Hydrosmart soil microbial trial at RMIT University

Crop soil contains a healthy mix of microbes which cycle nutrients in the soil. This helps the plant. In turn, the plant provides sugars to the microbes in the soil. The trial was conducted to identify beneficial soil microbes and to see whether these are increased in abundance when Hydrosmart treatment is used relative to an untreated control.

Hydrosmart is a non-chemical water treatment widely used by Australian farmers, for irrigation maintenance, and has gained attention through conferring better garden health. Importantly, the technology is now also catching-on as a growth improver for crops. This greenhouse study establishes the baseline science of the newly developing field, finding that an electronic water treatment can improve growth outcomes for crops, by improving soil health.

Hydrosmart Director Paul Pearce explained that the technology generates an electric field through water by simply using a section of pipe wrapped with copper wires connected to a controller. Treated water is then piped onto crops. The technology was inspired by the finding that ships can communicate to submarines using low frequency fields that actually penetrate water. By employing similar frequencies, the electric fields can act on the dissolved minerals in the water.

Lettuce were selected as the trial crop, because Hydrosmart is already known to improve lettuce weight. In this trial, a specific hypothesis was tested: that that soil microbes may benefit from the Hydrosmart, and that the microbes may transduce these benefits to the lettuce. Hence the lettuce grows bigger.

Borewater of 3500 ppm, a particularly salty and hard water was used in the trial. Many farmers have a reasonable amount of this type of water available for instance at their house, but are not currently using it for cropping. In other instances entire lakes such as Lake Wellington near Perth are considered slightly too salty for cropping.

The trial at RMIT University came about when Hydrosmart spoke to The WA Department of Agriculture, about putting Wellington Dam water to use. The Department suggested a soil trial would be needed, to follow up Hydrosmart's successful hydroponics trial, and sent Paul Pearce away to get it done.

Untreated Treated Untreated Treated

Figure 1. Growth trial. Lettuce were grown at Bundoora Campus RMIT University in a purpose built greenhouse in the autumn of 2019. Irrigation was fed by untreated borewater (first and third rows from left), and Hydrosmart-treated borewater (second and fourth rows from left. The objective was to influence the lettuce in their immature stage, and the growth trial went for 6 weeks. Seedlings were obtained from local nurseries and soil from a local garden centre. The two treated lines were individually fitted with Hydrosmart (not shown). Untreated lines were kept far from Hydrosmart units to avoid fields influencing them.

Hydrosmart staff set up a scientific trial with Professor Andy Ball at RMIT, to undertake the task. Professor Andy has been testing the technology since 2011 in various aspects, some aspects he has tested himself and other aspects he has set his collaborators to work on.

The greenhouse trial described here is the most complete to date. Previous trials included showing that the technology can alter the equilibrium of carbonate and bicarbonate providing for the first time a mechanism for how Hydrosmart removes calcium scale from pipes. When previously at Flinders University, Andy also showed that Hydrosmart can affect particle size in borewater.

The biological trial presented here went one step further, away from physics and chemistry and towards the effects of Hydrosmart on living organisms. Andy who is an environmental microbiologist, reasoned that certain observed plant growth benefits were likely to be due to effects on the soil, and therefore that plant benefit was a result of soil health. He proposed to test this in a greenhouse adjacent to his lab at RMIT (Figure 1).

The results that came back were very interesting to Professor Andy. For one thing, the treatment did have an pronounced effect on sol microbiology. Beneficial soil microbes were favoured by the treatment, when seen in comparison to microbes grown with untreated water. Secondly, plants indeed grew better on this treated soil (Figure 2).

Andy now has some support for his hypothesis that Hydrosmart may partly act through the soil microbes. In fact, the particular microbes favoured by the treatment were found to be ones that degrade soil into its constituent nutrients, a circumstance that could provide the plants with a more nutritious diet than they get on untreated soil.

Paul Pearce noted that the altered nutrient balance had allowed the plants to grow better, and all just by treating the water used to irrigate them!

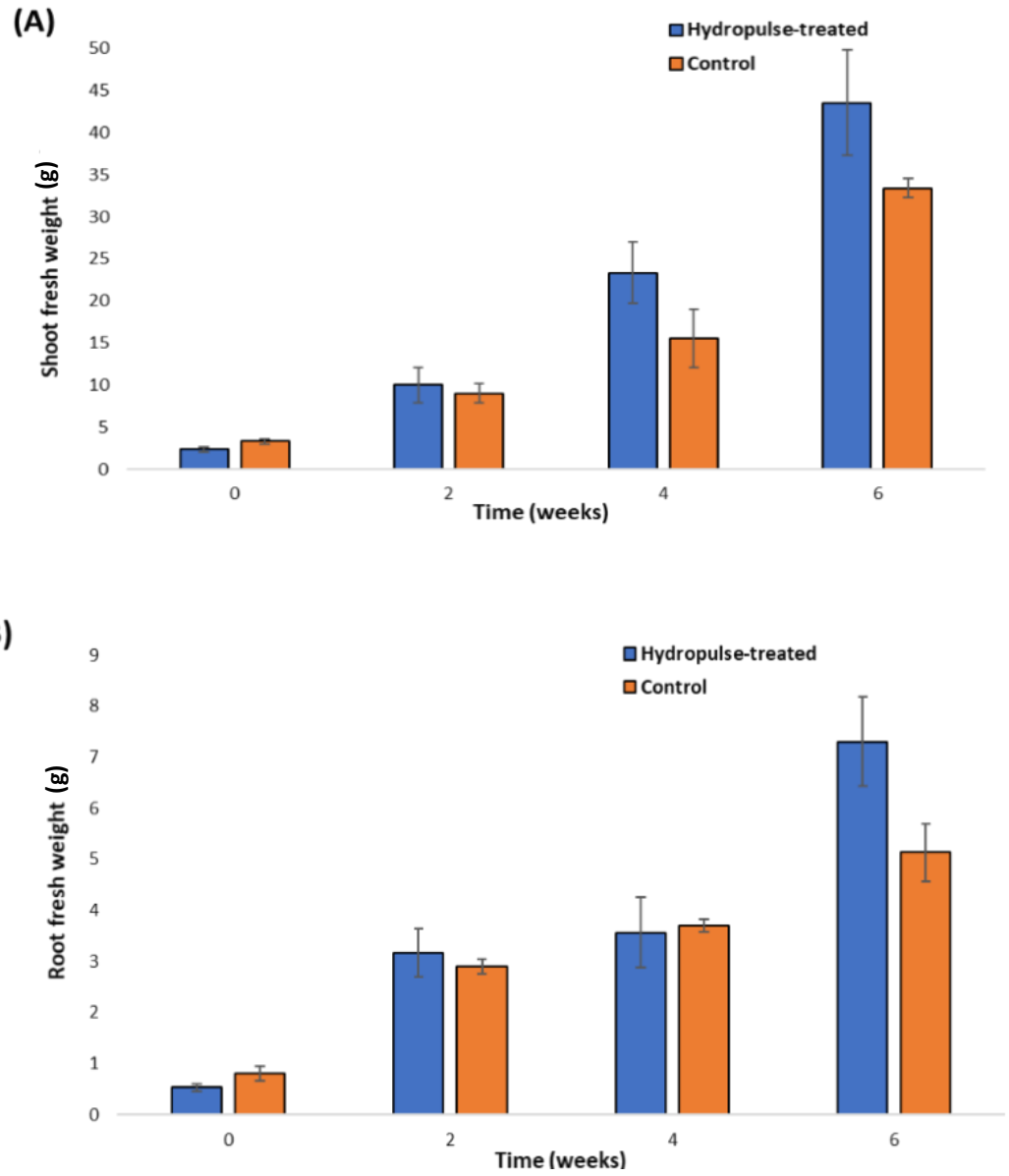

Fig 2. Lettuce weights. Shoots (A) and Roots (B) were weighed from treated and untreated plots of lettuce respectively over a 6-week period.

Planting location and the lettuce selected for measurement, were chosen using a numerically random selection method.

Measurements were made in triplicate allowing statistical analysis.

Shoot and root weight were recorded from the date of planting of the seedlings.

Both shoot weight and root weight were more than 20% greater in the treated than in the untreated lettuce.

This is in accordance with other lettuce trials done using Hydrosmart treated versus untreated water and conduced in Adelaide Hills. The finding is always consistent.

Specifics of the microbial fungi population were gathered .

The microbial population of root ball soil was analysed, and showed that beneficial microbes are favoured in soil that has been irrigated by electronically-treated bore water. Fungi favoured included *Coprinus*, *Coprinellus*, and *Phaeoisaria.*

Hard water with this range of mineral content is widely used by farmers, such as on their own backyards, if less often on their crops.

The level of mineral content in this trial would be considered extreme, and the water unuseable, so this level of mineral content represented a stringent test case for growth of edible crops.

Interest has been building strongly in the potential of electronic water treatment to increase the bottom line on cropping ventures, by facilitating the use of bore water on crops.

New installations on a variety of mainstream cropping operations are now underway, based on good results obtained in RMIT trials and in-house trials at Hydrosmart.

Trial outcomes overall support a hypothesis (or “running model”) that Hydrosmart and RMIT scientists have recently been using to explain improvements in crop growth: that microbes play a large role in the outcomes.

The RMIT greenhouse trial builds on the growth trials already conducted in-house at Hydrosmart.