Original thinking... applied

Maintaining GB biosecurity by intercepting pathogens in trade

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Fera Science Ltd.

‘To support and develop a sustainable food chain, a healthy natural environment, and to protect the global community from biological and chemical risks’

Institute for Plant Pathology, 1914

- Scientific heritage of over 100 years
- Joint venture between Bridgepoint & Defra, since 17th January 2024
- Helping industry stay ahead of tomorrow’s regulation and enhance it’s brand values
- Providing expert support and innovative science
- 450+ interdisciplinary scientists

Department for Environment, Food & Rural Affairs

Bridgepoint

The Plant Protection Business Unit

The Plant Clinic

R&D

Entomology | Virology | Bacteriology | Mycology | Nematology | Seeds

Molecular Technology Unit

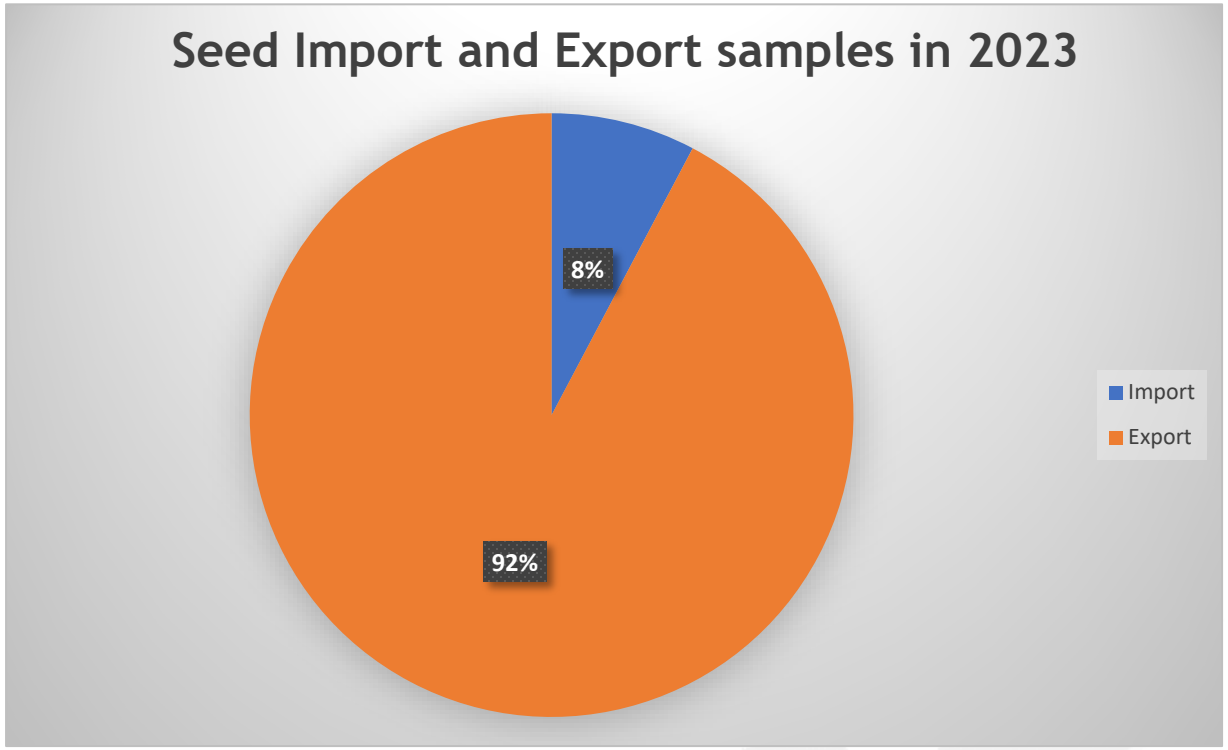
- National Reference Laboratory
- More than 30,000 samples each year for government and commercial customers worldwide
- 200+ years of experience across Plant Clinic
- Provision of advice and training
- Quarantine laboratories, CE rooms, glasshouses and drainage facilities
- National Collections of plant pests
- Emergency Response

The Team


A world class science services company, our science delivers real-world impact, creating a more sustainable world for generations to come.
fera
STEM
DST
Nematology

Seed Testing at Fera

- Funded by Defra to deliver statutory seed testing for England and Wales.
- Animal and Plant Health Agency (APHA) Plant Health and Seed Inspectors (PHSI) submit around 9,000 seed samples a year.
- Seed export testing team handles the majority of Fera's seed samples carrying out visual examinations and fungal testing.
- Plant clinic teams are set up to test for bacteria, viruses, arthropods and nematodes in seeds.
- Testing seed that is moving in trade either imported into the UK or exported.



The pie chart illustrates the percentage of import and export seed samples received last year.

Viruses and Viroids screened for in *Solanum lycopersicum* and *Capsicum spp.* import samples.

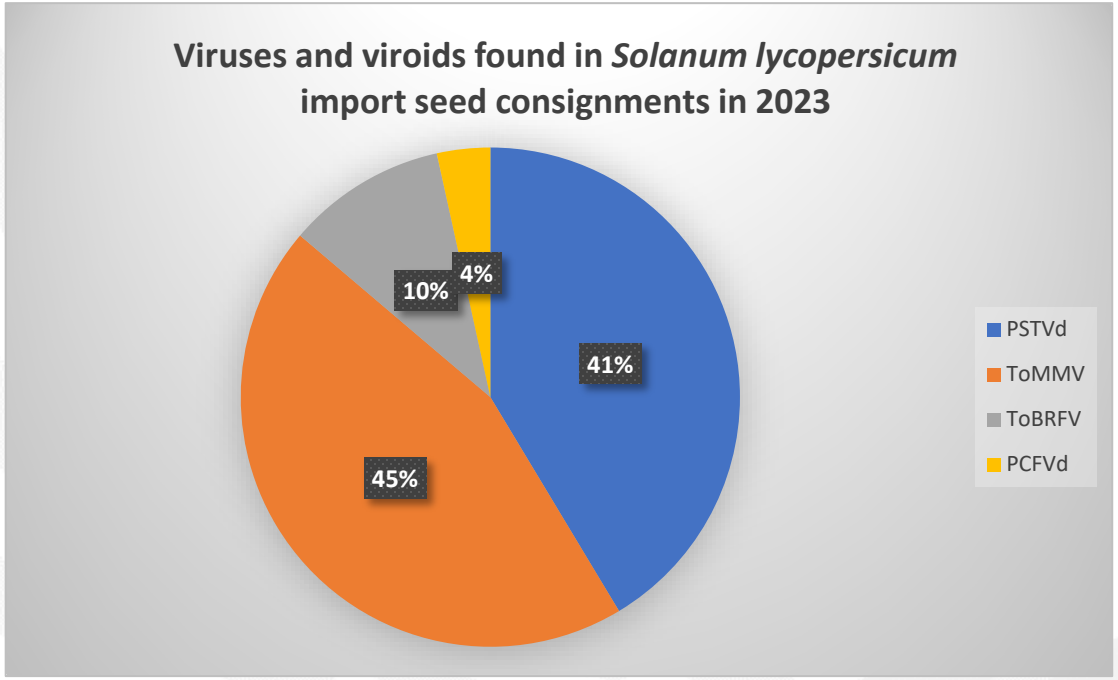
In 2023 the Great Britain legislation required that consignments of Solanum lycopersicum and Capsicum spp. were screened for the following viruses and viroids.

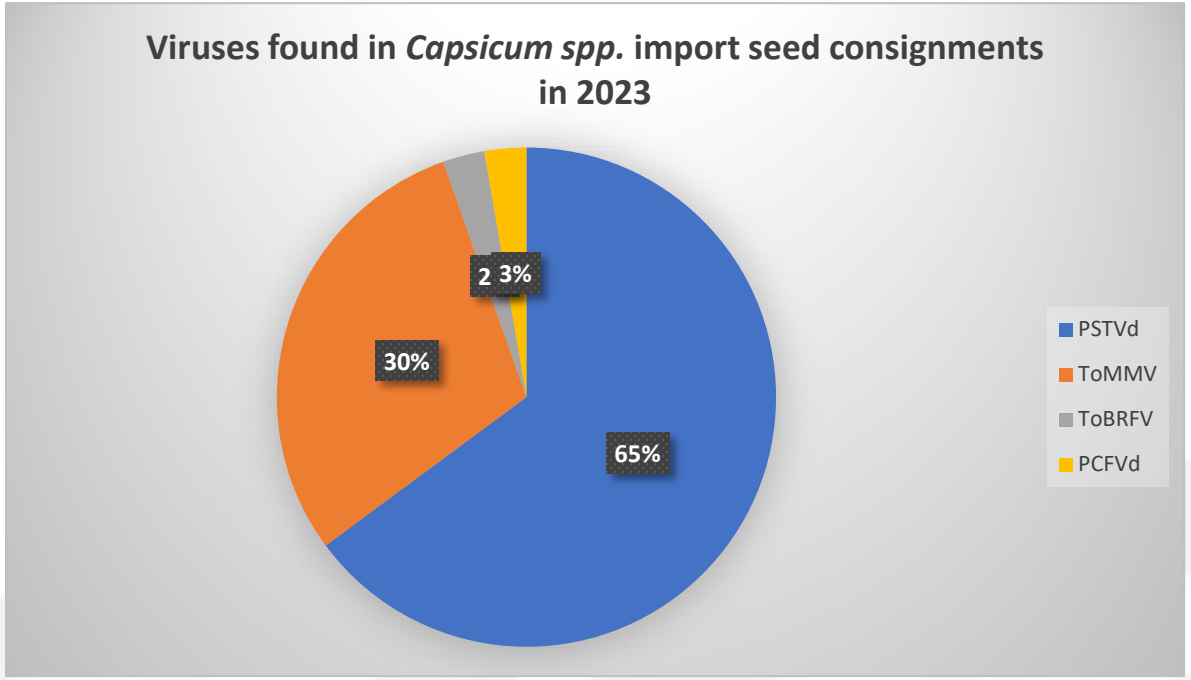
- Potato spindle tuber viroid (PSTVd)
- Tomato mottle mosaic virus (ToMMV)*
- Tomato brown rugose fruit virus (ToBRFV)
- Pepper chat fruit viroid (PCFVd)
- Columnea latent viroid
- Tomato chlorotic dwarf viroid
- Tomato apical stunt viroid
- Tomato planta macho viroid
- Tomato leaf curl New Delhi virus
- Chilli veinal mottle virus
- Tomato spotted wilt virus
- Pepino mosaic virus (tomato seed only)

*deregulated

Viruses and Viroids intercepted in *Solanum lycopersicum* and *Capsicum spp.* import consignments

308 *Solanum lycopersicum* and *Capsicum spp.* import seed samples were sent to Fera in 2023 for virus and viroid testing. 66 of the samples were positive, the pie charts illustrate the viruses and viroids found in each commodity.





What Bacterial Pathogens are Samples Screened for?

- The following table identifies the screening requirements for those seed commodities entering the country, alongside legislative designation:

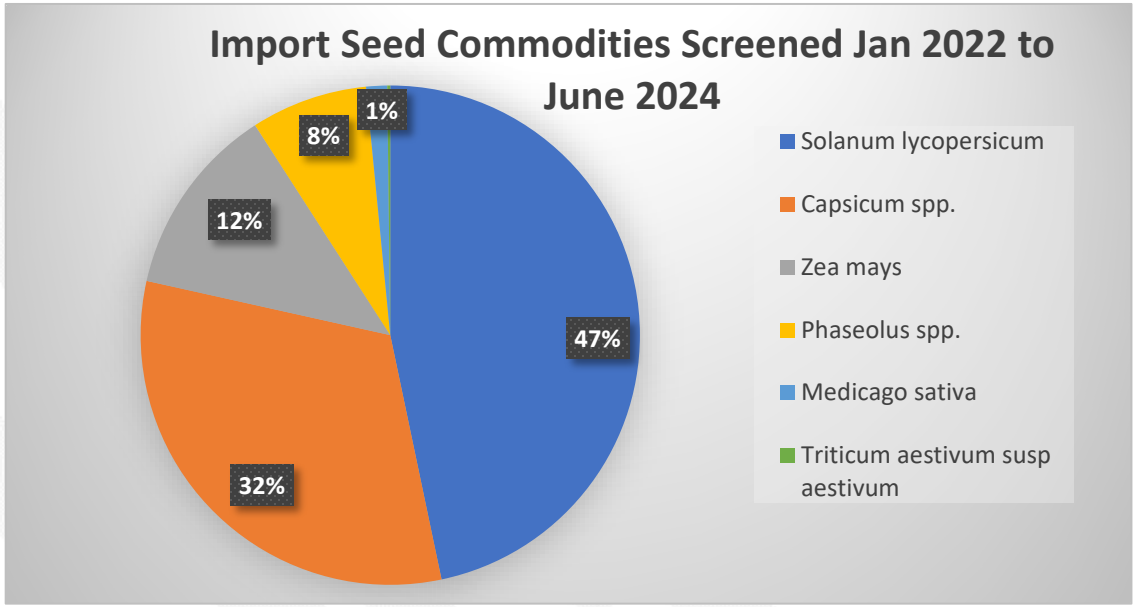
Seed Commodity	Regulated Pathogens	GB Status	EPPO Status
Solanum lycopersicum	*Clavibacter michiganensis*	RNQP	A2 (Quarantine – present)
	Xanthomonas spp.*	RNQP	A2 (Quarantine – present)
Capsicum spp.	*Xanthomonas* spp.*	RNQP	A2 (Quarantine – present)
Zea mays	*Pantoea stewartii*	Quarantine (Absent)	A2 (Quarantine – present)
Phaseolus spp.	*Xanthomonas phaseoli* pv. *phaseoli*	RNQP	A2 (Quarantine – present)
	Xanthomonas citri pv. *fuscans*	RNQP	A2 (Quarantine – present)
Medicago sativa	*Clavibacter insidiosus*	RNQP	A2 (Quarantine – present)

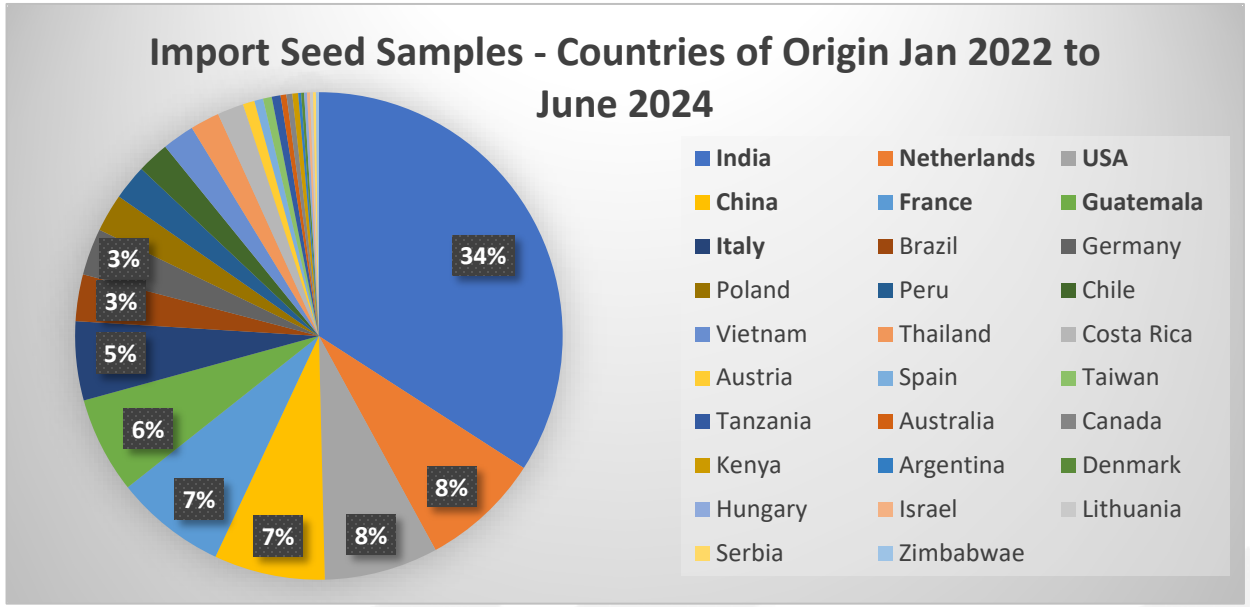
*Xanthomonas spp. *(Xanthomonas euvesicatoria* pv. *euvesicatoria, Xanthomonas hortorum* pv. *gardneri, Xanthomonas euvesicatoria* pv. *perforans & Xanthomonas vesicatoria)*

- Over 200 import samples are screened for bacterial plant pathogens yearly. Positive findings are infrequent, but the importance of each finding/interception is high.

Seed Import Screening for Bacterial Plant Pathogens

- The following pie charts illustrate the import commodities screened and countries of origin respectively when considering the last two-year period:





- *Solanum lycopersicum*, *Capsicum* spp., *Zea mays* & *Phaseolus* spp. make up the majority of seed commodities screened on import to minimise the potential biosecurity risk associated with pathogens known to occur on these hosts.

UK Interceptions within the seed trade.

Bacterial pathogens since January 2022:

- *Clavibacter michiganensis* ex *Solanum lycopersicum* seed sample
- *Xanthomonas citri* pv. *fuscans* ex 2 x *Phaseolus vulgaris* seed samples
- *Xanthomonas euvesicatoria* ex *Capsicum annuum* seed sample

In 2018:

- Tilletia indica ex *Triticum aestivum subsp. aestivum* grain sample

An example of the importance of this work

- *Clavibacter michiganensis* (bacterial canker of tomato) is in most areas of the world where tomatoes are grown.
- A seedborne pathogen transmitted from infected seed to seedlings and mechanically from plant to plant.
- A previous UK outbreak saw yield losses over 50% resulting in significant financial impact to the grower.
- This destructive pathogen can spread rapidly within glasshouses via irrigation/water splash and cultural practice.
- Disease incidence can be as high as 100% when introduced leading to severe yield losses through killing young plants or disfiguring fruits.
- Use of healthy seeds is the key factor in controlling the disease

UK position and action

- *Clavibacter michiganensis* is not currently present in the UK. Previous outbreaks in the Channel Islands, Isle of Wight and Cambridgeshire were eradicated.
- The latest detection on seed was completed following methods outlined in the current EPPO diagnostic protocol (PM 7/42).
- Screening involved extraction, immunofluorescence microscopy, dilution plating on semi-selective media and TaqMan real-time PCR.
- The consignment was held prior to completion of screening results and a recommendation for destruction was put in place by Defra due to 0% tolerance on tomato seed.
- A previous UK outbreak saw yield losses over 50% resulting in significant financial impact to the grower.

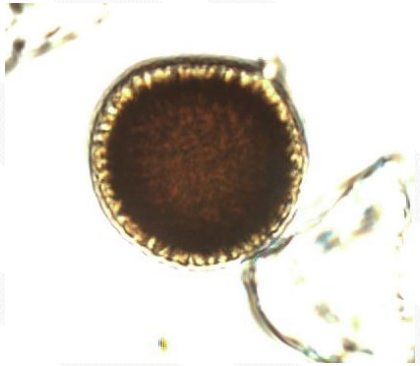
Tilletia indica

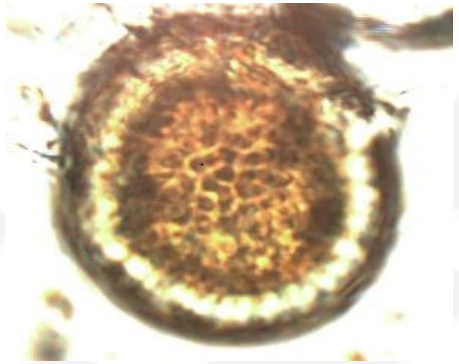
- *Tilletia indica* (Karnal bunt) is a regulated quarantine pathogen, EPPO A1 listed fungal plant pathogen which causes Karnal bunt of wheat (Triticum spp.)
- A seedborne pathogen that spreads through teliospores.
- Teliospores can last in the soil for at least 3 years and longer in stored seed.
- Spread when teliospores germinate in warm and moist conditions.
- *T. indica* reduces grain quality by discolouring and imparting an objectionable odour to the grain and causes a reduction in yield. Wheat grain containing more than 3% bunted kernels is considered unsatisfactory for human consumption.

(a) Uninfected wheat
(b) Bunted grain
(c) Whole seed infected
(d) Canoeing of seed

Interception of Tilletia indica in 2018

- In 2018 we saw the first interception of *T.indica* in England and Wales since 2006
- Four consignments of wheat grain were held whilst testing took place.
- Detection was completed following EPPO diagnostic protocol (PM 7/29)
- Entry to UK was refused and they were re-exported.
- Interceptions were reported on EUROPHYT.





Summary

Testing a lot of seed is valuable in stopping significant losses for industry.

Institute for Plant Pathology, 1914

- Imported seed commodities are being screened for Quarantine and Regulated Non-Quarantine Pests (RNQPs)
- Pathogens are being detected and stopped from entering the UK.
- Seed testing is key in maintaining biosecurity.

Department for Environment, Food & Rural Affairs

Bridgepoint

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