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Magnetic treatment of irrigation water: Its effects on vegetable crop yield and water productivity

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ABSTRACT

This study examines whether there are any beneficial effects of magnetic treatment of different irrigation water types on water productivity and yield of snow pea, celery and pea plants. Replicated pot experiments involving magnetically treated and non-magnetically treated potable water (tap water), recycled water and saline water (500 ppm and 1000 ppm NaCl for snow peas; 1500 ppm and 3000 ppm for celery and peas) were conducted in glasshouse under controlled environmental conditions during April 2007 to December 2008 period at University of Western Sydney, Richmond Campus (Australia). A magnetic treatment device with its magnetic field in the range of 3.5–136 mT was used for the magnetic treatment of irrigation water. The analysis of the data collected during the study suggests that the effects of magnetic treatment varied with plant type and the type of irrigation water used, and there were statistically significant increases in plant yield and water productivity (kg of fresh or dry produce per kL of water used). In particular, the magnetic treatment of recycled water and 3000 ppm saline water respectively increased celery yield by 12% and 23% and water productivity by 12% and 24%. For snow peas, there were 7.8%, 5.9% and 6.0% increases in pod yield with magnetically treated potable water, recycled water and 1000 ppm saline water, respectively. The water productivity of snow peas increased by 12%, 7.5% and 13% respectively for magnetically treated potable water, recycled water and 1000 ppm saline water. On the other hand, there was no beneficial effect of magnetically treated irrigation water on the yield and water productivity of peas. There was also non-significant effect of magnetic treatment of water on the total water used by any of the three types of vegetable plants tested in this study. As to soil properties after plant harvest, the use of magnetically treated irrigation water reduced soil pH but increased soil EC and available P in celery and snow pea. Overall, the results indicate some beneficial effect of magnetically treated irrigation water, particularly for saline water and recycled water, on the yield and water productivity of celery and snow pea plants under controlled environmental conditions. While the findings of this glasshouse study are interesting, the potential of the magnetic treatment of irrigation water for crop production needs to be further tested under field conditions to demonstrate clearly its beneficial effects on the yield and water productivity.

1. Introduction

Long spell of drought and competing water demands in most parts of Australia have put enormous pressure on water resources. Steps need to be taken to conserve both the quantity and quality of water and appropriate strategies will have to be developed to avoid risk to future water supplies. The main efficiency gains must come from the dominant user, irrigation, accounting for over 70% of the total water use in Australia (ANRA, 2008).

One of the ways by which we can reduce the total water used for irrigation is to employ practices that improve crop yield per unit volume of water used (i.e., water productivity). There have been some claims made that the magnetic treatment of irrigation water can improve water productivity (Duarte Diaz et al., 1997). If those claims are valid, there is scope for magnetic treatment of water to save water supplies and assist in coping with the future water scarcity.

There is hardly any study reported, with valid scientific experiments, on the effects of magnetic treatment of water on crop yield and water productivity. However, some closely related studies have reported on some beneficial effects of magnetic field in a number of other farming situations. For example, Lin and

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