Update on the Pest Risk Assessment on *Xylella fastidiosa*

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Updated Xylella PRA

- Update the 2015 EFSA Pest Risk Assessment (PRA)
- Changes in subspecies & STs detected in EU since EFSA (2015)
- Developments in research since EFSA (2015)

EFSA Journal

SCIENTIFIC OPINION

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Update of the Scientific Opinion on the risks to plant health posed by *Xylella fastidiosa* in the EU territory

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PONTE PestOrganisms ThreateningEurope

XF ACTORS

BRIGIT Vector Borne Disease of Plants

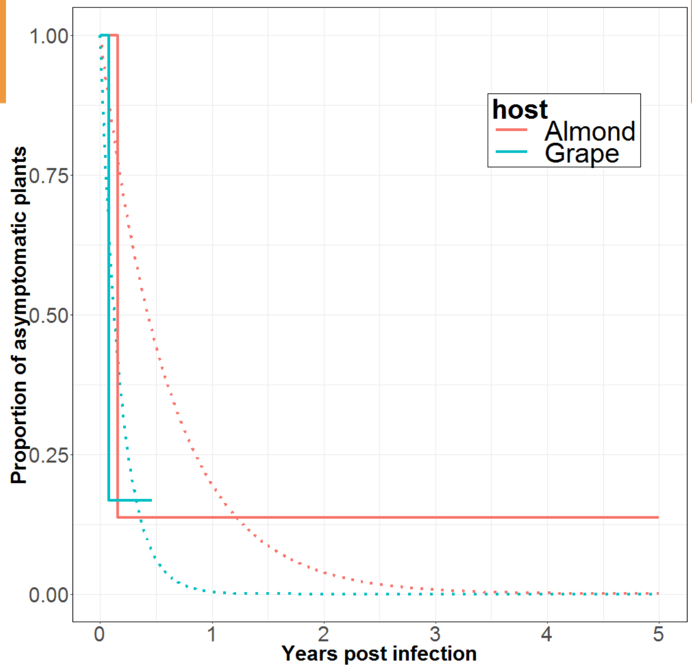
Sub-tasks from Mandate

- Asymptomatic period length
- Risk of establishment
- Short range spread
- Long range spread
- Assessment of Impact
- Risk Reduction Options Review

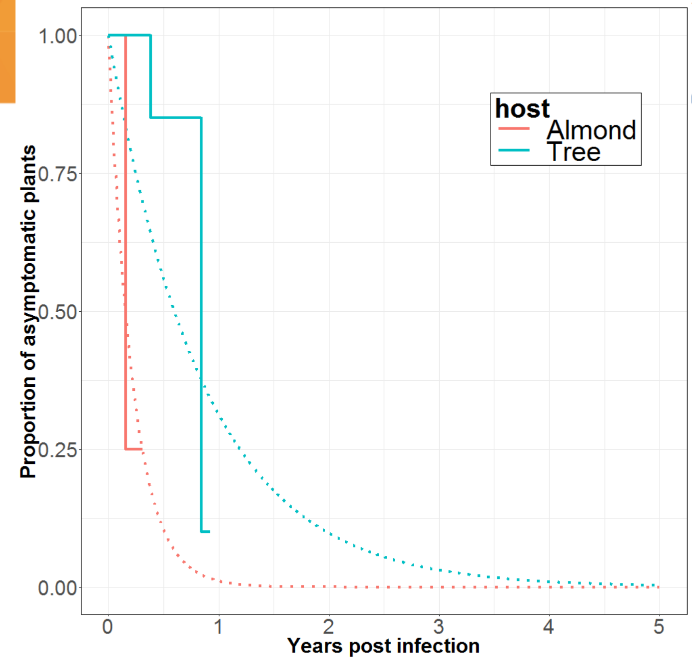
Available data

- Each paper may contain a number of different **experiments**.
- We considered different **subspecies** of *X. fastidiosa* and different **host** groupings for analysis.
- Excluding subspecies-host combinations with fewer than one study, we have data for a total of **75 experiments**:

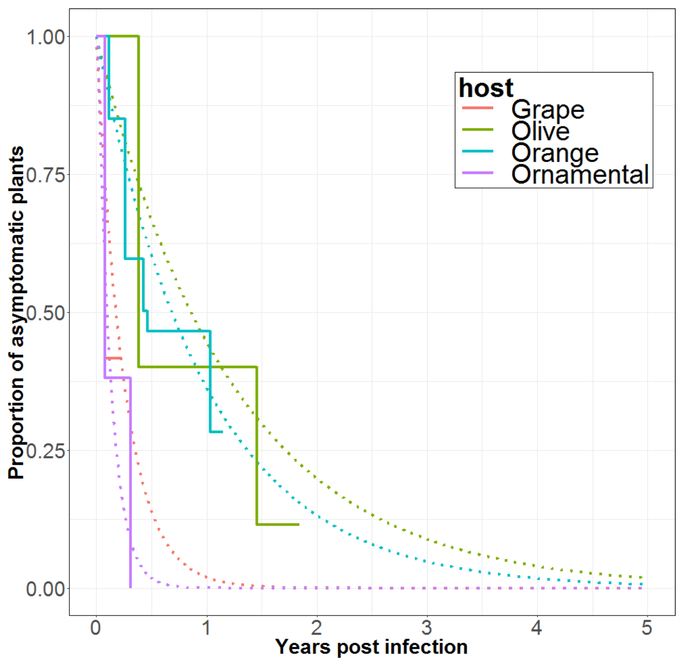
Subspecies	Host	Number of exp.
***X. f* ss fastidiosa**	**Almond**	**14**
	Grape	**10**
***X. f* ss multiplex**	**Tree**	**2**
	Almond	**2**
***X. f* ss pauca**	**Orange**	**23**
	Grape	**18**
	Olive	**4**
	Ornamental	**2**



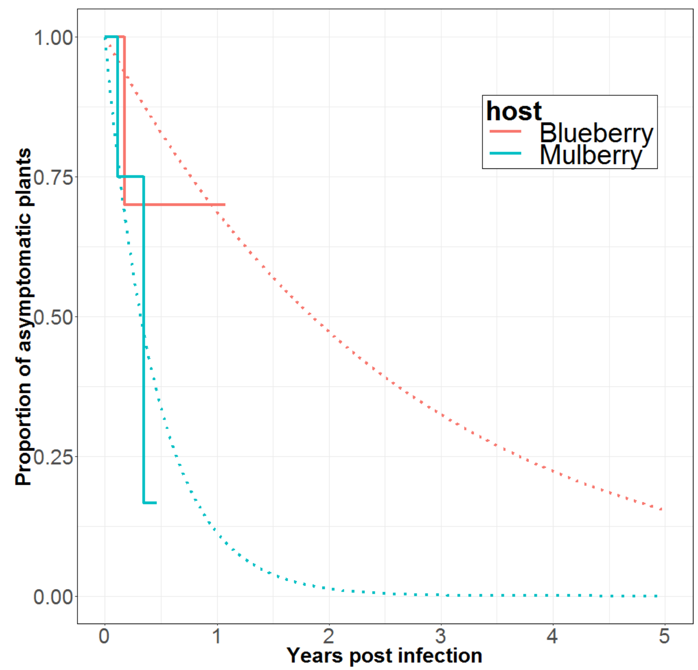
host
Almond
Grape
Proportion of asymptomatic plants
Years post infection



host
Almond
Tree
Proportion of asymptomatic plants
Years post infection



host
Grape
Olive
Orange
Ornamental
Proportion of asymptomatic plants
Years post infection



host
Blueberry
Mulberry
Proportion of asymptomatic plants
Years post infection

Asymptomatic period Conclusions

Key uncertainties:

- Curves and estimates *fitted* to data
- Symptomless hosts
- Inoculation success
- Young plants only

Key conclusions:

- Asymptomatic periods were highly variable depending on host and subspecies combinations
- Almond infected with *X. fastidiosa* subsp. *multiplex* and orange or olive infected with *X. fastidiosa* subsp. *pauca* remained asymptomatic for the longest durations after infection
- Visual inspection will lead to detections only after a considerable period from infection has already occurred and thus methods that can detect the pathogen earlier in the infection period should be utilised, e.g. sampling and diagnostic testing of vectors and asymptomatic host.

Sub-tasks from Mandate

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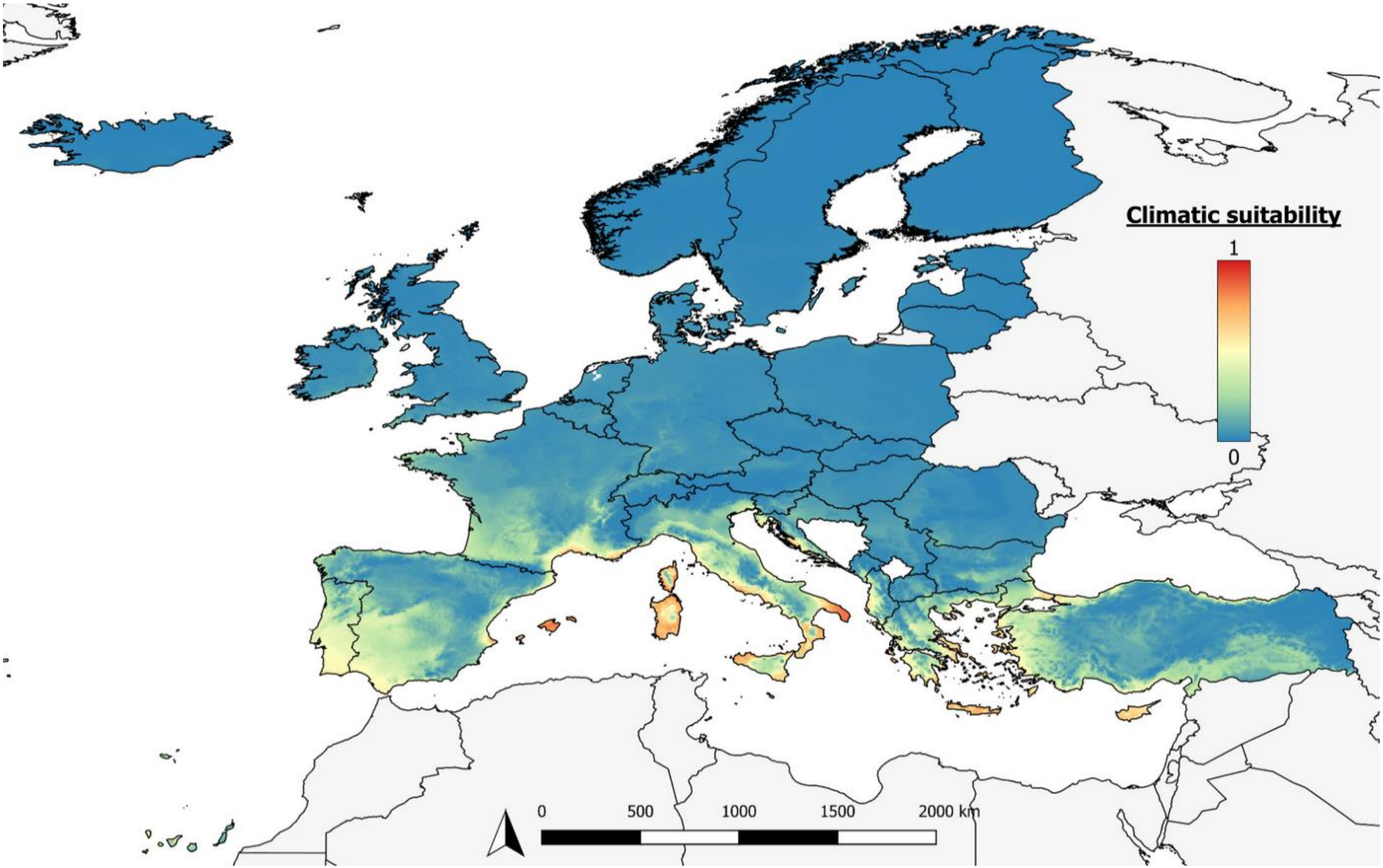
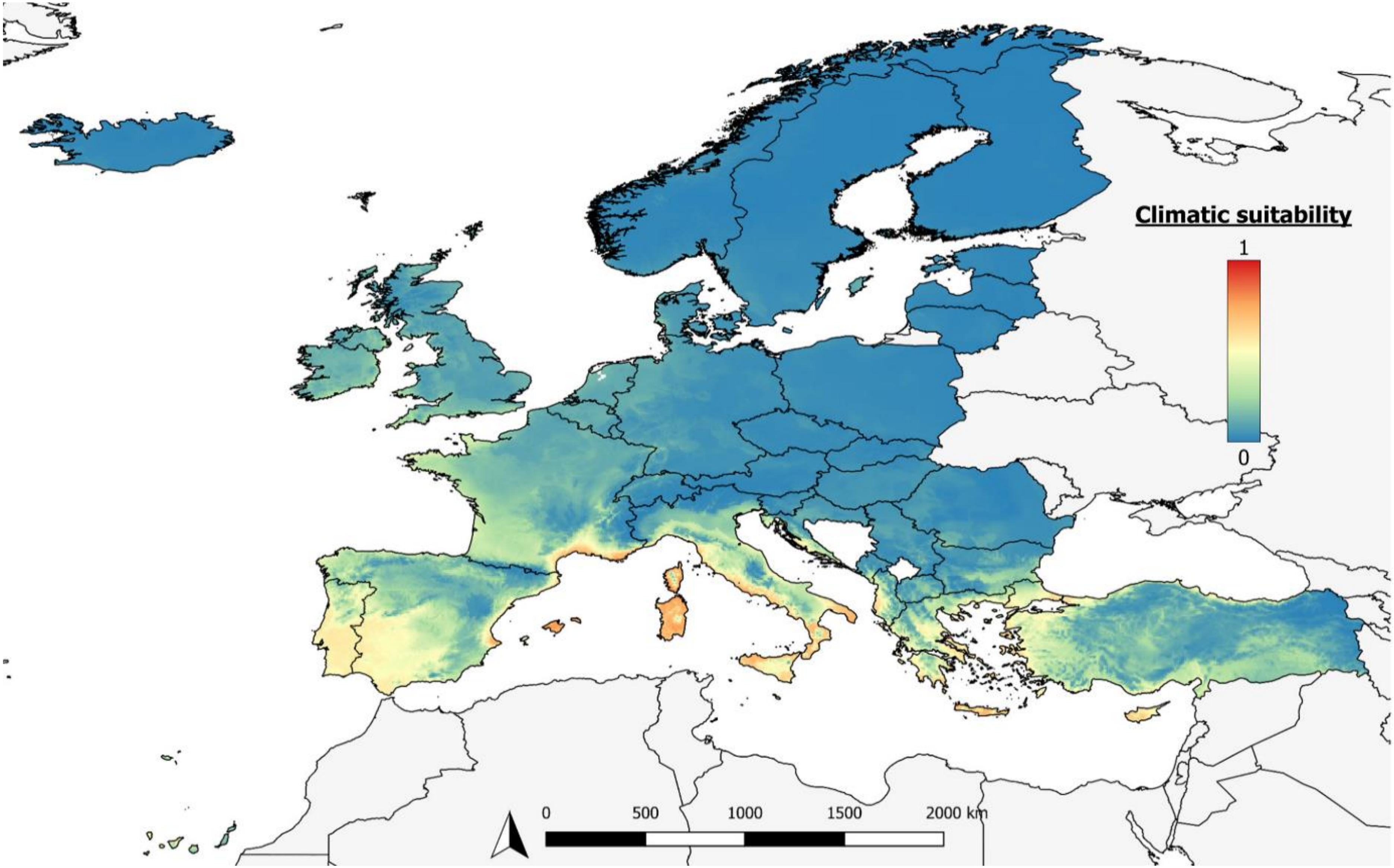
Climatic suitability for *X. fastidiosa*



Climatic suitability for *Xylella fastidiosa* subsp. *multiplex*



Potential establishment: Conclusions

Key uncertainties:

- Other factors that influence distribution
- Availability of host and vectors
- Bias in survey data / reporting (northern latitudes?)
- New or as yet unknown strains

Key conclusions:

- Most of the EU territory is estimated to have some level of risk, based on available data, southern Europe is most at risk
- *X. fastidiosa* subsp. *multiplex* has areas of potential establishment further north in Europe compared to other subspecies (but high uncertainty).
- Given the wide host range of *X. fastidiosa*, climate suitability mapping is an important tool in the design of targeted detection surveys for *X. fastidiosa* for Member States. to further refine estimates of potential establishment.
- Spatially-referenced data on positive, and importantly negative reports, from representative i.e. unbiased monitoring surveys are crucial

Sub-tasks from Mandate

- Asymptomatic period length
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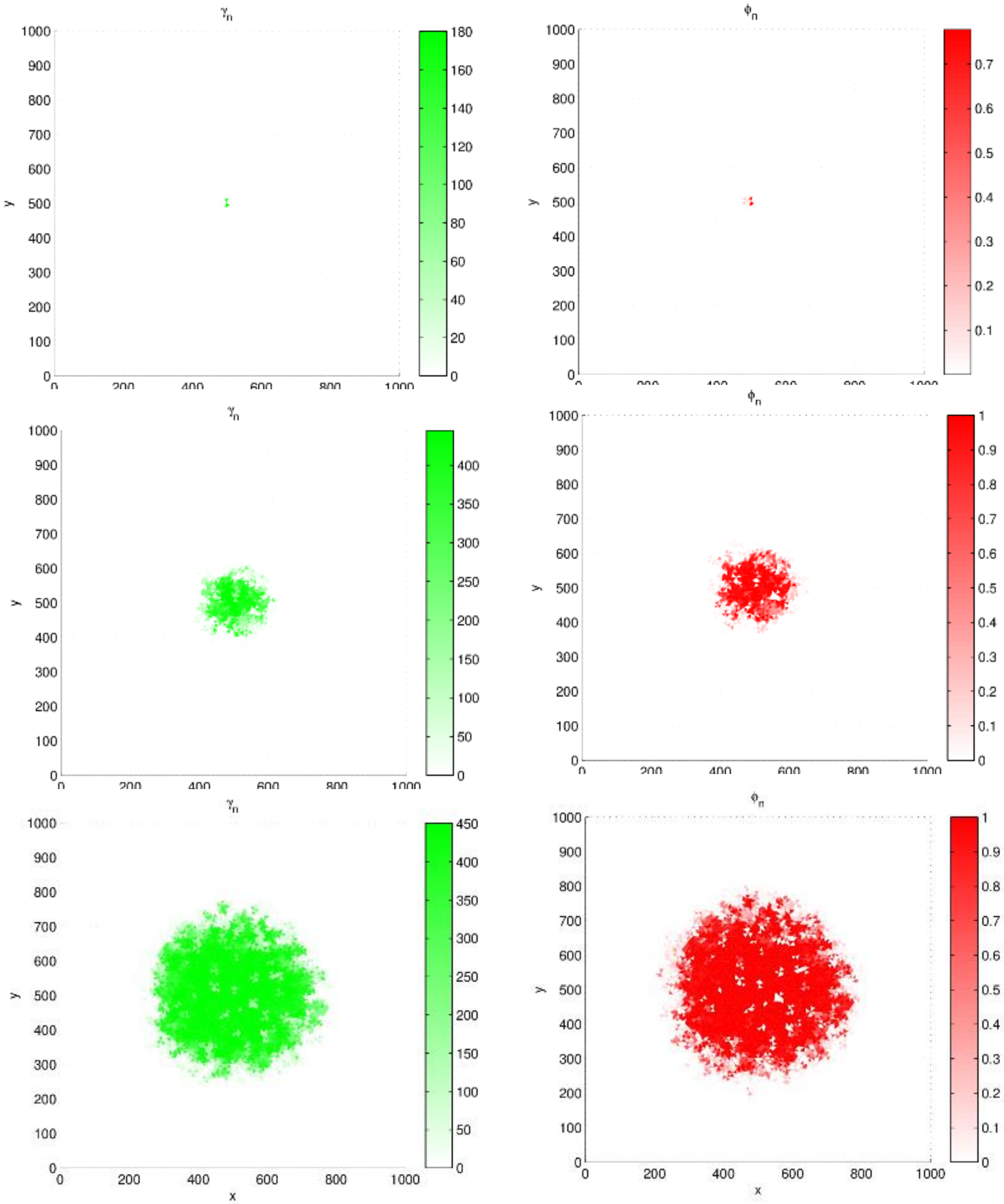
Simulations

1 y

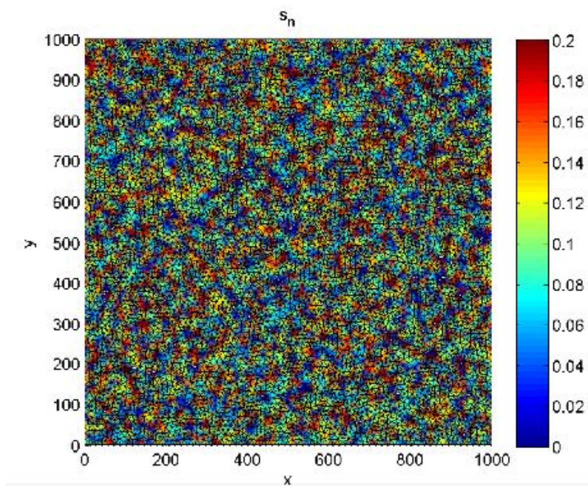
5 y

10 y

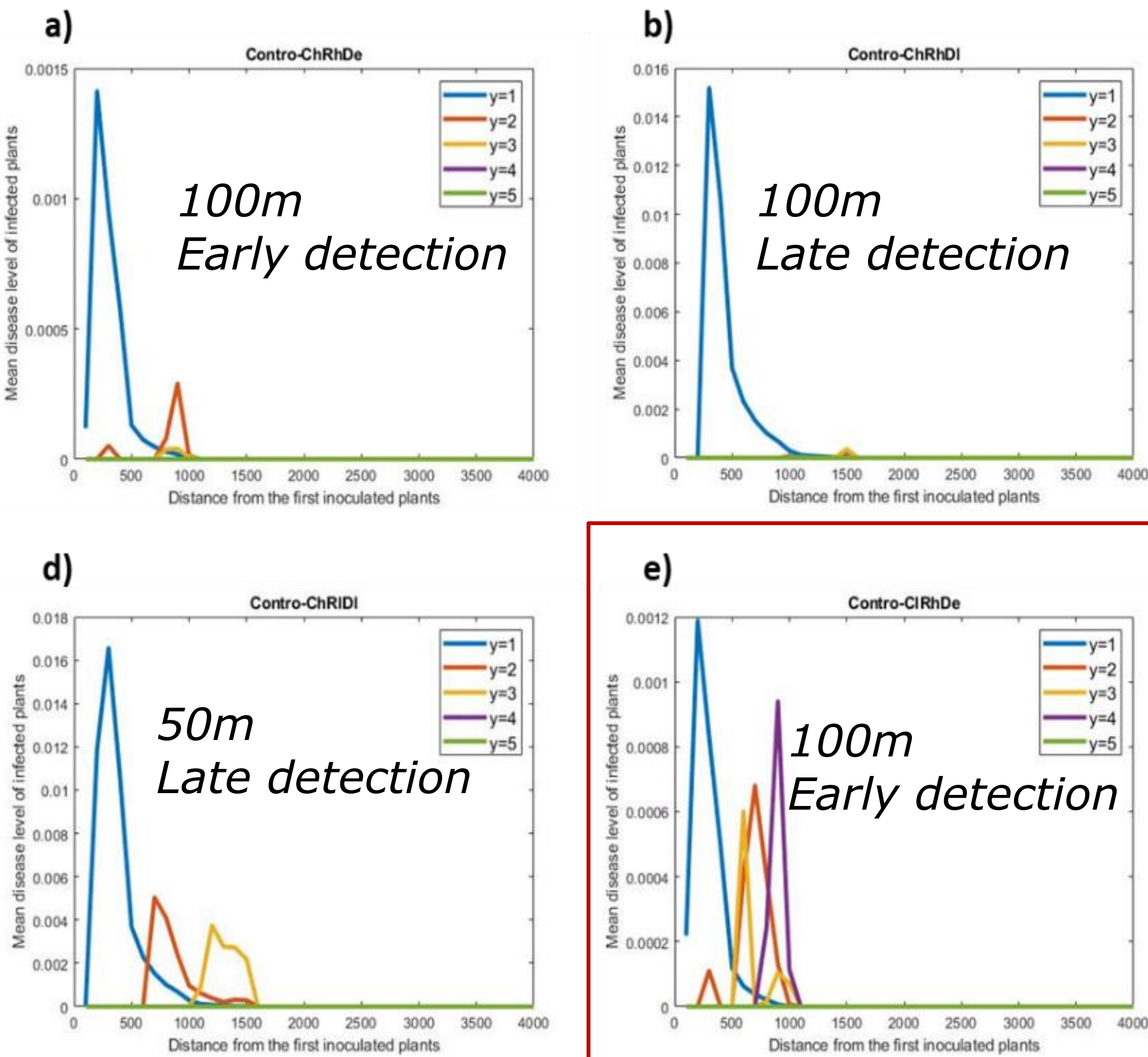


Disease

Vector



Strategies where eradication was achieved



The only scenario with **low vector control that achieved eradication** but it needed:

- **100m radius**
- **Early detection**
- **Early instigation of interventions**

Short range spread
Conclusions

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- Spread <1km per year (doesn’t include long range jumps)
- Under a scenario including the measure of plant removal, the modelling suggested that important factors for control where:
  - Reduction of transmission though control of vector populations is the most important factor for effective eradication of an outbreak in a previously free area.
  - Early detection (i.e. the time from infection to detection), and consequent removal of plants, through intensive surveillance and prompt implementation of interventions (i.e. the time from detection to implementation of control measures)
- Local eradication can be achieved with a 50m cutting radius. However, not even a 100m radius can achieve eradication if vector control, detection time and the delay in implementation of measures are poor.

Sub-tasks from Mandate

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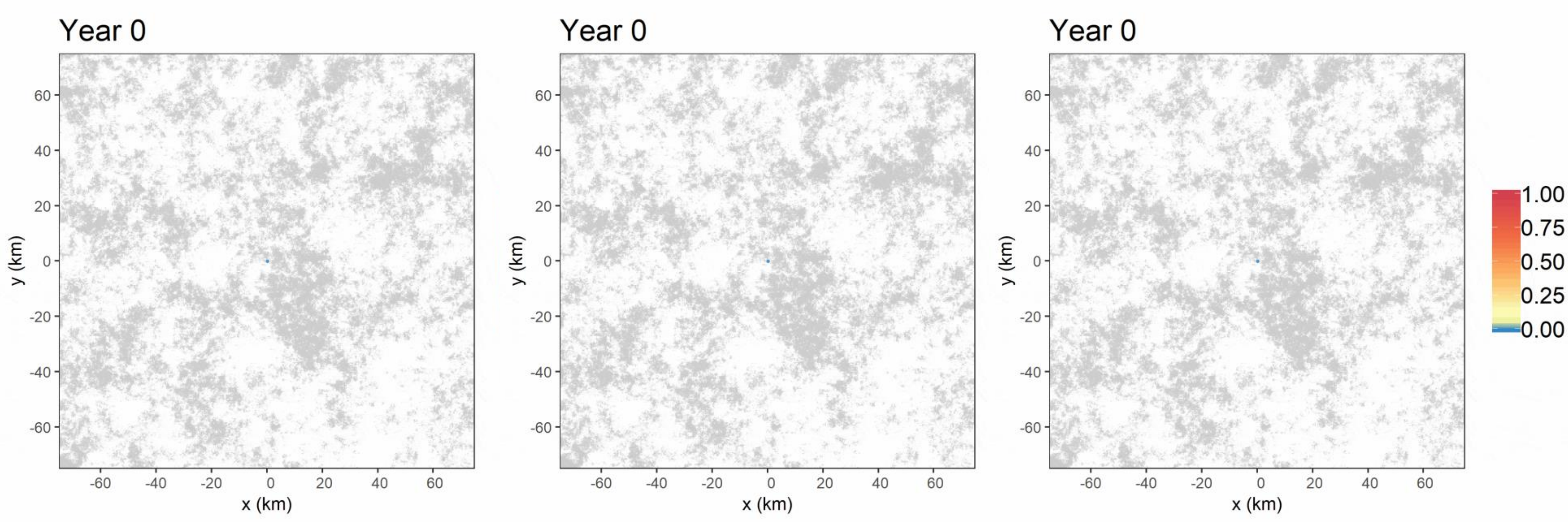
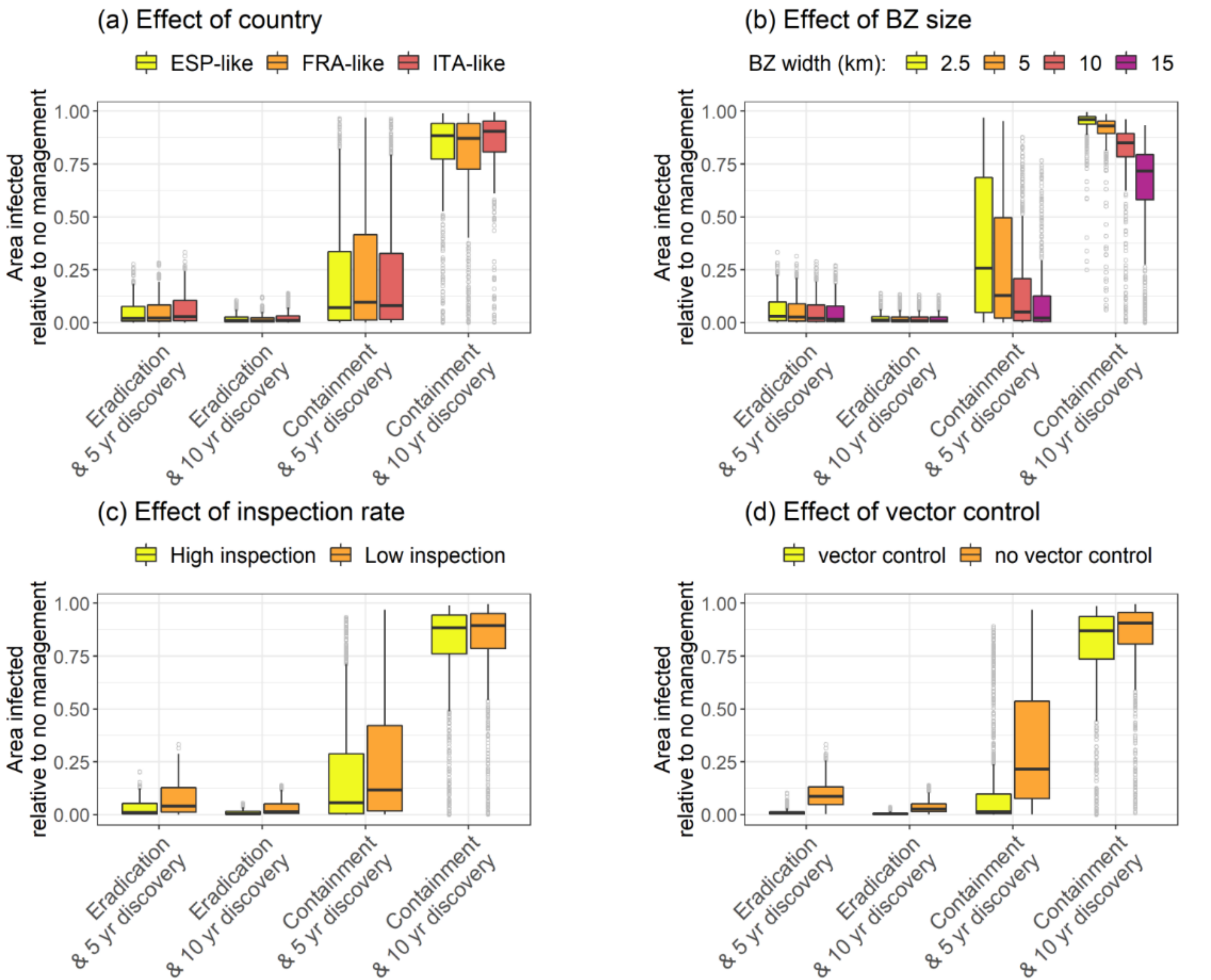
Illustrative Example Simulations

In the examples shown there is no surveillance outside the demarcated area. In other scenarios analysed, escaping foci will be detected and removed depending on the intensity of surveillance outside the demarcated area

No control | Eradication | Containment



Impact of management measures on the infected area



Long range spread
Conclusions

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- Reducing the BZ width increased the infected areas.
- The gain in BZ effectiveness decreased for high BZ widths
- long-range model also reinforced the importance of early detection surveillance
- Need for better understanding and quantification of the mechanisms and ranges of long distance dispersal
- As also found with the short-range model, the long range spread model suggested that maintaining effective vector control in the infected and uninfected areas, in combination with surveys and prompt application of measures to slow the growth of disease foci are recommended.
- The models suggest vector control plays an important role in disease management; better data on the effect of vector control on disease transmission should be collected to develop more accurate model assessments.

Sub-tasks from Mandate

- Asymptomatic period length
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Impact & Risk Reduction Options

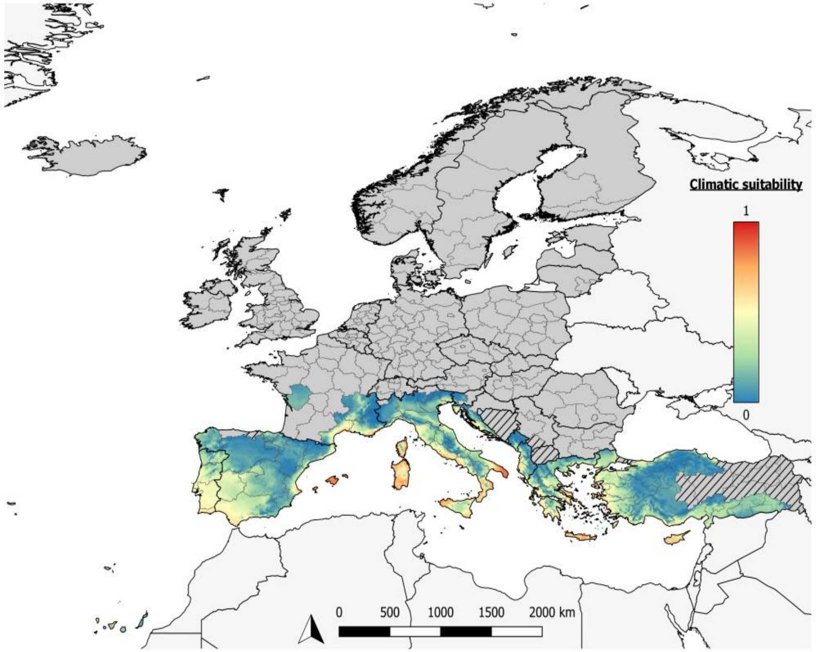
Impact

- Assessed for range of commerical hosts, forests & nurseries
- Expert knowledge elicitation and literature review
- Almond, citrus & grapevine estimated to have lower impact than olive

Risk Reduction Options (RROs)

- Currently no control measure available to eliminate X. fastidiosa from a diseased plant in open field conditions.

X. fastidiosa climate suitability on olive cultivation areas



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Appendix

Uncertainty

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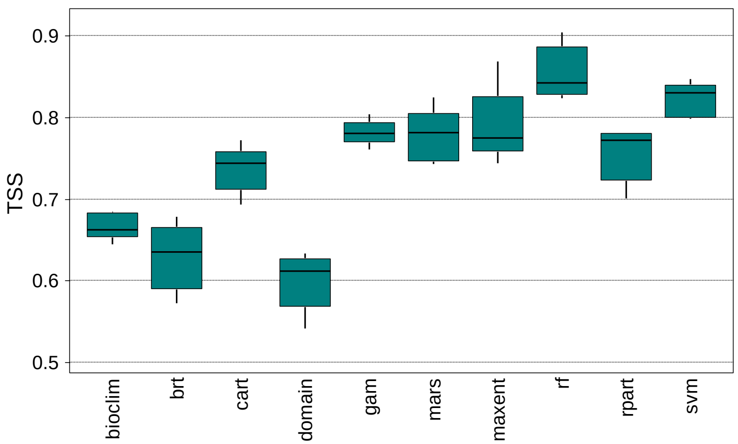
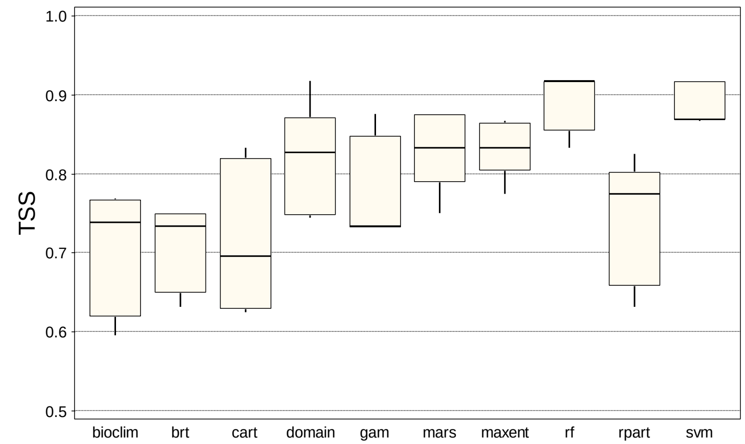
High uncertainty at sub-species level due to small number of data points

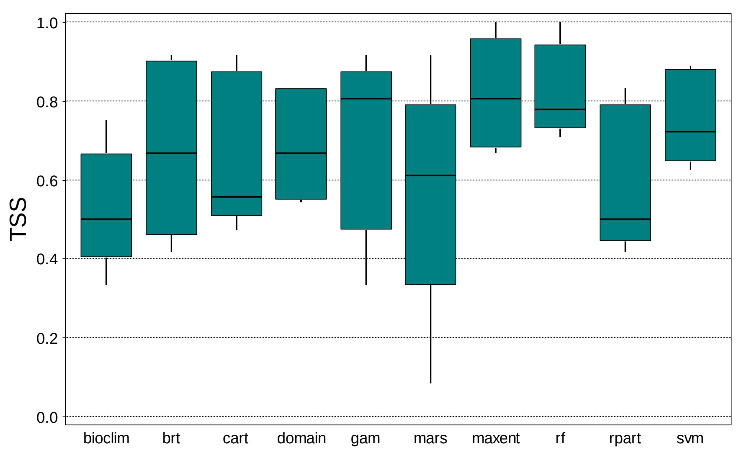
Species level



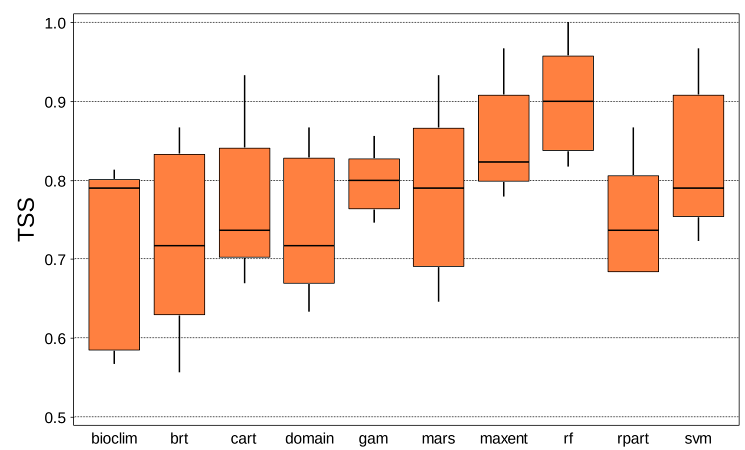
X.f. subsp. *multiplex*



X.f. subsp. *fastidiosa*



X.f. subsp. *pauca*



Impact on grapevine

- Main assumptions
  - Assessment at species level but focus on subsp. *fastidiosa*
  - The most suitable climatic conditions
  - High temperatures, no chilling effect, dry out during summer period
  - Climate conditions suitable for the pathogen but not for the vector
  - *P. spumarius* the only considered vector
  - Assessment done for wine grape and table grape in Southern Europe and for wine grape in Central Europe

- Experts
  - Joao Spotti Lopes
  - Domenico Bosco
  - Juan Antonio Navas Cortés
  - Miguel Angel Miranda
  - Pierfederico Lanotte
  - Gianni Gilioli

Results

Wine grape
Southern Europe

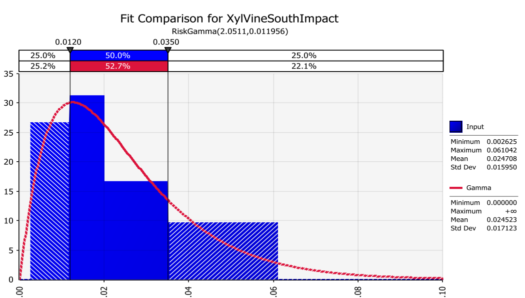
Percentile	% loss
1	0.2
25	1.2
50	2.1
75	3.3
99	8.1

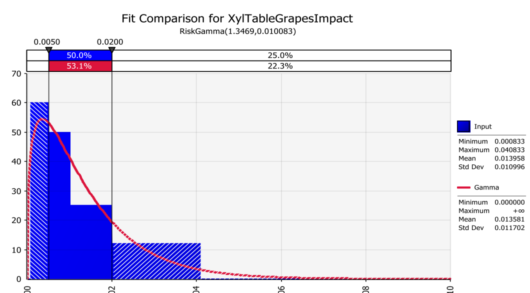
Table grape
Southern Europe

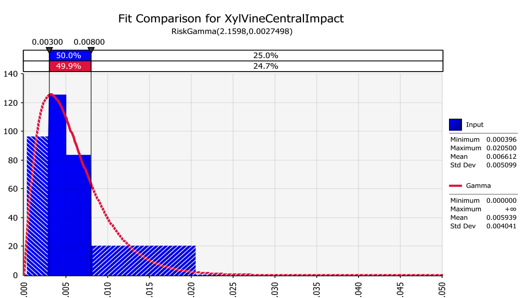
Percentile	% loss
1	0.0
25	0.5
50	1
75	1.9
99	5.4

Wine grape
Central Europe

Percentile	% loss
1	0.1
25	0.3
50	0.5
75	0.8
99	1.9







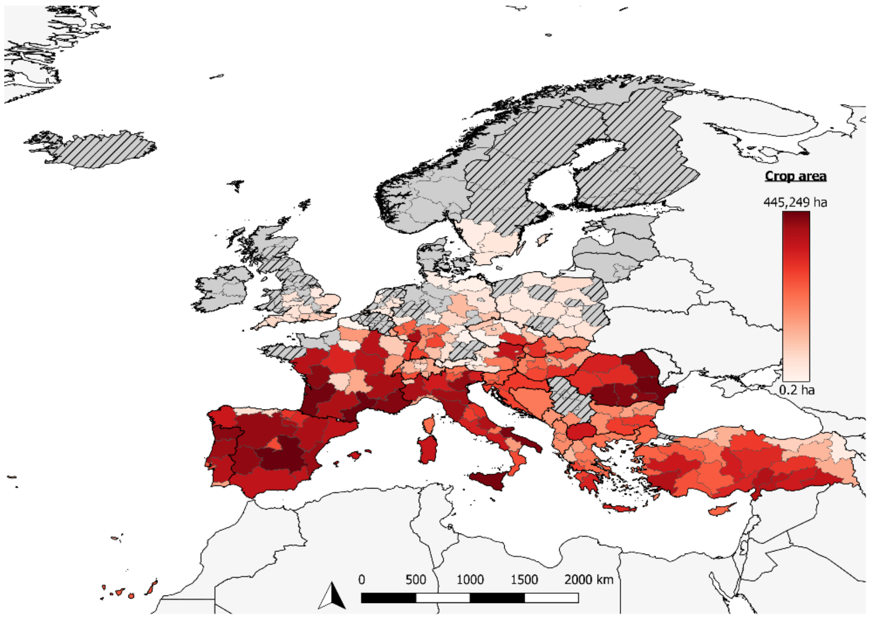
Impact on grapevine

Main evidences

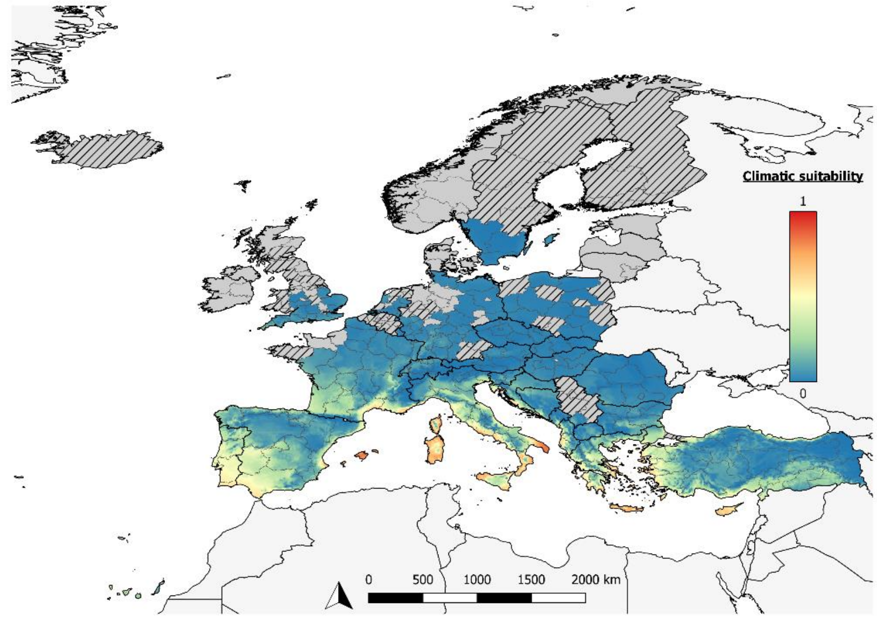
- The only vector that was considered in the assessment was *P. spumarius*
- In central Europe freezing winter temperatures would eliminate the bacterium from grapevine infected in spring.
- Very low density of *P. spumarius* is found in grapevine
- Since grapevine is not a preferred host, the probability of secondary spread is very low.
- *P. spumarius* is hard to spot all over season. This phenomenon was observed in Spain, south Italy, and Greece above all in summer time inside vineyards.
- A recent publication (Santoiemma et al., 2019) reports that population levels of *P. spumarius* negatively correlates with vineyards in the landscape.
- One of the most used vine training system (i.e. Guyot) is based on seasonal heavy pruning which could determine a lower probability of systemic infection. In general plants are pruned at the end of the season.
- The window of time in which infectious vectors can effectively transmit the diseases (determining a systemic infection) is short, just 2 or 3 months (late infections would be removed by pruning).

Grapevine production areas & *X. fastidiosa* climate suitability

Grapevine growing areas
(statistics of crop area at NUTS 2)



X. fastidiosa climate suitability on grapevine cultivation areas



In dark grey the regions and countries included in the analysis but with no olive growing areas. Areas with lines indicate areas with no data. Areas in light grey are neighbour countries not included in the analysis.

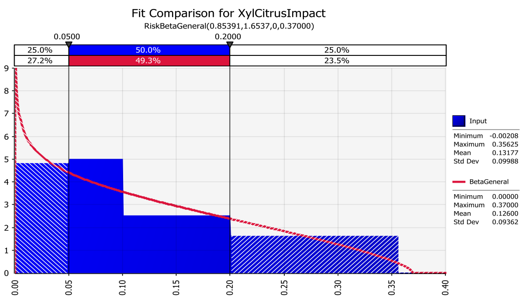
Impact on *Citrus* spp.

- Main assumptions
  - Assessment at species level but focus on subsp. *pauca*
  - Lemons and lime excluded
  - Mandarins less susceptibles than sweet oranges
  - Climate conditions suitable for the pathogen but not for the vector
  - Yield loss considering reduction in production weight including lower number of fruits, size of fruit below marketable threshold, lower productivity
  - An average 25 years productive cycle was considered

- Experts
  - Joao Spotti Lopes
  - Antonio Vicent
  - Juan Antonio Navas Cortés
  - Gianni Gilioli

Results

Percentile	% loss
1	0.1
25	4.5
50	10.9
75	19.4
99	34.4



Main evidences

- Mandarins can be considered moderately resistant
- In Mediterranean area citrus is irrigated. Irrigation might mitigate effect on production and reduce symptoms. However, even with irrigation, dry summers typical of the Mediterranean Basin may stress the trees to a certain level
- In Spain grass cover in citrus orchards, but not in summer for dry conditions. This element would not favour vectors
- Goncalves et al. (2012) reported 23% loss after 8 years in an area considered ideal for the disease (Northern São Paulo State, Brazil)

Citrus spp. production areas & *X. fastidiosa* climate suitability

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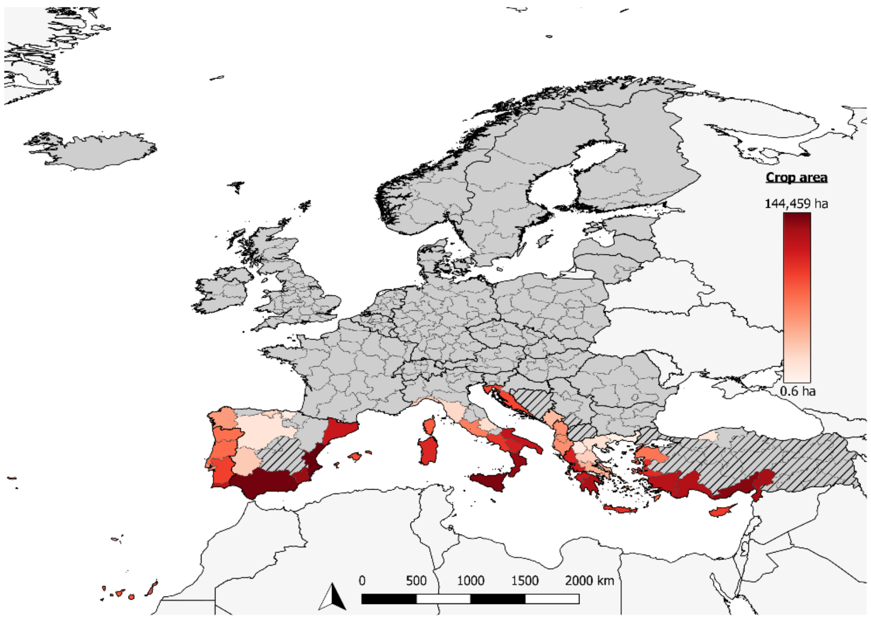
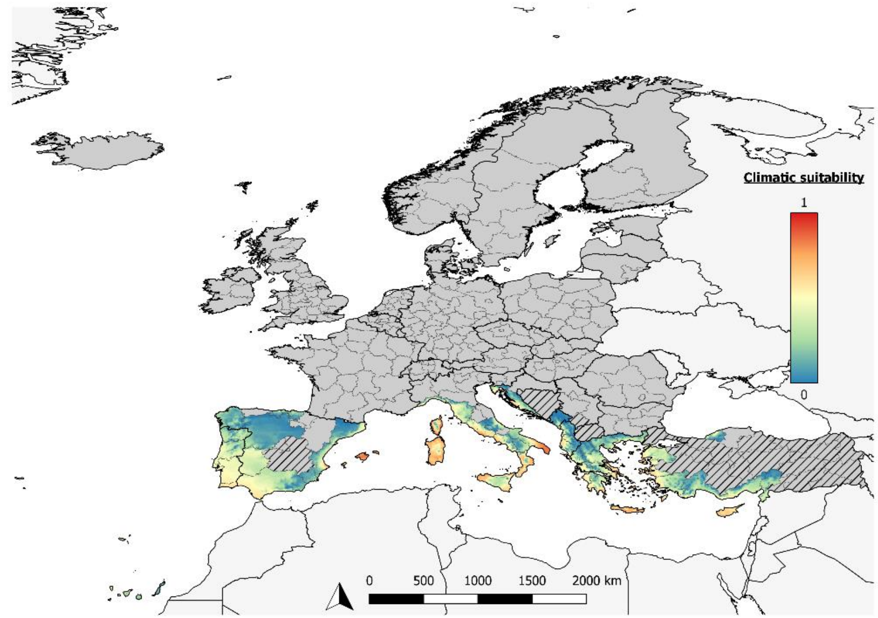
Citrus spp. growing areas
(statistics of crop area at NUTS 2)



X. fastidiosa climate suitability on *Citrus* spp. cultivation areas



In dark grey the regions and countries included in the analysis but with no olive growing areas. Areas with lines indicate areas with no data. Areas in light grey are neighbour countries not included in the analysis.

Risk Reduction Options

Risk Reduction Options

Vector control

- SO include results from final report of the EFSA Procurement on vector biology and control (will be published together with Xylella SO)
- Efficient vector control (adult and nymphs) is fundamental for controlling and slowing down the spread

Pruning

- Recent study on grapevine (from US) showed that pruning does not remove infection from sistemically infected plants

Phytosanitary measures and the taxonomic level of *X. fastidiosa*

- Decision whether to work at *X. fastidiosa* species, subspecies, ST, or at the strain levels is taken based on the available knowledge on the diversity of the bacterial population
- Intensive sampling and testing is conducted on plant species in the outbreak area to identify possible new host plants

Timing of application

- Early detection and rapid application of phytosanitary measures are essential to prevent further spread of the pathogen to new areas

Resistant germplasm

- Possibility to mitigate the impact of *X. fastidiosa* through tolerant/resistant varieties. The acquisition efficiency of *X. fastidiosa* is known to be correlated with bacterial load (Hill and Purcell, 1997) and thus focus should be on varieties that reduce pathogen load as well as limit disease severity
- EFSA Report on olive susceptibility (https://www.efsa.europa.eu/en/efsajournal/pub/4772)
- Review ongoing for other crops (grape, almond, citrus)

Conclusions – RROs *in planta*

- The Panel concludes that, although the presented published experiments show some effects in reducing symptom development, the tested control measures are not able to completely eliminate *X. fastidiosa* from diseased plants.

- The Panel confirms that there is currently no control measure available to eliminate *X. fastidiosa* from a diseased plant in open field conditions.