Pesky Garden Pests - Fruits and Veggies

Gary Fish
State Horticulturist
Maine Department of Agriculture, Conservation & Forestry
gary.fish@maine.gov
207-287-7545

Got Pests?

Japanese Beetle

Black Cutworm

Insects & Mites

Wildlife

Weeds

Pathogens

Powdery Mildew

Use IPM! Integrated Pest Management

1. Prevent Pests

2. Monitor & Identify

3. Use Combos of Anti-Pest Strategies

4. Keep Records

Pest Prevention: Select Plants Wisely

- **Right plant**, right place
- Pest resistant species and cultivars
- Plant certified seed
- Rotate crops from same plant family to different areas
- Remove sources of disease or pest transmission
- Look for alternate hosts

Pest Prevention: Provide Optimal Growing Conditions

- Do a soil test
- Fertilize and amend according to soil test results for nutrients, organic matter, pH
- Water where/when needed
- Plant at recommended time, soil temperature, depth, spacing.

Plant Disease Prevention

- Select disease resistant varieties
- Select good site (water drainage, good soil, full sun, air movement)
- Rotate annual crops

Plant Disease Resistance Codes

An alphabetical list of disease code acronyms used on our website and in our catalog.

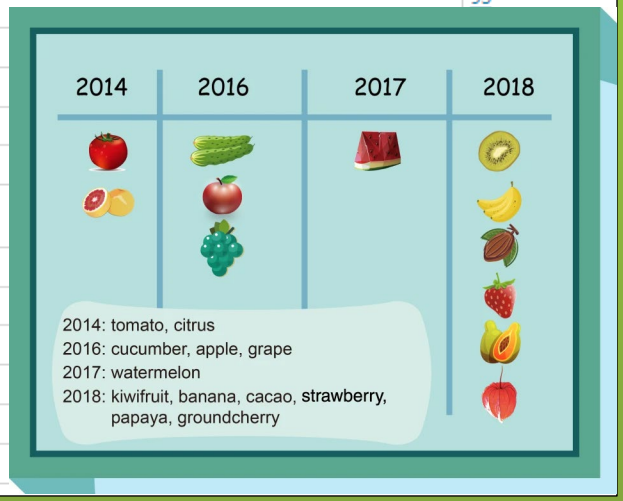
Note: HR = High Resistance IR = Intermediate Resistance

- **A** | Anthracnose | Fungus
  - *Colletotrichum lindemuthianum* (Bean)
  - *C. orbiculare* (Cucurbitaceae)
- **AB** | Alternaria Blight | Fungus | *Alternaria dauci* (Carrot) [See **EB** for Alternaria Blight of Tomato]
- **ALS** | Angular Leaf Spot | Bacterium | *Pseudomonas syringae* pv. *lachrymans* (Cucumber)
- **AS** | Alternaria Stem Canker | Fungus | *Alternaria alternata* f. sp. *lycopersici* (Tomato)
- **B** | Bacterial Wilt | Bacterium | *Erwinia tracheiphila* (Cucumber)
- **BB** | Bacterial Blight | Bacterium | *Xanthomonas hortorum* pv. *carotae* (Carrot)
- **BBS** | Bacterial Brown Spot | Bacterium | *Pseudomonas syringae* pv. *syringae* (Bean)
- **BLS** | Bacterial Leaf Spot | *Xanthomonas campestris* pv. *vesicatoria* (Pepper)
- **BMV** | Bean Mosaic Virus (Bean)

Don't be afraid of gene editing

Current applications of CRISPR-Cas9 in fruit crops

Crop species	Target genes	Target traits	Refs.
Resistance to biotic stresses			
Tomato	*CP* and *Rep* of virus	Resistance against tomato yellow leaf curl virus	83
Tomato	*DCL2*	Susceptibility to potato virus X, tobacco mosaic virus, and tomato mosaic virus	84,85
Tomato	*DMR6*	Resistance against downy mildew	86
Tomato	*MLO1*	Resistance against powdery mildew	87
Tomato	*PMR4*	Resistance against powdery mildew	88
Tomato	*Solyc08g075770*	Susceptibility to *Fusarium* wilt disease	89
Tomato	*MAPK3*	Susceptibility to gray mold disease	90
Tomato	*JAZ2*	Resistance against bacterial speck disease	91
Banana	ORF region of virus	Resistance against banana streak virus	92
Cucumber	*eIF4E*	Resistance against cucumber vein yellowing virus, zucchini yellow mosaic virus, and papaya ring spot mosaic virus	93
Grape	*MLO7*	Resistance against powdery mildew	
Grape	*WRKY52*	Resistance against gray mold disease	
Cacao	*NPR3*	Resistance against *Phytophthora tropicalis*	
Papaya	*alEPIC8*	Resistance against *Phytophthora palmivora*	
Citrus	*LOB1 promoter*	Resistance against citrus canker	
Apple	*DIPM1, 2, 4*	Resistance against fire blight disease	
Resistance to abiotic stresses			
Tomato	*BZR1*	Decrease in heat stress tolerance	
Tomato	*CBF1*	Decrease in chilling stress tolerance	
Tomato	*MAPK3*	Decrease in drought stress tolerance	
Watermelon	*ALS*	Resistance against herbicide	



https://www.nature.com/articles/s41438-019-0159-x

PLANT SPACING

Extra Large
1 Plant
Placed 12 inches apart:

Broccoli

Cabbage

Pepper

Large
4 Plants
Placed 6 inches apart:

Leaf Lettuce

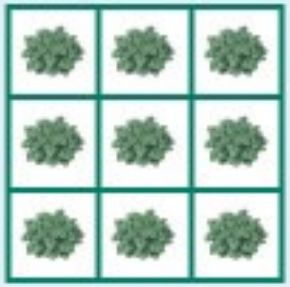
Swiss Chard

Marigold

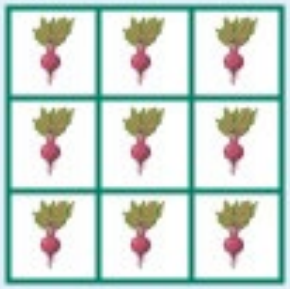
Medium
9 Plants
Placed 4 inches apart:

Bush Bean

Spinach



Beet

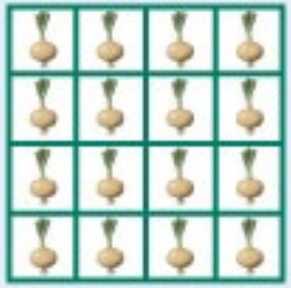


Small
16 Plants
Placed 3 inches apart:

Carrot

Radish

Onion

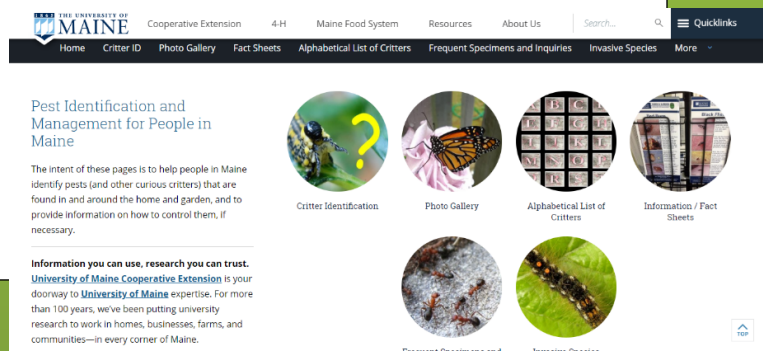


More Ways to Prevent Disease

- Mulch prevents rain-splash of soil-borne diseases
- ‘Rogue-out’ diseased plants
- Ensure plants get the right amount of sun, water, and nutrition.
- Control/prevent disease-vectoring insects such as aphids, thrips, leaf hoppers, cucumber beetle.

Monitor and Identify Pests and Beneficials

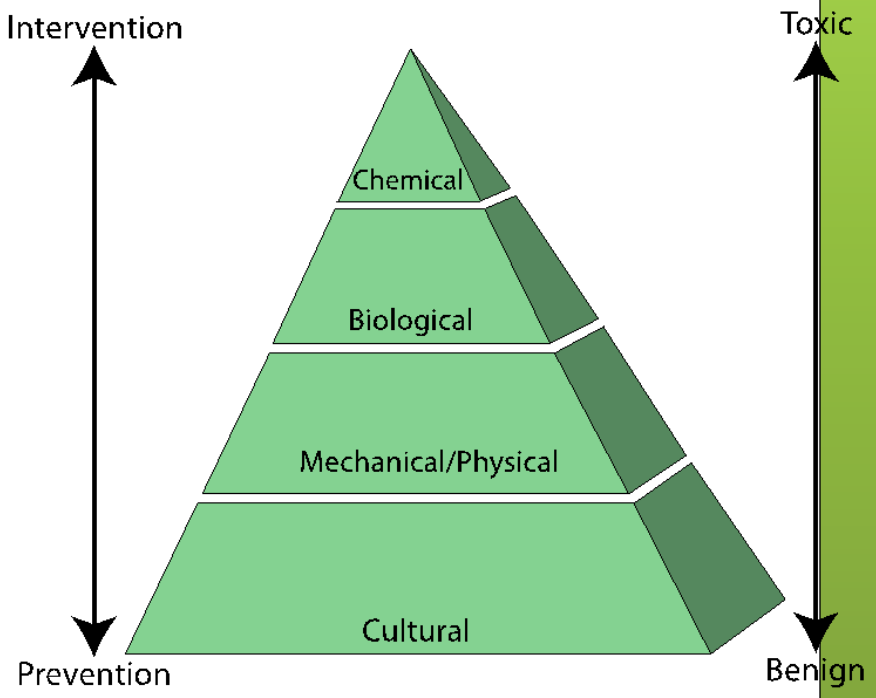
- Regularly inspect garden plants
  - Look for insects, damage, off-color, poor or distorted growth
- Send samples to UM Pest Management Office or local Extension office.
- Find identification resources in websites, books, fact sheets
  - www.GotPests.org
  - www.Bugguide.net
  - https://extension.umaine.edu/home-and-garden-ipm/



Use Combos of Anti-Pest Tactics

Outsmart pests by denying them access to food and habitat conditions they need using…

- Cultural tactics
- Physical tactics
- Biological tactics
- Chemical tactics



Physical Methods for Weed Suppression

- Sheet mulch
- Hand-pulling
- Shade them out with optimal plant spacing
- Shallow tillage

Pulling or weed whacking

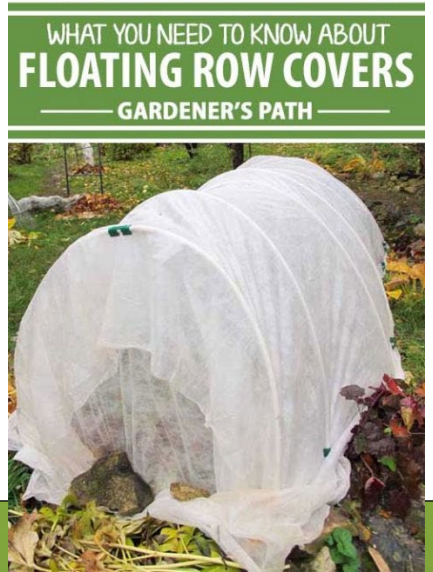
- Pull weeds when they are small
- Weed whack or mow before flowering or reproduction
- Know the weeds – Do not fragment stoloniferous or rhizomatous weeds like Japanese knotweed, quackgrass or bentgrass

Quackgrass

Japanese knotweed

Physical Control Methods for Insects and Vertebrates

- Exclusion: screens, row covers, fencing, netting
- Prune out infested branches
- Hand-pick bugs



Common Garden Pests and Solutions

Striped cucumber beetle

- Transplant cukes, squash, zucchini, pumpkins instead of direct seed
- Cover with spun-bonded row cover (example Remay, Typar) until flowering.

Avoid Late Blight

- Plant only certified potato seed
- Destroy any volunteer potatoes
- Plant only healthy tomato seedlings
- Bag infected plants. Have disease confirmed by Extension. Dispose of infected plant tissue. **Don't compost**

Slugs and Snails

- Control weeds
- Keep grass mown low or consider gravel strip around gardens
- Traps (beer cups, melon rinds or wooden boards)
- Copper foil ribbon around raised beds or pots.


Japanese Beetle


Cabbage Flea Beetle


Spotted and Striped Cucumber Beetles


Black Vine Weevil


Golden Tortoise Beetle


Lily Leaf Beetle


Rose Chafer

Japanese Beetle

- Select non-preferred shrubs and trees (avoid linden, roses, crabapples, grapes, raspberries)
- Hand-pick beetles (but leave the parasitized beetles)
- Cover susceptible plants with protective netting
- Grub Control: *Heterorhabditis bacteriophora* (Hb) nematodes. purchase on-line, water them in.
- Avoid Japanese beetle traps

Blackflies

Spotted wing drosophila

Apple Maggot

Diptera

flies

Where found:
Every habitat (except marine). Many are aquatic or semi-aquatic in larval stage.

Habits:

Maggots: Predators, fruit, root, stem & bud feeders, leaf miners.
Adults: nectar feeders, pollinators, scavengers, blood feeders

Iris Bud Fly

Prefers
Siberian Iris

Thrips and Mites

Piercing-Sucking Pests

- True bugs

True Bugs

- Many are plant sap feeders
- Some are predators
- Immatures=nymphs

Squash Bug

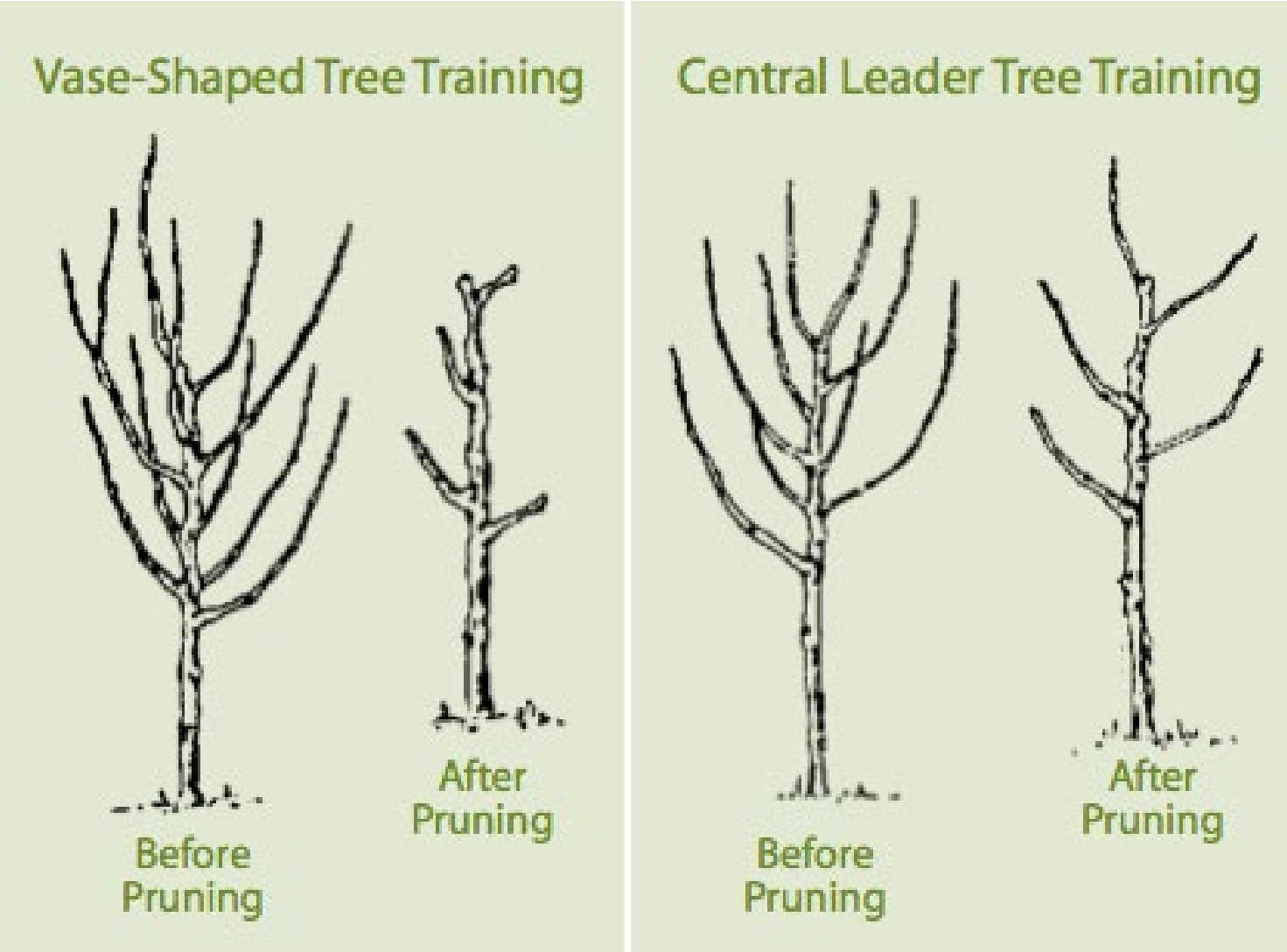
- Keep plants healthy with proper fertilization and watering.
- Remove or knock off nymphs and adults. Drop into pail of soapy water. Crush eggs (attached to the undersides and stems of leaves).
- Trap squash bugs: lay out boards or pieces of newspaper. In morning, collect and destroy bugs gathered underneath.
- Remove plant debris around the garden during the growing season to reduce the potential harborages where bugs hide.
- Clean up cucurbits and other plant matter around the garden in the fall to reduce the number of overwintering sites.

Apple scab

susceptible

resistant

Air circulation is essential



Where to learn more

https://weedecology.css.cornell.edu/index.php

Bacteria

Water splash is an important means of dissemination

Crown gall

Fire blight

Viruses

Many viruses are spread
by insects, some by seed
& most by vegetative cuttings

8. Keep a Garden Journal

- What varieties planted where? Draw maps.
- What pest problems encountered
- What control methods used and what were results
- Soil test results and amendments applied

Resources

- **Maine Department of Agriculture, Conservation and Forestry Plant Health Division**
  - **Apiary • Arborist • Ginseng • Horticulture • Hemp • IPM - Programs**
    207-287-3891
  - https://www.maine.gov/dacf/php/index.shtml
  - **Cooperative Extension: Insect Pests, Ticks, and Plant Diseases**
  - 207.581.3880 or 800.287.0279 (in Maine)
  - extension.diagnosticlab@maine.edu