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Pest categorisation of *Amyelois transitella*

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of the navel orangeworm, *Amyelois transitella* (Lepidoptera: Pyralidae), for the EU. This polyphagous species feeds on citrus, almonds, pistachios, grapes and other crops cultivated in the EU. *A. transitella* occurs in North, Central and South America in a range of climates some of which also occur in the EU. Adult females lay up to 200 eggs on overripe, damaged, cracked or mummified fruits or nuts. In citrus, eggs are laid at the navel end of damaged fruit. On occasions, they may be found on adjacent leaves or stems. This species is not included in EU Commission Implementing Regulation 2019/2072. Potential entry pathways for *A. transitella*, such as plants for planting, and fruit, exist. The pest is not known to be present in the EU territory although it has been intercepted in Italy and Austria. Should *A. transitella* arrive in the EU the availability of hosts and occurrence of potentially suitable climates would be conducive for establishment. Should this species establish in the EU, yield and quality losses in citrus, nuts, stone and pome fruit production is anticipated. *A. transitella* satisfies the criteria that are within the remit of EFSA to assess for this species to be regarded as a potential Union quarantine pest.

Keywords: navel caterpillar, navel orangeworm, pest risk, plant health, plant pest, quarantine

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1. Introduction

1.1. Background and Terms of Reference as provided by the requestor

1.1.1. Background

The new Plant Health Regulation (EU) 2016/2031, on the protective measures against pests of plants, is applying from 14 December 2019. Conditions are laid down in this legislation in order for pests to qualify for listing as Union quarantine pests, protected zone quarantine pests or Union regulated non-quarantine pests. The lists of the EU regulated pests together with the associated import or internal movement requirements of commodities are included in Commission Implementing Regulation (EU) 2019/2072. Additionally, as stipulated in the Commission Implementing Regulation 2018/2019, certain commodities are provisionally prohibited to enter in the EU (high risk plants, HRP). EFSA is performing the risk assessment of the dossiers submitted by exporting to the EU countries of the HRP commodities, as stipulated in Commission Implementing Regulation 2018/2018. Furthermore, EFSA has evaluated a number of requests from exporting to the EU countries for derogations from specific EU import requirements.

In line with the principles of the new plant health law, the European Commission with the Member States are discussing monthly the reports of the interceptions and the outbreaks of pests notified by the Member States. Notifications of an imminent danger from pests that may fulfil the conditions for inclusion in the list of the Union quarantine pest are included. Furthermore, EFSA has been performing horizon scanning of media and literature.

As a follow-up of the above mentioned activities (reporting of interceptions and outbreaks, HRP, derogation requests and horizon scanning), a number of pests of concern have been identified. EFSA is requested to provide scientific opinions for these pests, in view of their potential inclusion by the risk manager in the lists of Commission Implementing Regulation (EU) 2019/2072 and the inclusion of specific import requirements for relevant host commodities, when deemed necessary by the risk manager.

1.1.2. Terms of Reference

EFSA is requested, pursuant to Article 29(1) of Regulation (EC) No 178/2002, to provide scientific opinions in the field of plant health.

EFSA is requested to deliver 53 pest categorisations for the pests listed in Annex 1A, 1B, 1D and 1E (for more details see mandate M-2021-00027 on the Open.EFSA portal). Additionally, EFSA is requested to perform pest categorisations for the pests so far not regulated in the EU, identified as pests potentially associated with a commodity in the commodity risk assessments of the HRP dossiers (Annex 1C; for more details see mandate M-2021-00027 on the Open.EFSA portal). Such pest categorisations are needed in the case where there are not available risk assessments for the EU.

When the pests of Annex 1A are qualifying as potential Union quarantine pests, EFSA should proceed to phase 2 risk assessment. The opinions should address entry pathways, spread, establishment, impact and include a risk reduction options analysis.

Additionally, EFSA is requested to develop further the quantitative methodology currently followed for risk assessment, in order to have the possibility to deliver an express risk assessment methodology. Such methodological development should take into account the EFSA Plant Health Panel Guidance on quantitative pest risk assessment and the experience obtained during its implementation for the Union candidate priority pests and for the likelihood of pest freedom at entry for the commodity risk assessment of High Risk Plants.

1.2. Interpretation of the Terms of Reference

Amyelois transitella is one of a number of pests listed in Annex 1 to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a regulated pest for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores, and so inform European Commission decision-making as to its appropriateness for potential inclusion in the lists of pests of Commission Implementing Regulation (EU) 2019/2072. If a pest fulfils the criteria to be potentially listed as a regulated pest specific import requirements for relevant host commodities will be identified; for pests already present in the EU additional risk reduction options will be identified.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on *Amyelois transitella* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific name of the pest as search term. Papers relevant for the pest categorisation were reviewed, and further references and information were obtained from experts, as well as from citations within the references and grey literature.

2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), the CABI databases and scientific literature databases as referred above in Section 2.1.1.

Data about the import of commodity types that could potentially provide a pathway for the pest to enter the EU and about the area of hosts grown in the EU were obtained from EUROSTAT (Statistical Office of the European Communities).

The Europhyt and TRACES databases were consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network run by the Directorate General for Health and Food Safety (DG SANTÉ) of the European Commission, and is a subproject of PHYSAN (Phyto-Sanitary Controls) specifically concerned with plant health information. TRACES is the European Commission's multilingual online platform for sanitary and phytosanitary certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union, and the intra-EU trade and EU exports of animals and certain animal products. Up until May 2020, the Europhyt database managed notifications of interceptions of plants or plant products that do not comply with EU legislation, as well as notifications of plant pests detected in the territory of the Member States and the phytosanitary measures taken to eradicate or avoid their spread. The recording of interceptions switched from Europhyt to TRACES in May 2020.

2.2. Methodologies

The Panel performed the pest categorisation for *Amyelois transitella* following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018), the EFSA guidance on the use of the weight of evidence approach in scientific assessments (EFSA Scientific Committee, 2017) and the International Standards for Phytosanitary Measures No. 11 (FAO, 2013) and No. 21 (FAO, 2004).

The criteria to be considered when categorising a pest as an EU-regulated quarantine pest (QP) is given in Regulation (EU) 2016/2031 article 3. Table 1 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. In judging whether a criterion is met the Panel uses its best professional judgement (EFSA Scientific Committee, 2017) by integrating a range of evidence from a variety of sources (as presented above in Section 2.1) to reach an informed conclusion as to whether or not a criterion is satisfied.

The Panel's conclusions are formulated respecting its remit and particularly with regard to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU) No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, deemed to be a risk management decision, the Panel will present a summary of the observed impacts in the areas where the pest occurs, and make a judgement about potential likely impacts in the EU. Whilst the Panel may quote impacts reported from areas where the pest occurs in monetary terms, the Panel will seek to express potential EU impacts in terms of yield and quality losses and not in monetary terms, in agreement with the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018). Article 3 (d) of Regulation (EU) 2016/2031 refers to unacceptable social impact as a criterion for quarantine pest status. Assessing social impact is outside the remit of the Panel.

Table 1: Pest categorisation criteria under evaluation, as defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest (article 3)
Identity of the pest (Section 3.1)	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?
Absence/presence of the pest in the EU territory (Section 3.2)	Is the pest present in the EU territory? If present, is the pest widely distributed within the EU? Describe the pest distribution briefly
Regulatory status (Section 3.3)	If the pest is present in the EU but not widely distributed in the risk assessment area, it should be under official control or expected to be under official control in the near future.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Is the pest able to enter into, become established in, and spread within, the EU territory? If yes, briefly list the pathways
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?
Available measures (Specific import requirements) (Section 3.6)	Are there measures available to prevent the entry into the EU such that the likelihood of introduction becomes mitigated?
Conclusion of pest categorisation (Section 4)	A statement as to whether 1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and 2) if not, which one(s) were not met.

3. Pest categorisation

3.1. Identity and biology of the pest

3.1.1. Identity and taxonomy

Is the identity of the pest established, or has it been shown to produce consistent symptoms and/or to be transmissible?

Yes, the identity of the species is established and *Amyelois transitella* (Walker) is the accepted name.

Amyelois transitella (Walker, 1863) is an insect of the order Lepidoptera, family Pyralidae. Junior synonyms are *Paramyelois transitella* (Walker, 1863); *Emporia cassiae* Dyar, 1917; *Myelois duplipunctella* Bagenot, 1857; *Myelois notatalis* Walker, 1863; *Myelois solitella* Zeller, 1881; *Myelois venipars* Dyar, 1914 (AQIS, 1999). The common name for this species is navel caterpillar and navel orangeworm (EPPO, online); however, most literature describes damage on nuts (e.g. Rosenheim et al., 2017 and other literature).

The EPPO code[1] for this species is: PARMTR (EPPO, online).

3.1.2. Biology of the pest

Adult *A. transitella* are nocturnal. They emerge from pupae in the early evening, followed by mating and oviposition within the next one to two nights. Females emit a pheromone to attract male moths (Wang et al., 2010), who then proceed through a series of courtship behaviours before mating (Girling and Cardé, 2006), after which they remain in copula for at least 2 h (Wade, 1961). Mating typically takes place in the final hours of the night just before dawn. However, sexual activity starts earlier in the night when temperatures drop below 17°C. Gravid females can produce ~ 100–200 eggs each and complete most oviposition on the first few nights after mating (Burks, 2014). Eggs are laid singly,

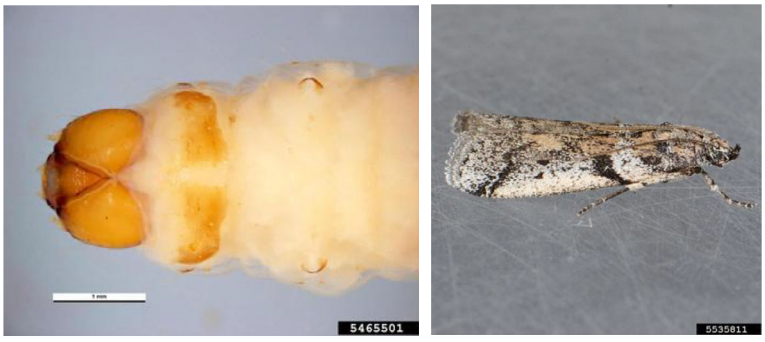
[1] An EPPO code, formerly known as a Bayer code, is a unique identifier linked to the name of a plant or plant pest important in agriculture and plant protection. Codes are based on genus and species names. However, if a scientific name is changed, the EPPO code remains the same. This provides a harmonised system to facilitate the management of plant and pest names in computerised databases, as well as data exchange between IT systems (Griessinger and Roy, 2015; EPPO, 2019).

primarily on nuts while they are still on the tree. They may be laid on 'mummies' (nuts that remain on the tree after harvest), or on damaged fresh nuts, or fresh nuts after hull split (Strand, 2002). Larvae of *A. transitella* pass through five to six instars and will reach a length of 13–19 mm before pupation. Young larvae enter the nut shortly after egg hatch and will remain inside until they reach the adult stage. Typically found in association with their own frass and webbing, multiple larvae may be found in a single nut. The quality of fruit is reduced by insect damage making the fruit susceptible to pathogenic fungi. Increased fruit drop may occur.

The lower developmental threshold of *A. transitella* is 12.8°C and the upper threshold 34.4°C (Engle and Barnes, 1983; Seaman and Barnes, 1984). Eggs and pupae require 56 and 113 degree days (DD) to complete development, respectively (Engle and Barnes, 1983; Sanderson et al., 1989). Development from egg to adult requires 424–427 DD on new crop almonds, but this rate varies with host quality. Developmental rates proved different across multiple crops as well as among varieties within the same crop and multiple strains of *A. transitella*. Under California conditions, *A. transitella* can have three to four generations per year. In California, *A. transitella* overwinter as larvae inside either unharvested tree nuts that have been left in the orchard (i.e. 'mummies' or 'mummy nuts') or other vulnerable agricultural commodities such as apples, figs and oranges (Wilson et al., 2020).

Navel orangeworm is more likely to be found on blighted, codling moth[2] infested or otherwise damaged walnuts (Strand, 2002). Newly hatched larvae feed directly on nutmeats, although in almonds, larvae may feed on the hull as well as the kernel.

Figure 1 shows the larva and adults of *Amyelois transitella*. Key biological features of the organism relevant to the pest categorisation are summarised in Table 2.



a. Larva (Pest and Diseases Image Library, Bugwood.org) b. Adult (Mark Dreiling, Bugwood.org)

Figure 1: *Amyelois transitella* larva and adult (both illustrations under a Creative Commons Attribution-Noncommercial 3.0 License)

Table 2: Important features of the life history strategy of *Amyelois transitella*

Life stage	Phenology and relation to host	Other relevant information (UC IPM, 2019; Wilson et al., 2020)
Egg	Eggs (100–200/female) are laid singly on overripe, damaged, cracked or mummified fruits or nuts. In navel group of citrus eggs are laid at the navel end. There is no data about location of oviposition in other citrus. On occasion, they may be found on adjacent leaves or stems.	Eggs hatch after 4–23 days depending on temperature.
Larva	Larvae enter the nut shortly after egg hatch and will remain inside until they reach the adult stage. Typically found in association with their own frass and webbing. Multiple larvae may be found in a single nut. Larvae can overwinter in mummified nuts either in trees or on the ground.	The larvae develop more rapidly when relative humidity is high. At 55%, they take 55 days to develop, but at 95%, they require only 22 days (Bugguide website accessed on 27/4/2021) Larvae measure 13–19 mm long before pupating in infested fruit or nuts.

[2] Codling moth, *Cydia pomonella,* occurs widely in the EU.

Life stage	Phenology and relation to host	Other relevant information (UC IPM, 2019; Wilson et al., 2020)
Pupa	*A. transitella* pupates either within the infested nut or outside of the shell. Pupae are dark brown in coloration, 7.25–12 mm long, and are typically encased within silk cocoons.	Pupation lasts for about a week
Adult	In the spring adults emerge and begin to lay eggs. Adults are nocturnal. They enclose from pupae in the early evening, followed by mating and oviposition within the next one to two nights. Females emit a pheromone to attract male moths. Mating typically takes place in the final hours of the night just before dawn although sexual activity starts earlier in the night when temperatures drop below 17°C. Females can be multiply mated, although in the wild, this is not very common and tends to correlate with increased moth abundance. Gravid females complete most oviposition on the first few nights after mating.	Upwind movement of adults as far as 375 m was observed and increased damage in pistachio orchards adjacent to infested almond blocks. While originally noted as a weak disperser (Wade, 1961), more recent literature (Burks and Higbee, 2006; Sappington and Burks, 2014) reports a high dispersal capacity up to 1,000 metres in 24 h with mated females that tend to fly further than unmated ones (Rovnyak et al., 2018). Longer distance spread occurs by the movement of nuts and plant material infested with larvae or pupae of navel orangeworm.

3.1.3. Host range

A. transitella is highly polyphagous on a variety of fruits and nuts belonging to 15 botanical families. Hosts include *Citrus spp. Juglans regia*, *Pistacia vera*, *Prunus spp., Vitis vinifera.* An extensive list of hosts is provided in Appendix B.

3.1.4. Intraspecific diversity

Although there are lighter and darker forms of this species, and adult size can vary considerably (Wilson et al., 2020), this intraspecific phenotypic diversity has not been related to any feature affecting the conclusions of this categorisation.

3.1.5. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes. The adult pest can be detected in the field using various types of traps (e.g. pheromone, egg and bait traps) and symptoms and damage on the hosts can be seen in the field (e.g. frass and webbing). Morphological keys are available to identify the species.

Adult *A. transitella* are small and grey, measuring approximately 9–10 mm from head to the tip of the abdomen with a wingspan of 19–20 mm. The forewings of the species are predominantly silver grey, marked with irregular black patterning. The hindwings of the species are a uniform white to dusky grey with some darkening one the wing edge and veins. There are lighter and darker forms, and adult size can vary considerably (Wilson et al., 2020).

Eggs are small (0.5–1.0 mm), dorsoventrally flattened, reticulated and oval in shape with ridge-like marks. At oviposition eggs are creamy white but develop a reddish-orange hue as they mature. Young worms are reddish orange and later appear cream-coloured, although their diet can influence colouration. They have a crescent-shaped sclerite on each side of the second body segment behind the head. As the worm matures, the head becomes reddish brown (UC IPM, 2019; Wilson et al., 2020).

Larvae of *A. transitella* pass through five to six instars and will reach a length of 13–19 mm before pupation. Young larvae are reddish orange but become pinkish orange or cream coloured after the first moult. Body coloration is influenced by diet, for instance, those fed on walnuts develop a pinkish orange hue, whereas those reared on almonds remain creamy white. Larval head capsules are a solid dark red-brown, may exhibit some mottling and do not change in colour or pattern between instars.

The carob moth *Ectomyelois ceratoniae* (Zeller) (Lepidoptera: Pyralidae), present in the EU, may be hard to distinguish from *A. transitella*, also due to overlapping niche in Mediterranean climates. The two species can be differentiated based on pupal characteristics—*E. ceratoniae* has a raised dark ridge towards the head and two short spines on each abdominal segment, whereas *A. transitella* does not (Haviland et al., 2020).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

The moth is believed to be of neotropical origin (Figure 2). First described in Mexico in 1915, it was later discovered in Arizona on navel oranges, giving it its common name; it is possible, however, that it was already present in Arizona prior to 1915 (Wade, 1961). Introduced into California in the 1940s, it became a serious pest of walnuts, almonds, pistachios and figs (Johnson, 2013). In the US, the moth is reported from Florida to Texas north to Tennessee and in Washington. Further records are Costa Rica, Cuba, Guatemala, Panama, Brazil, Colombia, Argentina and Peru (AQIS, 1999; USDA, 2015; Muñoz Agudel et al., 2014; EPPO, online). Biosecurity Queensland (2011) mentions Canada, but no other record was found.

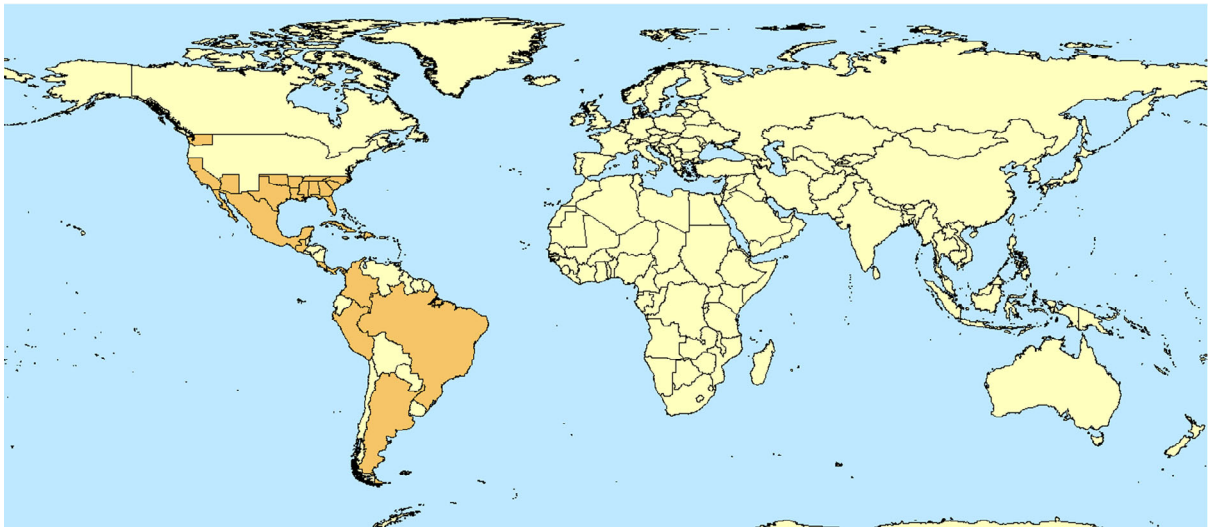


Figure 2: Global distribution of *Amyelois transitella* (Source: as in Appendix A)

For more details about the distribution, see the table in Appendix A.

3.2.2. Pest distribution in the EU

Is the pest present in the EU territory? If present, is the pest widely distributed within the EU?

No. The pest is not known to be present in the EU territory although it has been intercepted in Italy and Austria.

Absent from the EU. The presence in Italy is mentioned in several publications (e.g. AQIS, 1999; USDA, 2015); however, this record appears to originate from an interception (Trematerra, 1988). Similarly, *A. transitella* entered Austria (Essl and Rabitsch, 2002), but is rated as not established. Although Lopez-Vaamonde (2010) reports these countries as 'invaded' the pest does not seem to be established. *A. transitella* is also recorded as present in Germany according to Fauna Europaea (de Jong et al., 2014); however, no record was found, and it may also refer to an interception. Consequently, the pest was considered absent from the EU, with an uncertainty (DROPSA, 2016).

3.3. Regulatory status

3.3.1. Commission Implementing Regulation 2019/2072

Amyelois transitella is not included in EU plant health regulation EC 2019/2072, the implementing act of Regulation (EU) 2016/2031.

3.3.2. Hosts of *Amyelois transitella* that are prohibited from entering the Union from third countries

As specified in Annex VI of 2019/2072, some plants, which are also *A. transitella* host plants, are prohibited from entering the EU as plants for planting, or have specific conditions applied. Hosts plants that are prohibited from the Americas are *Cydonia, Malus, Prunus, Pyrus* (Annex VI, 9.), *Vitis* (Annex VI, 10) and *Citrus* (Annex VI, 11.).

Table 3: List of plants, plant products and other objects that are *Amyelois transitella* hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI)

List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited			
	Description	**CN Code**	**Third country, group of third countries or specific area of third country**
9.	Plants for planting of [...] *Cydonia* Mill., *Malus* Mill., *Prunus* L., *Pyrus* L. [...],		Third countries other than: [...] United States
10.	Plants of Vitis L., other than fruits		Third countries other than Switzerland
11.	Plants of *Citrus* L.,[...] other than fruits and seeds		All third countries

3.3.3. Legislation addressing the organisms vectored by *Amyelois transitella* (Commission Implementing Regulation 2019/2072)

A. transitella is able to introduce spores of *Aspergillus flavus* Link into the nuts (Palumbo et al., 2014). The fungal pathogen has a cosmopolitan distribution and is not regulated by EU phytosanitary regulations.

3.4. Entry, establishment and spread in the EU

3.4.1. Entry

Is the pest able to enter into the EU territory? If yes, identify and list the pathways. Comment on plants for planting as a pathway.

Yes. It can enter as larvae in fruits and nuts; it can also enter as eggs carried on plant stems under bud scales, therefore plants for planting could provide a pathway.

Amyelois transitella is a polyphagous species with multiple potential pathways carrying eggs and larvae (Table 4). However, larvae are most often present in damaged fruit which are rejected during sorting after harvest (AQIS, 1999). It is uncertain if this species would be on traded table grapes.

Other pathways are represented by plants for planting (NSW, 2012). Indeed, eggs besides being laid in fissures on the ripening fruit, can also be laid under bud scales (AQIS, 1999).

Table 4 identifies potential pathways and life stages associated with each pathway.

Table 4: Potential pathways for *Amyelois transitella* into the EU 27

Pathways	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI) or special requirements (Annex VII) within Implementing Regulation 2019/2072]
Plants for planting	Eggs	The introduction of plants for planting of *Citrus* and *Vitis*, is prohibited (see Section 3.3.2) Plants for planting of *Cydonia, Pyrus*, *Prunus* and *Cydonia* are prohibited except from the United States.
Fruit and nuts	Eggs, larvae	A phytosanitary certificate is required to import fresh fruits and nuts into the EU (2019/2072, Annex XI, Part A) unless exempt by being listed in 2019/2072 Annex XI, Part C). No *A. transitella* fruit or nut hosts are in Annex XI, Part C; hence, their introduction does require a phytosanitary certificate. However, no specific requirements are specified in relation to *A. transitella*. A proportion of imported consignments are liable to be physically inspected but not all consignments will be inspected.

EU 27 statistics showing imports of fresh produce hosts of *A. transitella* from countries in the Americas where *A. transitella* is recorded are provided in Table 5. Details of imports from specific countries are provided in Appendix C.

Table 5: EU 27 annual imports of fresh produce hosts from countries where *Amyelois transitella* is present, 2016–2020 (Hundreds of kg) Source: Eurostat accessed on 27/4/2021

Commodity	HS code	2016	2017	2018	2019	2020
Citrus fruit, fresh or dried	0805	4,153,902	3,603,158	3,918,639	3,028,952	2,804,468
Fresh pears	0808 30	611,589	434,935	519,803	391,090	506,000
Fresh or dried pistachios, in shell	0802 51	346,938	546,704	523,944	720,737	675,107
Fresh apples	0808 10	275,389	398,976	467,600	283,809	255,903
Fresh grapes	0806 10	228,389	264,088	284,721	207,189	235,018
Fresh or dried almonds, in shell	0802 11	26,268	41,850	20,056	25,695	24,278
Fresh plums	0809 4005	2,075	673	6,812	1,424	837
Sum		5,644,550	5,290,384	5,741,574	4,658,895	4,501,610

Notifications of EU interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. Both databases were consulted on 14 April 2021. No records of interceptions of *A. transitella* were retrieved from either database.

Trematerra (1988) reports an interception in Italy and Essl and Rabitsch (2002) report an interception in Austria. *A. transitella* has been intercepted in Korea on fresh oranges and walnuts from the USA (Hong et al., 2012). *A. transitella* is a pest of concern for Australia and is subject to alerts (Biosecurity Queensland, 2011; NSW, 2012).

3.4.2. Establishment

Is the pest able to become established in the EU territory?

Yes, *A. transitella* could establish in the EU.

Southern regions of the EU where hosts and suitable climates co-exist are most suitable for establishment.

Climatic mapping is the principal method for identifying areas that could provide suitable conditions for the establishment of a pest taking key abiotic factors into account (Baker et al., 2000). Availability of hosts is considered in Section 3.4.2.1. Climatic factors are considered in Section 3.4.2.2.

3.4.2.1. EU distribution of main host plants

As noted above, and in Appendix B, *A. transitella* is polyphagous. Some hosts are confined to the warmer southern EU (e.g. citrus) whilst others occur more widely (e.g. apples, pears, plums). Hosts are grown both in commercial production and also in home-gardens. Table 6 shows the harvested area

of key hosts cultivated in the EU 27 in recent years. Appendix C provides production statistics for individual member states.

Table 6: Harvested area of some *Amyelois transitella* hosts in EU 27, 2016–2020 (thousand ha). Source EUROSTAT (accessed 25/4/2021)

Crop	Code	2016	2017	2018	2019	2020
Grapes	W1000	3,136.04	3,134.93	3,137.17	3,160.68	:
Almonds	F4300	689.68	743.39	774.85	799.86	:
Citrus fruits	T0000	519.01	502.84	508.99	512.53	487.08
Apples	F1110	506.48	505.55	507.24	491.35	474.8
Plums	F1250	152.79	153.88	153.43	154.48	:
Pears	F1120	115.76	114.84	114.84	111.84	108.93
Walnuts	F4100	72.61	74.15	80.6	86.1	:

':' data not available.

3.4.2.2. Climatic conditions affecting establishment

Climatic zones in the parts of the USA, Central and South America where *A. transitella* is found are comparable to climatic zones within the EU (Figure 3). The global Köppen–Geiger climate zones (Kottek et al., 2006) describe terrestrial climate in terms of average minimum winter temperatures and summer maxima, amount of precipitation and seasonality (rainfall pattern). *A. transitella* occurs in a number of zones such as Cfa, Csa, Csb, Csc and BSk. These climate zones also occur in the EU where many hosts of the moth are grown.

We assume that climatic conditions will not limit the ability of *A. transitella* to establish in the EU.

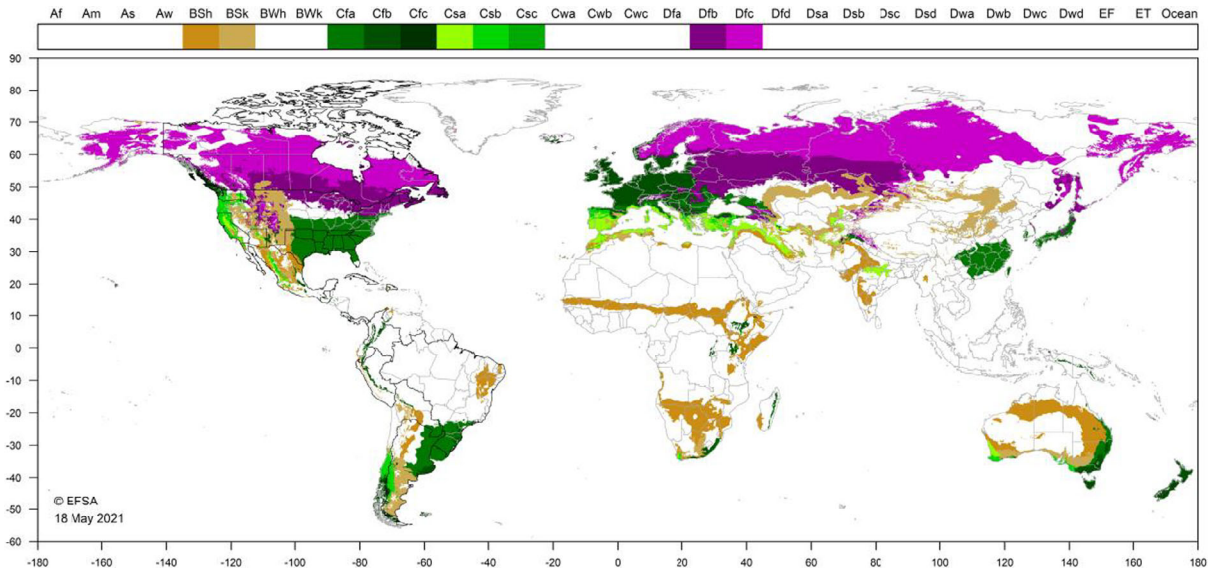


Figure 3: World distribution of Köppen–Geiger climate types that occur in the EU and where *Amyelois transitella* has been reported (USA, Central and South America)

3.4.3. Spread

Describe how the pest would be able to spread within the EU territory following establishment?

As a free-living organism *A. transitella* has the capacity for natural dispersal (adults can fly), i.e. it can disperse unaided by human activity. Long distance spread within the EU will be facilitated by the human movement of contaminated commodities.

Comment on plants for planting as a mechanism for spread.

There is no evidence of plants for planting being the main route of spread for this insect, as *A. transitella* would most likely spread via natural spread, as adults can fly.

Movement of *A. transitella* between orchard blocks was first demonstrated by Meals and Caltagirone (1971), who found increased egg deposition on sentinel nuts in an uninfested orchard adjacent to a heavily infested orchard. Subsequent work documented upwind movement of adults as far as 375 m (Andrews et al., 1980) and increased damage in pistachio orchards adjacent to infested almond blocks (Andrews and Barnes, 1982). While originally noted as a weak disperser (Wade, 1961), more recent literature using both flight mills and mark and recapture experiments (Burks and Higbee, 2006; Sappington and Burks, 2014) reports a high dispersal capacity up to 1,000 metres in 24 h, with mated females that tend to fly further than unmated ones (Rovnyak et al., 2018). Fatty acid profiles of adult moths have also been used to more definitively document movement between orchards (Bayes et al., 2014).

3.5. Impacts

Would the pests' introduction have an economic or environmental impact on the EU territory?

Yes, the introduction of *A. transitella* is likely to have yield and quality impacts on hosts in the EU through qualitative and quantitative effects on agricultural production.

A. transitella is a serious pest of some nut crops (e.g. almonds, pistachios, walnut), and also grazes on some citrus fruit, causing surface scarring that favours entry by decay-causing organisms, leading to fruit quality reduction and fruit drop. Larvae are in splits and wounds of citrus fruit, feeding in or near the core (Biosecurity Queensland, 2011). The pest is identified as the most important and damaging pest of pistachio (UC IPM, 2019) and the most important insect pest of almonds (Agudelo-Silva et al., 1995). It causes extensive losses to nut crops in the USA, through feeding damage and contamination of nuts with frass and webbing, and it also vectors saprophytic fungi that infect crops (Ampt et al., 2015). Routine insecticide spraying is done (UC IPM, 2019). On nuts, it is able to introduce spores of *Aspergillus flavus* which produces toxic aflatoxins; infestation of the nut by *A. transitella* larvae provides a suitable environment for *A. flavus* colonisation (Palumbo et al., 2014; Ampt et al., 2015). Due to this association between *A. transitella* infestation and aflatoxin, growers, processors and exporters have allow tolerance for *A. transitella* damage in all nut crops, typically aiming for < 2% infestation (Wilson et al., 2020). Navel orangeworm is a moth that infests both almonds and pistachios. Maturing larvae and their frass cause damage to the kernels that leads to infection with both *A. flavus* and *A. parasiticus*. Pistachios with split and tattered hulls found at the end of harvest also have been demonstrated to have higher levels of aflatoxin as tissues were subject to navel orangeworm infestation (Harris and Ferguson, 2013).

3.6. Available measures and/or potential specific import requirements and limits of mitigation measures

Are there measures available to prevent the entry into the EU such that the risk becomes mitigated?

Yes. Although not specifically targeted against *A. transitella,* existing phytosanitary measures mitigate the likelihood of its entry within the EU (see also Section 3.6.1).

3.6.1. Identification of potential additional measures

Phytosanitary measures are currently applied to many *A. transitella* hosts although measures in Annex VII of Commission Implementing Regulation 2019/2072 do not specifically refer to this species.

Potential control measures for imported hosts are listed in Table 7.

Table 7: Potential additional measures (a full list is available in EFSA PLH Panel, 2018) to mitigate the likelihood of pest entry

Special requirements/measures (with hyperlink to summary information sheet if available)	Control measure summary in relation to *Amyelois transitella*
Pest freedom	Used to mitigate likelihood of infestation by specified pest at origin, hence to mitigate entry
Growing plants in isolation	Used to mitigate likelihood of infestation by specified pest in vicinity of growing site (mitigates entry)
Certification of reproductive material (voluntary/official)	Used to mitigate the likelihood of the presence of pests that are included in a certification scheme
Inspections	Used to mitigate likelihood of infestation by specified pest at origin, hence mitigate entry. Pheromone, egg and bait traps can be used to detect the presence, track the timing and phenological development of *A. transitella* (Rosenheim et al., 2017)
Chemical treatments on consignments or during processing	Used to mitigate likelihood of infestation of pests susceptible to chemical treatments at origin, hence mitigate entry
Physical treatments on consignments or during processing	Used to mitigate likelihood of infestation of pests susceptible to physical treatments at origin, hence to mitigate entry
Heat and cold treatments	Used to mitigate likelihood of infestation of pests susceptible to physical treatments at origin, hence mitigate entry
Controlled atmosphere	Used to mitigate likelihood of infestation of pests susceptible to modified atmosphere (during transport or storage) hence mitigate entry
Timing of planting and harvesting and timing of export to EU	Used to mitigate likelihood of entry of pests associated with particular phenological stages of host. Like winter sanitation (i.e. removal and destruction of remnant 'mummy' nuts in and around the orchard), the importance of early harvest to reduce *A. transitella* infestation has long been a key to the management of this pest, and has been demonstrated in walnuts and almonds. Early or timely harvest can reduce crop damage by minimising the amount of time new crop nuts are exposed to *A. transitella* populations late in the season (Wilson et al., 2020).
Conditions of transport	Used to mitigate likelihood of entry of pests that could otherwise infest material post-production
Phytosanitary certificate and plant passport	Used to attest which of the above requirements have been applied

3.6.1.1. Biological or technical factors limiting the effectiveness of measures to prevent the entry of the pest

- Eggs are minute and may be difficult to detect.
- Larvae and pupae are hidden in the fruit/nuts.
- As internal feeders, larvae may be protected from pre- and post-harvest treatments applied to fruit and nuts.
- Adults could be present as hitchhikers even on non-host plants.
- Adults have a high dispersal capacity of up to 1,000 metres in 24 h.

3.7. Uncertainty

By its very nature of being a rapid process, there are uncertainties in a pest categorisation. However, there are no uncertainties affecting the conclusions of the categorisation. Key uncertainties are listed in Table 8 of the Panel's conclusions.

4. Conclusions

Considering the criteria within the remit of EFSA to assess its regulatory plant health status, *A. transitella* meets the criteria for consideration as a potential Union quarantine pest (it is absent from the EU, potential pathways exist although partly regulated and its establishment would cause an economic impact.

Table 8: The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of *Amyelois transitella* is well established.	No uncertainties
Absence/ presence of the pest in the EU (Section 3.2)	*A. transitella* is not known to occur in the EU territory.	*A. transitella* has been reported for Italy, Austria and Germany but reports are assumed to be interceptions (hence uncertain)
Regulatory status (Section 3.3)	*A. transitella* is currently not regulated in the EU.	No uncertainties
Pest potential for entry, establishment and spread in the EU (Section 3.4)	*A. transitella* could enter into, establish in, and spread within the EU territory. The main pathway is host fruit and nuts; plants for planting of several host species may also be a pathway.	No uncertainties
Potential for consequences in the EU (Section 3.5)	Should *A. transitella* be introduced into the EU, an economic impact would most likely follow.	No uncertainties
Available measures (Section 3.6)	There are measures available to prevent the likelihood of entry into the EU (i.e. import of some host plant for planting are prohibited, import of fruit and nuts is subject to certification).	
Conclusion (Section 4)	*Amyelois transitella* meets all of the criteria assessed by EFSA Plant Health Panel to satisfy the definition of a Union quarantine pest.	No uncertainties
Aspects of assessment to focus on/ scenarios to address in future if appropriate		

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Abbreviations

EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
HRP	high risk plants
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
MS	Member State
PLH	EFSA Panel on Plant Health
QP	quarantine pest
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference

Glossary

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2018).
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2018).

Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2018).
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2018).
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2018).
Greenhouse	A walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products (PPPs) into the environment.
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units.
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2018).
Pathway	Any means that allows the entry or spread of a pest (FAO, 2018).
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2018).
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2018).
Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager.
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2018).

Appendix A – Distribution of *Amyelois transitella*

Distribution records based on literature records, EPPO Global Database (EPPO, online) and CABI.

Region	Country	Sub-national (e.g. State)	Status	Reference
North America	Canada			Biosecurity Queensland (2011)
	Mexico		Present, no details	CABI
	USA		Present, no details	CABI, Bugguide, 2021
		Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Texas, Washington and Tennessee	Present, no details	
Central America	Costa Rica		Present, no details	CABI (undated)
	Cuba			Muñoz Agudel et al. (2014)
	Dominican Republic			Muñoz Agudel et al. (2014)
	Guatemala			Muñoz Agudel et al. (2014)
	Panama			Muñoz Agudel et al. (2014)
South America	Argentina		Present, no details	USDA (2015)
	Brazil		Present, no details	AQIS, 1999
	Colombia			Muñoz Agudel et al. (2014)
	Peru			Muñoz Agudel et al. (2014)
Europe			Intercepted only, presumed absent	
Africa			No records, presumed absent	
Asia			No records, presumed absent	
Oceania			No records, presumed absent	

Appendix B – *Amyelois transitella* host plants

Source: the literature.

Host status	Plant family	Host name	Common name	Reference[A]
Cultivated hosts	Anacardiaceae	*Pistacia vera*	pistachio	DROPSA (2016)
	Arecaceae	*Phoenix dactylifera*	Date palm	DROPSA (2016)
	Asparagaceae	*Yucca* sp.		DROPSA (2016)
	Fabaceae	*Acacia farnesiana*	Sweet acacia	DROPSA (2016)
		Ceratonia siliqua	Carob	DROPSA (2016)
		Gleditsia triacanthos	Honey locust	DROPSA (2016)
		Pithecellobium flexicaule	Texas ebony	DROPSA (2016)
	Juglandaceae	*Carya illinoensis*	Pecan	DROPSA (2016)
		Juglans regia	Walnuts	DROPSA (2016)
	Malvaceae	*Brachychiton* sp.	Narrowleaf bottle tree	DROPSA (2016)
	Moraceae	*Ficus* sp.	Fig	DROPSA (2016)
	Punicaceae	*Punica granatum*	Pomegranate	DROPSA (2016)
	Resedaceae	*Forchhammeria* sp.		DROPSA (2016)
	Rhamnaceae	*Ziziphus* sp.	Jujube	DROPSA (2016)
	Rosaceae	*Prunus dulcis*	Almond	DROPSA (2016)
		Cydonia oblonga	Quince	DROPSA (2016)
		Eriobotrya japonica	Loquat	DROPSA (2016)
		Heteromeles arbutifolia	Toyon	DROPSA (2016)
		Malus pumila	Apple	DROPSA (2016)
		Prunus armeniaca	Armenian plum	DROPSA (2016)
		Prunus domestica	Common plum	DROPSA (2016)
		Prunus		DROPSA (2016)
		Pyrus communis	European pear	DROPSA (2016)
	Rubiaceae	*Coffea* sp.	Coffee	DROPSA (2016)
		Genipa americana	Genipapo	DROPSA (2016)
	Rutaceae	*Citrus limon*	Lemon	DROPSA (2016)
		Citrus sinensis	Sweet orange	DROPSA (2016)
		Citrus paradisi	Grapefruit	DROPSA (2016)
		Citrus		
	Sapindaceae	*Ungnadia speciosa*	Mexican buckeye	Lara-Villalon et al. (2017)
	Vitaceae	*Vitis vinifera*	Grape vine	DROPSA 2016
Wild/weed hosts		–		
Artificial/ experimental hosts		–		

Appendix C – EU 27 imports of *Amyelois transitella* host produce

Source: Eurostat (accessed on 27/4/2021), Units 100 kgs

		2016	2017	2018	2019	2020
Citrus fruit, fresh or dried	Argentina	2,412,706.76	1,913,772.23	2,242,298.89	1,585,087.09	1,403,570.09
	Brazil	864,863.09	903,432.95	900,907.24	822,134.46	901,964.62
	Mexico	570,402.80	553,818.66	589,021.12	443,743.54	349,626.14
	USA	301,229.06	231,210.47	185,706.99	177,755.45	148,845.72
	Costa Rica	4,700.31	921.32	704.93	231.20	461.60
	Canada	0.00	2.35	–	–	–
	Sum	4,153,902.02	3,603,157.98	3,918,639.17	3,028,951.74	2,804,468.17
Fresh grapes	Brazil	194,152.79	249,279.81	271,987.56	196,465.22	228,130.95
	Argentina	32,521.13	5,415.79	8,320.07	8,505.97	5,629.80
	USA	1,714.93	8,868.74	4,413.37	1,866.20	1,072.48
	Mexico	–	358.96	–	186.71	184.62
	Canada	–	164.64	–	164.64	–
	Costa Rica	–	0.00	–	–	–
	Sum	228,388.85	264,087.94	284,721.00	207,188.74	235,017.85
Fresh plums	Argentina	2,075.00	588.13	6,477.68	1,104.78	836.84
	Costa Rica	–	0.00	–	319.01	–
	Mexico	–	0.00	211.68	–	–
	Brazil	–	84.84	122.95	–	–
	USA	–	0.00	–	0.29	0.08
	Canada	–	0.00	–	–	–
	Sum	2,075.00	672.97	6,812.31	1,424.08	836.92
Fresh pears	Argentina	611,166.07	434,480.03	519,079.90	390,070.38	505,999.69
	Brazil	208.68	0.00	251.27	926.88	–
	USA	214.47	454.76	471.49	12.54	–
	Costa Rica	–	0.00	–	80.64	–
	Mexico	–	0.00	–	–	–
	Canada	–	0.00	–	–	–
	Sum	611,589.22	434,934.79	519,802.66	391,090.44	505,999.69
Fresh or dried almonds in shell	USA	18,915.75	41,830.25	20,010.65	25,694.76	24,277.03
	Argentina	7,352.40	20.00	45.00	–	–
	Brazil	–	0.00	–	–	0.31
	Mexico	–	0.00	–	0.06	0.16
	Canada	–	0.00	–	–	0.03
	Costa Rica	–	0.00	–	–	–
	Sum	26,268.15	41,850.25	20,055.65	25,694.82	24,277.53
Fresh or dried pistachios, in shell	USA	346,787.62	543,547.63	523,093.94	718,669.61	674,398.39
	Argentina	150.00	3,114.90	850.00	2,058.00	708.80
	Canada	–	41.60	–	9.10	–
	Mexico	–	0.00	–	–	–
	Costa Rica	–	0.00	–	–	–
	Brazil	–	0.00	–	–	–
	Sum	346,937.62	546,704.13	523,943.94	720,736.71	675,107.19

		2016	2017	2018	2019	2020
Fresh apples	Brazil	154,768.58	249,520.21	242,632.64	139,015.43	92,900.91
	Argentina	120,597.09	148,910.00	222,092.84	144,581.51	163,002.01
	USA	0.05	545.82	2,874.22	–	–
	Costa Rica	0.00	0.00	–	211.68	–
	Canada	23.38	0.16	–	–	–
	Mexico	–	0.00	–	–	–
	Sum	275,389.10	398,976.19	467,599.70	283,808.62	255,902.92

Imports into the EU include imports to French DOMS (Saint Barthélemy, French Guiana, Guadeloupe, Martinique, Réunion and Mayotte).

Appendix D – EU 27 and member state cultivation/harvested/production area of *Amyelois transitella* hosts (thousands ha)

Eurostat data accessed on 27/4/2021

Apples (F1100)	**2016**	**2017**	**2018**	**2019**	**2020**
EU 27	506.48	505.55	507.24	491.35	474.8
Belgium	6.49	6.16	5.99	5.79	5.48
Bulgaria	4.11	3.97	3.98	4.14	4.7
Czechia	7.49	7.35	7.25	7.32	7.19
Denmark	1.35	1.28	1.42	1.39	1.38
Germany	31.74	33.98	33.98	33.98	33.98
Estonia	0.51	0.48	0.6	0.57	0.62
Ireland	0.7	0.7	0.71	0.71	0.71
Greece	10.04	9.6	10.35	9.82	9.82
Spain	30.87	30.55	29.93	29.64	29.49
France	49.65	50.31	50.54	50.37	50.15
Croatia	5.89	4.84	4.73	4.95	4.37
Italy	56.16	57.26	57.44	55	36.14
Cyprus	0.53	0.37	0.37	0.37	0.38
Latvia	2.4	3.3	3.2	3.44	3.5
Lithuania	9.7	9.82	10.13	10.18	10.74
Luxembourg	0.26	0.27	0.27	0.27	0.27
Hungary	32.49	32.17	31.84	30.97	25.9
Malta	0	0	0	0	0
Netherlands	7.3	7	6.6	6.42	6.2
Austria	6.67	6.67	6.74	6.59	6.43
Poland	164.76	162.53	166.15	155.62	163.25
Portugal	14.98	14.79	14.58	14.58	14.58
Romania	55.53	55.6	53.94	52.74	53.4
Slovenia	2.42	2.36	2.33	2.27	2.18
Slovakia	2.31	2.18	2.14	2.06	1.8
Finland	0.62	0.63	0.63	0.65	0.67
Sweden	1.54	1.4	1.41	1.52	1.49
Pears (F1200)	**2016**	**2017**	**2018**	**2019**	**2020**
EU 27	115.76	114.84	114.84	111.84	108.93
Belgium	9.69	10.02	10.15	10.37	10.66
Bulgaria	0.41	0.45	0.57	0.7	0.6
Czechia	0.74	0.71	0.75	0.8	0.83
Denmark	0.3	0.3	0.29	0.3	0.3
Germany	1.93	2.14	2.14	2.14	2.14
Estonia	0	0	0	0	0
Ireland	0	0	0	0	0
Greece	4.08	4.07	4.41	4.34	4.34
Spain	22.55	21.89	21.33	20.62	20.22
France	5.3	5.25	5.24	5.25	5.61
Croatia	0.93	0.71	0.8	0.86	0.72
Italy	32.29	31.73	31.34	28.71	25.75
Cyprus	0.07	0.07	0.06	0.06	0.06
Latvia	0.2	0.2	0.2	0.2	0.2
Lithuania	0.8	0.82	0.82	0.82	0.85

Luxembourg	0.02	0.02	0.02	0.02	0.02
Hungary	2.87	2.9	2.84	2.81	2.6
Malta	0	0	0	0	0
Netherlands	9.4	9.7	10	10.09	10
Austria	0.46	0.46	0.49	0.5	0.54
Poland	7.49	7.26	7.3	7.22	7.39
Portugal	12.62	12.56	12.5	12.5	12.5
Romania	3.15	3.12	3.1	3.08	3.1
Slovenia	0.2	0.2	0.21	0.21	0.23
Slovakia	0.11	0.11	0.12	0.11	0.1
Finland	0.04	0.04	0.05	0.04	0.05
Sweden	0.12	0.12	0.11	0.1	0.13
Plums (F1250)	**2016**	**2017**	**2018**	**2019**	**2020**
EU 27	152.79	153.88	153.43	154.48	:
Belgium	0.03	0.03	0.03	0.04	0.04
Bulgaria	6.71	6.82	7.36	8.02	:
Czechia	1.88	1.76	1.82	1.88	1.89
Denmark	0.06	0.06	0.07	0.08	0.09
Germany	4.35	4.83	4.82	4.83	4.84
Estonia	0	0.02	0.02	0.02	0.02
Ireland	0	0	0	0	0
Greece	2.6	2.06	2.2	2.18	2.18
Spain	15.28	15.2	14.64	14.85	14.41
France	14.81	15.06	14.97	14.83	14.83
Croatia	4.83	4.36	4.28	4.46	4
Italy	11.57	11.68	11.72	11.94	11.89
Cyprus	0.45	0.38	0.37	0.38	0.39
Latvia	0.1	0.1	0.1	0.06	0.1
Lithuania	0.73	0.73	0.72	0.74	0.75
Luxembourg	0.04	0.04	0.04	0.04	0.04
Hungary	7.98	7.94	7.92	7.96	6.9
Malta	0	0	0	0	0
Netherlands	0.25	0.26	0.26	0.28	0.27
Austria	0.18	0.19	0.2	0.2	0.21
Poland	13.39	13.31	13.48	13.63	13.68
Portugal	1.8	1.78	1.8	1.8	1.8
Romania	65.11	66.68	65.91	65.58	66.5
Slovenia	0.04	0.04	0.05	0.05	0.06
Slovakia	0.58	0.52	0.61	0.61	0.59
Finland	0	0	0	0	0
Sweden	0.04	0.04	0.04	0.04	0.04
Walnuts (F4100)	**2016**	**2017**	**2018**	**2019**	**2020**
EU 27	72.61	74.15	80.6	86.1	:
Belgium	0.05	0.05	0.08	0.1	0.12
Bulgaria	6.28	5.05	6.18	6.36	:
Czechia	0.18	0.19	0.17	0.13	0.16
Denmark	0	0	0	0	0
Germany	0	0.29	0.29	0.29	0.29
Estonia	0	0	0	0	0
Ireland	0	0	0	0	0
Greece	12.04	13.19	15.27	14.82	14.82

Spain	9.63	10.37	11	11.44	12.29
France	21.36	21.63	22.17	25.88	24.99
Croatia	5.4	5.55	6.7	7.21	8.2
Italy	4.54	4.35	4.5	4.67	4.93
Cyprus	0.21	0.19	0.18	0.21	0.21
Latvia	0	0	0	0	0
Lithuania	0	0	0	0	0
Luxembourg	0.01	0.01	0.01	0.01	0.01
Hungary	4.85	5.08	5.4	6	5.8
Malta	0	0	0	0	0
Netherlands	0	0	0	0	0
Austria	0.14	0.14	0.17	0.17	0.18
Poland	2.47	2.38	2.31	2.27	2.22
Portugal	3.32	3.54	3.85	3.85	3.85
Romania	1.67	1.6	1.59	1.62	1.63
Slovenia	0.27	0.34	0.38	0.44	0.47
Slovakia	0.19	0.21	0.36	0.63	1.17
Finland	0	0	0	0	0
Sweden	0	0	0	0	0
Almonds (F4300)	**2016**	**2017**	**2018**	**2019**	**2020**
EU 27	689.68	743.39	774.85	799.86	:
Belgium	0	0	0	0	0
Bulgaria	0.99	0.94	1.09	1.01	:
Czechia	0	0	0	0	0
Denmark	0	0	0	0	0
Germany	0	0	0	0	0
Estonia	0	0	0	0	0
Ireland	0	0	0	0	0
Greece	11.93	13.17	14.14	15.13	15.13
Spain	583.67	633.56	657.77	687.23	718.54
France	1.2	1.24	1.22	1.18	1.23
Croatia	0.43	0.46	0.42	0.62	0.81
Italy	57.42	57.6	57.99	52.04	52.65
Cyprus	2.38	2.2	2.31	2.71	2.76
Latvia	0	0	0	0	0
Lithuania	0	0	0	0	0
Luxembourg	0	0	0	0	0
Hungary	0.2	0.21	0.26	0.31	0.34
Malta	0	0	0	0	0
Netherlands	0	0	0	0	0
Austria	0	0	0	0	0
Poland	0	0	0	0	0
Portugal	31.46	34	39.64	39.64	47.42
Romania	0	0	0	0	0
Slovenia	0.01	0.01	0.01	0	0.01
Slovakia	0	0	0	0	0
Finland	0	0	0	0	0
Sweden	0	0	0	0	0
Citrus fruits (T0000)	**2016**	**2017**	**2018**	**2019**	**2020**
EU 27	519.01	502.84	508.99	512.53	487.08
Belgium	0	0	0	0	0

Bulgaria	0	0	0	0	0
Czechia	0	0	0	0	0
Denmark	0	0	0	0	0
Germany	0	0	0	0	0
Estonia	0	0	0	0	0
Ireland	0	0	0	0	0
Greece	45.86	43.47	46.26	44.23	44.48
Spain	295.33	294.26	297.62	296.48	297.97
France	4.22	4.27	4.39	4.61	4.69
Croatia	2.19	2.06	1.97	2.2	2.04
Italy	147.65	135.36	134.64	140.74	113.8
Cyprus	3.41	2.92	3.05	3.2	3.04
Latvia	0	0	0	0	0
Lithuania	0	0	0	0	0
Luxembourg	0	0	0	0	0
Hungary	0	0	0	0	0
Malta	0	0	0	0	0
Netherlands	0	0	0	0	0
Austria	0	0	0	0	0
Poland	0	0	0	0	0
Portugal	20.36	20.51	21.07	21.07	21.07
Romania	0	0	0	0	0
Slovenia	0	0	0	0	0
Slovakia	0	0	0	0	0
Finland	0	0	0	0	0
Sweden	0	0	0	0	0
Grapes (W1000)	**2016**	**2017**	**2018**	**2019**	**2020**
EU 27	3,136.04	3,134.93	3,137.17	3,160.68	:
Belgium	0.24	0.24	0.3	0.38	0.49
Bulgaria	36.55	34.11	34.11	30.05	:
Czechia	15.8	15.81	15.94	16.08	16.14
Denmark	0	0	0	0	0
Germany	:	:	:	:	:
Estonia	0	0	0	0	0
Ireland	0	0	0	0	0
Greece	98.09	101.75	100.34	101.85	101.85
Spain	935.11	937.76	939.92	936.89	931.96
France	751.69	750.46	750.62	755.47	758.86
Croatia	23.4	21.9	20.51	19.82	20.63
Italy	673.76	670.09	675.82	697.91	703.9
Cyprus	6.07	5.93	6.67	6.67	6.79
Latvia	0	0	0	0	0
Lithuania	0	0	0	0	0
Luxembourg	1.26	1.26	1.25	1.24	1.24
Hungary	68.12	67.08	66.06	64.92	62.9
Malta	0.68	0.68	0.42	0.42	0.42
Netherlands	0.14	0.16	0.17	0.16	0.17
Austria	46.49	48.05	48.65	48.72	48.06
Poland	0.62	0.67	0.73	0.74	0.76
Portugal	179.05	178.84	178.78	178.78	178.78
Romania	174.17	175.32	172.8	176.34	176.76

Slovenia	15.84	15.86	15.65	15.57	15.29
Slovakia	8.71	8.47	8.01	7.92	7.73
Finland	0	0	0	0	0
Sweden	0.05	0.04	0.05	0.05	0.06