

Supplementary Material

Potential of produced water from oil and gas operations for irrigation in the rooting phase of *Eucalyptus* spp. mini-cuttings

Supplementary Table S1. Daily monitoring of pH, electrical conductivity (EC), and temperature of the two irrigation water sources throughout the 25-day rooting period.

Day	PW			USW		
	pH	EC (dS m ⁻¹)	Temp (°C)	pH	EC (dS m ⁻¹)	Temp (°C)
1	7.89	0.57	28.8	8.36	0.49	28.8
2	7.93	0.54	28.5	8.39	0.48	28.5
3	7.93	0.57	28.9	8.37	0.49	28.9
4	7.91	0.53	29	8.37	0.5	29
5	7.88	0.53	28.8	8.38	0.51	28.8
6	7.91	0.54	28.5	8.38	0.5	28.5
7	7.95	0.56	28.6	8.38	0.5	28.6
8	7.92	0.54	29.5	8.39	0.5	29.5
9	7.94	0.55	29.4	8.37	0.5	29.4
10	7.97	0.55	29.3	8.39	0.49	29.3
11	8.01	0.54	29.5	8.39	0.51	29.5
12	7.99	0.54	29.4	8.39	0.51	29.4
13	7.92	0.54	28.8	8.39	0.51	28.8
14	7.9	0.53	28.8	8.39	0.5	28.8
15	7.9	0.56	28.5	8.4	0.51	28.5
16	7.91	0.54	28.9	8.39	0.5	28.9
17	7.91	0.54	28.8	8.39	0.5	28.8
18	7.91	0.57	28.7	8.37	0.51	28.5
19	7.9	0.57	28.9	8.37	0.5	28.9
20	7.91	0.55	29	8.37	0.5	29
21	7.94	0.55	28.8	8.37	0.49	28.8
22	7.94	0.54	28.5	8.36	0.5	28.5
23	7.93	0.54	28.6	8.37	0.5	28.6
24	7.95	0.54	29.5	8.37	0.5	29.5
25	7.94	0.54	29.4	8.37	0.5	29.4
Mean	7.93	0.55	28.94	8.38	0.50	28.93
SD	0.03	0.01	0.35	0.01	0.01	0.36
Min	7.88	0.53	28.5	8.36	0.48	28.5
Max	8.01	0.57	29.5	8.4	0.51	29.5

Notes: PW: treated produced water; UWS: urban water supply; EC: electrical conductivity; SD: standard deviation. The pH, EC, and water temperature were measured daily using calibrated portable meters at the time of each irrigation assessment. Both water sources were stored in 2,000 L containers placed close to each other, which accounts for the similar water temperature values recorded across irrigation sources. No significant variation was observed in any parameter throughout the experimental period, supporting the representativeness of the initial physicochemical characterization (Table 1) for the full 25-day study duration. Daily monitoring records are provided here as supplementary evidence of hydrochemical stability.

Table S4. Mean values ($\pm$ standard error, $n = 5$) of morphological and biomass traits of *Eucalyptus* spp. mini-cuttings for five hybrid clones irrigated with treated produced water (PW) or urban water supply (UWS). Letters compare clones within each water source independently, with "a" assigned to the clone with the highest mean; letters in the PW column are independent from those in the UWS column. Comparisons follow Tukey's HSD test ($p \leq 0.05$). "ns" indicates no significant difference among clones within that water source.

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Traits	Clone 13		Clone 14		Clone 30		Clone 104		Clone 106	
	PW $\pm$ SE	UWS $\pm$ SE	PW $\pm$ SE	UWS $\pm$ SE	PW $\pm$ SE	UWS $\pm$ SE	PW $\pm$ SE	UWS $\pm$ SE	PW $\pm$ SE	UWS $\pm$ SE
Stem diameter (mm)	1.558 $\pm$ 0.023 a	1.166 $\pm$ 0.051 a	1.235 $\pm$ 0.066 b	0.815 $\pm$ 0.033 b	1.218 $\pm$ 0.073 b	1.196 $\pm$ 0.038 a	0.977 $\pm$ 0.074 c	1.231 $\pm$ 0.020 a	1.301 $\pm$ 0.022 b	1.175 $\pm$ 0.053 a
Rooting (%)	78.5 $\pm$ 1.69 ab	84.2 $\pm$ 3.37 ab	84.2 $\pm$ 6.01 ab	81.8 $\pm$ 2.87 ab	67.0 $\pm$ 4.40 b	94.2 $\pm$ 1.69 a	91.8 $\pm$ 3.02 a	68.5 $\pm$ 4.56 b	92.2 $\pm$ 2.00 a	79.4 $\pm$ 1.77 ab
Num. of roots (unit.)	4.29 $\pm$ 0.40 a	9.78 $\pm$ 4.57 bc	4.04 $\pm$ 0.35 a	3.00 $\pm$ 0.18 ab	2.64 $\pm$ 0.34 b	2.98 $\pm$ 0.10 a	3.42 $\pm$ 0.20 ab	2.29 $\pm$ 0.22 b	3.35 $\pm$ 0.05 ab	3.24 $\pm$ 0.19 ab
Longest root (cm)	8.762 $\pm$ 0.422 a	9.991 $\pm$ 0.955 a	8.511 $\pm$ 1.146 a	13.050 $\pm$ 1.214 a	6.506 $\pm$ 0.556 b	13.356 $\pm$ 0.619 a	10.955 $\pm$ 0.182 a	9.506 $\pm$ 0.735 b	8.784 $\pm$ 0.114 a	10.811 $\pm$ 0.553 a
Roots volume (cm ³)	0.633 $\pm$ 0.080 b	0.871 $\pm$ 0.234 ns	0.395 $\pm$ 0.112 b	0.489 $\pm$ 0.096 ns	0.332 $\pm$ 0.093 b	0.528 $\pm$ 0.150 ns	1.141 $\pm$ 0.344 a	0.762 $\pm$ 0.225 ns	1.569 $\pm$ 0.274 a	0.989 $\pm$ 0.260 ns
Shoot dry matter (%)	29.375 $\pm$ 1.00 b	45.862 $\pm$ 0.902 b	54.516 $\pm$ 4.094 a	54.714 $\pm$ 2.180 a	50.354 $\pm$ 4.239 a	50.586 $\pm$ 2.451 a	30.752 $\pm$ 0.475 b	43.910 $\pm$ 0.585 b	25.033 $\pm$ 0.335 b	40.021 $\pm$ 0.434 b
Shoot dry weight (g)	0.228 $\pm$ 0.014 b	0.263 $\pm$ 0.012 a	0.271 $\pm$ 0.01 a	0.233 $\pm$ 0.012 b	0.204 $\pm$ 0.015 b	0.219 $\pm$ 0.002 b	0.291 $\pm$ 0.022 a	0.289 $\pm$ 0.032 a	0.333 $\pm$ 0.023 a	0.334 $\pm$ 0.032 a
Shoot fresh weight (g)	0.793 $\pm$ 0.022 b	0.556 $\pm$ 0.019 a	0.539 $\pm$ 0.051 c	0.426 $\pm$ 0.032 b	0.452 $\pm$ 0.023 c	0.423 $\pm$ 0.028 b	0.950 $\pm$ 0.085 b	0.672 $\pm$ 0.067 a	1.337 $\pm$ 0.102 a	0.844 $\pm$ 0.094 a
Root fresh weight (g)	0.157 $\pm$ 0.014 b	0.109 $\pm$ 0.010 a	0.089 $\pm$ 0.010 b	0.078 $\pm$ 0.004 b	0.072 $\pm$ 0.008 b	0.203 $\pm$ 0.047 a	0.629 $\pm$ 0.047 a	0.125 $\pm$ 0.021 a	0.827 $\pm$ 0.106 a	0.118 $\pm$ 0.011 a
Root dry weight (g)	0.058 $\pm$ 0.004 b	0.063 $\pm$ 0.006 a	0.054 $\pm$ 0.007 b	0.045 $\pm$ 0.004 a	0.047 $\pm$ 0.006 b	0.076 $\pm$ 0.014 a	0.079 $\pm$ 0.004 a	0.068 $\pm$ 0.009 a	0.142 $\pm$ 0.035 a	0.063 $\pm$ 0.005 a

Traits	Clone 13		Clone 14		Clone 30		Clone 104		Clone 106	
	PW $\pm$ SE	UWS $\pm$ SE	PW $\pm$ SE	UWS $\pm$ SE	PW $\pm$ SE	UWS $\pm$ SE	PW $\pm$ SE	UWS $\pm$ SE	PW $\pm$ SE	UWS $\pm$ SE
Root dry matter (%)	38.072 $\pm$ 2.202 b	67.325 $\pm$ 3.670 ns	60.035 $\pm$ 3.462 a	57.401 $\pm$ 4.115 ns	61.640 $\pm$ 1.678 a	54.712 $\pm$ 1.233 ns	12.680 $\pm$ 0.343 c	58.652 $\pm$ 2.547 ns	17.255 $\pm$ 3.099 c	55.332 $\pm$ 1.187 ns
Total fresh weight (g)	0.950 $\pm$ 0.036 c	0.746 $\pm$ 0.019 a	0.628 $\pm$ 0.060 c	0.504 $\pm$ 0.036 b	0.524 $\pm$ 0.031 c	0.639 $\pm$ 0.035 b	1.579 $\pm$ 0.132 b	0.797 $\pm$ 0.085 a	2.164 $\pm$ 0.209 a	0.962 $\pm$ 0.105 a
Total dry weight (g)	0.286 $\pm$ 0.018 b	0.326 $\pm$ 0.017 a	0.325 $\pm$ 0.017 b	0.279 $\pm$ 0.015 a	0.250 $\pm$ 0.019 b	0.295 $\pm$ 0.014 a	0.370 $\pm$ 0.025 a	0.356 $\pm$ 0.040 a	0.475 $\pm$ 0.056 a	0.397 $\pm$ 0.039 a
Total dry matter (%)	30.095 $\pm$ 1.392 b	43.661 $\pm$ 1.094 b	52.727 $\pm$ 3.661 a	55.636 $\pm$ 2.380 a	47.849 $\pm$ 3.003 a	46.249 $\pm$ 0.643 b	23.540 $\pm$ 0.426 b	44.747 $\pm$ 1.190 b	21.776 $\pm$ 0.571 b	41.409 $\pm$ 0.520 b
Survival	69.09 $\pm$ 6.17 a	89.09 $\pm$ 3.40 ns	83.64 $\pm$ 6.68 a	89.09 $\pm$ 3.40 ns	89.09 $\pm$ 4.45 a	96.36 $\pm$ 2.23 ns	89.09 $\pm$ 3.40 a	96.36 $\pm$ 2.23 ns	34.55 $\pm$ 3.40 b	89.09 $\pm$ 3.40 ns
Height (cm)	7.67 $\pm$ 0.172 ns	8.21 $\pm$ 0.265 b	6.83 $\pm$ 0.2 ns	7.50 $\pm$ 0.450 c	8.15 $\pm$ 0.478 ns	9.59 $\pm$ 0.235 b	9.46 $\pm$ 1.285 ns	11.17 $\pm$ 0.084 a	7.68 $\pm$ 0.063 ns	9.84 $\pm$ 0.564 a
Number of leaves	3.03 $\pm$ 0.057 ns	3.09 $\pm$ 0.074 b	3.09 $\pm$ 0.037 ns	3.15 $\pm$ 0.093 b	3.09 $\pm$ 0.391 ns	3.53 $\pm$ 0.059 a	3.54 $\pm$ 0.445 ns	3.95 $\pm$ 0.043 a	3.36 $\pm$ 0.028 ns	3.67 $\pm$ 0.224 a
Diameter of the longest root (mm)	0.517 $\pm$ 0.026 ns	0.479 $\pm$ 0.019 a	0.438 $\pm$ 0.041 ns	0.248 $\pm$ 0.004 b	0.415 $\pm$ 0.009 ns	0.399 $\pm$ 0.024 a	0.400 $\pm$ 0.038 ns	0.503 $\pm$ 0.034 a	0.465 $\pm$ 0.012 ns	0.459 $\pm$ 0.028 a

