

Figure S1 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -1.7787$, 95% confidence interval from -1.8328 to -1.7245, $Q (df=19) = 462.6090$, $p < 0.0001$, $I^2 = 95.89\%$. Panel B shows the results from the random-effects model, $E = -1.6679$, 95% confidence interval from -1.9695 to -1.3663, $Q (df=19) = 462.6090$, $p < 0.0001$, $I^2 = 96.71\%$). The results indicate that, under both the random-effects and fixed-effects models, the first instar larval development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

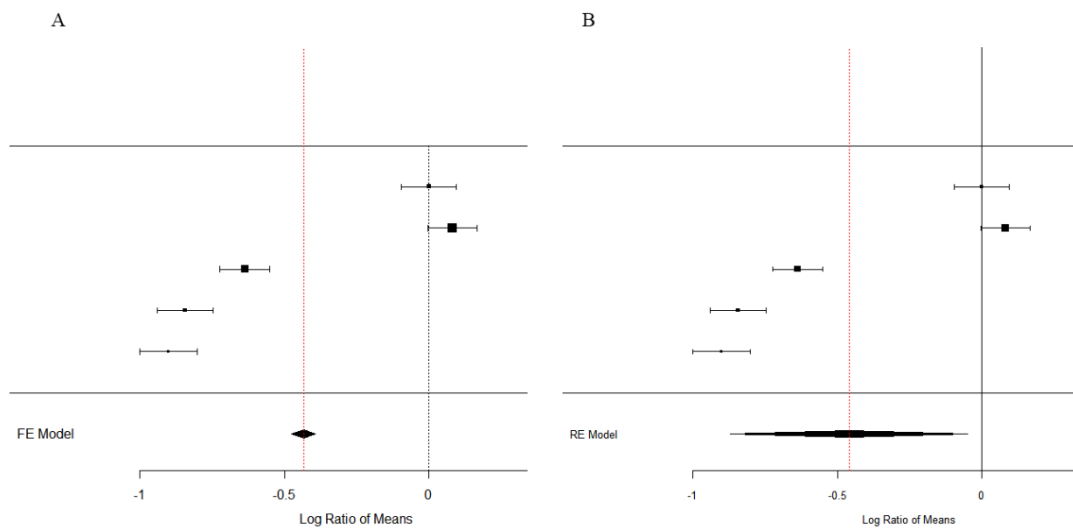


Figure S2 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -1.3156$, 95% confidence interval from -1.3156 to -1.2378, $Q (df=19) = 167.9342$, $p < 0.0001$, $I^2 = 88.69\%$. Panel B shows the results from the random-effects model, $E = -1.3114$, 95% confidence interval from -1.5628 to -1.0600, $Q (df=19) = 167.9342$, $p < 0.0001$, $I^2 = 90.00\%$). The results indicate that, under both the random-effects and fixed-effects models, the second instar larval development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

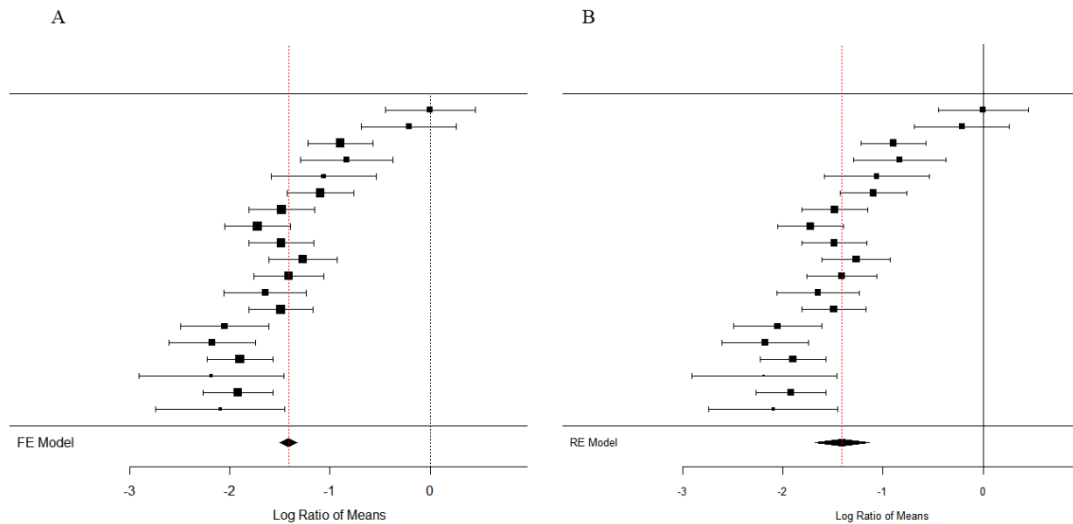


Figure S3 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -1.4120$, 95% confidence interval from -1.5000 to -1.3240 , $Q(df = 18) = 134.8382$, $p < 0.0001$, $I^2 = 86.65\%$. Panel B shows the results from the random-effects model, $E = -1.4094$, 95% confidence interval from -1.6807 to -1.1381 , $Q(df = 18) = 134.8382$, $p < 0.0001$, $I^2 = 89.17\%$). The results indicate that, under both the random-effects and fixed-effects models, the third instar larval development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

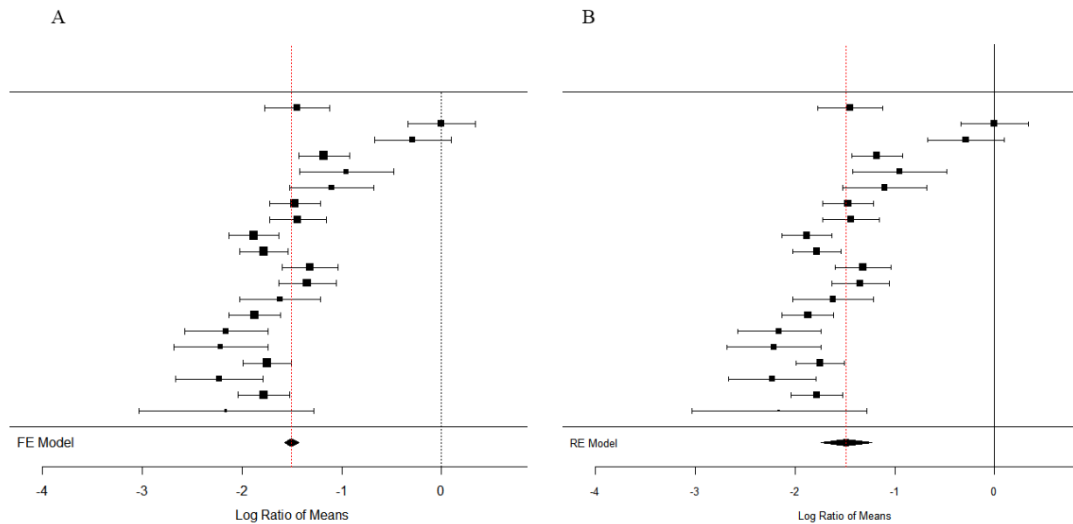


Figure S4 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -1.5018$, 95% confidence interval from -1.5714 to -1.4321, $Q(df = 19) = 192.8081$, $p < 0.0001$, $I^2 = 90.15\%$. Panel B shows the results from the random-effects model, $E = -1.4876$, 95% confidence interval from -1.7433 to -1.2318, $Q(df = 19) = 192.8081$, $p < 0.0001$, $I^2 = 92.27\%$). The results indicate that, under both the random-effects and fixed-effects models, the fourth instar larval development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

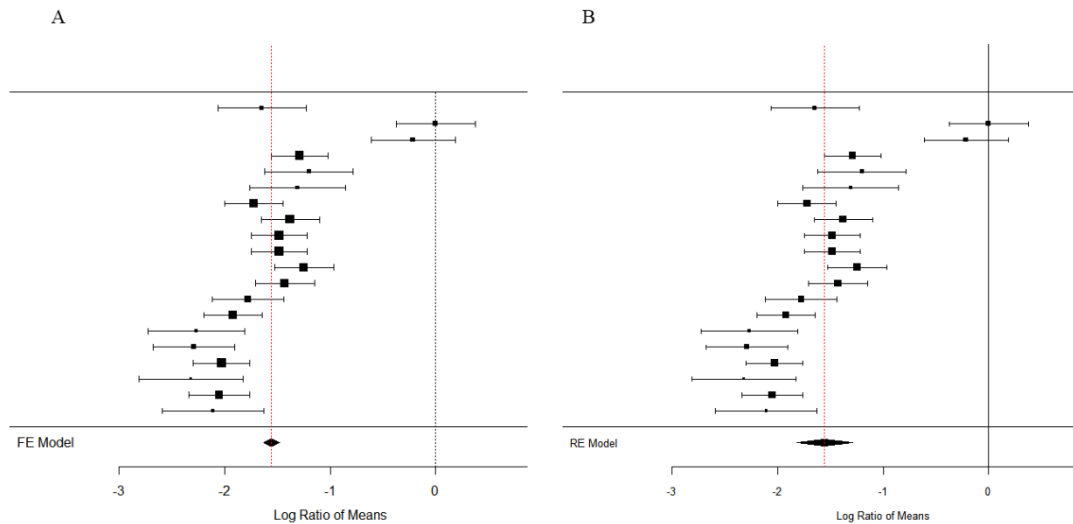


Figure S5 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -1.5542$, 95% confidence interval from -1.6265 to -1.4818, $Q(df = 19) = 195.3696$, $p < 0.0001$, $I^2 = 90.27\%$. Panel B shows the results from the random-effects model, $E = -1.5547$, 95% confidence interval from -1.8201 to -1.2893, $Q(df = 19) = 195.3696$, $p < 0.0001$, $I^2 = 92.39\%$). The results indicate that, under both the random-effects and fixed-effects models, the fifth instar larval development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

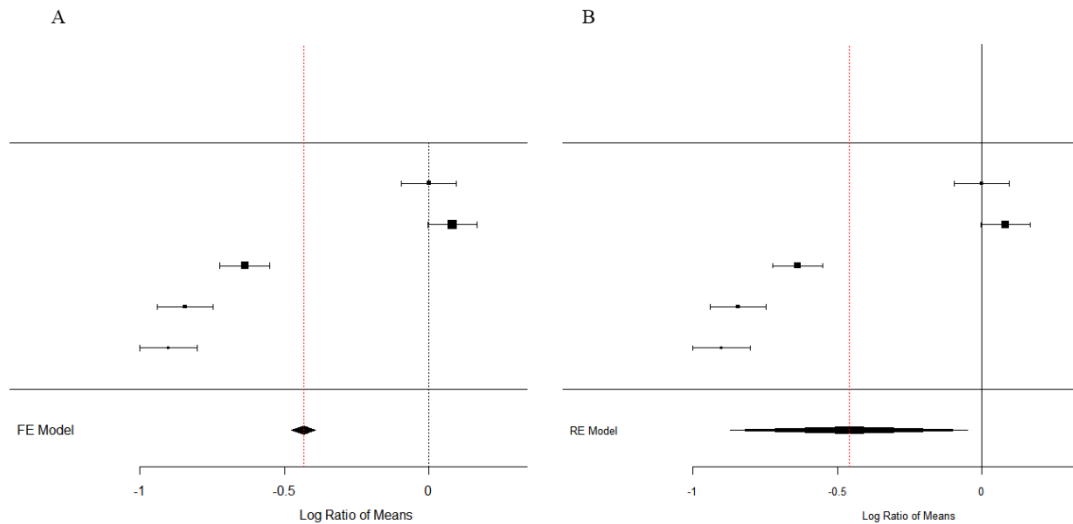


Figure S6 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -0.4334$, 95% confidence interval from -0.4744 to -0.3923, $Q (df = 4) = 397.6805$, $p < 0.0001$, $I^2 = 98.99\%$. Panel B shows the results from the random-effects model, $E = -0.4595$, 95% confidence interval from -0.8695 to -0.0496, $Q (df = 4) = 397.6805$, $p < 0.0001$, $I^2 = 98.99\%$). The results indicate that, under both the random-effects and fixed-effects models, the sixth instar larval development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

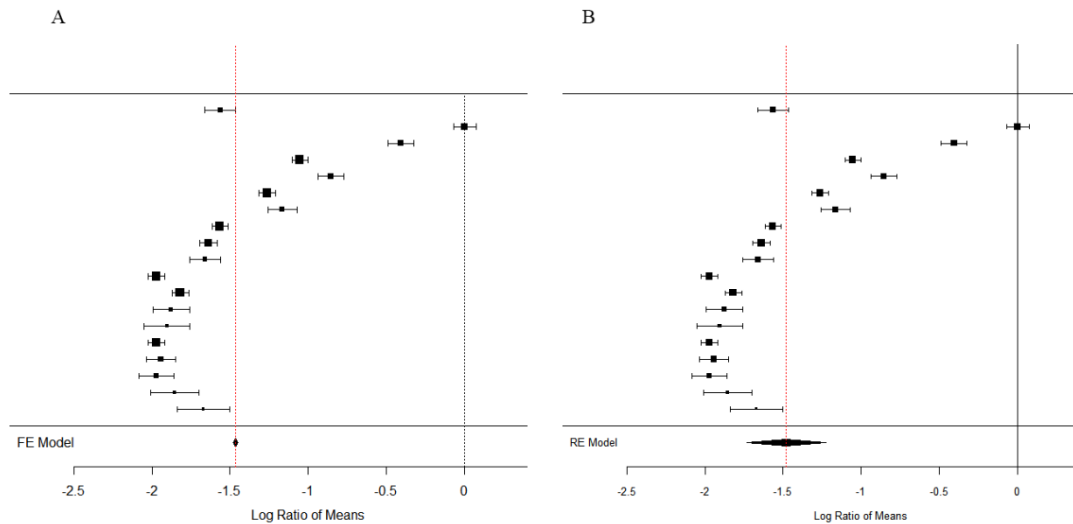


Figure S7 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -1.4641$, 95% confidence interval from -1.4804 to -1.4478, $Q (df = 18) = 4085.3176$, $p < 0.0001$, $I^2 = 98.57\%$. Panel B shows the results from the random-effects model, $E = -1.4807$, 95% confidence interval from -1.7341 to -1.2274, $Q (df = 18) = 4085.3176$, $p < 0.0001$, $I^2 = 98.57\%$). The results indicate that, under both the random-effects and fixed-effects models, the egg stage development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

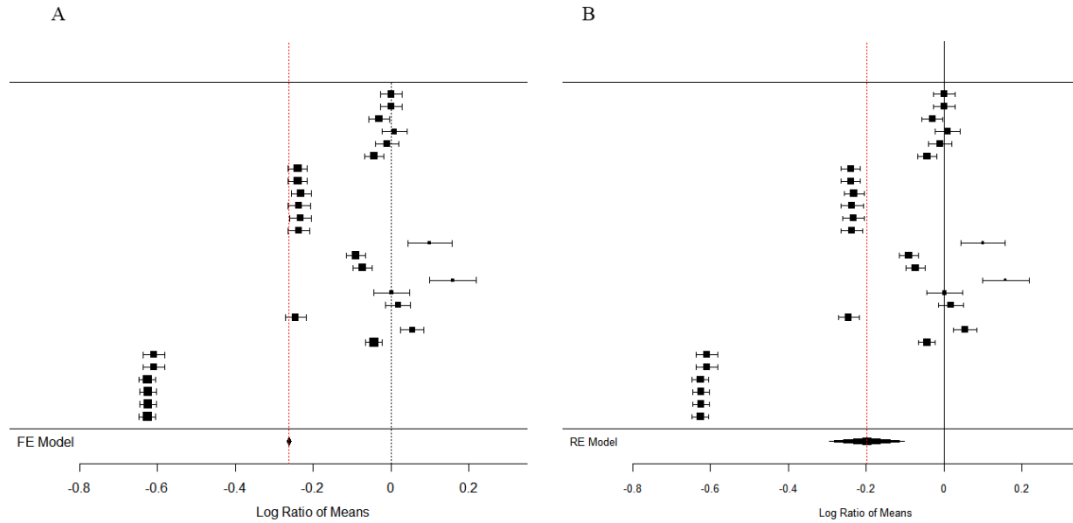


Figure S8 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -0.2662$, 95% confidence interval from -0.2674 to -0.2570, $Q (df = 26) = 9635.8421$, $p < 0.0001$, $I^2 = 99.73\%$. Panel B shows the results from the random-effects model, $E = -0.1977$, 95% confidence interval from -0.2942 to -0.1012, $Q (df = 26) = 9635.8421$, $p < 0.0001$, $I^2 = 99.71\%$). The results indicate that, under both the random-effects and fixed-effects models, the larval stage development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

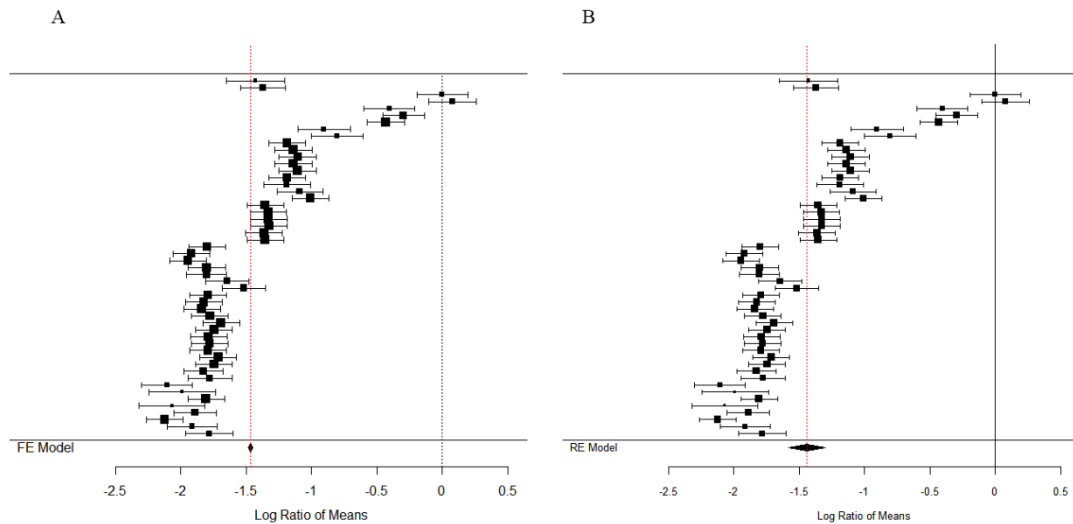


Figure S9 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -0.4660$, 95% confidence interval from -1.4873 to -1.4447, $Q (df = 51) = 1928.5788$, $p < 0.0001$, $I^2 = 97.36\%$. Panel B shows the results from the random-effects model, $E = -1.4421$, 95% confidence interval from -1.5845 to -1.2998, $Q (df = 51) = 1928.5788$, $p < 0.0001$, $I^2 = 97.75\%$). The results indicate that, under both the random-effects and fixed-effects models, the pupal stage development time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

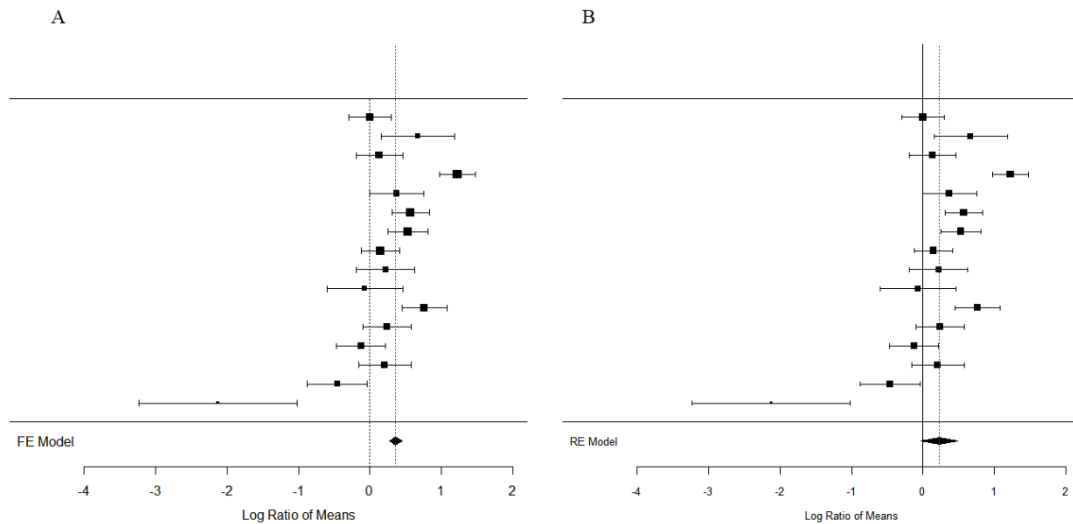


Figure S10 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = 0.3597$, 95% confidence interval from 0.2750 to 0.4445, $Q (df = 15) = 113.0038$, $p < 0.0001$, $I^2 = 86.73\%$. Panel B shows the results from the random-effects model, $E = 0.2277$, 95% confidence interval from -0.0271 to 0.4825, $Q (df = 15) = 113.0038$, $p < 0.0001$, $I^2 = 88.27\%$). The results indicate that, under both the random-effects and fixed-effects models, the female average fecundity of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

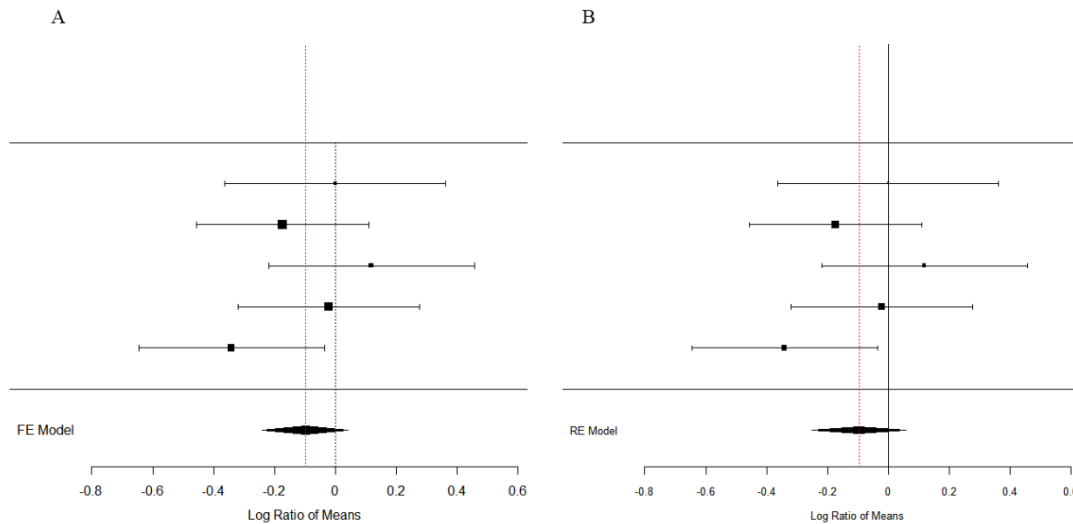


Figure S11 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -0.0990$, 95% confidence interval from -0.2392 to 0.0412, $Q (df = 4) = 4.8222$, $p < 0.0001$, $I^2 = 17.05\%$. Panel B shows the results from the random-effects model, $E = -0.0966$, 95% confidence interval from -0.2508 to 0.0576, $Q (df = 4) = 4.8222$, $p < 0.0001$, $I^2 = 16.81\%$). The results indicate that, under both the random-effects and fixed-effects models, the pre-oviposition period of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

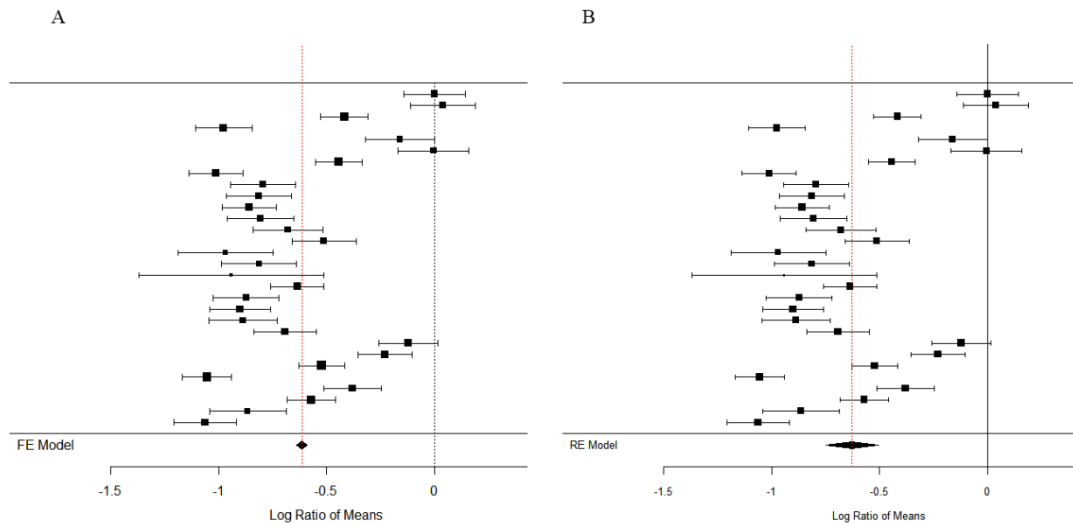


Figure S12 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -0.6143$, 95% confidence interval from -0.6397 to -0.5888 , $Q (df = 29) = 616.2937$, $p < 0.0001$, $I^2 = 95.29\%$. Panel B shows the results from the random-effects model, $E = -0.6286$, 95% confidence interval from -0.7500 to -0.5072 , $Q (df = 29) = 616.2937$, $p < 0.0001$, $I^2 = 95.53\%$). The results indicate that, under both the random-effects and fixed-effects models, the adult lifespan of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.

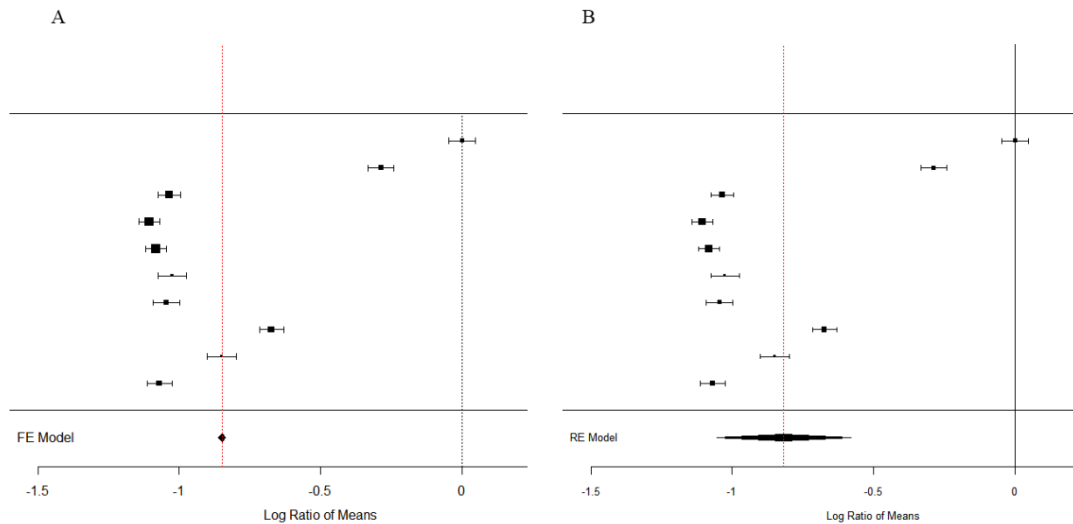


Figure S13 Comparison of effect sizes between the random-effects model and fixed-effects model (Panel A shows the results from the fixed-effects model, $E = -0.8493$, 95% confidence interval from -0.8493 to -0.8356, $Q(df = 9) = 2513.7223$, $p < 0.0001$, $I^2 = 99.64\%$. Panel B shows the results from the random-effects model, $E = -0.8175$, 95% confidence interval from -1.0558 to -0.5793, $Q(df = 9) = 2513.7223$, $p < 0.0001$, $I^2 = 99.67\%$). The results indicate that, under both the random-effects and fixed-effects models, the generation time of *Spodoptera exigua* significantly shortens with increasing temperature. The black squares represent the cumulative effect size for each variable, and the black horizontal lines represent the 95% confidence intervals. In both Panel A and Panel B, the red line indicates the cumulative effect size.