SCIENTIFIC OPINION

Scientific Opinion on the pest categorisation of *Eotetranychus lewisi*[1]

EFSA Panel on Plant Health (PLH)[2,3]

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ABSTRACT

The Panel on Plant Health performed a pest categorisation of the Lewis spider mite, *Eotetranychus lewisi*, for the European Union (EU). The Lewis spider mite is a well-defined and distinguishable pest species that has been reported from a wide range of hosts, including cultivated species. Its distribution in the EU territory is restricted to (i) Madeira in Portugal; and to (ii) Poland where few occurrences were reported in glasshouses only. The pest is listed in Annex IIAI of Council Directive 2000/29/EC. A potential pathway of introduction and spread is plants traded from outside Europe and between Member States. The Lewis spider mite has the potential to establish in most part of the EU territory based on climate similarities with the distribution area outside the EU and the widespread availability of hosts present both in open fields and in protected cultivations. With regards to the potential consequences, one study is providing quantitative data on impact showing that the pest can reduce yield and affect quality of peaches and poinsettias, and only few studies describe the general impact of the pest on cultivated hosts. Although chemical treatments are reported to be effective in controlling the Lewis spider mite, it is mentioned as a growing concern for peaches, strawberries, raspberries and vines in the Americas. Overall, *Eotetranychus lewisi* meets the pest categorisation criteria defined in the International Standards for Phytosanitary Measures No 11 for a quarantine pest and in No 21 for a non-regulated quarantine pest.

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KEY WORDS

Eotetranychus lewisi, Lewis spider mite, pest categorisation, quarantine pest, regulated non-quarantine pest

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BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION

The current European Union plant health regime is established by Council Directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (OJ L 169, 10.7.2000, p. 1).

The Directive lays down, amongst others, the technical phytosanitary provisions to be met by plants and plant products and the control checks to be carried out at the place of origin on plants and plant products destined for the Union or to be moved within the Union, the list of harmful organisms whose introduction into or spread within the Union is prohibited and the control measures to be carried out at the outer border of the Union on arrival of plants and plant products.

The Commission is currently carrying out a revision of the regulatory status of organisms listed in the Annexes of Directive 2000/29/EC. This revision targets mainly organisms which are already locally present in the EU territory and that in many cases are regulated in the EU since a long time. Therefore it is considered to be appropriate to evaluate whether these organisms still deserve to remain regulated under Council Directive 2000/29/EC, or whether, if appropriate, they should be regulated in the context of the marketing of plant propagation material, or be deregulated. The revision of the regulatory status of these organisms is also in line with the outcome of the recent evaluation of the EU Plant Health Regime, which called for a modernisation of the system through more focus on prevention and better risk targeting (prioritisation).

In order to carry out this evaluation, a recent pest risk analysis is needed which takes into account the latest scientific and technical knowledge on these organisms, including data on their agronomic and environmental impact, as well as their present distribution in the EU territory. In this context, EFSA has already been asked to prepare risk assessments for some organisms listed in Annex IIAII. The current request concerns 23 additional organisms listed in Annex II, Part A, Section II as well as five organisms listed in Annex I, Part A, Section I, one listed in Annex I, Part A, Section II and nine organisms listed in Annex II, Part A, Section I of Council Directive 2000/29/EC. The organisms in question are the following:

Organisms listed in Annex II, Part A, Section II:

- *Ditylenchus destructor* Thome
- *Circulifer haematoceps*
- *Circulifer tenellus*
- *Helicoverpa armigera* (Hübner)
- *Radopholus similis* (Cobb) Thome (could be addressed together with the IIAI organism *Radopholus citrophilus* Huettel Dickson and Kaplan)
- *Paysandisia archon* (Burmeister)
- *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis *et al.*
- *Erwinia amylovora* (Burr.) Winsl. *et al.* (also listed in Annex IIB)
- *Pseudomonas syringae* pv. *persicae* (Prunier *et al.*) Young *et al.*
- *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye
- *Xanthomonas campestris* pv. *pruni* (Smith) Dye
- *Xylophilus ampelinus* (Panagopoulos) Willems *et al.*
- *Ceratocystis fimbriata* f. sp. *platani* Walter (also listed in Annex IIB)
- *Cryphonectria parasitica* (Murrill) Barr (also listed in Annex IIB)
- *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili
- *Verticillium albo-atrum* Reinke and Berthold
- *Verticillium dahliae* Klebahn
- Beet leaf curl virus
- Citrus tristeza virus (European isolates) (also listed in Annex IIB)
- Grapevine flavescence dorée MLO (also listed in Annex IIB)

- Potato stolbur mycoplasma
- *Spiroplasma citri* Saglio *et al.*
- Tomato yellow leaf curl virus

Organisms listed in Annex I, Part A, Section I:

- *Rhagoletis cingulata* (Loew)
- *Rhagoletis ribicola* Doane
- Strawberry vein banding virus
- Strawberry latent C virus
- Elm phloem necrosis mycoplasm

Organisms listed in Annex I, Part A, Section II:

- *Spodoptera littoralis* (Boisd.)

Organisms listed in Annex II, Part A, Section I:

- *Aculops fuchsiae* Keifer
- *Aonidiella citrina* Coquillet
- Prunus necrotic ringspot virus
- Cherry leafroll virus
- *Radopholus citrophilus* Huettel Dickson and Kaplan (could be addressed together with IIAII organism *Radopholus similis* (Cobb) Thome
- *Scirtothrips dorsalis* Hendel
- *Atropellis* spp.
- *Eotetranychus lewisi* McGregor
- *Diaporthe vaccinii* Shaer.

TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION

EFSA is requested, pursuant to Article 29(1) and Article 22(5) of Regulation (EC) No 178/2002, to provide a pest risk assessment of *Ditylenchus destructor* Thome, *Circulifer haematoceps, Circulifer tenellus, Helicoverpa armigera* (Hübner), *Radopholus similis* (Cobb) Thome, *Paysandisia archon* (Burmeister), *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis *et al, Erwinia amylovora* (Burr.) Winsl. *et al, Pseudomonas syringae pv. persicae* (Prunier *et al)* Young *et al. Xanthomonas campestris* pv. *phaseoli* (Smith) Dye, *Xanthomonas campestris* pv. *pruni* (Smith) Dye, *Xyîophilus ampelinus* (Panagopoulos) Willems *et al, Ceratocystis fimbriata* f. sp. *platani* Walter, *Cryphonectria parasitica* (Murrill) Barr, *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili, *Verticillium alboatrum* Reinke and Berthold, *Verticillium dahliae* Klebahn, Beet leaf curl virus, Citrus tristeza virus (European isolates), Grapevine flavescence dorée MLO, Potato stolbur mycoplasma, *Spiroplasma citri* Saglio *et al,* Tomato yellow leaf curl virus, *Rhagoletis cingulata* (Loew), *Rhagoletis ribicola* Doane, Strawberry vein banding virus, Strawberry latent C virus, Elm phloem necrosis mycoplasma, *Spodoptera littoralis* (Boisd.), *Aculops fuchsiae* Keifer, *Aonidiella citrina* Coquillet, Prunus necrotic ringspot virus, Cherry leafroll virus, *Radopholus citrophilus* Huettel Dickson and Kaplan (to address with the IIAII *Radopholus similis* (Cobb) Thome), *Scirtothrips dorsalis* Hendel, *Atropellis* spp., *Eotetranychus lewisi* McGregor *md Diaporthe vaccinii* Shaer., for the EU territory.

In line with the experience gained with the previous two batches of pest risk assessments of organisms listed in Annex II, Part A, Section II, requested to EFSA, and in order to further streamline the preparation of risk assessments for regulated pests, the work should be split in two stages, each with a specific output. EFSA is requested to prepare and deliver first a pest categorisation for each of these 38 regulated pests (step 1). Upon receipt and analysis of this output, the Commission will inform EFSA for which organisms it is necessary to complete the pest risk assessment, to identify risk reduction options and to provide an assessment of the effectiveness of current EU phytosanitary requirements (step 2). *Clavibacter michiganensis* spp. *michiganensis* (Smith) Davis *et al.* and *Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye, from the second batch of risk assessment

requests for Annex IIAII organisms requested to EFSA (ARES(2012)880155), could be used as pilot cases for this approach, given that the working group for the preparation of their pest risk assessments has been constituted and it is currently dealing with the step 1 “pest categorisation”. This proposed modification of previous request would allow a rapid delivery by EFSA by May 2014 of the first two outputs for step 1 “pest categorisation”, that could be used as pilot case for this request and obtain a prompt feedback on its fitness for purpose from the risk manager's point of view.

As indicated in previous requests of risk assessments for regulated pests, in order to target its level of detail to the needs of the risk manager, and thereby to rationalise the resources used for their preparation and to speed up their delivery, for the preparation of the pest categorisations EFSA is requested, in order to define the potential for establishment, spread and impact in the risk assessment area, to concentrate in particular on the analysis of the present distribution of the organism in comparison with the distribution of the main hosts and on the analysis of the observed impacts of the organism in the risk assessment area.

ASSESSMENT

1. Introduction

1.1. Purpose

This document presents a pest categorisation prepared by the EFSA Scientific Panel on Plant Health (hereinafter referred to as the Panel) for the Lewis spider mite, *Eotetranychus lewisi* (McGregor), in response to a request from the European Commission.

1.2. Scope

This pest categorisation is for the Lewis spider mite, *Eotetranychus lewisi* (McGregor).

The pest risk assessment (PRA) area is the territory of the European Union (hereinafter referred to as the EU) with 28 Member States (hereinafter referred to as EU MSs), restricted to the area of application of Council Directive 2000/29/EC, which excludes Ceuta and Melilla, the Canary Islands and the French overseas departments.

2. Methodology and data

2.1. Methodology

The Panel performed the pest categorisation for *E. lewisi* following guiding principles and steps presented in the EFSA Guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standard for Phytosanitary Measures (ISPM) No 11 (FAO, 2013) and ISPM No 21 (FAO, 2004).

In accordance with the harmonised framework for pest risk assessment in the EU (EFSA PLH Panel, 2010), this work was initiated as result of the review or revision of phytosanitary policies and priorities. As explained in the background of the European Commission request, the objective of this mandate is to provide updated scientific advice to European risk managers to take into consideration when evaluating whether those organisms listed in the Annexes of Council Directive 2000/29/EC deserve to remain regulated under Council Directive 2000/29/EC, or whether they should be regulated in the context of the marketing of plant propagation material, or should be deregulated. Therefore, to facilitate the decision-making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for a quarantine pest in accordance with ISPM 11 (FAO, 2013) but also for a regulated non-quarantine pest (RNQP) in accordance with ISPM 21 (FAO, 2004) and includes additional information required as per the specific terms of reference received by the European Commission. In addition, for each conclusion, the Panel provides a short description of its associated uncertainty.

The Table 1 below presents the ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria on which the Panel bases its conclusions. It should be noted that the Panel's conclusions are formulated respecting its remit and particularly with regards to the principle of separation between risk assessment and risk management (EFSA founding regulation[4]); therefore, instead of determining whether the pest is likely to have an unacceptable impact, the Panel will present a summary of the observed pest impacts. Economic impacts are expressed in terms of yield and quality losses and not in monetary terms, in agreement with EFSA guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

[4] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31/1, 1.2.2002, p. 1–24.

Table 1: International Standards for Phytosanitary Measures ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria under evaluation.

Pest categorisation criteria	ISPM 11 for being a potential quarantine pest	ISPM 21 for being a potential regulated non-quarantine pest
Identity of the pest	The identity of the pest should be clearly defined to ensure that the assessment is being performed on a distinct organism, and that biological and other information used in the assessment is relevant to the organism in question. If this is not possible because the causal agent of particular symptoms has not yet been fully identified, then it should have been shown to produce consistent symptoms and to be transmissible	The identity of the pest is clearly defined
Presence or absence in the PRA area	The pest should be **absent from all or a defined part of the PRA area**	The pest is **present** in the PRA area
Regulatory status	If the pest is present but not widely distributed in the PRA area, it should be under official control or expected to be under official control in the near future	The pest is under official control (or being considered for official control) in the PRA area with respect to the specified plants for planting
Potential for establishment and spread in the PRA area	The PRA area should have ecological/climatic conditions including those in protected conditions suitable for the establishment and spread of the pest and, where relevant, host species (or near relatives), alternate hosts and vectors should be present in the PRA area	–
Association of the pest with the plants for planting and the effect on their intended use	–	Plants for planting are a pathway for introduction and spread of this pest
Potential for consequences (including environmental consequences) in the PRA area	There should be clear indications that the pest is likely to have an unacceptable economic impact (including environmental impact) in the PRA area	–
Indication of impact(s) of the pest on the intended use of the plants for planting	–	The pest may cause severe economic impact on the intended use of the plants for planting
Conclusion	If it has been determined that the pest has the potential to be a quarantine pest, the PRA process should continue. If a pest does not fulfil all of the criteria for a quarantine pest, the PRA process for that pest may stop. In the absence of sufficient information, the uncertainties should be identified and the PRA process should	If a pest does not fulfil all the criteria for an regulated non-quarantine pest, the PRA process may stop

Pest categorisation criteria	ISPM 11 for being a potential quarantine pest	ISPM 21 for being a potential regulated non-quarantine pest
	continue	

In addition, in order to reply to the specific questions listed in the terms of reference, three issues are specifically discussed only for pests already present in the EU: the analysis of the present EU distribution of the organism in comparison with the EU distribution of the main hosts; the analysis of the observed impacts of the organism in the EU; and the pest control and cultural measures currently implemented in the EU.

The Panel will not indicate in its conclusions of the pest categorisation whether the pest risk assessment process should be continued, as it is clearly stated in the terms of reference that, at the end of the pest categorisation, the European Commission will indicate EFSA if further risk assessment work is required following its analysis of the Panel's scientific opinion.

2.2. Information and data

2.2.1. Literature search

An extensive literature search on *E. lewisi* was conducted. The literature search follows the first three steps (preparation of search protocol and questions, search, selection of studies) of the EFSA guidance on systematic review methodologies (EFSA, 2010). As the same species is often mentioned under several synonyms, the most frequent, together with the most often applied common names (section 3.1), were used for the extensive literature search and can be found in Appendix A. Further references and information were obtained from experts and from citations within the selected references.

2.2.2. Data collection

To complement the information concerning the current situation of the pest provided by the literature and online databases on pest distribution, damage and management, the PLH Panel sent a short questionnaire, on the current situation at country level based on the information available in the European and Mediterranean Plant Protection Organization Plant Quarantine Retrieval System (EPPO PQR), to the National Plant Protection Organisation (NPPO) contacts of all the EU MSs. A summary of the pest status based on EPPO PQR and MSs replies is presented in Table 2.

The most updated information on the host range of the pest was retrieved from Migeon and Dorkeld (2006–2013) Spider Mites Web and is presented in Appendix B. The information on distribution of the host plants in the EU was obtained from the EUROSTAT database. Aggregated data on potted plants were used as a proxy of the areas where poinsettia is produced in the EU MSs.

3. Pest categorisation

3.1. Identity and biology of *Eotetranychus lewisi* (McGregor)

The organism under assessment currently has the following valid scientific name: *Eotetranychus lewisi* (McGregor).

3.1.1. Taxonomy

Eotetranychus lewisi (McGregor) previously named *Tetranychus lewisi* (McGregor) is a single taxonomic entity (CAB International, 2014a)

- Domain: Eukaryota
- Kingdom: Metazoa

- Phylum: Arthropoda
- Subphylum: Chelicerata
  - Class: Arachnida
  - Subclass: Acari
    - Superorder: Acariformes
    - Suborder: Prostigmata
    - Family: Tetranychidae
      - Genus: *Eotetranychus*
      - Species: *Eotetranychus lewisi*

Its common names are "Lewis spider mite" and the "Araña roja del duraznero".

3.1.2. Biology of *Eotetranychus lewisi* (McGregor)

3.1.2.1. Development

As in all the tetranychid species, the life cycle of *E. lewisi* comprises five stages: egg, larva, protonymph, deutonymph and adult.

The lower development temperature threshold of *E. lewisi* from egg to adult lies at 8.3 or 9.0 °C based on estimations using the Lactin and linear model, respectively (Lai and Lin, 2005). The upper development threshold lies at 28.2 °C according to the same authors. Deutonymphs are the most cold-tolerant stage with estimated thresholds at 2.5 or 3.4 °C according to the Lactin and linear model, respectively (Lai and Lin, 2005). The most heat-tolerant stage is the protonymph, with an upper development threshold at 31.5 °C. Development from egg to adult on poinsettia leaves takes 19 days at 16 °C and decreases linearly with temperature to a minimum of eight days at 26 °C (Lai and Lin, 2005). At 26 °C, egg hatching took an average of 2.5 days, while the larval, protonymphal and deutonymphal stages lasted for 1.8, 1.4 and 2.3 days, respectively (Lai and Lin, 2005).

E. lewisi was found on plants of poinsettia in the fields in mountainous areas of Taiwan with suitable climate conditions for its development. At lower elevations, the mite was found only on potted poinsettias (Ho, 2007; Lai and Lin, 2005).

When *E. lewisi* was reared on tender lemon leaves at temperatures ranging from 17 to 23 °C, the period between egg deposition and female emergence was twelve days (McGregor, 1943). The average duration of stages was six days for egg incubation, two days for the larval stage, two days for the protonymph and another two days for the deutonymph. The development of males was two days shorter than that of females.

3.1.2.2. Survival

The egg to adult survival rate of *E. lewisi* on poinsettia leaves from 16 to 26 °C varies between 65 and 85 %, but drops considerably to approximately 30 % at 28 °C (Lai and Lin, 2005). No information has been found on the survival of the Lewis spider mite on other host species.

3.1.2.3. Reproduction

The species reproduces by arrhenotoky, with diploid females and haploid males (Helle et al., 1981). The lifetime fecundity of females feeding on poinsettia leaves is 21, 51 and 32 eggs and the intrinsic rate of increase is 0.0988, 0.1731 and 0.1145 at 20, 24 and 28 °C, respectively (Lai and Lin, 2005). Females live for 12.0, 16.0 and 9.6 days at 20, 24 and 28 °C, respectively (Lai and Lin, 2005). According to McGregor (1943), *E. lewisi* females reared on tender lemon leaves at temperatures varying from 17 to 23 °C started oviposition less than 24 hours after emergence, and deposited five eggs per day on average.

3.1.2.4. Feeding

On most plant species *E. lewisi* feeds on the underside of leaves, in general close to the main veins (Ochoa et al., 1994), but as the infestation progresses the mites spread to all parts of the leaf blade. Like all tetranychid mites, *E. lewisi* feeds by piercing the cell tissues with its stylets, and absorbs cell contents (Park and Lee, 2002). Spider mite feeding causes mechanical injury, which results in a wide range of morphological and physiological plant responses, including changes in photosynthetic activity (Pérez-Santiago et al., 2007). On citrus, *E. lewisi* primarily feeds on the fruit (Jeppson et al., 1975). Symptoms and damage of Lewis spider mites on several hosts are described in section 3.5.1.

3.1.2.5. Dispersal

While no studies have specifically addressed the biological aspects of dispersal in *E. lewisi*, Kennedy and Smitley (1985) provide a comprehensive review of dispersal in tetranychid mites. Briefly, mated females colonise new hosts at short distances by crawling, which is sometimes facilitated by dropping down from infested leaves on webs. For long-distance dispersal, mites are transported with the help of the wind or passively on other animals, including humans. Long-distance dispersal by ballooning (spinning down on silk threads) has been observed in many species, but no reports of ballooning exist for *E. lewisi.* Wind-borne dispersal of another tetranychid thriving on citrus, *Eutetranychus banksi*, has been recorded with sticky traps by Hoelscher (1967), who caught mites along a 55-m-long transect as they dispersed from a citrus grove in Texas. Quayle (1916, and references therein) reported that *Bryobia praetiosa*, another tetranychid, may be carried by the wind to distances over 198 m, and gain an altitude of 15 m. *Tetranychus urticae*, another tetranychid mite, can cover distances of 16–48 m from a falling height of 5 m and at a wind speed of 8 m/s (Jung and Croft, 2001). Hoy et al. (1984) showed that *T. urticae* from infested almond trees could disperse a distance of 200 m in the air. Aerial dispersal was greater when prevailing winds were stronger. Kennedy and Smitley (1985) also discuss phoretic relationships between mites and other animals, and note that birds landing on heavily infested plants very likely take off carrying some mites. Mites can easily move to new areas via human activities, including the transportation of infested plant material, e.g. poinsettia cuttings, as discussed in section 3.4.4 on “Spread capacity”.

3.1.3. Intraspecific diversity

While *E. lewisi* has been found on several hosts and it has a wide distribution area, which could lead to the formation of differentiate populations, no reports on intraspecific diversity were found in published literature.

3.1.4. Detection and identification of *Eotetranychus lewisi* (McGregor)

E. lewisi individuals can be present on most parts of the plant, including leaves, flowers and fruits (Jeppson et al., 1975; Ochoa et al., 1994). All stages of the spider mite are difficult to detect, because of their small size (EPPO, 2006), which allows them to go undetected under plant hairs, calyces, stipules and other plant structures. In severe attacks on poinsettias the inter-veinal areas turn yellow while the veins keep their green colour, and the infestation may be mistaken for zing and magnesium deficiency (Ochoa et al., 1994). However, at high population levels, colonies are noticeable owing to the presence of webbing, and damage symptoms (Doucette, 1962). Although damage symptoms (section 3.5.1) are distinctive of mite infestations, symptoms alone do not allow for the identification of *E. lewisi*.

In field conditions, it is important to note that *E. lewisi* can be easily mistaken for *T. urticae*, a tetranychid species with a global cosmopolitan distribution. However, females of *E. lewisi* are slightly smaller than females of *T. urticae* (360 and 500 µm, respectively), and usually have two or more lateral feeding spots, in contrast to the two large feeding spots present laterally in *T. urticae* (McGregor, 1943; Dara, 2011).

Identification of *E. lewisi* requires examination of cleared and mounted adult specimens of both sexes by transmission light microscopy as, in general for spider mite, immature stages cannot be used for

identification. The EPPO diagnostic protocol PM 7/68 describes the identification criteria for *E. lewisi* (EPPO, 2006). The genus *Eotetranychus* can be distinguished from other tetranychids by the presence of two pairs of para-anal setae; the duplex setae on tarsus I are distal and adjacent; the empodium splits into three pairs of ventrally directed hairs and the idiosomal striae with small lobes are longitudinal on the prodorsum and transverse on the opisthosoma. Adults of *E. lewisi* share the following characters: in females the ventral body striae immediately anterior to the genital flap and on the flap itself run transversely; tibiae I and II in both sexes bear nine and eight tactile setae, respectively, and there are five tactile setae on tarsus I proximal to the duplex setae; the peritremes are hooked distally in both sexes (Jeppson et al., 1975; EPPO, 2006). Because the above morphological characters may be present in other *Eotetranychus* species, identification requires examination of the aedeagus of adult males that need to be positioned laterally on the fixing slides. The distinguishing feature of the aedeagus is its distal tapering and the formation of a broad sigmoid ventral bend (Jeppson et al., 1975; EPPO, 2006).

It can be concluded that *E. lewisi* is a distinct species with clear diagnostic criteria for identification.

3.2. Current distribution of *Eotetranychus lewisi* (McGregor)

3.2.1. Global distribution of *Eotetranychus lewisi* (McGregor)

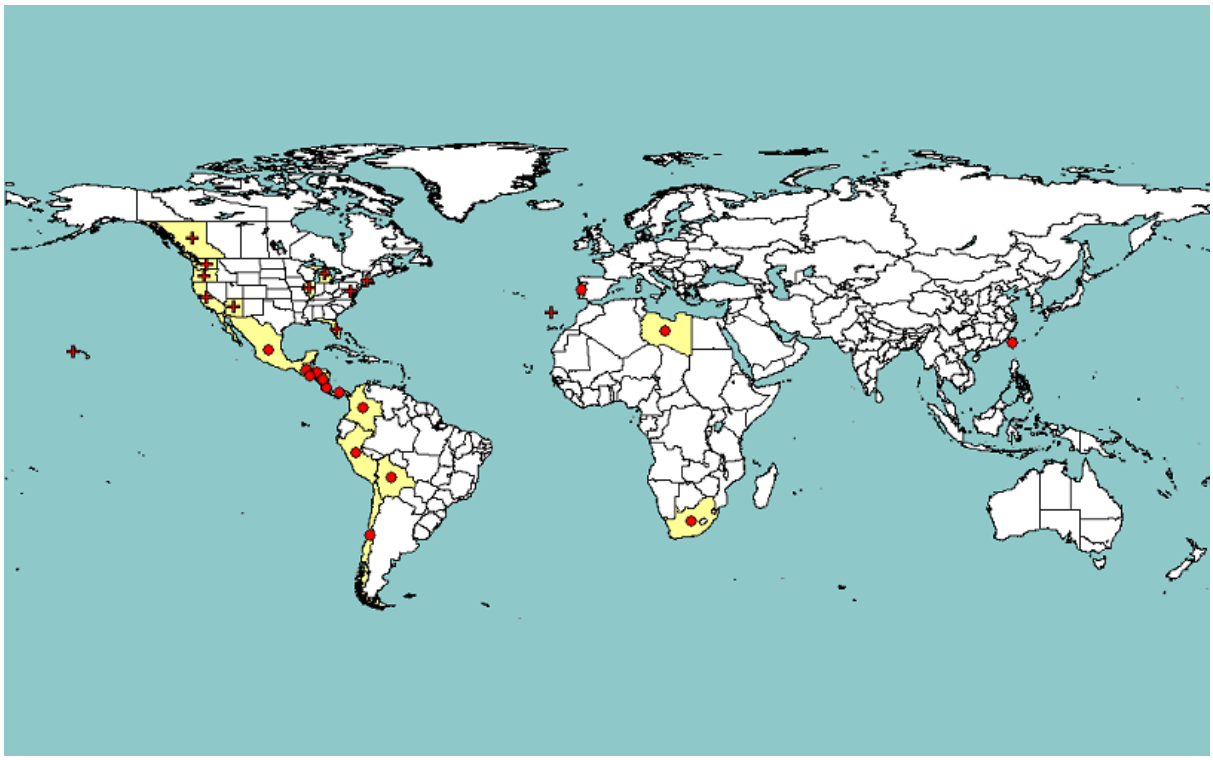

Figure 1: Global distribution map for *Eotetranychus lewisi* (extracted from EPPO PQR, version 5.3.1, accessed June 2014). Red circles represent pest presence as national records and red crosses represent pest presence as subnational records (note that this figure combines information from different dates, some of which could be out of date).

The Lewis spider mite has been reported from 17 countries in Africa, North and South America, Asia and Europe (Madeira) (Figure 1). It is to be noted that Figure 1 does not indicate records for Poland although the pest has also been reported to be present in Poland, without confirmed pest identification, with few occurrences in glasshouse production of poinsettia where outbreaks were successfully controlled, (Table 2; Labanowski, 2009).

E. lewisi occurs on native *Euphorbia* species—including on poinsettia (*Euphorbia pulcherrima*)—in the tropical area of Central America, which has been suggested as the native host and habitat of the mite (Doucette, 1962). Poinsettia grows wild along the tropical Pacific slope in mid-elevation dry

forests from north-western Mexico to southern Guatemala over a range of some 2 000 km (Trejo et al., 2012).

3.2.2. Distribution in the EU of *Eotetranychus lewisi* (McGregor)

No data on the pest are available in the *Fauna Europaea* database. No interceptions on *E. lewisi* are reported in the EUROPHYT database.

Table 2: Current distribution of *Eotetranychus lewisi* in the risk assessment area, based on answers received from the 28 Member States, Iceland and Norway.

Member State	NPPO answer	Comments
Austria	**Absent**, no pest records	
Belgium	**Absent**, no pest records	
Bulgaria	**Absent**	
Croatia	**Absent,** no pest records	
Cyprus	–	
Czech Republic	**Absent**, no record	
Denmark	Known not to occur	
Estonia	**Absent**, no pest records	
Finland	**Absent,** no pest records	
France [(a)]	—	
Germany	**Absent**, no pest records	
Greece[(a)]	—	
Hungary	**Absent**, no pest records	
Ireland	**Absent**, no pest record	
Italy	no data	
Latvia [(a)]	–	
Lithuania [(a)]	–	
Luxemburg [(a)]	–	
Malta	**Absent**, no pest records	
Netherlands	**Absent**, confirmed by survey	
Poland	**Present,** few occurrences (in glasshouses only)	In accordance with results of scientific studies, the pest has been introduced a few times to glasshouse on plant material coming from third states (not direct export but movement from other Member States) and other EU Member States; all such foci were successfully controlled. Detection of this organism has not been confirmed by SPHSIS (Central Laboratory of Polish Plant Health and Seed Inspection Service)
Portugal	**Present**, restricted distribution (In Madeira)	
Romania [(a)]	–	
Slovak Republic	**Absent**, no pest record	
Slovenia	**Absent**, no pest records on *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf.	
Spain	**Absent**	
Sweden	**Absent**, no pest record	
United Kingdom	**Absent**	
Iceland [(a)]	–	

Member State	NPPO answer	Comments
Norway [(a)]	–	

(a): When no information was made available to EFSA, the pest status in the EPPO PQR (2012) was used.
–: No information available; EPPO PQR, European and Mediterranean Plant Protection Organization Plant Quarantine Data Retrieval System; NPPO, National Plant Protection Organisation.

3.3. Regulatory status

3.3.1. Legislation addressing *Eotetranychus lewisi* (McGregor) (Directive 2000/29/EC)

E. lewisi (McGregor) is currently listed in the Council Directive 2000/29/EC in Annex II, Part A, Section I, point 13.

Table 3: *Eotetranychus lewisi* (McGregor) in Council Directive 2000/29/EC.

Annex II, Part A	Harmful organisms whose introduction into, and spread within, all Member States shall be banned if they are present on certain plants or plant products	
Section I	Harmful organisms not known to occur in the community and relevant for the entire community	
	Species	**Subject of contamination**
13	*Eotetranychus lewisi* (McGregor)	Plants of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids, other than fruit and seeds

3.3.2. Legislation addressing hosts of *Eotetranychus lewisi* (McGregor) (Directive 2000/29/EC)

In this section, the Panel lists only the legislative articles of Annexes III, IV and V that are relevant for the cultivated host plants of *E. lewisi* for which impact has been reported in the literature (see section 3.5.1), namely poinsettia (*Euphorbia pulcherrima*), strawberry (*Fragaria* × *ananassa*), raspberry (*Rubus* sp.), orange (*Citrus sinensis*), lemon (*C. limon*), peach (*Prunus persica*) and vine (*Vitis vinifera*).

Table 4: *Eotetranychus lewisi* (McGregor) host plants in Council Directive 2000/29/EC.

Annex III, Part A	Plants, plant products and other objects the introduction of which shall be prohibited in all Member States	
9	Plants of *Chaenomeles* Ldl., *Cydonia* Mill., *Crateagus* L., *Malus* Mill., *Prunus L., Pyrus L., and Rosa L.,* intended for planting, other than dormant plants free from leaves, flowers and fruit	Non-European countries
15	Plants of *Vitis* L., other than fruits	Third countries other than Switzerland
16	Plants of *Citrus* L., *Fortunella* Swingle, *Poncirus Raf.,* and their hybrids, other than fruit and seeds	Third countries
18	Plants of *Cydonia* Mill., *Malus* Mill., *Prunus L. and Pyrus L.* and their hybrids, and *Fragaria* L., intended for planting, other than seeds	Without prejudice to the prohibitions applicable to the plants listed in Annex III, Part A (9), where appropriate, non-European countries, other than Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA
Annex IV, Part A	Special requirements which must be laid down by all Member States for the introduction and movement of plants, plant products and other objects into and within all Member States	
Section II	plants, plant products and other objects originating in the Community	
	Plants, plant products and other objects	**Special requirements**

30.1.	Fruits of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids	The packaging shall bear an appropriate origin mark.	
Part B	Special requirements which shall be laid down by all Member States for the introduction and movement of plants, plant products and other objects into and within certain protected zones.		
	Plants, plant products and other objects	**Special requirements**	**Protected zone(s)**
31	Fruits of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids originating in E, F (except Corsica), CY and I	Without prejudice to the requirement in Annex IV, Part A, Section II, point 30.1 that packaging should bear an origin mark: (a) the fruits shall be free from leaves and peduncles; or (b) in the case of fruits with leaves or peduncles, official statement that the fruits are packed in closed containers which have been officially sealed and shall remain sealed during their transport through a protected zone, recognised for these fruits, and shall bear a distinguishing mark to be reported on the passport.	►**M19** EL, F (Corsica), M, P (except Madeira) ◄
Annex V	Plants, plant products and other objects which must be subject to a plant health inspection (at the place of production if originating in the Community, before being moved within the Community—in the country of origin or the consignor country, if originating outside the Community) before being permitted to enter the Community		
Part A	Plants, plant products and other objects originating in the Community		
Section I	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community and which must be accompanied by a plant passport		
1	Plants and plant products		
1.1	Plants, intended for planting, other than seeds, of *Amelanchier* Med., *Chaenomeles* Lindl., *Cotoneaster* Ehrh., *Crataegus* L., *Cydonia* Mill., *Eriobotrya* Lindl., *Malus* Mill., *Mespilus* L., *Photinia davidiana* (Dcne.) Cardot, *Prunus* L., other than *Prunus laurocerasus* L. and *Prunus lusitanica* L., *Pyracantha* Roem., *Pyrus* L. and *Sorbus* L.		
1.4.	Plants of Fortunella Swingle, Poncirus Raf., and their hybrids and *Vitis* L., other than fruit and seeds		
1.5.	Without prejudice to point 1.6, plants of *Citrus* L. and their hybrids other than fruit and seeds.		
1.6.	Fruits of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf. and their hybrids with leaves and peduncles		
2	Plants, plant products and other objects produced by producers whose production and sale is authorised to persons professionally engaged in plant production, other than those plants, plant products and other objects which are prepared and ready for sale to the final consumer, and for which it is ensured by the responsible official bodies of the Member States, that the production thereof is clearly separate from that of other products		
2.1	Plants intended for planting other than seeds of the genera *Abies* Mill., *Apium graveolens* L., *Argyranthemum* spp., *Aster* spp., *Brassica* spp., *Castanea* Mill., *Cucumis* spp., *Dendranthema* (DC) Des Moul., *Dianthus* L. and hybrids *Exacum* spp., *Fragaria* L., *Gerbera* Cass., *Gypsophila* L., all varieties of New Guinea hybrids of *Impatiens* L., *Lactuca* spp., *Larix* Mill., *Leucanthemum* L., *Lupinus* L., *Pelargonium* l'Hérit. ex Ait., *Picea* A. Dietr., *Pinus* L., *Platanus* L., *Populus* L., *Prunus laurocerasus* L., *Prunus lusitanica* L., *Pseudotsuga* Carr., *Quercus* L., *Rubus* L., *Spinacia* L., *Tanacetum* L., *Tsuga* Carr., *Verbena* L. ►**M3** and other plants of herbaceous species, other than plants of the family Gramineae, intended for planting, and other than bulbs, corms, rhizomes, seeds and tubers ◄		
Section II	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for certain protected zones, and which must be accompanied by a plant passport valid for the appropriate zone when introduced into or moved within that zone Without prejudice to the plants, plant products and other objects listed in Section I		

2	Plants, plant products and other objects produced by producers whose production and sale is authorised to persons professionally engaged in plant production, other than those plants, plant products and other objects which are prepared and ready for sale to the final consumer, and for which it is ensured by the responsible official bodies of the Member States, that the production thereof is clearly separate from that of other products
2.1	Plants of *Begonia* L., intended for planting, other than corms, seeds, tubers, and plants of *Euphorbia pulcherrima* Willd., *Ficus* L. and *Hibiscus* L., intended for planting, other than seeds
Part B	Plants, plant products and other objects originating in territories, other than those territories referred to in Part A
Section I	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community
1	Plants, intended for planting, other than seeds but including seeds of *Cruciferae Gramineae*, *Trifolium* spp., originating in Argentina, Australia, Bolivia, Chile, New Zealand and Uruguay, genera *Triticum*, *Secale* and *X Triticosecale* from Afghanistan, India ►**M9** , Iran ◄, Iraq, Mexico, Nepal, Pakistan ►**M5** , South Africa ◄ and the USA. *Capsicum* spp., *Helianthus annuus* L., *Lycopersicon lycopersicum* (L.) Karsten ex Farw., *Medicago sativa* L., *Prunus* L., *Rubus* L., *Oryza* spp., *Zea mais* L., *Allium ascalonicum* L., *Allium cepa* L., *Allium porrum* L., *Allium schoenoprasum* L. and *Phaseolus* L.
2	Parts of plants, other than fruits and seeds of: […] — *Prunus* L., originating in non-European countries,
3	Fruits of: […] — *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids ►**M3** , *Momordica* L. and *Solanum melongena* L. ◄, — *Annona* L., *Cydonia* Mill., *Diospyros* L., *Malus* Mill., *Mangifera* L., *Passiflora* L., *Prunus* L., *Psidium* L., *Pyrus* L., *Ribes* L. *Syzygium* Gaertn., and *Vaccinium* L., originating in non-European countries
Section II	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for certain protected zones Without prejudice to the plants, plant products and other objects listed in Section I
6a	Fruits of *Vitis* L.

3.3.3. Marketing directives

Some of the host plants of *E. lewisi* are also regulated under Marketing Directives of the EU.

Table 5: *Eotetranychus lewisi* (McGregor) host plants in EU Marketing Directives.

Plant propagation material	Marketing directive	Comment
Prunus persica L. *Citrus* L. *Fragaria* L. *Rubus* L.	Council directive 2008/90/EC of 29 September 2008 on the marketing of fruit plant propagating material and fruit plants intended for fruit production (OJ L 267, 08/10/2008, p. 8–22)	Official inspections check if the material meets criteria for: identity; quality; plant health; The rules also cover batch separation and marking, identification of varieties and labelling

Vine: Plants of the genus *Vitis* (L.) intended for the production of grapes or for use as propagation material for such plants	Council Directive 68/193/EEC of 9 April 1968 on the marketing of material for the vegetative propagation of the vine (OJ L 93, 17/04/1968, p. 15–23)	
Euphorbia pulcherrima	Council Directive 98/56/EC of 20 July 1998 on the marketing of propagating material of ornamental plants (OJ L 226, 13/08/1998, p. 0016-0023)	The seed and propagating material of ornamental plants can only be marketed if: – it is substantially free from harmful organisms that may affect its quality as propagating material; – for propagating material, it has satisfactory vigour and dimensions; – for seed, it has satisfactory germination. Suppliers are responsible for the quality of their products

3.4. Elements to assess the potential for establishment and spread in the EU

3.4.1. Host range

E. lewisi has been reported from 69 herbaceous and woody plant species belonging to 26 different families (Migeon and Dorkeld, 2013) (Appendix B). The list of potential hosts includes cultivated species, such as castor oil plant (*Ricinus communis*), poinsettia (*Euphorbia pulcherrima*), strawberry (*Fragaria* × *ananassa*), cotton (*Gossypium hirsutum*), orange (*Citrus sinesnis*), fig (*Ficus carica*), lemon (*C. limon*), pawpaw (*Carica papaya*), olive (*Olea europaea*), peach (*Prunus persica*), and vine (*Vitis vinifera*). Wild hosts include weeds, such as nightshade (*Solanum eleagnifolium*), and several tree species including acacias (*Acacia* spp.), pines (*Pinus ponderosa*) and aspens (*Populus tremuloides*).

It should be noted, however, that the report of a species as a host of *E. lewisi* does not necessarily mean that the mite can complete its life cycle on the species or it can cause economic damage. Therefore, there is uncertainty regarding the exact host status of many species on the list.

3.4.2. EU distribution of relevant host plants

The Panel presents in this section data on cultivated plants that are hosts of *E. lewisi* for which impact has been reported in the literature (see section 3.5.1), namely:

- poinsettia (*Euphorbia pulcherrima*) (Table 6);
- strawberry (*Fragaria* × *ananassa*) (Table 7);
- raspberry (*Rubus* sp.) (Table 8);
- orange (*Citrus sinesnis*) and lemon (*C. limon*) (Table 9);
- peach (*Prunus persica*) (Table 10); and
- vine (*Vitis vinifera*) (Table 11).

Data on the distribution of these host plants in the EU MSs have been searched in the EUROSTAT database.

It is to be noted that the most important host plant of the Lewis spider mite as reported in the literature is poinsettia, and the EUROSTAT database does not include disaggregated data for this ornamental plant. However, poinsettia is the economically most important potted plant worldwide, driving annual

sales in the hundreds of millions of dollars (Trejo et al., 2012), and potted plants, including poinsettias, are widely produced in greenhouses across the EU MSs (AIPH, 2011). The International Statistics on Flowers and Plants 2011 (AIPH, 2011) does not include specific production data for poinsettia for all MSs. When such data are available, they are presented in Table 6. Otherwise the more aggregated data available for pot plants production are presented (Table 6) and are used as a proxy of the areas where poinsettia is produced in the EU MSs.

Table 6: Areas of poinsettia production and of potted plants production in the EU MSs extracted from the 2011 International Statistics on Flowers and Plants (AIHP, 2011).

Member State	Year	Open field area (ha)	Protected cultivation area (ha)	Million pieces of poinsettia
Belgium	2010	102	461	
Denmark	2010		265.6	
Finland	2010			2.3
France	2010		1826	
Germany	2008	1 804 (including cut flowers)	1 699 (including cut flowers)	25.6
Greece	1995	110 (open + protected)		
Hungary	2009		160 (including annuals)	
Ireland	2007		5 (poinsettias)	
Italy	2007	2 573	2 458	14
Netherlands	2010	1 383 (open + protected)		
Norway	2006		91	5.8
Spain		No data on potted plants		
Sweden	2010			6
United Kingdom	2007			1.9

Table 7: Area of strawberry (*Fragaria* × *ananassa*) production (in 1 000 ha) in Europe in 2012 according to the Eurostat database (Crops products—annual data [apro_cpp_crop] extracted on 23 January 2014), and the distribution of *Fragaria vesca* (wild strawberry) in the EU-28 according to *Flora Europaea*.

Member State	Strawberry	Strawberries under glass or high accessible cover	Presence of *Fragaria vesca*
Austria	1.3	0	+
Belgium	1.6		+
Bulgaria	0.7	0	+
Croatia	0.2	0.1	+ [(a)]
Cyprus	0		
Czech Republic	0.5	0	+
Denmark	1.1		+
Estonia	0.4	0	+
Finland	3.4	0	+
France	3.2	1.6	+
Germany	15	0.4	+
Greece	1.1	1.1	+
Hungary	0.6		+
Ireland	0.5	0	+
Italy[(b)]	2[(b)]	2.7 [(b)]	+
Latvia	0.3	0	+

Member State	Strawberry	Strawberries under glass or high accessible cover	Presence of *Fragaria vesca*
Lithuania	1	0	+
Luxembourg	0		
Malta	0		+
Netherlands	1.8	0.3	+
Poland	50.6	0.1	+
Portugal	0.5	0.1	+
Romania	2.3	0	+
Slovakia	0.2		+
Slovenia	0.1	0	+ [(a)]
Spain	7.6	7.4	+
Sweden	2.2	0	+
United Kingdom	5	0	+

(a): Presence interpreted from the presence in Yugoslavia.
(b): Inconsistent figures as total strawberry area is lower than glasshouse area.

Table 8: Area of raspberry (*Rubus* spp.) production (in 1 000 ha) in Europe in 2012 according to the Eurostat database (Crops products—annual data [apro_cpp_crop], extracted on 18 June 2014), and distribution of wild raspberry according to *Fauna Europaea* and the CABI Invasive Species Compendium.

Member State	Area of raspberry production	Raspberry distribution (wild)
Austria	0.2	+
Belgium	0.1	+
Bulgaria	1.4	+
Croatia	0	+ [(a)]
Cyprus	–	
Czech Republic	0	+
Denmark	0	+
Estonia	0	
Finland	0.3	+
France	0.7	+
Germany	1	+
Greece	–	+
Hungary	0.7	+
Ireland	–	+
Italy	–	+
Latvia	0.2	
Lithuania	1.1	
Luxembourg	0	
Malta	–	
Netherlands	0	+
Poland	28.4	+
Portugal	0.2	+
Romania	0	+
Slovakia	0	+
Slovenia	0	
Spain	1.4	+
Sweden	0	+
United Kingdom	1	+

(a): Presence interpreted from the presence in Yugoslavia.
–: No data available in Eurostat.

Table 9: Area of citrus production (in 1 000 ha) in Europe in 2007 according to the Eurostat database (Crops products—annual data [apro_cpp_crop], extracted on 21 February 2013.

Member State	Orange varieties	Lemon varieties
Croatia	0.2	0.1
Cyprus	1.554	0.665
France	0.028	0.022
Greece	32.439	5.180
Malta [(a)]	0.095	0.038
Italy	73.785	16.633
Portugal	12.416	0.494
Spain	158.824	39.859
European Union	279.048	62.854

(a): Data for the citrus production area in Malta are provided according FAOSTAT (online) for the year 2011.

Table 10: Area of peach (*Prunus persica*) production (in 1000 ha) in the EU in 2011 according to the Eurostat database (Crops products—annual data [apro_cpp_crop], extracted on 8 May 2014).

Member State	Peach
Austria	0.2
Bulgaria	4.2
Croatia	1.4
Cyprus	0.3
Czech Republic	0.7
France	6.6
Greece	35.5
Hungary	6.7
Italy	54.9
Poland	3.5
Portugal	3.7
Romania	1.7
Slovakia	0.5
Slovenia	0.5
Spain	50.8

Table 11: Area of vine (*Vitis vinifera*) production (in 1 000 ha) in the EU in 2011 according to the Eurostat database (Crops products—annual data [apro_cpp_crop], extracted on 8 May 2014).

Member State	Vineyards
Bulgaria	46.1
Czech Republic	16
Denmark	0
Germany	99.7
Greece	103.2
Spain	963.1
France	764.2
Croatia	32.5
Italy	717.6
Cyprus	7.7

Member State	Vineyards
Latvia	0
Luxembourg	1.2
Hungary	73.9
Malta	0.6
Netherlands	0
Austria	43.8
Poland	0.4
Portugal	179.5
Romania	174.9
Slovenia	16.4
Slovakia	9.9
Sweden	0
United Kingdom	1

3.4.3. Analysis of the potential distribution of *Eotetranychus lewisi* (McGregor) in the EU

E. lewisi has been reported from 17 countries in Africa, North and South America, Asia and Europe (Madeira and Poland (in greenhouses)). The climate of the countries representing the current distribution of the pest encompasses the main Köppen–Geiger climate types of the EU (CSa, CSb for Mediterranean parts of the EU, and Cfb, Cfa for the continental part of the EU) (Kottek et al., 2006). Therefore, the pest could potentially establish in large parts of the risk assessment area. It should be noted, however, that precise locations of the distribution of the pest within each country are not readily available, and therefore the resolution of the current distribution (CAB International, 2014a) may not be detailed enough to allow for accurate projections of the suitability of the EU climate for the pest.

Several of the host plants (Tables 6 to 11) on which *E. lewisi* has been reported are economically important crops, and some are particularly widely distributed in Europe, cultivated in either protected agricultural systems and/or in open fields (e.g. poinsettia, strawberry, peach), or widely distributed in open fields in the case of weeds (e.g. *Ipomea*). Greenhouse cultivations provide suitable environmental conditions for the pest to establish all year round. This is the case in particular for poinsettias considering the long production season, from propagation in the hot months of summer to vegetative growth and then flower bract development in the shorter days and cooler months of autumn and early winter (University of Florida, 2011; Barne et al., 2014; CAB International, 2014b).

In conclusion, host plants of *E. lewisi* are widely available throughout the year and thus would not present a limiting factor for the establishment and spread of this mite in Europe. However, despite favourable climate and host availability in the EU, the pest distribution is currently restricted to the island of Madeira and to Poland (few reports in glasshouses, Table 2; Karnkowski, 2004; Labanowski, 2009).

3.4.4. Spread capacity

Like other spider mites, *E. lewisi* has multiple ways to disperse (natural active and passive, animal/human assisted) (see section 3.1.2), all of which occur in the risk assessment area. *E. lewisi* is a polyphagous species and several potential host plants are widely distributed in the EU (Tables 6 to 11).

Because of its relatively wide range of hosts, movements of *E. lewisi* between targeted plants and reservoir plants could easily occur, facilitating mite spread and new infestations. In Taiwan, *Eotetranychus* spider mites were found on plants nearby poinsettias; however, the exact species were not confirmed. In spring, when poinsettia is often pruned, mites were not able to survive on poinsettia

and would have needed other host plant(s) before poinsettia grew new shoots and new leaves (Ho, 2007).

Populations of *E. lewisi* can increase rapidly in numbers and spread gradually from original source plants, as was observed in an infestation of poinsettia greenhouses in the Portland, Oregon, area, which resulted from the arrival of a few cuttings received four to six weeks before the outbreak (Doucette, 1962). *E. lewisi* has been introduced a few times to glasshouses in Poland on poinsettias, and all outbreaks were successfully controlled (Table 2; Labanowski, 2009).

The method of culture of *E. pulcherrima* would aid transfer to new hosts and then mite spread. Pests could initially enter the risk assessment area on cuttings, imported at the beginning of the year in order to obtain first-generation mother stock plants. One of the key factors that could facilitate the transfer of the pest is that *E. pulcherrima* is a seasonal crop fitted in among various other crops (Fransen, 1994), several of which are hosts for *E. lewisi*. The poinsettia trade including plants for planting could be a significant pathway of introduction (and spread) of *E. lewisi.* The rapid spread of *E. lewisi* that occurred in Taiwan has been attributed to manual transfer of poinsettias (Lai and Lin, 2005).

Plants for planting of the hosts plants indicated in Tables 6 to 11 cannot be imported into the EU (section 3.3.2); however, they could be a pathway for spread of the Lewis spider mite by internal movement. No trade data on internal movement in the EU were found on plants for planting originating from Madeira or Poland. In addition, the introduction of the pest on other host plants listed in Appendix B cannot be excluded.

All these elements led the Panel to conclude that potential for establishment and spread of *E. lewisi* in the EU is high. However, the important inspections and controls performed on the agricultural products traded from Madeira to continental Portugal, and the measures currently applied to control spider mites in general, could explain the very restricted distribution presently observed in Madeira in the field (section 3.6).

3.5. Elements to assess the potential for consequences in the EU

3.5.1. Potential effects of *Eotetranychus lewisi* (McGregor)

The Tetranychidae are one of the most important families of the Acari in terms of economic impact, because it comprises several agricultural pest species of major relevance (Bolland et al., 1998).

Regarding *E. lewisi* in particular*:*

On poinsettias, Doucette (1962) reported that Lewis spider mites feed on the lower side of leaves, causing a speckled or peppered appearance, and produce profuse webbing, especially around the flowers. Extensive feeding by the spider mite causes leaf chlorosis of poinsettias and eventually leaf loss (Doucette, 1962). Similarly, poinsettias heavily infested with *E. lewisi* and the whitefly *Aleurodicus dispersus* suffered severe defoliation (Ho, 2007). If populations of *E. lewisi* are not controlled, the resulting loss of colour and leaves ruins the sale value of poinsettias (Doucette, 1962). Mites tend to be more of a problem during hot and dry weather conditions. Although pesticides have been effective at controlling the mite, failure to detect the mites early can lead to crop damage and economic losses (CAB International, 2014b).

On citrus, Lewis spider mite infestations on fruits lead to stippling on the rind (McGregor, 1943), and heavy infestations cause silvering on lemons and silvering or russeting on oranges (Jeppson et al., 1975). The mite produces large quantities of webbing that collects dust and makes infestations highly visible. No notable injury occurs on citrus leaves by the mite. The authors consider *E. lewisi* as an occasional host of citrus in southern California. The mite is also considered by Vacante (2010) a minor pest of citrus.

On strawberry, feeding by *E. lewisi* results in chlorosis and bronzing of the leaves, and a reduction in fruit production at high mite densities. The spider mite produces light to heavy webbing, and has been an increasing problem in organic strawberry and raspberry fields in recent years (Howell and Daugovish, 2013). *E. lewisi* is considered as an emerging pest in California commercial strawberries and has also been found on raspberries with an increasing frequency (Howell and Daugovish, 2013).

On peach, Pérez-Santiago et al. (2007) reported that *E. lewisi* is the most important pest of peach trees in north-central Mexico. Infestation by *E. lewisi* was found to reduce yield by 62 % and average fruit weight by 54 % (Zegbe Domínguez and Mena Covarrubias, 2007).

On vine, Sazo et al. (2003) indicates that in some regions of Chile outbreaks of the Lewis spider mites have been reported in vineyards.

3.5.2. Observed impact of *Eotetranychus lewisi* (McGregor) in the EU

E. lewisi has been reported in the EU, in a restricted area of Portugal, on the island of Madeira on poinsettias and vine (Carmona, 1992) and on citrus (Vacante, 2010). However, no information on pest impact in this area could be found.

The pest has also been reported to be present in Poland, without confirmed pest identification, with few occurrences in glasshouse production of poinsettia where outbreaks were successfully controlled, (Table 2; Labanowski, 2009). No further information is available.

3.6. Currently applied control methods

E. lewisi has been reported as present in Madeira and in Poland. In Poland outbreaks were controlled successfully (Table 2), but no information on the control measures undertaken could be collected.

Outside Europe, reports show that the Lewis spider mite is being controlled on cultivated crops:

- Harvesting of citrus fruits often removes the Lewis spider mite infestation (Jeppson et al., 1975).

- The use of acaricides is the current method to control the mite and produces satisfactory results provided the acaricides are applied to the underside of the leaves. On poinsettia plants, some injury can occur on the bracts if chemicals are applied after bract coloration (Doucette, 1962). Some suspected resistance issues were reported in strawberry-growing areas in California (Dara, 2011) and peaches in Mexico (Zegbe Domínguez and Mena Covarrubias, 2007). However, no confirmed reports of pesticide resistance were found in peer-reviewed scientific literature. The molecules used against spider mites in crop production are usually not targeted to specific species. Therefore, chemical treatments applied to control other tetranychid mites, and also some insects, might also be effective in controlling *E. lewisi*. This could explain why *E. lewisi* is not widely distributed in the risk assessment area where favourable conditions for spread and establishment exist (section 3.4). However, mites have become more problematic for growers in recent years since many of the insecticides on the market today are more targeted, with each product controlling a specific type of insect pest or a relatively small number of insect pests compared with past products, which tended to offer broader-spectrum control of a number of various pests, including spider mites, simultaneously.

- Biocontrol measures by the use of predatory mites, Phytoseiidae, are often also applied to control spider mites. According to Howell and Daugovish (2013), the predatory mite *Phytoseiulus persimilis* (Athias-Henriot), typically used for biocontrol of *Tetranychus urticae*, provided strawberries growers in California little to no control of *E. lewisi*, but laboratory tests show that other commonly used phytoseiid mites—*Neoseiulus californicus* (McGregor), *N. fallacis* (Garman) and *Amblyseius andersoni* (Chant)—did feed on the Lewis spider mite and lowered its populations.

3.7. Uncertainty

The main sources of uncertainties of this pest categorisation are listed below:

- Uncertainty on the pest identification: Possible misidentification because field identification is not possible and expertise is required for proper diagnosis.

- Uncertainty on the global pest distribution: The map presented in Figure 1 combines information from different dates, some of which could be out of date.

- Uncertainty on the pest absence in the EU: Only one Member State confirms absence of the pest through survey. Surveys have not been performed on this pest in all the EU MSs.

- Uncertainty on the pest occurrence in Poland: *E. lewisi* is reported to be present with few occurrences in glasshouses, but the identification of the pest has not been confirmed.

- Uncertainty on the host range of the pest: A comprehensive list of potential host plants is presented in Appendix B, but this does not necessarily mean that the mite can complete its life cycle on the species or that it can cause economic damage.

- Uncertainty on spread: The reasons why the pest is not spreading in the EU are unclear as few data are available. The exact locations where the mite is currently present in the world are not specified; consequently, the matching of the EU climate with those areas is very approximate and the potential area of distribution of the pest in the EU cannot be specified precisely. No disaggregated trade and production data of poinsettias in the EU have been found and very imprecise data showing the economic importance of the crop in the EU could be derived. No interceptions on *E. lewisi* are reported in the Europhyt database.

- Uncertainty on the impact of the pest: Very few relevant scientific papers are available on the pest. Very few recent studies provide scientific information on the pest impact. No impact reports are available for Europe.

Uncertainty on the conclusion: the conclusions of the pest categorisation are based on very little information and data as almost no recent scientific publications are available for this pest.

CONCLUSIONS

The Panel summarises in the Table 12 below its conclusions on the key elements addressed in this scientific opinion in consideration of the pest categorisation criteria defined in ISPM 11 and ISPM 21 and of the additional questions formulated in the terms of reference.

Table 12: Panel's conclusions on the pest categorisation criteria defined in the International standards for Phytosanitary measures No 11 and No 21 and on the additional questions formulated in the terms of reference.

Criterion of pest categorisation	Panel's conclusions against ISPM 11 criterion Yes /No	Panel's conclusions against ISPM 21 criterion Yes /No	List of main uncertainties
Identity of the pest	*Is the identity of the pest clearly defined?* **Yes,** clear taxonomical criteria are available. *Do clearly discriminative detection methods exist for the pest?* **Yes,** a clear identification method exists based on observation of morphological characters by microscopic examination of adult specimens only.		-
Absence/presence of the pest in the PRA area	*Is the pest absent from all or a defined part of the PRA area?* **Yes,** the pest is reported as present only in Portugal (restricted distribution in Madeira) and Poland (few occurrences in glasshouse).	*Is the pest present in the PRA area?* **Yes**, the pest distribution in the EU is restricted to Madeira in Portugal and to a few occurrences in glasshouses in Poland.	Possible misidentification of the mite because field identification is not possible and expertise is required for diagnosis. Absence confirmed by MSs questionnaire; however, no surveys were specifically performed on this pest in all the EU MSs.
Regulatory status	*Considering that the pest under scrutiny is already regulated, just mention in which annexes of 2000/29/EC and the marketing directives the pest and associated hosts are listed without further analysis. (the risk manager will have to consider the relevance of the regulation against official control)* *E. lewisi* is an Annex IIAI organism regulated only on plants of *Poncirus*, *Fortunella* and *Citrus*, and their hybrids, other than fruit and seed. The pest has a very wide host range and many host plants are not included in Annex III (e.g. poinsettia).		-

Criterion of pest categorisation	Panel's conclusions against ISPM 11 criterion Yes /No	Panel's conclusions against ISPM 21 criterion Yes /No	List of main uncertainties
Potential establishment and spread	*Does the PRA area have ecological conditions (including climate and those in protected conditions) suitable for the establishment and spread of the pest?* *And, where relevant, are host species (or near relatives), alternative hosts and vectors present in the PRA area?* **Yes,** the Lewis spider mite is polyphagous and several host plants are widely distributed in the EU, in open field and in protected cultivation; environmental conditions are also suitable for the establishment of the pest in the EU.	*Are plants for planting a pathway for introduction and spread of the pest?* **Yes,** poinsettia in particular (reported in Poland greenhouses) and plants for planting of the other hosts could also be a means of introduction and spread of the pest in the EU.	Lack of precise data on the current distribution of the pest that is needed for climate matching with the EU. Lack of data on host plants (e.g. poinsettia production and trade date are very approximate).
Potential for consequences in the PRA area	*What are the potential for consequences in the PRA area? Provide a summary of impact in terms of yield and quality losses and environmental consequences*	*If applicable is there indication of impact(s) of the pest as a result of the intended use of the plants for planting?*	
	No impact has been reported in the EU. Potential impacts: the Lewis spider mite is polyphagous and can feed on several cultivated crops of economic importance in the EU (citrus, peach, strawberry, poinsettia, vine, etc.). The Lewis spider mite is a growing concern in California on strawberry and raspberry, in Mexico on peach and in Chile on vine. The Lewis spider mite can cause damage on poinsettia, as reported in third countries, where control methods seem to be effective at preventing yield and quality losses. In the areas of its current distribution, minor impact on citrus is reported, and for peach, vine, strawberry and poinsettia the impact is limited with control measures in place.	The pest may cause severe impact on the intended use of the plants for planting.	No observed impact reported in the EU despite *E. lewisi* presence reported in Madeira since 1988. Only one study is providing quantitative data on impact and only few studies describe the general impact of the pest.

Criterion of pest categorisation	Panel's conclusions against ISPM 11 criterion Yes /No	Panel's conclusions against ISPM 21 criterion Yes /No	List of main uncertainties
Conclusion on pest categorisation	*E. lewisi* has the potential to be a quarantine pest as it fulfils all criteria above, although its current regulatory status is limited to a very restricted number of its host plants. Lewis spider mite has been reported from Madeira on poinsettia and vine since 1988 but no impact reports are available, and no information on control measures. In Poland, there were reports of a few occurrences of the mite on poinsettia in glasshouses where the outbreaks were successfully controlled without further information.	*E. lewisi* has the potential to be a regulated non-quarantine pest (RNQP) as it fulfils all criteria above although: (i) its distribution is restricted to Madeira in Portugal and to few occurrences in glasshouses in Poland and; (ii) plants for planting of several hosts are not under official control (e.g. poinsettia).	Conclusion based on a very limited number of scientific publications that are available.

Conclusion on specific ToR questions	*If the pest is already present in the EU, provide a brief summary of* – *the analysis of the present distribution of the organism in comparison with the distribution of the main hosts, and the distribution of hardiness/climate zones, indicating in particular if in the PRA area, the pest is absent from areas where host plants are present and where the ecological conditions (including climate and those in protected conditions) are suitable for its establishment,* Host plants of *E. lewisi* are widely distributed in the risk assessment area where climate conditions match those of the current area of distribution of the pest outside Europe. – *the analysis of the observed impacts of the organism in the risk assessment area* No impacts have been reported in the EU.	-

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Appendix A. Literature search performed on *Eotetranychus lewisi* (McGregor)

The literature search was performed on 2/06/2014.

1. Information sources

The information sources used to produce a set of relevant evidence that were consulted for performing the pest categorisation of *Eotetranychus lewisi* were:

- ISI Web of Knowledge (Web of Science™ Core Collection (1975–present); BIOSIS Citation Index℠ (1926–present); CABI: CAB Abstracts® (1910–present); Chinese Science Citation Database℠ (1989-present); Current Contents Connect® (1998–present); Data Citation Index℠ (1900–present); FSTA®—the food science resource (1969–present); MEDLINE® (1950–present); SciELO Citation Index (1997-present); Zoological Record® (1864–present)).

- Web-based search utilities (Google Scholar).

- Expert knowledge.

2. Search results

- Search equation:

The search equation used was articulated around the names of the pest (Latin name, synonyms, and common names) and was performed to search on the topic in ISI Web of Knowledge:

(eotetranychus lewisi) OR (“Lewis spider mite”) OR (Tetranychus lewisi) OR (“araña roja del duraznero”))
Timespan=All years
Search language=Auto

As a result, 69 hits were obtained running the search equation. Considering the manageable number of hits no filtering has been applied.

- Web-based search utilities:

“Google Scholar” was consulted and 36 additional publications and/or technical reports were identified for screening.

3. Screening

The resulting 105 publications were screened for relevance by their titles and abstracts.

The screening process was unmasked and performed on the basis of irrelevance to the subject of this work, i.e. documents not dealing with the pest under scrutiny were considered irrelevant.

As a result, 36 references were considered to produce a set of relevant evidence and the corresponding full texts were scrutinised and consulted to prepare the scientific opinion.

Appendix B. Host range of *Eotetranychus lewisi* (McGregor)

The host range of *Eotetranychus lewisi* is presented in the Table 13 below:

Table 13: Host range of Eotetranychus lewisi (McGregor) extracted on 3 June 2014 from Alain Migeon and Franck Dorkeld (2006-2013) Spider Mites Web: a comprehensive database for the Tetranychidae. http://www.montpellier.inra.fr/CBGP/spmweb.

No	Host family	Host species	References
1	Bixaceae	*Bixa orellana*	Estebanes-Gonzalez and Baker (1968)
2	Caricaceae	*Carica papaya*	Berry (1959); Baker and Pritchard (1962); Andrews and Poe (1980); Flechtmann et al. (1999)
3	Cleomaceae	*Cleome* sp.	Urueta (1975)
4	Compositae	*Ambrosia confertiflora*	Tuttle et al. (1974)
5		*Bebbia juncea*	Tuttle et al. (1974)
6		*Brickellia californica*	Tuttle et al. (1974)
7		*Encelia frutescens*	Tuttle and Baker (1964)
8		*Haplopappus* sp.	Tuttle et al. (1976)
9		*Heterotheca* sp.	Tuttle et al. (1974)
10		*Xanthisma spinulosum*	Tuttle and Baker (1964)
11	Convolvulaceae	*Ipomoea* sp.	Tuttle et al. (1974)
12	Cucurbitaceae	*Cucurbita* sp.	Estebanes-Gonzalez and Baker (1968)
13	Cyperaceae	*Schoenoplectus californicus*	Tuttle and Baker (1964)
14	Euphorbiaceae	*Cnidoscolus* sp.	Tuttle et al. (1976)
15		*Croton ciliatoglandulifer*	Tuttle et al. (1974)
16		*Croton glabellus*	
17		*Croton sonorae*	Tuttle et al. (1974)
18		*Croton* sp.	Tuttle et al. (1974)
19		*Ditaxis lanceolata*	Tuttle and Baker (1964)
20		*Euphorbia cyathophora*	
21		*Euphorbia heterophylla*	Urueta (1975)
22		*Euphorbia marginata*	
23		*Euphorbia pulcherrima*	Baker and Pritchard (1962); Andrews and Poe (1980); Lee Goff (1986); Carmona (1992); Ho and Shih (2004)
24		*Euphorbia* sp.	Tuttle et al. (1976)
25		*Jatropha cardiophylla*	Tuttle and Baker (1964)
26		*Ricinus communis*	McGregor (1950); Pritchard & Baker (1955); Guanilo et al. (2012)
27	Fagaceae	*Quercus* sp.	Tuttle et al. (1976)
28	Hydrangeaceae	*Hydrangea arborescens*	Tuttle et al. (1976)
29	Lamiaceae	*Monarda* sp.	Tuttle et al. (1976)
30	Leguminosae	*Acacia constricta*	Tuttle et al. (1976)
31		*Acacia kamerunensis*	
32		*Acacia pennatula*	Tuttle et al. (1976)

No	Host family	Host species	References
33		*Bauhinia picta*	Urueta (1975)
34		*Bauhinia* sp.	Meyer (1987)
35		*Crotalaria* sp.	Estebanes-Gonzalez and Baker (1968)
36		*Erythrina edulis*	
37		*Medicago polymorpha*	McGregor (1950)
38		*Mimosa aculeaticarpa*	Tuttle et al. (1974)
39		*Mimosa laxiflora*	Tuttle et al. (1974)
40	Malpighiaceae	*Malpighia* sp.	Tuttle et al. (1976)
41	Malvaceae	*Abutilon malacum*	Tuttle et al. (1974)
42		*Ceiba acuminata*	Tuttle et al. (1974)
43		*Gossypium hirsutum*	Guanilo et al. (2012)
44		*Sphaeralcea orcuttii*	Tuttle and Baker (1964)
45	Moraceae	*Ficus carica*	
46		*Ficus* sp.	Estebanes-Gonzalez and Baker (1968)
47	Oleaceae	*Olea europaea*	Pritchard and Baker (1955)
48	Papaveraceae	*Bocconia arborea*	Estebanes-Gonzalez and Baker (1968)
49	Pinaceae	*Pinus cembroides*	Estebanes-Gonzalez and Baker (1968)
50		*Pinus nelsonii*	Estebanes-Gonzalez and Baker (1968)
51		*Pinus ponderosa*	Estebanes-Gonzalez and Baker (1968)
52	Polygonaceae:	*Antigonon leptopus*	Tuttle et al. (1976)
53	Rhamnaceae	*Ceanothus* sp.	Pritchard and Baker (1955)
54	Rosaceae	*Fragaria × ananassa*	Howell, Daugovish (2013)
55		*Prunus persica*	Tuttle and Baker (1964); Perez-Santiago et al. (2002)
56		*Prunus* sp.	Estebanes-Gonzalez and Baker (1968)
57		*Pyrus* sp.	
58		*Rosa* sp.	Estebanes-Gonzalez and Baker (1968)
59	Rutaceae	*Citrus limon*	McGregor (1943)
60		*Citrus sinensis*	McGregor (1943); McGregor (1950)
61	Salicaceae	*Populus deltoides*	Estebanes-Gonzalez and Baker (1968)
62		*Populus tremuloides*	Tuttle et al. (1976)
63	Sapindaceae	*Cardiospermum halicacabum*	Tuttle et al. (1974)
64		*Koelreuteria paniculata*	Tuttle et al. (1976)
65	Solanaceae	*Brugmansia arborea*	Guanilo et al. (2012)
66		*Lycium* sp.	
67		*Solanum elaeagnifolium*	Tuttle & Baker (1964)
68		*Solanum* sp.	Tuttle et al. (1976)
69	Vitaceae	*Vitis* sp.	Carmona (1992)

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ABBREVIATIONS

EFSA:	European Food Safety Authority
EPPO:	European and Mediterranean Plant Protection Organization
EPPO-PQR:	European and Mediterranean Plant Protection Organization Plant Quarantine Retrieval System
EU:	European Union
ISPM:	International Standard for Phytosanitary Measures
MS(s):	Member State(s)
NPPO:	National Plant Protection Organisation
PLH Panel:	Plant Health Panel
RNQP:	Regulated Non Quarantine Pest