

**Supplementary figure 1.** Thermal regimes applied during red-eye pupa development. The fluctuation thermal regime (FTR) shown in green, static thermal regime (STR) shown in blue, and control temperatures in purple.

**Supplementary figure 2**. Stages of metamorphosis at -10°C for 1-4 days, y-axis reports percent dead. Post-diapause quiescent (PDQ) pre pupa had individuals surviving at all time points. The red-eye pupa and emergence ready (ER) stage did not survive any time points at -10°C.

**Supplementary table 1.** Developmental stages included in each experiment. Columns denote developmental stage and (X) indicates that stage was included in the experiment (rows).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Pre-pupa | Larval-pupal molt | Pink-eye pupa | Red-eye pupa | Emergence ready |
| supercooling point | **x** | **x** | **x** | **x** | **x** |
| post-cold survival | **x** |  |  | **x** | **x** |
| CTmin |  |  |  | **x** |  |
| chilling recovery |  |  |  | **x** |  |
| emergence |  |  |  | **x** |  |

**Supplementary table 2.** Temperature treatments applied during development for each experiment. Columns denote the temperature regime, and rows denote the experiment.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Control | FTR | STR | -5°C | -10°C |
| post-cold survival |  |  |  | **x** | **x** |
| CTmin | **x** | **x** | **x** |  |  |
| chilling recovery | **x** | **x** | **x** |  |  |
| emergence | **x** | **x** | **x** |  |  |

**Supplementary table 3.** GLM pairwise comparisons of treatment effects on chilling recovery.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| contrast                    estimate | SE | df | z.ratio | p.value |
| X1,control - X3,control  -0.32093023 0.04117120 Inf  -7.795  <.0001 | | | | |
| X1,control - X24,control -0.60000000 0.04117120 Inf -14.573  <.0001 | | | | |
| X1,control - X1,FTR       0.13425926 0.04107579 Inf   3.269  0.0299 | | | | |
| X1,control - X3,FTR      -0.18667097 0.05815745 Inf  -3.210  0.0360 | | | | |
| X1,control - X24,FTR     -0.46574074 0.05815745 Inf  -8.008  <.0001 | | | | |
| X1,control - X1,STR       0.09624413 0.04122017 Inf   2.335  0.3209 | | | | |
| X1,control - X3,STR      -0.22468610 0.05825951 Inf  -3.857  0.0037 | | | | |
| X1,control - X24,STR     -0.50375587 0.05825951 Inf  -8.647  <.0001 | | | | |
| X3,control - X24,control -0.27906977 0.04117120 Inf  -6.778  <.0001 | | | | |
| X3,control - X1,FTR       0.45518949 0.05815745 Inf   7.827  <.0001 | | | | |
| X3,control - X3,FTR       0.13425926 0.04107579 Inf   3.269  0.0299 | | | | |
| X3,control - X24,FTR     -0.14481051 0.05815745 Inf  -2.490  0.2366 | | | | |
| X3,control - X1,STR       0.41717436 0.05825951 Inf   7.161  <.0001 | | | | |
| X3,control - X3,STR       0.09624413 0.04122017 Inf   2.335  0.3209 | | | | |
| X3,control - X24,STR     -0.18282564 0.05825951 Inf  -3.138  0.0448 | | | | |
| X24,control - X1,FTR      0.73425926 0.05815745 Inf  12.625  <.0001 | | | | |
| X24,control - X3,FTR      0.41332903 0.05815745 Inf   7.107  <.0001 | | | | |
| X24,control - X24,FTR     0.13425926 0.04107579 Inf   3.269  0.0299 | | | | |
| X24,control - X1,STR      0.69624413 0.05825951 Inf  11.951  <.0001 | | | | |
| X24,control - X3,STR      0.37531390 0.05825951 Inf   6.442  <.0001 | | | | |
| X24,control - X24,STR     0.09624413 0.04122017 Inf   2.335  0.3209 | | | | |
| X1,FTR - X3,FTR          -0.32093023 0.04117120 Inf  -7.795  <.0001 | | | | |
| X1,FTR - X24,FTR         -0.60000000 0.04117120 Inf -14.573  <.0001 | | | | |
| X1,FTR - X1,STR          -0.03801513 0.04122017 Inf  -0.922  0.9918 | | | | |
| X1,FTR - X3,STR          -0.35894536 0.05825951 Inf  -6.161  <.0001 | | | | |
| X1,FTR - X24,STR         -0.63801513 0.05825951 Inf -10.951  <.0001 | | | | |
| X3,FTR - X24,FTR         -0.27906977 0.04117120 Inf  -6.778  <.0001 | | | | |
| X3,FTR - X1,STR           0.28291510 0.05825951 Inf   4.856  <.0001 | | | | |
| X3,FTR - X3,STR          -0.03801513 0.04122017 Inf  -0.922  0.9918 | | | | |
| X3,FTR - X24,STR         -0.31708490 0.05825951 Inf  -5.443  <.0001 | | | | |
| X24,FTR - X1,STR          0.56198487 0.05825951 Inf   9.646  <.0001 | | | | |
| X24,FTR - X3,STR          0.24105464 0.05825951 Inf   4.138  0.0012 | | | | |
| X24,FTR - X24,STR        -0.03801513 0.04122017 Inf  -0.922  0.9918 | | | | |
| X1,STR - X3,STR          -0.32093023 0.04117120 Inf  -7.795  <.0001 | | | | |
| X1,STR - X24,STR         -0.60000000 0.04117120 Inf -14.573  <.0001 | | | | |
| X3,STR - X24,STR         -0.27906977 0.04117120 Inf  -6.778  <.0001 | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| treatment | N | Subset means | | |
| 1 | 2 | 3 |
| CON | 196 | 22.12 |  |  |
| STR | 77 |  | 24.64 |  |
| FTR | 164 |  |  | 25.84 |
| Sig. |  | 1.000 | 1.000 | .966 |

**Supplementary table 4.** Mean days to emergence with respect to temperature treatment applied during the red-eye stage. Means for groups in homogeneous subsets are displayed. The error term is Mean Square(Error) = 4.421. Table uses Harmonic Mean Sample Size = 123.001 at alpha 0.05.