Tomato Production-
More Than You Ever Wanted to Know
Lycopersicon esculentum

• Nightshade: potatoes, peppers, eggplant
  – Tender, warm season perennial grown as annual
• Planted in 95% of American gardens
• Most popular garden vegetable in Arkansas
• Many varieties and types
Tomatoes – The Benefits

Lycopene
Vitamins
Minerals
Anti-oxidants
Recommending Soil Amendments for the Garden

- Agricultural Limestone to Raise soil pH
- Sulfur to Lower soil pH
- Gypsum pH neutral
- Poultry Litter
- Cover Crops
- No saw dust!
Blossom End Rot – Calcium Deficiency
pH of Soil

- Low soil pH leads to poor growth, blossom end rot of fruit and interveinal chlorosis of oldest leaves.
- Mn and Al toxicity, leaf burn and poor plant growth.
pH of Soil

- When the soil pH is too low
- Manganese and Aluminum are toxic
- Phosphorus, Magnesium & Calcium are unavailable
Preplant Fertilizer

- Preplant application $\frac{1}{4}$ to $\frac{1}{2}$ of total N
- As 50% NH$_4$ 50% NO$_3$ forms
- Apply fertilizer according to the use demand of the plant
- All PO$_4$ and ½ of K at recommended rates.
- Band fertilizer on opposite side of the row from drip tape
Use A Transplant Starter Solution

- 1 Tbs. of a soluble fertilizer high in Phosphorus
- In 1 gallon of water
- Apply 1 cup of solution per plant
- 1-1-1
Transplanting

• Use 8oz of starter solution per plant at transplanting.
• Starter solution- high in PO$_4$ stimulates root growth
• 8-34-16 or 10-20-10 at 200 ppm PO$_4$
Drip Irrigation

• Water usage is more efficient
• Improved fertilizer application efficiency
• Precise timing of fertilizer application when the plants need it
Tomatoes – The Variety
Tomato History

- From South America, used by 600 AD
- Aztec Word for Tomato is Xiotomate
- Seed taken to Southern Europe by 1519 AD
- Grown in England by Patrick Bellow 1554
- First Considered Poisonous
- Culinary Use by 1650?
- Seed Sent to N. America 1750
Things That Go Wrong

- Diseases
- Insects
- Environmental Disorders
- Physiological Disorders
Early Blight - Tomato
Root Knot Nematodes
TSWV- Tomato
The Secret of the Good Life

“Home Grown Tomatoes”
Home Grown Tomatoes
Fruit Set and Growth

• Tomatoes have perfect flowers
• Tomatoes are self pollinating
• Pollen formation above 72 deg night temperature is inhibited.
• Flowers need movement to release pollen.
• 95% of cells in tomato are present when the flower is pollinated
Start With a Flower
Young Fruit

- Fruit Growth is by cell expansion. 95% of the fruit’s cells are present when the flower opens.
Cat Facing, Cold Damage
Tomato Milestones

• M. Mahon, American Gardener’s Calendar includes tomatoes in 1806
• Thomas Jefferson grew and ate them 1781 to 1809.
• Tomato Catsup invented 1812
• Col. Robert Johnson ate a bushel of tomatoes in 1820 in Salem NJ and Lived!
• 1876 H. & J Heinz start selling Tomato Ketchup and the modern era begins.
Planting Tomatoes

• Soil Temperature needs to be 60 deg F
• Hardening Plants – the truth!
• Plant a little deeper than root ball.
• Don’t let the roots dry out!
• Fertilize with 8 oz. of starter solution.
• (1 Tbs 10-20-10 soluble fertilizer in a gallon of water.)
Check Soil Temperature 2 inches deep at 10:30 am
Tomato Milestones

• Landreth’s Seed Company est 1784 - one of the first to sell tomato seeds.
• Seed sold in Paper Packets - Shakers 1850
• Wide spread Use by 1890
• Taken to the Supreme Court and Declared a Vegetable. 1893. Nix vs. Hedden
• Declared a vegetable by USDA 1981!
• Tomato Seeds in Space 1984
Starting Transplants
Home Tomato Production
Choosing Transplants
Economical Hot Caps-
The New Cloche
Tomato Trivia

• The tomato is a fruit-- Berry
• New World crop from Peru
• Grown by over 90% of Gardeners
• Grown by Thomas Jefferson at Monticello in 1781
Determinate Tomato Growth

- Determinate plants top out with flowers and quit growing.
- Indeterminate plants continue to set leaves and flowers.
Fruit Ripening

• Fruit ripening is initiated by plant hormone called ethylene. $\text{C}_2\text{H}_2$
• Ripening starts at the blossom end and progresses to stem end.
• Fruit ripen best at 72-76 deg F
• Color, softening, and sugar/acid balance are independent but happen at same time.
Fruit Ready to Ripen
Fruit Ripening – Genetic Manipulation

• Flavr-Savr Tomato
• Anti-sense ethylene gene
• Ethylene Generators
Spring Tomatoes

- 4 or 5 clusters of fruit
- 4 to 5 fruit per cluster
- Fruit will set until night temperatures are greater than 72 degrees
Fertilizing

• Preplant: 1 lb / 100 sq ft of a complete fertilizer (13-13-13).

• Transplanting: One cup of starter fertilizer solution per plant (1 Tbs of 20-20-20 per gallon solution)

• After 1st cluster of fruit has set: Side dress each plant with 1 Tbs of a complete fertilizer (13-13-13). Repeat every 3 weeks.
Determinate Tomato Growth

- Determinate plants top out with flowers and quit growing.
- Indeterminate plants continue to set leaves and flowers.
Indeterminate Tomato Growth

- Indeterminate plants keep growing.
- Indeterminate plants continue to set leaves and flowers.
Pruning Staked Tomatoes
Single Stem Plants

• Identify Axillary Shoots
• Pinch Them Out When They are 2” Long
• Do Not Pinch out Flowers
• Determinate Cultivars Need Less Pruning
• Indeterminate Cultivars Need Multiple Prunings
Pruning Tomatoes
Harvest

- Fruit forms at the base of flower
  - Cell division finished, fruit growth=cell growth
- Flower to ripe fruit: 2 months
- Pick when pink, ripen indoors
  - Out of sun
  - Best 70-75
Insects
Horn Worm

• Hawk Moth or Sphinx Moth
• Eats leaves quickly
• Use Dipel, Thuricide, Bt to control
Tomato Fruit Worm

Moth lays egg at top of plant, larvae hatch, move on to fruit
Spray insecticide weekly ex: Sevin
Stink Bug Damage
Disease Control

• Bacterial – Do not over use uncomposted organic material. Sawdust, litter. Use copper compounds as a bactericide.

• Fungal - Use Mulches to separate plants from soil. Use copper compounds. Use bicarbonate solutions on leaves. Use a fungicide such as Daconil.

• Virus - Resistant cultivars and sanitation
Disease Codes

- V- Verticillium Wilt
- F- Fusarium Wilt
  - (FF- Races 1&2, FFF- Race 3)
- N- Nematodes
- Tobacco Mosaic Virus
- A- Alternai Stem Canker
- St- Stemphylium Gray Leaf Spot
Fusarium Wilt

- Leaves yellow, wilt, then die
- Prevention: Resistant varieties
Grafting Tomatoes for Resistance
Septoria Leaf Spot
Early Blight
Curly Top Virus

- Beet leafhopper
- Leaf curling, stunting, chlorosis and purpling
Fruit Rot - Anthracnose
Physiological Disorders
Blossom End Rot
Magnesium Deficiency
Phosphorus Deficiency
Fruit Cracking
Cat Facing

- Cold damage
Leaf Roll

Excessive moisture or pruning
2-4 D or CMV
Home Tomato Production Types and Cultivars

- Large Fruited or Salad Tomatoes
- Small Fruited or Cherry Tomatoes
- Processing, Plum and Saladette
- Specialty Types
Abraham Lincoln

- 78 days
- 10 oz fruit
- Red round fruit
- Good yields
- Great flavor

Yields per plant:
Fayetteville  15.1 lb
Kibler       12.8 lb
Better Boy VFNAS\text{t}

- 75 Days
- Indeterminate
- Heavy Foliage
- Widely adapted

Yields per plant:
- Fayetteville: lb
- Kibler: lb
Celebrity
VFFNTASt
- 70 Days
- AAS
- 7 oz globe shape
- Semi-Determinate plant

Yields per plant:
Fayetteville 11.3 lb
Kibler 15.5 lb
Mountain Spring VF

- 72 Days
- Cracking and BER resistance
- Determinate plant

Yields per plant:
Fayetteville  10.3 lb
Kibler      8.6 lb
Amelia

- 80 Days
- TSWV
- F3
- Crack tolerant
- Determinate
- SE USA
Dona VFFNT

- 65 days
- Deep red
- Excellent balanced flavor

Yield per plant:
- Fayetteville 13.9 lb
- Kibler 12.9 lb
Bradley

- Arkansas Variety
- 80 day
- Determinate
- 7 oz Pink
- Fusarium Wilt Resistance
- Prone to cracking
- Great flavor

Yield per plant:
Fayetteville 8.9 lb
Kibler 8.5 lb
Traveler 76

- Arkansas Variety
- 78 day
- 6 oz Pink
- Heat & Drought Resistant
- Less cracking than Bradley
- Great flavor
- BER Fayetteville
Dr. Tomato – Joe McFerren
Traveler 76
Ozark Pink

- Arkansas Variety
- 80 day
- 7 oz Pink
- Heat resistant
- Great flavor
- BER Fayetteville

Yield per plant:
Fayetteville 9.2 lb
Kibler 11.0 lb
Arkansas 7985

- Arkansas processor
- 2-3 oz round fruit
- Firm fruit
- Thick wall and skin
- Resistant to fruit rot
- Good flavor
- BER-Both
Amish Paste

- 74 days
- 8 oz meaty fruit
- Indeterminate plant
Red Potato Leaf
F 2.5 lb/plant
K 9.3 lb/plant

Red Regular Leaf
F 5.8 lb/plant
K 12.2 lb/plant

Yellow
F 6.5 lb/plant
K 5.8 lb/plant

Brandywine
• 90-100 days
• over 1 lb
• ‘Best flavor’
• Potato or regular vines
• Original - pink (red, yellow, black)
• Cracks, catfacing, irregular shape
Persimmon

- 80 days
- 1-2 lb fruit
- Few flaws in fruit
- Big, tall plants
- Heavy yields
- Meaty fruit
- Excellent flavor
Green Zebra

- 75 days
- 3 oz striped fruit
- Green flesh
- Plants have good cover
- Great tangy flavor
- BER - Both
Cherokee Purple

• 90 days
• 10 oz fruit
• Purple skin
• Red flesh
• Cracking
• Green shoulders
Sweet 100

- 65 Days
- 1” Cherry fruit
- Indeterminate
Juliet

- 60 Days
- AAS
- Large grape
- Indeterminate plant
Grape

- 60 Days
- Elongated cherry
- Heat tolerant
- Crack resistant
Tomatoes in the Future

• From past to the future
• Gaius Plinius Secundus  0077
• Stephen Hawking  2007