Control Pathogen Spread through use of Disinfectants

CGMMV-BFB

Chet Kurowski
Monsanto Vegetables
Colusa Industrial Park
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What is a Disinfectant?

Disinfectant -

usually a chemical agent (but sometimes a physical agent) that destroys / inactivates disease-causing pathogens or other harmful microorganisms but might not kill bacterial spores. It refers to substances applied to inanimate objects. EPA groups disinfectants by product label claims of "limited," "general," or "hospital" disinfection.

Disinfection -

describes a process (thermal, chemical) that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects

Sterilization-

describes a process that destroys or eliminates all forms of microbial life and is carried out in health-care facilities by physical or chemical methods. Steam under pressure, dry heat, hydrogen peroxide gas plasma, and liquid chemicals

- Unlike sterilization, disinfection is not sporicidal

Disinfectant effectiveness depends on many factors.

- **Type** of contaminating microorganism. Each disinfectant has unique antimicrobial attributes.
- **Degree** of contamination. This determines the quality of disinfectant required and time of exposure.
- Amount of proteinaceous material present. High protein based materials absorb and neutralize some chemical disinfectants.
- **Presence of organic matter** and other compounds such as soaps may neutralize some disinfectants.
- **Active ingredient** /mode of action in order to select the appropriate disinfectant. Product resistance?
- **Concentration and quantity of disinfectant**. situations will warrant different [conc].

Disinfectant effectiveness cont…….

- **Contact time / temperature**. May depend on level of contamination and organic matter load.
  68^{o}F above is best for most (see product label).
- **Residual activity** and effects on fabric and metal should be considered for specific situations.
- **pH** and interactions with other compounds must be considered.
- Toxicity to the environment and relative safety to people that may be exposed.
- **Cost**

Cleaning + Disinfectant + Contact = Efficacy

- **Cleaning –**

  the removal of foreign material (e.g., soil, and organic material) from objects and is normally accomplished using water with detergents or enzymatic products.

  removes rather then kill microrganisms

  O.M. will interfere with the effectiveness of these processes and products.

  Aggitation (power washer, brushing) will help.

- **Contact time –**

  is the length of time a disinfectant's label states that it must remain wet on a surface in order to achieve efficacy

  (i.e. quaternary products 5-10 minutes)

  Non-compliance with contact times may mean that surfaces are not being properly disinfected and that pathogens could survive even after application.

  In order to meet a contact time of ten minutes, additional applications of product are usually needed, thus reducing operational efficiency.

A Few Types of Disinfectants

Chlorine Compounds (i.e.NaOCl)

- Low cost, fast acting, contact
- greatly reduced by organic material and high pH.
- Ensure efficacy one needs to clean surfaces before using bleach
- widely used
- short shelf life, can release as chlorine gas
- Corrosive

Phenolics

- general disinfectants. Good bacterial . Some viruses
- Active ingredients in some household disinfectants. They are also found in some mouthwashes
- Can be absorbed through skin and or rubber
- Disposal issues

Quaternary Ammonium

- Active against most bacteria but not effective against viruses
- Considered too be broad spectrum in its control not biocidal
- Newer synergous, low-alcohol formulations can kill in 3-5 min. exposure time
- Use: ENVIRONMENTAL SURFACES
- Considered to be a biocide as there able to kill Algae.

Types of Disinfectants cont.....

Virkon

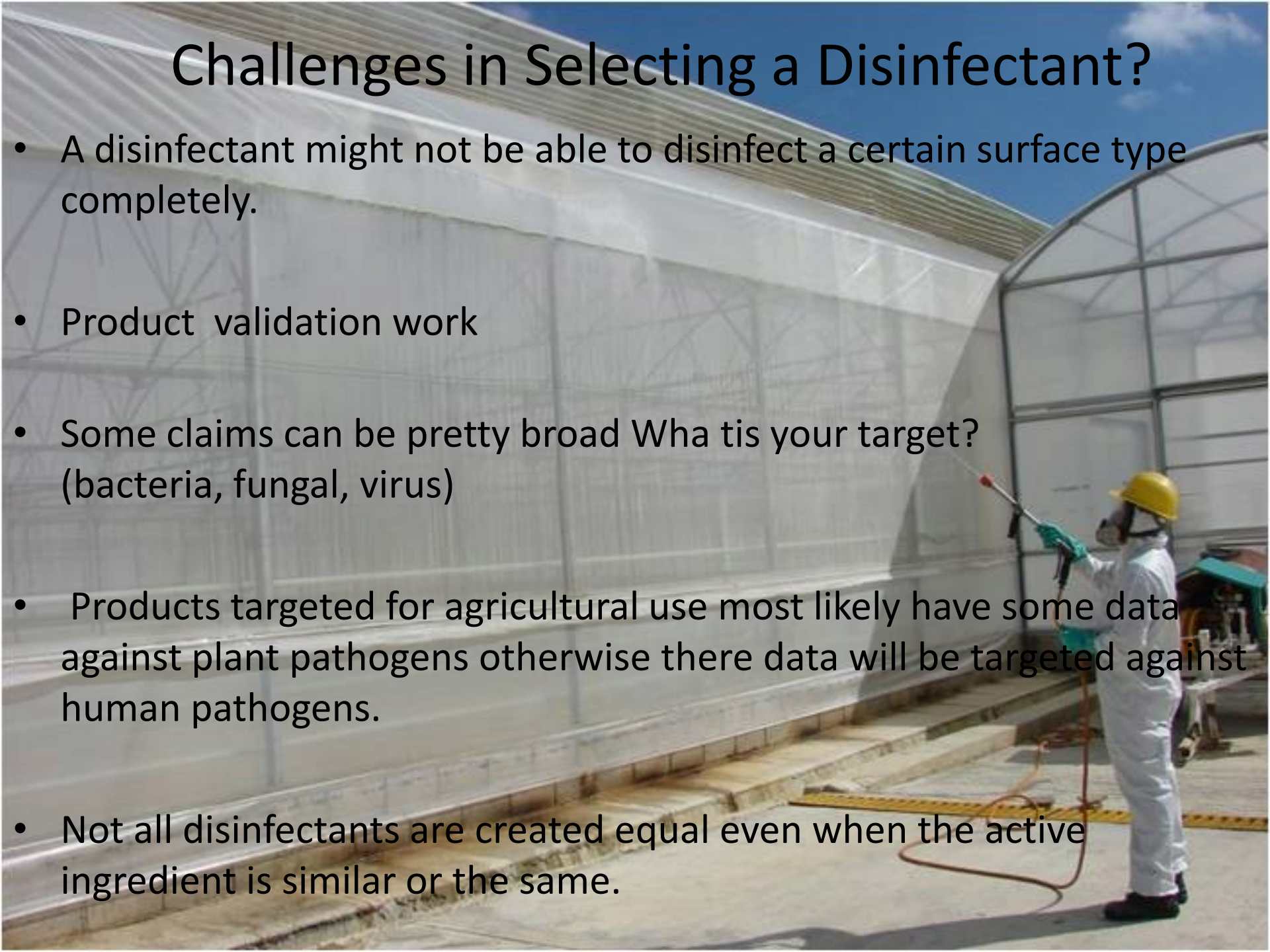
- **Active ingredient**: Potassium Monopersulfate (Oxone®) and Sodium Chloride (NaCl)
- Active against wide range of viruses and bacteria. Fungi less effective.
- Solution is not considered corrosive but the powder is corrosive avoid contact with metals.
- Not approved to be used on hands but shown to be non-irritating if incidental contact occurs.
- Fast acting

Alcohol

- ***ethyl alcohol and isopropyl alcohol*—**denatures proteins of microorganisms
- Ethyl alcohol, best at concentrations of 60%–80% (70-75% commonly used)
- is a potent virucidal agent
- Isopropyl and ethyl are effective in controlling bacteria too.
- Volatile - evaporates rapidly, making extended **exposure/contact time difficult** to achieve unless the items are immersed.

Challenges in Selecting a Disinfectant?

- A disinfectant might not be able to disinfect a certain surface type completely.
- Product validation work
- Some claims can be pretty broad Wha tis your target? (bacteria, fungal, virus)
- Products targeted for agricultural use most likely have some data against plant pathogens otherwise there data will be targeted against human pathogens.
- Not all disinfectants are created equal even when the active ingredient is similar or the same.



Challenges in Selecting a Disinfectant?

- Hygiene Program -Implement the use of a few different disinfectants

NO SILVER BULLET

- Some products have test kits to help you measure product activity (Physan 20,Kleengrow)

- Products targeted for hospital use are always a good starting point. Best to try and find ones targeting agricultural use.

"QUAT" Generations

Generation	Chemical Name (on product label)	Common Name
1st	Alkyl Dimethyl Benzyl Ammonium Chloride	ADBAC –lowest biocidal activity
2nd	Alkyl Dimethyl Benzyl / Alkyl Dimethyl Ethylbenzyl Ammonium Chlorides	2 ADBAC- closely related to 1st gen.
3rd	Dialkyl Dimethyl Ammonium Chloride	Dual Quats – increase biocidal activity (i.e Physan 20)
4th	Dialkyl Dimethyl / Alkyl Dimethyl Benzyl Ammonium Chlorides	Increase activity tolerates O.M. /hard water(i.e Kleengrow, Simple Green Pro 5)

5th - superior germicidal performance and used best under conditions where organic load is higher

Information from www.essind.com/FAQ/FAQDN-intro.htm

The chart below best illustrates the physical properties of various disinfectants:
Information from www.essind.com/FAQ/FAQDN-intro.htm

PROPERTIES	Quats	NaOCl	Iodine	Phenol
Affected by pH	No	Some	Yes	Yes
Corrosive to Equipment	No	Yes	Yes	Yes
Unpleasant Odor	No	Yes	Yes	Yes
Skin Irritant at Use Dilution	No	Yes	Yes	Yes
Cleaning Ability	Good	Good	Fair	Poor
Organic Soil Tolerance	Good	Poor	Poor	Poor
Hard Water Tolerance	Good	Poor	Good	Good
Stability / Shelf Life	V.Good	V. Poor	Good	Good
Toxicity	Moderate	High	Moderate	High

Hygiene Programs

- Identify target organisms
- Protective clothing (i.e. boots, eyewear, gloves, clothing)
- Target people working/visiting fields
- Equipment – especially if a field is suspected for a disease
- Seed Wash / Drying Areas – all tools and equipment used during the process.

POWER WASH HARVESTER and SEED WASHERS
Inspect and re-clean if Necessary.


4

Products shown to have good efficacy against Bacteria, Fungal and Virus Diseases (Solanum)

- Virkon S (Potassium peroxymonosulfate + NaOCl) – bacteria, virus
- Non-Fat Dry Milk – virus (3.5%protein)
- Lysol (all purpose cleaner)– bacteria, virus
- Kleengrow (Quaternary)– bacteria, fungal
- Green Shield (Quaternary) – bacteria, fungal
- Menno TerForte (Quaternary) bacteria, fungal
- Menno Florades (Benzoic acid) – bacteria, fungal
- Des-O-Germ (Quaternary)– bacteria, fungal
- Bioside – (Peroxy-acetic acid and hydrogen peroxide) bacteria, fungal
- Clorox / Bleach (10%)– virus , bacteria, fungal
- Physan 20, Simple Green Pro 5 (evaluation in progress)

Tomato SCRI Project – 2013 Tomato Disease Workshop – Evaluating disinfectants against viruses, viroids, bacteria and fungal pathogens in GH tomato. Baysal-Gurel (OSU), R. Li , K.-S. Ling (USDA-ARS), S. Miller (OSU)

Quiz Time!

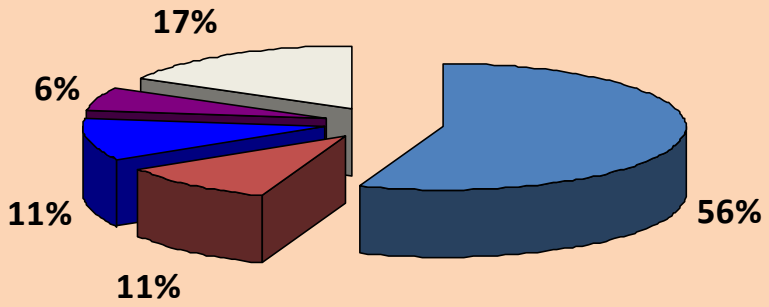
CGMMV /BFB

Cucumber Green Mottle is a very stable and easily transmitted virus?

100% ✓	A. True
0%	B. False

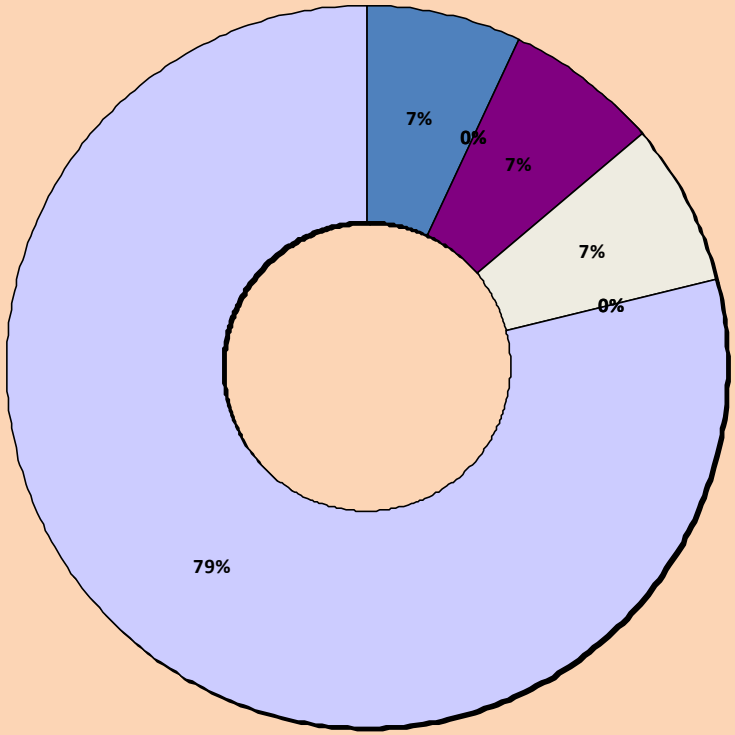
What kind of lighting condition favors CGMMV symptom expression?

A. Low lighting
B. High lighting
C. Winter conditions
D. Summer conditions
E. Lighting does not affect expression



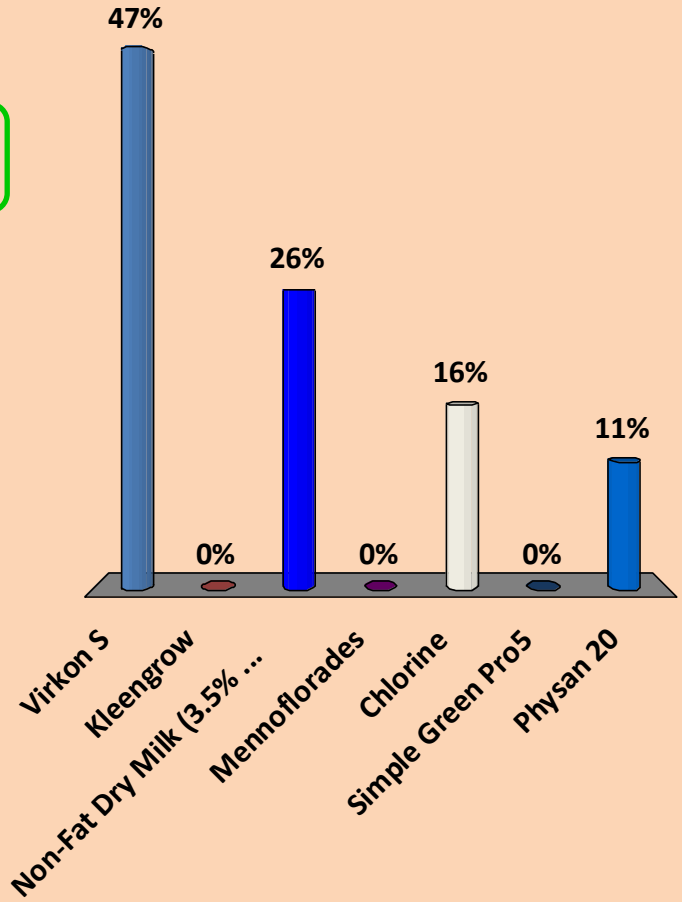
How can a Tobamovirus get Introduced?

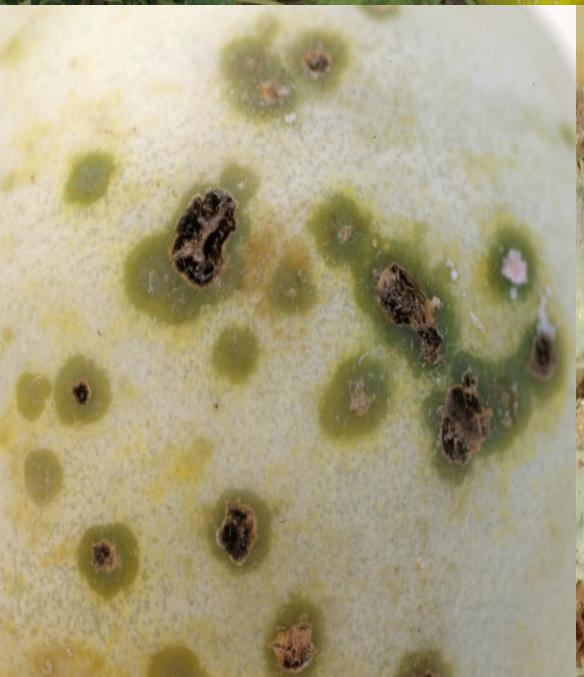
A. Transplants
B. Importation of plant materials
C. Contaminated soil /substrate
D. People
E. Equipment
F. Seed
G. Irrigation water
H. All of the above



Identify a disinfectant effective against viruses ?

A. Virkon S
B. Kleengrow
C. Non-Fat Dry Milk (3.5% protein)
D. Mennoflorades
E. Chlorine
F. Simple Green Pro5
G. Physan 20

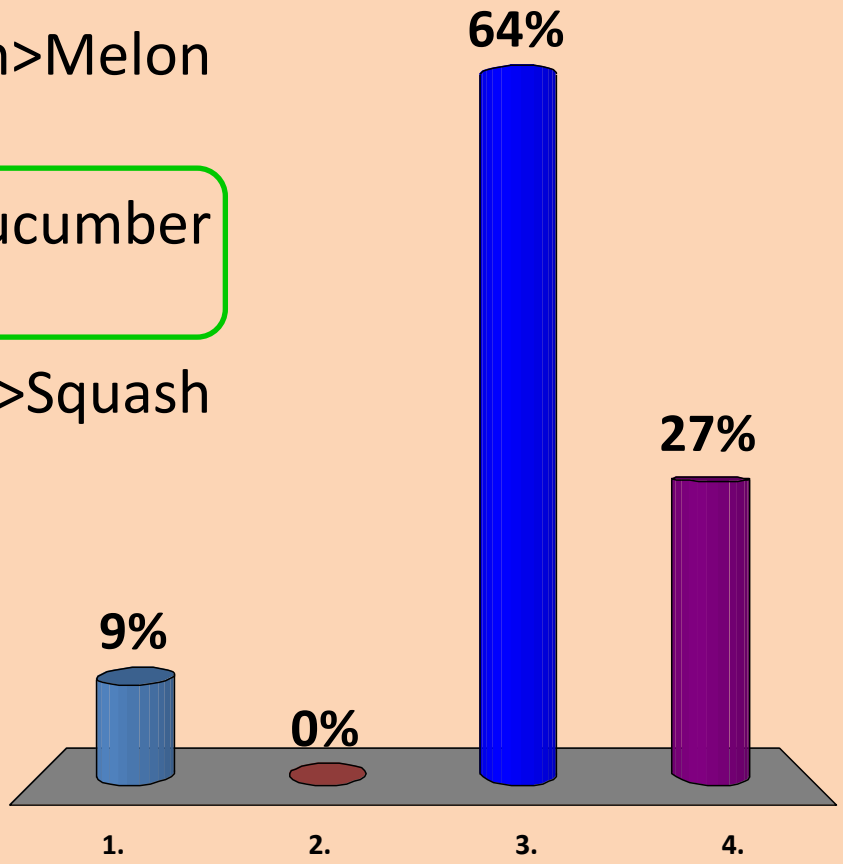





UGA - Ext. Plant Pathology

Rank the cucurbit crops by susceptibility to BFB (greatest to least)?

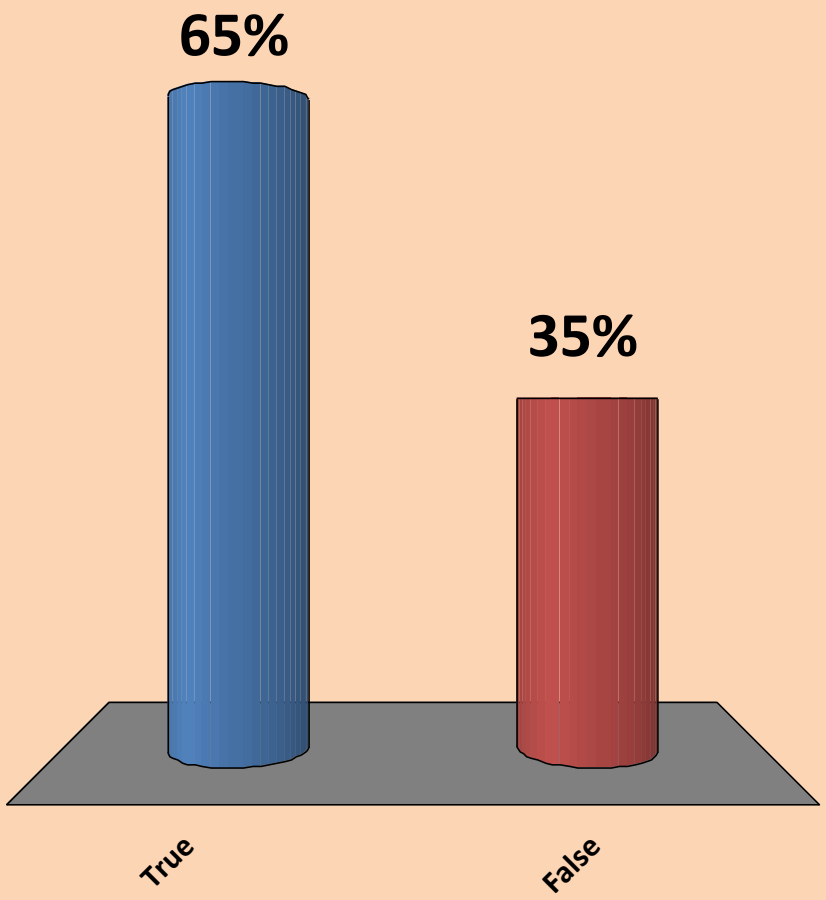
1. Melon>Cucumber>Watermelon>Squash
2. Watermelon>Cucumber>Squash>Melon
3. Watermelon>Melon>Squash>Cucumber
4. Watermelon>Melon>Cucumber>Squash



California's environment is not favorable for BFB to develop?

A. True

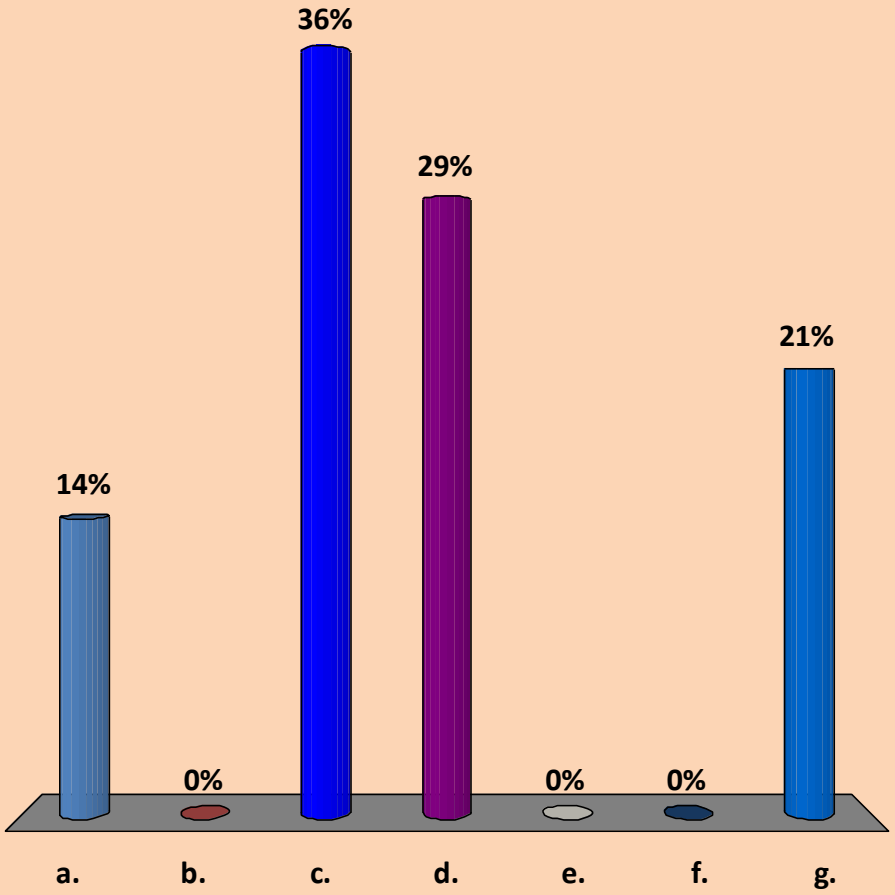
✓ B. False



People and Tools can spread bacteria:

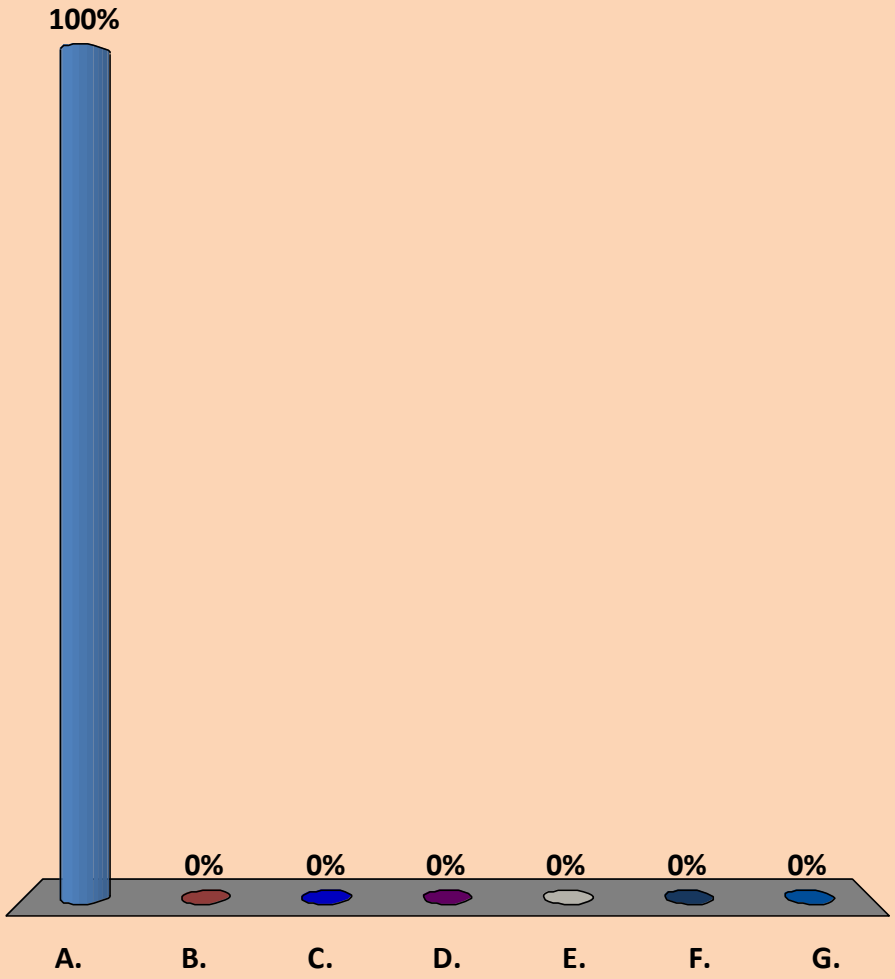
Choose the Disinfectants to control and prevent spread of bacteria (i.e. BFB)?

- ✓ a. NaOCl / CaOCl
- b. Non-Fat Dry milk (NFDM)
- ✓ c. Quaternary Ammonium
- ✓ d. Isopropyl or Ethanol 70%
- ✓ e. Soap (2%)
- ✓ f. Benzoic Acid – (Mennoflorades)
- g. Cupric sulfate



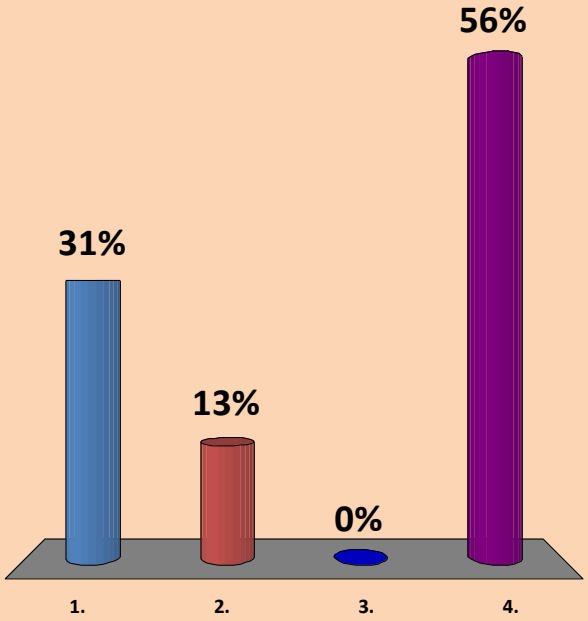
How can Bacterial Fruit Blotch be transmitted or moved about?

A. Bumble bees
B. Rain (overhead irrigation)
C. Workers
D. Mechanically
E. Seed
F. Equipment
G. All the above



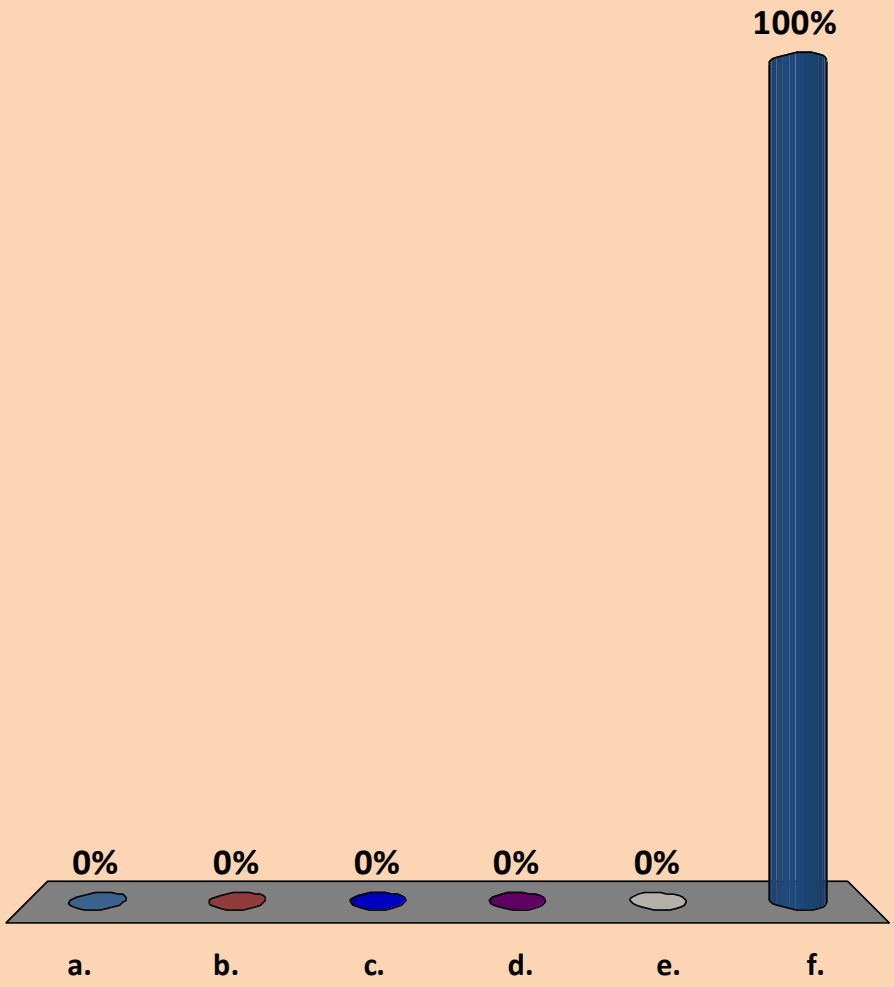
Which seedling photo is a symptom of BFB?

1. A
2. B
3. None of the above
4. All of the above ✓



What can you do to help diagnose BFB while inspecting your crops?

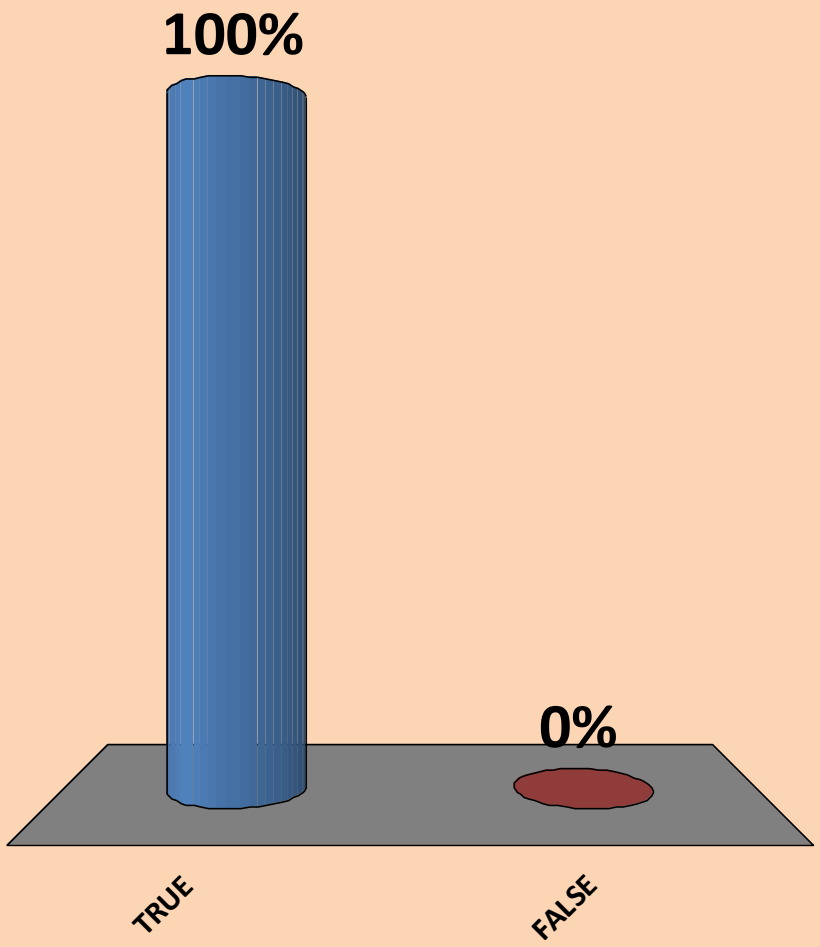
a. Test suspect with a field test kit (i.e. immunostrip).
b. Call Field pathologist /Extension specialist for support
c. Identify area where suspect was found in the field
d. Submit samples to a reputable lab.
e. Take photographs of suspect plant(s)
f. All of the above



Bacteria in general are easier to control with disinfectants than viruses?

✓ A. TRUE

B. FALSE



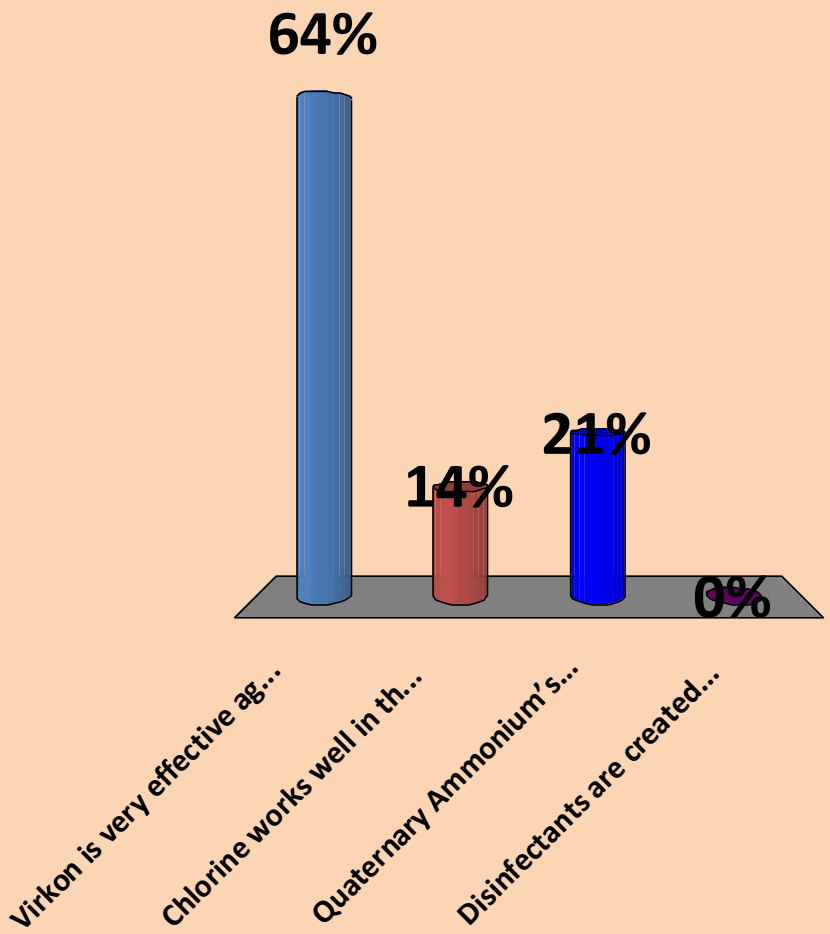
Which statement about Disinfectants are "TRUE"?

A. Virkon is very effective against bacteria and virus.

B. Chlorine works well in the presence of organic material

C. Quaternary Ammonium's are a biocide able to kill algae

D. Disinfectants are created equal.



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Cucurbit Disease Cards:

CGMMV

BFB

GSB

MNSV

SqMV