**SUPPLEMENTARY MATERIAL**

**Table S1.** Details about sampling effort and the number of parental sporophytes that provided the gametophytes included in our experiments.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Experiment 1 |  | Experiment 2 |
| Region | Population | **# parental Sporophytes** |  | **# parental Sporophytes** |
| ***Peruvian Province*** | JNN | 3 |  | 8 |
|  | YAP | 2 |  | - |
|  | ARV | 1 |  | 4 |
|  | LCU | 2 |  | - |
|  | PDA | 2 |  | 3 |
|  |  |  |  |  |
| ***Intermediate Region*** | LVL | - |  | 6 |
|  | ALG | - |  | 7 |
|  | CHO | 2 |  | 8 |
|  | LAVAP | 1 |  | - |
|  | NLH | 2 |  | 4 |
|  | PUC | 2 |  | - |
|  | PAR | 2 |  | - |
|  | FCO | 3 |  | 6 |
|  |  |  |  |  |
| ***Corcovado Gulf*** | SAN | 2 |  | - |
|  | ACH | 3 |  | - |
|  | QEL | 3 |  | - |
|  |  |  |  |  |
| ***Magellan Province*** | NAT | 2 |  | 6 |
|  | FSI | 2 |  | 6 |
|  | YAR | 2 |  | 6 |
|  | SKY | 2 |  | - |
|  | DUN | 2 |  | - |

**Table S2.** Experimental design and structure of our dataset, indicating which are sympatric or allopatric combinations.

|  |  |  |
| --- | --- | --- |
| A |  | **Regional temperature** |
| **Region** | **Population** | **Texp 1** | **Texp 2** | **…** | **Texp i** |
|  |  |  |  |  |  |
| **Region 1** | **Pop\_1\_1** | sympatric | allopatric | allopatric | allopatric |
| **Pop\_1\_2** |
| **…** |
| **Pop\_1\_n** |
|  |  |  |  |  |  |
| **Region 2** | **Pop\_2\_1** | allopatric | sympatric | allopatric | allopatric |
| **Pop\_2\_2** |
| **…** |
| **Pop\_2\_n** |
|  |  |  |  |  |  |
| **…** | **…** | … | … | … | … |
| **…** |
| **…** |
| **…** |
|  |  |  |  |  |  |
| **Region i** | **Pop\_i\_1** | allopatric | allopatric | allopatric | sympatric |
| **Pop\_i\_2** |
| **…** |
| **Pop\_i\_n** |

**Table S3.** Details about the mixed linear models used to analyze data from the experiment 1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Suvival** | **Fertility** | **Fecundity** | **Photosynthetic efficiency** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Mixed Model** | **W ~ TEXP + Region + Population[Region] + (TEXP x Region) + (TEXP x Population[Region])** |
| **REML criterion convergence** | 127,9 |  |  |  | -108,2 |  |  |  | -90,7 |  |  |  | -329,8 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Random Effects** | Var | Std. Dev. |  |  | Var | Std. Dev. |  |  | Var | Std. Dev. |  |  | Var | Std. Dev. |  |
| Pop[Region]-intercept | 2,7E-05 | 0,005 |  |  | 0 | 0 |  |  | 7,2E-08 | 0,000 |  |  | 2,0E-04 | 0,014 |  |
| TEXP \* Pop[Region]-intercept | 0,022 | 0,149 |  |  | 0 | 0 |  |  | 0,002 | 0,043 |  |  | 3,7E-04 | 0,019 |  |
| Residuals | 0,147 | 0,383 |  |  | 0,013 | 0,116 |  |  | 0,018 | 0,134 |  |  | 1,9E-03 | 0,043 |  |
| **Fixed Effects** | Estimate | Std. Error | t-value |  | Estimate | Std. Error | t-value |  | Estimate | Std. Error | t-value |  | Estimate | Std. Error | t-value |
| Intercept | 1,337 | 0,127 | 10,532 |  | 0,036 | 0,034 | 1,059 |  | 0,053 | 0,043 | 1,237 |  | 0,476 | 0,016 | 29,985 |
| TEXP (12) | -0,015 | 0,160 | -0,093 |  | 0,080 | 0,048 | 1,657 |  | 0,122 | 0,055 | 2,233 |  | 0,002 | 0,018 | 0,104 |
| TEXP (18) | -0,385 | 0,156 | -2,459 |  | 0,071 | 0,048 | 1,460 |  | 0,012 | 0,055 | 0,216 |  | -0,028 | 0,018 | -1,575 |
| CG | -0,371 | 0,205 | -1,809 |  | 0,074 | 0,053 | 1,394 |  | -0,030 | 0,071 | -0,420 |  | 0,022 | 0,026 | 0,844 |
| MP | 0,112 | 0,188 | 0,597 |  | -0,036 | 0,051 | -0,693 |  | -0,034 | 0,063 | -0,532 |  | 0,047 | 0,023 | 2,001 |
| PP | -0,101 | 0,192 | -0,527 |  | -0,036 | 0,051 | -0,693 |  | -0,020 | 0,063 | -0,323 |  | -0,030 | 0,024 | -1,281 |
| TEXP (12) x CG | 0,077 | 0,255 | 0.300 |  | 0,097 | 0,082 | 1,176 |  | 0,080 | 0,088 | 0,906 |  | -0,018 | 0,028 | -0,656 |
| TEXP (18) x CG | -0,405 | 0.260 | -1.560 |  | -0,097 | 0,079 | -1,221 |  | -0,011 | 0,088 | -0,123 |  | -0,014 | 0,028 | -0,521 |
| TEXP (12) x MP | -0,064 | 0,238 | -0,269 |  | -0,055 | 0,073 | -0,753 |  | -0,138 | 0,082 | -1,668 |  | -0,040 | 0,026 | -1,533 |
| TEXP (18) x MP | -0,218 | 0,232 | -0,938 |  | -0,071 | 0,074 | -0,951 |  | -0,024 | 0,081 | -0,294 |  | -0,040 | 0,026 | -1,548 |
| TEXP (12) x PP | 0,166 | 0,246 | 0,674 |  | -0,080 | 0,076 | -1,057 |  | 0,094 | 0,081 | 1,159 |  | 0,007 | 0,026 | 0,279 |
| TEXP (18) x PP | -0,008 | 0,236 | -0,034 |  | -0,071 | 0,074 | -0,951 |  | 0,069 | 0,081 | 0,853 |  | -0,001 | 0,026 | -0,036 |

**Table S4.** Pairwise comparisons among treatments from the experiment 1 (post hoc Tukey’s HSD tests), performed for significant fixed effects (see Table 1). *diff* indicates the difference between temperatures or regions of the left column. *lwr* and *upr* represent lower and upper case values of the 95% confidence interval. Bold p-values indicate statistical significance.

|  |
| --- |
| **Survival** |
| **TEXP** | **diff** | **lwr** | **upr** | **p-adj** |
| 12-8 | 0,026 | -0,197 | 0,249 | 0,959 |
| 18-8 | -0,493 | -0,711 | -0,274 | **<0.001** |
| 18-12 | -0,518 | -0,743 | -0,294 | **<0.001** |
| **Region** |  |  |  |  |
| CG vs IR | -0,456 | -0,746 | -0,165 | **<0.001** |
| MP vs IR | 0,01 | -0,254 | 0,275 | 1 |
| PP vs IR | -0,071 | -0,341 | 0,198 | 0,901 |
| MP vs CG | 0,466 | 0,165 | 0,767 | **0,001** |
| PP vs CG | 0,384 | 0,078 | 0,69 | **0,008** |
| PP vs MP | -0,082 | -0,363 | 0,2 | 0,874 |
| **Fertility** |
| **Region** | **diff** | **lwr** | **upr** | **p-adj** |
| CG vs IR | 0,063 | -0,026 | 0,153 | 0,255 |
| MP vs IR | -0,076 | -0,157 | 0,006 | 0,077 |
| PP vs IR | -0,084 | -0,167 | -0,001 | **0,045** |
| MP vs CG | -0,139 | -0,233 | -0,045 | **0,001** |
| PP vs CG | -0,148 | -0,243 | -0,052 | **0,001** |
| PP vs MP | -0,009 | -0,097 | 0,079 | 0,994 |
| **Fecundity** |
| **TEXP** | **diff** | **lwr** | **upr** | **p-adj** |
| 12-8 | 0,132 | 0,056 | 0,208 | **<0.001** |
| 18-8 | 0,021 | -0,055 | 0,097 | 0,783 |
| 18-12 | -0,111 | -0,186 | -0,035 | **0,002** |
| **Region** |  |  |  |  |
| CG vs IR | -0,009 | -0,108 | 0,089 | 0,995 |
| MP vs IR | -0,089 | -0,181 | 0,003 | 0,063 |
| PP vs IR | 0,024 | -0,067 | 0,116 | 0,898 |
| MP vs CG | -0,08 | -0,183 | 0,024 | 0,19 |
| PP vs CG | 0,034 | -0,069 | 0,136 | 0,826 |
| PP vs MP | 0,113 | 0,017 | 0,21 | **0,014** |
| **Photosynthetic Efficiency** |
| **TEXP** | **diff** | **lwr** | **upr** | **p-adj** |
| 12-8 | -0,01 | -0,035 | 0,015 | 0,622 |
| 18-8 | -0,041 | -0,066 | -0,015 | **0,001** |
| 18-12 | -0,031 | -0,056 | -0,005 | **0,013** |
| **Region** |  |  |  |  |
| CG vs IR | 0,013 | -0,02 | 0,046 | 0,714 |
| MP vs IR | 0,022 | -0,009 | 0,053 | 0,262 |
| PP vs IR | -0,029 | -0,06 | 0,002 | 0,079 |
| MP vs CG | 0,008 | -0,026 | 0,043 | 0,92 |
| PP vs CG | -0,042 | -0,076 | -0,008 | **0,009** |
| PP vs MP | -0,05 | -0,083 | -0,018 | **<0.001** |

**Table S5.** Details about the mixed linear models used to analyze data from the experiment 2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Suvival** |  | **Fertility** |  | **Physiological Vigor** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Mixed Model | **W ~ TEXP + Region + Population[Region] + (TEXP x Region) + (TEXP x Population[Region])** |
| **REML criterion convergence** | 702,4 |  |  |  | -3049,1 |  |  |  | 378,7 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Random Effects** | Var | Std. Dev. |  |  | Var | Std. Dev. |  |  | Var | Std. Dev. |  |
| Pop[Region]-intercept | 0,081 | 0,285 |  |  | 3,2E-12 | 1,8E-06 |  |  | 6,3E-17 | 7,9E-09 |  |
| TEXP \* Pop[Region]-intercept | 0,466 | 0,683 |  |  | 3,1E-10 | 1,8E-05 |  |  | 3,5E-17 | 5,9E-09 |  |
| Residuals | 2,488 | 1,577 |  |  | 1,9E-09 | 4,4E-05 |  |  | 0,418 | 0,647 |  |
| **Fixed Effects** | Estimate | Std. Error | t-value |  | Estimate | Std. Error | t-value |  | Estimate | Std. Error | t-value |
| Intercept | 1,882 | 0,437 | 4,309 |  | 4,14E-05 | 1,12E-05 | 3,713 |  | 0,648 | 0,118 | 5,488 |
| TEXP (12) | 0,845 | 0,401 | 2,11 |  | -1,93E-05 | 1,11E-05 | -1,738 |  | 0,082 | 0,166 | 0,496 |
| TEXP (18) | -0,013 | 0,401 | -0,033 |  | -3,03E-05 | 1,11E-05 | -2,73 |  | 0,474 | 0,166 | 2,864 |
| PP | 0,872 | 0,757 | 1,152 |  | -3,64E-05 | 1,92E-05 | -1,898 |  | -0,048 | 0,209 | -0,229 |
| MP | 0,482 | 0,721 | 0,668 |  | -3,24E-05 | 1,84E-05 | -1,757 |  | -0,032 | 0,193 | -0,167 |
| TEXP (12) x PP | -0,003 | 0,728 | -0,004 |  | 1,45E-05 | 1,96E-05 | 0,736 |  | -0,072 | 0,295 | -0,244 |
| TEXP (18) x PP | -0,581 | 0,728 | -0,799 |  | 2,75E-05 | 1,96E-05 | 1,401 |  | -0,22 | 0,292 | -0,754 |
| TEXP (12) x MP | -1,272 | 0,667 | -1,905 |  | 1,69E-05 | 1,86E-05 | 0,909 |  | 0,695 | 0,274 | 2,534 |
| TEXP (18) x MP | 0,234 | 0,673 | 0,347 |  | 2,59E-05 | 1,86E-05 | 1,391 |  | -0,272 | 0,272 | -1,003 |

**Table S6.** Pairwise comparisons among treatments from the experiment 2 (post hoc Tukey’s HSD test), performed for significant fixed effects (see Table 2). Bold p-values indicate statistical significance.

|  |
| --- |
| **Fertility** |
| **Region** | **diff** | **lwr** | **upr** | **p-adj** |
| PP vs IR | -2,31E-05 | -4,31E-05 | -3,02E-06 | **0,020** |
| MP vs IR | -1,87E-05 | -3,77E-05 | 4,24E-07 | 0,057 |
| MP vs PP | 4,40E-06 | -1,81E-05 | 2,69E-05 | 0,889 |
| **Physiological Vigor** |
| **TEXP** | **diff** | **lwr** | **upr** | **p-adj** |
| 12-8 | 0,257 | -0,017 | 0,531 | 0,072 |
| 18-8 | 0,346 | 0,074 | 0,618 | **0,009** |
| 18-12 | 0,089 | -0,183 | 0,361 | 0,721 |
| **TEXP x Region** |  |  |  |  |
| (12 x IR) vs (8 x IR) | 0,082 | -0,438 | 0,602 | 1 |
| (18 x IR) vs (8 x IR) | 0,474 | -0,046 | 0,994 | 0,105 |
| (8 x PP) vs (8 x IR) | -0,048 | -0,705 | 0,609 | 1 |
| (12 x PP) vs (8 x IR) | -0,038 | -0,695 | 0,619 | 1 |
| (18 x PP) vs (8 x IR) | 0,206 | -0,436 | 0,848 | 0,985 |
| (8 x MP) vs (8 x IR) | -0,032 | -0,638 | 0,573 | 1 |
| (12 x MP) vs (8 x IR) | 0,745 | 0,129 | 1,361 | **0,006** |
| (18 x MP) vs (8 x IR) | 0,169 | -0,436 | 0,775 | 0,994 |
| (18 x IR) vs (12 x IR) | 0,392 | -0,124 | 0,908 | 0,297 |
| (8 x PP) vs (12 x IR) | -0,13 | -0,784 | 0,524 | 0,999 |
| (12 x PP) vs (12 x IR) | -0,12 | -0,774 | 0,534 | 1 |
| (18 x PP) vs (12 x IR) | 0,124 | -0,514 | 0,763 | 1 |
| (8 x MP) vs (12 x IR) | -0,114 | -0,716 | 0,487 | 1 |
| (12 x MP) vs (12 x IR) | 0,663 | 0,05 | 1,276 | **0,023** |
| (18 x MP) vs (12 x IR) | 0,087 | -0,514 | 0,689 | 1 |
| (8 x PP) vs (18 x IR) | -0,522 | -1,176 | 0,132 | 0,235 |
| (12 x PP) vs (18 x IR) | -0,512 | -1,166 | 0,142 | 0,259 |
| (18 x PP) vs (18 x IR) | -0,268 | -0,906 | 0,371 | 0,925 |
| (8 x MP) vs (18 x IR) | -0,506 | -1,108 | 0,095 | 0,176 |
| (12 x MP) vs (18 x IR) | 0,271 | -0,342 | 0,884 | 0,901 |
| (18 x MP) vs (18 x IR) | -0,305 | -0,906 | 0,297 | 0,809 |
| (12 x PP) vs (8 x PP) | 0,01 | -0,757 | 0,777 | 1 |
| (18 x PP) vs (8 x PP) | 0,254 | -0,5 | 1,009 | 0,979 |
| (8 x MP) vs (8 x PP) | 0,016 | -0,708 | 0,739 | 1 |
| (12 x MP) vs (8 x PP) | 0,793 | 0,06 | 1,526 | **0,023** |
| (18 x MP) vs (8 x PP) | 0,217 | -0,506 | 0,941 | 0,99 |
| (18 x PP) vs (12 x PP) | 0,244 | -0,51 | 0,999 | 0,984 |
| (8 x MP) vs (12 x PP) | 0,006 | -0,718 | 0,729 | 1 |
| (12 x MP) vs (12 x PP) | 0,783 | 0,05 | 1,516 | **0,026** |
| (18 x MP) vs (12 x PP) | 0,207 | -0,516 | 0,931 | 0,993 |
| (8 x MP) vs (18 x PP) | -0,239 | -0,948 | 0,471 | 0,98 |
| (12 x MP) vs (18 x PP) | 0,539 | -0,18 | 1,258 | 0,317 |
| (18 x MP) vs (18 x PP) | -0,037 | -0,747 | 0,673 | 1 |
| (12 x MP) vs (8 x MP) | 0,777 | 0,091 | 1,464 | **0,014** |
| (18 x MP) vs (8 x MP) | 0,202 | -0,475 | 0,878 | 0,991 |
| (18 x MP) vs (12 x MP) | -0,576 | -1,262 | 0,111 | 0,181 |

**Table S7.** Details about the mixed linear models used to analyze data from the experiment of Heat Wave.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Growth** | **Fertility** |  | **Physiological Vigor** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Mixed Model** | **W ~ Region + Population[Region]** |
| **REML criterion convergence** | 286 |  |  |  | -1135,2 |  |  |  | 166,6 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Random Effects** | Var | Std. Dev. |  |  | Var | Std. Dev. |  |  | Var | Std. Dev. |  |
| Pop[Region]-intercept | 0 | 0 |  |  | 2,7E-11 | 5,2E-06 |  |  | 1,9E-14 | 1,4E-07 |  |
| Residuals | 5,92 | 2,433 |  |  | 2,9E-10 | 1,7E-05 |  |  | 0,810 | 0,900 |  |
| **Fixed Effects** | Estimate | Std. Error | t-value |  | Estimate | Std. Error | t-value |  | Estimate | Std. Error | t-value |
| Intercept | 1,736 | 0,444 | 3,908 |  | 1,2E-05 | 3,9E-06 | 3,146 |  | 1,423 | 0,164 | 8,663 |
| PP | 0,308 | 0,769 | 0,4 |  | -4,4E-06 | 6,7E-06 | -0,656 |  | -0,422 | 0,285 | -1,482 |
| MP | -0,671 | 0,725 | -0,924 |  | -9,4E-06 | 6,4E-06 | -1,485 |  | -1,292 | 0,268 | -4,816 |

**Table S8.** Pairwise comparisons among treatments from the experiment of Heat Wave (post hoc Tukey’s HSD test), performed for significant fixed effects (see Table 3). Significant (p<0,05) adjusted p-values are in bold.

|  |
| --- |
| **Physiological Vigor** |
| **Region** | **diff** | **lwr** | **upr** | **p-adj** |
| PP vs IR | -0,422 | -1,106 | 0,262 | 0,307 |
| MP vs IR | -1,292 | -1,937 | -0,647 | **0,01** |
| MP vs PP | -0,87 | -1,626 | -0,114 | **0,02** |

**Figure S1. Hedge’s d distribution** for testing the hypothesis of “local is best”, performed with data from Experiment 1 at the regional scale. The null hypothesis (i.e. no local adaptation) cannot be rejected as both negative (maladaptation) and positive (local adaptation) d-values were encountered for each proxy.



**Figure S2. Hedge’s d distribution** for testing the hypothesis of “local is best”, performed with data from Experiment 2 at the population scale. The null hypothesis (i.e. no local adaptation) cannot be rejected as both negative (maladaptation) and positive (local adaptation) d-values were encountered for each proxy.

