

# Tips and tricks for vegetable SEED SAVING

Presented by:

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# What is seed saving?

The act of preserving the reproductive material (seeds) of plants to be sown in subsequent years



Photo: <http://utahseed.blogspot.com/p/introduction-to-heirloom-gardening-and.html>

## Why do we save seeds?

- Preserve family varieties
- Maintain genetic diversity
- Cost savings

Why **shouldn't** we save seed?

## Diseases

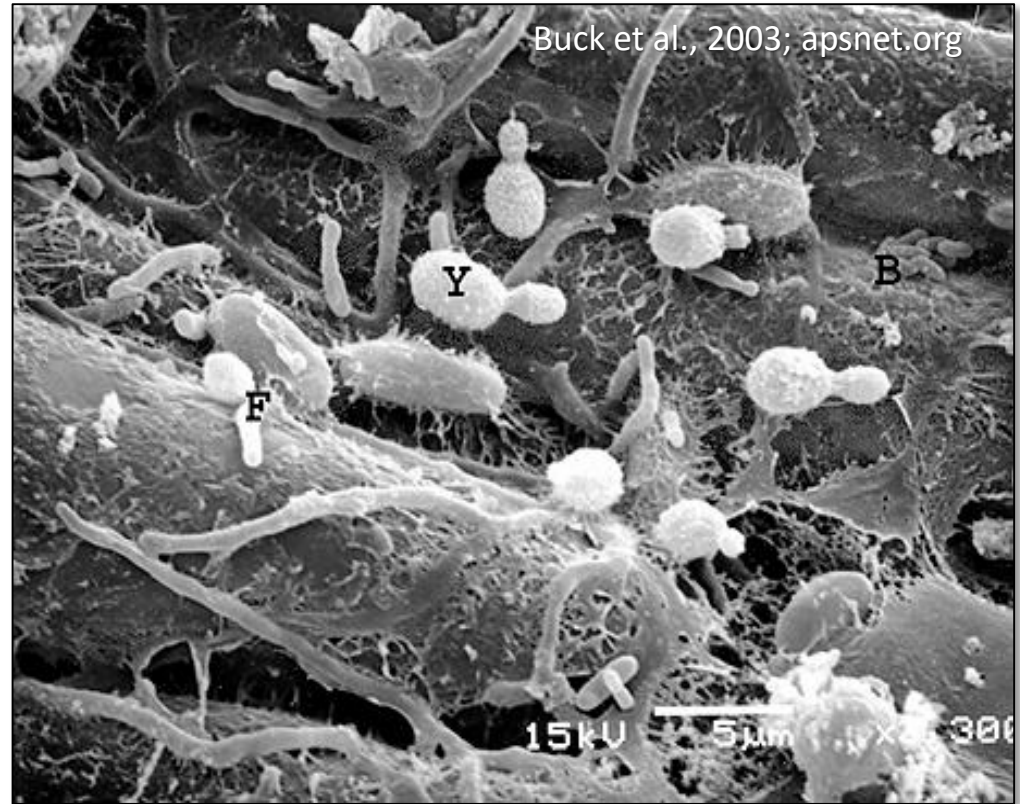
Fungal  
Bacterial  
Viral



Photo: <http://www.seedbuzz.com/knowledge-center/article/seeds-diseases-treatment>

# Seed-borne pathogens

- Diseases result from pathogen infection
- Pathogens can be on the surface or inside of seeds
- Diseases may be caused by fungal, bacterial, viral, or other pathogens





# Common fungal diseases of tomato that can be seed-transmitted



Kaiser, UK

Fusarium wilt



Septoria lesions on stem and leaves

Bachi, UK

5368790

Septoria leaf spot

# Common bacterial diseases of tomato that can be seed-transmitted



Photo: Seebold, UKY

Bacterial spot

Bacterial canker



Photo: Seebold, UKY

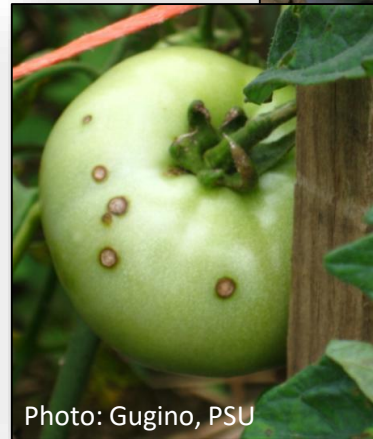


Photo: Gugino, PSU



Photo: Gugino, PSU

Bacterial speck



Photo: Seebold, UKY



# Common diseases of pepper that can be seed-transmitted



Photo: Seebold, UKY

Bacterial leaf spot



Photo: Parthasarathy Seethapathy, Tamil Nadu Agricultural University, Bugwood.org

Anthracnose fruit rot



# Common diseases of cucurbits that can be seed-transmitted

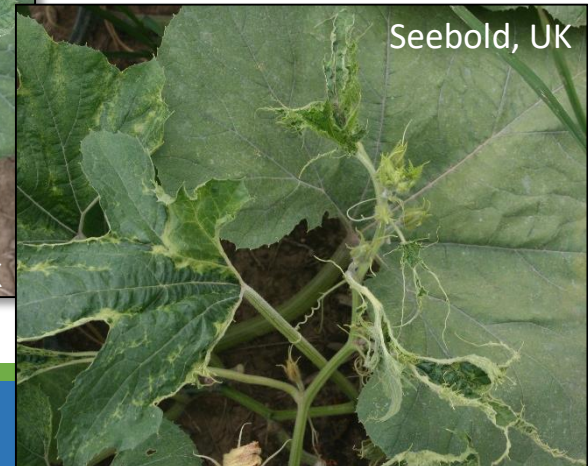
Bacterial fruit blight of watermelon



Anthracnose



Most viral diseases





# Common diseases of leafy greens that can be seed-transmitted



LaMarque and Bossennec, INRA

Lettuce mosaic virus



Spinach leaf spot  
(fungal)

du Toit, WSU, 2005



# Common diseases of legumes that can be seed-transmitted



Anthracnose

E. Bush, Virginia Tech



Many viral diseases



©R. Providenti



# Common diseases of onion that can be seed-transmitted



*P. ananatis*

Botrytis neck rot

Center rot (bacterial)



Chilvers and du Toit, 2006

# Common diseases of crucifers that can be seed-transmitted



Black rot  
(bacterial)



Alternaria leaf spot



NC State

Bacterial  
soft rot

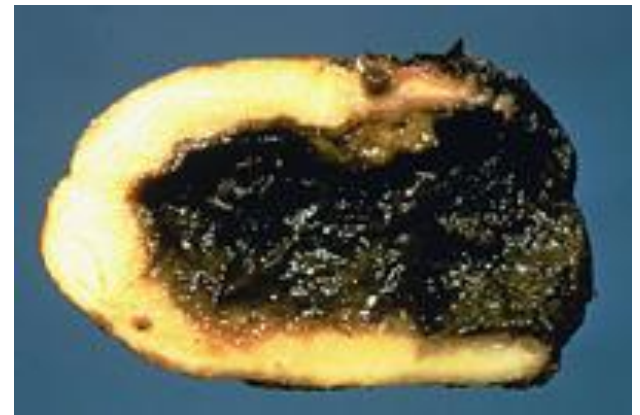


# How common is seed transmission?

Directly affected by how much disease is present in parent crop

## Common infestation rates

- 1.5 - 5% (bacterial spot of tomato and pepper)
- 27%+ (bacterial fruit blotch of watermelon)
- Potato black leg



Gitaitis and Walcott, 2007. Ann. Rev. Phytopathology.

# Selecting seeds to save

- Always save seeds from the highest quality produce



Photo: R. Gardner, NCSU



Photo: Seebold, UKY



# What else can we do to prevent seed diseases?

## Seed treatments



Photo: Joseph Berger, Bugwood.org

## What is seed treatment?

A process that utilizes chemicals or heat to eliminate some fungal, bacterial, and viral pathogens

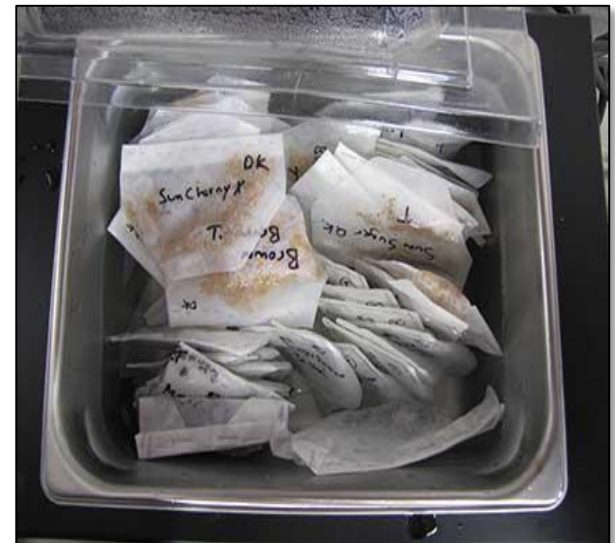


Photo: <http://vegetablemdonline.ppath.cornell.edu/NewsArticles/HotWaterSeedTreatment.html>

# Types of Seed Treatments

- Aerated steam
- Dry heat
- Electron microwave (<http://www.oired.vt.edu/ipmil/wp-content/uploads/2014/06/Seed-borne-fungal-pathogens-of-vegetable-crops.pdf>)
- Chemical treatment
  - Fungicide dusts
  - Pelleted seed
- Hot water treatment



<http://growappalachia.berea.edu/2011/11/18/pretty-in-pink-pine-mountain-maggie-ashmore/>



# Which seeds can be heat treated?

- Brussel sprouts
  - Broccoli
  - Cabbage
  - Carrot
  - Cauliflower
  - Celery
  - Chinese cabbage
  - Collards
  - Cress
  - Cucumber
  - Eggplant
  - Kale
  - Kohlrabi
  - Lettuce
  - Mint
  - Mustard
  - Onion (sets)
  - Pepper
  - Radish
  - Rutabaga
  - Shallot
  - Spinach
  - Sweetpotato
  - Tomato
  - Turnip
- Some you can't:**
- Beans
  - Peas
  - Most cucurbits
  - Potatoes

# Hot Water Treatment

## Materials needed

- Hot water baths
- Thermometers
- Coffee filters
- Pencil (for labeling)
- Stapler and Staples
- Tongs/Slotted Spoon
- Timer
- Paper towels
- Drying plates

| Crop                | Temp (°F) | Treat Time (min) |
|---------------------|-----------|------------------|
| Brussels sprouts    | 122       | 25               |
| Broccoli            | 122       | 20               |
| Cabbage             | 122       | 25               |
| Carrot              | 122       | 20               |
| Cauliflower         | 122       | 20               |
| Celery              | 118       | 30               |
| Chinese cabbage     | 122       | 20               |
| Collards            | 122       | 20               |
| Cress               | 122       | 15               |
| Cucumber            | 122       | 20               |
| Eggplant            | 122       | 25               |
| Kale                | 122       | 20               |
| Kohlrabi            | 122       | 20               |
| Lettuce             | 118       | 30               |
| Mint                | 112       | 10               |
| Mustard             | 122       | 15               |
| Pepper              | 125       | 30               |
| Radish              | 122       | 15               |
| Rutabaga            | 122       | 20               |
| Shallot             | 115       | 60               |
| Spinach             | 122       | 25               |
| Sweetpotato (roots) | 115       | 65               |
| (cuttings, sprouts) | 120       | 10               |
| Tomato              | 122       | 25               |
| Turnip              | 122       | 20               |
| Yam (tubers)        | 112       | 30               |



# Hot Water Treatment

- Benefits
  - Effective for internal and external pathogens
  - Chemical free
- Disadvantages
  - Does not protect plants once seeds have germinated
  - Can be time-consuming
  - Exact temperatures are necessary
    - Too low – pathogens are not killed
    - Too high – seeds may not germinate



# Hot Water Treatment

- Step 1: Prepare equipment

Begin heating water baths

- Heat at least one to 100°F
- Heat others to temperature specified for type of seed being treated

- Step 2: Prepare seeds



Put seeds to be treated into coffee filters and fold closed. Secure with staples. Label packet.



# Hot Water Treatment

- Step 3: Pre-heat seeds

Place seed packet into 100°F water bath for 5 minutes.

- Step 4: Hot water treatment

Place seed packet into second water bath for time specified for type of seed.



# Hot Water Treatment

- Step 5: Seed Storage
  - Ensure seeds are fully dry before storage
  - Place in storage containers (zip baggies, leftover washed prescription bottles, etc.) and place in cool dark place (fridge, cabinet in basement, etc.)
  - Do not treat seed more than once
  - For best results, use seed within same season of treatment



# Other treatments for seed savers

- Chlorine bleach
  - 1:4 solution of household bleach
  - Soak seed for 1 minute; rinse with fresh water
  - Immediate sowing recommended
  - **Effective only on external seed pathogens**
- Trisodium phosphate
  - 1:10 solution of TSP in water
  - Soak seed for 15 min; rinse with fresh water
  - Immediate sowing recommended
  - **Effective only on external seed pathogens**



# Success after seed treatment

Even though seeds have been treated they can still become infected once in the garden.



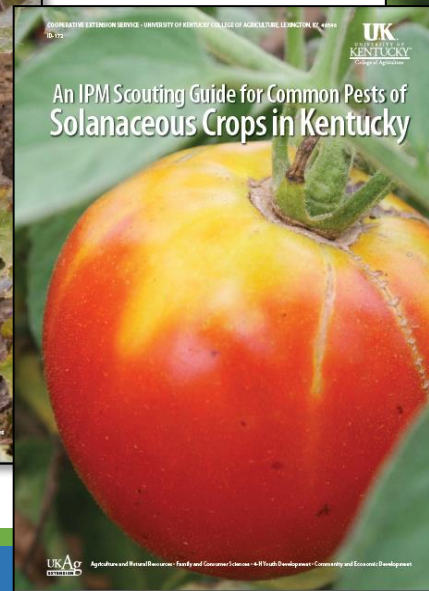
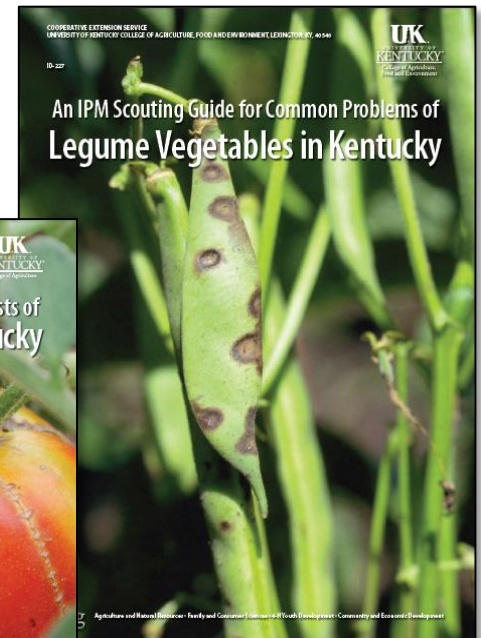
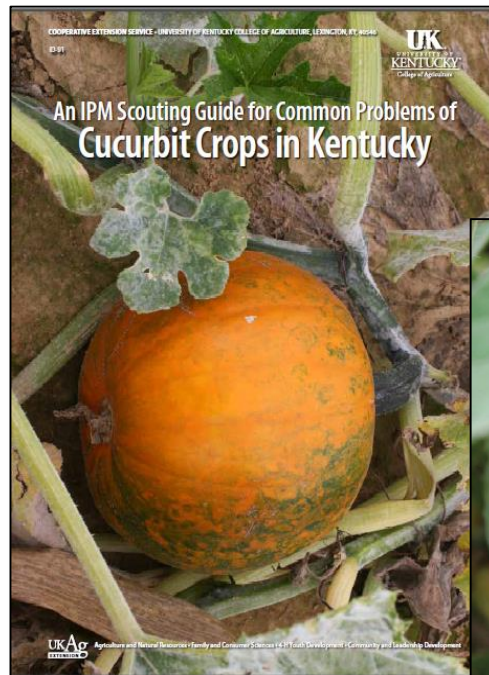
Photo: Dezene and Joyel Huber, [www.lifeunplugged.net](http://www.lifeunplugged.net)

- Steps to garden establishment that limit disease
  - Plant into warm soils
  - Good planting sites
  - Maintain plant health
  - Crop rotation
  - Manage weeds
  - Scout for disease

# Know where to get help

- County Extension Agent
- Scouting Guides
- Plant Pathology Publications

[www2.ca.uky.edu/agcollege/plantpathology/extension/pubs.html](http://www2.ca.uky.edu/agcollege/plantpathology/extension/pubs.html)



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Photo: <http://cdn.blogs.sheknows.com/gardening.sheknows.com/2010/12/colorful-fruits-and-vegetables.jpg>

#### References

- Managing Pathogens Inside Seed with Hot Water, Meg McGrath (Cornell University), Andy Wyenandt, and Kris Holstrom (Rutgers University), <http://vegetablemndonline.ppath.cornell.edu/NewsArticles/HotWaterSeedTreatment.html>
- Seed-borne fungal pathogens of vegetable crops, Barry J. Jacobsen, Montana State University, <http://www.oired.vt.edu/ipmil/wp-content/uploads/2014/06/Seed-borne-fungal-pathogens-of-vegetable-crops.pdf>