**S2 Table. Formulation of climate-dependent parameters in the MPAD model, sourced from Jia et al. [24].**

|  |  |
| --- | --- |
| Parameter | Equation |
| *f*E | $$f\_{E}\left(T\right)=0.5070exp⁡\left[-\left(\frac{T-30.85}{12.82}\right)^{2}\right]$$ |
| *f*dia | $$f\_{dia}\left(T\right)=0.1\*0.5070exp⁡\left[-\left(\frac{T-30.85}{12.82}\right)^{2}\right]$$ |
| *f*L | $$f\_{L}\left(T\right)=0.1727exp⁡\left[-\left(\frac{T-28.40}{10.20}\right)^{2}\right]$$ |
| *f*P | $$f\_{P}\left(T\right)=0.6020exp⁡\left[-\left(\frac{T-34.29}{15.07}\right)^{2}\right]$$ |
| *m*L | $$m\_{L}\left(T\right)=min\left\{1,\frac{1}{|-0.1305T^{2}+3.868T+30.83|}\right\}$$ |
| *m­*p | $$m\_{P}\left(T\right)=min\left\{1,\frac{1}{|-0.1502T^{2}+5.057T+3.517|}\right\}$$ |
| *m*A | $$m\_{A}\left(T\right)=min\left\{1,\frac{1}{|-0.1921T^{2}+8.147T-22.98|}\right\}$$ |
| *β* | $$β\left(T\right)=max\left\{0,-0.0163T^{2}+1.2897T-15.837\right\}$$ |
| *f*Ag | $$f\_{Ag}\left(T\right)=max\left\{0,\frac{T-10}{77}\right\}$$ |
| *k*L | $$k\_{L}\left(PP\_{norm}\right)=κ\_{L}(1+PP\_{norm})$$ |
| *k*P | $$k\_{P}\left(PP\_{norm}\right)=κ\_{P}(1+PP\_{norm})$$ |
| *z*1 | $$z\_{1}\left(T\_{ave},SD\_{ave}\right)=$$$$\left\{\begin{array}{c}1, T\_{ave}\left(t\right)<21℃ and SD\_{ave}\left(t\right)<13.5h, t\_{eggBegin}<t<t\_{diaBegin}\\0, otherwise\end{array}\right.$$ |
| *z2* | $$z\_{2}\left(T\_{ave},SD\_{ave}\right)=$$$$\left\{\begin{array}{c}1, T\_{ave}\left(t\right)>10.5℃ and SD\_{ave}\left(t\right)>11.25h, t\_{diaEnd}<t<t\_{eggEnd}\\0, otherwise\end{array}\right.$$ |
| *z*dia | $$z\_{2}\left(T\_{ave},SD\_{ave}\right)=$$$$\left\{\begin{array}{c}1, T\_{ave}\left(t\right)<9.5℃, t>t\_{diaBegin} or t<t\_{diaEnd}\\0, otherwise\end{array}\right.$$ |

*Abbreviations*: *T* - daily mean temperature, *PP*norm - rainfall (precipitation, normalized between 0 and 1) over a 2-week period, *T*ave - 7-day averaged daily mean temperature, *SD*ave - 7-day averaged daily sunlight hour (photoperiod), *t*eggBegin - the emergence time of diapause eggs, *t*eggEnd - the time when diapause eggs finish hatching, *t*diaBegin - the onset of diapause period, *t*diaEnd - the ending time of diapause period.