



NO PASAR
VIRUS

NO PASAR
VIRUS

Guay



HORTI HYGIENZ

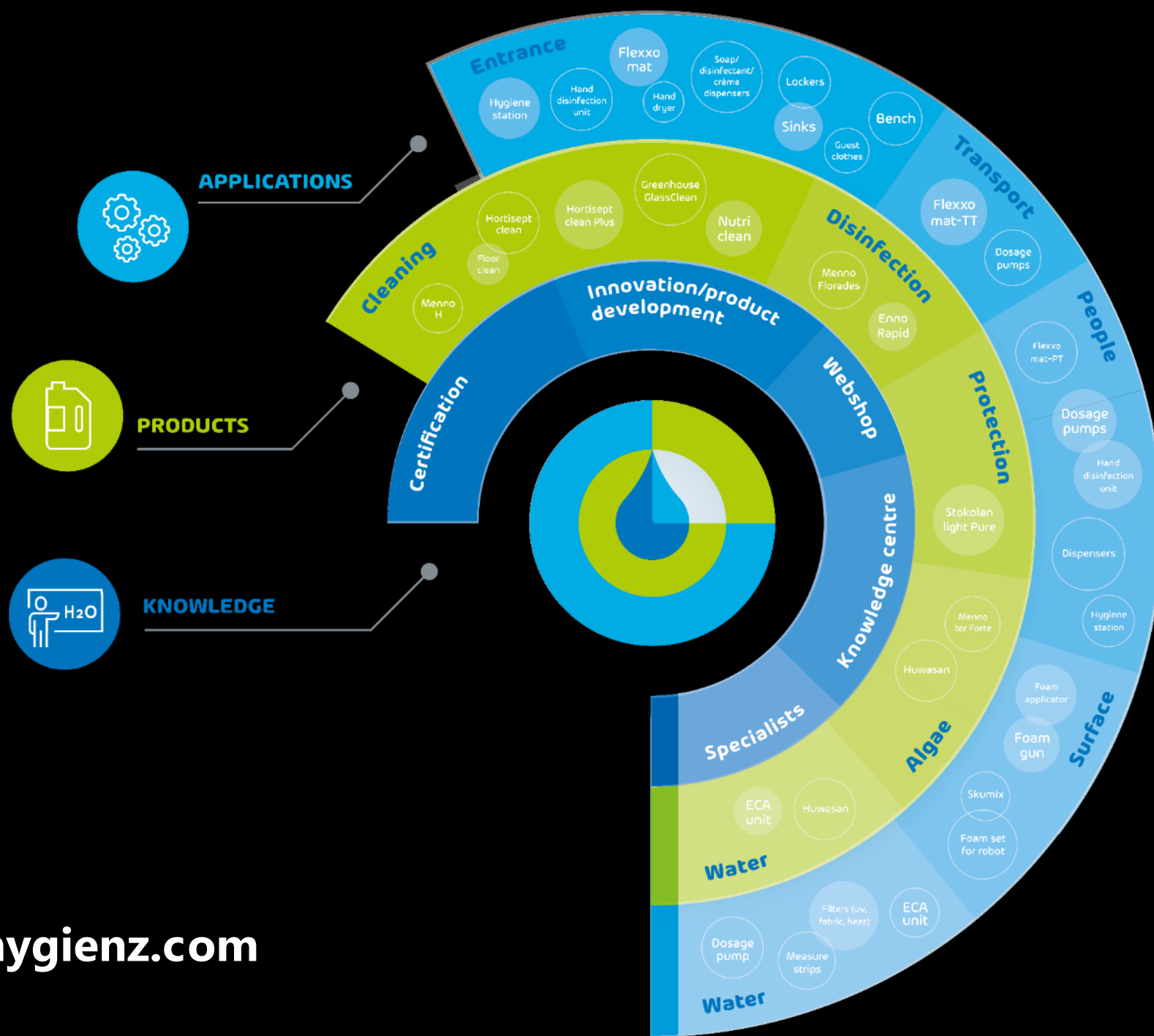
Disinfection solutions


royal brinkman
global specialist in horticulture



Hygiene management - ToBRFV

Product specialist: Jasper Verhoeven



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How to recognize, treat, and control ToBRFV (Tomato Brown Rugose Fruit Virus)

ToBRFV belongs to the genus of the Tobamoviruses which also includes tomato mosaic virus (ToMV) and tobacco mosaic virus (TMV). The virus spreads mechanically through people and tools, but also through bumblebees, birds and infected fruits. While most of the tomato varieties have built up resistance against Tobamoviruses (such as TMV and ToMV), research has shown that the virus breaks through the resistance (Tm-2 and TM-2²(superscript)) that most tomato varieties have against Tobamoviruses.



Leave your contact details and one of our specialists will contact you as soon as possible.

Which crops are susceptible to the virus?

Capsicum species, such as (hot) peppers, have components that the virus needs to grow (propagate). So far it is not known whether pepper varieties are resistant to ToBRFV. Resistant varieties are not affected by the virus. According to the literature, in a limited number of non-commercial paprika varieties, the Tobamo resistances can be broken under certain circumstances.

Where was the virus found?

ToBRFV was first found in Jordan in 2016, after which it was also found in Israel, Germany, Mexico, United States (California) and recently in Italy (Sicily).

ToBRFV prevention

Because ToBRFV is easily spread mechanically, a strict **hygiene plan** is of great importance. The general company hygiene must be in order so that contamination with the virus is prevented, or spread by persons and materials is limited. Also make sure that everyone who visits the company - both employees and other visitors - is aware of the applicable hygiene measures and ensure strict compliance.

Every entrepreneur will also have to make a thorough inventory of the incoming flows and the dangers of these flows. Think of several growers who work together with the same crates, for example in producer organisations. In this case, working with special harvest barrels and other barrels in which the product is disposed of is a good option.

Combat ToBRFV

Combating ToBRFV is not yet possible. Therefore, in the event of an outbreak of the virus, the removal and destruction of the infected plants will have to be carried out. Therefore, focus 100% on prevention! However, there is a possibility to reduce the chance of the virus and to prevent it from spreading.

Measures before entering the greenhouse:

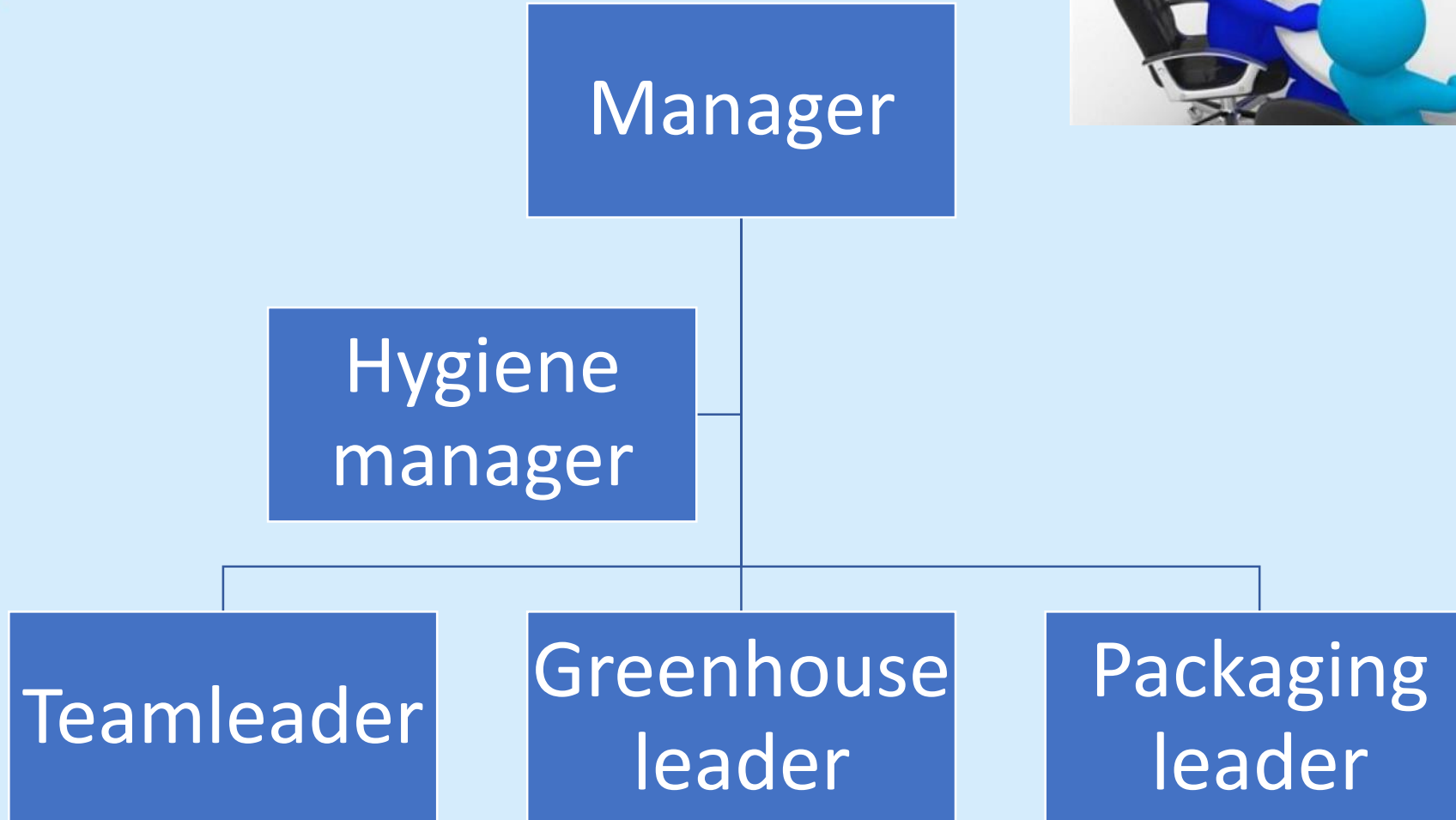
- Clean hands with disinfectant soap and then disinfect the dry hands again.
- Install a hygiene station to disinfect hands and footwear.
- Place disinfection mats where personnel and transport have to pass before entering the greenhouse.
- Before re-entering the greenhouse, after a break, visiting the sanitary facilities, smoking, etc., disinfect and clean the hands again.
- Let visitors wear gloves, overlays and hairnets everywhere.
- Provide clean work clothing for staff.

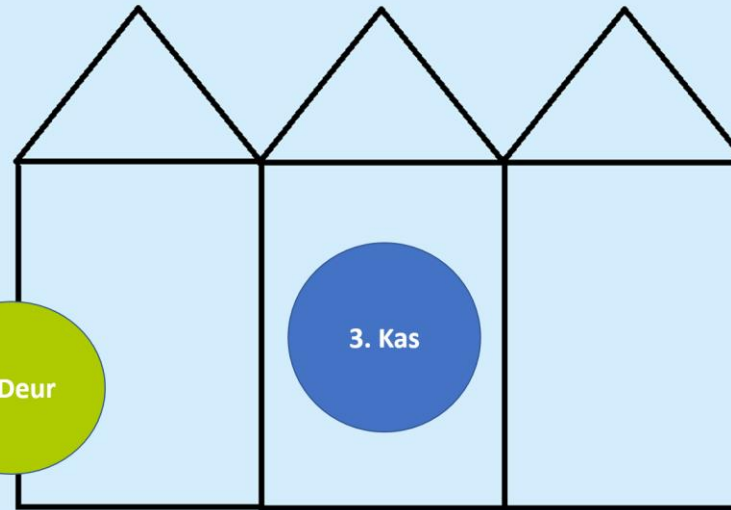
Measures that can be taken in the greenhouse:

- Disinfect the used knives and scissors after each path.
- Disinfect hands while working.
- Disinfect trolleys, spray trolleys and all moving equipment that comes into contact with the crop.
- Clean and disinfect the entire greenhouse during the crop rotation. Tobamoviruses, including the ToBRFV virus, can survive for a long time, both on organic and non-organic material. See the protocol disinfection for tomato for an overview of all the measures you should take during the crop rotation.



Risk assessment





1. External

- Eppo.com
- Horticultural media
- Knowledge partners
- Exchange knowledge
- Sharing experiences
- Research
- Meetings
- Job agency
- Contractors
-

- **Mindset**

2. Door

- Employees
- Visitors
- Drivers
- Incoming goods
- Boxes / crates
- Pallets
- Risk assessment
-

- **Mindset**

3. Greenhouse

- Crop activities
- Trolleys
- Harvesting boxes
- Spraying equipment
- Visitors
- Water
- Crop rotation
-

- **Mindset**

1. Extern



2. Door

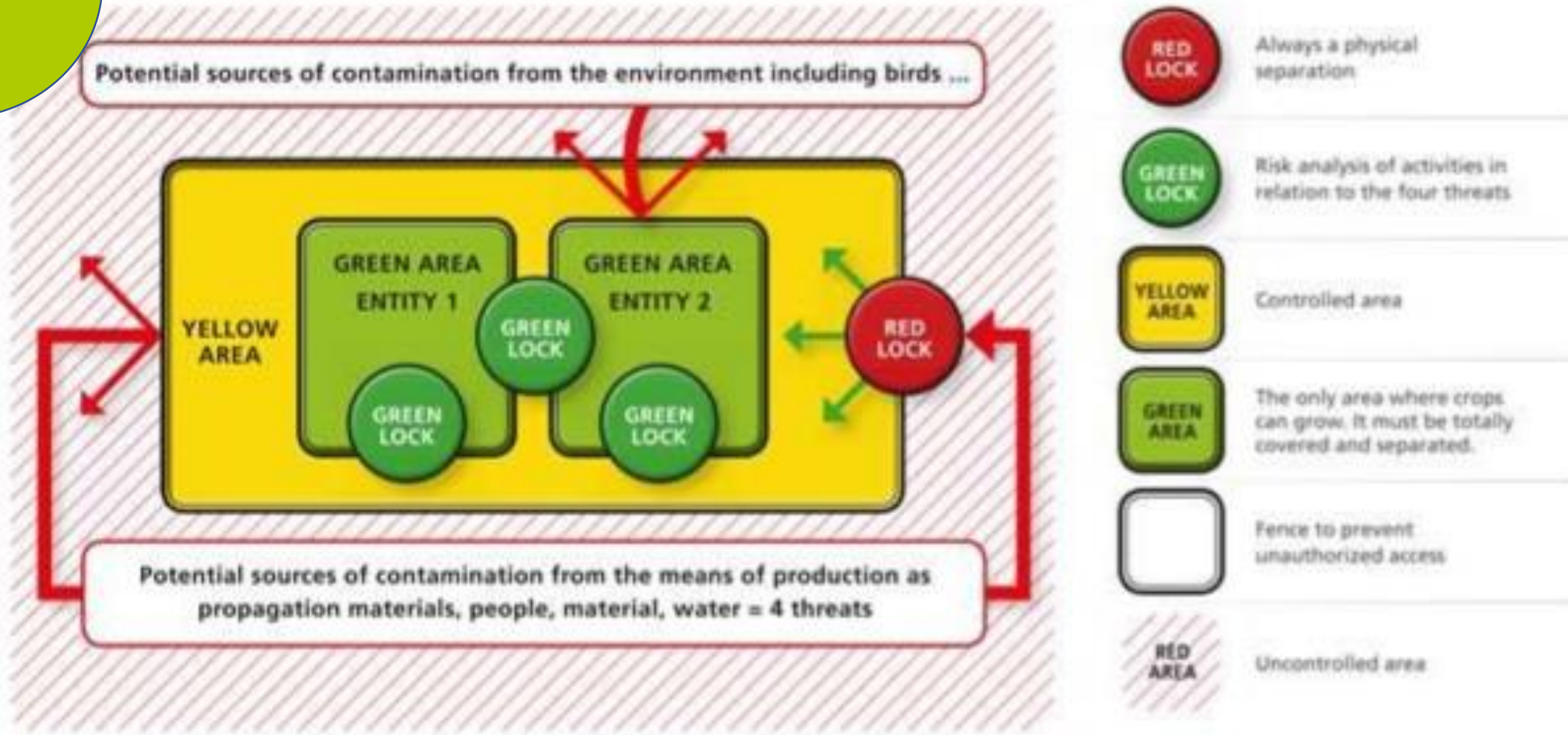


Figure 1 Schematic model of a GSPP site



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DOMI
Innovatie 1900 2021

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1. Wash hands
2. Disinfect hands



PROCEDIMIENTO LAVADO DE MANOS
Humedece tus manos y con la
cantidad necesaria de MENNO H
(5 mililitros aprox.) frota
igualmente tus manos, palma,
dorso, entre los dedos y uñas
durante 20 segundos enjuaga y
seca con toallas desechables.
Después aplica ENNO RAPID (5
mililitros aprox.) frota las manos
palma, dorso, entre los dedos y
uñas hasta que la solución se
haya evaporado (1 y 1 minuto). No
es necesario enjuagar.

LAVADO DE
MANOS
OBLIGATORIO

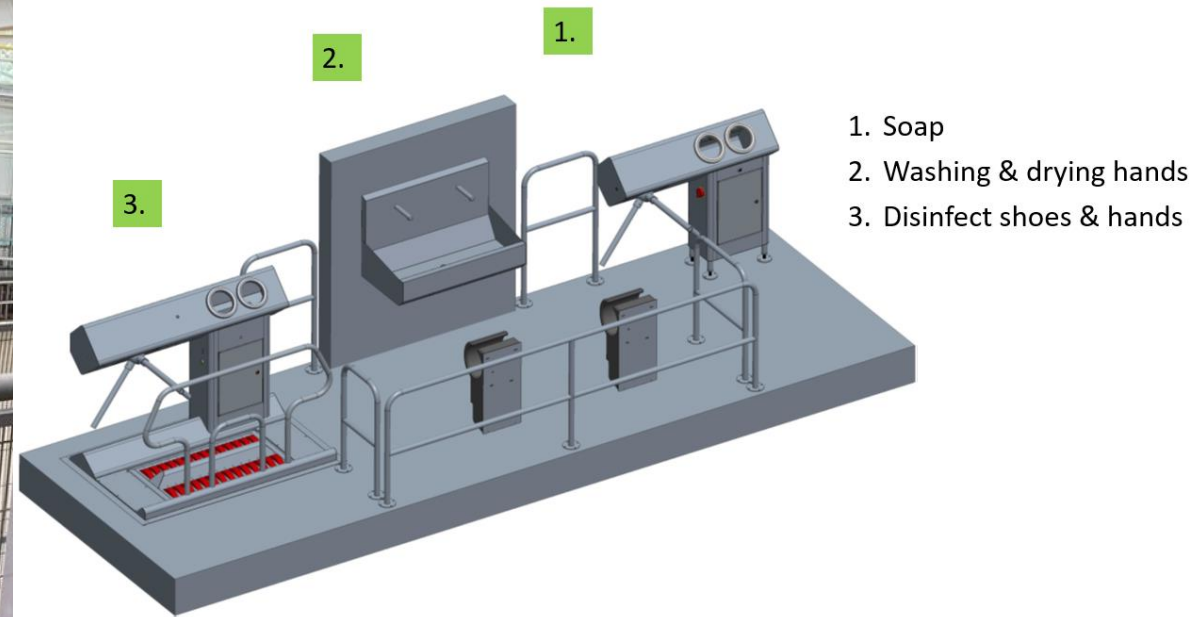
2. Doors



2. Doors



2. Doors

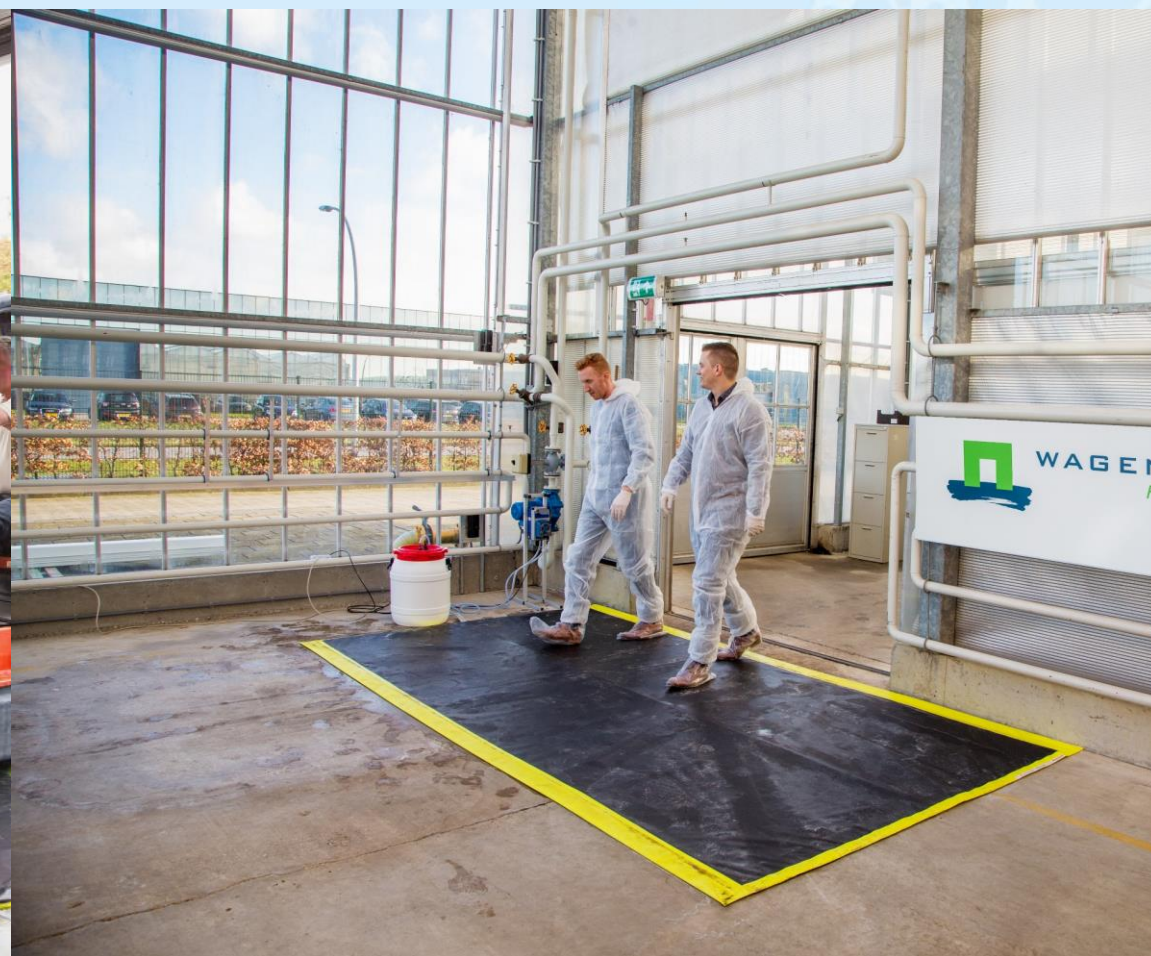


2. Doors



Disposables before or after disinfecting?

2. Doors



Entries: Flexxomats for wheels & footwear

3. Greenhouse



3. Greenhouse

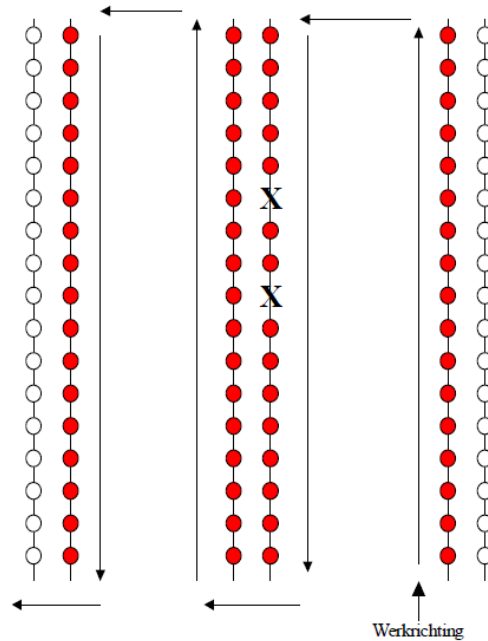


3. Greenhouse

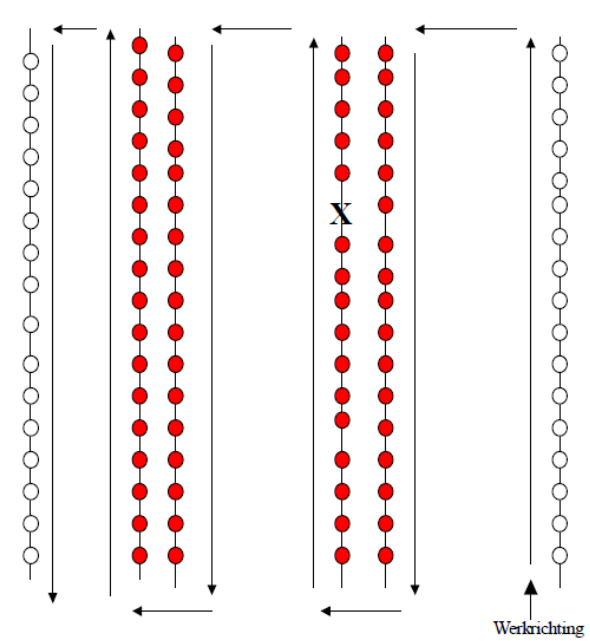


Diagram

Voorbeeld 1



Voorbeeld 2



- X = geïnfecteerde plant
- = plant binnen geïnfecteerde eenheid
- = plant vrij van *Clavibacter michiganensis michiganensis* binnen kascompartiment

3. Greenhouse



- Change gloves every row
- Change knife / scissor every row
- Disinfect trolleys between compartments
- Transport of tomatoes through departments
- Be careful with plant juices
- Dipping materials at least some minutes
- Spraying robot?
- Clean clothes (washing procedure)

3.
Greenhouse

Be aware





Hygiene management during crop rotation

1.

- Removing material

2.

- Killing algae

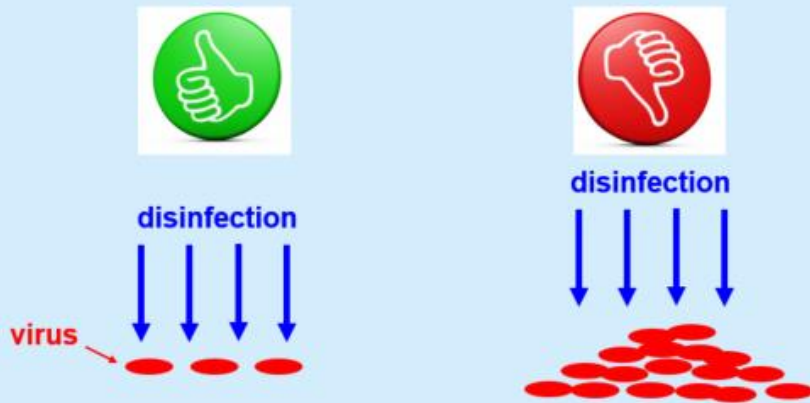
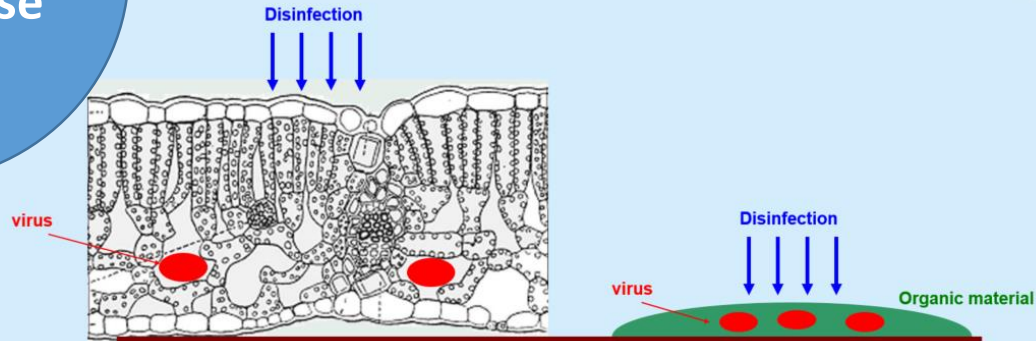
3.

- Cleaning surfaces

4.

- Disinfection surfaces

3. Greenhouse



Cleaning:

- Remove organic material (with virus..)
- Dilution of virus concentration (plant juice)



3. Greenhouse



3. Greenhouse

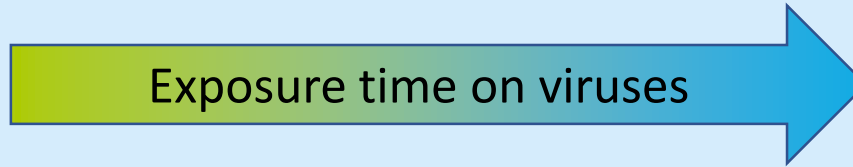


3. Greenhouse



3. Greenhouse





1%

PepMV

ToBRFV
CGMMV

2%

PepMV

ToBRFV
CGMMV

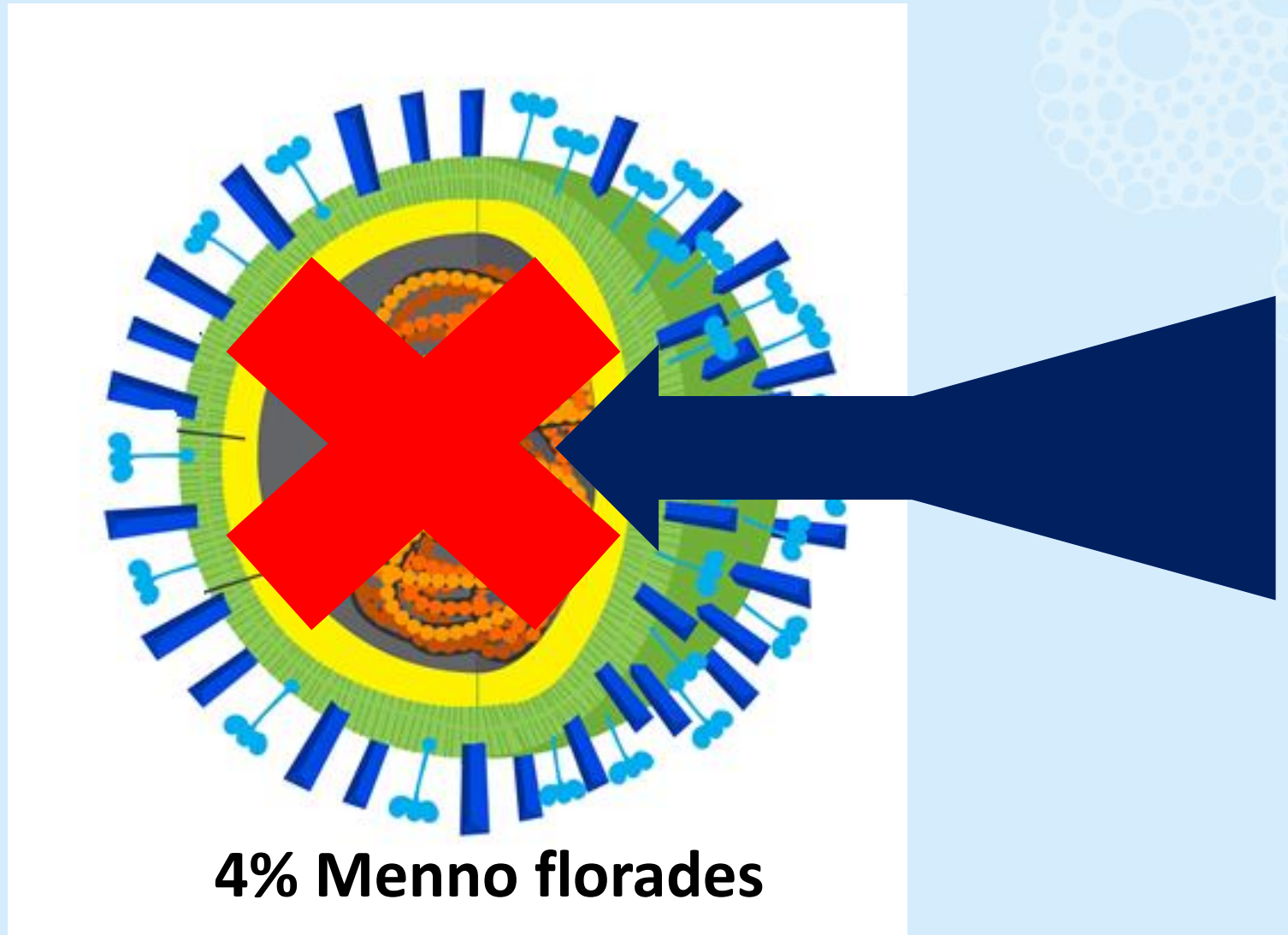
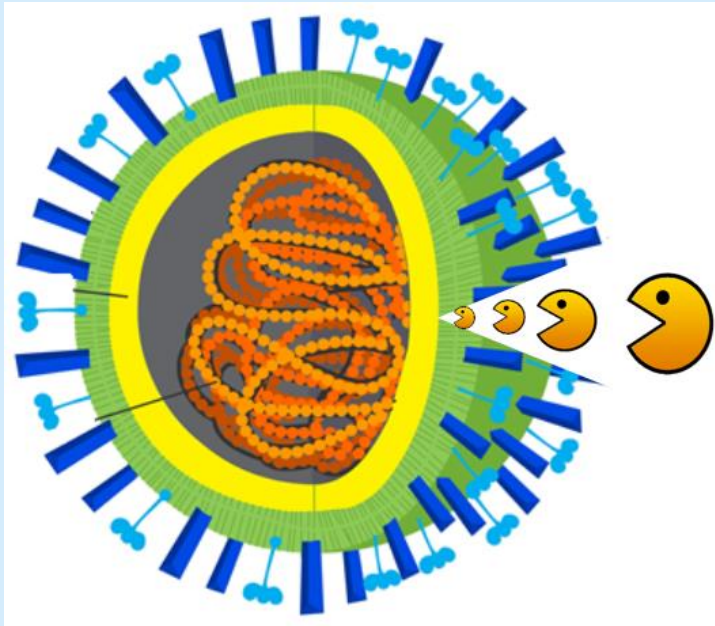
4%

PepMV

ToBRFV
CGMMV



De-activation virus by disinfectants





Water

- ToBRFV can survive in water
- Check drain disinfection/ storage (UV/heater + tank)
- Disinfection of irrigation water





Attention points ToBRFV

- Rootstocks?
- Bumblebees (other stinging insects)?
- High virus content found in fruits!
- High virus content found in root remains (drain water)?
- Knife disinfection: useful with bumblebees in the greenhouse?
- Concentrations & contact time (studies)
- Realize compartments in the greenhouse; doors really closed?
- Mechanics and other visitors?
- Manual instead of Mypex to remove crop?
- Crop rotation: contractors?





Thank you for your attention

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