

Summary of the Express Pest Risk Analysis for *Tuta absoluta*

PRA area: Ireland

Describe the endangered area: Indoor tomato production

Main conclusions

Tuta absoluta (syn. *Phthorimaea absoluta*), commonly known as the tomato leaf miner, can pose a significant threat to tomatoes, especially in the absence of effective control measures. For the purpose of this PRA, particular emphasis is placed on assessing the impacts following invasions in countries with similar cultivation practices. The tomato leaf miner gained prominence in Europe following its introduction in 2006, spreading rapidly across the continent, including within glasshouse cultivation systems where effective control strategies were subsequently implemented, such as in the UK. However, *T. absoluta* has a history of quickly adapting to current control measures, necessitating the development of new strategies to combat the pest. Therefore, monitoring how populations are adapting and changing in the pest's current distribution should be closely monitored.

Tuta absoluta has never been officially detected or confirmed in Ireland. However, uncertainty remains regarding the presence of the pest or if any transient populations occurred in the past, based on unconfirmed reports. If large, established outdoor populations existed, they would likely have been detected through moth recording schemes in Ireland. Additionally, if established populations occurred in glasshouses, they could have been identified by official surveillance programs conducted in tomato cultivation for regulated pests.

In this assessment, the risk of pest entry is judged as moderate with moderate uncertainty, primarily because the pest continues to move through the fruit pathway, which was deemed the most likely route of entry. Other pathways assessed, including plants for planting, packing material, and natural spread, were also considered viable pathways of entry with varying degrees of likelihood.

The likelihood of establishing glasshouse populations of *T. absoluta* in Ireland is regarded as very likely with low uncertainty, given the presence of *T. absoluta* in glasshouses across Northwestern Europe. This coupled with the lack of evidence of large established populations in outdoor environments in Northwestern Europe, suggests that the pest is not well suited to outdoor climates similar to that of Ireland.

Impacts in the pest's current distribution include yield losses, reduced quality, increased insecticide application, and higher production costs. However, control measures in cultivation systems similar to those in Ireland, such as in the UK, appear to be currently effective, therefore a score of low - moderate is given for economic impact on the sector in the PRA area.

Targeted surveys are recommended to establish official pest status. In terms of EU protected zone criteria, *T. absoluta* meets all requirements, provided that pest freedom is confirmed through surveys. Exclusion of the pest from trade is recommended and technically justified.

Phytosanitary risk for the endangered area (*Individual ratings for likelihood of entry and establishment, and for magnitude of spread and impact are provided in the document*)

High	<input type="checkbox"/>	Moderate	<input checked="" type="checkbox"/>	Low	<input checked="" type="checkbox"/>
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Level of uncertainty of assessment (*see section 17 for the justification of the rating. Individual ratings of uncertainty of*

High	<input type="checkbox"/>	Moderate	<input checked="" type="checkbox"/>	Low	<input type="checkbox"/>
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<i>entry, establishment, spread and impact are provided in the document)</i>			
<p>Other recommendations:</p> <ul style="list-style-type: none"> • Submit IE PRA to EPPO • Produce Pest factsheet for DAFM website 			

Express Pest Risk Analysis:

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Tuta absoluta

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Stage 1. Initiation

Reason for performing the PRA:

Tuta absoluta (syn. *Phthorimaea absoluta*), commonly known as the tomato leaf miner, can pose a significant threat to tomatoes, particularly in the absence of effective control measures. Originating in South America, it was reported for the first time outside of South America, in Spain in 2006. Since then, it has rapidly spread as an invasive crop pest particularly across tomato-growing regions in Europe, Africa, the Middle East, and parts of Asia.

Recent literature indicates ongoing spread to new countries particularly in Asia and Africa. Additionally, recent interception reports highlight instances of the pest in tomato fruit trade entering the EU, which adds to historical findings of *T. absoluta* associated with tomato fruit trade.

Of relevance to Ireland is the ongoing establishment and changes in management of the pest in in Northwestern Europe glasshouses, such as in the UK.

A rapid risk assessment was initiated to evaluate the potential impacts posed to Ireland and to recommend appropriate phytosanitary measures.

PRA area: *Ireland*

Stage 2. Pest risk assessment

1. Taxonomy & Nomenclature

The species was originally described and named as *Phthorimaea absoluta* by Meyrick in 1917 based on samples collected in Peru. It underwent reclassification into different genera until it was redescribed as *Tuta absoluta* in 1994 (Biondi *et al.*, 2018). The classification of *Tuta absoluta* has historically been

contested (Chang and Metz, 2021). Based on recent morphological analysis of this species by Chang and Metz (2021), the authors propose to reinstate the name of the species as *Phthorimaea absoluta*.

2. Pest overview

2.1 Origin

Tua absoluta is native to South America and likely to have originated in Peru (Giorgini *et al.*, 2019).

2.2 Current Distribution

Since *T. absoluta* was reported in eastern Spain in 2006, it subsequently invaded a considerable number of other regions in Europe, Africa Middle East and Asia (See Figure 1).

Despite being considered a tropical species and unlikely to invade temperate climate regions, *T. absoluta* has become a key pest of tomato crops in Europe highlighting a high capacity for spreading and adapting to new areas (Desneux *et al.*, 2010; Giorgini *et al.*, 2019).

Of significance to Ireland would the presence of the pest in similar climates in Northwestern Europe countries. This appears to be restricted to glasshouse environments, with *T. absoluta* able to overwinter in or near glasshouses.

In the United Kingdom, *T. absoluta* was detected for the first time in a packing station in Essex in 2009 (EPPO, 2009). Further outbreaks were discovered including in growing tomato crops, prompting eradication measures. In October 2015, the NPPO of the United Kingdom officially declared that *T. absoluta* has been eradicated from its territory (EPPO, 2016). However, the pest resurged significantly in 2016 (Anon, 2017) spreading to such a degree that only a few growers were known not to be affected (Rob Jacobson pers comm. April 2021). EPPO list *T. absoluta* distribution in the UK as present, restricted distribution (EPPO, 2024). However, precise details on the current distribution remain unclear since the pest is no longer under statutory controls, official monitoring, or eradication efforts in the UK. Currently some growers have eliminated (no presence of *T. absoluta* found in 3 years) and some close to eliminating the pest (Rob Jacobson pers comm. April 2021).

However, with resistance to insecticides and the emergence of UK populations capable of parthenogenetic reproduction, which could potentially impact key new IPM mating disruption techniques, it has been recommended to conduct year-round monitoring of UK populations to detect any further changes (Jacobson, 2024a).

A first finding of *T. absoluta* (and subsequent findings in additional glasshouses) in Norway in 2017 is one of the most recent European example of a new country finding (VKM, 2017). In 2020, the Czech Republic officially closed an outbreak that began in 2013, concluding that the pest is now widespread and cannot be eradicated. In Ukraine, the spread dynamics of *T. absoluta* remained relatively unchanged from 2015 to 2020 (ranging from 829.92 to 1191.00 hectares). However, the area significantly increased to 4532.23 hectares in 2021 and further to 5965.83 hectares in 2022 (Burdulanyuk *et al.*, 2023).

The distribution of the pest in countries in which Ireland currently trades with and on host commodities (in particular tomato fruit) is important to note and should be subject to trade analysis to determine likelihood of entry. This is summarised in Table 1 & 2 in the appendix and discussed further in section 8. Pathways for entry.

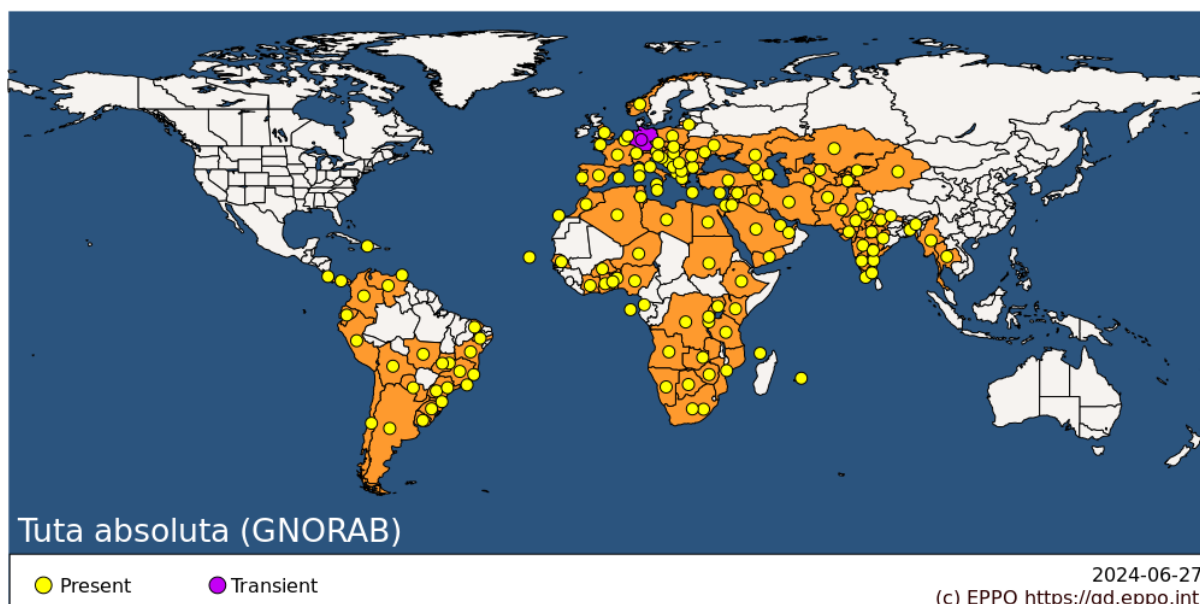


Figure 1 Distribution of *T. absoluta* as reported on the EPPO database (accessed on the 27/06/2024)

2.3 Hosts

Solanaceous species are the main host plants of *T. absoluta*, with tomato, potato, and black nightshade (*Solanum nigrum*) being the most suitable (Biondi *et al.*, 2018; Desneux *et al.*, 2010). Although, *T. absoluta* has expanded its host range in newly invaded regions to now include several plant species belonging to Amaranthaceae, Convolvulaceae, Fabaceae and Malvaceae families. For example, French bean (*Phaseolus vulgaris*) in Italy and wild hosts *Chenopodium album* and *Convolvulus arvensis* in Turkey (Idriss *et al.*, 2020).

Idriss *et al.* (2020) investigated the preference of *T. absoluta* for different host plants. In choice and no-choice tests, tomato was the most preferred host of *T. absoluta* having the highest number of eggs deposited, followed by black nightshade, French bean and chilli pepper (*Capsicum frutescens*). Larvae developed quickest on tomato followed by black nightshade and French bean. These findings confirm the oligophagous nature of the pest with strong preference for Solanaceous crops, especially tomato.

2.4 Lifecycle & Aetiology

Studies indicate that the optimal temperature for *T. absoluta* development is around 30°C, with upper and lower developmental thresholds estimated at 34.6°C and 14°C, respectively. The duration of its life cycle varies significantly depending on thermal conditions, ranging from 26 to 75 days (Biondi *et al.*, 2018). The thermal requirements of *Tuta absoluta* (14–35°C) are well-suited to optimal tomato cultivation conditions, facilitating 10-12 generations per year under glasshouse conditions. (Desneux *et al.*, 2010).

In addition, it should be noted that these developmental thresholds (14–35°C) do not imply high mortality for *T. absoluta* below 14°C, as the pest demonstrates tolerance to much lower temperatures (Van Damme *et al.*, 2015). In fact, *T. absoluta* exhibits cold tolerance at 0°C across all developmental stages (CABI, 2021). In cold hardiness experiments, Van Damme *et al.* (2015) provides evidence that *T. absoluta* is able to survive the winter conditions in cleared glasshouses in Western Europe. In their experiments, with lower lethal times (LT) at 0°C, at least half of a population of pupae or adults of *T. absoluta* survived for two weeks.

Tuta absoluta has four stages of development: egg, larva, pupa and adult (see Fig 2). Females of *T. absoluta* lay an average of 260 eggs during their lifetime. Under suitable condition (time, temperature, humidity) the

larvae pass through four instars. The larvae mine the mesophyll of the leaf leaving the epidermis intact. At high densities, larvae can also penetrate tomato fruits to feed and develop, leaving characteristic mines and galleries (CABI, 2021; Hoge, 2020). Adults emerging from pupae are 6-7 mm in length, characterized by filiform antennae and black spots on their anterior.

Emerging evidence in France, Tunisia, and the UK has revealed instances of parthenogenesis (reproductive development without fertilisation) in populations of *T. absoluta* (Grant *et al.*, 2021). In the UK, pheromone-based mating disruption plays a crucial role in managing *T. absoluta* (Grant *et al.*, 2021). However, if the incidence of parthenogenesis continues to be observed and increases, the effectiveness of this key control strategy (mating disruption using pheromones) could be significantly compromised. This is because the pest may reproduce without mating, thereby reducing the impact of mating disruption control strategy.

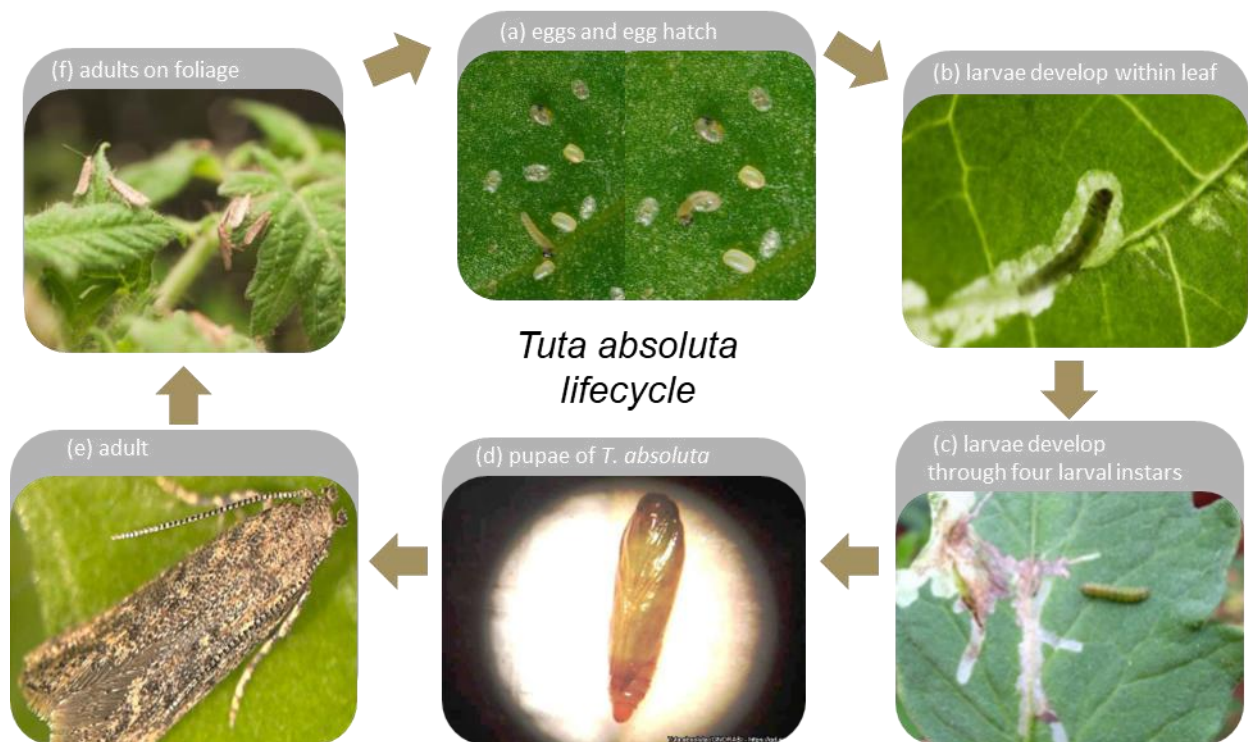


Figure 2 *Tuta absoluta* lifecycle has four main stages of development: egg, larva, pupa and adult.

Signs/Symptoms

After the eggs hatch, larvae can begin mining inside the tomato leaf within 90 minutes (Jacobson, 2022). The larvae produce papery, blotch mines which can contain an accumulation of dark-coloured frass in a selected area of the mine (Fig. 3 (a) & (b)).

In addition to leaf damage, in some cases, larvae can damage growing points of plants, although it is not understood what causes larvae to migrate to this part of the plant (Jacobson, 2022). The larvae are less commonly found affecting stems, however whenever this happens stems become severely weakened (Jacobson, 2022). Fruit damage symptoms include pin-sized entry and exit holes (Fig. 3 (c) & (d)). Entry holes are often located below the calyx and may be overlooked during crop monitoring, while exit holes are generally more obvious due to their position on the fruit and are typically larger (Jacobson, 2022).

Continent	Distribution (list countries, or provide a general indication, e.g. present in West Africa)	Provide comments on the pest status in the different countries where it occurs e.g. widespread, native, introduced....)	Reference
	<i>Lithuania; Malta; Moldova; Montenegro; Netherlands; North Macedonia; Norway; Portugal; Romania; Russia; Serbia; Slovakia; Slovenia; Spain; Switzerland; Türkiye; Ukraine; United Kingdom</i>		
<i>South America</i>	<i>Argentina; Bolivia; Brazil; Chile; Colombia; Costa Rica; Ecuador; Haiti; Panama; Paraguay; Peru; Uruguay; Venezuela</i>		<i>EPPO, 2024</i>

Tuta absoluta is present in tomato production areas across many parts of the world, with a widespread presence in Europe, South America, Africa, the Middle East, and Western Asia.

In Ireland, there are conflicting reports on the presence of the *T. absoluta*, making it uncertain if the pest is present in Ireland. These are summarised below:

- *Tuta absoluta* distribution tables on both EPPO and CABI databases do not list Ireland on the country lists.
- As a result of a record for *T. absoluta* from Waterford from 2011, the species appears on the MothIreland's Checklist of Irish Lepidoptera (Anon, 2021b). This may represent a rare appearance of migrant adult moth rather than a breeding population since there are no further records.

Further searches for *T. absoluta* on the online recording platforms Moths Ireland, GBIF, iNaturalist did not yield any additional records from Ireland. GBIF shows only a few records for the UK (four occurrences), whereas there are numerous records of adults in Belgium and the Netherlands. However, the question remains unanswered in the literature regarding whether *T. absoluta* can survive throughout Western European winters. To date, there have been no reports of *T. absoluta* overwintering in open fields in Western Europe (Van Damme et al., 2015).

- DAFM inspections of tomato growers have not found any evidence of *T. absoluta*. DAFM's SOP 025 Phytosanitary Inspection of Tomato and Peppers does list *T. absoluta* as a pest to survey for. Therefore, if established populations occurred in glasshouses, they could have been identified by official surveillance programs conducted in tomato cultivation.
- There are anecdotal reports from growers that *T. absoluta* may be present or has been present in the past in the Dublin area and is managed through biological control measures.
- ISONET® T, the specific pheromone attractant for mating disruption and reduction of damage caused by *Tuta absoluta*, is registered as a plant protection product in Ireland. It is approved for use on protected crops of Aubergines, Peppers and Tomatoes (DAFM, 2024). It is unclear if approval was sought as a contingency or if it is actually in use in Ireland.

- In USA, *T. absoluta* is a regulated pest and imports of hosts of *T. absoluta* are subject to certain requirements, specifically imports of tomato fruit and propagative material of *Datura* spp. and *Salpichroa* spp. In a Federal Order last updated August 2019, Ireland is included in a list of 109 countries considered to be infested with *T. absoluta*, and therefore prohibited from exporting the host commodities mentioned (Anon, 2019b).
- In a review paper on *T. absoluta* by Biondi *et al.* (2018), Ireland was marked as invaded between 2008 and 2009 on their invasion timetable.

Taking into account all current information available, in particular due the lack of official detection, reporting and confirmation of established populations of the pest in Ireland, *T. absoluta* is not considered to be present in Ireland, however there is high uncertainty surrounding this.

7. Host plants /habitats* and their distribution in the PRA area

Commercial tomato production in Ireland utilises a modern high-wire system, in a controlled environment, and with soil-less growing media (coir, peat, or rockwool) (Anon, 2024). The tomato sector, though small in terms of the number of growers, is highly valuable; it is the most important protected vegetable in Ireland by value. The estimated the farmgate value of the industry at €9 million in 2021, up from €6.9 million in 2013. As a result, even small yield or quality issues can lead to costly losses. The production area is almost entirely under glass and is estimated to be around 12ha, primarily situated in Dublin and the South East (Bord Bia, 2013; Callaghan, 2021).

8. Pathways for entry

Several pathways for entry exist, the most likely are imported tomato fruits, plants for planting, packing material and migration.

(a) Tomato fruit

Ireland imports fresh tomatoes in substantial volumes, in CSO vegetables trade figures it was fourth highest vegetable imported with 29,000 tonnes in 2017 (CSO, 2018).

Further detail on Eurostat (Appendix, Table 1) suggests Ireland imports the vast majority of the commodity 'Tomatoes, fresh or chilled' through European countries. With the Netherlands, Spain, Germany and the UK the main countries Ireland trades with.

On the EU TRACES platform more granular trade data (country of origin, precise volumes, final place of destination etc) is available on trade from countries that require a phytosanitary cert. These countries that Ireland trade with are summarised in Table 2 in the appendix.

Trade in this commodity, tomato fruit has been the source of a large number of interceptions of *T. absoluta*. According to Europhyt/TRACES-NT covering all interceptions since 1995 there were 113 interceptions of *T. absoluta* on the fruit/vegetable pathway. The vast majority of these were found in the period 2009-2011 with interceptions on exports mostly from Spain, Greece, Morocco & Turkey. In recent years (2019 – 2023) interceptions have only be recorded from Tunisia (12 times), Morocco (3) and Azerbaijan (1). It is possible other interceptions have gone unreported as *T. absoluta* is not an EU regulated pest.

No records of interceptions on trade into Ireland were found. However, as Ireland trades with countries that have been the source of *T. absoluta* interceptions elsewhere, a risk of introduction exists. In addition,

countries we trade with include regions where *T. absoluta* is widely distributed and where *T. absoluta* is not regulated.

(b) Packing material

Packing material used in transport is a potential pathway for entry. Previous pest risk assessments including (Potting, 2013) have reported on such a pathway. Outbreaks in both Netherlands and the UK have been linked to this movement of infested crates / containers. All life stages of *T. absoluta* can survive transport in crevices of packaging material/crates. For example, small *T. absoluta* pupae produce a sticky cocoon that can easily attach to all kind of surfaces. Especially for soil-less cultivation systems, larvae may revert to all kind of substrates for pupation, such as crates and corrugated cardboard (Potting, 2013).

(c) Planting for planting

It is believed growers (possibly all) import tomato propagation material into Ireland from countries where *T. absoluta* is present. For example, one Irish grower imports plants approx. 25cm size, 48 days old from the Netherlands (Anon, 2021c). While *T. absoluta* is not specifically regulated in the EU, tomato plants for planting still require a plant passport ensuring their compliance with the plant health requirements.

Both risk assessments by VKM (2017) and Potting (2013) considered the probability of entry by *T. absoluta* on this pathway as unlikely. This was mainly due to no significant trade into those particular PRA areas (Norway, Netherland & UK) from infested areas. A lack of data exists on the details of these imports of tomatoes for plants for planting into Ireland. In theory there is a high probability of entry of *T. absoluta* into Ireland if commercial growers are importing plants for planting from infested regions.

(d) Natural spread

As mentioned in section 6. Distribution, a record of *T. absoluta* exists for Waterford, Ireland. *Tuta absoluta* moths are easily transported long distances by wind, cited in VKM (2017), The Canadian Food Inspection Agency reports on adult flights of *T. absoluta* up to 100 kilometres. Actual flight distance is probably considerably shorter than 100 kilometres. In Spain, moths were found in distances up to 10 km from tomato production sites in the open field (Kehlenbeck *et al.*, 2013).

As the species is present in Europe, migration could provide a natural pathway for entry of the pest into Ireland.

Overall, all the pathways assessed above are viable entry points for the pest to arrive in Ireland, with varying degrees of likelihood. Based on interception data, the trade in tomato fruit has the highest number of recorded interceptions, demonstrating this as probably the most likley pathway of entry. However, no interceptions have been recorded for Ireland. The liklehood of entry is judged to be moderate, and this rating will be reassessed should evidence of *T. absoluta* presence in Ireland emerge or should interceptions in Ireland begin to be detected.

<i>Rating of the likelihood of entry</i>	Low <input type="checkbox"/>	Moderate X	High <input type="checkbox"/>
<i>Rating of uncertainty</i>	Low <input type="checkbox"/>	Moderate X	High <input type="checkbox"/>

9. Likelihood of establishment outdoors in the PRA area

Based on the evidence to date the probability of establishment of significant outdoor populations of *T. absoluta* is regarded as unlikely in Ireland. As mentioned in 2.4 Lifecycle & Aetiology, *T. absoluta* exhibits cold tolerance and adaptability to survive overwintering in Northwestern European glasshouses. However, questions remain regarding the extent of its ability to survive outdoors in Ireland. There are no reports or evidence thus far of *T. absoluta* overwintering in open fields in Western Europe (Van Damme *et al.*, 2015). Additionally, Ireland's cool climate is likely to prevent the buildup of large populations outdoors, given that

the thermal requirements for pest development are 14–35°C, with an optimal temperature for *T. absoluta* development around 30°C (Biondi et al., 2018). Thus, the likelihood of establishing *T. absoluta* significant populations outdoors in Ireland is low, with moderate uncertainty.

Rating of the likelihood of establishment outdoors	Low X	Moderate <input type="checkbox"/>	High <input type="checkbox"/>
Rating of uncertainty	Low <input type="checkbox"/>	Moderate X	High <input type="checkbox"/>

10. Likelihood of establishment in protected conditions in the PRA area

The probability of establishment of glasshouse populations of *T. absoluta* is regarded as very likely with low uncertainty. A key factor in assessing the risk of *T. absoluta* establishment is therefore the proximity of the entry pathways (tomato fruit, packing material, plants for planting, natural spread) to commercial tomato growing premises in Ireland.

In regards to entry and subsequent establishment, plants for planting pathway results in plants arriving into commercial glasshouses, therefore this is the riskiest pathway.

In regards to tomato fruit and packing material pathways, if large distribution centers, packing facilities, or transport routes are located near tomato growing glasshouses, this increases the likelihood of risk of establishment from these pathways. It is believed Irish growers don't import fruit to pack (e.g. in the off season) in addition to their own (Michael Gaffney pers comm. October 2024). In addition, it is not clear if there how much movement between various links in the trade within Ireland. According to AHDB, one of the main issues in the UK was the spread of *T. absoluta* from one site to another by the transfer of adult moths in produce trays and other materials (Anon, 2021a). However, it's likely that Irish growers are careful about crate movement due to the experiences with *T. absoluta* in the UK. Tomatoes, whether loose or typically flow-wrapped, are transported in cardboard boxes or plastic crates. The cardboard boxes are not sent back to the nursery, while the plastic crates undergo a thorough cleaning and sanitisation process before being returned (Michael Gaffney pers comm. October 2024).

The risk associated with the natural spread/migration pathway is low, unless again moths were able to enter or establish near commercial glasshouses. The single verified record in Ireland, documented by Moths Ireland and located in Waterford, is in proximity to a major tomato grower in the country. However, currently human assisted means (e.g. trade) present the riskiest pathways of introduction.

The risk of ongoing *T. absoluta* establishment in glasshouse production in Ireland is high, as evidence provided by the study by Van Damme et al. (2015) found that *T. absoluta* can overwinter between two successive tomato crops in commercial greenhouses in Western Europe. This is further supported by the evidence of outbreaks and continued establishment of the pest in the UK.

The short cultivation in commercial glasshouses enables *T. absoluta* to bridge cropping seasons. In the UK, *T. absoluta* pupae has been shown to survive between growing seasons in unheated glasshouses (Jacobson, 2024b). Although good hygiene at end of season clean up is an important control measure, the pupae of *T. absoluta* are very small and can easily hide in small crevices. Even with a meticulous removal of infested plant parts, debris, and substrate plastics, it is unlikely that all pupae can be removed (Van Damme et al., 2015).

Furthermore as *T. absoluta* is a multivoltine insect with a high fecundity, even a survival of 10 % of the hibernating population can give rise to a damaging population that needs to be controlled in the next growing season. This is expected to be a similar scenario in Ireland.

Tuta absoluta development and population growth is suited to those conditions of Irish tomato glasshouse crops. The risk of establishment under glasshouses is rated as high with low uncertainty.

<i>Rating of the likelihood of establishment in protected conditions</i>	Low <input type="checkbox"/>	Moderate <input type="checkbox"/>	High X
<i>Rating of uncertainty</i>	Low X	Moderate <input type="checkbox"/>	High <input type="checkbox"/>

11. Spread in the PRA area

It is considered unlikely *T. absoluta* will establish outdoors in Ireland in such high numbers to become a significant source of pest populations spreading and colonising indoor tomato crops. However, transient populations near glasshouses could potentially spread into them in some years, though this is uncertain. Spread solely within glasshouse crops is rated as high as *T. absoluta* can develop 10-12 generations/year under glasshouse conditions (Desneux *et al.*, 2010). The pest can spread from leaves, to upper plant growing points and to the fruit. If left uncontrolled by current management practices or if left unmonitored, spread of *T. absoluta* in Irish crops it is assumed would occur quickly. Although some control methods already exist for other pests, such as the use of the predatory mirid *Macrolophus pygmaeus*, and suitable control options like the mating disruptor ISONET® T are approved for use in Ireland, these measures could help slow the pest's spread.

Therefore, the spread is considered to be moderate with a moderate level of uncertainty due to doubts about the effectiveness of current management practices in slowing or curbing the initial spread of *T. absoluta* in Irish tomato production.

<i>Rating of the magnitude of spread</i>	Low <input type="checkbox"/>	Moderate X	High <input type="checkbox"/>
<i>Rating of uncertainty</i>	Low <input type="checkbox"/>	Moderate X	High <input type="checkbox"/>

12. Impact in the current area of distribution

12.1 Economic Impact

Tuta absoluta attacks all the aboveground plant parts (leaves, stems, petioles, and fruits) of the developing tomato plant. Infestation by this pest during the early plant stages can cause up to 100% losses when no management methods are efficiently implemented. On the leaves, mines reduce the plants' photosynthetic ability and consequently reduce tomato yield. Fruit can be attacked once they are formed, reducing their quality, marketability and also making them more susceptible to secondary pathogen infections (Biondi *et al.*, 2018 Idriss *et al.*, 2020).

An increased risk of crop damage is associated with open tomato production and unscreened greenhouses compared to glasshouse/screen greenhouses. This is due to the success of Integrated Pest Management (IPM) strategies that incorporate control options such as mirid predators, egg parasitoids, mating disruption that are not very applicable in open systems. In unscreened systems and with large populations of *T. absoluta*, the pest is able to colonise the crop continuously from the outside (Giorgini *et al.*, 2019).

Control in cultivation systems similar to those in Ireland, such as in the UK, appears to be effective, leading to a rating of low - moderate economic impact. However, there is moderate uncertainty since the exact increase in management costs required to deal with *T. absoluta* compared to *T. absoluta* free production sites is not precisely known.

<i>Rating of the magnitude of impact</i>	Low X	Moderate X	High <input type="checkbox"/>
<i>Rating of uncertainty</i>	Low <input type="checkbox"/>	Moderate X	High <input type="checkbox"/>

12.2 Ecological Impact

No biodiversity impacts are expected since pest impacts in Ireland will largely occur within glasshouses. As a result, a low rating is given with low uncertainty.

<i>Rating of the magnitude of impact in the current area of distribution</i>	<i>Low X</i>	<i>Moderate</i> <input type="checkbox"/>	<i>High</i> <input type="checkbox"/>
<i>Rating of uncertainty</i>	<i>Low X</i>	<i>Moderate</i> <input type="checkbox"/>	<i>High</i> <input type="checkbox"/>

12.3 Sociological Impact

There is not expected to be any social impacts associated with establishment of *T. absoluta* in Ireland. If production costs increase as a result of widespread establishment of *T. absoluta*, society in general could in the end be affected by fewer available Irish grown tomatoes or available at a higher cost. A low rating is given with low uncertainty.

<i>Rating of the magnitude of impact in the current area of distribution</i>	<i>Low X</i>	<i>Moderate</i> <input type="checkbox"/>	<i>High</i> <input type="checkbox"/>
<i>Rating of uncertainty</i>	<i>Low X</i>	<i>Moderate</i> <input type="checkbox"/>	<i>High</i> <input type="checkbox"/>

13. Potential impact in the PRA area

An outbreak of *T. absoluta* has the capacity in Ireland to cause economic damage from yield losses and reduction in crop quality. This could be most apparent in the initial phase when the outbreak of this moth is discovered, as insecticides or changes to a current integrated pest management (IPM) programme are needed to deal with the outbreak. The timing of the initial finding would be important as a number of control measures effective against *T. absoluta* need to be implemented early on. In the first year, the grower could experience some economic losses. Thereafter, higher production costs could arise due to ongoing pest management (UK growers employ specific *T. absoluta* pheromone mating disruptors) and ongoing pest monitoring.

Currently in similar tomato cultivation systems in the UK, *T. absoluta* is controlled effectively by a tailored IPM strategy for *T. absoluta*. However, a key part of this strategy is the management of generalist biocontrol predators *Macrolophus pygmaeus* (Heteroptera: Miridae). This species is also known to be used by at least some Irish tomato growers for control of whiteflies, therefore a part of the IPM strategy needed for *T. absoluta* may be in place to degree already. Some Irish growers no longer use insecticides, but they are likely to be needed initially or as part of a new IPM program to deal with *T. absoluta* (Rob Jacobson pers comm. April 2021). A score of low - moderate is given for economic impact on the sector, however there is medium uncertainty.

This potential impact score may need to be adjusted upwards if *T. absoluta* adapts to current control measures in its current distribution, as emerging control failures in the UK suggest could happen, however, it is too early to draw definitive conclusions. Such control failures may also be related to changes in cultivation practices, such as the shift to year-round production under lights in the UK (Rob Jacobson, pers. comm., April 2021), which also needs to be monitored in Ireland.

<i>Rating of the magnitude of impact in the current area of distribution</i>	<i>Low X</i>	<i>Moderate X</i>	<i>High</i> <input type="checkbox"/>
<i>Rating of uncertainty</i>	<i>Low</i> <input type="checkbox"/>	<i>Moderate X</i>	<i>High</i> <input type="checkbox"/>

14. Identification of the endangered area

Irish tomato fruit industry.

15. Overall assessment of risk

Tuta absoluta is a serious pest of tomatoes if left uncontrolled. The pest rose to prominence particularly in the period 2009-2011 as it spread rapidly throughout Europe before effective control strategies were then implemented. Nevertheless, *T. absoluta* still poses risks to Ireland's tomato production, particular since impacts have been seen in countries with similar tomato glasshouse cultivation practices to Ireland. *Tuta absoluta* is highly likely to establish in Ireland and may already be present, given the current uncertainty about its status. Proving pest freedom through official surveys is recommended as a precursor to implementing any legislative measures. Continued exclusion of the pest on trade is scientifically and technically justified. In terms of EU protected zone criteria, *T. absoluta* meets all requirements, provided that pest freedom is confirmed through surveys.

Stage 3. Pest risk management

16. Phytosanitary measures

- A survey should be considered of all commercial tomato growers (circa 12) to comprehensively establish pest status in Ireland. Pheromone traps for *T. absoluta* should be considered to supplement visual inspection and are also of benefit to growers as early detection of first adults is vital for effective control of *T. absoluta*. Given the distance between and isolation of production glasshouses in Ireland, along with the strict protocols these nurseries enforce regarding the movement of crates and other potential carriers of *T. absoluta*, continued exclusion of the pest from trade would remain justified, even if isolated detections occur.

Increased surveillance of *T. absoluta* would fit with survey requirements for similar EU quarantine tomato pests, such as the leaf mining moth *Keiferia lycopersicella* which from is same family (Gelechiidae) as *T. absoluta*. Or the Liriomyza spp. leaf miners that also affect tomatoes such as *L. bryoniae*, *L. huidobrensis*, *L. sativae*.

- Exclusion of the pest from trade is recommended and technically justified.

17. Uncertainty

- Pest status in Ireland: As a result of conflicting evidence there is uncertainty if the pest is currently present in Ireland.
- Fruit packhouses: It is not believed Irish growers pack outside fruit produce in addition to their own, however this is uncertain. It is also uncertain how much movement of trays exist between growers that would enable the spread of the pest. This was a major pathway of entry of *T. absoluta* in the UK and elsewhere in Europe therefore data on this aspect is important to assess fully risk of the fruit pathway. However, since most Irish tomato growers work with external advisors from countries managing *Tuta absoluta*, expertise and effective strategies to reduce its spread may already be in place.

18. Remarks

- A summary factsheet will be prepared on the pest and added to the Irish plant pest factsheet webpage

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Appendix

A. Photo credits:

Fig 2 Lifecycle (a),(b),(f) © Cuthbertson *et al.*, (2013); Fig 2 Lifecycle (c) © Metin Gülesci, Leaf Tobacco, Bugwood.org; Fig 3 (a),(c) © Rob Jacobson, AHDB Tomato crop damage caused by *Tuta absoluta*. Fig 1; Fig 2 Lifecycle (d),(e); Fig 3 (b),(d) images are from EPPO <https://gd.eppo.int/taxon/GNORAB/photos>

B. Trade:

Table 1: Data was extracted from Eurostat summarising imports (volumes & export countries) into Ireland in 2019 and 2020.

Table 1: Import volumes into Ireland of Tomatoes, fresh or chilled: (Eurostat Data 2019-2020)		
Export Country	Jan - Dec 2020 (Tonnes)	Jan - Dec 2019 (Tonnes)
All	24734	26343
Netherlands	13740	14960
Spain	5082	4203
Germany	2344	2252
United Kingdom	1986	4126
Italy	581	74
Portugal	356	246
France	316	169
Poland	179	246
Belgium	77	33
Morocco	55	<1

Table 2: Data was extracted from TRACES NT summarising imports (country of origin) into Ireland for 2021 to 2023

Table 2: List of Countries of Origin for Tomato Fruit Imports into Ireland Requiring Phytosanitary Certificates (TRACES Data 2021 - 2023)		
Country of origin	Commodities Latin Name	Commodity
Belgium	Solanum lycopersicum	Other living plants: fruit and vegetables
France	Solanum lycopersicum	Other living plants: fruit and vegetables
Germany	Solanum lycopersicum	Other living plants: fruit and vegetables
India	Solanum lycopersicum	Other living plants: fruit and vegetables
Italy	Solanum lycopersicum	Other living plants: fruit and vegetables
Morocco	Solanum lycopersicum	Other living plants: fruit and vegetables
Netherlands	Solanum lycopersicum	Other living plants: fruit and vegetables

Poland	Solanum lycopersicum	Other living plants: fruit and vegetables
Portugal	Solanum lycopersicum	Other living plants: fruit and vegetables
South Africa	Solanum lycopersicum	Other living plants: fruit and vegetables
Spain	Solanum lycopersicum	Other living plants: fruit and vegetables
United Kingdom	Solanum lycopersicum	Other living plants: fruit and vegetables
