

# Viruses of major European crops



challenges of disease prevention and control in light of an increased international movement of plant materials and intensified agricultural production

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# Outline

- **Major viruses**
- **Drivers of virus epidemics**
- **Elements of virus dissemination & spread**
- **Newly emerging viruses**
  - **Leaf curl viruses of tomato**
  - **Criniviruses, Viroids, Torradoviruses**

# Preamble

- Viruses are present everywhere in the environment
- presence of plant viruses is only limited by the availability of host plants and efficient vectors for establishment & spread
- In natural plant populations there is an equilibrium of infected and healthy plants
- Agri/horticultural activities disrupt/ shift equilibrium and consequently outbreaks occur



# shifting crop cultivation seasons





# prolonging crop cycles





# mass production





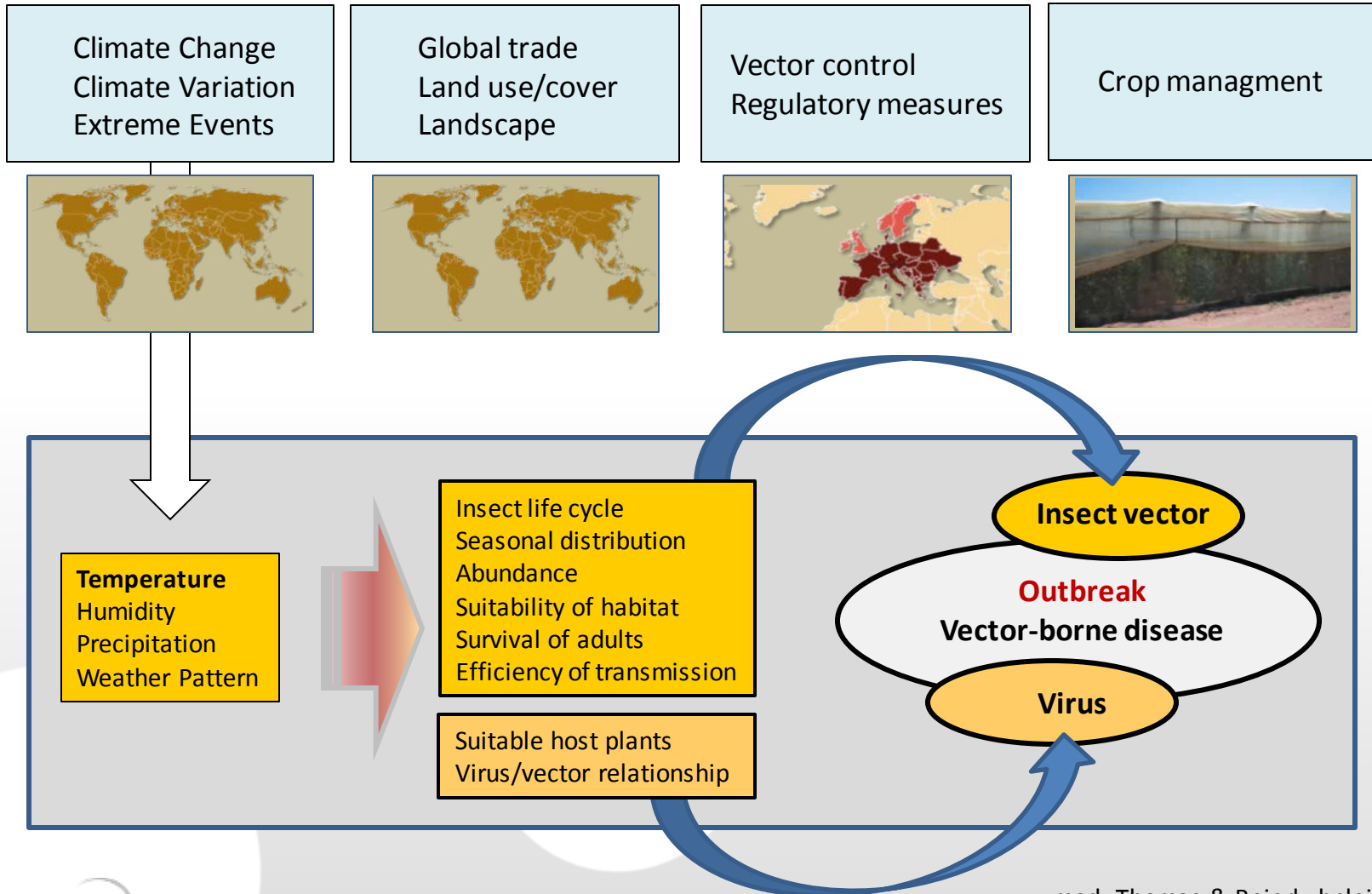


# contaminated seed

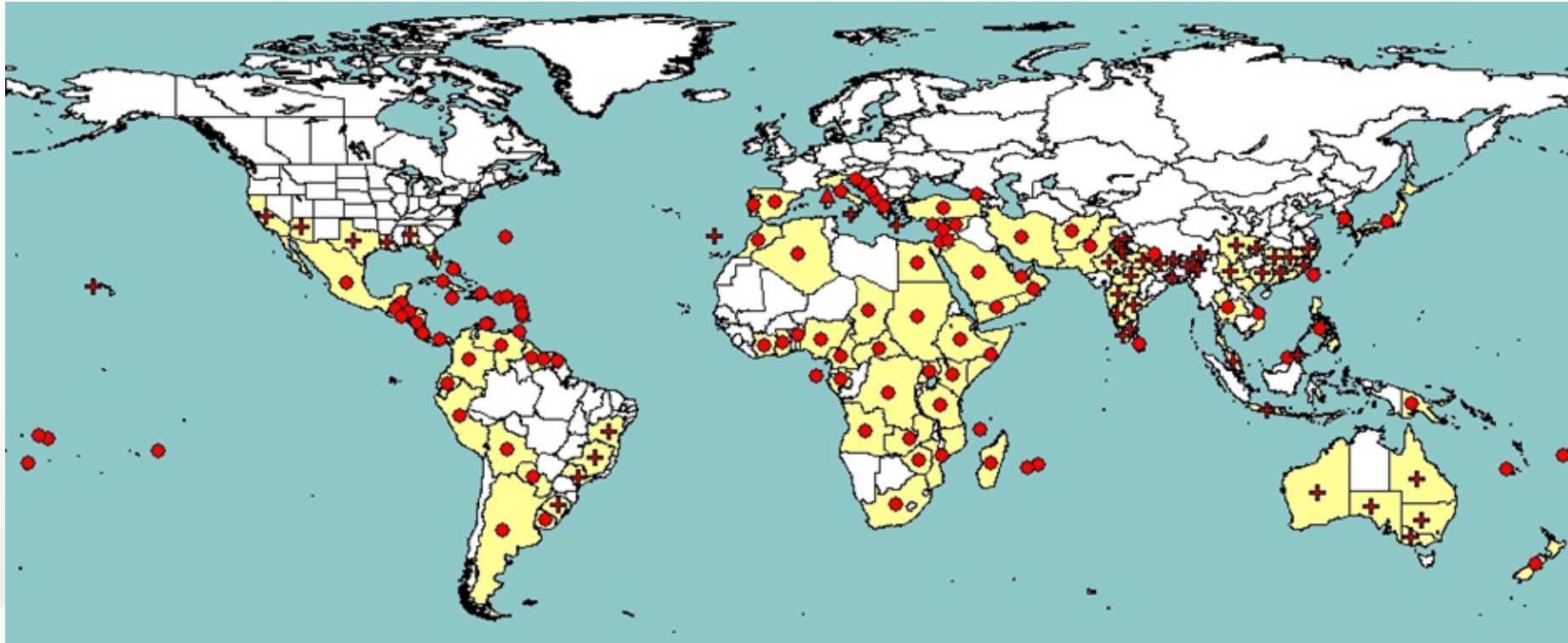




# Drivers of vector-borne diseases



# Aphid vectors: *Citrus tristeza virus*



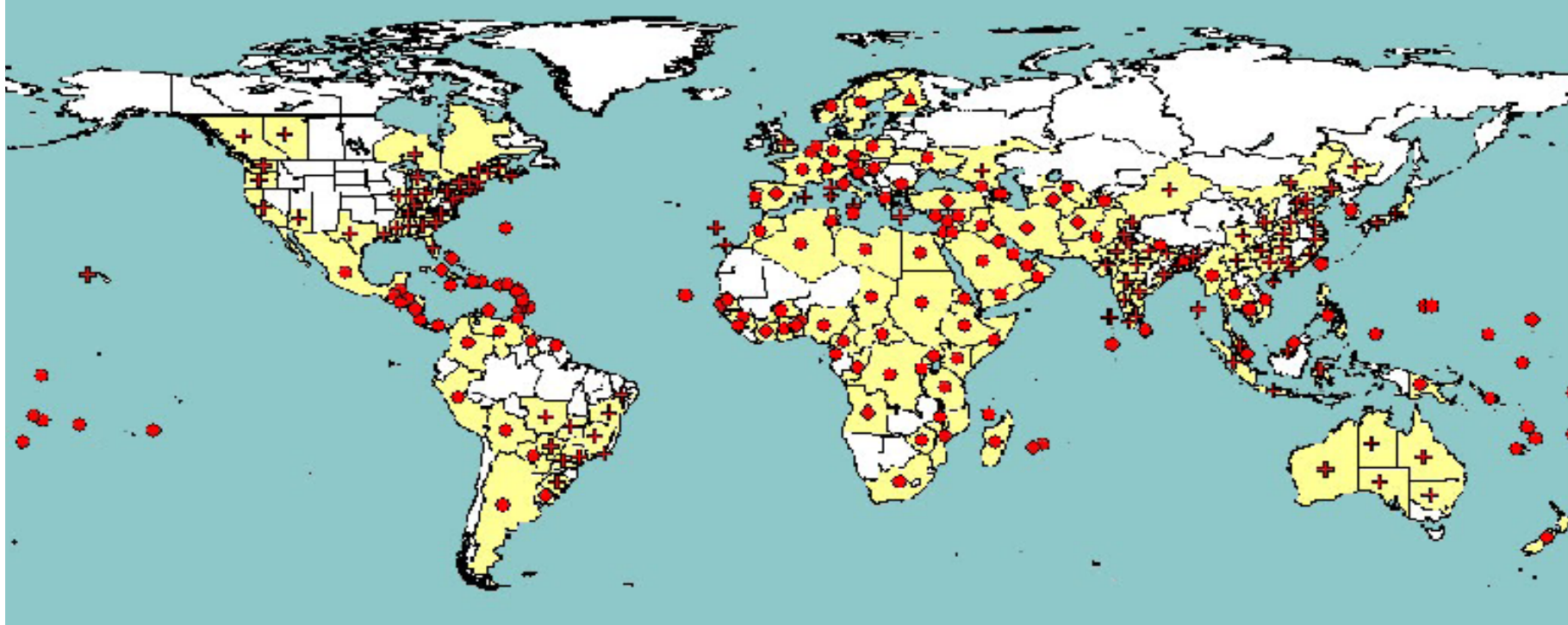
EPPO PQR, ver. 5.3.1, June 2014



# Thrips vectors: Tospoviruses



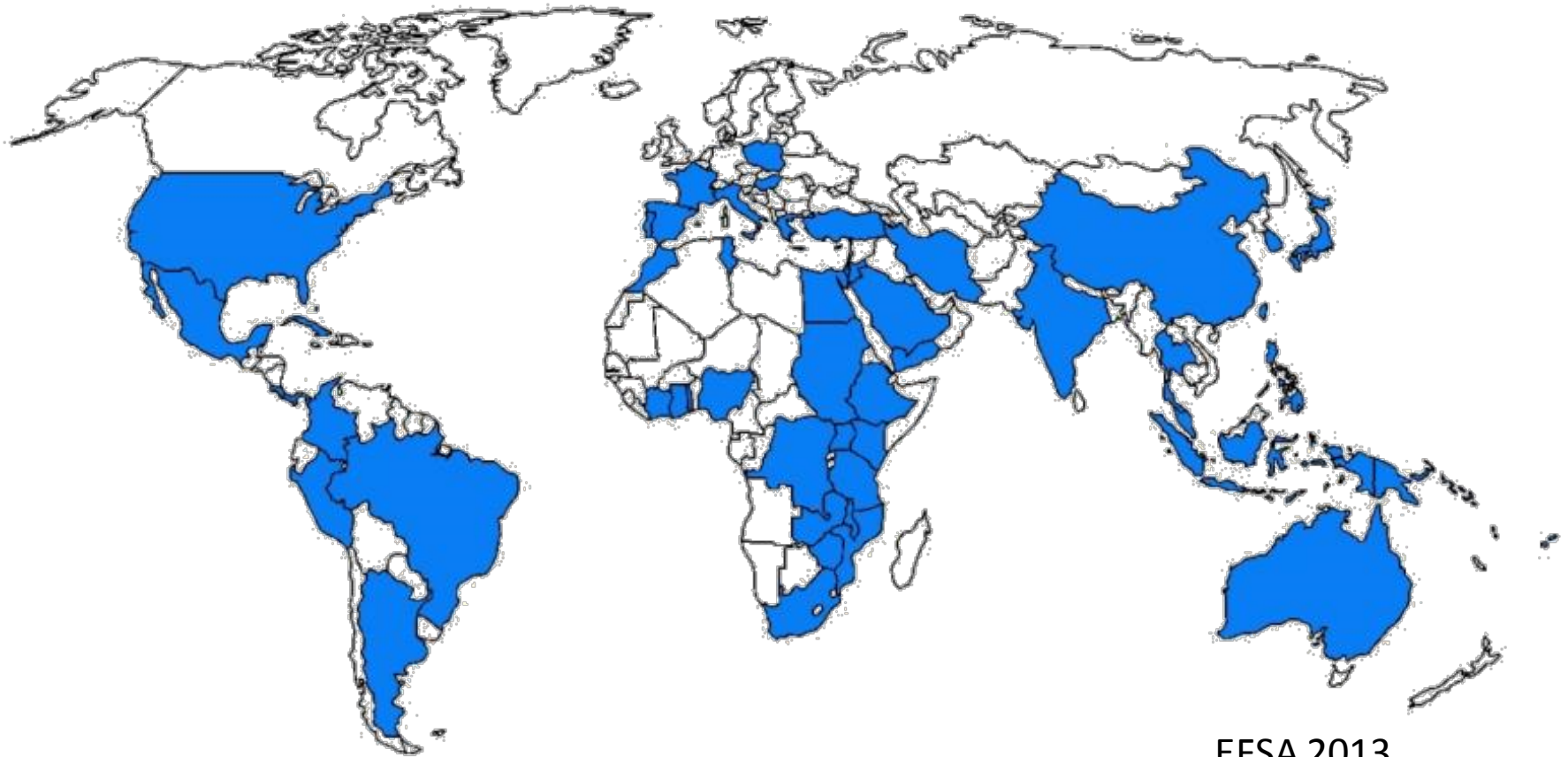
# Bemisia tabaci: Changing vector populations



EPPO PQR, ver. 5.3.1, June 2014



# Bemisia tabaci transmitted viruses of tomato and cucurbits



EFSA 2013





# Leaf curl diseases in tomato caused by other viruses



EFSA 2013









NATIONAL  
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# Options for pest and virus control

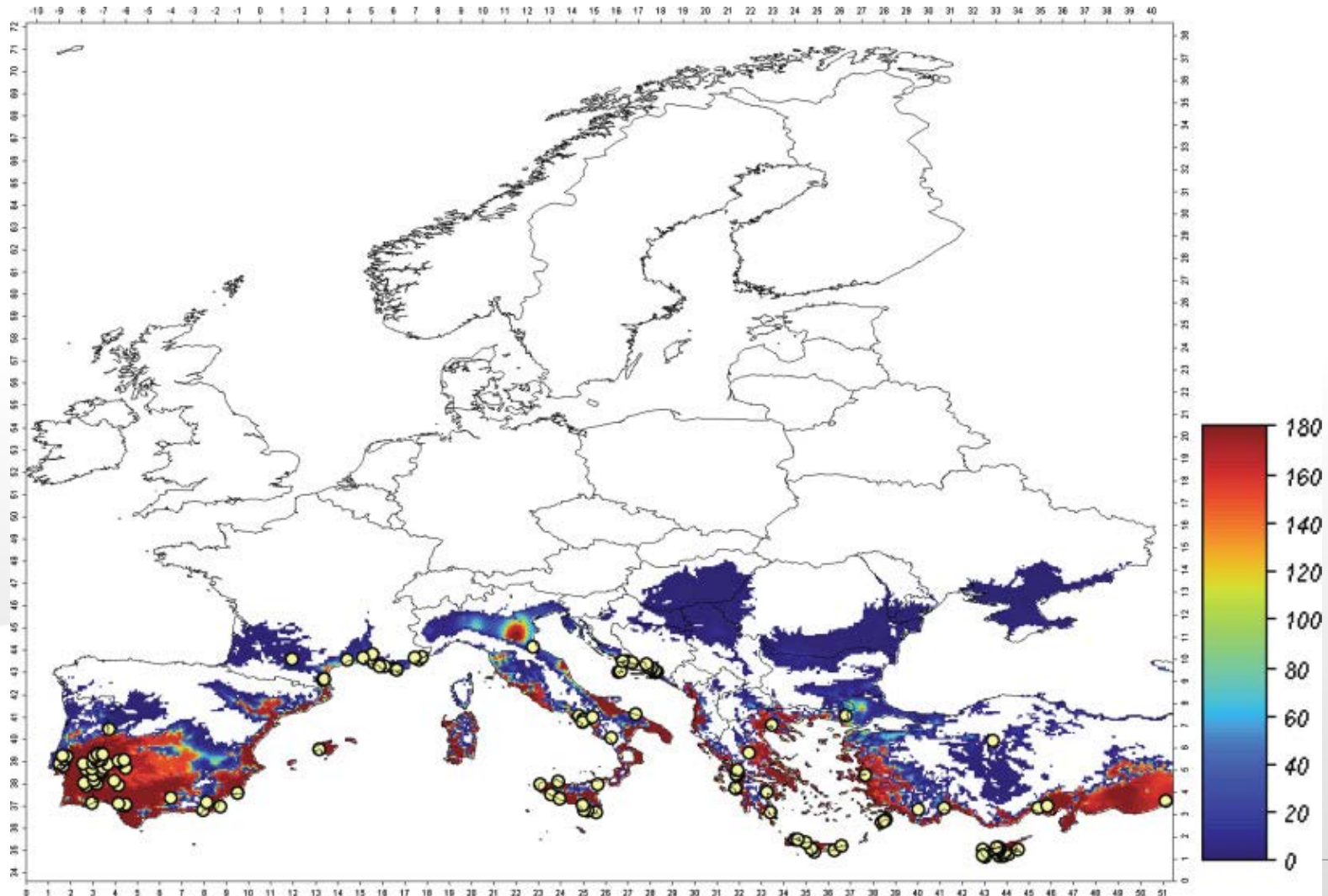






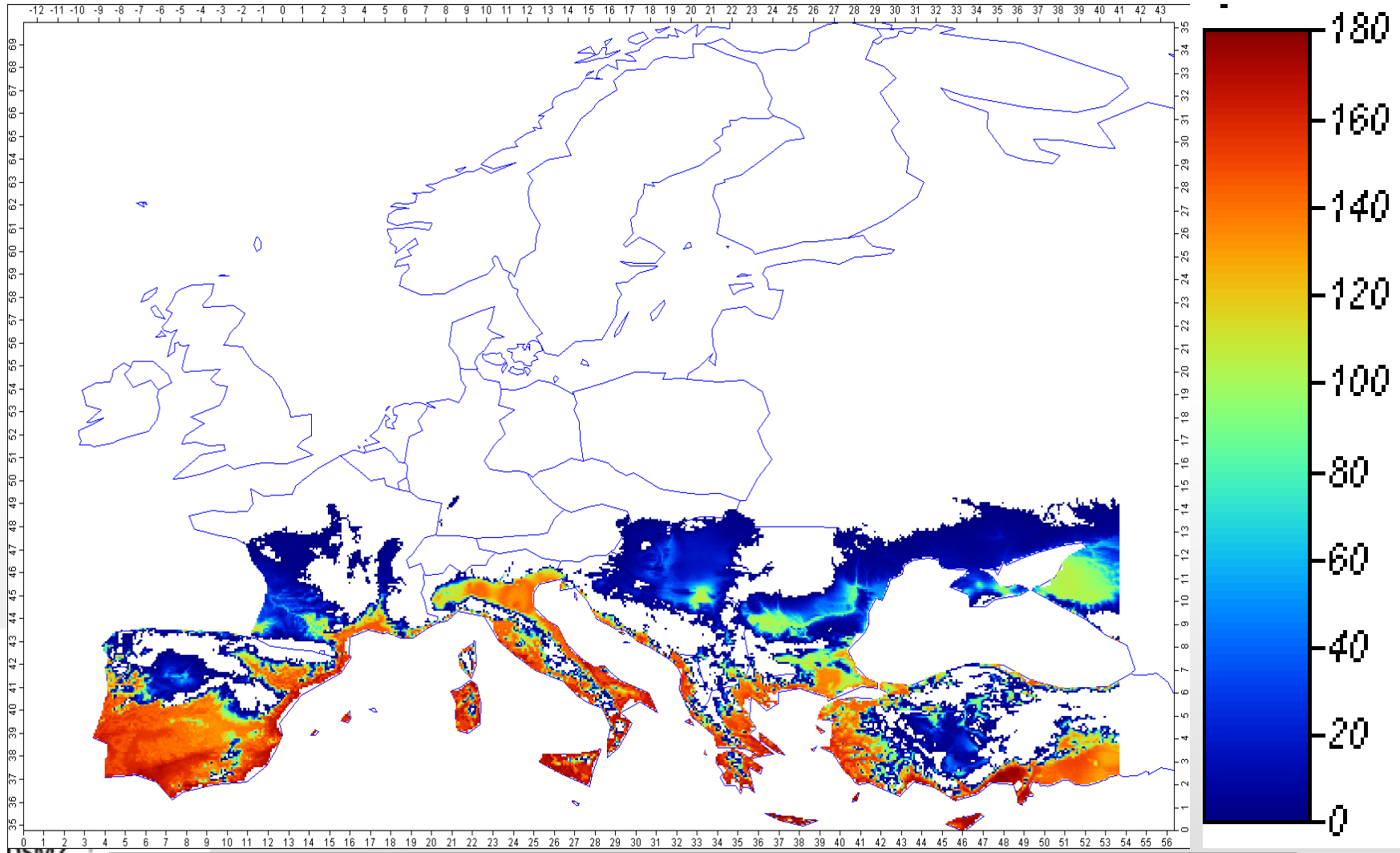


# Population dynamic model to estimate the distribution of *B. tabaci* in Europe

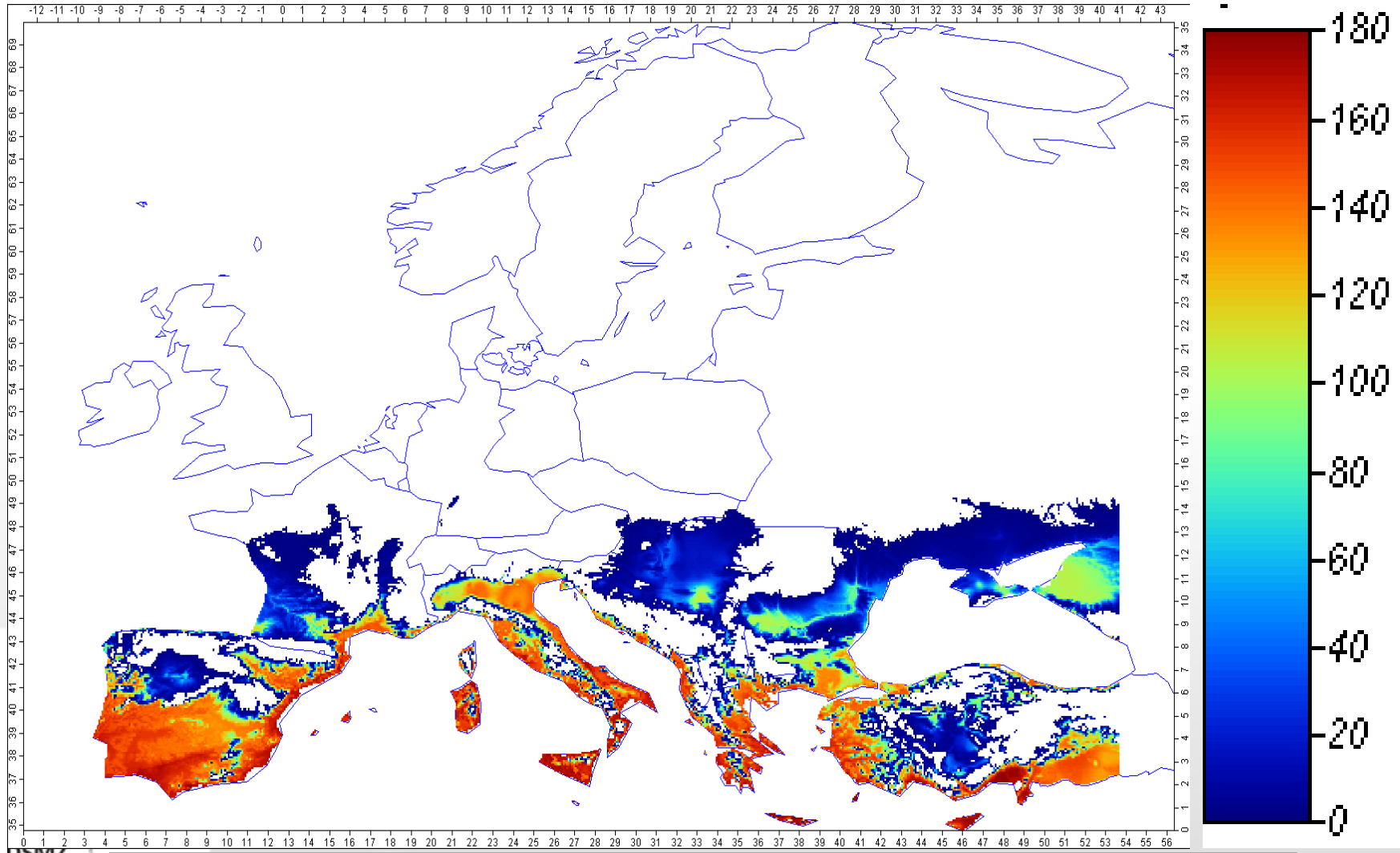




# ... under changing climate +2°C



# ... under changing climate +2°C





# Emerging viruses: ToLCNDV



- *Bemisia tabaci* transmitted
- ToLCNDV infects tomato in India and other countries in Asia



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2012: Murcia (zucchini isolate PV-1109)

2013: Almeria (tomato isolate PV-1111)





# Emerging viruses: Criniviruses

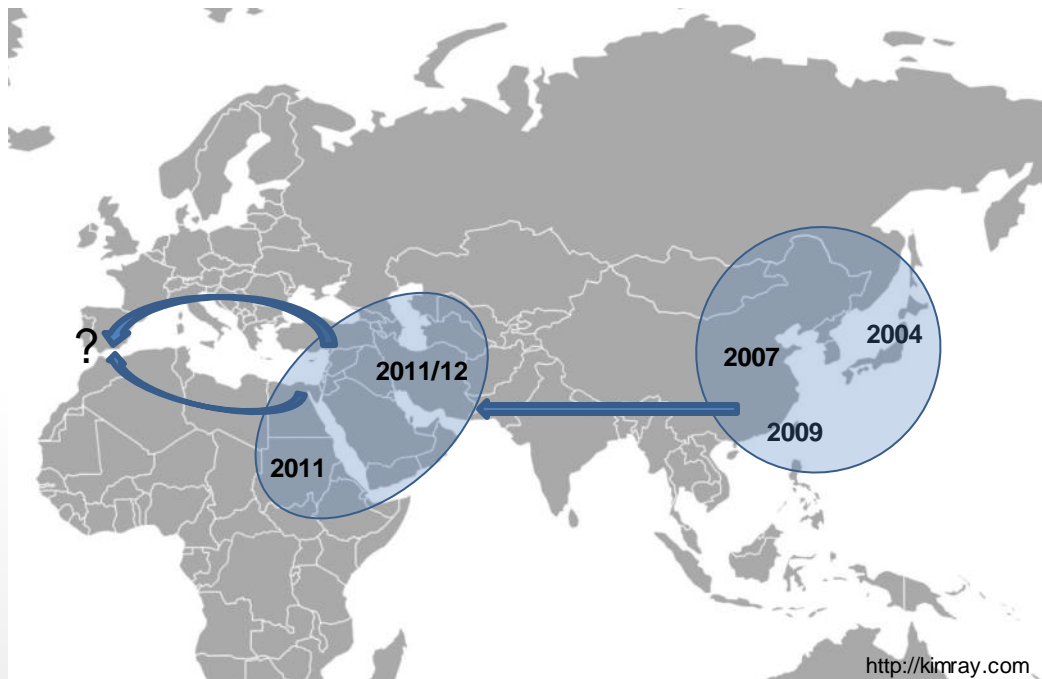


# Emerging viruses? Cucurbit chlorotic yellows virus





# Emerging viruses? Cucurbit chlorotic yellows virus



# Emerging viruses: ToCV





# Emerging viruses: ToCV





# Elusive viruses: TiCV





# Summary

- Severe virus diseases of crops are always associated with intensive crop production and disturbed agroecologies
- New virus introductions occur frequently and when efficient virus vectors are present virus establishment & spread occurs
  - Establish the link between virus & disease, strains and isolate
- Origin & pathway of new incursions is not predictable
- Begomoviruses comprise the top emerging virus genus driven by B. tabaci invasion of MEAM1 and Med
- Climatic changes, international movement of plant material, insect adaptation to cool climates and new hosts favour the dissemination of viruses
- Viruses in new environments and/or existing viruses in new hosts trigger the evolution of viruses into new variants and strains
- Alternative strategies to insecticide applications are needed to combat insect vectors and the viruses transmitted.

# Thank you for your attention!

