Successful Heirloom Vegetable Production

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What is an Heirloom?

- Always open pollinated, never hybrids
- An “old variety”
- Must have a history of its own
Heirlooms Are Open Pollinated

**Open Pollinated** varieties:
- Have seeds that breed true ($F_1 = F_2 = F_3$)
- Are traditional varieties that have been selected for desirable traits over a long time
- Are often suitable for low-input production systems
- Can adapt to local ecosystems over generations
- Have little commercial incentive to produce new open pollinated varieties
Heirlooms Are Not Hybrids

**Hybrids** varieties:

- $F_1$ (first generation) offspring of two different but compatible parents
- Typically do not breed true, over time they will revert to characteristics of the parents
- Are often selected for shipping qualities
- Typical in high-input, commercial horticulture
Heirlooms are Old

- How old is old? Here are some opinions:
  - In production before 1950 (availability of hybrid seeds)
  - In production during the WWII Victory Gardens 1940’s
  - Traditional Native American crops (over 200 yrs old)
  - Old European crops (400 yrs old)

- Should varieties be excluded from Heirloom classification just because they were commercially successful?
Heirlooms Have History

- The tomato cultivar ‘Mortgage Lifter’ was developed in the 1930’s by “Radiator Charlie” Byles by crossing a variety of tomato cultivars with a German Johnson until he was happy.
- He sold the plants for $1.00 each, and paid off his mortgage.

From Living on Earth: www.loe.org
Heirlooms are Popular

Figure 1: San Francisco Chronicle and New York Times coverage, 1989–2005

J. Jordan. 2007.
What You Should Know About Heirlooms

• Require trial and error to produce consistent quality and yield
• Select varieties suited for our area
• Quirky growing characteristics
• Many varieties lack modern-day disease resistance
• Many varieties are indeterminate, and may have poor canopy cover
• Subject to physiological disorders
• Variable shape and soft skin make pack-out difficult
• Best for direct markets
Field Production

- Heat and high humidity facilitate the onset of disease.
- Lack of resistance exacerbates the problem, necessitating a number of preventative and curative sprays.
- For these reasons, drip irrigation is preferred vs. overhead.
Shade Houses
Shade Houses
High Tunnels
Greenhouses
Grafting

- Grafting provides site-specific management tool for soilborne disease
  - Bacterial Wilt (*Ralstonia solanacearum*)
  - Fusarium Wilt (*Fusarium oxysporum f.sp. lycopersici*)
  - Root-knot Nematodes (*Meloidogyne spp.*)
  - Verticillium Wilt (*Vertcillium dahliae (race 2)*)
  - Southern Stem Blight (*Sclerotium rolfsii*)

Rivard and Louws, NCSU
Grafting

- ~25 days early season extension with high tunnels.
- Total productivity was higher in the tunnel system.
- Beaufort and Maxifort show higher yields under no soilborne disease pressure.
Tomatoes
Physiological Disorders

- Catfacing
- Zippering
- Blossom End Rot
- Sun scald
Tomato
Tomato

- Large, red slicers are in demand
- Cherries, grapes require additional time and labor to harvest
- Varieties grown in Florida include:
  - Brown Betty (brown cherry)
  - Mortgage Lifter (giant red slicer)
  - German Johnson (red slicer)
  - Amish Paste (red-orange elongated)
  - Striped Roman (red w/yellow stripes plum)
## Taste Test Results of Three Heirloom Cultivars Produced in Spring 2007 at Live Oak, FL.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Treatments</th>
<th>Sensory quality</th>
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<td>Tomato flavor</td>
<td>Sweetness</td>
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<td>Cream</td>
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<td>Sausage</td>
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<sup>z</sup>Mean separation (in column) by Duncan’s Multiple Range Test (α = 0.05).
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<td>TTA(^y) (% citric acid)</td>
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\(^x\)Mean separation (in column) by Duncan’s Multiple Range Test (\(\alpha = 0.05\))
Take Home Message

- Recommended varieties for field production
  - Brown Berry
  - Cream Sausage
  - Juanne Flamme
- Recommended varieties for shade house production:
  - Brown Berry
  - Cream Sausage
  - Mortgage Lifter
- Anecdotally I have had good success with:
  - Tommy Toe
  - Yellow Pear
- Heirloom cultivars are suitable for direct market, but none would be suitable for large-scale commercial production.
Saving Seed

- All are capable of self-pollinating, but will also easily out-cross with insect assistance.
- Isolate by at least 500 feet, or cage.
- May need flower agitation or hand pollination.
- Bag individual flowers to prevent crossing.
Beans

- Thousands of cultivars with variations in – size, color, markings, and climate adaptability.
- Generally not cross-pollinated.

**Saving Seed**

- Separate plantings by enough distance to avoid vines from intertwining.
- Allow seed to mature thoroughly on the vine.
- Pull the entire plants and place them in shade to dry out for 1-2 weeks.
- Bring inside under a protected structure in case of rains.
- Shell and store in a cool, dry place. Preferably in paper bags.
- Bean and cowpea seeds keep for three or more years.
Lima/Butter Beans

‘Christmas Lima’ - does well in hot humid climates.

‘Jackson Wonder’ – drought resistant and does well in hot, dry conditions.
Pole, Snap, and Dry Beans

‘Cherokee Trail of Tears’ – these pole beans were carried by the Cherokee Indians on the ‘Trail of Tears’. Pods are purple in color and seeds are black in color.
Pole, Snap, and Dry Beans

‘Greasy Cutshort’ pole beans – these beans have shiny leaves, giving a greasy appearance. They are good for use as snap beans.
Pole, Snap, and Dry Beans

‘Jacobs Cattle’ – Originally from Germany. Pure white beans with deep maroon splashes are produced on 24” plants. Excellent for use in soups and baking.
Peas

- **Saving Seed:** Peas are handled the same way as beans.
- ‘Calico Crowder’ is a medium sized climbing pea.
- White with maroon splotches.
- Good fresh or dried
‘Pink-Eye Purple Hull’ Pea

- Has cream colored seeds with maroon eyes in pods which turn purple at maturity.
- Vigorous, heat loving and drought tolerant plants with little vining.
Heirloom Potatoes

- Come in different unusual colors, shapes and flavors.
- **Saving Seed:** Heirloom potatoes are saved from year to year as tubers.
- Easy to maintain and stay true to type.
‘Russian Banana’ Potato

- Fingerling Potato, thought to have originated from Russia.
- Yellow fleshed with waxy texture.
- Medium-sized, lavender-flowered plants are resistant to scab and somewhat resistant to late blight. Late maturity, good yield, stores well.
‘Yellow Finns’ Potato

- Exceptional buttery sweet flavor.
- This is the classic European gourmet potato.
- Good for boiling, mashing, frying or baking.
- Productive plants, tubers are spread out over larger area than most potatoes.
- Excellent keeper, 95-100 days.
‘Ruby Crescent Fingerling’ Potato

- Origin: Andes Mountains Heirloom.
- Ruby red skin with deep yellow flesh.
- Has small tubers, 2-3” long.
- Excellent grilled, sautéed, deep fried, boiled and roasted.
- Great in salads.
‘All Blue’ Potato

- Origin: Maybe US or the UK in the late 1900s.
- Very uniform, oblong to oval shape.
- Deep purple skin with netted texture.
- Flesh is purple streaked with white and its defining characteristic, a white ring beneath the skin.
- Excellent for steaming, mashing, microwaving, brightly colored salads. Keeps color when cooked.
- Moderately resistant to late blight, hollow heart, second growth, shatter bruise, PVA, PVM, PVX, PVS.
- Susceptible to PVLR, PVY, common scab, bacterial ring rot, black leg, golden nematode Ro1.
‘All Blue Potato’
Squash and Pumpkins

- Exception to the open pollinated feature of heirlooms.
- Squash and pumpkins readily cross pollinate. Offspring are nothing like the parent plants.
- No cross pollination between different species.
- **Saving Seed:** Grow only one variety of the same species. Separate by ½ mile radius or hand pollinate to maintain seed purity.
- Commonly grown species: banana, buttercup, cushaw and hubbard squash; butternut squash; acorn, crookneck, scallop squash, zucchinis, and most pumpkins.
‘Cushaw Green-Striped’ Squash

- Upto 20" long, and weigh 10-20 lbs.
- The pumpkins have a long curved neck.
- The skin is white with green stripes and has thick yellow flesh.
- Good for pies and baking.
- Drought tolerant and stores well.
Cinderella Pumpkin

- French heirloom pumpkin.
- Fruits are deeply ridged, exceptionally flattened, burnt orange to red, 1-2 feet across, and weigh 25-35 lbs.
‘Connecticut Field’ Pumpkin

- Origin: Grown by the North American Indians prior to European settlement.
- Globe shaped deep orange yellow pumpkins.
- Flesh is yellow, thick, coarse and stringy.
- Good for making canned pumpkin or baking.
‘Small Sugar’ Pumpkin

- An older, smaller variety of the Connecticut Field pumpkin.
- Sweet, tasty pumpkins 9-10” in diameter. 8-10 lbs in weight.
- Good for making pies.
- Deep orange-yellow skin. It is very fine-grained, sweet and sugary, and keeps well.
- Prolific bearer.
Lettuce

- Grown in Egypt by about 4500 BC.
- **Seed Saving:** Largely self-pollinating, as flower opens.
- Can be insect pollinated, chance of cross-pollination by neighboring varieties not well known.
- Cage to ensure complete purity, or stagger planting times.
- USDA recommends 12 feet between varieties.
Lettuce Varieties

- Amish Deer Tongue
- Australian Yellowleaf
- Baby Oakleaf
- Bronze Arrowhead
- Bunte Forellenschuss
- Buttercrunch
- Crisp Mint
- Flame
- Gold Rush
- Green Oakleaf
- Lollo Rossa
- Mascara
- Merveille des Quatre Saisions
- Pablo
- Pirat
- Red Coral
- Red Leprechaun
- Red Rapids
- Red Romaine
- Red Salad Bowl
- Red Velvet
- Rubin
- Slobolt……..
Pest Control
Tobacco Hornworm

White diagonal lines on abdomen
Red dorsal horn on tip of abdomen
Tomato Pinworm

- Small caterpillars that cause leaf and fruit damage
- Cause injury similar to leaf miners
- Cause pin size holes in fruit which can lead to secondary infection
Tomato Pinworm
Tomato Fruit Worm

- Also known as corn earworm
- Prominent yellowish or orangish head
- Body has small dark bumps
- Usually brown and green, sometimes pink, yellow and bronze
Cabbage Looper

- 1 to 1.5 inches long
- Thin white lines along the side of body
- Cabbage “loops” when it moves
Beet Armyworm
Yellow Striped Armyworm

- Beet armyworm originally from SE Asia
- Newly hatched larvae are pale green
- As they mature become darker on top
- Yellow striped armyworm Native to N. America
- Mature larva have dark brown stripe surrounded by 2 yellow bands
Leaf Footed Bug
Stink Bug

- Leaf footed bus have a stripe across elytra
- Stink bugs can be green or brown
- Both are piercing-sucking insects
- Both are usually not a serious problem
- Large populations can cause premature fruit drop and leaf wilting
- Can spread plant viruses
Aphids

- Piercing-sucking insects
- Various colors
- Can cause serious leaf damage
  - Leaf necrosis, rolling, stunting, wilting
Insecticides

Nature and the pesticide industry apparently have decided that the best way to poison an animal is through its nervous system.

-Daniel Shankland (1976)
Control

- **Caterpillars**
  - Bt, Spinosad, Pyrethroids, Acetamiprid, or Carbaryl

- **Leaf footed bugs/stinkbugs**
  - Again, only a problem in large numbers
  - Pyrethroids, Carbaryl, Malathion

- **Aphids**
  - Neem oil, Horticultural oils, Insecticidal soaps
  - Neonicotinoids
  - Pyrethroids
  - Malathion
Bt (Group 11)

- Approved for organic production
- Fermented spores and crystalline delta endotoxins of *Bacillus thuringiensis*
- Stomach activity only, insect must ingest insecticide
- Effective on the caterpillars with high gut pH
  - Good, most of the destructive caterpillars have high gut pH
- Most common strains, *Bacillus thuringiensis* spp *kurstaki* and *Bacillus thuringiensis* spp *aizawai*
- Causes gut paralysis and ruptures stomach wall
- Only affects larval lepidopteron insects
- Very low mammalian toxicity
- Low impact on beneficial insects
Spinosad (Spinosyns A&D) (Group 5)

- Most formulations are approved for organic production
- Generic, many brand names
- It is a fermented metabolite of the bacteria *Saccharopolyspora spinosa*
- Nerve toxin
- Low mammalian toxicity
- Low impact on beneficial insects
- Contact and stomach activity
- Caterpillars (worms), thrips, leafminers, and Colorado potato beetle
- Very low use rates
  - 18-40 grams per acre
Pyrethrin (Group 3)

- Most formulations are approved for organic production
- Extracted from chrysanthemum flowers
- Very fast acting, contact activity
- Low mammalian toxicity
- Nerve toxin
- Axonic poison: sodium channel blocker
- Broad spectrum: effective against every known crawling and flying insect
- **VERY HARD ON BENEFICIAL INSECTS**
Neem Oil

- Oil from the seeds of the neem tree (*Azadirachta indica*)
- Insect growth regulator, interferes with the juvenile molting hormone
- Very low mammalian toxicity
- Very effective against aphids, scales, and other soft body insects
- Has stomach and contact activity
- Low impact on beneficial insects
Horticultural Oils

- Similar to neem oil in effectiveness
- Works against aphids, scales, and other soft-bodied insects
- Contact activity
- Smother insects
- Low impact on beneficial insects

**All horticultural oils including neem oil can burn foliage if temperatures are too high**

- Spray in evening or early morning
- Low impact on beneficial insects
Carbamates (Group 1A)

- Not approved for organic production
- Derived from carbamic acid
- Only 1 left for homeowner use: Carbaryl sold as Sevin®
- First invented in 1956
- Contact activity, nerve toxin
- Synaptic poison: cholinesterase inhibitor
- Low mammalian toxicity
  - Mammals can quickly metabolize carbaryl and break it down, insects cannot
  - Other carbamates can be extremely toxic
- Very broad spectrum
- **VERY HARD ON BENEFICAL INSECTS**
Organophosphates (Group 1B)

- Not approved for organic production
- Only 1 left for homeowner use: malathion
- Contact activity, Nerve toxin
- Similar to the carbamates: synaptic poison cholinesterase inhibitor
- Low mammalian toxicity
  - Mammals can quickly metabolize malathion and break it down, insects cannot
  - Most other organophosphates are extremely toxic
- **VERY HARD ON BENEFICAL INSECTS**
Neonicotinoids (Group 4A)

- Not approved for organic production
- Two products for homeowner use: Imidacloprid and Acetamiprid
- Systemic, moves in xylem tissue of plant
- Modeled after natural nicotine
- Nerve toxin
- AChE mimic, targets insects synaptic ganglion
- Moderate mammalian toxicity
  - Neonicotinoids target neural pathway that is more abundant in insects

**CAN BE TOXIC TO BEES DEPENDING ON RATE, TIME OF DAY, AND HOW IT IS APPLIED**
Fungicides

- Copper (organic)
- Sulfur (organic)
- Mancozeb
  - Dithane® and many other brand names
- Chlorothalonil
  - Daconil®, and many other brand names

- All are protectant fungicides
  - Must be applied preventatively
  - Sulfur and chlorothalonil can cause severe leaf burns if applied under very hot conditions
  - Excessive copper application can cause toxic levels to build up in the soil
Additional Resources

- Southern Exposure Seed Exchange
- Grafted heirloom tomatoes produced in high tunnels
  http://www.cefs.ncsu.edu/PDFs/Grafting%20and%20High%20Tunnels%20Heirloom%20fact%20sheet.pdf
- Growing Bell Peppers under shade
  http://edis.ifas.ufl.edu/hs368
- UF-IFAS Small Farms website
  http://smallfarms.ifas.ufl.edu/
- University of Kentucky publication – Heirloom Vegetables
  http://www.uky.edu/Ag/NewCrops/introsheets/heirloom.pdf