Water Storage Management

Recent weather conditions have put pressure on the water management techniques of production nurseries in South East Queensland. The sudden dramatic increase in rain intensity has concentrated overland flows and wastewater from nursery production hardstand areas, testing drainage networks and water storages. Nursery drainage systems are designed to remove excess water from the growing areas in a controlled manner as quickly as possible, but combined with stormwater at high velocity, these systems have been severely tested.

Nursery construction generally increases the level of impermeable surfaces and subsequently increases the volumes and velocities of wastewater required to be conveyed by a drainage system. Design calculations for drainage and storage systems take into consideration peak flows (eg. typically a 1 in 20 year storm), any wastewater discharge from normal seasons, and incorporate energy dissipaters and erosion protection measures within the design to allow wastewater runoff to be slowed, reduced and cleaned before it outfalls.

Excessive inflows through drainage systems and into water storage facilities on production nurseries have caused damage and erosion to drains and collection areas, and have also produced a number of water quality issues such as sudden increases in water storage pH values, algal blooms, significant increases in turbidity and nutrient levels.

Growers have identified higher than normal pH values in their wastewater and water storage facilities. Any pH values above 7.5 may reduce the effectiveness of oxidising agents, particularly the chlorine disinfestation of irrigation water.

The incidence and severity of algal blooms in on-farm nursery storage facilities has increased. The most noticeable indication of the presence of algae is a discolouration of the water (green colouration is the most common, but there are also brown algae that can be mistaken for sediment. All algal blooms in irrigation water storages have the potential to cause some water management concerns. Algae are small to microscopic plant life that can clog irrigation systems, obstruct foot valves, congest filters, affect water disinfestation, and present odour problems. Managing an algal bloom requires careful planning. Some algae may be toxic and as algae die, their decomposition diminishes the oxygen level in water storages and noxious gasses such as hydrogen sulphide can be produced.

Algae and suspended solids also increase the turbidity or cloudiness of water in on-farm storage facilities. Turbid water becomes warmer as suspended particles absorb heat from sunlight, causing oxygen levels to fall. Turbid water greatly reduces the effectiveness of a number of disinfestation (eg. Ultraviolet and Chlorination) and filtration systems.

The salt levels or salinity measured in nursery runoff, wastewater and water storages has varied substantially between production nurseries and appears dependent on the storage volume and production schedule. The high EC or electrical conductivity measured at some sites provides an indication of the concentration of ions in the water, reflecting the amount of salt contained in a sample, however it does not identify the type of salt or their concentration. High salt levels commonly affect plant growth by reducing the ability of plant roots to absorb water eventually causing the plant to wilt and die if not corrected. High EC measurements can also be a result of toxic levels of some individual elements.

The prolonged wet has leached nutrients and fine particles from the growing media and reduced oxygen levels in the waterlogged containers, suppressing root development. In the surrounding grassed buffer areas and stock gardens, waterlogging of the soil can also cause a loss of nitrogen through denitrification and can quickly affect the availability of other nutrients. The anaerobic bacteria that flourish in waterlogged soils may also secrete toxins that can damage plants. The wastewater runoff from these rain sodden, water-soaked surface areas can have the potential to be high in nutrients and other waste products either dissolved in the water or absorbed on suspended clay or organic matter.

Acid sulphate soils have their own peculiar set of problems. Acid sulphate soils are static when left untouched and waterlogged. Iron sulphides are contained in these sediments and soils and when exposed to oxygen through drainage or disturbance, produce sulphuric acid. Rainfall events can flush the acid into drainage systems and subsequently into water storage facilities. The recent high rainfall events that have followed the years of drought pose some concern for water quality in acid sulphate soil affected areas.

High velocity water flows into retention storage areas have produced significant turbulent action on the sediment layers adjacent to inflows, clouding the water and upsetting the water quality. Reduced oxygen levels in this sediment layer of wastewater storage facilities often provide anaerobic conditions that reduce the rate of waste product breakdown, and the sudden inflows unsettle this sediment and silt.

Iron can be released from disturbed sediments in nursery water storage facilities where oxygen supply has been limited. Iron has shown to be soluble in water where there is a limited oxygen supply. Discolouration or staining of structures and plant leaves can be a result of high iron levels in the water. This discolouring of plant leaves can be quite harmful to plants due to reduced photosynthesis and plant transpiration. Elevated iron levels can also interfere with successful chlorine disinfestation of irrigation water.

It is essential to recognize and manage all water quality issues, to reduce potential problems and ensure continued safe on-farm use. Monitoring and identifying the quality of the water in a storage facility over time, ensures continued appropriate water disinfestation, reduced irrigation system blockages, a lessening of staining to structures and stock, and other undesirable effects. Water should be tested regularly and records maintained to provide a history of water quality. Simple pH and EC testing can be carried out on-farm and it is imperative that water is tested by an accredited laboratory at regular intervals to provide a seasonal outline of water quality changes.

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