Supporting information

Projecting the Potential Global Distribution of *Carpomya vesuviana* (Diptera: Tephritidae), Considering Climate Change and Irrigation Patterns

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Supplementary Figure 1. Projected potential distribution using existing CLIMEX parameters for *C. vesuviana*.

Supplementary Figure 2. Impacts of climate change on monthly growth indices for *C. vesuviana*.

Supplementary Figure 3. Impacts of climate change on the monthly stress indices for *C. vesuviana*.

Supplementary Figure 4. Impacts of climate change on the precipitation and climatic suitability.

Supplementary Material 1. Biological data related to temperature, moisture, and generations of *C. vesuviana*.

Supplementary Figure 1. Projected potential distribution using existing CLIMEX parameters for *C. vesuviana*. Figure (a₁) and (a₂) show the projection of He under historical and future climate scenarios, respectively. (b₁) and (b₂) show the projected potential distribution by using Lü’s CLIMEX parameter under historical and future climate scenarios.
Supplementary Figure 2. Impacts of climate change on monthly growth indices for *C. vesuviana*. (a) and (b) show the change of monthly temperature index (TI) and moisture index (MI) for *C. vesuviana*, respectively. Red means increase, blue means decrease, the depth of the color shows the change degree of each value.
**Supplementary Figure 3.** Impacts of climate change on the monthly stress indices for *C. vesuviana*. (a) The change of monthly cold stress (CS), (b) the change of monthly heat stress (HS), (c) the change of monthly dry stress (DS), and (d) the change of monthly wet stress indices (WS). Red means increase, blue means decrease, the depth of the color shows the change degree of each value.

**Supplementary Figure 4.** Impacts of climate change on precipitation and climatic suitability. (a) The monthly average precipitation, (b) EI values for *C. vesuviana*. Red means increase, blue means decrease, the depth of the color shows the change degree of each value.

**Supplementary material 1.** Biological data related to temperature, moisture and generations of *C. vesuviana*.

**1.1 Temperature**
He et al. [1] reported that the developmental threshold temperature for pupae = 13.63 ± 1.91°C, and the effective accumulated temperature for pupae = 807.55 ± 110.12 day-degrees. After a constant temperature of more than 40°C, the pupae will die due to excessive water loss. He also reported that it was conducive to adult emergence when the temperature was 25–35 °C and the relative humidity was 30–37%. Hu et al. [2] indicated that the developmental threshold temperature for eggs = 13.57 °C, and the effective accumulated temperature for eggs = 48.18 day-degrees, the developmental threshold temperature for pupae = 6.38°C, and the effective accumulated temperature for pupae = 357.17 day-degrees; egg-to-pupae developmental threshold temperature = 8.78°C, and the effective accumulated temperature = 283.29 dayddegrees; the developmental threshold temperature for larva
= 6.39 °C, and the effective accumulated temperature for larva = 245.61 °C day-degrees. According to Lakra et al. [3], when the average weekly minimum temperature was 10–25 °C, the highest temperature was 25–40°C, and the relative humidity between 25% to 75%, then it was the most favorable climate condition for C. vesuviana to survive. Ding et al. [4] measured the mean supercooling point of 5 day old pupae of C. vesuviana was –16.56 °C, and the mean freezing point of 5 day old pupae was –14.07 °C.

1.2 Humidity
Ding et al. [5] reported that the pupae and adults of C. vesuviana prefer a soil relative humidity of 5–25%; in addition, when the relative humidity of the air is 20–40%, pupae and adults show a high survival rate and rapid development.

1.3 Generations
The generations of C. vesuviana would be various in different regions. In Turpan of Xinjiang, China, the pest C. vesuviana exhibits 2 to 3 generations in a year [1]; in northern India, it exhibits 6–9 generations a year, and in Iran, 8-10 generations a year [6].

REFERENCE