

Introduction to Plant Health and Good Biosecurity Practice

Module 3

Pathways of Introduction and Spread

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Content

3.1 How could these harmful organisms be introduced?

- Plants for planting
- Plant products
- Wood and bark
- Wood packaging materials (WPM)
- 'Natural' routes – air, water, vectors

3.2 How could these harmful organisms be spread?

- Natural pathways – water, soil and growing media, air, plant waste
- Assisted pathways – people, vectors, vehicles, machinery and equipment



Learning objectives

- Be able to give examples to show that you appreciate the diverse range of pathways of both introduction and spread
- appreciate the difference between introduction and spread
- appreciate the difference between natural and human-assisted pathways



Definitions

ISPM and FAO definitions:

Introduction

- The *entry* of a pest (includes pathogens) resulting in *establishment*

Entry

- Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled

Establishment (established)

- Perpetuation, for the foreseeable future, of a pest within an area after entry

Spread

- Expansion of the geographical distribution of a pest within an area

Pathway

- Any means that allows the entry or spread of the pest

Simply

- Introduction – first time it arrives and establishes
- Spread – how it then moves around

3.1 How could these harmful organisms be introduced?



Pathways of Introduction

- Plants for planting
- Plant products
- Wood and bark
- Wood packaging materials (WPM)
- 'Natural' routes – air, water, vectors



Wooden pallets



Dumper truck



Insect vectors



Sawn branch



Plants for planting

Q. Place the following in the order of risks from low to high?

1. Bare root plants
2. Budwood/graftwood
3. Bulbs and tubers
4. In vitro culture
5. Meristem tissue culture
6. Rooted cuttings
7. Root fragments, root cuttings, rhizomes
8. Rooted plants in pots
9. Unrooted cuttings



Plants for planting

From low to high risk:

- Meristem tissue culture
- In vitro culture
- Budwood/ graftwood
- Unrooted cuttings
- Rooted cuttings
- Root fragments, root cuttings, rhizomes
- Bulbs and tubers
- Bare root plants
- Rooted plants in pots

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Plants for planting

Production related factors that affect risk:

- Origin, size, age
- Type of growing media
- Irrigation method and water source
- Growing conditions – low to high risk:
 - growth chamber,
 - greenhouse,
 - shade house,
 - field grown in containers,
 - field grown,
 - plant collected from wild
- Mixing of different plant species



Plants products

- Fruit
- Vegetables
- Potatoes and other tuber forming crops
- Seeds
- Cut flowers and foliage
- Parts of trees – Wreaths, sprays, Christmas trees

Defra guidance on importing plants, fruit, vegetables or plant material to the UK

<https://www.gov.uk/guidance/importing-plants-fruit-vegetables-or-plant-material-to-the-uk>



Wood, bark and Wood Packaging Materials

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- Wood
 - Round wood – with or without bark e.g. stakes
 - Sawn wood – with or without bark e.g. wooden structures
 - Mechanically processed wood e.g. fibre board, MDF
- Risks?
 - Bark and wood boring beetles, termites, scales...
 - Canker fungi, decay pathogens, rusts, vascular wilts
 - Nematodes



Log stack



DIY Shelves with bark



Sawn branch



Wood Packaging Materials

Wood packaging materials (WPM)

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Crates, boxes, packing cases, pallets, cable drums and spools/reels

Dunnage – scrap wood +/- bark used for packing

Must be made from Debarked wood

Exemptions from WPM regulations

< 6mm thickness

Processed – plywood, particle board, strand board,

Veneer (using glue, heat, pressure)

Sawdust, wood shavings, wood wool

Barrels for wine and spirits – heat treated

Treatment

HT Heat treatment (56C > 30 mins)

MB Methyl bromide (sustained concentration over 24h)

DH Dielectric heating e.g. microwave

Pallet stack



IPPC stamp



3.1 Summary

Although plants for planting pose the greatest risk of introduction other pathways should be considered:

- Plant products
- Wood and bark
- Wood packaging materials (WPM)
- 'Natural' routes – air, water, vectors

3.2 How could these harmful organisms be spread?



Natural pathways - water

Spread of pests and pathogens:

- Fungal spores
- Bacteria
- Nematodes

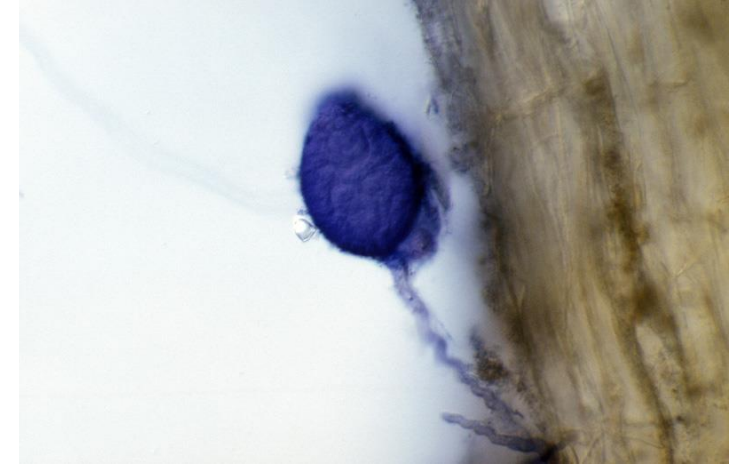
Purposeful

- Irrigation source (low to high risk)
 - Mains, Borehole, Tank/reservoir, +/- covered
 - +/- treated (filtered, uv, chemical)
 - 'Green' untreated ex. Drainage canals, rivers etc
- Application mechanism
 - Misting/overhead irrigation/ drip irrigation...
 - Leaf wetness and high humidity – favours pathogens

Accidental – splash onto plants

- Puddles and Leaks
- Floods

Phytophthora spores



Puddle by path



Natural pathways - – soil and growing media

Q. Which growing media components facilitate pest and disease survival?

- Baked clay pellets
- Bark
- Biowaste
- Clay
- Coconut fibres (coir)
- Compost
- Cork
- Gravel
- Leaf litter
- Paper
- Peat
- Sand
- Sawdust
- Soil
- Sphagnum moss
- Synthetic media e.g. glass wool, rock wool
- Vermiculite, perlite, volcanic rock
- Wood chips
- Wood shavings



Natural pathways - – soil and growing media

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Would not facilitate P&D survival

No organic component

- Baked clay pellets
- Synthetic media e.g. glass wool, rock wool
- Vermiculite, perlite, volcanic rock
- Clay
- Gravel
- Sand

Would facilitate P&D survival

- Paper
- Coconut fibres (coir)
- Sawdust, Wood shavings, Wood chips
- Cork
- Peat
- Sphagnum moss
- Leaf litter
- Bark
- Biowaste
- Compost, Soil





Natural pathways - – soil and growing media

- ISPM 40

Risk factors:

- Growing media - new or used
- Origin
- Components
- Degree of processing
- Treatments e.g. heat, steam, chemical
- Measures to prevent contamination
- Amount of media associated with plant for planting



Bagged growing media



Natural pathways - air

Spread of pests and pathogens:

- Fungal spores, bacteria, pests (mainly insects),
- Contaminated soil and plant debris, vectors of pathogens

Distance:

- Plant to plant spread
- Block to block spread
- Production site to production site
- Production site to natural environment
- Intercontinental

How:

- Air borne blown spores, soil or plant debris
- Wind driven rain, mists
- Wings – active flight



Natural pathways – plant waste

- Excess stock
- Returned plants
- ‘Failures’
- Arisings, prunings etc

European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

PM 3/66 (2)

Phytosanitary procedures
Procédures phytosanitaires

Guidelines for the management of plant health risks of biowaste of plant origin

COMPOSTING of BIOWASTE (EPPO Guidelines)

- A minimum number of turnings may be required to ensure that the whole mass is exposed to this temperature

Conditions	Temp (C)	Duration (d)	Moisture (%)
Open composting facility	55	14	40
Open composting facility	65	7	40
Closed composting facility	60	7	40



Assisted spread

Q. Apart from natural pathways what other types of mechanisms might be involved in assisting the spread of pests and diseases?

- People
- Vectors
- Vehicles, machinery and equipment



Spread - people

- Hands - mechanical transmission
- Footwear
- Clothing
- Personal Protective Equipment (PPE)
- Tools

Clothing

Equipment



PPE - overtrousers



Clean footwear and debris



Foot dip mat



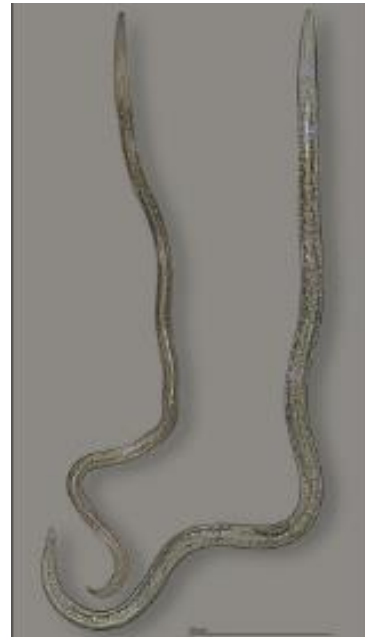
Spread – vectors of pathogens

Invertebrate Pests

- Nematodes
- Sap-suckers
- Chewers and tunnellers
- Mites



Longhorn beetle



Nematode



Thrips

Spread – vehicles, machinery & equipment (VME)

VME used in:

ISPM 41

- Agriculture and forestry
- Construction and Industrial purposes, Mining, Waste management

Planting, growing, harvesting, packing, transport

- Boxes, crates, pots, stakes, canes, fleece, netting, weed suppressant fabrics...

May carry:

- Pests, Diseases, Weeds, Soil, Plant debris, Seeds

Cleaning:

- Removing internal and superficial contaminants/debris
- Pressure washing, steam cleaning, vacuuming, compressed air

Treatments:

- Chemical or Temperature



Dumper truck

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Bamboo canes



Pots



3.2 Summary

Harmful organisms may also be spread with assistance by:

- People
- Vectors
- VME



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