# PEST SURVEY CARD SUMMARY

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# Pest survey card on Citrus leprosis viruses

European Food Safety Authority (EFSA), Elena Lázaro[1], Pilar Vanaclocha[1], Antonio Vicent[1], María Carmen Vives[1], Alice Delbianco[2]

[1]*Institut Valencià d'Investigaciones Agràries (IVIA)*
[2]*European Food Safety Authority (EFSA)*

## Abstract

This document provides the conclusions of the pest survey card that was prepared in the context of the EFSA mandate on plant pest surveillance (M-2020-0114) at the request of the European Commission. The full pest survey card for citrus leprosis viruses is published and available online in the EFSA Plant Pest Survey Cards Gallery at the following link and will be updated whenever new information becomes available: https://efsa.europa.eu/plants/planthealth/monitoring/surveillance/citrus-leprosis-viruses

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# 1. Introduction

This pest survey card was prepared in the context of the EFSA mandate on plant pest surveillance (M-2020-0114), at the request of the European Commission. Its purpose is to guide the Member States in preparing data and information for surveys of citrus leprosis viruses. These are required to design statistically sound and risk-based pest surveys, in line with current international standards. Six of the seven viruses that cause citrus leprosis (CiLV-C, CiLV-C2, HGSV-2, OFV, CiLV-N *sensu novo* and CiCSV) are clearly defined taxonomic entities, while the status of CiBSV is unclear. CiLV-C, CiLV-C2, HGSV-2, the citrus strain of OFV, CiLV-N *sensu novo* and CiCSV are Union quarantine pests. Citrus leprosis viruses do not cause systemic infections and they are all exclusively transmitted by mites of the genus *Brevipalpus*. *Brevipalpus* mites associated with the transmission of the leprosis disease are present in some regions of EU territory. The commercial citrus species most relevant to the EU are considered susceptible to citrus leprosis disease. There are no ecoclimatic constrains known for the citrus leprosis viruses, except for those affecting their host plants and their mite vectors. Therefore, due to the wide availability of host species and the presence of *Brevipalpus* mites, all citrus-growing areas in the EU are considered potentially suitable for the viruses to become established. Long-distance spread is likely to occur through movement of viruliferous mites phoretically associated with commodities. Detection of citrus leprosis viruses in the field should be performed by visual examination of symptoms followed by sampling and molecular identification in the laboratory. Visual examination should be preferably conducted in late summer / early autumn. Based on the analyses of the information on the pest–host plant system, the various units that are needed to design a survey should be defined and tailored to the situation in each Member State.

# 2. The survey preparation

Table 1 addresses the key questions that are relevant for preparing a pest survey. First, the plant pest needs to be characterised in in terms of its life cycle and biology. Then, the structure and size of the target population needs to be characterised and these analyses should be tailored to the situation in each Member State. Figure 1 gives examples of the components of a target population for citrus leprosis viruses and is not necessarily exhaustive. Finally, the detection process needs to be characterised in terms of the sequence of detection and identification methods required for the survey.

**Table 1:**   Preparation of surveys for citrus leprosis viruses

| Survey question | Section | Key information |
|---|---|---|
| What? | 1. The pest and its biology | Citrus leprosis disease is associated with at least seven different viruses: CiLV-C, CiLV-C2, HGSV-2, OFV, CiLV-N *sensu novo,* CiCSV and CiBSV. These viruses are transmitted by *Brevipalpus* mites (Acari: Tenuipalpidae) with a persistent circulative mechanism. Citrus leprosis is not a systemic disease. All motile mite stages can acquire the virus and transmit it to healthy plant tissues through their feeding activity. |
| Where? | 2. Target population | Citrus leprosis viruses have a natural host range largely limited to Rutaceae species and collectively infect many species of citrus. Citrus leprosis viruses can potentially affect the most relevant commercial citrus species in the EU.<br><br>Epidemiological unit: individual homogeneous area that contains at least one individual host plant (e.g. orchard, hectare, NUTS area). |

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|---|---|---|
| | | Risk areas: areas with citrus hosts near nurseries, garden centres, packing houses, processing plants, outdoor fruit-drying facilities, fresh fruit markets and livestock feeding areas. |
| | | Inspection unit: individual citrus plant |
| How? | 3. Detection and identification | Recommended method: visual examination of symptoms on leaves, twigs, branches and fruit followed by sampling symptomatic material and laboratory testing. Specific primers targeting different genomic regions and RT-PCR protocols for detection of all characterised citrus leprosis viruses are available. |
| When? | | Visual examination and sampling for testing should preferably be conducted in late summer / early autumn. |
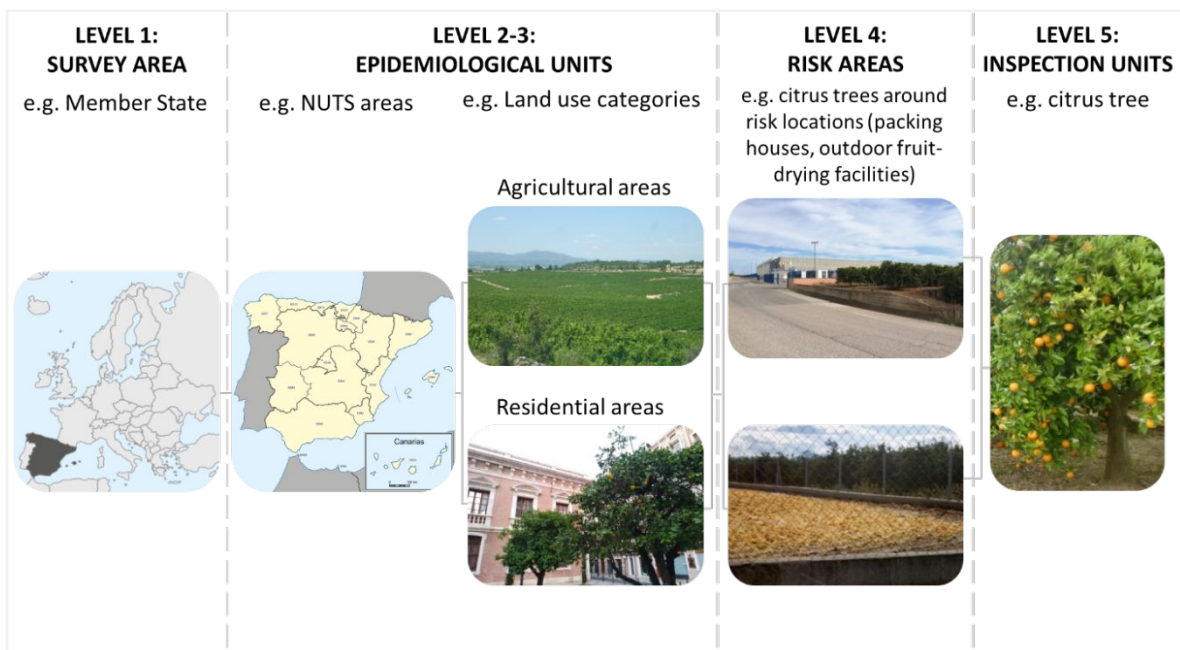


**Figure 1:** Example of hierarchical structure of the target population for citrus leprosis viruses in the EU (Copyright: Eurostat, 2018 (levels 1–2), Plant Health Service of Generalitat Valenciana (GVA) (level 4, up), Antonio Vicent, IVIA (levels 3, 4 bottom, 5))

# 3.   From survey preparation to survey design

Figure 2 shows the next steps after the survey preparation for designing statistically sound and risk-based detection and delimiting surveys of citrus leprosis viruses. Guidance on the selection of type of survey, related survey preparation and design, is provided in the EFSA general guidelines for pest surveys[1].
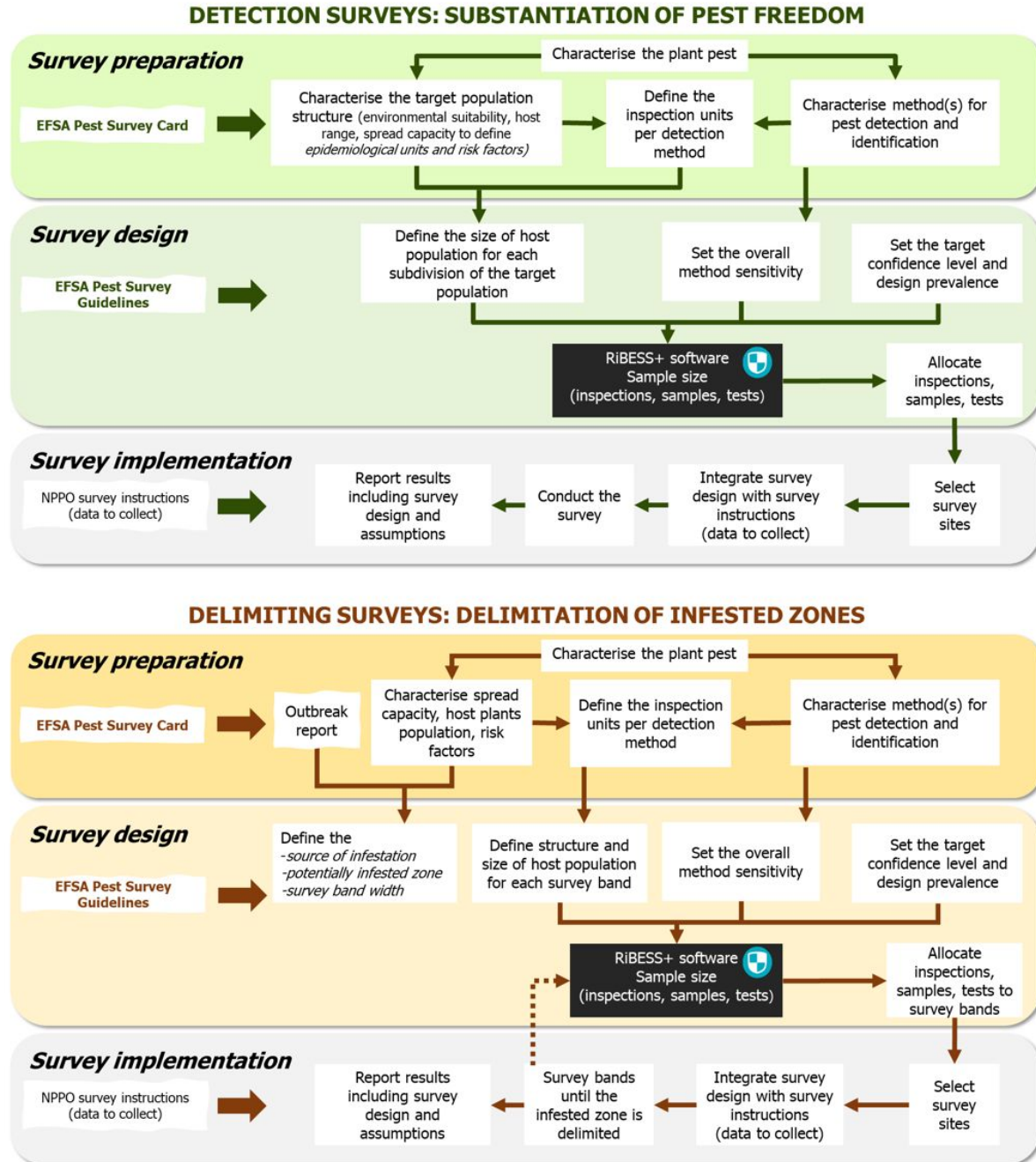


**Figure 2:** Steps required for the preparation, design and implementation of detection and delimiting surveys, in accordance with the methodology for statistically sound and risk-based surveillance[1]

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[1] EFSA (European Food Safety Authority), Lázaro E, Parnell S, Vicent Civera A, Schans J, Schenk M, Cortiñas Abrahantes J, Zancanaro G and Vos S, 2020. General guidelines for statistically sound and risk-based surveys of plant pests. EFSA supporting publication 2020:EN-1919. 65 pp. doi:10.2903/sp.efsa.2020.EN-1919 https://efsa.onlinelibrary.wiley.com/doi/10.2903/sp.efsa.2020.EN-1919

## Relevant EFSA outputs

- General guidelines for statistically sound and risk-based surveys of plant pests: https://efsa.onlinelibrary.wiley.com/doi/10.2903/sp.efsa.2020.EN-1919

- Pest survey card on Citrus leprosis viruses: https://efsa.europa.eu/plants/planthealth/monitoring/surveillance/citrus-leprosis-viruses

- Pest categorisation of Citrus leprosis viruses: https://efsa.onlinelibrary.wiley.com/doi/full/10.2903/j.efsa.2017.5110

- Index of the EFSA Plant Pest Survey Toolkit: https://efsa.europa.eu/plants/planthealth/monitoring/surveillance/index

- Plant pest survey cards gallery: https://efsa.europa.eu/plants/planthealth/monitoring/surveillance/gallery

- Pest survey cards: what, when, where and how to survey? https://www.youtube.com/watch?v=kHAnmRDelx8

- The statistical tool RiBESS+: https://r4eu.efsa.europa.eu/app/ribess

- The RiBESS+ manual: https://zenodo.org/record/2541541#.Ys7G5HZByUn

- The RiBESS+ video tutorial: https://youtu.be/qYHqrCiMxDY