Garlic Festival! Schedule

- Growing Gourmet Garlic – Patrick Byers
- Health Benefits of Garlic – Pamela Duitsman
- Garlic tasting – roasted and fresh garlic, as prepared by Kelly McGowan
- Visit the garlic store – purchase garlic bulbs and support our garlic project
Growing Gourmet Garlic in Missouri

Patrick Byers
Regional Horticulture Specialist
MU Extension – Greene County
Interesting Quotes

• "What garlic is to salad, insanity is to art." Augustus Saint-Gaudens, ‘Reminiscences’

• "Three nickels will get you on the subway, but garlic will get you a seat."
  New York (Yiddish or Jewish ?) saying.

• "There is no such thing as a little garlic."
  Arthur Baer

• "Shallots are for babies; onions are for men; garlic is for heroes."
  unknown
Interesting Quotes

• “Tomatoes and oregano make it Italian; wine and tarragon make it French. Sour cream makes it Russian; lemon and cinnamon make it Greek. Soy sauce makes it Chinese; Garlic makes it good.”

- Alice May Brock (of “Alice’s Restaurant” fame)
Interesting Quotes

• “We season our garlic with food.”

Stinking Rose Restaurant
San Francisco, CA
My Thanks

• **Bob Kipfer**, garlic beacon
• **Eric Fitts**, director of Bethlehem Farm and the source of much of my garlic
• **Katie Peregoy**, partner in garlic
• **Tim Peregoy**, garlic guru
Outline

• Introduction to garlic
• Garlic classification
• Choosing planting stock
• Garlic cultural practices
• Weed and pest management
• Garlic harvest and storage
• Marketing garlic
Introduction to Garlic
Introduction to Garlic

- Garlic is native to central Asia, and has been cultivated for five millennia
- Grown for culinary, medicinal and religious purposes
- Botanically, garlic is *Allium sativum* L.
  - Softnecks: *Allium sativum* var. *sativum*
  - Hardnecks: *Allium sativum* var. *ophioscorodon*
Introduction to Garlic

- Garlic terminology
  - Bulb
  - Clove
  - Scape
  - Bulbil
  - Bulb wrappers
  - Bulb plate
  - Roots

Diagram courtesy of Jim Anderson
Filaree Farms, Okanogan, WA
Introduction to Garlic

- Leading US state in garlic production is California (87%), followed by Nevada and Oregon.
- Annual per capita garlic consumption is 2.0 lbs and increasing...

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* = Unofficial figure | [] = Official data | A = May include official, semi-official or estimated data
F = FAO estimate | Im = FAO data based on imputation methodology | M = Data not available
Source: UN Food & Agriculture Organisation (FAO)
Introduction to Garlic

- Garlic is a growth industry
  - affinity for its flavor
  - promotion of the health benefits of garlic
    - Antibiotic effects
    - Antioxidant effects
    - Reduction of cholesterol
    - Reduction of blood pressure levels
Introduction to Garlic

• Ideal Growing Environment
  – Moderately cold winter
  – Good snow cover
  – Adequate fall and spring moisture
  – Warm (not hot) and dry June and July
  – Direct sunlight and low humidity
  – Light sandy loam soil with good drainage
  – No plant competition
Introduction to Garlic

• Labor - Intensive and Extensive
  – Hand “crack” seed cloves
  – Hand plant - “basal root plate down”
  – Hand weed, hand weed, hand weed, ...
  – Removal (topping) of scape (stem)
  – Hand harvest and “hang” for curing
  – Hand clean, remove excess stem and roots
  – Hand sort for seed stock
Garlic Classification

- Porcelain
- Creole
- Hard Neck
- Purple Stripe
- Rocambole
- Soft Neck
- Turban
- Artichoke
- Silver Skin
Softneck Garlic

- Generally do not form scapes
- Many cloves per bulb
- Tighter clove skins
- Generally longer storage life than hardnecks
- Grow better in warmer climates than hardnecks
- Can be planted mechanically
- Flexible stalk allows for braiding
- Most commercial garlic is of this type
- Latest classification (2003) – 2 varietal groups
  - Artichoke
  - Silverskin

Diagram courtesy of Jim Anderson, Filaree Farms, Okanogan, WA
Artichoke

- Common type in markets
- Bulb wrappers coarse and thick
- Adaptable, easy to grow
- 3 to 5 clove layers containing 12 to 20 total cloves; inner cloves are smaller
- Clove skins adhere fairly tightly, one reason for their long storage life.
- Very vigorous and large bulbed.
- Flavor ranges from mild to full flavored
- Some Artichoke strains produce large round, symmetrical bulbs, others have a knobby, asymmetrical appearance.
- 1 pound of cloves will produce approx 90 plants
Artichoke
Silverskin

- Softneck
- Easily braided
- Late harvest season
- Longest storage potential
- Bulb wrappers fine, smooth, and white
- 12-20 cloves per bulb; 3 clove layers are common; inner cloves are smaller
- Lots of variability in this group in flavor
- Widely adapted as a group, do well in a wide range of climates, hot southern, wet maritime, and cold northern climates as well.
- Plant growth is more upright than other types.
- One pound of seed garlic will very roughly produce 90 plants
Silverskin
Hardneck Garlic

- Produce scapes and bulbils
- Few and larger cloves per bulb
- More uniform sized cloves
- Clove skins easier to remove
- More variation in taste characteristics
- Generally shorter storage life than softnecks
- Adapted to cool growing conditions
- Latest classification (2003) – 8 varietal groups
  - Rocambole
  - Purple types – stripe, mottled, glazed
  - Porcelain
  - Turban
  - Creole
  - Asiatic
Rocamboles

- Hardneck
- Thin bulb wrappers
- 7-9 clover per bulb
- Strong, rich, deep flavor
- Best in cold climates
- Short storage potential
- Scapes form complete double loop
- 1 lb of cloves will produce approx. 60 plants
Rocambole
Purple Stripe, Mottled, Glazed

- Hardneck
- Thick, vividly striped outer wrappers
- 8-12 cloves per bulb
- Widely adapted
- Rich flavor, often mild; excellent baked
- Scapes make 270° curl
- Midseason harvest time
- Medium storage time
- 1 lb of cloves will produce approx. 60 plants
Purple Stripe, Mottled, Glazed
Porcelain

- Hardneck
- Thick bulb wrappers
- Large, fat cloves; 4-8 per bulb
- Rich flavor, often hot tasting
- Late harvest
- Good storage potential
- Very hardy, adaptable, best in northern areas
- Scapes coil in many directions
- 1 lb cloves will produce about 40 plants
Porcelain
Turban

- 5-7 fat cloves per bulb
- May not have a scape
- Pungent flavor
- Scapes form upside down U
Creole

- White bulbs wrapper, reddish clove wrappers
- 8-12 cloves per bulb
- Flavor that is full but not hot
- Small bulbs
- Best in warm climates
Elephant Garlic

- Related to leek
- Culture is similar to garlic
- 4-6 large cloves per bulb
- Mild flavor
- Produces scapes
Choosing Planting Stock
Choosing Planting Stock

- Cultivar characterizations are not standardized
- Choose cultivars adapted to the region
Choosing Planting Stock

• If saving cloves to plant:
  – Select large, undamaged bulbs at harvest
  – Proper storage of bulbs for seed cloves
    • 50°F
    • 55-65% RH
  – Select the largest cloves for planting
  – Examine and discard any diseased or soft cloves; in particular watch out for garlic bloat nematode
Garlic Cultural Practices
Garlic Growth Cycle

- Planting
- Dormancy
- Plant growth resumes
- Harvest scapes
- Harvest bulbs
- Curing
- Bulb storage
- Plant growth

www.gardenswag.com
Soil and Fertility

- Soil – soil test is helpful
  - Well drained
  - Friable – adequate organic matter is important
  - pH of 6.5-7.0

- Fertility management
  - 50 lbs/acre N at planting (1.7 oz/100 ft²)
  - 50 lbs/acre N at emergence in spring
  - 50 lbs/acre N in early June
  - Other nutrients as indicated by soil test
Planting Garlic

- Plant in the fall 4-6 weeks before freezing temperatures; September is best time in Missouri
- Spring planting is possible; spring planted garlic should be stored under refrigeration for at least 8 weeks prior to planting, and should be set as early in the spring as possible
- Break bulbs into cloves no more than a few days before planting
- Avoid planting doubles, and do not damage cloves when breaking
- Select large, healthy cloves from large, healthy bulbs
Planting Garlic

• Plant cloves vertically, with basal root plate down
• Plant 2-3 inches deep, space 4-6 inches apart in the row (depending on cultivar)
• Planting plan can be a single row, double row raised beds, or dense beds (8” apart in dense beds)
• If planted in rows, space rows 12-18 inches apart
Irrigation

- Consider straw mulch
- Irrigate as indicated by weather
- Irrigate until the bulbs reach desired size, and there are 2-3 mature scales surrounding the bulbs
- Do not irrigate once tops begin to dry
Scape Removal, Bulbils

- Positive yield response if scapes are removed
- Cut scapes when they reach the coil stage
- Bulbils are formed at the top of the scape, or on the stem; bulbils may be used to propagate garlic
Weed and Pest Management
Weed Management

• Major issue for garlic production
• Both cool season and warm season weeds are an issue
• Weed impact
  – Direct competition
  – Increase risk of diseases
  – Slows the drying of foliage in advance of harvest
  – Harvest is more difficult
Weed Management

• Cultural control with cultivation
  – Must be shallow to avoid root damage
  – Hand weeding is used
• Mulching is helpful
• Flaming is helpful before emergence
• Herbicides are available
Disease Management

• General thoughts
  – Rotate garlic planting locations annually
  – Use only disease tested cloves if purchasing seed stock
  – Check all cloves saved for seed stock carefully for disease signs and symptoms
  – Soak cloves in advance of planting
    • 16 hours in 1 gal water + 1 tbsp baking soda + 1 tbsp liquid seaweed, followed by
    • 3-4 minutes in alcohol
White Rot (*Sclerotium cepivorum*)

- **Symptoms**
  - Leaves decay at base, turn yellow, and die
  - Roots rot

- **Controls**
  - Clean seed stock
  - Clean soils

Basal Rot (*Fusarium culmorum*)

- **Symptoms**
  - Preemergence decay of cloves and seedlings
  - Stem plates and leaves may decay
  - Postharvest decay

- **Control**
  - Rotation
  - Clean soils
  - Proper curing and storage of bulbs

http://utahpests.usu.edu/uppdl/htm/recent-pests/diseases-diagnosed-in-may-2011#Basal_Rot
Bloat Nematode
(Ditylenchus dipsaci)

• **Symptoms**
  – Stunted plants that die prematurely
  – Cloves and bulbs become shrunken, soft, and decay
  – Absence of roots

• **Control**
  – Plant clean seed
  – Sanitation

http://umaine.edu/publications/1205e/
Other Diseases

• Blue mold rot
• Leaf blight
• Neck rot
• Viruses
Insect Pests

- Bulb mites
- Thrips
- Wireworms
- Grasshoppers

http://www.imagejuicy.com/images/plants/o/ononis/11/
Garlic Harvest and Storage
Harvesting Garlic

• Scapes will be ready for harvest around Memorial Day, when fully extended but before heads open
• Green garlic may be harvested at any time once the bulbs are large enough
Scapes
Harvesting Garlic

• Garlic bulb harvest in Missouri is in late June-August, depending on the cultivar
• Harvest decisions are based on the drying of the foliage; dig when ½ to ¾ of the lower leaves are brown (5-6 upper leaves should be green)
• If left in the ground too long the wrappers will begin to break down, leaving a naked bulb (especially the hardneck types); the bulb may start rotting
• Digging garlic is done by hand in Missouri, using care to avoid bruising or cutting the bulbs
• Shake off soil, leaving roots and tops intact
Harvesting Garlic
Harvesting Garlic

Note that the bulb wrappers have disintegrated – this garlic was harvested too late.
Harvest

• Curing
  – Wash bulbs in advance of curing if needed; avoid washing if possible
  – Cure in a shady, well ventilated area; bundle and hang, place loosely in mesh bags, place on trays, or hang in mesh fence.
  – Provide for good air movement – critical! Forced air can be helpful
  – Curing is complete when the stems are dry, generally 2-4 weeks after digging
  – Once cured and dried, remove tops (leave 1” of stem) and cut roots to ½”
Harvest

Curing the bulbs
Harvest

Trimmed bulbs
Harvest

• Storage
  – Depending on the type, garlic can be stored for up to 12 months at 30-32°F and 60-70% RH
  – Many cultivars will store up to 7 months at 55-58°F and 55-60% RH

• Yields of softneck types can range up to 18,000 lbs per acre; yields of hardneck types are generally lower
Marketing Garlic
Marketing Garlic

• Garlic bulbs
  – Pricing ranges from $1-$2 per bulb or higher at farmers market
  – Interest in “gourmet garlic”, especially hardneck types

Marketing Garlic

- Scapes
- Green garlic
- Garlic sprouts

Marketing Garlic

• Value added
  – Garlic braids and wreaths
  – Dried garlic
  – Garlic infused salts
  – Pickled garlic
  – Garlic as a cut flower
One More Interesting Quote

- "Garlick maketh a man wynke, drynke, and stynke."
  Thomas Nash, 16th Century poet
Any Questions?

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http://extension.missouri.edu/greene/HorticultureProgramminginGreeneCounty.aspx