

**Fig. S1.**  Monthly mean temperature for each sugar maple seed source used in the study for the time period 1901-2010. Monthly mean temperature was extrapolated from McKenney et al. (2011)\* climate model.

\*McKenney, D.W., Hutchinson, M.F., Papadopol, P., Lawerence, K., Pedlar, J., Campbell, K., Milewska, E., Hopinson, R.F., Price, D., & Owen, T. (2011) Customized spatial climate models for North America. American Meteorological Society, 92, 1611-1622.



**Fig. S2.** Cumulative germination by seed origin under (A) constant incubation temperature, (B) cool shifting, and (C) warm shifting by weeks stratified.



**Fig. S3**. Cumulative seed germination by (A) constant incubation temperature, (B) cool shifting, and (C) warm shifting by weeks stratified.

**Table S1.** Approximate geographical location (decimal degrees) of sugar maple seed sources used in the study.

|  |  |  |
| --- | --- | --- |
| Seed Source | Latitude | Longitude |
| Tennessee, USA | 35.78° | -83.67° |
| Kentucky, USA | 38.26° | -84.95° |
| Pennsylvania, USA | 41.13° | -77.62° |
| Sherbrooke , Canada | 45.49° | -72.17° |
| Montmagny, Canada | 46.95° | -70.46° |
| Ville-Marie, Canada | 47.33° | -79.39° |
| Rivière-du-Loup, Canada | 47.73° | -69.48° |

**Table S2.** Mean cumulative germination % by cool and warm shifting treatment differences. *Note:* To assist in brevity, here we present the difference in shifting treatments (example: a treatment initially placed at -1°C and shifted to 7°C would have a difference of +8 and reported below as so).

|  |  |  |  |
| --- | --- | --- | --- |
| Cool Shift Treatment (°C) | Mean Cumulative Germination (%) | Warm Shift Treatment (°C) | Mean Cumulative Germination (%) |
| -14 | 68.43 | +14 | 29.43 |
| -13 | 71.29 | +13 | 37.00 |
| -12 | 70.21 | +12 | 21.00 |
| -11 | 72.71 | +11 | 17.86 |
| -10 | 66.38 | +10 | 34.19 |
| -9 | 71.43 | +9 | 58.86 |
| -8 | 66.71 | +8 | 43.29 |
| -7 | 72.57 | +7 | 67.14 |
| -6 | 71.62 | +6 | 48.57 |
| -4 | 68.14 | +4 | 61.00 |

**Table S3**. Pairwise comparisons for constant incubation temperature effect on seed originating from Tennessee, USA. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C | 0°C | 1°C | 3°C | 5°C | 7°C | 9°C | 11°C |
| -1°C |  |  |  |  |  |  |  |  |
| 0°C | 0.9653 |  |  |  |  |  |  |  |
| 1°C | **<0.0001** | **<0.0001** |  |  |  |  |  |  |
| 3°C | **0.0012** | 0.0853 | **0.0011** |  |  |  |  |  |
| 5°C | 0.6248 | 0.9986 | **<0.0001** | 0.4020 |  |  |  |  |
| 7°C | 0.9945 | 1.0000 | **<0.0001** | 0.0332 | 0.9850 |  |  |  |
| 9°C | 1.0000 | 0.8254 | **<0.0001** | **0.0001** | 0.3390 | 0.9393 |  |  |
| 11°C | 0.9858 | 0.4306 | **<0.0001** | **<0.0001** | 0.0869 | 0.6292 | 0.9995 |  |
| 13°C | **0.0073** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **0.0002** | **0.0249** | 0.1539 |

**Table S4**. Paired wise comparisons for constant incubation temperature effect on seed originating from Kentucky, USA. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C | 0°C | 1°C | 3°C | 5°C | 7°C | 9°C | 11°C |
| -1°C |  |  |  |  |  |  |  |  |
| 0°C | 0.9998 |  |  |  |  |  |  |  |
| 1°C | 0.9930 | 1.0000 |  |  |  |  |  |  |
| 3°C | 0.9533 | 0.9990 | 1.0000 |  |  |  |  |  |
| 5°C | 0.6876 | 0.9387 | 0.9939 | 0.9996 |  |  |  |  |
| 7°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **0.0014** |  |  |  |
| 9°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **0.0004** | 1.0000 |  |  |
| 11°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.9546 | 0.9906 |  |
| 13°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.9026 | 0.9715 | 1.0000 |

**Table S5**. Paired wise comparisons for constant incubation temperature effect on seed originating from Pennsylvania, USA. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C | 0°C | 1°C | 3°C | 5°C | 7°C | 9°C | 11°C |
| -1°C |  |  |  |  |  |  |  |  |
| 0°C | 0.9985 |  |  |  |  |  |  |  |
| 1°C | 0.5508 | 0.1544 |  |  |  |  |  |  |
| 3°C | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |
| 5°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |
| 7°C | **<0.0001** | **<0.0001** | **<0.0001** | 0.7526 | **0.0486** |  |  |  |
| 9°C | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **0.0004** | 0.9341 |  |  |
| 11°C | **<0.0001** | **<0.0001** | **<0.0001** | 0.9089 | **0.0163** | 1.0000 | 0.9885 |  |
| 13°C | **<0.0001** | **<0.0001** | **<0.0001** | 0.9926 | **0.0031** | 0.9972 | 0.9999 | 0.9999 |

**Table S6.** Paired wise comparisons for constant incubation temperature effect on seed originating from Sherbrooke, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C | 0°C | 1°C | 3°C | 5°C | 7°C | 9°C | 11°C |
| -1°C |  |  |  |  |  |  |  |  |
| 0°C | 0.4063 |  |  |  |  |  |  |  |
| 1°C | **0.0103** | 0.8989 |  |  |  |  |  |  |
| 3°C | 0.1330 | **<0.0001** | **<0.0001** |  |  |  |  |  |
| 5°C | **0.0077** | 0.8729 | 1.0000 | **<0.0001** |  |  |  |  |
| 7°C | **<0.0001** | 0.0996 | 0.8907 | **<0.0001** | 0.9082 |  |  |  |
| 9°C | **<0.0001** | **0.0121** | 0.5025 | **<0.0001** | 0.5340 | 0.9996 |  |  |
| 11°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** |  |
| 13°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 |

**Table S7**. Paired wise comparisons for constant incubation temperature effect on seed originating from Montmagny, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C | 0°C | 1°C | 3°C | 5°C | 7°C | 9°C | 11°C |
| -1°C |  |  |  |  |  |  |  |  |
| 0°C | 0.3220 |  |  |  |  |  |  |  |
| 1°C | **<0.0001** | 0.0961 |  |  |  |  |  |  |
| 3°C | 0.5302 | **0.0004** | **<0.0001** |  |  |  |  |  |
| 5°C | **<0.0001** | 0.0599 | 1.0000 | **<0.0001** |  |  |  |  |
| 7°C | **<0.0001** | **<0.0001** | **0.0050** | **<0.0001** | **0.0088** |  |  |  |
| 9°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.3217 |  |  |
| 11°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **0.0005** | 0.5242 |  |
| 13°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.2173 | 0.9999 |

**Table S8**. Paired wise comparisons for constant incubation temperature effect on seed originating from Ville-Marie, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C | 0°C | 1°C | 3°C | 5°C | 7°C | 9°C | 11°C |
| -1°C |  |  |  |  |  |  |  |  |
| 0°C | 0.0926 |  |  |  |  |  |  |  |
| 1°C | **<0.0001** | **0.0103** |  |  |  |  |  |  |
| 3°C | 0.9974 | **0.0057** | **<0.0001** |  |  |  |  |  |
| 5°C | **<0.0001** | 0.1383 | 0.9951 | **<0.0001** |  |  |  |  |
| 7°C | **<0.0001** | **<0.0001** | 0.2408 | **<0.0001** | **0.0225** |  |  |  |
| 9°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **0.0001** |  |  |
| 11°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.8347 |  |
| 13°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.9789 | 0.9999 |

**Table S9.** Paired wise comparisons for constant incubation temperature effect on seed originating from **Rivière du Loup**, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C | 0°C | 1°C | 3°C | 5°C | 7°C | 9°C | 11°C |
| -1°C |  |  |  |  |  |  |  |  |
| 0°C | 0.9156 |  |  |  |  |  |  |  |
| 1°C | **<0.0001** | **<0.0001** |  |  |  |  |  |  |
| 3°C | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |
| 5°C | 0.9274 | 1.0000 | **<0.0001** | **<0.0001** |  |  |  |  |
| 7°C | **0.0051** | 0.2616 | **0.0098** | **<0.0001** | 0.2994 |  |  |  |
| 9°C | **<0.0001** | **<0.0001** | 0.9574 | **<0.0001** | **<0.0001** | 0.2560 |  |  |
| 11°C | **<0.0001** | **<0.0001** | 0.1245 | **<0.0001** | **<0.0001** | **<0.0001** | **0.0019** |  |
| 13°C | **<0.0001** | **<0.0001** | **0.0020** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.9365 |

**Table S10.** Paired wise comparisons for the overall warm shifting effect on seed germination. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C to 7°C | -1°C to 9°C | -1°C to 11°C | -1°C to 13°C | 0°C to7 °C | 0°C to 9 °C | 0°C to 11°C | 0 °C to 13°C | 1°C to 7°C | 1°C to 9°C | 1°C to 11°C | 1°C to 13°C | 3°C to 7°C | 3°C to 9°C | 3°C to 11°C |
| -1°C to 7°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 9°C | 0.0015 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 11°C | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 13°C | **<0.0001** | **<0.0001** | 0.9526 |  |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 7 °C | 0.0772 | 0.9999 | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 9°C | **<0.0001** | 0.9998 | **<0.0001** | **<0.0001** | 0.8633 |  |  |  |  |  |  |  |  |  |  |
| 0°C to 11°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |
| 0°C to 13°C | **<0.0001** | **0.0005** | **<0.0001** | **0.0138** | **<0.0001** | **0.0360** | **<0.0001** |  |  |  |  |  |  |  |  |
| 1°C to 7 °C | **<0.0001** | 0.9932 | **<0.0001** | **<0.0001** | 0.6465 | 1.0000 | **<0.0001** | 0.1260 |  |  |  |  |  |  |  |
| 1 °C to 9°C | **<0.0001** | **<0.0001** | **0.0258** | 0.8145 | **<0.0001** | **<0.0001** | **<0.0001** | 0.9533 | **0.0004** |  |  |  |  |  |  |
| 1°C to 11°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.9999 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |
| 1°C to 13°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.6036 | **<0.0001** | **<0.0001** | **<0.0001** | 0.9939 |  |  |  |  |
| 3°C to 7°C | **<0.0001** | 0.9932 | **<0.0001** | **<0.0001** | 0.6477 | 1.0000 | **<0.0001** | 0.1262 | 1.0000 | **0.0004** | **<0.0001** | **<0.0001** |  |  |  |
| 3°C to 9°C | **<0.0001** | **<0.0001** | 1.0000 | 1.0000 | **<0.0001** | **<0.0001** | **<0.0001** | **0.0005** | **<0.0001** | 0.2523 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |
| 3°C to 11°C | **<0.0001** | **<0.0001** | **0.0007** | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | **<0.0001** | 0.9863 | 0.2596 | **<0.0001** | **<0.0001** |  |
| 3°C to 13°C | **<0.0001** | **<0.0001** | 0.9980 | 1.0000 | **<0.0001** | **<0.0001** | **<0.0001** | **0.0020** | **<0.0001** | 0.4863 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** |

**Table S11**. Paired wise comparisons for the overall cool shifting effect on seed germination. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7°C to-1°C | 7°C to0°C | 7°C to1°C | 7 °C to 3°C | 9°C to-1°C | 9 °C to 0°C | 9°C to 1°C | 9°C to 3°C | 11°C to -1°C | 11°C to 0°C | 11°C to 1°C | 11°C to 3°C | 13°C to -1°C | 13 °C to 0°C | 13°C to 1°C |
| 7°C to -1°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 0°C | **0.0065** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 1°C | 1.0000 | **0.0262** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 3°C | 0.9969 | **<0.0001** | 0.9573 |  |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to -1°C | 1.0000 | **0.0171** | 1.0000 | 0.9804 |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to 0°C | **<0.0001** | 0.2590 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |
| 9°C to 1°C | 0.9992 | 0.2183 | 1.0000 | 0.5411 | 1.0000 | **<0.0001** |  |  |  |  |  |  |  |  |  |
| 9°C to 3°C | **0.0002** | **<0.0001** | **<0.0001** | **0.0413** | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |
| 11°C to -1°C | **0.0002** | 1.0000 | **0.0009** | **<0.0001** | **0.0005** | 0.8356 | **0.0173** | **<0.0001** |  |  |  |  |  |  |  |
| 11°C to 0°C | 1.0000 | **0.0125** | 1.0000 | 0.9899 | 1.0000 | **<0.0001** | 0.9999 | **0.0001** | **0.0004** |  |  |  |  |  |  |
| 11°C to 1°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.4596 | **<0.0001** | **<0.0001** | **0.0007** | **<0.0001** |  |  |  |  |  |
| 11°C to 3°C | **0.0427** | **<0.0001** | **0.0103** | 0.7023 | **0.0179** | **<0.0001** | **0.0004** | 0.9939 | **<0.0001** | **0.0262** | **<0.0001** |  |  |  |  |
| 13°C to -1°C | 0.1856 | 0.9996 | 0.4102 | **0.0023** | 0.3255 | **0.0098** | 0.8987 | **<0.0001** | 0.8787 | 0.2716 | **<0.0001** | **<0.0001** |  |  |  |
| 13°C to 0°C | 0.9984 | **<0.0001** | 0.9718 | 1.0000 | 0.9881 | **<0.0001** | 0.6016 | **0.0337** | **<0.0001** | 0.9942 | **<0.0001** | 0.6539 | **0.0032** |  |  |
| 13°C to 1°C | 0.9987 | **<0.0001** | 0.9747 | 1.0000 | 0.9895 | **<0.0001** | 0.6151 | **0.0310** | **<0.0001** | 0.9950 | **<0.0001** | 0.6365 | **0.0035** | 1.0000 |  |
| 13°C to 3°C | 1.0000 | **0.0076** | 1.0000 | 0.9906 | 1.0000 | **<0.0001** | 0.9997 | **<0.0001** | **0.0002** | 1.0000 | **<0.0001** | **0.0225** | 0.2127 | 0.9947 | 0.9955 |

**Table S12**. Paired wise comparisons for the warm shifting effect on seed originating from Tennessee, USA. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C to 7°C | -1°C to 9°C | -1°C to 11°C | -1°C to 13°C | 0°C to7 °C | 0°C to 9 °C | 0°C to 11°C | 0 °C to 13°C | 1°C to 7°C | 1°C to 9°C | 1°C to 11°C | 1°C to 13°C | 3°C to 7°C | 3°C to 9°C | 3°C to 11°C |
| -1°C to 7°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 9°C | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 11°C | 0.9730 | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 13°C | 0.3601 | 0.8678 | 0.9995 |  |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 7 °C | 0.2763 | **0.0355** | **0.0013** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 9°C | 1.0000 | 0.9985 | 0.8047 | 0.1199 | 0.5743 |  |  |  |  |  |  |  |  |  |  |
| 0°C to 11°C | 1.0000 | 1.0000 | 0.9686 | 0.3376 | 0.2764 | 1.0000 |  |  |  |  |  |  |  |  |  |
| 0°C to 13°C | 0.9885 | 1.0000 | 1.0000 | 0.9978 | 0.0022 | 0.8742 | 0.9862 |  |  |  |  |  |  |  |  |
| 1°C to 7 °C | 0.3865 | 0.0614 | 0.0028 | **<0.0001** | 1.0000 | 0.7025 | 0.3875 | **0.0044** |  |  |  |  |  |  |  |
| 1 °C to 9°C | 1.0000 | 0.9977 | 0.7829 | 0.1116 | 0.6351 | 1.0000 | 1.0000 | 0.8562 | 0.7560 |  |  |  |  |  |  |
| 1°C to 11°C | 0.9986 | 1.0000 | 1.0000 | 0.9860 | 0.0071 | 0.9613 | 0.9983 | 1.0000 | **0.0135** | 0.9525 |  |  |  |  |  |
| 1°C to 13°C | 0.4553 | 0.9228 | 0.9999 | 1.0000 | **<0.0001** | 0.1698 | 0.4310 | 0.9994 | **<0.0001** | 0.1585 | 0.9948 |  |  |  |  |
| 3°C to 7°C | 0.2553 | **0.0320** | **0.0012** | **<0.0001** | 1.0000 | 0.5437 | 0.2553 | **0.0019** | 1.0000 | 0.6048 | **0.0063** | **<0.0001** |  |  |  |
| 3°C to 9°C | 0.9938 | 0.7692 | 0.1980 | 0.0057 | 0.9886 | 0.9999 | 0.9943 | 0.2620 | 0.9970 | 1.0000 | 0.4427 | **0.0095** | 0.9845 |  |  |
| 3°C to 11°C | 1.0000 | 1.0000 | 0.9999 | 0.8324 | **0.0494** | 0.9994 | 1.0000 | 1.0000 | 0.0830 | 0.9990 | 1.0000 | 0.8967 | **0.0446** | 0.8246 |  |
| 3°C to 13°C | 1.0000 | 0.9991 | 0.8376 | 0.1411 | 0.5365 | 1.0000 | 1.0000 | 0.8995 | 0.6665 | 1.0000 | 0.9718 | 0.1970 | 0.5063 | 0.9999 | 0.9997 |

**Table S13.** Paired wise comparisons for the cool shifting effect on seed originating from Tennessee, USA. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7°C to-1°C | 7°C to0°C | 7°C to1°C | 7 °C to 3°C | 9°C to-1°C | 9 °C to 0°C | 9°C to 1°C | 9°C to 3°C | 11°C to -1°C | 11°C to 0°C | 11°C to 1°C | 11°C to 3°C | 13°C to -1°C | 13 °C to 0°C | 13°C to 1°C |
| 7°C to -1°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 0°C | 0.5121 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 1°C | 0.9998 | 0.9877 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 3°C | 0.0215 | 0.9987 | 0.3568 |  |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to -1°C | 1.0000 | 0.4942 | 0.9997 | **0.0198** |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to 0°C | 0.5774 | 1.0000 | 0.9930 | 0.9976 | 0.5595 |  |  |  |  |  |  |  |  |  |  |
| 9°C to 1°C | 0.7407 | 1.0000 | 0.9993 | 0.9737 | 0.7244 | 1.0000 |  |  |  |  |  |  |  |  |  |
| 9°C to 3°C | 0.0023 | 0.9467 | 0.0952 | 1.0000 | 0.0021 | 0.9289 | 0.7541 |  |  |  |  |  |  |  |  |
| 11°C to -1°C | 1.0000 | 05703 | 0.9999 | **0.0288** | 1.0000 | 0.6345 | 0.7898 | **0.0034** |  |  |  |  |  |  |  |
| 11°C to 0°C | 1.0000 | 0.9244 | 1.0000 | 0.1698 | 1.0000 | 0.9482 | 0.9872 | **0.0327** | 1.0000 |  |  |  |  |  |  |
| 11°C to 1°C | 0.0979 | 1.0000 | 0.7090 | 1.0000 | 0.0915 | 1.0000 | 0.9995 | 0.9997 | 0.1229 | 0.4557 |  |  |  |  |  |
| 11°C to 3°C | **<0.0001** | 0.0004 | **<0.0001** | **0.0355** | **<0.0001** | **0.0003** | **<0.0001** | 0.1496 | **<0.0001** | **<0.0001** | **0.0052** |  |  |  |  |
| 13°C to -1°C | 0.9997 | 0.9906 | 1.0000 | 0.3889 | 0.9996 | 0.9948 | 0.9995 | 0.1065 | 0.9999 | 1.0000 | 0.7365 | **<0.0001** |  |  |  |
| 13°C to 0°C | 0.8026 | 1.0000 | 0.9997 | 0.9641 | 0.7883 | 1.0000 | 1.0000 | 0.7204 | 0.8445 | 0.9933 | 0.9990 | **<0.0001** | 0.9998 |  |  |
| 13°C to 1°C | 1.0000 | 0.7413 | 1.0000 | 0.0600 | 1.0000 | 0.7951 | 0.9099 | **0.0082** | 1.0000 | 1.0000 | 0.2192 | **<0.0001** | 1.0000 | 0.9407 |  |
| 13°C to 3°C | **<0.0001** | 0.4557 | **0.0058** | 0.9929 | **<0.0001** | 0.4145 | 0.1893 | 1.0000 | **<0.0001** | **0.0014** | 0.8901 | 0.7405 | **0.0067** | 0.1719 | **0.0002** |

**Table S14.** Paired wise comparisons for the warm shifting effect on seed originating from Kentucky, USA. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C to 7°C | -1°C to 9°C | -1°C to 11°C | -1°C to 13°C | 0°C to7 °C | 0°C to 9 °C | 0°C to 11°C | 0 °C to 13°C | 1°C to 7°C | 1°C to 9°C | 1°C to 11°C | 1°C to 13°C | 3°C to 7°C | 3°C to 9°C | 3°C to 11°C |
| -1°C to 7°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 9°C | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 11°C | 0.9533 | 0.9973 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 13°C | **0.0080** | **0.0018** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 7 °C | 0.9998 | 1.0000 | 1.0000 | **0.0001** |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 9°C | 0.9984 | 1.0000 | 1.0000 | **<0.0001** | 1.0000 |  |  |  |  |  |  |  |  |  |  |
| 0°C to 11°C | 0.4925 | 0.2386 | **0.0043** | 0.9873 | **0.0486** | **0.0222** |  |  |  |  |  |  |  |  |  |
| 0°C to 13°C | **0.0007** | **0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | 0.8157 |  |  |  |  |  |  |  |  |
| 1°C to 7 °C | 1.0000 | 1.0000 | 0.9313 | **0.0150** | 0.9995 | 0.9964 | 0.6025 | 0.0016 |  |  |  |  |  |  |  |
| 1 °C to 9°C | 0.5201 | 0.2607 | **0.0053** | 0.9879 | 0.0563 | **0.0264** | 1.0000 | 0.8227 | 0.6283 |  |  |  |  |  |  |
| 1°C to 11°C | 0.2000 | 0.0725 | **0.0006** | 0.9999 | **0.0100** | **0.0039** | 1.0000 | 0.9776 | 0.2804 | 1.0000 |  |  |  |  |  |
| 1°C to 13°C | 0.1053 | **0.0328** | **0.0002** | 1.0000 | **0.0036** | **0.0013** | 1.0000 | 0.9943 | 0.1595 | 1.0000 | 1.0000 |  |  |  |  |
| 3°C to 7°C | 0.9997 | 0.9893 | 0.3517 | 0.2434 | 0.8244 | 0.6866 | 0.9911 | 0.0541 | 0.9999 | 0.9925 | 0.8948 | 0.7721 |  |  |  |
| 3°C to 9°C | 0.9924 | 0.9274 | 0.1662 | 0.4715 | 0.5911 | 0.4273 | 0.9996 | 0.1460 | 0.9973 | 0.9997 | 0.9810 | 0.9352 | 1.0000 |  |  |
| 3°C to 11°C | **0.0067** | **0.0014** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | 0.9822 | 1.0000 | **0.0126** | 0.9829 | 0.9997 | 1.0000 | 0.2176 | 0.4346 |  |
| 3°C to 13°C | 0.1899 | 0.0670 | **0.0005** | 0.9998 | **0.0088** | **0.0033** | 1.0000 | 0.9725 | 0.2691 | 1.0000 | 1.0000 | 1.0000 | 0.8918 | 0.9806 | 0.9996 |

**Table S15.** Paired wise comparisons for the cool shifting effect on seed originating from Kentucky, USA. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7°C to-1°C | 7°C to0°C | 7°C to1°C | 7 °C to 3°C | 9°C to-1°C | 9 °C to 0°C | 9°C to 1°C | 9°C to 3°C | 11°C to -1°C | 11°C to 0°C | 11°C to 1°C | 11°C to 3°C | 13°C to -1°C | 13 °C to 0°C | 13°C to 1°C |
| 7°C to -1°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 0°C | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 1°C | 1.0000 | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 3°C | 1.0000 | 1.0000 | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to -1°C | 0.9973 | 0.9992 | 0.9783 | 0.9996 |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to 0°C | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9813 |  |  |  |  |  |  |  |  |  |  |
| 9°C to 1°C | 0.9983 | 0.9965 | 1.0000 | 0.9942 | 0.5206 | 1.0000 |  |  |  |  |  |  |  |  |  |
| 9°C to 3°C | 0.9369 | 0.9674 | 0.8160 | 0.9780 | 1.0000 | 0.8327 | 0.2039 |  |  |  |  |  |  |  |  |
| 11°C to -1°C | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9839 | 1.0000 | 0.9999 | 0.8438 |  |  |  |  |  |  |  |
| 11°C to 0°C | 0.9925 | 0.9972 | 0.9563 | 0.9985 | 1.0000 | 0.9618 | 0.4276 | 1.0000 | 0.9662 |  |  |  |  |  |  |
| 11°C to 1°C | 0.9945 | 0.9902 | 0.9997 | 0.9854 | 0.4360 | 0.9998 | 1.0000 | 0.1578 | 0.9996 | 0.3504 |  |  |  |  |  |
| 11°C to 3°C | 0.9995 | 0.9988 | 1.0000 | 0.9978 | 0.6142 | 1.0000 | 1.0000 | 0.2710 | 1.0000 | 0.5198 | 1.0000 |  |  |  |  |
| 13°C to -1°C | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9102 | 1.0000 | 1.0000 | 0.6247 | 1.0000 | 0.8559 | 1.0000 | 1.0000 |  |  |  |
| 13°C to 0°C | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9997 | 1.0000 | 0.9912 | 0.9819 | 1.0000 | 0.9989 | 0.9791 | 0.9965 | 1.0000 |  |  |
| 13°C to 1°C | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 0.9896 | 1.0000 | 0.9998 | 0.8726 | 1.0000 | 0.9764 | 0.9989 | 0.9999 | 1.0000 | 1.0000 |  |
| 13°C to 3°C | 0.1396 | 0.1218 | 0.3105 | 0.1047 | **0.0020** | 0.3217 | 0.8928 | **0.0002** | 0.2950 | **0.0012** | 0.9525 | 0.8459 | 0.5143 | 0.0855 | 0.2232 |

**Table S16.** Paired wise comparisons for the warm shifting effect on seed originating from Pennsylvania, USA. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C to 7°C | -1°C to 9°C | -1°C to 11°C | -1°C to 13°C | 0°C to7 °C | 0°C to 9 °C | 0°C to 11°C | 0 °C to 13°C | 1°C to 7°C | 1°C to 9°C | 1°C to 11°C | 1°C to 13°C | 3°C to 7°C | 3°C to 9°C | 3°C to 11°C |
| -1°C to 7°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 9°C | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 11°C | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 13°C | **<0.0001** | **<0.0001** | 0.9149 |  |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 7 °C | 0.9122 | 0.9844 | **0.0030** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 9°C | 0.9917 | 0.9203 | **<0.0001** | **<0.0001** | 0.0975 |  |  |  |  |  |  |  |  |  |  |
| 0°C to 11°C | **<0.0001** | **<0.0001** | 0.9526 | 1.0000 | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |
| 0°C to 13°C | **<0.0001** | **<0.0001** | 0.6629 | 1.0000 | **<0.0001** | **<0.0001** | 1.0000 |  |  |  |  |  |  |  |  |
| 1°C to 7 °C | **0.0011** | **0.0036** | 0.9732 | 0.0612 | 0.41000 | **<0.0001** | 0.0899 | **0.0141** |  |  |  |  |  |  |  |
| 1 °C to 9°C | **<0.0001** | **<0.0001** | 0.9598 | 1.0000 | **<0.0001** | **<0.0001** | 1.0000 | 1.0000 | 0.0981 |  |  |  |  |  |  |
| 1°C to 11°C | **<0.0001** | **<0.0001** | 0.9944 | 1.0000 | **<0.0001** | **<0.0001** | 1.0000 | 0.9999 | 0.2108 | 1.0000 |  |  |  |  |  |
| 1°C to 13°C | **<0.0001** | **<0.0001** | 0.3086 | 0.9999 | **<0.0001** | **<0.0001** | 0.9996 | 1.0000 | **0.0020** | 0.9995 | 0.9908 |  |  |  |  |
| 3°C to 7°C | **<0.0001** | **<0.0001** | 1.0000 | 0.8012 | **0.0100** | **<0.0001** | 0.8689 | 0.4872 | 0.9959 | 0.8833 | 0.9716 | 0.1858 |  |  |  |
| 3°C to 9°C | **<0.0001** | **<0.0001** | 0.7862 | 1.0000 | **<0.0001** | **<0.0001** | 1.0000 | 1.0000 | **0.0266** | 1.0000 | 1.0000 | 1.0000 | 0.6233 |  |  |
| 3°C to 11°C | **<0.0001** | **<0.0001** | 0.7317 | 1.0000 | **<0.0001** | **<0.0001** | 1.0000 | 1.0000 | **0.0195** | 1.0000 | 1.0000 | 1.0000 | 0.5596 | 1.0000 |  |
| 3°C to 13°C | **<0.0001** | **<0.0001** | 0.9815 | 1.0000 | **<0.0001** | **<0.0001** | 1.0000 | 1.0000 | 0.1377 | 1.0000 | 1.0000 | 0.9976 | 0.9325 | 1.0000 | 1.0000 |

**Table S17.** Paired wise comparisons for the cool shifting effect on seed originating from Pennsylvania, USA. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7°C to-1°C | 7°C to0°C | 7°C to1°C | 7 °C to 3°C | 9°C to-1°C | 9 °C to 0°C | 9°C to 1°C | 9°C to 3°C | 11°C to -1°C | 11°C to 0°C | 11°C to 1°C | 11°C to 3°C | 13°C to -1°C | 13 °C to 0°C | 13°C to 1°C |
| 7°C to -1°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 0°C | 0.8252 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 1°C | 0.9107 | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 3°C | **<0.0001** | **0.0226** | **0.0135** |  |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to -1°C | 1.0000 | 0.9562 | 0.9847 | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to 0°C | 0.6658 | 1.0000 | 1.0000 | 0.0529 | 0.8733 |  |  |  |  |  |  |  |  |  |  |
| 9°C to 1°C | 0.0739 | 0.9961 | 0.9873 | 0.5827 | 0.1835 | 0.9997 |  |  |  |  |  |  |  |  |  |
| 9°C to 3°C | **0.0036** | 0.7555 | 0.6470 | 0.9756 | **0.0134** | 0.8922 | 1.0000 |  |  |  |  |  |  |  |  |
| 11°C to -1°C | 0.9999 | 0.1947 | 0.2987 | **<0.0001** | 0.9963 | 0.1036 | **0.0023** | **<0.0001** |  |  |  |  |  |  |  |
| 11°C to 0°C | 0.9993 | 0.1163 | 0.1929 | **<0.0001** | 0.9863 | 0.0567 | **0.0009** | **<0.0001** | 1.0000 |  |  |  |  |  |  |
| 11°C to 1°C | **<0.0001** | **<0.0001** | **<0.0001** | 0.3030 | **<0.0001** | **<0.0001** | **<0.0001** | **0.0018** | **<0.0001** | **<0.0001** |  |  |  |  |  |
| 11°C to 3°C | **<0.0001** | **<0.0001** | **<0.0001** | 0.8379 | **<0.0001** | **<0.0001** | **0.0018** | **0.0361** | **<0.0001** | **<0.0001** | 1.0000 |  |  |  |  |
| 13°C to -1°C | 0.4186 | 1.0000 | 1.0000 | 0.1373 | 0.6713 | 1.0000 | 1.0000 | 0.9785 | 0.0377 | **0.0184** | **<0.0001** | **<0.0001** |  |  |  |
| 13°C to 0°C | 1.0000 | 0.9883 | 0.9972 | **<0.0001** | 1.0000 | 0.9496 | 0.2872 | **0.0260** | 0.9737 | 0.9320 | **<0.0001** | **<0.0001** | 0.8110 |  |  |
| 13°C to 1°C | 0.9569 | 1.0000 | 1.0000 | **0.0047** | 0.9954 | 1.0000 | 0.9530 | 0.4638 | 0.3898 | 0.2629 | **<0.0001** | **<0.0001** | 0.9999 | 0.9995 |  |
| 13°C to 3°C | **<0.0001** | **0.0006** | **0.0003** | 0.9999 | **<0.0001** | 0.0018 | 0.0838 | 0.4959 | **<0.0001** | **<0.0001** | 0.9066 | 0.9996 | **0.0069** | **<0.0001** | **<0.0001** |

**Table S18.** Paired wise comparisons for the warm shifting effect on seed originating from Sherbrooke, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C to 7°C | -1°C to 9°C | -1°C to 11°C | -1°C to 13°C | 0°C to7 °C | 0°C to 9 °C | 0°C to 11°C | 0 °C to 13°C | 1°C to 7°C | 1°C to 9°C | 1°C to 11°C | 1°C to 13°C | 3°C to 7°C | 3°C to 9°C | 3°C to 11°C |
| -1°C to 7°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 9°C | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 11°C | **<0.0001** | **0.0028** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 13°C | 0.8443 | 0.9994 | 0.0898 |  |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 7 °C | 0.5842 | 0.9791 | 0.4402 | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 9°C | 0.0028 | 0.0666 | 1.0000 | 0.5885 | 0.9459 |  |  |  |  |  |  |  |  |  |  |
| 0°C to 11°C | **<0.0001** | **<0.0001** | 0.9811 | **0.0002** | **0.0064** | 0.5795 |  |  |  |  |  |  |  |  |  |
| 0°C to 13°C | 1.0000 | 1.0000 | **0.0008** | 0.9965 | 0.9402 | **0.0283** | **<0.0001** |  |  |  |  |  |  |  |  |
| 1°C to 7 °C | 0.2831 | 0.8524 | 0.7475 | 0.9999 | 1.0000 | 0.9962 | **0.0291** | 0.7256 |  |  |  |  |  |  |  |
| 1 °C to 9°C | 0.4059 | 0.9306 | 0.5852 | 1.0000 | 1.0000 | 0.9819 | **0.0126** | 0.8453 | 1.0000 |  |  |  |  |  |  |
| 1°C to 11°C | **<0.0001** | **<0.0001** | 0.9509 | **<0.0001** | **0.0035** | 0.4552 | 1.0000 | **<0.0001** | **0.0171** | **0.0071** |  |  |  |  |  |
| 1°C to 13°C | **<0.0001** | **<0.0001** | **0.0204** | **<0.0001** | **<0.0001** | **0.0007** | 0.7183 | **<0.0001** | **<0.0001** | **<0.0001** | 0.8403 |  |  |  |  |
| 3°C to 7°C | 0.1477 | 0.6824 | 0.8892 | 0.9979 | 1.0000 | 0.9997 | 0.0654 | 0.5164 | 1.0000 | 1.0000 | **0.0403** | **<0.0001** |  |  |  |
| 3°C to 9°C | **0.0047** | 0.0910 | 1.0000 | 0.6575 | 0.9635 | 1.0000 | 0.5654 | **0.0414** | 0.9980 | 0.9890 | 0.4433 | **0.0007** | 0.9999 |  |  |
| 3°C to 11°C | **<0.0001** | **<0.0001** | 0.1481 | **<0.0001** | **<0.0001** | **0.0102** | 0.9768 | **<0.0001** | **<0.0001** | **<0.0001** | 0.9936 | 1.0000 | **0.0002** | **0.0103** |  |
| 3°C to 13°C | 0.5325 | 0.9794 | 0.2378 | 1.0000 | 1.0000 | 0.8482 | **0.0011** | 0.9360 | 1.0000 | 1.0000 | **0.0006** | **<0.0001** | 1.0000 | 0.8889 | **<0.0001** |

**Table S19.** Paired wise comparisons for the cool shifting effect on seed originating from Sherbrooke, Canada. Significant differences in bold (Fleming-Harrington, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7°C to-1°C | 7°C to0°C | 7°C to1°C | 7 °C to 3°C | 9°C to-1°C | 9 °C to 0°C | 9°C to 1°C | 9°C to 3°C | 11°C to -1°C | 11°C to 0°C | 11°C to 1°C | 11°C to 3°C | 13°C to -1°C | 13 °C to 0°C | 13°C to 1°C |
| 7°C to -1°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 0°C | 0.0514 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 1°C | 1.0000 | **0.0219** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 3°C | 0.5349 | **<0.0001** | 0.7144 |  |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to -1°C | 1.0000 | 0.0354 | 1.0000 | 0.6343 |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to 0°C | **0.0002** | 0.9943 | **<0.0001** | **<0.0001** | **0.0001** |  |  |  |  |  |  |  |  |  |  |
| 9°C to 1°C | 1.0000 | 0.2184 | 1.0000 | 0.1584 | 1.0000 | **0.0022** |  |  |  |  |  |  |  |  |  |
| 9°C to 3°C | **0.0135** | **<0.0001** | **0.0317** | 0.9937 | **0.0221** | **<0.0001** | **0.0010** |  |  |  |  |  |  |  |  |
| 11°C to -1°C | 0.0898 | 1.0000 | **0.0411** | **<0.0001** | 0.0638 | 0.9816 | 0.3247 | **<0.0001** |  |  |  |  |  |  |  |
| 11°C to 0°C | 0.5946 | **<0.0001** | 0.7653 | 1.0000 | 0.6905 | **<0.0001** | 0.1948 | 0.9911 | **<0.0001** |  |  |  |  |  |  |
| 11°C to 1°C | **0.0001** | 0.9876 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **0.0012** | **<0.0001** | 0.9652 | **<0.0001** |  |  |  |  |  |
| 11°C to 3°C | **0.0076** | **<0.0001** | **0.0192** | 0.9893 | **0.0130** | **<0.0001** | **0.0004** | 1.0000 | **<0.0001** | 0.9853 | **<0.0001** |  |  |  |  |
| 13°C to -1°C | 1.0000 | 0.1677 | 1.0000 | 0.2320 | 1.0000 | **0.0014** | 1.0000 | **0.0021** | 0.2580 | 0.2779 | **0.0007** | **0.0010** |  |  |  |
| 13°C to 0°C | 0.9890 | **0.0001** | 0.9985 | 0.9998 | 0.9958 | **<0.0001** | 0.8099 | 0.5711 | **0.0003** | 0.9999 | **<0.0001** | 0.4900 | 0.8865 |  |  |
| 13°C to 1°C | 0.7349 | **<0.0001** | 0.8734 | 1.0000 | 0.8159 | **<0.0001** | 0.2999 | 0.9665 | **<0.0001** | 1.0000 | **<0.0001** | 0.9490 | 0.4038 | 1.0000 |  |
| 13°C to 3°C | 0.9826 | **<0.0001** | 0.9973 | 0.9999 | 0.9929 | **<0.0001** | 0.7591 | 0.5584 | **0.0002** | 0.9999 | **<0.0001** | 0.4757 | 0.8493 | 1.0000 | 1.0000 |

**Table S20.** Paired wise comparisons for the warm shifting effect on seed originating from Montmagny, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C to 7°C | -1°C to 9°C | -1°C to 11°C | -1°C to 13°C | 0°C to7 °C | 0°C to 9 °C | 0°C to 11°C | 0 °C to 13°C | 1°C to 7°C | 1°C to 9°C | 1°C to 11°C | 1°C to 13°C | 3°C to 7°C | 3°C to 9°C | 3°C to 11°C |
| -1°C to 7°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 9°C | **0.0155** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 11°C | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 13°C | **<0.0001** | 0.1357 | **0.0180** |  |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 7 °C | **0.0051** | 1.0000 | **<0.0001** | 0.4400 |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 9°C | **0.0017** | 1.0000 | **<0.0001** | 0.5248 | 1.0000 |  |  |  |  |  |  |  |  |  |  |
| 0°C to 11°C | **<0.0001** | **<0.0001** | 0.9893 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |
| 0°C to 13°C | 0.2379 | 0.9997 | **<0.0001** | **0.0020** | 0.9876 | 0.9579 | **<0.0001** |  |  |  |  |  |  |  |  |
| 1°C to 7 °C | **0.0002** | 0.9992 | **<0.0001** | 0.9077 | 1.0000 | 1.0000 | **<0.0001** | 0.7162 |  |  |  |  |  |  |  |
| 1 °C to 9°C | **<0.0001** | 0.2186 | **0.0245** | 1.0000 | 0.5635 | 0.6471 | **<0.0001** | **0.0057** | 0.9490 |  |  |  |  |  |  |
| 1°C to 11°C | **<0.0001** | **<0.0001** | 0.4201 | **<0.0001** | **<0.0001** | **<0.0001** | 0.9991 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |
| 1°C to 13°C | **<0.0001** | **<0.0001** | 0.5535 | **<0.0001** | **<0.0001** | **<0.0001** | 0.9999 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 |  |  |  |  |
| 3°C to 7°C | **<0.0001** | 0.9938 | **<0.0001** | 0.9727 | 0.9999 | 1.0000 | **<0.0001** | 0.5402 | 1.0000 | 0.9871 | **<0.0001** | **<0.0001** |  |  |  |
| 3°C to 9°C | **<0.0001** | **0.0001** | 0.9543 | 0.8522 | **0.0021** | **0.0028** | 0.1398 | **<0.0001** | 0.0292 | 0.8622 | **0.0028** | **0.0058** | 0.0643 |  |  |
| 3°C to 11°C | **<0.0001** | **<0.0001** | 0.7986 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | 1.0000 | **<0.0001** | **0.0216** |  |
| 3°C to 13°C | **<0.0001** | **<0.0001** | 0.9487 | 0.7889 | **0.0009** | **0.0012** | 0.1156 | **<0.0001** | **0.0161** | 0.8042 | **0.0018** | **0.0038** | 0.0388 | 1.0000 | 0.**0156** |

**Table S21.** Paired wise comparisons for the cool shifting effect on seed originating from Montmagny, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7°C to-1°C | 7°C to0°C | 7°C to1°C | 7 °C to 3°C | 9°C to-1°C | 9 °C to 0°C | 9°C to 1°C | 9°C to 3°C | 11°C to -1°C | 11°C to 0°C | 11°C to 1°C | 11°C to 3°C | 13°C to -1°C | 13 °C to 0°C | 13°C to 1°C |
| 7°C to -1°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 0°C | **0.0011** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 1°C | 1.0000 | **0.0263** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 3°C | 0.9241 | **<0.0001** | 0.4059 |  |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to -1°C | 1.0000 | **0.0019** | 1.0000 | 0.8664 |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to 0°C | **<0.0001** | 0.7298 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |
| 9°C to 1°C | 1.0000 | **<0.0001** | 0.9913 | 0.9982 | 1.0000 | **<0.0001** |  |  |  |  |  |  |  |  |  |
| 9°C to 3°C | **<0.0001** | **<0.0001** | **<0.0001** | 0.1144 | **<0.0001** | **<0.0001** | **0.0011** |  |  |  |  |  |  |  |  |
| 11°C to -1°C | **0.0081** | 1.0000 | 0.1134 | **<0.0001** | **0.0128** | 0.3894 | **0.0005** | **<0.0001** |  |  |  |  |  |  |  |
| 11°C to 0°C | 1.0000 | **0.0014** | 1.0000 | 0.9209 | 1.0000 | **<0.0001** | 1.0000 | **<0.0001** | **0.0094** |  |  |  |  |  |  |
| 11°C to 1°C | **<0.0001** | 0.9069 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | 0.6318 | **<0.0001** |  |  |  |  |  |
| 11°C to 3°C | **0.0476** | **<0.0001** | **0.0018** | 0.9723 | **0.0283** | **<0.0001** | 0.2321 | 0.9472 | **<0.0001** | **0.0476** | **<0.0001** |  |  |  |  |
| 13°C to -1°C | 0.7529 | 0.6251 | 0.9952 | 0.0089 | 0.8308 | **0.0009** | 0.3106 | **<0.0001** | 0.9047 | 0.7727 | **0.0034** | **<0.0001** |  |  |  |
| 13°C to 0°C | 0.9826 | **<0.0001** | 0.6144 | 1.0000 | 0.9605 | **<0.0001** | 0.9999 | **0.0470** | **<0.0001** | 0.9814 | **<0.0001** | 0.8863 | **0.0247** |  |  |
| 13°C to 1°C | 0.3715 | **<0.0001** | 0.0464 | 1.0000 | 0.2782 | **<0.0001** | 0.7767 | 0.6666 | **<0.0001** | 0.3687 | **<0.0001** | 1.0000 | **0.0002** | 0.9990 |  |
| 13°C to 3°C | 0.9928 | **<0.0001** | 0.6863 | 1.0000 | 0.9803 | **<0.0001** | 1.0000 | 0.0142 | **<0.0001** | 0.9921 | **<0.0001** | 0.7272 | **0.0293** | 1.0000 | 0.9923 |

**Table S22.** Paired wise comparisons for the warm shifting effect on seed originating from Ville-Marie, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C to 7°C | -1°C to 9°C | -1°C to 11°C | -1°C to 13°C | 0°C to7 °C | 0°C to 9 °C | 0°C to 11°C | 0 °C to 13°C | 1°C to 7°C | 1°C to 9°C | 1°C to 11°C | 1°C to 13°C | 3°C to 7°C | 3°C to 9°C | 3°C to 11°C |
| -1°C to 7°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 9°C | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 11°C | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 13°C | **<0.0001** | 0.8167 | **0.0167** |  |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 7 °C | 0.8554 | 0.0980 | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 9°C | 0.0805 | 0.8211 | **<0.0001** | **0.0038** | 0.9976 |  |  |  |  |  |  |  |  |  |  |
| 0°C to 11°C | **<0.0001** | **<0.0001** | 0.9920 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |
| 0°C to 13°C | **<0.0001** | 1.0000 | **<0.0001** | 0.7205 | 0.0724 | 0.7956 | **<0.0001** |  |  |  |  |  |  |  |  |
| 1°C to 7 °C | **0.0009** | 1.0000 | **<0.0001** | 0.2953 | 0.5192 | 0.9975 | **<0.0001** | 1.0000 |  |  |  |  |  |  |  |
| 1 °C to 9°C | **<0.0001** | 0.0398 | 0.8036 | 0.9659 | **<0.0001** | **<0.0001** | 0.0531 | **0.0195** | **0.0029** |  |  |  |  |  |  |
| 1°C to 11°C | **<0.0001** | **<0.0001** | 0.8373 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | **0.0067** |  |  |  |  |  |
| 1°C to 13°C | **<0.0001** | **<0.0001** | 0.9802 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | **0.0342** | 1.0000 |  |  |  |  |
| 3°C to 7°C | **0.0027** | 0.9999 | **<0.0001** | 0.1807 | 0.6936 | 0.9998 | **<0.0001** | 0.9999 | 1.0000 | **0.0012** | **<0.0001** | **<0.0001** |  |  |  |
| 3°C to 9°C | **<0.0001** | **<0.0001** | 1.0000 | **0.0049** | **<0.0001** | **<0.0001** | 0.9998 | **<0.0001** | **<0.0001** | 0.5726 | 0.9678 | 0.9990 | **<0.0001** |  |  |
| 3°C to 11°C | **<0.0001** | **<0.0001** | 0.9998 | **0.0002** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | 0.1625 | 0.9999 | 1.0000 | **<0.0001** | 1.0000 |  |
| 3°C to 13°C | **<0.0001** | 0.0341 | 0.7125 | 0.9695 | **<0.0001** | **<0.0001** | 0.0292 | 0.0158 | **0.0021** | 1.0000 | **0.0030** | **0.0179** | **0.0009** | 0.4597 | 0.1035 |

**Table S23.** Paired wise comparisons for the cool shifting effect on seed originating from Ville-Marie, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7°C to-1°C | 7°C to0°C | 7°C to1°C | 7 °C to 3°C | 9°C to-1°C | 9 °C to 0°C | 9°C to 1°C | 9°C to 3°C | 11°C to -1°C | 11°C to 0°C | 11°C to 1°C | 11°C to 3°C | 13°C to -1°C | 13 °C to 0°C | 13°C to 1°C |
| 7°C to -1°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 0°C | 0.1305 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 1°C | 0.2787 | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 3°C | 0.1497 | **<0.0001** | 1.0000 |  |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to -1°C | 0.9950 | **0.0012** | 0.9889 | 0.9470 |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to 0°C | **<0.0001** | 0.2747 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |
| 9°C to 1°C | 0.9890 | 0.9498 | **0.0024** | **0.0008** | 0.2935 | **0.0006** |  |  |  |  |  |  |  |  |  |
| 9°C to 3°C | **0.0001** | **<0.0001** | 0.8132 | 0.9388 | 0.0443 | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |
| 11°C to -1°C | **<0.0001** | 0.4703 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **0.0024** | **<0.0001** |  |  |  |  |  |  |  |
| 11°C to 0°C | 1.0000 | 0.1072 | 0.3433 | 0.1942 | 0.9978 | **<0.0001** | 0.9813 | **0.0002** | **<0.0001** |  |  |  |  |  |  |
| 11°C to 1°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.5078 | **<0.0001** | **<0.0001** | 0.3156 | **<0.0001** |  |  |  |  |  |
| 11°C to 3°C | 0.3365 | **<0.0001** | 1.0000 | 1.0000 | 0.9966 | **<0.0001** | **0.0027** | 0.5779 | **<0.0001** | 0.4098 | **<0.0001** |  |  |  |  |
| 13°C to -1°C | 0.2941 | 1.0000 | **<0.0001** | **<0.0001** | 0.0047 | 0.1025 | 0.9947 | **<0.0001** | 0.2174 | 0.2509 | **<0.0001** | **<0.0001** |  |  |  |
| 13°C to 0°C | 1.0000 | 0.5348 | **0.0487** | **0.0203** | 0.8362 | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | 0.0596 | 0.7841 |  |  |
| 13°C to 1°C | 0.9999 | **0.0059** | 0.9029 | 0.7629 | 1.0000 | **<0.0001** | 0.5739 | **0.0101** | **<0.0001** | 1.0000 | **<0.0001** | 0.9465 | **0.0208** | 0.9703 |  |
| 13°C to 3°C | 0.1143 | 1.0000 | **<0.0001** | **<0.0001** | 0.0007 | 0.1807 | 0.9524 | **<0.0001** | 0.3476 | 0.0927 | **<0.0001** | **<0.0001** | 1.0000 | 0.5195 | **0.0042** |

**Table S24.** Paired wise comparisons for the warm shifting effect on seed originating from Rivière-du-Loup, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | -1°C to 7°C | -1°C to 9°C | -1°C to 11°C | -1°C to 13°C | 0°C to7 °C | 0°C to 9 °C | 0°C to 11°C | 0 °C to 13°C | 1°C to 7°C | 1°C to 9°C | 1°C to 11°C | 1°C to 13°C | 3°C to 7°C | 3°C to 9°C | 3°C to 11°C |
| -1°C to 7°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 9°C | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 11°C | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| -1°C to 13°C | **<0.0001** | **0.0031** | 0.4409 |  |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 7 °C | **<0.0001** | 0.9996 | **<0.0001** | 0.2043 |  |  |  |  |  |  |  |  |  |  |  |
| 0°C to 9°C | **<0.0001** | 0.9863 | **<0.0001** | 0.3998 | 1.0000 |  |  |  |  |  |  |  |  |  |  |
| 0°C to 11°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |
| 0°C to 13°C | **<0.0001** | 1.0000 | **<0.0001** | **0.0441** | 1.0000 | 1.0000 | **<0.0001** |  |  |  |  |  |  |  |  |
| 1°C to 7 °C | **<0.0001** | 0.3794 | **0.0177** | 0.9944 | 0.9831 | 0.99988 | **<0.0001** | 0.8655 |  |  |  |  |  |  |  |
| 1 °C to 9°C | **<0.0001** | **<0.0001** | 0.9938 | 0.9993 | **0.0111** | **0.0315** | **<0.0001** | **0.0010** | 0.5921 |  |  |  |  |  |  |
| 1°C to 11°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |
| 1°C to 13°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 |  |  |  |  |
| 3°C to 7°C | **<0.0001** | 0.9390 | 0.0004 | 0.6620 | 1.0000 | 1.0000 | **<0.0001** | 0.9998 | 1.0000 | 0.0952 | **<0.0001** | **<0.0001** |  |  |  |
| 3°C to 9°C | **<0.0001** | **<0.0001** | 0.9746 | **0.0047** | **<0.0001** | **<0.0001** | **0.0075** | **<0.0001** | **<0.0001** | 0.2365 | **0.0017** | **0.0077** | **<0.0001** |  |  |
| 3°C to 11°C | **<0.0001** | **<0.0001** | 0.1352 | **<0.0001** | **<0.0001** | **<0.0001** | 0.5275 | **<0.0001** | **<0.0001** | 0.0015 | 0.2795 | 0.5300 | **<0.0001** | 0.9824 |  |
| 3°C to 13°C | **<0.0001** | **<0.0001** | 0.9972 | 0.9949 | **0.0028** | **0.0093** | **<0.0001** | **0.0002** | 0.3914 | 1.0000 | **<0.0001** | **<0.0001** | **0.0363** | 0.2508 | **0.0013** |

**Table S25.** Paired wise comparisons for the cool shifting effect on seed originating from Rivière-du-Loup, Canada. Significant differences in bold (Fleming-Harrington test, α ≤ 0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7°C to-1°C | 7°C to0°C | 7°C to1°C | 7 °C to 3°C | 9°C to-1°C | 9 °C to 0°C | 9°C to 1°C | 9°C to 3°C | 11°C to -1°C | 11°C to 0°C | 11°C to 1°C | 11°C to 3°C | 13°C to -1°C | 13 °C to 0°C | 13°C to 1°C |
| 7°C to -1°C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 0°C | **0.0009** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 1°C | 1.0000 | **0.0078** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7°C to 3°C | 1.0000 | **<0.0001** | 0.9916 |  |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to -1°C | 0.9036 | 0.3691 | 0.9956 | 0.3249 |  |  |  |  |  |  |  |  |  |  |  |
| 9°C to 0°C | **<0.0001** | 0.2756 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |  |  |
| 9°C to 1°C | 1.0000 | **0.0133** | 1.0000 | 0.9784 | 0.9987 | **<0.0001** |  |  |  |  |  |  |  |  |  |
| 9°C to 3°C | **0.0023** | **<0.0001** | 0.0002 | 0.0575 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |  |  |  |  |
| 11°C to -1°C | **<0.0001** | 1.0000 | 0.0001 | **<0.0001** | **0.0345** | 0.8745 | **0.0003** | **<0.0001** |  |  |  |  |  |  |  |
| 11°C to 0°C | **0.0001** | 1.0000 | 0.0015 | **<0.0001** | 0.1541 | 0.5420 | **0.0027** | **<0.0001** | 1.0000 |  |  |  |  |  |  |
| 11°C to 1°C | **<0.0001** | 0.0319 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **<0.0001** | 0.3472 | 0.1043 |  |  |  |  |  |
| 11°C to 3°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.7876 | **<0.0001** | **<0.0001** | **<0.0001** |  |  |  |  |
| 13°C to -1°C | 0.2624 | 0.9519 | 0.6328 | **0.0205** | 0.9999 | 0.0007 | 0.7341 | **<0.0001** | 0.4141 | 0.7824 | **<0.0001** | **<0.0001** |  |  |  |
| 13°C to 0°C | 0.7967 | **<0.0001** | 0.4067 | 0.9985 | 0.0900 | **<0.0001** | 0.3096 | 0.6978 | **<0.0001** | **<0.0001** | **<0.0001** | **0.0016** | **0.0001** |  |  |
| 13°C to 1°C | 0.9994 | **<0.0001** | 0.9630 | 1.0000 | 0.1948 | **<0.0001** | 0.9261 | 0.1215 | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **0.0087** | 0.9999 |  |
| 13°C to 3°C | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | **<0.0001** | 0.9684 | **<0.0001** | **<0.0001** | **<0.0001** | 1.0000 | **<0.0001** | **0.0124** | **0.0002** |