Understanding potentially unmanaged biosecurity risks to the arable industry

Mid-year update

Figure 1: Black grass seed head examples: Photo credit Trevor James

Contents

1. Executive summary

This report looked at Seed & Grain Readiness & Response (SGRR) unwanted organisms. These organisms represent arable pests of higher concern, including those pests listed as priority pests, quarantine pests requiring additional declarations, regulated (quarantine) weed seeds and those considered notifiable organisms by MPI.

The report focused on SGRR's unwanted organisms that had:

(i) a changing distribution (caused by trade or movement of plants or people or conveyances);
(ii) an expanding host range;
(iii) an impact in a new environment compared with their countries of origin; and
(iv) an increase in international regulatory or commercial attention.

Changing distribution (caused by trade or movement of plants or people or conveyances)

- **Corn leafhopper (*Dalbulus maidis*)** is spreading throughout key corn growing regions of the US. In 2024, corn leafhopper was detected for the first time in Oklahoma and non-contiguous New York counties (Erie, Jefferson, Monroe, and Yates). In Oklahoma both adult and nymph forms were shown to carry corn stunt spiroplasma (*Spiroplasma kunkelii*).
- **Pointed snail (or small pointed snail, *Cochlicella acuta*)** has now been recorded in Upper Egypt. Pointed snail was historically spread from the Mediterranean.
- **Brown Marmorated Stink Bug (BMSB)** was detected twice in Tasmania, once in February and again in March 2025, both detections were near Bell Bay.
- **Stewart's wilt of corn** (*P. stewartii* subsp. *stewartii*) has been confirmed as spreading and causing "bronzing disease" in jackfruit crops (*Artocarpus heterophyllus*). Jackfruit seeds are eligible for import under basic import conditions, while the nursery import conditions have been suspended. It is unknown if jackfruit seeds are being imported but based on it needing tropical growing conditions it is believed it is unlikely to be imported. The author could find no evidence of natural seed transmission in jackfruit seeds but notes jackfruit bronzing disease appears to be expanding distribution.
- **European crane fly** (*Tipula paludosa*) is one of the few Tipulidae species with confirmed anthropogenic spread between Europe and North America.

Expanding host ranges (new host records)

- **Mal de Rio Cuarto Virus** was reported naturally infecting rice (*Oryza sativa*) in Argentina in 2023.
- **Spotted stem borer (*Chilo partellus*)** was recorded infesting sweet cane (*Erianthus arundinaceus*) in India for the first time in 2023.
- ***Pantoea stewartii* subsp. *indologenes*** was confirmed as the causal agent for maize leaf blight. Prior to this *Pantoea stewartii* subsp. *indologenes* was considered non-pathogenic to maize unlike Stewart's wilt in corn (*Pantoea stewartii* subsp. *stewartii*).
- **Corn leafhopper (*Dalbulus maidis*)** is currently known to only reproduce in corn (maize); however, recent studies have shown the insect can survive in gamma grasses (*Tripsacum* spp.), alfalfa (*Medicago sativa*), winter wheat (*Triticum aestivum*), triticale (*Triticale hexaploide*), and possibly moist soil without plant material when corn or teosintes (*Zea* spp.) are no longer available.
- **Stewart's wilt of corn** (*P. stewartii* subsp. *stewartii*) - experimental host range testing found other plant species could be infected Stewart's wilt of corn under manual wound inoculation — including durian, longan, mango, tomato, broccoli, pumpkin, cucumber, corn, rice, sweet potato, water spinach, peanuts, green beans. No further action based on these records being experimental infection.

An increase in international regulatory or commercial attention.

- **Goss's wilt of maize (*Clavibacter nebraskensis*)** was detected in four provinces in South Africa in 2025. This detection resulted in Zimbabwe upgrading its phytosanitary infrastructure including constructing new border posts and new inspection procedures.

Horizon scanning

Emerging pests and diseases of importance to the arable sectors were classified based on increased international concern, spread overseas, or new information becoming available which elevated a pest threat. No new pests were identified which needed consideration for adding onto the SGRR unwanted pest list.

The author believes the following emerging pests should be followed up with MPI risk assessors:

- **Maize downy mildew (*Peronosclerospora neglecta*)**: A newly described Southeast Asian maize pathogen possibly spread via seed, not yet listed on New Zealand's pest register.
- **European corn borer (*Ostrinia nubilalis*)**: A major pest of corn whose range and generations are increasing due to climate change. Flag with MPI the regulatory discrepancy between *Ostrinia nubilalis* and *Ostrinia nubialis* in MPI's ONZPR.

Summary of actions and next steps

Several actions were recommended as part of this report. These include:

- Inform MPI of nomenclature change for *Clavibacter michiganensis* subsp. *nebraskensis* to *Clavibacter nebraskensis*.
- Consider confirming the *Pantoea stewartii* subspecies nomenclature with MPI noting the survey results of *P. stewartii* subsp. *indologenes* also infecting maize.
- Confirm whether jackfruit seeds (*Artocarpus heterophyllus*) seeds are being imported and whether MPI considers *Pantoea stewartii* subsp. *stewartii* represents a risk on this pathway.
- Consider adding the new weed (Palmer amaranth (*Amaranthus palmeri*)) onto the SGRR unwanted pest list.
- Inform MPI of the newly assigned *Peronosclerospora neglecta* to ensure it is included on MPI's Official New Zealand Pest Register

Upon completion of this report the author will request updated seed interception records from MPI for the 2023 to 2025 period. A further assessment of potential arable pests of higher concern on the seed pathway will then occur to continue to aid SGRR in meeting our minimum GIA commitments.

2. Introduction

A horizon scan of risks to the arable sector was undertaken. A range of sources were monitored to obtain information on SGRR's unwanted organisms, including: ISF notifications, IPPC's Pest Outbreak Alert and Response System (POARS), MPI's emerging risk reports (30th ERS), WTO notifications, EPPO and NAPPO pest alerts, international databases, scientific literature, industry publications, and relevant seed and grain conference information.

The report focused on SGRR's unwanted organisms[1] (Appendix 1) with:

(v) a changing distribution (caused by trade or movement of plants or people or conveyances);
(vi) an expanding host range;

[1] Unwanted organism as defined by MPI in the Biosecurity Act (1993). An unwanted organism is any organism that a chief technical officer believes is capable or potentially capable of causing unwanted harm to any natural and physical resources or human health.

(vii) an impact in a new environment compared with their countries of origin; and
(viii) an increase in international regulatory or commercial attention.

Where relevant surveillance techniques or possible control techniques were identified these were summarised throughout the report. Key findings for the unwanted organism (as detailed in Appendix 1) are summarised in Section 3, if there were no significant findings the unwanted organism is not discussed further.

3. Findings for SGRR's unwanted organisms

Pests are reported alphabetically by scientific name under a main crop host heading. Some pests are polyphagous in nature, where a pest species covers multiple crop types this is detailed in the pest description. The unwanted organism scanning period covers 1/6/2024 until 1/7/2025. If there were no significant findings for an unwanted organism during this period it is not discussed further.

Corn (maize and sweetcorn)

3.1. Spotted stem borer (*Chilo partellus*)

Spotted stem borer (*Chilo partellus*) is a polyphagous moth, primarily recognised as a significant pest of cereal crops. It is widely distributed across Africa and parts of Asia, particularly in tropical and subtropical regions (Mutua 2024). The larvae bore into the stems of important cereal hosts such as maize (corn), sorghum, and millet, causing extensive damage and yield losses (Mutua 2024). True seed is not considered a pathway for its movement (Mutua, 2024). The most likely pathway of entry is believed to be through movement of infested host plant material such as sugarcane and sweet sorghum stalks, and maize ears (CABI, 2022d). Estimated flight distances based on tethered-flight laboratory experiments suggest mated females were able to fly and lay eggs for at least three nights in a row without affecting egg deposits. The airspeed of spotted stem borer was shown to be around 0.9m/s (~3.2km/h) (Päts and Wiktelius, 1989). CLIMEX modelling has indicated an invasion risk posed by spotted stem borer to cropping regions in New Zealand (Yonow *et al.* 2017).

The spotted stem borer was recorded for the first time in sweet cane (*Erianthus arundinaceus*) in India (Mahesh *et al.* 2024). Sweet cane cannot be imported into New Zealand as it is not listed on MPI's Plant Biosecurity Index (PBI).

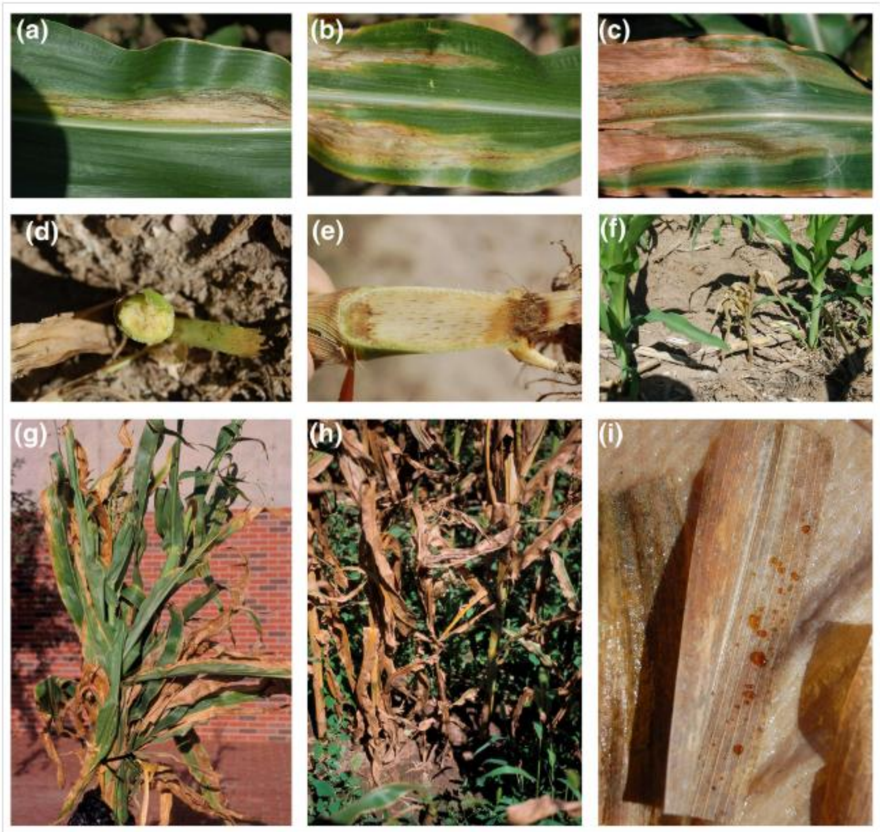
3.2. Goss's Wilt of Maize (*Clavibacter nebraskensis* comb. nov.)

Goss's wilt of maize (*Clavibacter nebraskensis*) is a bacterium pathogen of maize with a distribution previously limited to North America (Canada first recorded in 2009, Mexico first record 2024, South America – Argentina under monitoring) (Wise *et al.,* 2019). Severe infections have been documented to cause yield losses of up to 50% in susceptible maize varieties, especially under favourable environmental conditions such as high humidity and warm temperatures (Jackson-Ziems *et al*., 2014, Figure 1). Between 2012 and 2015, total yield losses due to Goss's Wilt in the U.S. and Canada were estimated to exceeded 1.27 million tonnes, making it one of the most destructive maize diseases in the northern U.S. and Ontario (Wise *et al*., 2019).

Seed is a known source of inoculum; the bacterium is seedborne and seed transmitted. Goss's wilt is listed as *Clavibacter michiganensis* subsp. *nebraskensis* in New Zealand's Import Health Standard: Seed for Sowing. Imported corn (maize) seed must come from a pest free area, pest free place of production or be tested and found free of Goss's wilt using an ISTA or AOSA approved methodology. Small seed lot sampling options are also available. Goss's wilt had a re-classification from *Clavibacter michiganensis* subsp. *nebraskensis* (Davis *et al.* 1987) to *Clavibacter nebraskensis* comb. nov. in 2017 (Li *et al.* 2017). Recommended management strategies include evaluating seed lots of production by field inspection and/or seed testing of a representative sample (ISF, 2025).

In 2025 Goss's wilt was detected in four provinces in South Africa (IPPC, 2025). This detection resulted in Zimbabwe significantly upgrading its phytosanitary infrastructure including constructing new border posts and inspection procedures.

Action: Inform MPI of nomenclature change for *Clavibacter michiganensis* subsp. *nebraskensis* to *Clavibacter nebraskensis*.



Clavibacter nebraskensis causing Goss's wilt of maize, 2024

Figure 1: *C. nebraskensis* infection causing Goss's wilt of maize. Symptoms include systemic vascular wilt and a leaf blight phase. Stalks of infected plants may develop orange vascular bundles and decaying cavities. Leaves exhibit dark and water-soaked lesions with small, dark, discontinuous, areas often called "freckles" on the margins. Image sourced from Jackson-Ziems *et al.* 2024.

3.3. Corn (maize) leafhopper (*Dalbulus maidis*)

Corn leafhopper (*Dalbulus maidis*) is a *Zea* specialist and phloem feeder. It is the most important maize and corn pest in South America because of its ability to vector several important maize (corn) plant pathogens, including, corn stunt spiroplasma (*Spiroplasma kunkelii*), Maize bushy stunt phytoplasma (maize bushy stunt), Maize rayado fino virus (CABI, 2021). Corn leafhopper is spread through active flight, wind dispersal and human assisted movement. It is not known to be seed-transmitted (CABI, 2021). The corn leafhopper has spread into parts of the southern United States, including California, New Mexico, Texas, Arkansas, Louisiana, Mississippi, and Florida, where in some locations it has sporadic outbreaks and economic loss have occurred (CABI 2021).

Prior to 2024, corn leafhopper had not been detected in Oklahoma, in mid-May in central corn-growing regions both adult and nymph life stages were detected during a warm winter (Faris et al. 2024, Figure 2). Both forms were shown to carry *Spiroplasma kunkelii*, the corn stunt pathogen (Faris *et al.* 2024). The presence of the corn stunt spiroplasma and corn leafhopper was also confirmed in corn fields in four non-contiguous New York Counties (Erie, Jefferson, Monroe, and Yates) in October 2024 (Bergstrom, 2024). This is the first record of corn stunt spiroplasma in a NY county (Jefferson County) (Bergstrom, 2024).

Corn leafhopper is currently known to only reproduce in corn (maize), however, studies have shown that when corn or teosintes (*Zea* spp.) are no longer available, the insect can survive in gamma grasses (*Tripsacum* spp.) (Larsen et al. 1992), alfalfa (*Medicago sativa* L.), winter wheat (*Triticum aestivum* L.), triticale (*Triticale hexaploide* Lart.) (Summers *et al*. 2004), and possibly moist soil without plant material (Moya-Raygoza *et al.* 2007).

A recent study in Brazil has shown corn leafhopper to be susceptible to the insecticides methomyl, carbosulfan, and acephate (Machado *et al.* 2024). Of these methomyl and acephate are available in New Zealand. Corn leafhopper was also shown to have reduced susceptibility to both bifenthrin (pyrethroid) and imidacloprid (neonicotinoid) (Machado *et al.* 2024).

Figure 2: Representation of Oklahoma counties where maize leafhopper, *Dalbulus maidis* was collected during August 2024. Figure from *Faris et al.* 2024

3.4. Western corn rootworm, WCR (*Diabrotica virgifera virgifera*)

Western corn rootworm (WCR) (*Diabrotica virgifera virgifera*) is a major pest of maize. While originally native to North America, it has become a significant threat to European agriculture since its introduction in the 1990s (Vörös *et al.* 2024). The larvae feed on maize roots, causing lodging and yield loss, while adults feed on corn silks and leaves, further damaging the crop. Controlling WCR in the EU has become increasingly difficult due to the withdrawal of several insecticides, including neonicotinoids and organophosphates (Tarigan *et al*. 2024). This reduction in chemical control options raises the risk of resistance development, highlighting the urgent need for sustainable alternatives. Research in the EU is now focusing on effective non-chemical strategies is crop rotation, which disrupts the WCR lifecycle. Biological control agents—such as *Beauveria bassiana*, *Metarhizium anisopliae* (fungi), *Heterorhabditis bacteriophora* (nematodes), and botanical insecticides like azadirachtin have been trialled under laboratory and greenhouse conditions these trials showed limited efficacy against WCR *in situ* (Tarigan *et al*. 2024). New Zealand has seen increased regulatory oversights for neonicotinoids and phased-out removal of some organophosphates meaning New Zealand could be subject to similar withdrawals or restrictions of neonicotinoids and organophosphates.

3.5. Brown marmorated stink bug (*Halyomorpha halys*)

Brown marmorated stink bug (*Halyomorpha halys,* BMSB) is native to East Asia but has spread to North America and Europe. It is considered an invasive pest and feeds on a wide range of host plants, including fruits, vegetables, maize, grape vines and ornamental plants.

In Tasmania, Australia, BMSB was detected twice in 2025, once in February and again in March, both near Bell Bay. In response, Biosecurity Tasmania has increased surveillance, including deploying additional traps and monitoring, and has established an Incident Management Team to coordinate the response.

In New Zealand there have been 38 live BMSB detected since the beginning of the 24/25 BMSB risk season, compared to 111 in the same reporting period last year. The New Zealand high risk season runs from 1st September until 30th April. The reporting period (April 1st – 30th 2025) saw one live bug detected post-border. All border and post border detections were followed up by MPI's investigation team to manage any potential risk, confirm no further bugs were present and identify likely entry pathway where possible (i.e. recent travel or imported goods). The key measure New Zealand uses to mitigate Brown Marmorated Stink Bug (BMSB) include:

(i) **Import Border Controls**: Seasonal import rules, inspections, and mandatory treatments (e.g. fumigation) for high-risk goods from BMSB-affected countries.
(ii) **Surveillance and Trapping**: BMSB traps and monitoring at ports, airports, and other high-risk locations to detect any incursions early.
(iii) **Biological Control Preparedness**: Approval to release the *samurai wasp* as a biocontrol agent if BMSB becomes established.
(iv) **Public Awareness Campaigns**: Education on identifying and reporting BMSB, especially during high-risk seasons.
(v) **Rapid Response Plans**: Contingency procedures in place for containment and eradication if BMSB is found.
(vi) **GIA BMSB Council and Readiness OA**: Government and industry agreement on actions to be taken in the event BMSB was intercepted at varying degrees (intercepted at border, post borer etc).

3.6. Corn earworm, tomato fruitworm or cotton bollworm (*Helicoverpa zea*)

Corn earworm (*Helicoverpa zea*) is one of the most destructive lepidopteran agricultural pests. It is polyphagous and its larvae frequently target corn, cotton, tomato, soybean, sorghum and vegetables (EFSA 2020). It can disperse long distances with and without human transportation (up to 400km naturally (Westbrook, 2010)). A recent Chinese study predicted the potential geographical distributions (PGDs) of corn earworm in China by using a calibrated MaxEnt model (Zhao *et al.* 2022). This study found suitable habitats in China, and substantially increased habitats under future climate scenarios (SSP1-2.6, SSP2-4.5, SSP5-8.5) and speculated it would expand its geographical potential further into East Asia during the 2030s and 2050s.

It is believed that New Zealand's climate could support establishment of corn earworm based on its survival in North America (EFSA, 2020). A recent study looked at the continental migratory patterns of corn earworm in the Americas using stable hydrogen isotope ratios in wing tissue to trace migratory pathways (Paula-Moraes *et al.* 2024) found:

(i) A clear northward spring/summer migration from the southeastern U.S. to mid-latitudes and Canada (up to 60–96% non-local individuals at high latitudes)
(ii) Significant reverse migration—southward flow back to regions like Puerto Rico (~15% of individuals)

The study concluded there was a need for continental management strategies of corn earworm that account for both northward and southward migration patterns.

3.7. Mal de Río Cuarto Virus (MRCV, Rio IV Maize virus)

Mal de Rio Cuarto virus (MRCV, Fijivirus) infects maize and other Gramineae. MRCV has been detected in maize-growing regions of Argentina, Brazil, and Uruguay. It is primarily spread via the small brown planthopper (*Delphacodes kuschelli*) which transmits the virus in a persistent-circulative manner. It's a significant threat to maize production in Argentina, causing reduced crop yields and quality. The virus is not believed to be seed-borne. In 2023 MRCV was reported naturally infecting 3 out of 20 rice (*Oryza sativa*) samples in Argentina (Solís *et al.* 2023). This was reportedly the first record of MRCV in rice (Solís *et al.* 2023). Its presence in rice was confirmed using DAS-ELISA serological test using anti-MRCV.

3.8. Bacterial wilt of maize (*Pantoea stewartii* subsp. *stewartii*)

Pantoea stewartii subsp. *stewartii* is a bacterial plant pathogen primarily affecting corn (*Zea mays*), where it causes Stewart’s wilt, a serious vascular disease. It is mainly distributed in North America, particularly in the United States, where its vector, the corn flea beetle (*Chaetocnema pulicaria*), is prevalent (EFSA, 2018). It also widely disseminated to Africa, North, Central and South America, Asia, and Europe (EFSA, 2018). While corn is its primary host, it has also been found on a limited number of other grasses and cereal crops under certain conditions (Mangeli *et al.* 2024). It has been causing jackfruit-bronzing disease in jackfruit crops (*Artocarpus heterophyllus*) in the Philippines in 2014, Vietnam in 2016 and spreading to Malaysia and Mexico in 2017 (Ibrahim *et al*. 2022).

New Zealand’s IHS: Seed for Sowing regulates *Pantoea stewartii* on the imported corn seed pathway. Imported corn (maize) seed must come from a pest free area, pest free place of production or be tested and found free of *Pantoea stewartii* using an ISTA or AOSA approved methodology. Small seed lot sampling options are also available for *Pantoea stewartii*. Recommended management strategies include evaluating seed lots of production by field inspection and/or seed testing of a representative sample (ISF, 2025). Jackfruit seeds (*Artocarpus heterophyllus*) are eligible for import into New Zealand under basic import conditions, while nursery stock imports are currently suspended. The author was unable to find any published data linking *P. stewartii* to jackfruit seeds.

An earlier study confirmed *P. stewartii* subsp. *stewartii* as present in Vietnam and found the subspecies *stewartii* also causes "bronzing disease" in Thai jackfruit (*Artocarpus heterophyllus*) (Ha *et al.* 2023*)*. *P. stewartii* subsp. *stewartii* was detected across multiple Vietnamese provinces. Researchers tested numerous other plants—durian, longan, mango, tomato, broccoli, pumpkin, cucumber, corn, rice, sweet potato, water spinach, peanuts, green beans—and found these were potential experimental hosts of *P. stewartii subsp. stewartii* when manually wound inoculated (Ha *et al.* 2023).

Recent research has shown that *Pantoea stewartii* subsp*. indologenes* is also capable of causing leaf blight in maize (*Zea mays).* A 2020 *report* confirmed *Pantoea stewartii* subsp*. indologenes* was responsible for emerging leaf blight disease of maize (*Zea mays*) in Kerman province of Iran (Mangeli *et al.* 2024). Prior to this work, *Pantoea stewartii* subsp. *indologenes* had previously not been linked to leaf blight of maize (Figure 3).

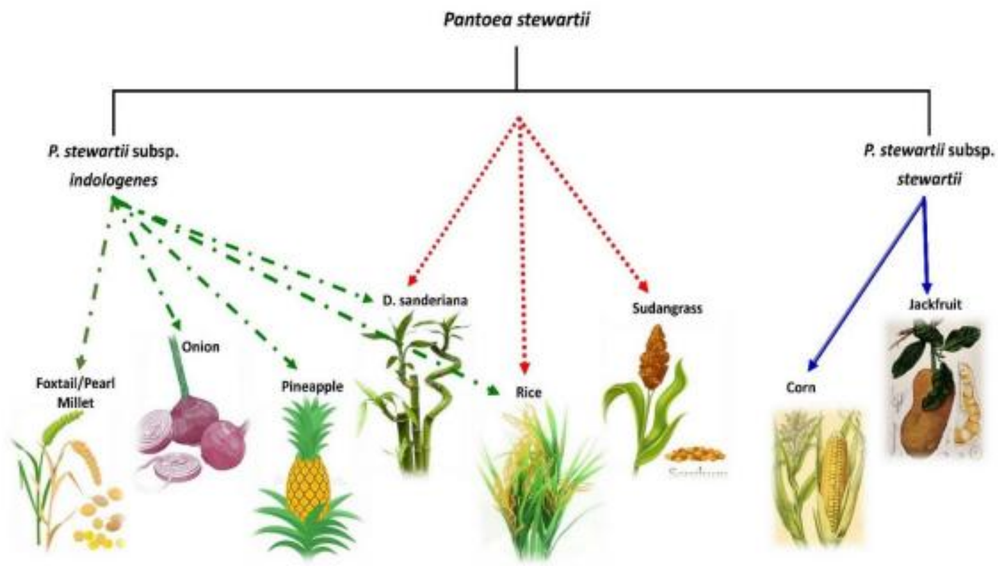


Figure 3: Host plants of the phytopathogens *P. stewartii, P. stewartii* subsp. *indologenes* and *P. stewartii* subsp. *stewartii.* Figure sourced from Ibrahim *et al.* 2022. *P. stewartii* subsp. *indologenes* is now linked to leaf blight of maize.

Action: confirm *Pantoea stewartii* nomenclature with MPI noting the survey results of *P. stewartii* subsp. *indologenes* also infecting maize.

Action: confirm if jackfruit (*Artocarpus heterophyllus*) seeds are imported into New Zealand and if jackfruit seeds represent a risk pathway. The author was unable to confirm based on existing literature.

3.9. Tar spot (*Phyllachora maydis*)

Tar spot (*Phyllachora maydis*) is a plant pathogen causing ascomycete diseases in corn (maize). It is native to Mexico, Central and South American and is an emerging disease in the USA and Canada (Check *et al.* 2025). It overwinters on corn residue, and its ascospores are dispersed by wind and rain, there is no evidence that the disease is transmitted through infected seeds (Kleczewski *et al.* 2020). Tar spot was first reported in the USA in September 2015 in Indiana and Illinois. It spread to Florida, Iowa, Michigan and Wisconsin in 2018, with further spread to Kent and Sussex counties in Delaware (October 2023) (Henrickson, Pollock and Koehler, 2024, Figure 4). Yield losses from tar spot vary depending on time of infection, environmental factors, and hybrid susceptibility and have been recorded up to 100% in Latin America (Rocco da Silva *et al*. 2021). Tar spot has led to estimated annual yield losses in the U.S. averaging 104.8 million bushels per acre from 2018 to 2023 (Henrickson *et al.* 2024). Multi-state Fungicide Efficacy Trials to Manage Tar Spot and Improve Economic Returns in Corn in the United States and Canada are being undertaken (Telenko *et al.* 2022a and b). Fungicides with two or three modes of action (MOAs) provided greater suppression than one MOA and the nontreated control (Ross *et al.* 2023; Ross *et al.* 2024).

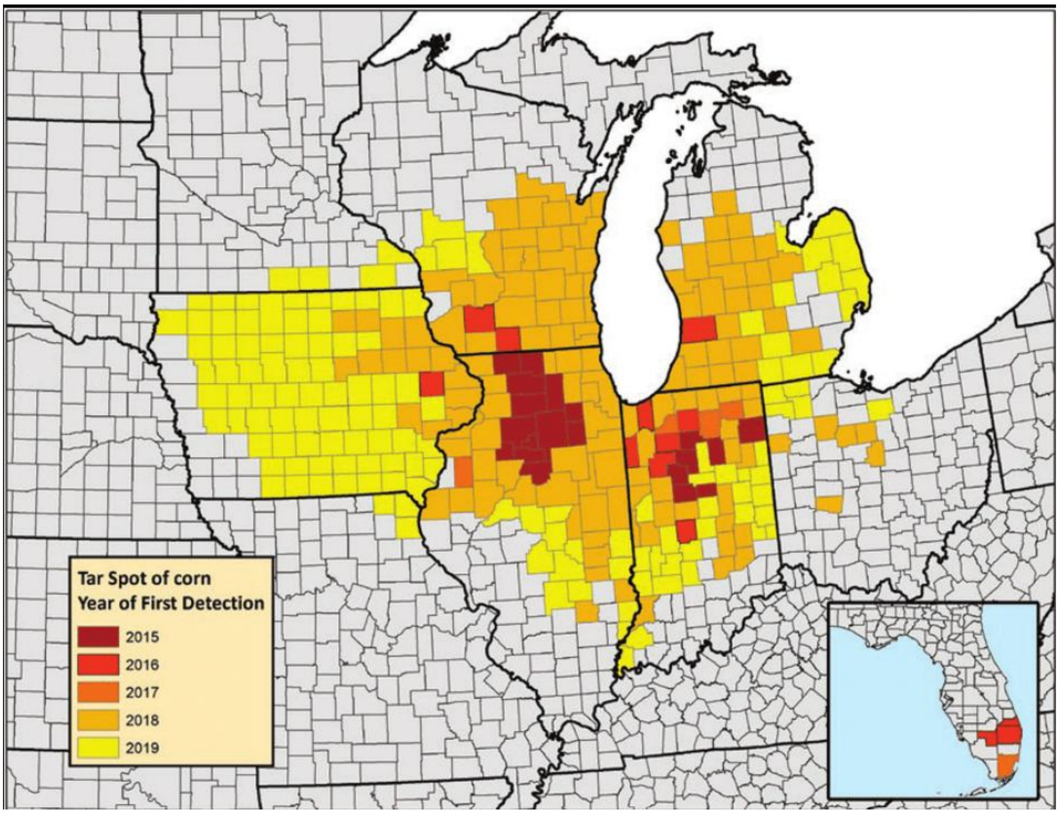


Figure 4: Map depicting incidence and spread of tar spot of corn, caused by *Phyllachora maydis*, in the United States from 2015 to 2019. Sourced from Kleczewski et al. 2020

3.10. Corn stunt spiroplasma (*Spiroplasma kunkelii*)

Corn stunt spiroplasma *(Spiroplasma kunkelii*) is a mollicute bacterium found in the Americas, especially Central and South America (EPPO, 2025: Figure 5). It is vectored by corn leafhopper (*Dalbulus maidis*). The presence of the corn stunt spiroplasma was confirmed in corn fields in four non-contiguous New York Counties (Erie, Jefferson, Monroe, and Yates) in October 2024 (Bergstrom, 2024). This is the first record of corn stunt spiroplasma and corn leafhopper in a NY county (Jefferson County) (Bergstrom, 2024). It is unknown whether corn leafhopper can overwinter as far north as New York. Only one report (Periera and Oliviera 1971; abstract only) indicates that *S. kunkelii* was isolated from maize seeds. No other report found in the literature indicating seedborne incidence or seed transmission of the pathogen (ISF, 2021). It is uncertain whether Corn stunt spiroplasma is seed transmitted (ISF, 2021).

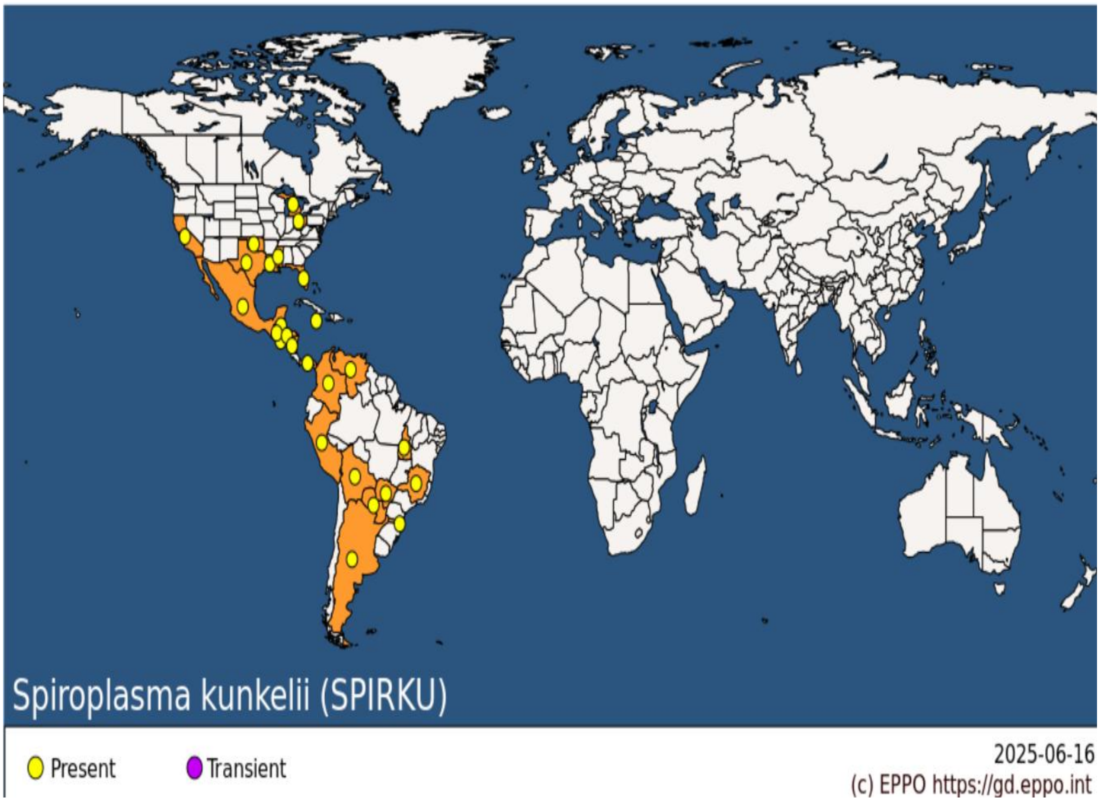


Figure 5: Map of locations *Spiroplasma kunkelii* has been recorded. Figure from *EPPO 2025.*

3.11. Sugarcane mosaic virus (SCMV)

SCMV infects various grain crops such as corn and sorghum and other poaceous species, it is reported to cause severe grain and forage yield losses among susceptible cultivars. SCMV is transmitted by aphids, particularly the corn leaf aphid and green peach aphid (Braidwood *et al.* 2019*)*. While considered to have a worldwide distribution it is not recorded in NZ (Figure 6). It is considered partially seed-transmitted and there are SCMV measures applied to NZ's Seed for Sowing IHS: *Zea* schedule. Since 2024, advancements made in understanding and managing SCMV included:

(i) early detection techniques – a study used machine learning and five-band multispectral imagery from unmanned aerial systems to detect sugarcane mosaic virus (SCMV) in corn across two growing seasons (Bevers *et al.* 2024). Results showed that XGBoost and SVM were the most effective models, with key vegetation indices like simplified canopy chlorophyll content index (SCCCI) and saturation index (SI) can play key roles in disease prediction, supporting the potential for UAS (unmanned aircraft systems)-based tools in precision agriculture and farming.

(ii) development of resistant varieties - breeding corn varieties with inherent resistance to SCMV is a key strategy to protect against SCMV. Resistance to SCMV is controlled primarily by a single dominant gene (*Scm1*). A study by Hislop *et al.* (2021) assessed a subset of 420 inbred lines were genotyped using 7504 high-quality genotyping-by-sequencing single-nucleotide polymorphism markers. 46 were found to be resistant to SCMV, providing valuable germplasm for future breeding programs focused on enhancing virus resistance.

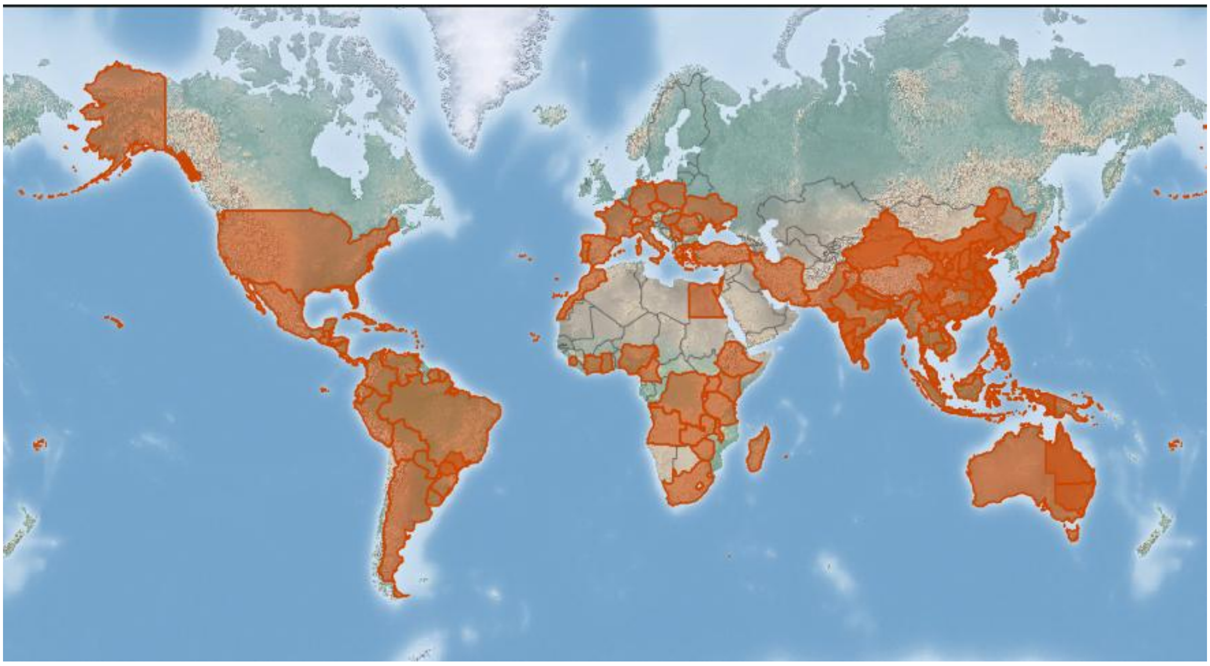


Figure 6: SCMV distribution using country incidence data from CABI (2022).

3.12. Khapra beetle (*Trogoderma granarium*)

Khapra beetle (*Trogoderma granarium)* is amongst the most damaging stored grain insect pests worldwide. Khapra beetle has a highly resilient larval stage that can survive a wide range of abiotic conditions (Athanassiou *et al.* 2019). This beetle has a generalist feeding habit affecting most globally traded stored grains (Shivananjappa *et al.* 2023).

A global modelling study (2024) weighed khapra beetle as in the top 5 of 15 of the world's most invasive insect species (Cao and Feng, 2024). This was because of khapra beetle's ability to survive in over 85% of global terrestrial regions under future climate scenarios (Cao and Feng, 2024).

An earlier study by Shivananjappa *et al.* (2023) documented retrogressive moulting in khapra larvae which saw larvae moult to shrink during starvation, losing about half their body mass over up to six moults across three months (Shivananjappa *et al.* 2023). The larvae were able to resume normal development once food became available. This mechanism is hypothesised to explain how they are so capable of surviving long periods in empty grain facilities or in storage imports (Shivananjappa *et al.* 2023).

Khapra beetle is an Australian priority pest due to the potential to impact exported grain. Effective May 28 May 2025 Australia tightened their import controls for *khapra* beetle. New measures included (DAFF's import industry advice notice IIAN 111-2025):

(i) New fumigation packaging declarations (requiring clarity on gas permeability)
(ii) NPPO supervised treatments (new declarations documenting NPPO oversight)
(iii) Simplified sampling requirements (better aligns with standard global practice)

Border trials conducted in Australia in 2021–2022, using dust samples from shipping containers (*1,475 samples examined using TaqMan real-time PCR assays*) showed ~9 % (133) were eDNA-positive and ~0.9 % (14) were both eDNA and eRNA positive for the presence of khapra beetles (Trujillo-González *et al.* 2022). Two containers with dual-positive results were further inspected and confirmed to contain either live beetles or beetle larvae skins (Trujillo-González *et al.* 2022). Australia is investing $14.5 million to enhance biosecurity measures against the khapra beetle. There maybe the ability to trial similar eDNA work in New Zealand.

Cereals

3.13. Black-grass (*Alopecurus myosuroides*)

Black-grass (*Alopecurus myosuroides*) is an unwanted grass weed that is a major agricultural pest in cereal crop production particularly for wheat and barley crops. It is capable of developing resistance to multiple herbicides belonging to different chemical classes. There are three types of herbicide resistance mechanisms that have been observed in black-grass (i.e. Non-target site resistance (NTSR), Acetyl-CoA carboxylase target site resistance (ACCase TSR), and acetolactate synthase inhibitors target site resistance (ALS [2] TSR).

Three black-grass responses have occurred in New Zealand since 2021. The most recent response is in one site planted with perennial rye-grass (*Lolium* spp.) imported from the USA (Oregon). Enhanced sampling of retained seed from three associated properties growing the same seed line did not detect black-grass contamination. MPI and its GIA partners are working towards eradication for the most recent detection.

While herbicide resistance in well documented and studied throughout Europe, less work has been published on herbicide resistance in black-grass in the US (Heap, 2025). A search of the international herbicide-resistant weed database did not find herbicide resistance black-grass in Oregon or in the USA (Heap, 2025). Biosecurity New Zealand's 2016 black-grass response has been closed by MPI.

3.14. Wheat curl mite, WCM (*Aceria tosichella*)

Wheat curl mite (WCM, *Aceria tosichella*) is a major global pest of cereals, present in most wheat-growing regions, including Europe, the Americas, and Australia. Its main hosts are wheat, maize, and sweet corn. WCM is a vector for several serious plant viruses (e.g., Wheat Streak Mosaic Virus (WSMV), Triticum mosaic virus (TriMV), High Plains wheat mosaic virus (HPWMoV), Brome Streak Mosaic Virus (BSMV). Due to its small size (~0.2 mm) and cryptic nature, it is hard to detect through field surveys. Recent research has focused on virus-mite interactions and population dynamics, resistance breeding efforts and reliable surveillance techniques. A review of 60 scientific papers evaluated the use of remote sensing for WCM monitoring, analysing 55 indices (Manu and Onete, 2025).

It concluded that effective application depends on:

(a) identifying the appropriate detection scale,
(b) standardising aerial imagery,
(c) accounting for environmental factors, and
(d) validating with ground-level data.

The review concluded remote sensing could support better monitoring and sustainable pest management, although appropriate precautions at address issues *a* to *d* are needed (Manu and Onete, 2025).

3.15. Vineyard snail (*Cernuella virgata*)

[2] Mesosulfuron + iodosulfuron

Vineyard snails (*Cernuella virgata*) is a medium-sized, terrestrial helicoid snail with variable colour patterns (CABI, 2022c). Its range includes almost the entire Mediterranean region, expanding along the Atlantic coastline of Europe (CABI, 2022c). In 1920-1921, vineyard snail was introduced to Australia, becoming an invasive agricultural pest. Since then, it has been widespread throughout southern and south-western Australia (Pomeroy and Laws (1967)). In the USA, it has been frequently intercepted on shipments of goods, indicating that it can be accidentally transported over long distances (CABI, 2022c). Its success in colonising new areas after introduction and establishment may be due to:

(i) climbing up behaviour to escape from the ground heat,
(ii) morphological adaptations (e.g. white-coloured shells and a moderate size of shell aperture) and
(iii) physiological adaptations (i.e. high tolerance to overheating) (CABI 2022c).

It is frequently a species of coastal habitats with warm to hot climates, although it extends into cooler and wetter areas in north-western Europe (CABI, 2022c). Global warming is likely to facilitate the invasion of vineyard snail into new regions of the world. Once introduced, its ability to reach very high population densities as well as high rates of growth and reproduction make it difficult to control this pest species. It is listed as a potential risk species with priority quarantine significance in the USA, Israel, China, Japan, New Zealand, Argentina and Chile (CABI, 2022c).

3.16. Pointed snail or small pointed snail (*Cochlicella acuta)*

Cochlicella acuta (pointed snail or small pointed snail) is considered an invasive terrestrial snail having been introduced from the Mediterranean regions of Europe into Australia, the US (notably California) South Africa and parts of South America (Ibrahim *et al.* 2023). In 2023 it was first recorded in Upper Egypt (Ibrahim *et al.* 2023). It is believed to be spread via contaminated soil, plant material or agricultural products. It is considered invasive because of its ability to rapidly reproduce and has high dispersal ability because of its ability to cling to materials and vehicles (Ibrahim *et al.* 2023). It is considered an agricultural pest because of its ability to directly damage crops and pastures and to clog harvesting equipment. New Zealand has widespread environments—sandy dune systems, pasture lands—where pointed snail could thrive, as it does in Australia under similar climatic and soil conditions.

In Australia in 2000, a parasitoid fly, *Sarcophaga villeneuveana*, was introduced into South Australia for biocontrol of the conical snail, *Cochlicella acuta*. The overall impact of the parasitoid fly is limited, with high parasitism rates in local environments with flowering resources available indicate the potential to enhance the parasitoid fly as a biocontrol of invasive conical snail species (Muir and Perry, 2021).

3.17. High plains virus (HPV, syn. High plains wheat mosaic virus)

High plains virus is an emaravirus which is the causative agent of High plains disease. It is vectored by wheat curl mite (*Aceria tosichella)* and has been found to infect corn seed at low levels (0.008%-3.4%).

High plains virus and its associated measures were removed from the *Avena* (oats), *Hordeum* (barely) and *Triticum* (wheat) schedules in August 2024 due to lack of evidence of High plains virus having a seedborne or seed-transmission nature. High plains virus and its associated measures were removed from the *Zea* (maize/corn/sweet corn) schedule in March 2025. MPI assessed the risk of HPV to New Zealand, without wheat curl mite (*Aceria tosichella*), as very low, with low uncertainty because of the absence of the mite vector.

Evidence was found by MPI that wheat curl mite could potentially remain viable as eggs on wheat seed, but MPI considered industry practices would render any eggs present as non-viable. While this pest remains “Regulated” on the Official New Zealand Pest Register, it is not a quarantine pest on the corn seed pathway, and it is not listed on the regulated actionable pest list for corn seed. MPI would not act if it was detected on corn seed at the border.

3.18. European crane fly or leatherjacket (*Tipula paludosa*)

European crane fly or leatherjacket (*Tipula paludosa*) is a crane fly native to northwestern Europe. Its larvae feed on grass roots and young plant stems, making it an economically significant arable pest (CABI, 2022b). While originally endemic to Europe, European crane fly has established populations throughout northern North America (Canada and the northern U.S.), likely via soil or plant imports (CABI, 2022b). Although Europe’s *T. paludosa* range was already well defined, a 2024 review on non-native and spreading craneflies noted its continued expansion across North America (Peck *et al.* 2009). While not new, the report by Kolcsár *et al*. (2025) resurfaced *T. paludosa* as one of the few Tipulidae species with confirmed anthropogenic spread between Europe and North America. In the U.S. Pacific Northwest, monitoring has recorded its presence along the coast, through the Willamette Valley, Cascade Mountains, and into northern California—reinforcing that its invasion front continues to press southward (Peck *et al.* 2009).

4. Horizon scanning

For the horizon scanning a range of sources were reviewed to obtain information on new emerging risks, including: ISF notifications, MPI’s emerging risk reports, WTO notifications, EPPO and NAPPO pest alerts, international databases, scientific literature and SGRR member feedback. The horizon scanning period covers 1/6/2024 until 1/7/2025.

Pests of interest are reported alphabetically by scientific name. One new pest (Palmer amaranth (*Amaranthus palmeri*)) was identified as needing further consideration for adding onto the SGRR unwanted pest list.

4.1. Palmer amaranth (*Amaranthus palmeri*)

Palmer amaranth (*Amaranthus palmeri*) is native to the southwestern United States and northern Mexico but has spread across most of the U.S., especially in the Southeast, Midwest, and Great Plains (EPPO, 2014). It is reported as present in Spain, Italy, Greece, Cyprus, Portugal, Turkey; transient in many additional European countries; also restricted occurrences in Argentina, Brazil, several African countries, Asia, and Australia. It is believed to have spread through contaminated seed or feed (EPPO, 2014). Its rapid spread is driven by climate adaptability, high seed production, herbicide resistance, and fast growth.

Palmer amaranth has developed resistance to herbicides, including triazines and glyphosate. Resistance to 5 different herbicide modes of action has been confirmed for this species. No control regime based on a single herbicide is likely to be successful for more than 4 to 5 years.

Palmer amaranth is not listed on MPI’s Plant Biosecurity Index (PBI). It is listed as regulated but not as notifiable or unwanted (MPI’s Official New Zealand Pest Register). In the PBI most *Amaranthus* species have basic seed import conditions listed. A review of the 2021-23 MPI provided interception data Palmer amaranth was not detected but other *Amaranthus* species were detected.

Action: add to SGRR pest list for further consideration

4.2. Tobacco budworm (*Chloridea virescens* syn. *Helicoverpa virescens*)

Tobacco budworm (*Chloridea virescens*) is a polyphagous moth pest of many field crops (in particular cotton, tobacco, soybean, chickpea, tomato, peppers, alfalfa, beans and less preferred maize). It is present throughout South America, North America and Canada (EPPO, 2024). It was added to EPPO A1 alert list in 2024. Seed is not considered a pathway. Trade of agricultural fresh fruit and vegetable commodities and moth flights are considered the main mechanisms for the dispersal of *C. virescens* (EPPO, 2024).

An EPPO PRA considered that host plants for planting and associated packaging material are the most likely pathways for entry of tobacco budworm into the EPPO region (excluding true seed, bare-rooted plants, bulbs, corms, rhizomes, tubers, pollen, tissue cultures). Live eggs and larvae of tobacco budworm have been intercepted on exported commodities from the Americas (asparagus as a stem vegetable, okra (*Abelmoschus esculentus*) cape gooseberry fruit and *Physalis* and *P. peruviana* fruit) (EPPO, 2024).

A 2025 study assessed the ability of tobacco budworm eggs, larvae, and pupae to survive under various transportation and storage conditions (Blanco *et al.* 2025). The findings indicated that exposure to temperatures around 0°C for extended periods significantly reduced egg viability and caused 100% mortality in larvae after 48 hours. Conversely, transporting specimens at ambient temperatures (13–24°C) without diet did not affect survival rates (Blanco *et al.* 2025). The author could find no evidence of tobacco budworm being intercepted at the New Zealand border.

4.3. Maize downy mildew (*Peronosclerospora neglecta*)

Peronosclerospora neglecta was described as a new species in 2023 (Muis *et al.* 2023). It is not listed on MPI's official New Zealand pest register (as of May 2025) and is not on the *Zea* regulated pest list. *P. neglecta* has been reported across Southeast Asia including Indonesia and Thailand (Muis *et al.* 2023). *Peronosclerospora neglecta* was reported as widespread in field crops of maize in Cambodia, Lao PDR, and Thailand during 2018-22 field surveys (Sudsanguan *et al.* 2024). Corn seed cannot currently be imported from Southeast Asian markets. It is hypothesised that vertical transmission by seeds could explain its distribution, further work is needed to determine if it is seed transmitted (Muis *et al.* 2023).

Action: send through *Peronosclerospora neglecta* to be included on MPI's Official New Zealand Pest Register

4.4. Asian corn borer (*Ostrinia furnacalis*)

Asian corn borer (*Ostrinia furnacalis*) is widespread throughout Asia and the western Pacific, with established populations in China, Japan, Korea, Southeast Asia, India, Bangladesh, Sri Lanka, and extending into Australia, the Solomon Islands, Micronesia, and parts of Africa and Russia (Abbas *et al*. 2025). It is a highly polyphagous pest with maize (corn) as a primary host, larvae also feed on crops such as sorghum, sugarcane, rice, cotton, ginger, and various wild grasses (Wang *et al.* 2023). Recently willow (*Salix viminalis*) was recorded as a novel host in Heilongjiang, China (first noted in 2021) (Wang *et al.* 2021). Asian corn borer's range has expanded since the late 20th century into colder temperate zones, aided by evolved cold tolerance and diapause traits, enabling it to colonise northern provinces like Heilongjiang and even parts of Russia (Wang *et al.* 2021).

4.5. European corn borer (*Ostrinia nubilalis*)

European corn borer (ECB, *Ostrinia nubilalis*) is a major agricultural moth pest. Its native range is Europe with reports of it being detected in North Africa and Asia. It is a polyphagous species with a preference for corn (including maize). Other hosts include sorghum, capsicum, beans, potatoes and hops. It has been introduced to North America and Canada.

In Europe, warmer temperatures have led to the emergence of a second generation of ECB in regions like Romania, which previously experienced only one generation per year (Pintilie *et al.* 2023). This shift is associated with increased crop damage and earlier pest emergence (Pintilie *et al.* 2023). A 2024 study forecasting the habitat suitability of ECB indicated potential shifts in its geographical range due to climate change (Li *et al.* 2024). The findings suggest that while the overall suitable habitats for ECB may decrease, areas with highly suitable conditions could expand, particularly in regions with favourable climates. This underscores the need for adaptive pest management strategies that consider changing environmental conditions and the potential for ECB to establish in new areas.

MPI's Official New Zealand Pest Register lists *Ostrinia nubilalis* as regulated and unwanted, while the listing for *Ostrinia nubialis* is regulated but not listed as unwanted.

Action: Flag with MPI the regulatory discrepancy between *Ostrinia nubilalis* and *Ostrinia nubialis*

4.6. Tomato brown rugose fruit virus

Tomato brown rugose fruit virus was first detected in tomato nursery production in Adelaide Australia in August 2024. It then spread to South Australia and Victoria. In May 2025, Australia announced the move from eradication to long term management for ToBRFV.

It is believed that ToBRFV was imported in seed from Israel. In February 2025 DAFF advised MPI Biosecurity that tomato (*Solanum lycopersicum*) seed line 116422-Sunkiss, tested positive for tomato brown rugose fruit virus (ToBRFV). The seed had cleared biosecurity controls in Australia with the required phytosanitary certification and seed testing results, including negative results for ToBRFV.

MPI undertook traceback and testing activities of the implicated seed line in New Zealand. In April 2024, 1,000 seeds had been released from biosecurity control to a South Island importer for evaluation during the 2025 growing season (MPI, 2025). Following the DAFF report, MPI's Incursion Investigation Plant Health Manager was informed, and an investigation initiated (summarised in MPI, 2025). It was found that the importer still had 900 seeds but had provided 100 seeds to an Auckland nursery to raise them for an Auckland tomato grower. Further testing of seeds, vine leaves and glass house water did not detect ToBRFV. The investigation concluded that any risk associated with seed line 116422-Sunkiss had been managed by the IIPH team. MPI has informed DAFF of the investigation outcome.

Summary of actions and next steps

Several actions were recommended as part of this report. These include:

- Inform MPI of nomenclature change for *Clavibacter michiganensis* subsp. *nebraskensis* to *Clavibacter nebraskensis*.
- Consider confirming the *Pantoea stewartii* subspecies nomenclature with MPI noting the survey results of *P. stewartii* subsp. *indologenes* also infecting maize.
- One new pest (Palmer amaranth (*Amaranthus palmeri*)) was identified as needing further consideration for adding onto the SGRR unwanted pest list.
- Inform MPI of the newly assigned *Peronosclerospora neglecta* to ensure it is included on MPI's Official New Zealand Pest Register.

The next report will focus on interception records from 2023 to 2025. The updated report will again focus on arable pests of higher concern including SGRR's unwanted organisms. The updated report will help the SGRR membership to continue to understand the biosecurity risk profile and is intended to identify measures to manage the biosecurity risks that we are best placed to manage. This will continue to aid us in meeting our minimum industry signatory commitments to the GIA Deed. It is intended that an agreed version of the report will be available on SGRR's website.

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Appendix 1: List of Seed and Grain Readiness and Response Unwanted Organisms

Pest - Common Name	Pest - Scientific Name	Pest Class	Regulatory Status	Unwanted	Notifiable
Black grass	*Alopecurus myosuroides*	Weed	Regulated	Yes	No
HPV	High plains wheat mosaic virus	Virus	Regulated	Yes	No
Maize lethal necrosis disease	Maize chlorotic mottle virus, Sugarcane mosaic virus	Virus	Regulated	Yes	No
Rio IV Maize virus	Mal de Rio Cuarto Virus	Virus	Regulated	Yes	No
Zea mosaic virus	Potyvirus	Virus	Regulated	Yes	No
Pea early browning virus	Tobravirus	Virus	Regulated	Yes	No
Wheat curl mite	*Aceria tosichella*	Mite	Regulated	Yes	No
Turnip moth	*Agrotis segetum*	Insect	Regulated	Yes	No
Pea weevil	*Bruchus pisorum*	Insect	Regulated	Yes	No
Chinese bruchid	*Callosobruchus chinensis*	Insect	Regulated	Yes	No
Spotted stalk borer	*Chilo partellus*	Insect	Regulated	Yes	No
Maize/corn leafhopper	*Dalbulus maidis*	Insect	Regulated	Yes	No
Northern corn rootworm	*Diabrotica barberi*	Insect	Regulated	Yes	No
Western corn rootworm	*Diabrotica virgifera virgifera*	Insect	Regulated	Yes	No
Brown marmorated stink bug	*Halyomorpha halys*	Insect	Regulated	Yes	Yes
Corn earworm	*Helicoverpa zea*	Insect	Regulated	Yes	No
Alfalfa weevil	*Hypera postica*	Insect	Regulated	Yes	No
Ground pearl	*Margarodes australis*	Insect	Regulated	Yes	No
Legume pod borer	*Maruca vitrata*	Insect	Regulated	Yes	No
Cruciferae flea beetle	*Phyllotreta cruciferae*	Insect	Regulated	Yes	No
Larger grain borer	*Prostephanus truncatus*	Insect	Regulated	Yes	No
Cabbage stem flea weevil	*Psylliodes chrysocephala*	Insect	Regulated	Yes	No
European crane fly	*Tipula paludosa*	Insect	Regulated	Yes	No
Khapra beetle	*Trogoderma granarium*	Insect	Regulated	Yes	Yes

Pest - Common Name	Pest - Scientific Name	Pest Class	Regulatory Status	Unwanted	Notifiable
Warehouse beetle	*Trogoderma variabile*	Insect	Regulated	Yes	No
Spodoptera Species	*Various*	Insect	Regulated	Yes	No
Mediterranean white and conical snails	*Cernuella virgata, Cochlicella acuta*	Gastropod	Regulated	Yes	No
Downy mildew	*Peronosclerospora philippinensis*	Fungi	Regulated	Yes	No
Tar spot	*Phyllachora maydis*	Fungi	Regulated	Yes	No
Karnal bunt	*Tilletia indica*	Fungi	Regulated	Yes	Yes
Goss' wilt of maize	*Clavibacter michiganensis* subsp. *Nebraskensis*	Bacteria	Regulated	Yes	No
Stalk rot/leaf blight	*Pantoea ananatis*	Bacteria	Regulated	Yes	No
Bacterial wilt	*Pantoea stewartii*	Bacteria	Regulated	Yes	No
Cornstunt spiroplasma	*Spiroplasma kunkelii*	Bacteria	Regulated	Yes	No

List correct as at 10th June 2025