

Supplementary files

Table S1: Overview of pH changes of the medium at the start and the end (day 92) of experiment 3

Treatment	NaHCO ₃ (mM)	CaCl ₂ ·2H ₂ O (mM)	pH			
			Day 0	Day 92 (Mean ± SE)		
				<i>R. chihsinianum</i>	<i>R. fortunei</i>	<i>R. vernicosum</i>
Acidic	0	0	5.6	4.3 ± 0.26 ^{NS}	4.4 ± 0.04	4.5 ± 0.03
Neutral	2	0	6.8	5.7 ± 0.07a	5.3 ± 0.08b	5.8 ± 0.05a
Alkaline	10	0	8.0	7.1 ± 0.11a	6.8 ± 0.08b	7.3 ± 0.06a
Acidic + Ca ²⁺	0	3.4	5.6	4.2 ± 0.29 ^{NS}	4.4 ± 0.03	4.7 ± 0.05
Neutral + Ca ²⁺	2	3.4	6.7	5.2 ± 0.03a	5.1 ± 0.05b	5.5 ± 0.07a
Alkaline + Ca ²⁺	10	3.4	7.8	6.7 ± 0.03a	6.4 ± 0.03b	6.7 ± 0.08ab

a, b significant different pH between species, NS: not significantly different – Tukey's HSD. Adding calcium did not affect the pH for any of the species ($p > 0.05$)

Table S2. Effects of pH and additional 3.4 mM Ca²⁺ on maximum germination (g_{MAX}), mean germination time (MGT), the time between 25% and 75% germination (uniformity) (day 41), percentage of seedlings with open cotyledons (CO) and abnormal cotyledons (AL) (day 61), percentage of seedlings with true leaves (TL) and seedling mortality (day 92), F_v/F_m and ΦPSII on day 41 and day 61 of *R. chihsinianum*, *R. fortunei* and *R. vernicosum*. All values are Mean ± SE.

		g _{MAX} (%)	MGT (Day)	Uniformity (Day)	CO (%)	AL (%)	TL (%)	Mortality (%)	F _v /F _m		ΦPSII	
									Day 41	Day 61	Day 41	Day 61
R. chihsinianum	pH											
	Acidic	35.5 ± 4.8	20.9 ± 0.5	6.6 ± 0.8	97.3 ± 3.3	7.1 ± 2.8 b	71.6 ± 6.6	13.6 ± 3.8 b	0.664 ± 0.005 a	0.631 ± 0.010 a	0.450 ± 0.003 a	0.415 ± 0.009
	Neutral	33.7 ± 4.6	21.2 ± 0.5	7.4 ± 1.3	98.4 ± 1.6	3.4 ± 2.2 b	71.2 ± 6.6	10.2 ± 3.3 b	0.655 ± 0.010 a	0.635 ± 0.016 a	0.412 ± 0.008 b	0.403 ± 0.011
	Alkaline	29.0 ± 4.1	22.0 ± 1.1	6.1 ± 1.3	91.7 ± 5.3	41.1 ± 9.9 a	42.5 ± 7.8	39.7 ± 8.1 a	0.593 ± 0.044 b	0.545 ± 0.027 b	0.394 ± 0.021 c	0.377 ± 0.015
	Ca ²⁺											
	0	29.6 ± 3.3	21.0 ± 0.5	6.8 ± 0.9	98.4 ± 2.6	13.9 ± 7.4	68.5 ± 7.0	16.8 ± 6.3	0.636 ± 0.021	0.619 ± 0.021	0.424 ± 0.012	0.409 ± 0.011
	3.4 mM	37.8 ± 4.1	21.5 ± 0.6	6.8 ± 0.9	94.4 ± 2.6	11.7 ± 3.7	61.8 ± 6.5	19.0 ± 3.5	0.656 ± 0.006	0.608 ± 0.011	0.424 ± 0.009	0.395 ± 0.008
	Anova											
	pH	ns	ns	ns	ns	***	ns	***	***	***	***	ns
	Ca ²⁺	ns	ns	ns	ns	ns	ns	ns	**	ns	ns	ns
	Interaction	ns	ns	ns	ns	*	ns	**	***	**	***	ns
R. fortunei	pH											
	Acidic	69.6 ± 3.4	21.6 ± 0.4	6.8 ± 0.5	97.9 ± 2.1	3.0 ± 1.4 b	65.3 ± 4.2	3.4 ± 0.9 b	0.685 ± 0.006 a	0.675 ± 0.004 a	0.448 ± 0.003 a	0.449 ± 0.004 a
	Neutral	73.2 ± 4.5	21.1 ± 0.4	6.2 ± 0.4	99.7 ± 2.4	0.7 ± 0.7 b	64.5 ± 3.3	2.5 ± 1.1 b	0.689 ± 0.002 a	0.667 ± 0.004 a	0.416 ± 0.002 b	0.417 ± 0.004 b
	Alkaline	68.4 ± 3.7	21.9 ± 0.5	5.8 ± 0.4	100 ± 2.0	29.2 ± 8.5 a	70.8 ± 6.9	28.2 ± 9.0 a	0.602 ± 0.018 b	0.589 ± 0.018 b	0.387 ± 0.006 c	0.387 ± 0.012 b

R. vermicosum	Ca2+											
	0	65.6 ± 3.4	21.9 ± 0.4	7.0 ± 0.4	100.3 ± 2.1	18.9 ± 6.8	65.4 ± 4.3	19.5 ± 6.7	0.638 ± 0.017	0.633 ± 0.016	0.412 ± 0.008	0.413 ± 0.009
	3.4 mM	75.2 ± 2.2	21.2 ± 0.3	5.6 ± 0.3	98.1 ± 1.2	3.0 ± 1.1	68.2 ± 3.9	3.2 ± 0.9	0.679 ± 0.007	0.654 ± 0.009	0.422 ± 0.006	0.422 ± 0.009
	Anova											
	pH	ns	ns	ns	ns	***	ns	***	***	***	***	***
	Ca2+	*	ns	**	ns	***	ns	***	***	ns	ns	ns
	Interaction	ns	ns	*	ns	***	**	***	**	ns	ns	ns
	pH											
	Acidic	38.0 ± 3.0	21.5 ± 0.7	7.9 ± 0.9	90.7 ± 4.0	4.2 ± 2.4 b	49.0 ± 3.3	8.9 ± 2.8 b	0.638 ± 0.006 a	0.658 ± 0.005 a	0.405 ± 0.006 a	0.418 ± 0.005 a
	Neutral	36.0 ± 3.1	21.0 ± 0.6	6.5 ± 1.1	91.5 ± 2.5	10.7 ± 3.6 b	58.9 ± 3.0	17.8 ± 4.9 b	0.637 ± 0.005 a	0.654 ± 0.008 a	0.383 ± 0.003 b	0.391 ± 0.007 b
	Alkaline	34.8 ± 3.4	21.0 ± 0.5	7.0 ± 0.7	93.0 ± 3.9	50.8 ± 5.1 a	50.5 ± 8.3	53.6 ± 7.2 a	0.530 ± 0.019 b	0.502 ± 0.021 b	0.34 ± 0.008 c	0.331 ± 0.008 c
	Ca2+											
	0	39.2 ± 2.3	22.5 ± 0.4	7.8 ± 0.5	94.3 ± 2.8	23.4 ± 7.8	51.4 ± 4.4	29.0 ± 8.4	0.590 ± 0.020	0.603 ± 0.026	0.377 ± 0.01	0.387 ± 0.012
	3.4mM	33.3 ± 2.6	19.9 ± 0.3	6.5 ± 0.9	89.2 ± 2.7	20.4 ± 4.3	54.2 ± 4.6	24.5 ± 4.1	0.613 ± 0.011	0.606 ± 0.017	0.375 ± 0.007	0.373 ± 0.009
	Anova											
	pH	ns	ns	ns	ns	***	ns	***	***	***	***	***
	Ca2+	ns	***	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Interaction	ns	ns	ns	ns	***	ns	***	ns	ns	ns	ns

ns, *, **, or *** indicate non-significant or significant effects at P < 0.05, 0.01, or 0.001 according to a 2-way ANOVA or a non-parametric Kruskal-Wallis analysis (AL and mortality).

a, b denote significant differences according to Tukey's HSD test or the Mann-Whitney U test (AL and mortality) (P = 0.05).

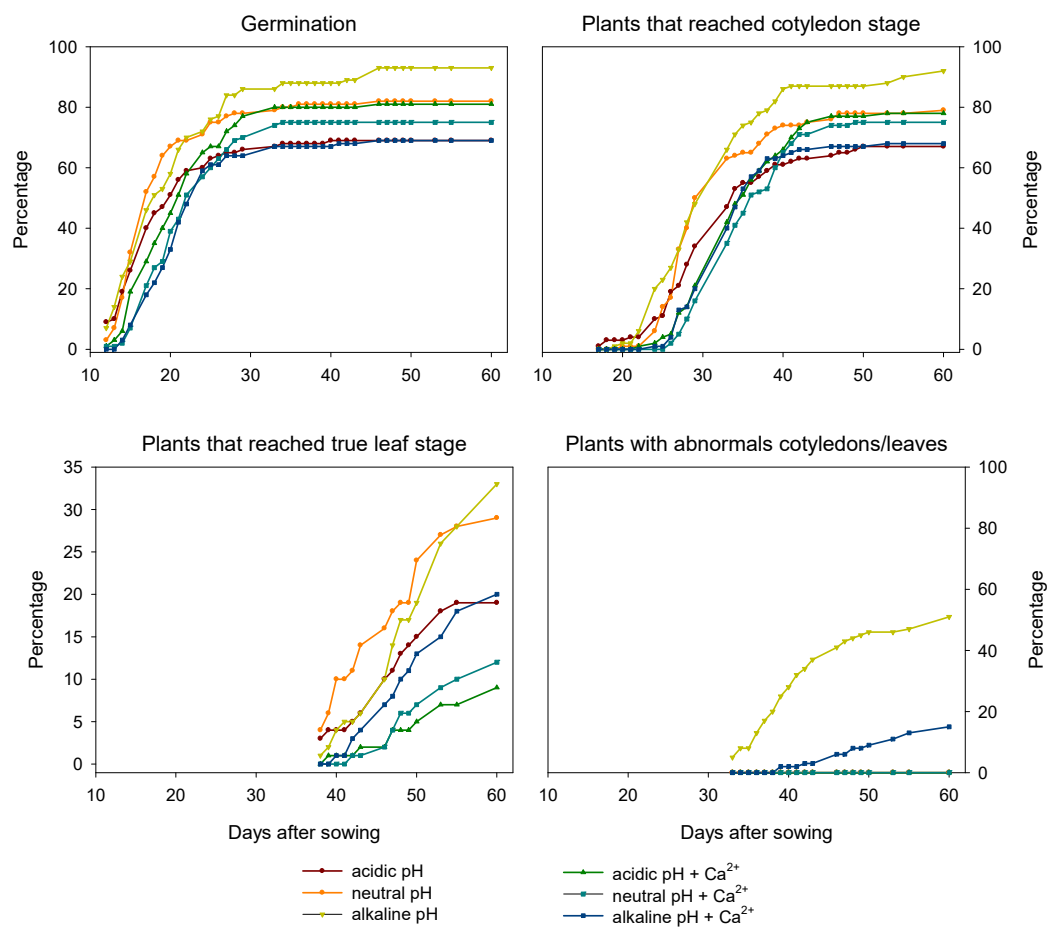


Figure S1. Germination percentage, development of the cotyledons, abnormal leaves and true leaves of *R. fortunei* under varying levels of pH (acidic, neutral and alkaline) without or with addition of 3.4 mM Ca²⁺