iWaresa 2018

| 11-15 June | Murcia | 1st Edition |

Early Registration

IWA Regional Conference of Water Reuse and Salinity Management
IWA REGIONAL CONFERENCE OF WATER REUSE AND SALINITY MANAGEMENT

CONFERENCE PROGRAMME 11-15 JUNE
Conference venue - Occidental Murcia Siete Coronas Hotel

SPONSORS
El futuro del agua, a debate

La capital murciana recibe desde hoy a más de 150 expertos de 15 países que hablarán sobre cómo aprovechar los recursos hídricos

R. D. C. | 11.06.2018 | 08:12

El consejero Del Amor inaugura el evento IWARESA 2018

Más de 150 investigadores, procedentes de 15 países, debatirán desde hoy sobre el futuro del agua y las innovaciones en reutilización y control de la salinidad dentro de la Conferencia Regional de IWA (IWARESA 2018), organizada por primera vez en Murcia gracias al Centro de Edafología y Biología Aplicada del Segura (CEBAS-CSIC). Hasta el próximo viernes, los asistentes a IWARESA 2018 abordarán, a través de cerca de cien comunicaciones, el problema de la escasez de agua inducida por el cambio climático en áreas áridas y semiáridas, el uso de fuentes de agua no convencionales en la agricultura y el riesgo de salinización de tierras agrícolas y
Dear Colleagues,

It is our privilege to announce that CEBAS-CSIC will be hosting The IWA Regional Conference on Water Reuse and Salinity Management (IWARESA) on June 11-15, 2018 in Murcia, Spain. The Conference will feature highly respected speakers who will share, discuss and debate significant new developments and scientific advancements that will impact the problem of water scarcity induced by climate change in arid and semiarid areas, the use of non-conventional water sources in agriculture and the risk of agricultural land and groundwater salinization in areas where aquifers are significantly depleted.

IWARESA will provide the benefit of learning about advancements in water reuse and salinity management in Murcia Region, a typical Mediterranean area where the salt and water stresses are the main limiting factors for a very productive and technical agriculture. The Conference will bring together researchers, engineers, environmentalists, policy makers and water practitioners from academia, industry, water utilities, public authorities and administration, to exchange experience and know how.

The Region of Murcia, located in the extreme western Mediterranean (Southeast Spain) has a dry climate (average rainfall 300 mm) and a population of 1.5 million people. Weather conditions and hundreds of years of expertise in irrigation techniques have made this Region a prime fruit and vegetable producer. The strategic location of Murcia in the EU has contributed to making fruit and vegetable exports one of the main economic pillars of this Region with the tourism.

On behalf of the Organizing Committee of IWARESA, we look forward to welcoming all to Murcia, one example of integrated water resources managements under semi-arid climate and a forerunner in the additional treatment and use of non-conventional water resources.

JUAN JOSÉ ALARCÓN CABAÑERO, PHD
DIRECTOR CEBAS-CSIC
CONFERENCE CHAIRMAN

FRANCISCO PEDRERO SALCEDO, PHD
RESEARCHER IRRIGATION DEPARTMENT CEBAS-CSIC
CONFERENCE TECHNICAL DIRECTOR
Moving water reuse forward as a safe and sustainable water supply – Jörg E. Drewes

Dear Colleagues and Friends,

On behalf of the IWA Water Reuse Specialist Group Management Committee and the local organizing committee, it is my great pleasure to welcome you all to the IWA Regional Conference of Water Reuse and Salinity Management in the gorgeous city of Murcia.

With the European Commission’s intent in moving forward the water reuse agenda in Europe by publishing a first draft of regulations for minimum requirements for water reuse and in particular on agricultural irrigation in May of 2018, this conference is not only very timely but it is also bringing together the leading experts from the region and the international reuse community to share the latest knowledge and advances in the field of agricultural reuse and salinity management. Water reuse has been identified as a corner stone of Europe’s Circular Economy and Spain is leading the charge in Europe regarding a large variety of reuse applications for many decades now. With impacts from climate change, there is a pressing need to explore alternative water resources options, not just in Southern Europe but also in other parts of Europe that suffer from seasonal water shortage and uncertain availability of conventional supplies. These developments underscore the growing interest in water reuse as a viable resource for future water supply.

This conference will provide ample opportunities to learn from case studies and long-term experiences in the leading region of practicing agricultural water reuse in Europe. The conference program includes technical aspects but also socio-economic elements as well as environmental concerns to establish safe and sustainable reuse practices. You will have an opportunity to learn about the latest national and international developments and trends in embracing and further growing water reclamation and reuse for agricultural irrigation and proper strategies for salinity management.

Water reuse has come a long way in the last couple of decades – also since the first IWA organized international symposium in Gerona, Spain in 1991. While water scarcity continues to be a key driver for water reuse in many regions of the world that lack sufficient freshwater supplies, climate change impacts, rising energy prices, the need to mitigate greenhouse gas emissions, requirements for environmental restoration, the paradigm shift to resource recovery, or achieving the targets of the 2030 Sustainable Development Goals are other key factors that have resulted in adopting water reuse as an increasingly important component of sustainable water resource management worldwide. This leading regional conference in the field of agricultural water reuse will feature many of these innovative projects and approaches in water reuse in the years to come.

Finally, I’d like to congratulate the organizing committee and in particular Prof. Juan José Alarcón Cabañero for putting together an exciting and well-rounded program for this conference. Enjoy the conference and networking with colleagues and friends!

Jörg E. Drewes
Chair, IWA Water Reuse Specialist Group

Committees

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Francisco Alcón, Technical University of Cartagena (Spain)
KEYNOTE SPEAKERS

RAFAEL MUJIEREGO
TECHNICAL UNIVERSITY OF CATALUÑA, ASERSA (SPAIN)
KEYNOTE TOPIC – WATER REUSE IN PERSPECTIVE: PROGRESS MADE AND CURRENT CHALLENGES

Pedro Simón is an Industrial Engineer, with around 30 years of professional experience in water sector. 7 years working in a private company (AUGA Gest) becoming Regional Operations Director in Valencia Community. Afterwards he was working as CEO in a regional public Company (EPSCAR) that manages the wastewater treatment system in Valencia Community (4,5 million of inhabitants and 450 WWTPs) and since 2002 he is working as technical director in ESAMUR, regional public company that manages the wastewater treatment system in Murcia Community (1.5 million of inhabitants and 93 WWTPs).

PEDRO SIMÓN
ESAMUR (SPAIN)
KEYNOTE TOPIC – THE REGION OF MURCIA EXPERIENCE IN THE USE OF RECLAIMED WATER

GONZALO DELACÁMARA
IMDEA-WATER (SPAIN)
KEYNOTE TOPIC – ECONOMIC ANALYSIS OF RECLAIMED WASTEWATER REUSE – PRICING LONG-TERM WATER SECURITY

Dr. Huub H.M. Rijnarts, since 2009 Professor in Environment and Water Technology, at Wageningen University. From 2009 to 2018 involved on different scientific tasks (Chairman Sub-department of Environment Technology Wageningen University, 2009; Director of Research School WIMEK, Wageningen University, 2012; Chairman Board Graduate School Sense, 2013-2018; Member of Board of AMS, Amsterdam Institute of Advanced Metropolitan Solutions, 2015). He is the Scientific Coordinator of WATER NEXUS, Research Program on Integrated solutions for water security for industry and agriculture in fresh water scarce delta regions. He has 500 peer reviewed scientific articles, 47 book chapters and 46 patents.

HUUB H.M. RIJNARTS
WAGENINGEN UNIVERSITY & RESEARCH, WATER NEXUS (NETHERLANDS)
KEYNOTE TOPIC – ADVANCED PHYSICO-CHEMICAL, BIOLOGICAL AND NATURE BASED TECHNOLOGIES TO RECLAIM WATER FOR INDUSTRIAL AND AGRICULTURAL RE-USE

JOSÉ MARÍA GARCÍA-MINA
UNIVERSITY OF NAVARRA, TIMAC AGRO (SPAIN)
KEYNOTE TOPIC – HUMIC SUBSTANCES: A VALUABLE AGRONOMIC TOOL TO IMPROVING CROP ADAPTATION TO SALINE WATER IRRIGATION

José María García-Mina is a full professor of Agricultural Chemistry at the University of Navarra and director of the Chair TIMAC AGRO (CAM Reusit) University of Navarra. Member of the International Board of the (BACH) group of the Environmental Biology Department of the Sciences School of the University of Navarra. Deputy Director of the Research and Development Division of Roullier Group for the last 18 years and currently member of the Scientific Board of Roullier Group. Author or co-author of 136 JCR scientific articles, 47 book chapters and 46 patents.

VALENTINA LAZAROVA
SUZ (FRANCE)
KEYNOTE TOPIC – ROADMAP ON DEVELOPMENT AND TECHNOLOGY INNOVATION IN WATER REUSE

Dr. Lazaro is an international expert with over 35 years of research and practical experience in the field of Civil, Sanitary and Environmental Engineering, in particular wastewater treatment and reuse. Her career started as designer and project manager of wastewater treatment plants, followed by academic interdisciplinary research experience as project coordinator and manager, and culminating as technical expert and advisor for full-scale operations, new business offers and policy development. Her main activities during the last years included ISO water reuse standard development, feasibility studies, technical assistance to plant designers and operators, master plans development, optimisation of capital investment and operation costs of wastewater and reclamation facilities, odour control and water reuse (France, French Polynesia, Australia, Middle East, Latin America, South and North Africa, Asia, the UK and the USA). Dr Lazaro has 7 patents and published over 300 scientific and peer-reviewed publications, as well as co-edited and contributed to 14 books on wastewater treatment and reuse. During her carrier, she consistently demonstrates high performance on projects, meeting or exceeding client expectations. Dr. Lazaro is the former Chair of the IWA Water Reuse Specialist Group and member of the International Water Academy and the International Desalination Academy. For her outstanding achievements, she received the distinguished French awards of CNRS Innovation Medal and the Legion of Honour in 2014.

STEVE GRATTON
UNIVERSITY OF DAVIS (USA)
KEYNOTE TOPIC – RE-EXAMINATION OF WATER QUALITY CRITERIA FOR ASSESSING WASTEWATER SUITABILITY FOR IRRIGATION

Dr. Gratton received his Ph.D. at the University of California, Riverside in 1984 and has since been on the faculty in the Department of Land, Air and Water Resources (LAWR) at the University of California, Davis. His research has focused on the reuse of saline wastewater for irrigation, water management strategies using saline/halodc water, crop response in saline-avoiding environments and the plateau of nutrients and specific ions by plants. Over the years he has received several honors and awards including, Sigma Xi, Gamma Sigma Delta, the Alumni Award of Merit, Outstanding Teamwork Distinguished Service Award, Fulbright Senior Specialist, Special Honorary Award by the Indian Soil Science Society and the Western Extension’s Director’s Award of Excellence. He has consulted for the World Bank, USAID, FAO-United Nations and has given numerous invited lectures sponsored by host countries/Universities in Argentina, Australia, China, Egypt, Greece, India, Israel, Italy, Jordan, Portugal, Spain, Thailand and the USA. He has over 115 peer-reviewed publications in journals, books, and special University of California publications on subjects related to salt-tolerance, crop response to saline/sodic conditions, reuse of drainage water, salt-stress physiology, and irrigation water management.

AKISSA BAHRI
AFRICAN WATER UTILITY TUNISIA (TUNISIA)
KEYNOTE TOPIC – CHALLENGES AND OPPORTUNITIES OF AGRICULTURAL WATER REUSE IN WATER-SCARCE AND SALT-AFFECTED ENVIRONMENTS

Akiessa Bahri is a professor at the National Agricultural Institute of Tunisia who has worked in the fields of water resources management and water reuse in various capacities such as Coordinator of the AWF, Director for Africa at INRAE, and as Director of Research of INRAE at INREDES in Tunisia. She manages the Institute of Water Resources Engineering from Lund University, Sweden. She is a member of different international scientific committees and has received international honors.
THE USE OF RECLAIMED WATER IS A VIABLE AND SAFE STRATEGY FOR THE IRRIGATION OF MYRTLE PLANTS IN A SCENARIO OF CLIMATE CHANGE

ABSTRACT

Regions with a Mediterranean climate suffer a permanent scarcity of conventional water resources. This situation leads us to consider the use of the reclaimed water (RW), as alternative water resource which is one current promising solution because it might include several plant nutrients with the possibility of decreasing the use external mineral fertilizers. In addition, its use carries on a reduction in the contribution of pollutants to natural water courses, particularly when the treated water is used for landscaping. However, reclaimed water may contain high salt concentrations and municipal wastewater treatment plants located near the Mediterranean coast tend to produce wastewater with a high electrical conductivity. With these premises, myrtle plants, an important ornamental shrub Mediterranean, were irrigated with two types of reclaimed waters, during ninety days and applying drainage. The irrigation treatments consisted in a Control (0.8 dS m⁻¹) and two reclaimed water: RW1 (2.0 dS m⁻¹) and RW2 (5.0 dS m⁻¹). Morphological, nutritional and physiological parameters were evaluated. From a morphological point of view, RW treatments provoked a loss of their leaf biomass without affecting their stems and roots, which is visually reflected in more compact plants. These morphological changes do not affect the survival of the myrtle plants because any plant treated with RW died at the end of the experiment. All the nutrients analysed were concentrated in greater proportion in shoot than in the roots in all treatments studied. In addition, the nutrients increased their concentration in the treatments with RW except for potassium. The greater solutes concentration in the treatments with RW produced a progressive decrease in the values of the root water potential which hindered the mobility of water to the leaves causing a drop in leaf water potential although more pronounced in the RW2 treatment. This fact induced a reduction of the stomatal opening (gs) which suppose decreases in photosynthesis (Pn) and therefore in the fixation of CO₂ which was more evident in the RW2 treatment. Even so, analysing the efficiency in the use of water (WUE) as the ratio Pn/gs, no differences were observed between all the treatments, so plants treated with RW are equally efficient as the control treatment. Taking together, it is feasible to use reclaimed water for myrtle plant irrigation despite its high electrical conductivity, as an alternative to the scarcity of conventional water resources in a future scenario of climate change.

José Ramón Acosta Matosas, María Fernanda Ortuño, Sara Álvarez, María Jesús Sánchez-Blanco, José Antonio Hernández Cortés

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LESSTON LEARNT FROM USING AN EVAPOTRANSPIRATION CALCULATION TOOL FOR SCHEDULING IRRIGATION OF OPEN FIELD VEGETABLE CROPS

ABSTRACT

A novel evapotranspiration modelling tool for irrigation (Riego-Asesor) is evaluated under field conditions in three vegetable crops; lettuce “Little gem” (LLG), potato (P), and lettuce “Romaine” (LR). Each trial included two treatments, i) Farmer treatment, where the amount of irrigation water is defined by the farmer, and ii) Riego-Asesor treatment, where the amount of irrigation water supply to the crop is defined by the evapotranspiration calculation tool. Both treatments, Farmer and Riego-Asesor, have the same irrigation frequency and since the amount of fertilizer in the irrigation water cannot be managed, the rate of fertilization is in proportion to the amount of irrigation water applied. The total amount of water applied in the Riego-Asesor treatment in relation to the Farmer treatment was 8.3% lower in LLG, 12% lower in P, and 31% higher in LR. Yield in the Riego-Asesor treatment regard to the Farmer treatment was 27% lower in LLG (shock fresh weight), 8% lower in potato (kg of potato per m²), and 8% higher in LR (shock fresh weight). The amount of irrigation water supply for the Riego-Asesor tool was acceptable in all crops in terms of yield, showing the usefulness of this tool for the irrigation management in all the vegetable crops tested. However, for regions where the water cost is high, the water supplies are unpredictable, and the water quality (NaCl concentration) is variable depending of the water origin, irrigation tools based on the calculation of evapotranspiration need additional adjustments. Here we describes some of the lessons learned from contrasting a tool for irrigation with the experience of the farmer: 1) salinity (or EC) in the irrigation water must be evaluated periodically for an adequate adjustment of the leaching fraction; 2) water scarcity rules irrigation management; 3) irrigation management for yield increasing purposes should be aimed to meet commercial demand and not only to increase biomass; 4) field base observations, e.g. rapid changes in climatic conditions should be better considered by the irrigation tool. Riego-Asesor has proven to be a useful instrument for irrigation in vegetable crops; it can discriminate between the evaporation and transpiration compounds of evapotranspiration, and be adapted to a wide range of crop culture techniques. Further work is required to fine-tuning Riego-Asesor to help farmers to deal with different situations in the field optimizing the use of irrigation water while obtaining profitable returns.


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The use of reclaimed water is a viable and safe strategy for the irrigation of myrtle plants in a scenario of climate change.

Water in the world

Water is fundamental for life, environment, wealth and employment but also has caused disputes and wars between peoples.

The increase in the world population (9000 millions for 2050) and the future scenario of climate change leads to a greater demand for good quality water resources including the use of reclaimed water.

Extreme environmental conditions associated with climate change

Source: U.S. Census Bureau, International Data Base, July 2007 version.
The importance of the use of reclaimed water in the Region of Murcia

The Region of Murcia, given the scarcity of water, has developed different strategies for obtaining and optimizing water resources.

There is a firm commitment to the use of reclaimed water and a lot of wastewater treatment plant (WWTP) has been put in place in the last decade.

| VOLUME OF WATER TREATED AND NUMBER OF WWTP CONTROLLED BY ESAMUR |
|--------------------|--------|--------|--------|--------|--------|--------|--------|
| Volume of water treated (hm³) | 96.1   | 105.7  | 102.5  | 110.9  | 110.8  | 104.3  | 105    |
| Nº of WWTP           | 71     | 80     | 83     | 97     | 90     | 90     | 93     |

105 hm³ per year is the amount of water treated in WWTPs under the control of ESAMUR in 2015

93 WWTP under the control of ESAMUR in 2015
Advantages of using reclaimed water

1.- Unconventional water resources in arid and semi-arid regions where the fresh water is very limited.

2.- Its high nutrient load means a saving of fertilizers applied to crops.

3.- Problems associated to vegetable or fruit crops are not so important to ornamental plant.
Disadvantages of using reclaimed water

1. High concentrations of salts (mainly $\text{Na}^+$ and $\text{Cl}^-$).

2. High concentrations of boron.

3. Presence of a certain amount of heavy metals.

4. Pathogenic organisms: protozoa, helminths, bacteria and virus

*Escherichia coli*
*Salmonella typhi*
*Vibrio cholerae*
Plant material

*Myrtus communis* L. (Myrtle)

- Species of the Myrtaceae family.
- Frequently used in landscaping and xeriscape projects.
- Adapted to Mediterranean environments.
- Salt-tolerant plant.
Experimental Conditions

Origin of water

<table>
<thead>
<tr>
<th>Irrigation treatments with drainage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water</td>
</tr>
<tr>
<td>Control, drainage = 10%</td>
</tr>
<tr>
<td>WWTP from Jumilla</td>
</tr>
<tr>
<td>RW1, drainage = 25%</td>
</tr>
<tr>
<td>WWTP from Campotéjar</td>
</tr>
<tr>
<td>RW2, drainage = 45%</td>
</tr>
</tbody>
</table>

Duration of Experiment

<table>
<thead>
<tr>
<th>Watering frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Moths (90 days)</td>
</tr>
<tr>
<td>3 Times per week</td>
</tr>
</tbody>
</table>

Chemical analyses of the water used in the different treatments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control</th>
<th>RW1</th>
<th>RW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC (dS m⁻¹)</td>
<td>0.80</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>pH (- log [H⁺])</td>
<td>7.75</td>
<td>8.02</td>
<td>8.11</td>
</tr>
<tr>
<td>Na⁺ (mmol l⁻¹)</td>
<td>2.03</td>
<td>7.46</td>
<td>23.11</td>
</tr>
<tr>
<td>Cl⁻ (mmol l⁻¹)</td>
<td>1.88</td>
<td>6.62</td>
<td>22.55</td>
</tr>
<tr>
<td>Ca²⁺ (mmol l⁻¹)</td>
<td>1.72</td>
<td>3.55</td>
<td>5.37</td>
</tr>
<tr>
<td>B³⁺ (mmol l⁻¹)</td>
<td>0.01</td>
<td>0.03</td>
<td>0.10</td>
</tr>
<tr>
<td>K⁺ (mmol l⁻¹)</td>
<td>0.45</td>
<td>0.38</td>
<td>1.36</td>
</tr>
<tr>
<td>Mg²⁺ (mmol l⁻¹)</td>
<td>1.45</td>
<td>2.73</td>
<td>5.61</td>
</tr>
<tr>
<td>P (mmol l⁻¹)</td>
<td>&lt;0.003</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>S (mmol l⁻¹)</td>
<td>2.74</td>
<td>5.06</td>
<td>13.22</td>
</tr>
</tbody>
</table>

Controlled growth chamber

- Photoperiod (16/8 hours)
- Temperature (23°C/18°C)
- Light intensity (350 μmol m⁻² s⁻¹)
- Relative Humidity (55%/70%)

30 plants per treatment

Measurements

- Water analyses: ICP-OES IRIS INTRPID II XDL.
- Mineral content in shoots and roots: ICP-OES IRIS INTRPID II XDL at the end of the experiment.
- Dry weight, leaf area and leaf number at the end of the experiment
- Plant water status: Root water potential using the next formula: \( \Psi_r = \Psi_{RW} - (\Psi_C \times g_{SRW}) / g_{SC} \), and leaf water potential using pressure chamber.
- Gas Exchange: Net photosynthesis and stomatal conductance in leaf using LICOR LI-6400,
Morphological parameters studied

- Leaf weight ratio (LWR) = Total leaf dry weight / Total leaf area
- Inverse of leaf area ratio (1/LAR) = Total dry weight (shoot + root) / total leaf area

RW1 plants had a better growth of the aerial part showing the highest values in number of leaves, total leaf area and total leaf dry weight.

RW2 plants had a worse growth of the aerial part which improves the development of the root showing the highest values in the LWR, in the inverse of the LAR and total dry weight.

These morphological changes, when reclaimed waters are used, do not affect the quality ornamental of the myrtle plants. The plants are more compact and the color of the leaves is more attractive.

Also, they do not affect survival because any plant treated with RW (RW1 and RW2) died at the end of the experiment.
Myrtle plants avoided the arrival of the phytotoxic ions (Na\(^+\) and Cl\(^-\)) to the shoot, restricting the build-up of toxic concentrations in leaves. Despite this avoidance mechanism, the arrival for the Cl\(^-\) is more marked.

All nutrients analyzed increased their concentration in shoot in the treatments with RW except for potassium (RW1 and RW2) and phosphorus (only RW2).

### Shoot and root mineral content

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Shoot (mmol/Kg DW)</th>
<th>Root (mmol/Kg DW)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Na(^+)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>200.91 B/b</td>
<td>358.99 AB/a</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW1</td>
<td>239.12 AB/a</td>
<td>288.37 B/a</td>
<td>&gt;0.05 n.s</td>
</tr>
<tr>
<td>RW2</td>
<td>453.73 A/a</td>
<td>458.26 A/a</td>
<td>&gt;0.05 n.s</td>
</tr>
<tr>
<td></td>
<td>&lt;0.05*</td>
<td>&lt;0.05*</td>
<td></td>
</tr>
<tr>
<td><strong>Cl(^-)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>343.66 B/a</td>
<td>200.94 B/b</td>
<td>&lt;0.05*</td>
</tr>
<tr>
<td>RW1</td>
<td>405.63 B/a</td>
<td>255.40 B/a</td>
<td>&lt;0.01**</td>
</tr>
<tr>
<td>RW2</td>
<td>668.54 A/a</td>
<td>398.12 A/a</td>
<td>&lt;0.05*</td>
</tr>
<tr>
<td></td>
<td>&lt;0.01***</td>
<td>&lt;0.001***</td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>36.15 B/a</td>
<td>15.68 B/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW1</td>
<td>74.16 A/a</td>
<td>33.96 A/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW2</td>
<td>77.84 A/a</td>
<td>37.83 A/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td></td>
<td>&lt;0.001***</td>
<td>&lt;0.001***</td>
<td></td>
</tr>
<tr>
<td><strong>Ca</strong></td>
<td></td>
<td></td>
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<tr>
<td>Control</td>
<td>321.05 B/a</td>
<td>158.54 B/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW1</td>
<td>351.14 B/a</td>
<td>147.30 A/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW2</td>
<td>411.79 A/a</td>
<td>186.39 A/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td></td>
<td>&lt;0.05*</td>
<td>&lt;0.05*</td>
<td></td>
</tr>
<tr>
<td><strong>K</strong></td>
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<tr>
<td>Control</td>
<td>775.36 A/a</td>
<td>246.15 A/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW1</td>
<td>726.62 AB/b</td>
<td>208.34 A/b/c</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW2</td>
<td>664.68 B/a</td>
<td>151.06 B/a/c</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td></td>
<td>&lt;0.05*</td>
<td>&lt;0.05*</td>
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<tr>
<td><strong>Mg</strong></td>
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<tr>
<td>Control</td>
<td>198.68 B/a</td>
<td>76.70 C/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW1</td>
<td>271.65 A/a</td>
<td>91.72 B/b</td>
<td>&lt;0.001***</td>
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<tr>
<td>RW2</td>
<td>289.13 A/a</td>
<td>107.19 A/b</td>
<td>&lt;0.001***</td>
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<tr>
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<td>&lt;0.01**</td>
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<tr>
<td><strong>S</strong></td>
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<tr>
<td>Control</td>
<td>163.31 B/a</td>
<td>86.90 A/b</td>
<td>&lt;0.001***</td>
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<tr>
<td>RW1</td>
<td>221.59 A/a</td>
<td>92.78 A/b</td>
<td>&lt;0.001***</td>
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<tr>
<td>RW2</td>
<td>224.01 A/a</td>
<td>92.59 A/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
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<td>&lt;0.01**</td>
<td>&gt;0.05 n.s</td>
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<tr>
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<td>1.00 B/b</td>
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<td>1.18 A/b</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>RW2</td>
<td>2.86 A/a</td>
<td>1.22 A/b</td>
<td>&lt;0.01**</td>
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<tr>
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<td>&lt;0.05*</td>
<td>&lt;0.05*</td>
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<tr>
<td><strong>P</strong></td>
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<tr>
<td>Control</td>
<td>152.58 A/a</td>
<td>75.41 A/b</td>
<td>&lt;0.001***</td>
</tr>
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<td>152.49 A/a</td>
<td>61.75 A/b</td>
<td>&lt;0.01**</td>
</tr>
<tr>
<td>RW2</td>
<td>84.82 B/a</td>
<td>52.16 B/b</td>
<td>&lt;0.05*</td>
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<tr>
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<td>&lt;0.05*</td>
<td>&lt;0.05*</td>
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</table>
The greater solutes concentration in RWs produced a decrease in RWP which hindered the mobility of water to the leaves causing a drop in LWP (specially in RW2 treatment).

Also, to avoid a loss of water by the leaf, there was a reduction of the stomatal opening (g_s) which suppose decreases in photosynthesis (P_n) and therefore in the fixation of CO₂ (specially in RW2 treatment).

The water use efficiency (WUE) expressed as the ratio P_n/g_s, was the same in all the treatments. Therefore the plants treated with RW (RW1 and RW2) are equally efficient that control treatment.
Conclusion

Under our experimental conditions, it is feasible to use reclaimed water for myrtle plant irrigation as an alternative to the scarce conventional water resources in a future scenario of climate change despite its high electrical conductivity.
Thank you very much for your attention

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