# Optimising Moisture Retention in Growing Media©

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Why do we need to get better use out of applied water to our plants? Look around at the headlines of most papers, periodicals, and news reports and what do you see? An ever increasing warning that water is becoming a major issue, not just to us in the plant industry, but to many activities of life on the planet. At the recent NGIA conference in Adelaide we were told that the once mighty Murray River will not be able to be used for Human consumption by the year 2020 unless radical and rapid changes are made. On the flight from Adelaide returning home to Sydney, major areas covered in saltpans were clearly evident along the Murray River system and surrounding lands.

In South East Queensland unseasonal weather patterns are having a major impact on growers, with no rain falling to assist applied water in plant growth and to replenish dam and other reservoir systems. One major nursery, which had traditionally pumped from the Coomera River, now has to use town water. Another nursery, whose sole source of water was the Logan River, was virtually overnight advised they could no longer use the river water. A consequence was a major loss of plants through dehydration.

Coffs Harbour, the region of next year's Australian Region IPPS conference has major water restrictions in place right now. This is an unheard-of event because this region is regarded as one of the wet zones in Australia.

With our nursery in New Zealand, we are fighting to maintain our bore allocation against a shrinking ceiling limit that the water authorities impose. Ongoing use is determined by actual use, with no consideration of seasonal variation in demand. We traditionally had a water right determined in litres whether we used the water or not.

My prediction is that usable water will become the single biggest challenge to our industry within 10 years determining the viability of the individual grower, our customers, the plants we grow, and the recreational use of plants in our communities. As Edward Bunker alluded to earlier in the conference, "change is the only constant thing in our working and professional lives".

It was once said " I love progress; it's only change I hate" (Mark Twain).

## WHY IS THIS RELEVANT?

Because change for you usually means more costs; a process of ongoing critical review and constant re-evaluation of process, systems, and resources being developed or allocated in the nursery. Naturally we like to fall into comfort zones and not always be stretched or challenged. When the need for change arises we are often confronted with fear and uncertainty.

If you as individuals and an industry are not pro-active in making the best use of the water available, you will by default become reactive to dictates from water authorities, councils, etc. I suggest we all need to look at the outcomes of research and development in both the products becoming available and the methodologies being investigated and promulgated to the industry.

You need to consider how you can get better, more accurate distribution of what water is available to just the growing media. I would suggest the days of overhead sprinklers apart from for frost protection are over. So what are some of the changes being offered to us?

In reticulation systems, drippers and sprinklers developed by the Israeli's and others have been around for many years but are only now being seriously considered in the nursery sector. These products have a significant advantage in that they accurately apply a known amount of water to an individual pot and not the surrounding surfaces. Many other water-efficient irrigation methods are also available.

Media components in our potting mixes and composts have been developed to replace our dependency on peat. Composted barks, sawdust, rice hulls, and coir are just some of the replacements now available that are commercially used. These have all varying influences in water retention, air space, wettability, weight, and structure. This media matrix is the study of many researchers and companies endeavouring to optimise either local or imported components to gain superior plant growth. The Australian Standards (1996) developed for potting mixes were a direct outcome of this need for change and provide a standard to measure, understand, and predict media behaviour to maximise reliability and plant quality.

Optimising moisture retention in potting mixes and composts is of increasing importance. This report focuses on two relatively new categories, wetting agents and water-storing crystals.

## WETTING AGENTS

In Australia, wetting agents originated in Western Australia where the soil/sand types typically repelled water and did not allow the water to penetrate into plant root zones. The first types used were liquid, subsequently a potting mix company on the east coast developed our first granular or solid wetting agent.

Do They Work? Yes! They work by first overcoming surface water repellency and allowing the applied water to get below the surface into the targeted root zone. Secondly, they optimise the uptake of water by the organic components of a potting mix such as the peat, coir, or composted bark. Peat can be very water repellent if allowed to dry out whereas coir fibre typically rewets very easily.

A wetting agent doesn't hold water in its own right, it simply optimises the uptake of water in a mix. If you top dress fertiliser on your plants and the mix or composts have become water repellent you are simply wasting your money and contributing to further environmental pollution with nutrient runoff. Keep in mind that, "where the water goes is where the nutrient goes"

A good mix is designed to rewet easily and wetting agents can certainly assist in maximising uptake in both the short and long term. Figure 1 illustrates how wetting agents improve wettability. This trial used a potting mix of Canadian peat and recycled potting mix (mainly composted pine bark with some sand) (1 : 1, v/v). It was highly water repellent with a wetting time of approximately 12 min, determined as per the Australian Standard for potting mixes.

All trialed wetting agents increased the amount of water retained by the dry mix. This clearly suggests that wetting agents are beneficial in ensuring water access into the root zone is greatly enhanced. All products were trialed at recommended rates and were nontoxic to test plants. This report will not expand on longevity of the wetting agents, that will be the subject of a future paper.

Anecdotal evidence in turf situations suggests that wetting agents will also assist in ensuring excess applied water will percolate quickly through a profile treated with wetting agents and the same is seen in potting mixes where excess water will flush and drain out better. This can be very important if salt leaching is required, where controlled release or other types of fertilisers are used.

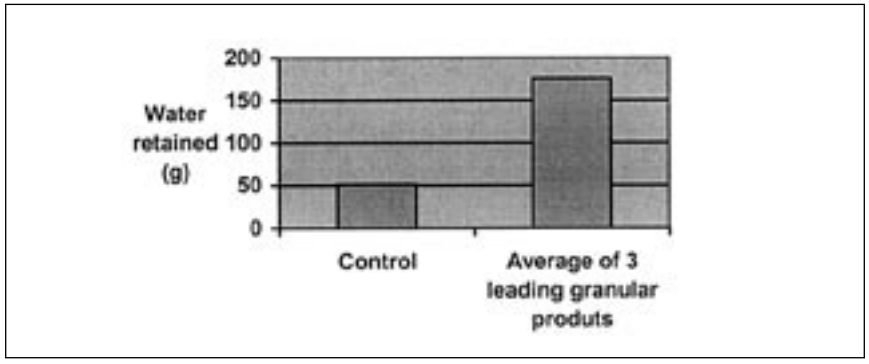


**Figure 1.** Water retained by potting mix — control as compared to the average of three commercial wetting agent treatments. Trial conducted for Hortex Australia P/L by Kevin Handreck, Adelaide (2002).

## WATER STORING CRYSTALS

The category for these products is "super absorbent polymers". The first types of product available many years ago were starch-based. These were typically developed for mining and other industrial uses. Plant growth and survival rates were not enhanced by these types. Anecdotal evidence suggests they actually stripped water back from the plants or did not release at suitable tensions for plant roots or the soils and potting mixes.

The next generation of crystals were sodium-based and these were developed for the sanitary and hygiene industries. Baby nappies/diapers, sanitary pads, etc. still use significant tonnages of this type worldwide. These were never developed for use with plants and generally have very high residual monomers, poor release rates, and are influenced in their expansion by soil pressures, water quality, and minerals present (fertilisers). Sometimes their expansion size can be detrimental to plant health and potting mix structure. Nonhorticultural companies typically offered the early types to the horticultural industry, I have reports of growers and consultants having had bad experiences with the early sodium- or starch-based products. In the sodium-based products currently available on the Australian market there is a range of issues that can affect crop outcomes and performance, however some growers and landscapers still use the latest sodium based products apparently with good results.

The third generation of crystals offered in Australia were potassium-based products. These had a distinct difference in that; their residual monomer levels were significantly lower than the sodium-based product, they were less influenced by soil pressures in their expansion, they did not expand to such a large degree and the structure of the high-tension cross-linked components were specifically designed for plants. That is not to say all potassium-based crystals in Australia are the same; they are not.

One product sold as RainSaver® has been extensively trialed over 7 years in Australia to determine efficacy in improving moisture retention, reducing plant stress through fluctuating availability of water, and extending applied water. One such trial at University of Queensland, Gatton Campus, demonstrated that in a bark-based mix the same quality table rose could be grown with half the amount of applied water using RainSaver®. This result is significant, especially when we are seeking ways to improve and extend water use for our plants.

The latest development with RainSaver® is the release of a new ammonium-based product. It has no residual monomers, is food-grade safe, completely biodegrades after approximately 5 years, and again is specifically designed for plant growth. This new type holds water within the crystal so that it doesn't "weep" into the potting mix. The water is retained for the plant only, which accesses the stored water by either sending a root through the crystal or onto the surface of the hydrated crystal. It is also designed to perform very well in saline environments, which is beneficial in revegetation schemes in degraded salt-affected soils. This new formulation also better retains soluble minerals, so there is less leaching of applied fertilisers.

Comment has recently been made that water crystals clog up a potting mix affecting air space and plant growth. This may well be true of the old types of crystals. The conundrum faced in potting mixes and composts is that air and water compete for the same space in a mix. Watering is greatly influenced by the particle size of the components within a potting mix. The air-filled porosity (AFP) determination developed for the Australian Standard was the first tool to explain this most important characteristic. The optimum AFP is of course different for various plant species.

Recent independent trials using hydrated RainSaver® were conducted to determine what influence the product has on AFP (Fig. 2) using a coir, composted bark, coal ash, and sand mix supplied by a commercial tree grower. The average from both these trials is a 31.3% improvement in AFP.

What I suggest this indicates is that the problem of trying to increase water availability without compromising airspace can be overcome.

So how can this help you in optimising moisture retention in your potting mix or compost?

First: Consider and trial using a wetting agent to improve water accessibility and uptake into the root zone and assist applied fertilisers getting to the feeder roots.

Secondly: Consider and trial using a modern water-absorbent crystal to significantly improve the retention and utilisation of both water and nutrients.

## HOW WILL THIS HELP ME WITH PROFITABILITY AND QUALITY?

On the basis of the reported trial results you should significantly reduce the amount of water required to grow an excellent plant, thereby extending what water resources are available to you. Anecdotal evidence suggests better longevity from your fertilisers will also result. These two factors combined reduce plant stress, optimise growth and quality, and can therefore directly improve your bottom line.

Shelf-life can also be extended for plants supplied to retail. A trial of 50,000 plants using RainSaver® in the mix were supplied to a major national retailer in three states by our grower. RainSaver® had a significant influence on the profitability of the plants sold. Previously a very high mark down to write off ratio of plants sold was the norm. With RainSaver® a complete sell through at full margin to the retailer and no credit requests or returns to the grower was achieved.

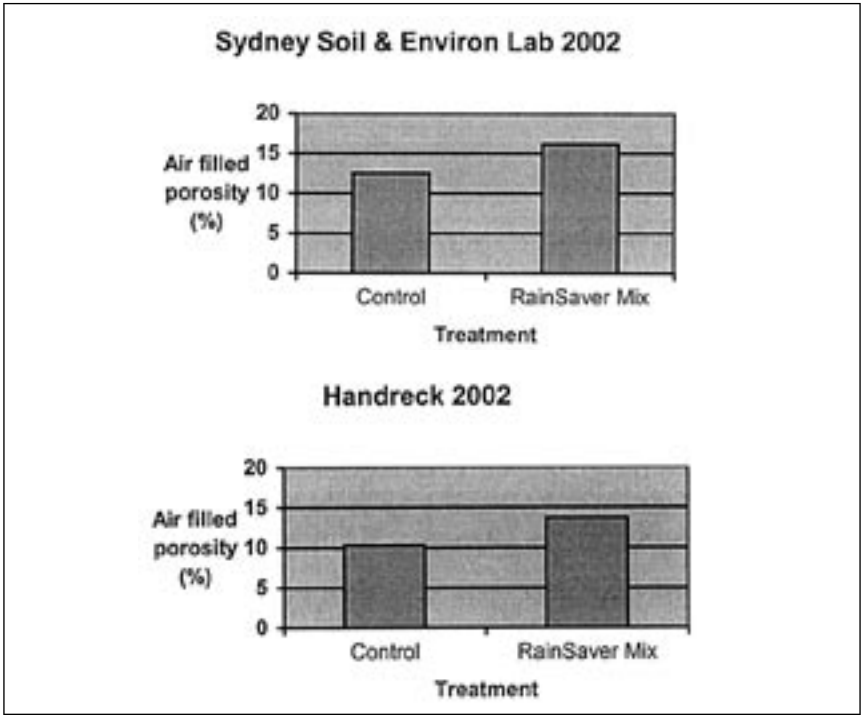


**Figure 2.** Influence of RainSaver® on air-filled porosity as tested by two independent sources.

In conclusion, I encourage you to embrace change and development. Trial the new technology and assess whether it is relevant for your situation. Take the time to determine the effect on your ongoing profitability and viability as a grower. Water is a vital and increasingly scarce resource, make sure your plants get the most out of what you apply.

## LITERATURE CITED

**Australian Standard for Potting Mixtures AS 3743.** 1996. Standards Australia. Homebush, NSW, Australia.