Potential impact of *Spodoptera frugiperda* in Europe

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Background

- The **fall armyworm** (FAW; *Spodoptera frugiperda*) is a significant invasive pest, feeding on over 80 crops, with maize being the most important.
- It is ranked among the **top 10 priority pests** for the EU (I2P2).
- This research presents the **climatic suitability** and **migration extent**; therefore, the area under risk within the European continent.

Data & Approach

Climatic Suitability Map (Fig. 1)

- FAW occurrence records were collected from a variety of sources (GBIF, Timilsena et al. (2018), Early et al. (2018), BAMONA, and literature resources).
- The resulting dataset (n=6851) and updated FAW parameter values *wrt*. growth and development requirements were used to fit the projected climatic suitability, by taking into account available information on **permanent** and **transient** populations.

Migration Distances (Fig. 2, Fig.3)

- The spatial pattern of seasonal dispersal was estimated using a data subset for the USA/Canada. This subset included only transient points (n=1831). These points were adjacent to an area with EI=0 and GI>0.
- The **minimum distance** of each point from the area (hub) with EI>0 was calculated and was used to obtain a set of percentile distances, indicating a series of **dispersal frequency** (buffer) **zones**.
- The migration zones were extrapolated into Europe, assuming that the observed migratory capacity of the moth follows a similar pattern.

Preliminary Results
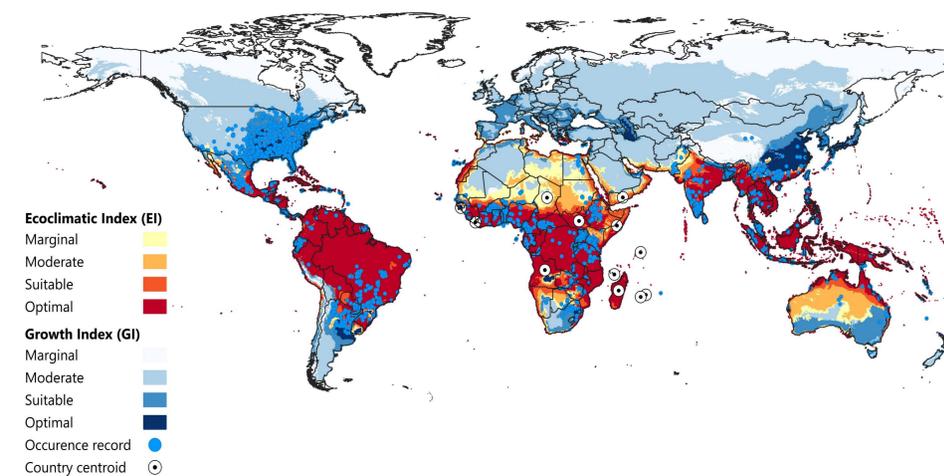
Figure 1. Known global distribution and climatic suitability of FAW modeled using the *Compare Locations* module in CLIMEX V4.1.1.0., CM_TC10_1995H_v1 climatology and a composite irrigation scenario (2.5 mm day^{-1} applied as top-up). Areas with a positive *Ecoclimatic Index* (yellow-red gradient) support permanent establishment, whereas in areas with a positive *annual Growth Index* (light-dark blue), the pest poses a seasonal risk.
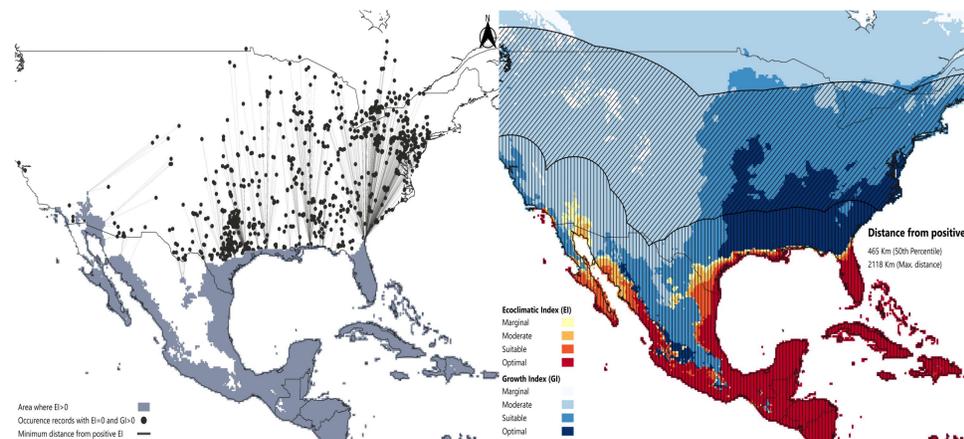
Figure 2. Dispersal frequency zones are depicted using cross-hatching buffer zones. The buffer zones were created using the minimum distance (distance to the nearest hub) of each transient point to the EI>0 area.
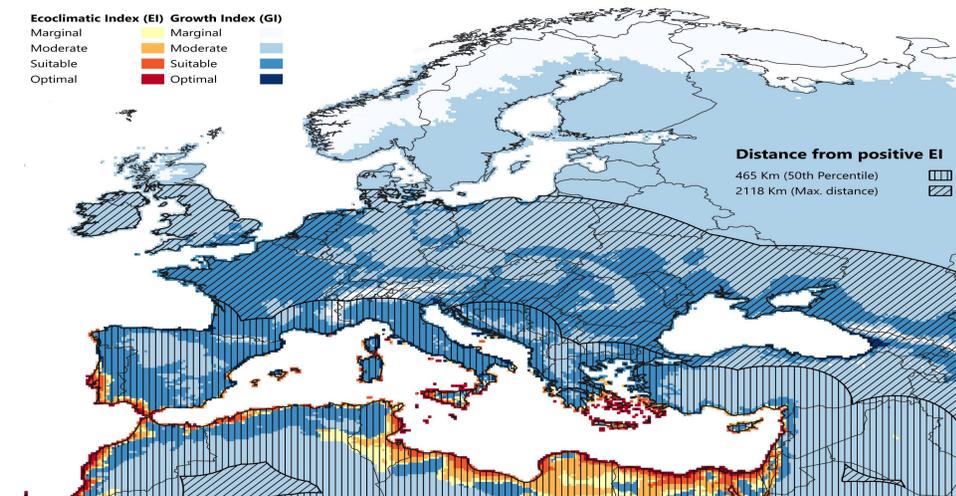
Figure 3. The area under risk for potential FAW migration (50th and maximum percentile), based on FAW's migratory patterns in the USA. Diagonal hatching indicates the zone that includes the maximum observed dispersal distance from the hub area (EI>0).

Conclusions

- The southern part of Spain, Greece, Italy, and Portugal supports **permanent establishment**.
- It is highly probable, that there is an inverse relation between the frequency of seasonal migration and the distance from the area suitable for persistent establishment (EI>0). In this case, **southern Europe bears a higher risk than northern Member States**.

Acknowledgments

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