*Appendix 3: Life-history data from literature*

**Supplementary Tables**

**Table S1:** The average per capita birth rate of *Cydia pomonella* female adults at different constant temperatures

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Temperature (°C) | Oviposition Period  (Days) | Mean eggs (lifetime) | Daily egg rate (1/day) | Source |
| 10.00 | 0.00 | 0.0 | 0.0 | (Aghdam et al. 2009a) |
| 14.00 | 25.38 | 0.0 | 0.0 | (Aghdam et al. 2009a) |
| 20.00 | 11.23 | 48.85 | 4.35 | (Aghdam et al. 2009a) |
| 25.00 | 8.75 | 89.25 | 10.29 | (Aghdam et al. 2009a) |
| 27 | 7.69 | 66.32 | 8.62 | (Aghdam et al. 2009a) |
| 30 | 6.64 | 20.18 | 3.04 | (Aghdam et al. 2009a) |
| 33 | 6.50 | 0.0 | 0.0 | (Aghdam et al. 2009a) |
| 35 | 0.00 | 0.0 | 0.0 | (Aghdam et al. 2009a) |

**Table S2:** Development duration and daily development rate of eggs at constant temperatures.

|  |  |  |  |
| --- | --- | --- | --- |
| Temperature (°C) | Development duration  (Days) | Development rate  (1/Days) | Source |
| 10.00 | NA | 0.00 | Penn State Extension |
| 13.90 | 22.70 | 0.044 | (Howell and Schmidt 2002) |
| 14.00 | 18.67 | 0.050 | (Aghdam et al. 2009b) |
| 14.00 | 18.67 | 0.050 | (Aghdam et al. 2011) |
| 14.80 | 17.70 | 0.056 | (Howell and Schmidt 2002) |
| 15.00 | 19.39 | 0.052 | (Blomefield and Giliomee 2009) |
| 16.44 | 14.00 | 0.071 | (Glenn 1922) |
| 17.28 | 12.67 | 0.079 | (Glenn 1922) |
| 18.30 | 10.66 | 0.094 | (Glenn 1922) |
| 19.71 | 9.35 | 0.107 | (Glenn 1922) |
| 20.00 | 9.19 | 0.109 | (Blomefield and Giliomee 2009) |
| 20.00 | 9.34 | 0.107 | (Aghdam et al. 2009b) |
| 20.00 | 10.00 | 0.100 | (Aghdam et al. 2011) |
| 20.10 | 8.70 | 0.115 | (Howell and Schmidt 2002) |
| 20.50 | 8.78 | 0.115 | (Glenn 1922) |
| 21.85 | 7.72 | 0.130 | (Glenn 1922) |
| 22.84 | 7.00 | 0.143 | (Glenn 1922) |
| 23.81 | 6.60 | 0.152 | (Glenn 1922) |
| 25.00 | 5.75 | 0.174 | (Glenn 1922) |
| 25.00 | 4.80 | 0.208 | (Aghdam et al. 2009b) |
| 25.23 | 6.12 | 0.163 | (Glenn 1922) |
| 25.5 | 5.30 | 0.189 | (Howell and Schmidt 2002) |
| 25.95 | 5.95 | 0.168 | (Glenn 1922) |
| 26.74 | 5.71 | 0.175 | (Glenn 1922) |
| 28.25 | 5.52 | 0.181 | (Glenn 1922) |
| 28.88 | 5.53 | 0.181 | (Glenn 1922) |
| 29.6 | 4.40 | 0.227 | (Howell and Schmidt 2002) |
| 30 | 4.04 | 0.248 | (Aghdam et al. 2009b) |
| 30 | 4.23 | 0.236 | (Blomefield and Giliomee 2009) |
| 33 | 4.19 | 0.239 | (Aghdam et al. 2009b) |
| 34 | NA | 0.000 | (Aghdam et al. 2009b) |

**Table S3:** Average development duration and development rate of *Cydia pomonella* larval instars at constant temperatures.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Instar | Temperature (°C) | Development Duration  (Days | Development Rate  (1/Days) | Source |
| 1st Instar | 10.00 | NA | 0.000 | (Setyobudi 1989) |
| 20.00 | 4.20 | 0.238 | (Williams and McDonald 1982) |
| 25.00 | 4.20 | 0.238 | (Williams and McDonald 1982) |
| 25.00 | 4.80 | 0.208 | (Williams and McDonald 1982) |
| 30.00 | 2.70 | 0.370 | (Williams and McDonald 1982) |
| 35.00 | 3.50 | 0.286 | (Williams and McDonald 1982) |
| 2nd Instar | 9.60 | NA | 0.000 | (Setyobudi 1989) |
| 20.00 | 4.20 | 0.238 | (Williams and McDonald 1982) |
| 25.00 | 4.40 | 0.227 | (Williams and McDonald 1982) |
| 25.00 | 3.00 | 0.333 | (Williams and McDonald 1982) |
| 30.00 | 2.10 | 0.476 | (Williams and McDonald 1982) |
| 35.00 | 2.50 | 0.400 | (Williams and McDonald 1982) |
| 3rd Instar | 12.00 | NA | 0.000 | (Setyobudi 1989) |
| 20.00 | 4.10 | 0.244 | (Williams and McDonald 1982) |
| 25.00 | 3.40 | 0.294 | (Williams and McDonald 1982) |
| 25.00 | 3.70 | 0.270 | (Williams and McDonald 1982) |
| 30.00 | 3.20 | 0.313 | (Williams and McDonald 1982) |
| 35.00 | 2.60 | 0.385 | (Williams and McDonald 1982) |
| 4th Instar | 14.23 | NA | 0.000 | (Setyobudi 1989) |
| 20.00 | 8.00 | 0.125 | (Williams and McDonald 1982) |
| 25.00 | 4.50 | 0.222 | (Williams and McDonald 1982) |
| 30.00 | 2.10 | 0.476 | (Williams and McDonald 1982) |
| 35.00 | 5.90 | 0.169 | (Williams and McDonald 1982) |
| 5th  Instar | 11.14 | NA | 0.000 | (Setyobudi 1989) |
| 20.00 | 5.30 | 0.189 | (Williams and McDonald 1982) |
| 25.00 | 5.90 | 0.169 | (Williams and McDonald 1982) |
| 30.00 | 3.60 | 0.278 | (Williams and McDonald 1982) |
| 35.00 | 3.00 | 0.333 | (Aghdam et al. 2009b) |

**Table S4:** Average development duration and development rate of *Cydia pomonella* pupae at constant temperatures from different sources.

|  |  |  |  |
| --- | --- | --- | --- |
| Temperature (°C) | Average development duration  (Day) | Development rate  (1/Day) | Source |
| 9.82 | NA | 0 | (Setyobudi 1989) |
| 11.44 | 45.50 | 0.022 | (Glenn 1922) |
| 13.16 | 35.20 | 0.028 | (Glenn 1922) |
| 13.41 | 34.01 | 0.029 | (Glenn 1922) |
| 14.72 | 29.77 | 0.034 | (Glenn 1922) |
| 14.80 | 53.70 | 0.019 | (Glenn 1922) |
| 15.00 | 56.25 | 0.018 | (Blomefield and Giliomee 2009) |
| 17.00 | 37.90 | 0.026 | (Blomefield and Giliomee 2009) |
| 20.00 | 21.90 | 0.046 | (Williams and McDonald 1982) |
| 20.00 | 27.48 | 0.036 | (Williams and McDonald 1982) |
| 20.10 | 23.30 | 0.043 | (Howell and Schmidt 2002) |
| 20.71 | 13.80 | 0.072 | (Glenn 1922) |
| 21.55 | 12.70 | 0.079 | (Glenn 1922) |
| 22.83 | 11.50 | 0.087 | (Glenn 1922) |
| 23.84 | 10.73 | 0.093 | (Glenn 1922) |
| 24.87 | 10.02 | 0.100 | (Glenn 1922) |
| 25.00 | 14.90 | 0.067 | (Williams and McDonald 1982) |
| 25.00 | 18.80 | 0.053 | (Williams and McDonald 1982) |
| 25.50 | 15.30 | 0.065 | (Howell and Schmidt 2002) |
| 26.18 | 9.44 | 0.106 | (Glenn 1922) |
| 27.15 | 9.43 | 0.106 | (Glenn 1922) |
| 28.15 | 9.24 | 0.108 | (Glenn 1922) |
| 29.60 | 13.50 | 0.074 | (Howell and Schmidt 2002) |
| 30.00 | 10.70 | 0.093 | (Setyobudi 1989) |
| 30.00 | 13.78 | 0.073 | (Williams and McDonald 1982) |
| 35.00 | 12.40 | 0.081 | (Williams and McDonald 1982) |

**Table S5:** Average development duration and development rate of *Cydia pomonella* reproductive adults at constant temperatures.

|  |  |  |  |
| --- | --- | --- | --- |
| Temperature (°C) | Development Duration  (Day) | Development Rate  (1/Day) | Source |
| 14 | 25.38 | 0.039 | (Aghdam et al. 2009b) |
| 20 | 11.23 | 0.089 | (Aghdam et al. 2009b) |
| 25 | 8.75 | 0.114 | (Aghdam et al. 2009b) |
| 30 | 6.64 | 0.151 | (Aghdam et al. 2009b) |
| 33 | 6.50 | 0.154 | (Aghdam et al. 2009b) |

**Table S6:** Mortality of the life-stages (egg, larvae, pupae, and diapausing larvae)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Life-stage | Temperature (°C) | Duration (Days) | Survivorship | Per Capita Mortality | Source |
| Egg | -1.00 | 23 | 0.035 | 0.063 | Other |
| 0.00 | 7.00 | 0.134 | 0.287 | (Yokoyama et al. 1987) |
| 0.10 | 8.75 | 0.114 | 0.004 | (Moffitt and Burditt 1989) |
| 13.90 | 22.70 | 0.591 | 0.023 | (Howell and Neven 2000) |
| 14.80 | 17.70 | 0.843 | 0.009 | (Howell and Neven 2000) |
| 20.10 | 8.70 | 0.743 | 0.034 | (Howell and Neven 2000) |
| 25.50 | 5.30 | 0.495 | 0.130 | (Howell and Neven 2000) |
| 29.60 | 4.40 | 0.370 | 0.220 | (Howell and Neven 2000) |
| 34.40 | 1.00 | 0.50 | 1.000 | (Chidawanyika and Terblanche 2011) |
|  | -25.00 | 1.00 | 0.020 | 1.000 | (Khani and Moharramipour 2010) |
|  | -20.00 | 1.00 | 0.001 | 6.900 | Other |
|  | -15.00 | 1.00 | 0.080 | 2.520 | Other |
|  | -10.00 | 1.00 | 0.980 | 0.020 | (Khani and Moharramipour 2010) |
|  | -1.00 | 21.00 | 0.113 | 0.103 | Other |
|  | 0.00 | 28.00 | 0.920 | 0.029 | (Neven 2013a) |
| Larvae | 5.00 | 28.00 | 0.780 | 0.008 | (Neven 2013b) |
|  | 14.80 | 53.30 | 0.620 | 0.008 | (Howell and Neven 2000) |
|  | 20.10 | 26.30 | 0.750 | 0.010 | (Howell and Neven 2000) |
|  | 25.50 | 16.30 | 0.780 | 0.015 | (Howell and Neven 2000) |
|  | 29.60 | 15.30 | 0.590 | 0.034 | (Howell and Neven 2000) |
|  | 35.00 | 15.70 | 0.180 | 0.109 | (Howell and Neven 2000) |
|  | 14.80 | 53.70 | 0.747 | 0.005 | (Howell and Neven 2000) |
|  | 20.10 | 23.30 | 0.853 | 0.006 | (Howell and Neven 2000) |
| Pupae | 25.5 | 15.30 | 0.947 | 0.003 | (Howell and Neven 2000) |
|  | 29.60 | 13.50 | 1.000 | 0.000 | (Howell and Neven 2000) |
|  | 35.00 | 0.00 | 0.000 | 1.000 | (Howell and Neven 2000) |
| D. Larvae | 12.70 | 129.8 | 0.760 | 0.002 | (Graf et al. 2018) |
| 15.10 | 80.7 | 0.825 | 0.002 | (Graf et al. 2018) |
| 17.60 | 60.90 | 0.818 | 0.003 | (Graf et al. 2018) |
| 19.90 | 46.50 | 0.802 | 0.004 | (Graf et al. 2018) |
| 22.40 | 37.00 | 0.793 | 0.006 | (Graf et al. 2018) |
| 25.10 | 29.10 | 0.858 | 0.005 | (Graf et al. 2018) |
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