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Agroscope

Risk-based sampling of woody plants for planting

Case Study “*Xylella fastidiosa*”

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27.04.2023, Liebefeld

www.agroscope.ch | good food, healthy environment



Xylella fastidiosa



Boscia, D. (2013). Symptoms of quick decline



Xylella fastidiosa



Xylella fastidiosa (XYLEFA) - <https://gd.eppo.int>

Boscia, D. (n.d.). Symptoms of quick decline

Xylella fastidiosa

October 2013



Boscia, D. (n.d.). Symptoms of quick decline

Xylella fastidiosa

April 2013

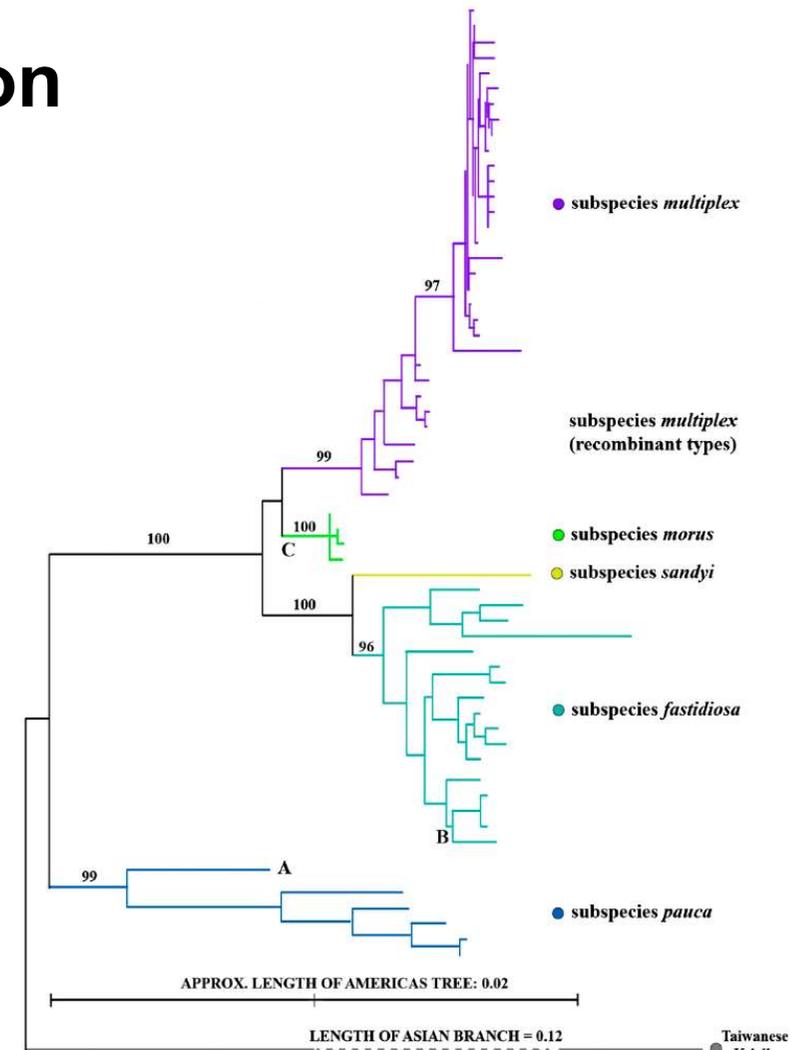


Boscia, D. (n.d.). Symptoms of quick decline



Xylella fastidiosa - Introduction

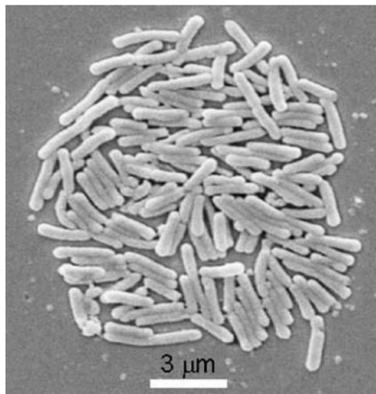
- 3 major subspecies
- Over 560 host plant species
 - But specific to different isolates
- Median yield losses (EFSA, 2019)
 - Olives $\geq 30y$: 69.1%
 - Citrus spp. : 13.9%
 - Grapes : 2.1%
- Potential economic impact : 5.5 B € /y in EU in the future (EFSA, 2019)



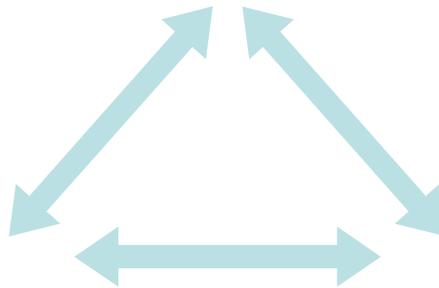
Almeida R, Nunney L (2015). Phylogenetic tree of *Xylella fastidiosa*



Xylella fastidiosa - Interactions



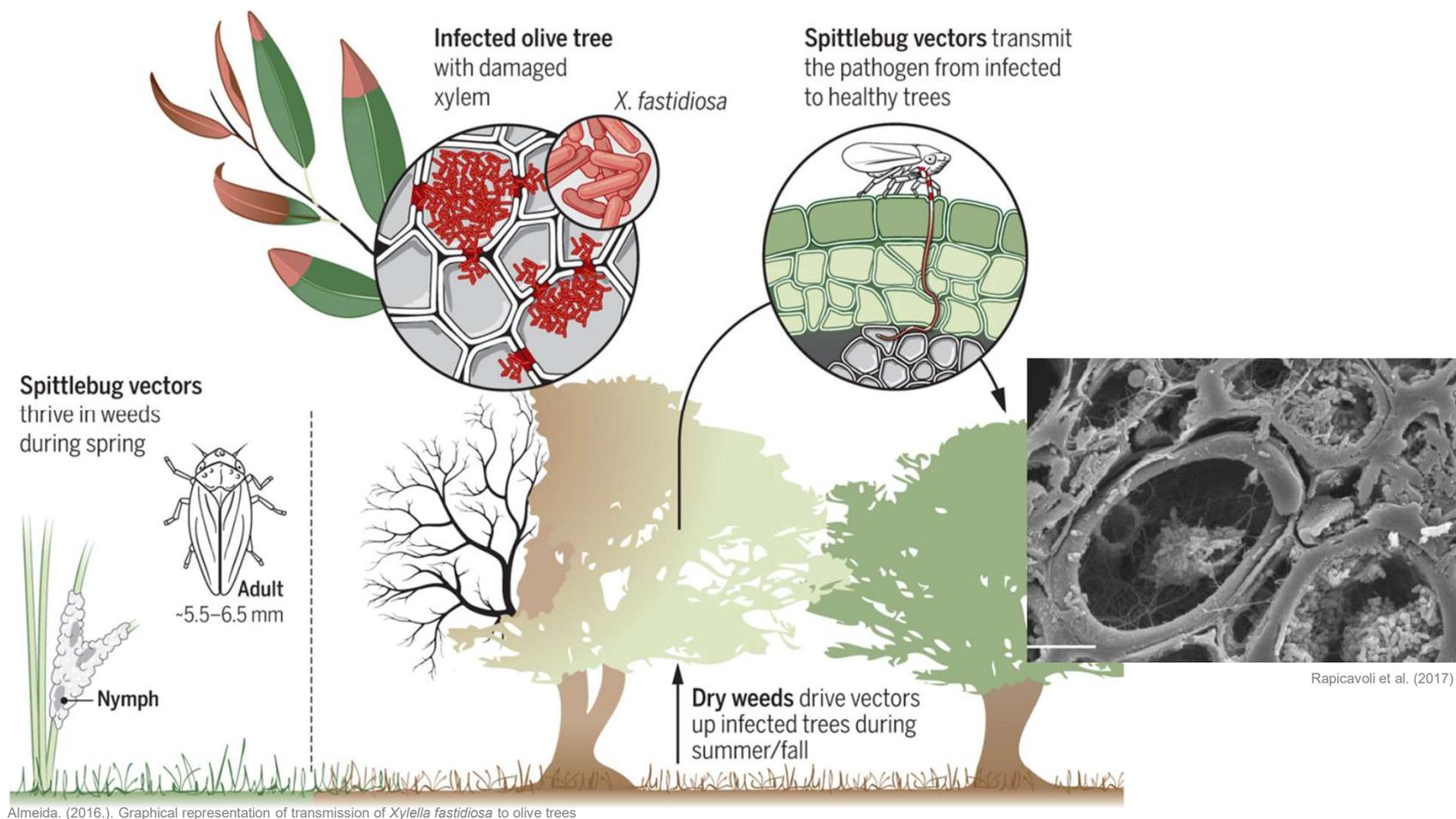
Alves, D. (n.d.)



Klejdzysz, T. (n.d.)

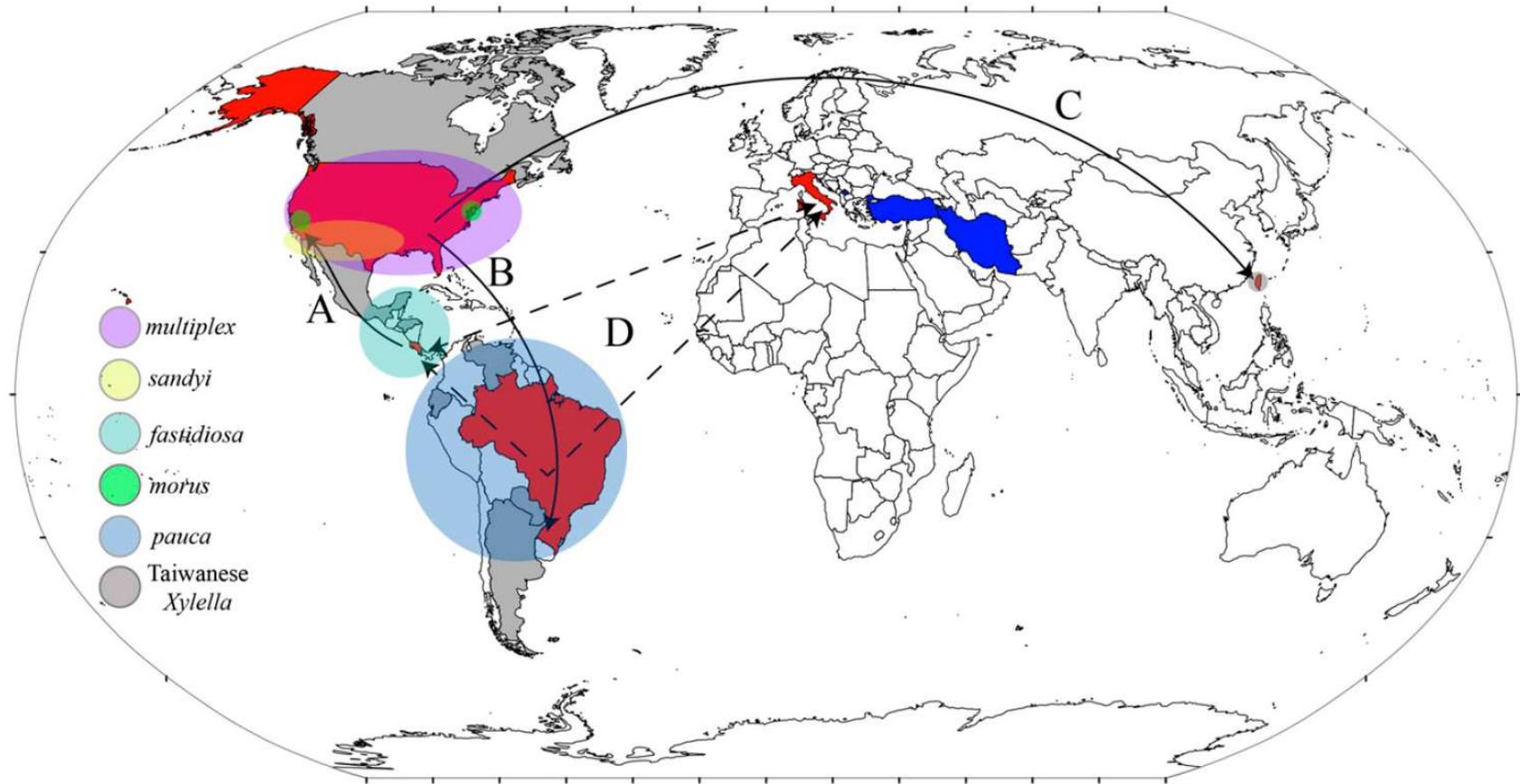


Xylella fastidiosa - Transmission





Xylella fastidiosa - Distribution



Almeida R, Nunney L (2015). World map illustrating the proposed endemic distribution of *Xylella fastidiosa* subspecies.



Xylella fastidiosa – control measures

- Remove and burn infested plants
- Antibacterial treatment
- Insecticides (pyrethroid)
- R&D
 - Kaolin, Harpine, *Beauveria bassiana*
 - Resistant/ tolerant cultivars

- Prevent movement of infected plants
- Surveillance



Risk estimation – Plant species

- Main host plant species as per 2015/789/EU:
 - *Coffea* spp.
 - *Lavandula dentata* L.
 - *Nerium oleander* L.
 - *Olea europaea* L.
 - *Polygala myrtifolia* L.
 - *Prunus dulcis*
- Other host plant species
- [EUR-Lex - 32020R1201 - EN - EUR-Lex \(europa.eu\)](#)

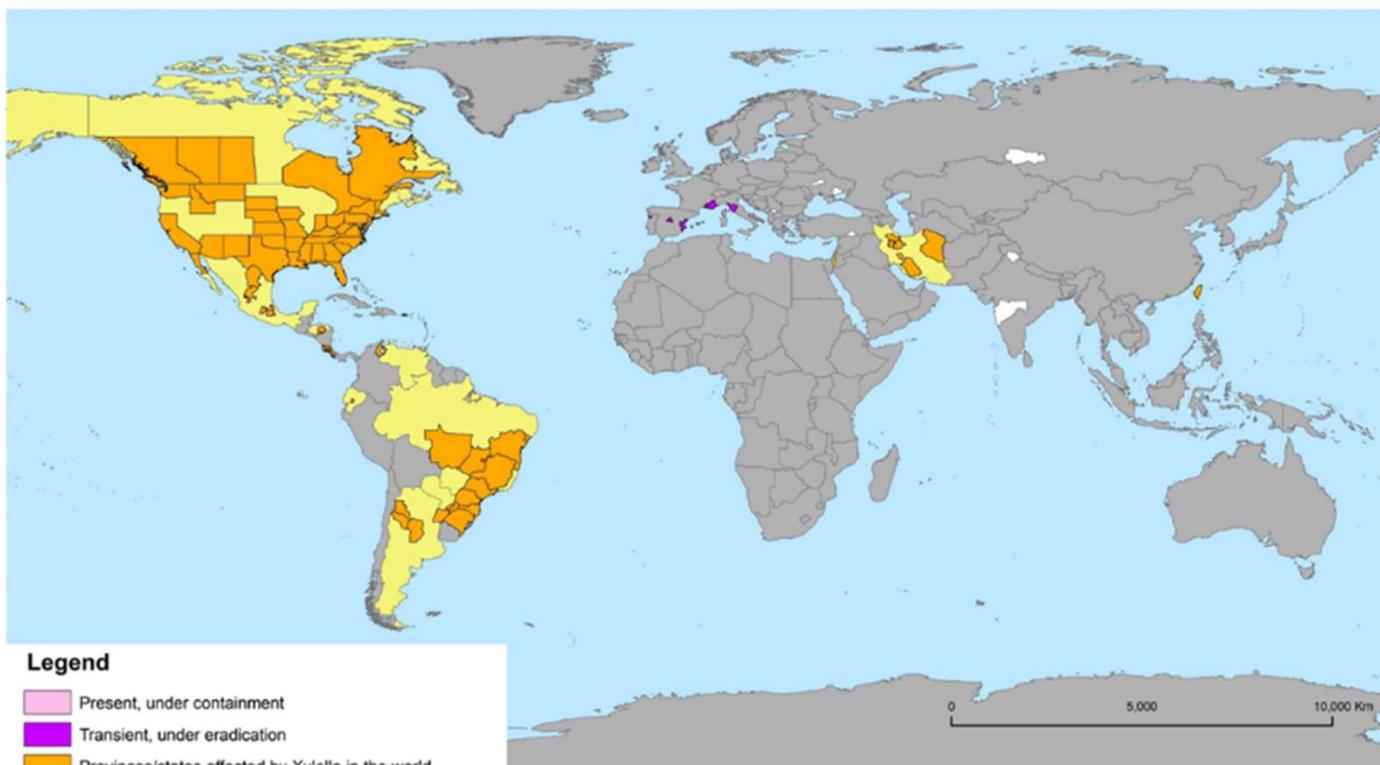


Risk estimation – Country of origin

[Pest survey card on Xylella fastidiosa \(arcgis.com\)](https://arcgis.com)



[ph biosec legis list-demarcated-union-territory en.pdf \(europa.eu\)](https://europa.eu)



- Legend**
- Present, under containment
 - Transient, under eradication
 - Provinces/states affected by Xylella in the world
 - Provinces dubious records in the world
 - Countries affected by Xylella outside Europe

World distribution of *Xylella fastidiosa* (modified from EFSA PLH Panel, 2018)



Risk estimation – Country of origin

- Three scenarios for importing plants
 - Country free of *X. fastidiosa*
 - Sampling only if symptoms are observed
 - Region free of *X. fastidiosa* in a country affected by *X. fastidiosa*
 - Routine samples
 - Region affected by *X. fastidiosa*
 - Import prohibited



Hygienic measures

How is *Xylella fastidiosa* spread naturally?

- Vector
- Routine sample → basic hygienic measures
 - Avoid touching plants
 - Disinfection: tools, shoes, hands, sample bag
- Suspicion → additional hygienic measures
 - E.g. disposable suit
 - Extended disinfection



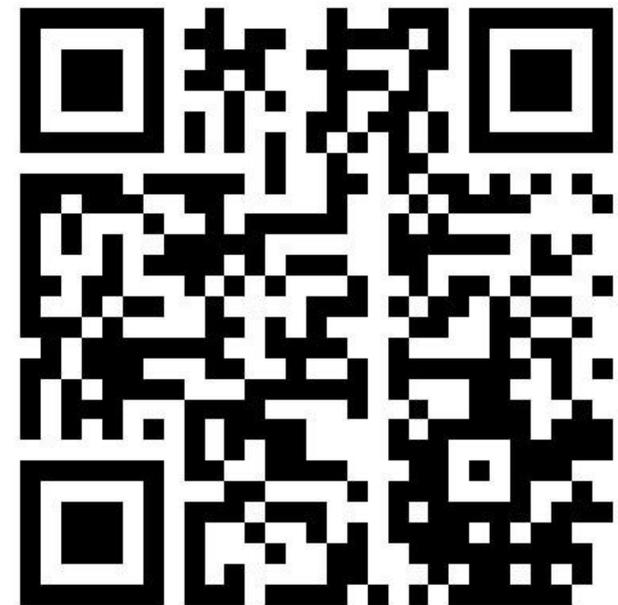


Sampling of plants

Number of plants to be sampled

- Confidence level
- Level of detection
 - both determined by NPPO
- Number of units in lot

[ISPM 31. Methodologies for sampling of consignments \(fao.org\)](https://www.fao.org/ipm/31/methodologies-for-sampling-of-consignments)



Number of units in lot	P = 95% (confidence level)					P = 99% (confidence level)				
	% level of detection × efficacy of detection					% level of detection × efficacy of detection				
	5	2	1	0.5	0.1	5	2	1	0.5	0.1
25	24*	–	–	–	–	25*	–	–	–	–
50	39*	48	–	–	–	45*	50	–	–	–
100	45	78	95	–	–	59	90	99	–	–
200	51	105	155	190	–	73	136	180	198	–
300	54	117	189	285*	–	78	160	235	297*	–



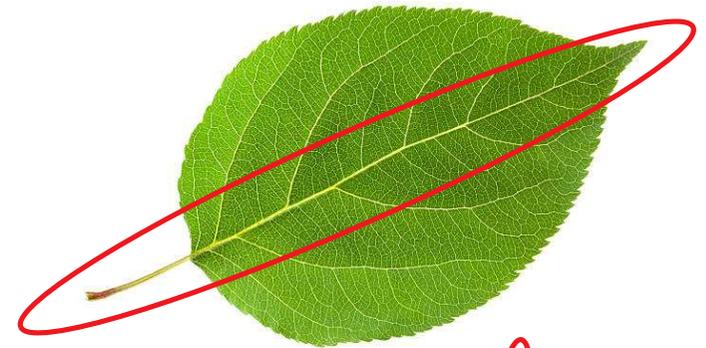
Sampling of plants

What type of plant tissue is to be sampled?

- Xylem containing plant tissue

Sampling adapted according to

- Period of active growth
- Host plant
- What the lab needs





Sampling of plants

Presence of symptoms: Suspicion

- Individual plants
- Pool only similar symptoms
- Branches with 10–25 leaves
- Transitional tissue

Absence of symptoms: Routine sample

- Representative sample
- 4–10 branches for individual plants

[DP 25: *Xylella fastidiosa* \(fao.org\)](https://www.fao.org/infocentre/dp/25/)

Table 1. Number of leaves (including their petioles) to be used and approximate weight of the laboratory sample. Data from EPPO (2018b).

Type of sample	Host plants and type of tissue	Minimum number of leaves per laboratory sample	Approximate weight of laboratory sample
Sample from individual plant with leaves	Petioles or midribs, or both, of leaves of large size (e.g. from <i>Coffea</i> spp., <i>Ficus</i> spp., <i>Vitis</i> spp., <i>Nerium</i> spp.)	5	0.5–1 g
	Petioles or midribs, or both, of leaves of small size (e.g. <i>Polygala myrtifolia</i> and <i>Olea</i> spp.)	25	0.5–1 g
	Plant species without petioles or with small petiole and midrib	25	0.5–1 g
Dormant plant or cuttings	Xylem tissue	n/a [†]	0.5–1 g
Composite sample from several coffee plants from a single lot with leaves	Samples of asymptomatic plants (e.g. collected from imported consignments or nursery monitoring)	100–200	10–50 g

[PM3/081\(3\) Inspection of consignments for *Xylella fastidiosa* \(epo.int\)](https://www.eppo.int/technical/PM3/081(3)_Inspection_of_consignments_for_Xylella_fastidiosa.html)

TABLE 1 Guidance on sampling for lots of plants for selected species and tissue to be recovered when testing samples composed of large amounts of tissue^a (e.g. composite samples from consignment/ places of production of plants for planting)

Host	Minimum number of leaves/twigs/stems to be collected per plant	Number of plants that can be pooled
<i>Olea europaea</i> ^b	4 (leaves)	Up to 225
<i>Nerium oleander</i>	2 (leaves)	Up to 100
Herbaceous plantlets	1 (plantlet)	Up to 200
<i>Polygala myrtifolia</i> ^c	2 (twigs)	Up to 125
<i>Lavandula</i> spp. ^d	2 (stems)	Up to 100
<i>Prunus dulcis</i> / <i>P. avium</i>	2 (twigs)	Up to 100
<i>Coffea</i> spp.	2 (leaves)	Up to 50
<i>Helichrysum italicum</i>	2 (stems)	Up to 50



Transport and shipment

- Threefold packaging: 2 layers of plastic + stable container
- Unique label

20230427_ 12345_1
Lavendula angustifolia
Routine sample
XYLEFA

- Cooled transport (4–15 °C)
- As fast as possible



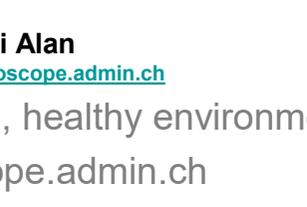


Practical exercise

You are called by the customs at Zurich airport for the following situations. What are the procedures to be followed in each situation?

Confidence level = 95%, detection level = 1%

State (country) of origin	Plant species	Lot size	Risk based inspection method	Sample size	Minimum number of leaves/twigs/stems to be collected per plant	Number of plants that can be pooled
Oregon (USA)	<i>Prunus dulcis</i>	500				
California (USA)	<i>Prunus dulcis</i>	500				
Fès-Meknès (MA)	<i>Olea europea</i>	50				
Bahia (BR)	<i>Theobroma cocoa</i>	100				
Western Cape (SA)	<i>Polygale myrtifolia</i>	1500				



Thank you for your attention

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