

Using sodium or calcium hypochlorite to disinfect nursery irrigation water

Sodium or calcium hypochlorite (Chlorine) is frequently used within the nursery industry in Australia for the disinfection of water used for nursery irrigation. It has proved suitable for most applications within the industry and is generally considered effective, simple to use, easy to monitor and relatively safe to handle and store.

Chlorination using either sodium or calcium hypochlorite is recognised as a suitable water disinfectant under NIASA, the Nursery Industry Accreditation Scheme, Australia, when used according to the guidelines. Chlorination does have limitations in the spectrum of disease organisms that it is effective against and is generally considered the minimum standard for water disinfection.

Sodium or calcium hypochlorite disinfection systems operate effectively with reasonable quality water that is relatively free of sediment, clays and organic matter, with medium to low levels of iron and manganese. Chlorination of irrigation water with high levels of dissolved iron and/or manganese is not recommended as the sodium or calcium hypochlorite oxidises these elements to form precipitates that can potentially clog up an irrigation system. Oxidising iron is a relatively quick process and can be managed by filtering the iron precipitate out of the water, however oxidising manganese is much slower and can potentially precipitate out later in the irrigation system, clogging valves, solenoids and sprinklers.

The effectiveness of chlorine is relatively short and is affected by many factors including sunlight, high temperatures, contaminants – inorganic (clay, soil, salts) and organic, and pH levels. Purchasing sodium hypochlorite more frequently to ensure on-site storage of thirty days or less, not contaminating new stocks with surplus older material and careful storage in sealed containers, in a cool position away from direct sunlight will help preserve the effectiveness of the product.

A number of compounds are formed when either sodium hypochlorite (liquid form) or calcium hypochlorite (powder form) is added to a water source and the balance between the compounds formed is dependent on pH and the contaminants in the water. The only compound formed that exhibits any genuine disinfection potential is hypochlorous acid, a strong oxidising agent and its production is extremely dependent on the pH of the water. Monitoring and maintaining water pH values within a set range (pH 5 – 7) is essential for reliable and effective pathogen control.

Other compounds produced (depending on contaminants and pH) when sodium or calcium hypochlorite is dissolved in water are chlorine (Cl_2), chloramines, trihalomethanes (THM) and hypochlorite ions (OCl^-). When chlorine combines with nitrogenous compounds in the water, chloramines are formed preventing the immediate formation of hypochlorous acid, while trihalomethane (THM) compounds are toxic chemicals formed in small quantities when chlorine combines with organic matter in the water supply.

The process of disinfecting irrigation water supplies is pH dependant with the higher the level of pH then the lower the effectiveness of either the sodium or calcium hypochlorite. A pH above 7 would require some pH adjustment or the use of a different disinfection system such as bromine, chlorine dioxide or a chlorine bromine combination.

The chlorine that is released from adding either sodium or calcium hypochlorite to the irrigation water will initially combine with the inorganic and organic contaminants before disinfection of the water can begin and the installation of an efficient filtration system prior to disinfection can assist in reducing the chlorine demand of the disinfection process.

The disinfection treatment of irrigation water using sodium or calcium hypochlorite as recognised by NIASA, the Nursery Industry Accreditation Scheme Australia, advocates a free chlorine residual of 2.5ppm (2.5mg/L) at the end of a 30 minute contact period. Sodium and Calcium hypochlorite can be added to irrigation water supplies either manually or by metering pumps allowing varying levels of automation depending on nursery budget constraints.

It is vitally important to have the irrigation water quality tested by a recognised laboratory prior to making a decision on the suitability or otherwise of any disinfestation system.

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