

Supplementary Tables & Figures

Supplementary Tables

Table S1 – Bootstrap analyses to test for differences in intrinsic growth rate (Lambda), intraspecific and interspecific competition 1) between no-cadmium and cadmium environments (only in the evolved without cadmium regimes); 2) between evolved with cadmium and evolved without cadmium regimes on the cadmium environment and 3) between evolved with cadmium and evolved without cadmium regimes on the no cadmium environment. The models were applied separately to each species (*T. urticae* and *T. evansi*). For each model we computed the number of times that a P-value lower or equal than 0.05 was obtained. Bootstrap was done using 1000 samples with replacement.

Test	Species	Selection regimes	Environment	Term	Observed P-value	Probability of obtaining a P-value ≤ 0.05
1) What is the impact of cadmium on spider-mite performance for the selection regimes that evolved without cadmium?	<i>T. urticae</i>	Evolved without cadmium	Cadmium vs no cadmium	Lambda	< 0.0001	0.122
				Intraspecific alpha	0.2084	0.123
				Interspecific alpha	0.0163	0.114
	<i>T. evansi</i>			Lambda	< 0.0001	0.119
				Intraspecific alpha	0.2989	0.115
				Interspecific alpha	0.0001	0.118
2) What is the impact of evolution with cadmium on spider-mite performance on the cadmium environment?	<i>T. urticae</i>	Evolved with cadmium vs Evolved without cadmium	Cadmium	Lambda	0.0129	0.127
				Intraspecific alpha	0.7174	0.122
				Interspecific Focal	0.3901	0.101
				Interspecific Competitor	0.2055	0.098
				Interspecific Interaction	0.7304	0.107
	<i>T. evansi</i>			Lambda	0.0342	0.157
				Intraspecific alpha	0.0034	0.137
				Interspecific Focal	0.0063	0.098
				Interspecific Competitor	0.3039	0.106
				Interspecific Interaction	0.0177	0.098
3) What is the impact of evolution with cadmium on spider-mite performance on the no cadmium environment?	<i>T. urticae</i>	Evolved with cadmium vs Evolved without cadmium	No cadmium	Lambda	0.7278	0.162
				Intraspecific alpha	0.9975	0.155
				Interspecific Focal	0.6566	0.099
				Interspecific Competitor	0.1734	0.102
				Interspecific Interaction	0.5015	0.104

				Lambda	0.1050	0.094
				Intraspecific alpha	0.2294	0.12
	<i>T. evansi</i>			Interspecific Focal	0.7259	0.088
				Interspecific Competitor	0.0817	0.115
				Interspecific Interaction	0.8646	0.112

Table S2 – Analyses of differences in interspecific competition in the cadmium environment. (A) Summary of the ANOVA (type III) to estimate the effect of evolving on plants with cadmium on the strength of interspecific competition for *T. urticae* and *T. evansi*. (B) Contrasts between the strength of interspecific competition for the *T. evansi* cadmium and non-cadmium selection regimes. Contrasts were obtained using the emmeans function, from the linear model including the selection regimes of focal and competitor individuals as well as their interaction.

A)

Parameter	<i>T. urticae</i>		<i>T. evansi</i>	
	Chisq	Pr(>Chisq)	Chisq	Pr(>Chisq)
Tu Regime	0.1325	0.7158	0.9035	0.3419
Te Regime	1.3768	0.2407	13.0935	0.0003***
Tu Regime: Te Regime	0.1188	0.7304	5.6283	0.018*

* 0.05 >= P-value > 0.01; ** 0.01 >= P-value > 0.001; *** P-value < 0.001

B)

Contrasts <i>T. evansi</i>	Estimate	T ratio	P-value
Te no cadmium: Tu no cadmium - Te cadmium: Tu no cadmium	-0.0531	-3.6180	0.0031***
Te no cadmium: Tu no cadmium - Te no cadmium: Tu cadmium	-0.0148	-0.9510	0.3592
Te no cadmium: Tu no cadmium - Te cadmium: Tu cadmium	-0.0157	-1.0070	0.3323
Te cadmium: Tu no cadmium - Te no cadmium: Tu cadmium	0.0383	2.4610	0.0286 *
Te cadmium: Tu no cadmium - Te cadmium: Tu cadmium	0.0374	2.4050	0.0318 *
Te no cadmium: Tu cadmium - Te cadmium: Tu cadmium	-0.0009	-0.0540	0.9581

* 0.05 >= P-value > 0.01; ** 0.01 >= P-value > 0.001; *** P-value < 0.001

Table S3 – Analyses of differences in interspecific competition in the no-cadmium environment. Summary of the ANOVA (type III) to estimate the effect of evolving in cadmium on the strength of interspecific competition for *T. urticae* and *T. evansi*. The linear model included the selection regimes of focal and competitor individuals as well as their interaction.

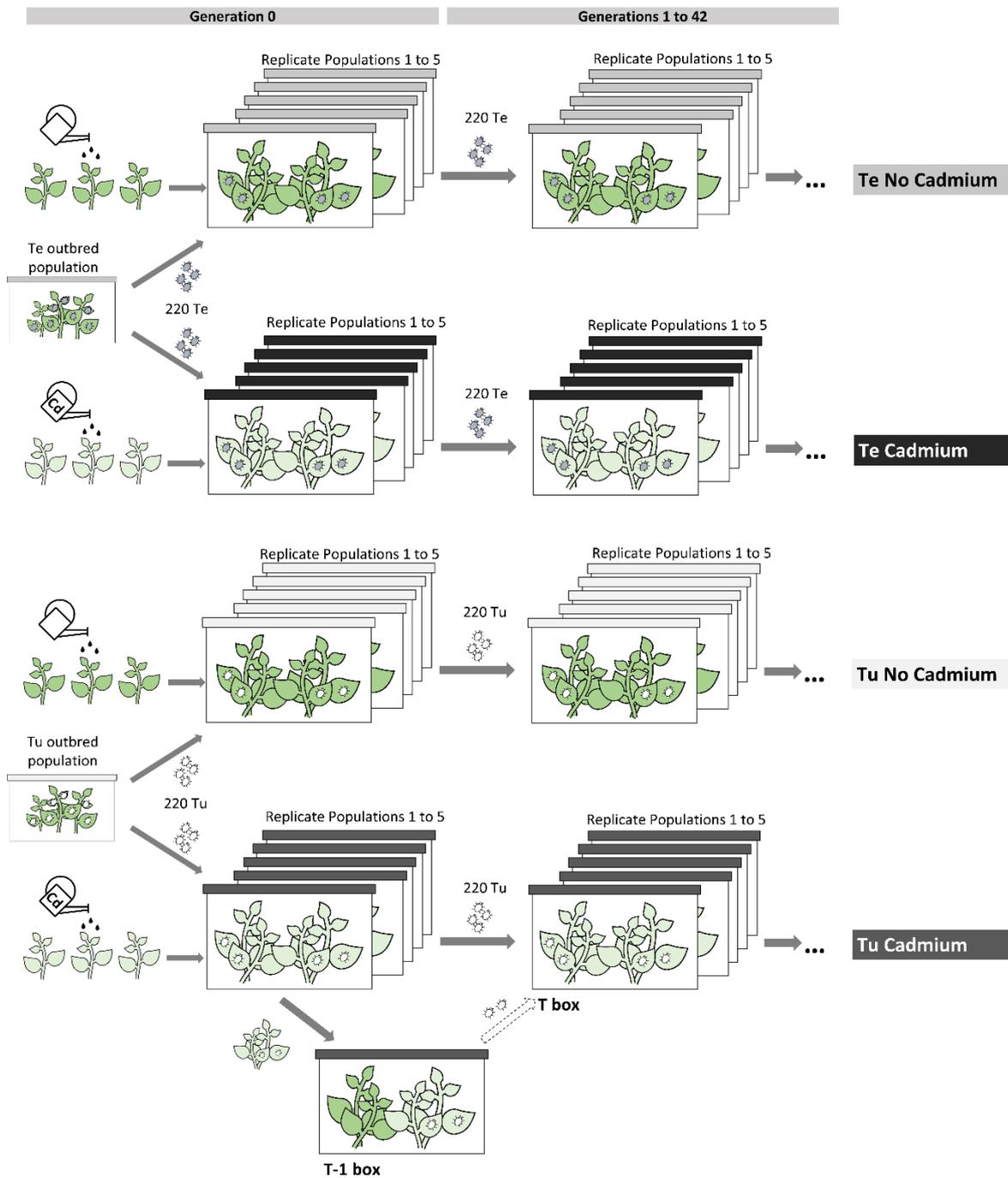
Parameter	<i>T. urticae</i>		<i>T. evansi</i>	
	Chisq	Pr(>Chisq)	Chisq	Pr(>Chisq)
Tu Regime	0.026	0.872	1.233	0.267
Te Regime	0.321	0.571	0.141	0.708
Tu Regime: Te Regime	0.452	0.502	0.029	0.865

Table S4 – Average proportion of *T. evansi* females obtained from the experiment to estimate the growth rate of populations with both intra and interspecific competitors.

Each treatment corresponds to a combination of selection regimes (no Cadmium Te: no-cadmium Tu, cadmium Te: no-cadmium Tu, no-cadmium Te: cadmium Tu and cadmium Te: cadmium Tu) and was composed of 10 replicate populations. Each box was initialized with 6 females of the two species.

Replicate population	Selection Regime Te	Selection Regime Tu	Environment	Proportion of Te females (per replicate)
1	No Cadmium	No Cadmium	Cadmium	0.9578
2	No Cadmium	No Cadmium	Cadmium	0.9992
3	No Cadmium	No Cadmium	Cadmium	0.9381
4	No Cadmium	No Cadmium	Cadmium	0.9622
5	No Cadmium	No Cadmium	Cadmium	0.9555
1	No Cadmium	No Cadmium	No Cadmium	0.6236
2	No Cadmium	No Cadmium	No Cadmium	0.6481
3	No Cadmium	No Cadmium	No Cadmium	0.7699
4	No Cadmium	No Cadmium	No Cadmium	0.7732
5	No Cadmium	No Cadmium	No Cadmium	0.7222
1	Cadmium	No Cadmium	Cadmium	0.9704
2	Cadmium	No Cadmium	Cadmium	0.9148
3	Cadmium	No Cadmium	Cadmium	0.9794
4	Cadmium	No Cadmium	Cadmium	0.9567
5	Cadmium	No Cadmium	Cadmium	0.9571
1	Cadmium	No Cadmium	No Cadmium	0.6015
2	Cadmium	No Cadmium	No Cadmium	0.5636
3	Cadmium	No Cadmium	No Cadmium	0.9167
4	Cadmium	No Cadmium	No Cadmium	0.5065
5	Cadmium	No Cadmium	No Cadmium	0.7478
1	No Cadmium	Cadmium	Cadmium	0.9184
3	No Cadmium	Cadmium	Cadmium	0.8195
4	No Cadmium	Cadmium	Cadmium	0.9129
5	No Cadmium	Cadmium	Cadmium	0.9236
1	No Cadmium	Cadmium	No Cadmium	0.6484
3	No Cadmium	Cadmium	No Cadmium	0.6837
4	No Cadmium	Cadmium	No Cadmium	0.7885
5	No Cadmium	Cadmium	No Cadmium	0.8269
1	Cadmium	Cadmium	Cadmium	0.8336
3	Cadmium	Cadmium	Cadmium	0.9518
4	Cadmium	Cadmium	Cadmium	0.9070
5	Cadmium	Cadmium	Cadmium	0.9662
1	Cadmium	Cadmium	No Cadmium	0.7917
3	Cadmium	Cadmium	No Cadmium	0.7228
4	Cadmium	Cadmium	No Cadmium	0.8712
5	Cadmium	Cadmium	No Cadmium	0.8225

A)



Supplementary Figures

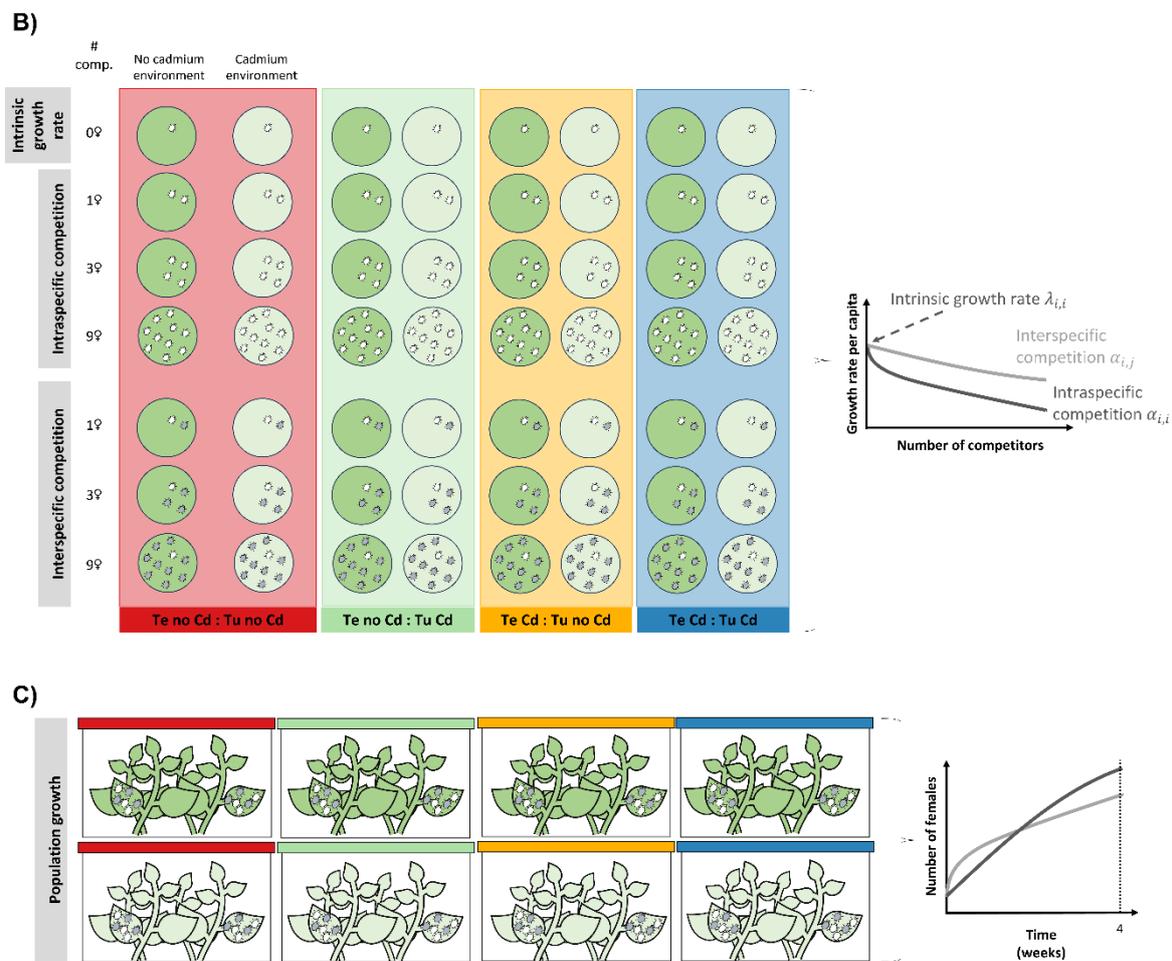


Figure S1 – Overview of the experimental procedure. A) Experimental evolution: 220 females from the *T. urticae* (Tu) or *T. evansi* (Te) outbred populations were transferred to create four experimental regimes: No-cadmium (plants grown in soil without cadmium, dark green) and Cadmium (plants grown in soil with 2mM cadmium, light green), for each mite species evolved in absence of interspecific competition. Each selection regime was replicated five times. Every two weeks (roughly corresponding to one spider mite generation), 220 females were transferred from each population to a new box with the same plant treatment. This procedure was followed for 42 mite generations. **B) Experiment to estimate strength of competition:** Females from the four experimental regimes were placed on a leaf disk of a plant grown with (light green) or without (dark green) cadmium. Focal females were exposed to a gradient of intraspecific or interspecific female competitors stemming from the cadmium or no-cadmium selection regimes. In total, four possible combinations of cadmium and no-cadmium selection regimes were performed: Te no-cadmium: Tu no-cadmium (red), Te no-cadmium: Tu cadmium (green), Te cadmium: Tu no-cadmium (yellow), Te cadmium: Tu cadmium (blue). The number of adult female offspring was measured after two weeks to calculate the per capita offspring production (total number of offspring divided by the number of focal females initially added to the patch). These data were then used to parameterize a Ricker model to estimate the intrinsic growth rate and the intra and interspecific competition coefficients. The parameters were then used to estimate 1) the relative impact of intra and interspecific competition by predicting the number of offspring produced under different

scenarios (cf. Figure 1 in main text) and 2) the long-term coexistence outcomes of competition between the different selection regimes (cf. Figure 2 in main text). C) **Population experiment:** Six females from each experimental evolution selection regime were placed in a box with two leaves from plants grown with or without cadmium. Boxes were created for the four possible combinations of cadmium and no-cadmium selection regimes: Te no-cadmium: Tu no-cadmium (red), Te no-cadmium: Tu cadmium (green), Te cadmium: Tu no-cadmium (yellow), Te cadmium: Tu cadmium (blue). After two weeks, two more plants were added, and the number of adult female offspring of each mite species was counted four weeks later. Figure adapted from Godinho et al (2024).

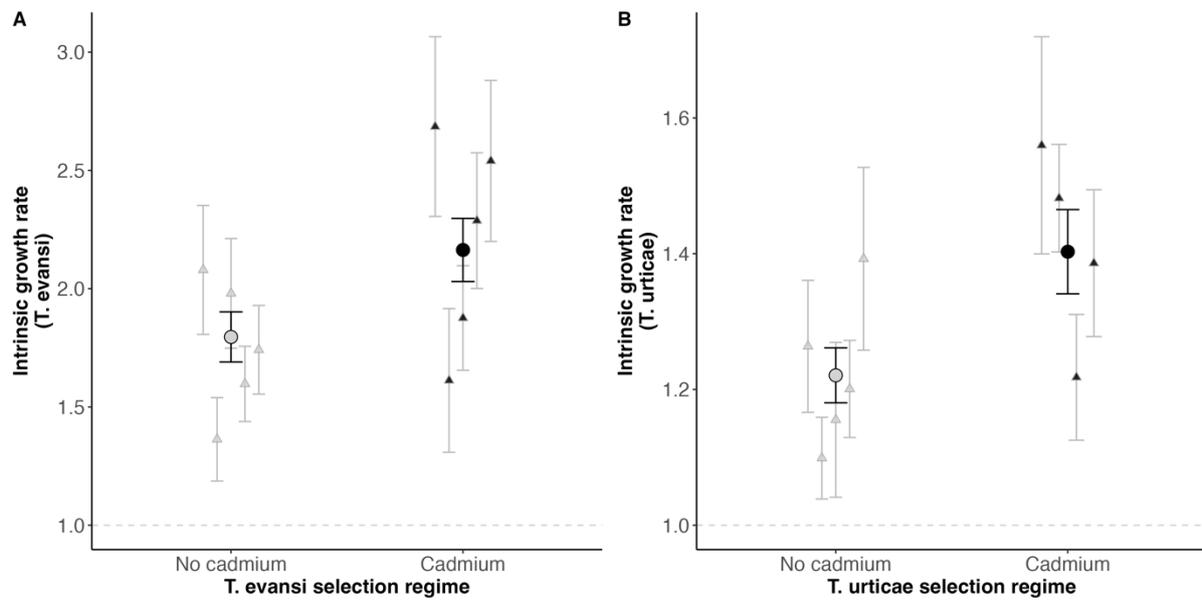


Figure S2 – Intrinsic growth rate of *T. evansi* (A) and *T. urticae* (B) from the cadmium and the no cadmium selection regimes, when tested in the cadmium environment. No-cadmium and cadmium selection regimes are represented in light and dark colours, respectively. Error bars were calculated based on standard error obtained from 1000 bootstrap samples. Circles correspond to the parameters estimated from all replicates pooled and triangles to parameters estimated from each replicate. Note that the scales are different between the two panels.

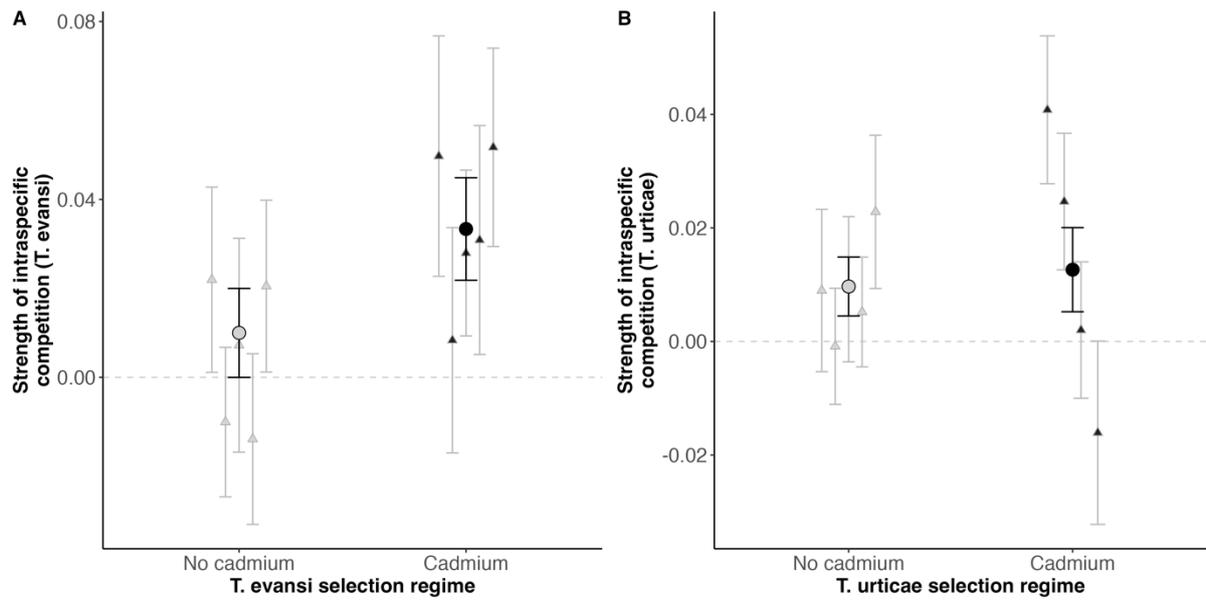


Figure S3 – Strength of intraspecific competition for *T. evansi* (A) and *T. urticae* (B) selection regimes in the cadmium environment. No cadmium and cadmium selection regimes are represented in light and dark colours, respectively. Error bars were calculated based on standard error obtained from 1000 bootstrap samples. Circles correspond to the parameters estimated from all replicates pooled and triangles to parameters estimated from each replicate. Note that the scales are different between the two panels.

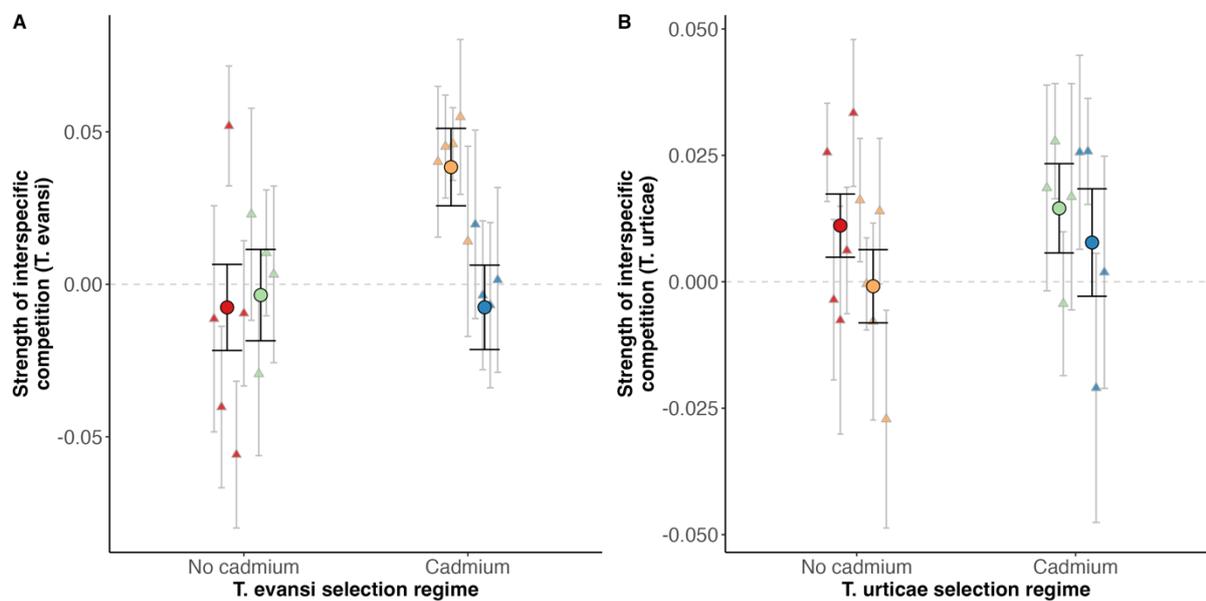


Figure S4 – Strength of interspecific competition for *T. evansi* (A) and *T. urticae* (B) selection regimes in the cadmium environment. Colors indicate the four possible combinations of cadmium and no-cadmium selection regimes were performed: Te no cadmium: Tu no cadmium (red), Te no cadmium: Tu cadmium (green), Te cadmium: Tu no cadmium (yellow), Te cadmium: Tu cadmium (blue). Error bars were calculated based on standard error obtained from 1000 bootstrap samples. Circles correspond to the parameters estimated from all replicates pooled and triangles to parameters estimated from each replicate. Note that the scales are different between the two panels.

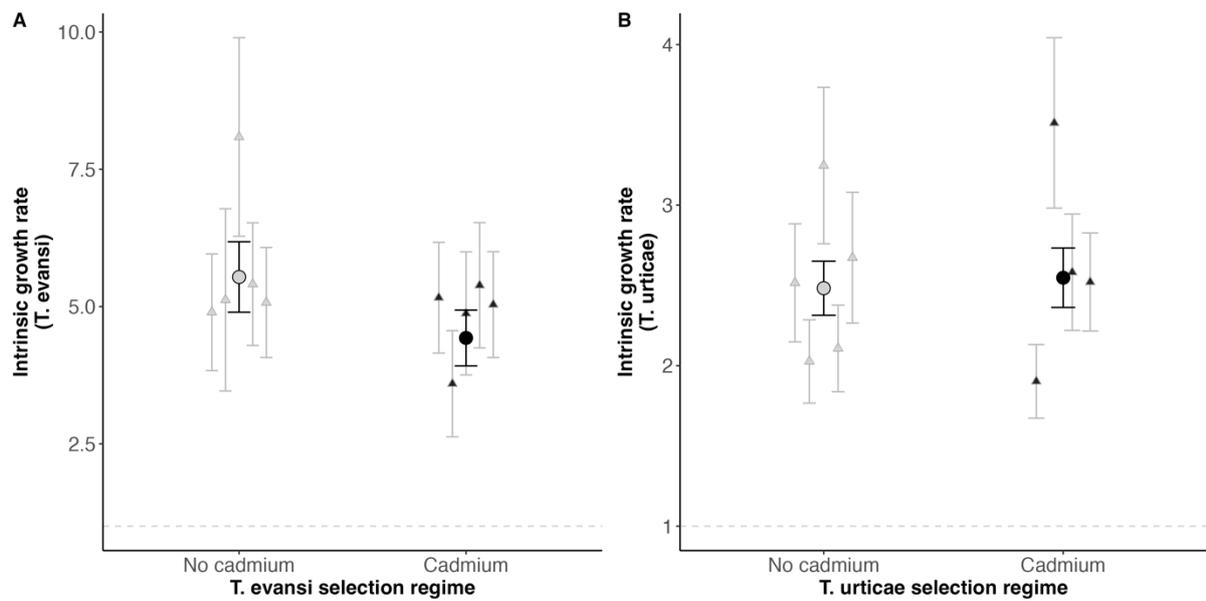


Figure S5 – Intrinsic growth rate for *T. evansi* (A) and *T. urticae* (B) selection regimes in the no cadmium environment. No-cadmium and cadmium selection regimes are represented in light and dark colours, respectively. Error bars were calculated based on standard error obtained from 1000 bootstrap samples. Circles correspond to the parameters estimated from all replicates pooled and triangles to parameters estimated from each replicate. Note that the scales are different between the two panels.

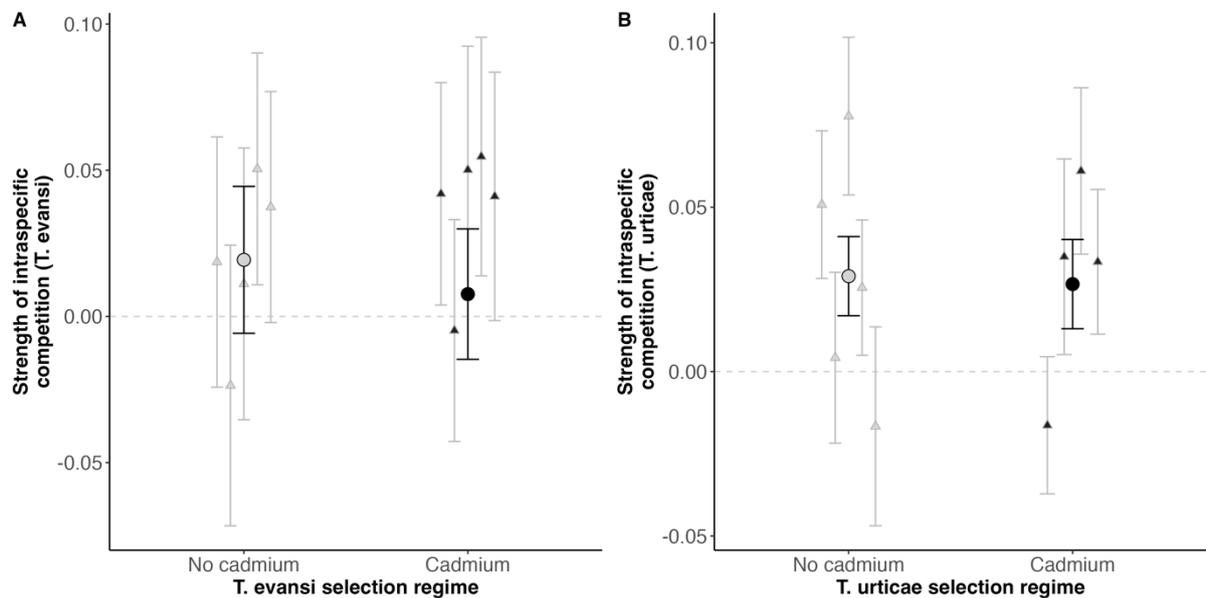


Figure S6 – Strength of intraspecific competition for *T. evansi* (A) and *T. urticae* (B) selection regimes in the no cadmium environment. No-cadmium and cadmium selection regimes are represented in light and dark colours, respectively. Error bars were calculated based on standard error obtained from 1000 bootstrap samples. Circles correspond to the parameters estimated from all replicates pooled and triangles to parameters estimated from each replicate. Note that the scales are different between the two panels.

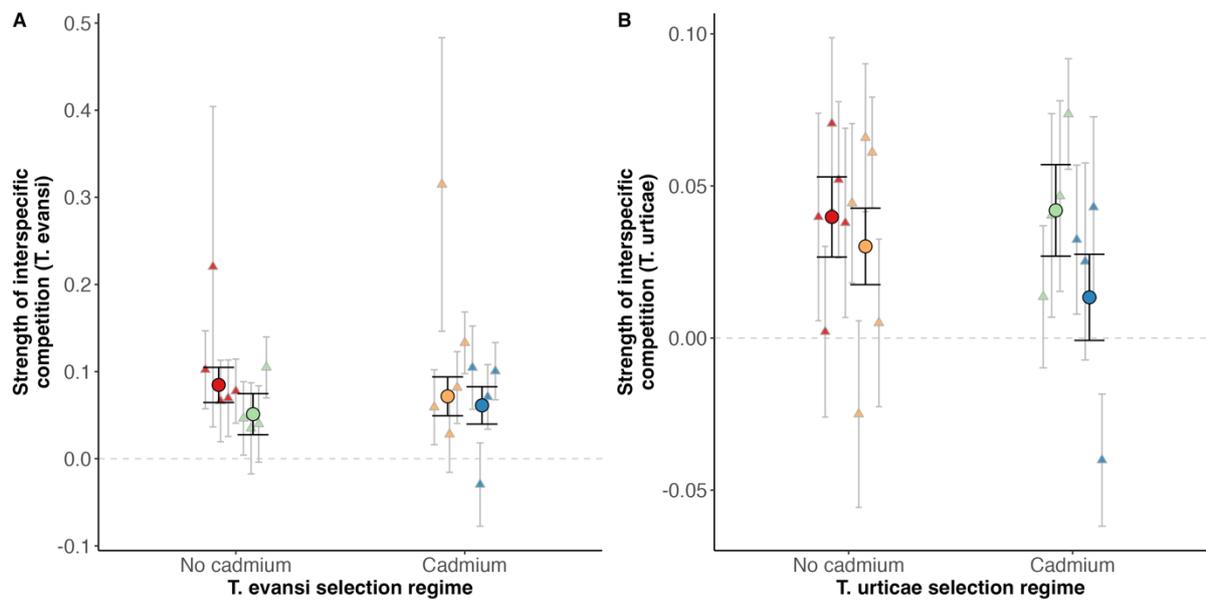


Figure S7 – Strength of interspecific competition for *T. evansi* (A) and *T. urticae* (B) selection regimes in the no cadmium environment. Colors indicate the four possible combinations of cadmium and no-cadmium selection regimes were performed: Te no-cadmium: Tu no-cadmium (red), Te no-cadmium: Tu cadmium (green), Te cadmium: Tu no-cadmium (yellow), Te cadmium: Tu cadmium (blue). Error bars were calculated based on standard error obtained from 1000 bootstrap samples. Circles correspond to the parameters estimated from all replicates pooled and triangles to parameters estimated from each replicate. Note that the scales are different between the two panels.

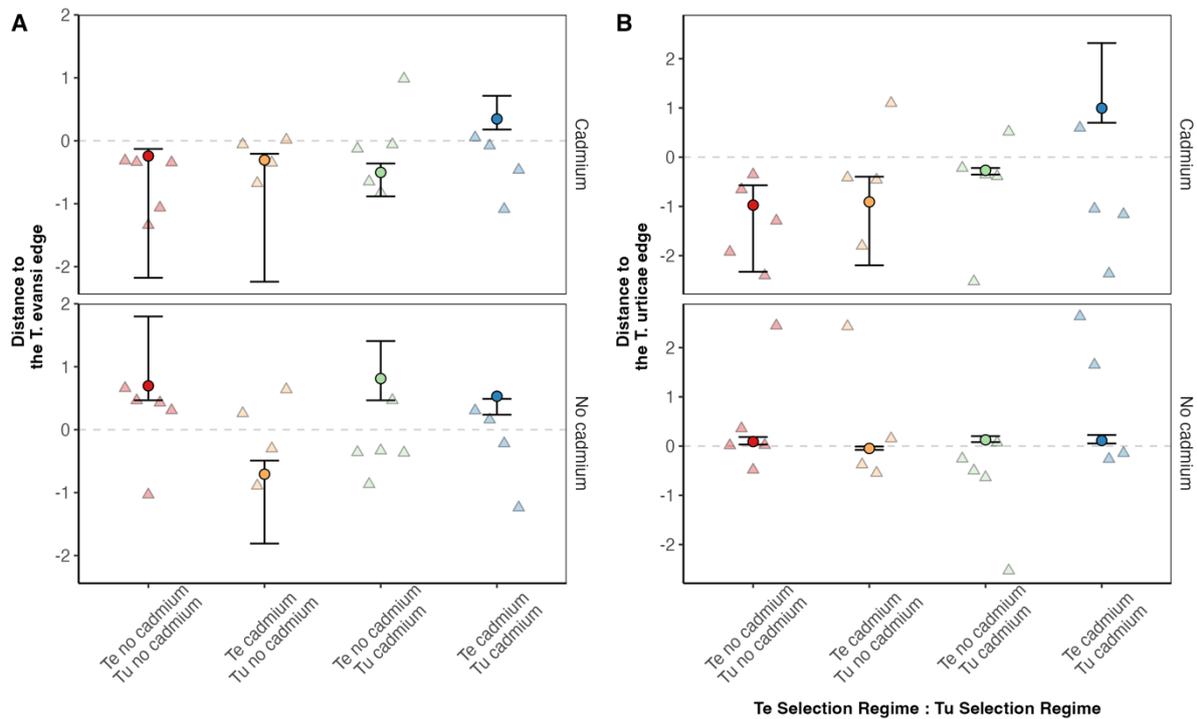


Figure S8 – Distance to the two edges of the feasibility domain for the different combinations of cadmium and no-cadmium selection regimes of *T. urticae* (Tu) and *T. evansi* (Te) in the cadmium and the no-cadmium environment. Distance between the realized growth rates and the edges of the feasibility domain for which Te (A) or Tu (B) will be excluded, in the cadmium (upper panels) and no-cadmium (lower panels) environments for the different treatments (i.e. combinations of no cadmium or cadmium selection regimes, cf. colour codes). Positive distances indicate that the vector of growth rates is inside of the feasibility domain (i.e., coexistence is possible), and negative distances indicate that the vector is outside of the feasibility domain (one species is excluded). Circles correspond to the distance calculated with data from all replicates pooled and triangles to distance calculated per replicate. Note the differences in scales between panels. Error bars were obtained by performing 1000 bootstrap samples with replacement when estimating parameters and were obtained from the data of all experimental replicates pooled.

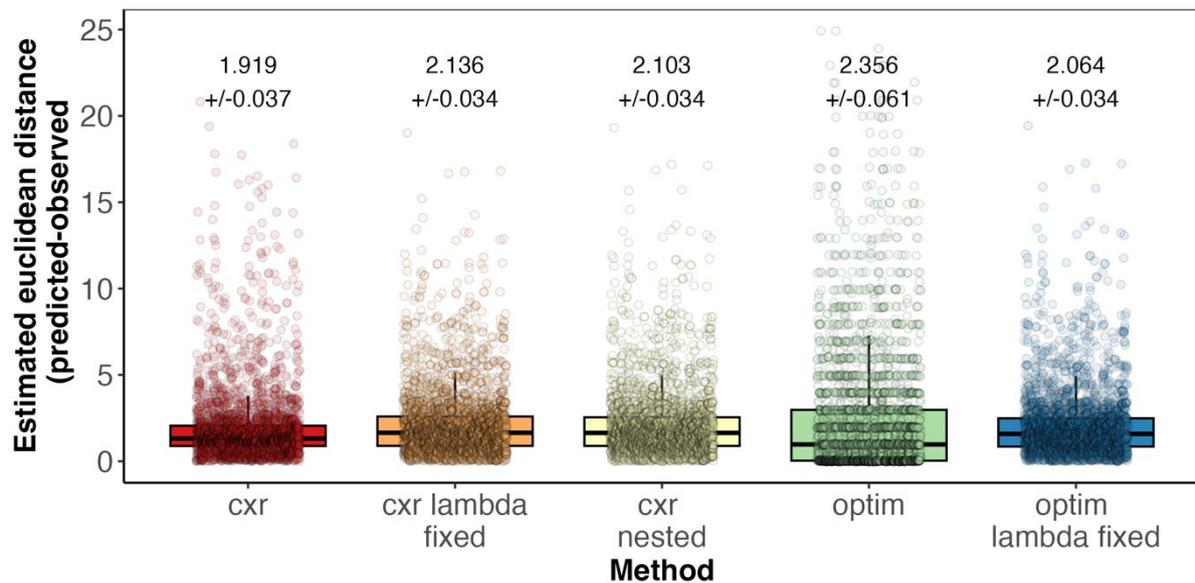


Figure S9 – Euclidean distance between predicted and observed estimates for five different fitting approaches (x axis). Boxplot limits represent first and third quartiles and the whiskers mark points within 1.5*interquartile range. The different methods tested were cxr: estimates fitted using the cxr package; cxr lambda fixed: using the cxr package with the intrinsic growth rate estimates directly obtained from the single female assays; cxr nested: using the cxr package but estimating first intrinsic growth rate, then intraspecific competitive ability and then the interspecific competitive ability; optim: using the method described in Matias et al (2018); optim lambda fixed: using the same method but with the intrinsic growth rate estimates directly obtained from the single female assays. Numbers in the plot indicate average distance for each method and their standard error. The cxr package method shows on average the smallest distance between predicted and observed. Details for the methods are available in the git repository.