigation can reduce leaching and may cause an increase in fertiliser salt levels. Irrigation applications should be scheduled to provide some leaching from the containers to prevent crops being injured by salinity. A leaching fraction (LF) of approximately 12 percent is recommended, however poorly scheduled irrigation can often provide considerably higher results.

Many factors may influence the frequency and the volume of water required in nursery container production and should also be considered when locating plants into irrigation/production areas or zones. A nursery site can often include hundreds of different plant species and varieties, all at different stages of growth, which are all exposed to varying levels of rainfall, wind and light conditions. Plants also vary in their growth rate and therefore their water and nutrient requirements. Scheduling irrigation to a growing pad or zone is often dictated by the fastest growing plant species or variety, or the ones with the highest water requirements. To reduce irrigation water use, wherever possible plants should be grouped into irrigation zones according to their daily water use requirements.

Growing media selection is vital to support an efficient irrigation system. Growing media should be selected to provide optimum air filled porosity, water holding capacity, and nutrient availability during plant growth and development in the nursery environment.

Evapotranspiration (ET) is the term used to describe the sum of evaporation (water moving to the air from the soil, canopy and water bodies) and transpiration (movement of water within a plant and the subsequent loss as vapour through stomata in the leaves). Evapotranspiration is affected by environmental factors including sunlight, air temperature, relative humidity, and wind speed. The design of production areas can limit this loss water from environmental factors. Purpose built structures that provide crop shading with low shade factors (eg. hail net materials) can reduce solar radiation and air temperatures, and increase relative humidity. Wind breaks and buffer zones can reduce wind effects on the crop reducing evapotranspiration losses.

Nursery owners and managers have traditionally used their grower experience and judgement to decide on time schedules for irrigation that have habitually been altered only two or four times a year to match seasonal changes. The latest generation irrigation controllers have the ability to alter the irrigation scheduling across all stations or zones by a percentage allowing a more flexible approach to water management. Graeme Logan from Logans Nursery at Capalaba in Brisbane recently stated that their recently purchased Hunter irrigation controller with a percentage control adjustment is an excellent irrigation management tool and allows regular changes to irrigation scheduling to match changing weather conditions.

Another simple method of determining irrigation management is by daily weighing the containers in the field using a scale by hand. Research is presently being conducted to develop an electronic scale or load cell that can interface with an irrigation controller and provide real time scheduling decisions. Calculated irrigation scheduling or water budgeting is another technique used in determining a more precise irrigation regime than the established systems. This involves calculating the evapotranspiration to determine irrigation frequency and duration. On-site weather stations or evaporation pans are often used in determining the required values.

Moisture probes are regularly used in field grown crops to provide information on water levels in the soil and often to initiate an irrigation event. Recent trials in Australia have shown that current technologies in moisture probes are not consistently reliable in the range of growing media used by production nurseries. Irrigation timing and frequency are prime considerations when scheduling nursery irrigation. Parameters that impact on this decision process include evaporation pressures, disease potential, business operational requirements, pumping capacity, growing media, and irrigation application systems.

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