Small Fruit Production

Mike Reeves, Regional Extension Agent, Commercial Horticulture

"Locally Grown"

- Increased Consumer Demand for locally grown fruits and vegetables.
- Farmers Market Nutrition Program
- "Locavores"

Fruits Produced Commercially in Alabama

- Strawberries
- Blueberries
- Blackberries
- Muscadines
- Peaches/Nectarines
- Plums
- Apples
- Pecans

Some fruits require intensive management

Examples:

- Apples
- Peaches and Nectarines
- Bunch Grapes

Some fruits require less intensive management

Examples:

- Blueberries
- Figs
- Muscadines
- Blackberries

Fruitfulness and Pollination

- Self-pollination
- Cross-pollination
- Perfect-flowered

- Peach, fig, strawberry
- Apple, blueberry
- Peach, some muscadines


Strawberry Production
Mike Reeves
Regional Extension Agent
Commercial Horticulture

Current Strawberry Production in Alabama

- Many ½ to 2 acre growers. Some 5 acre plus.
- Local markets or u-pick

Strawberry growing systems

- Raised bed plasticulture system
- Matted row system

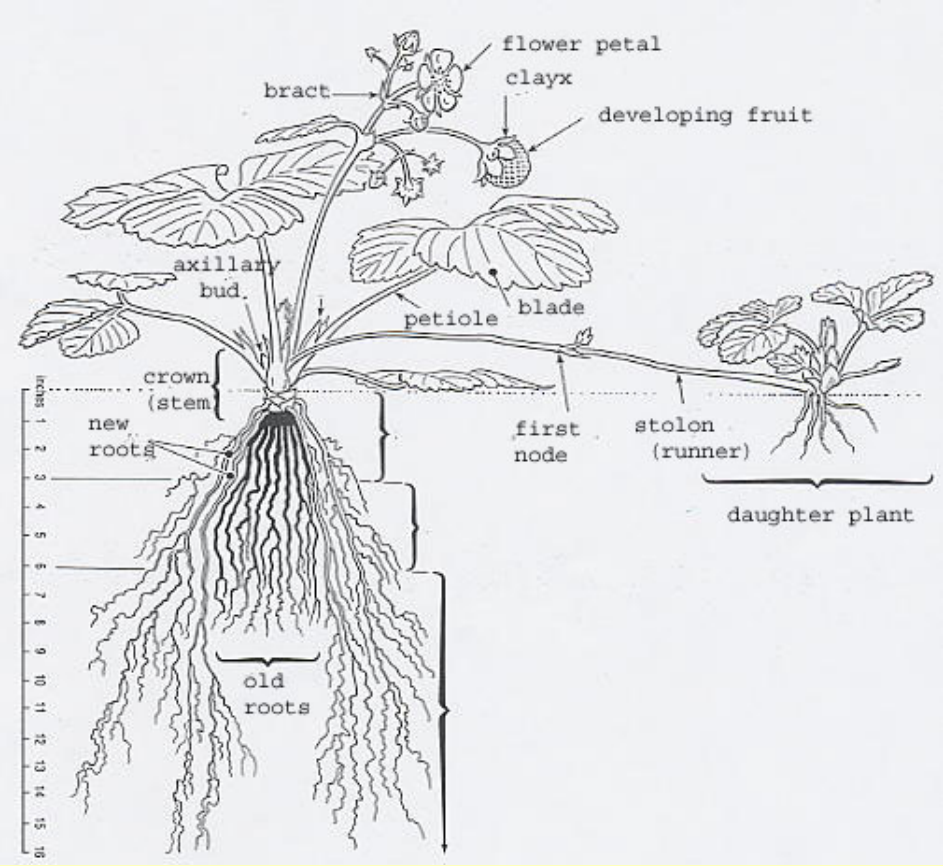
Matted Row

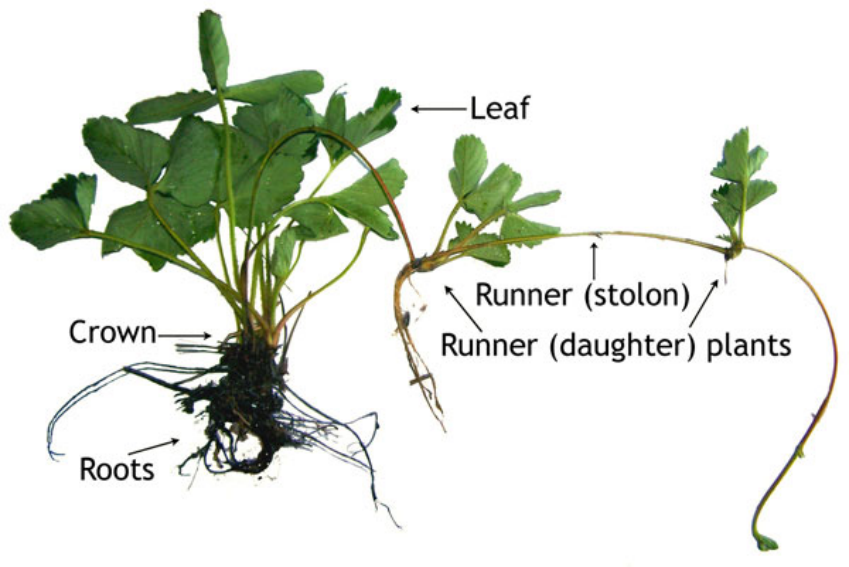
- Plant dormant plants in late winter.
- Grow "daughter" plants the first year.
- Harvest the following spring.
- Renovate the bed after harvest
- Good for three or four years
- Plants readily available to gardeners

Raised bed Plasticulture

- Plant actively growing plants in October.
- Harvest the following spring.
- Destroy planting after harvest.
- Varieties hard to get for the homeowner.

The Strawberry Plant





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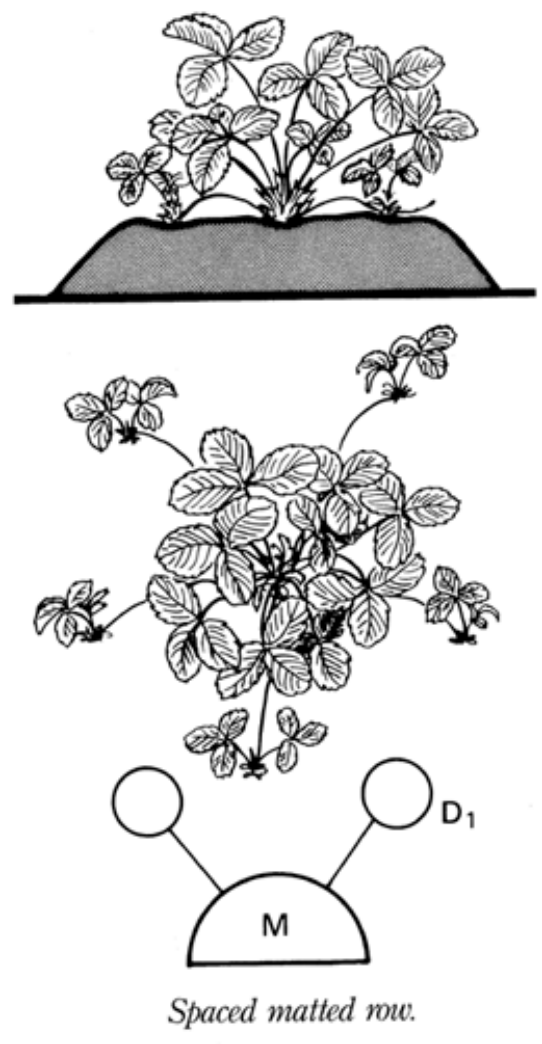
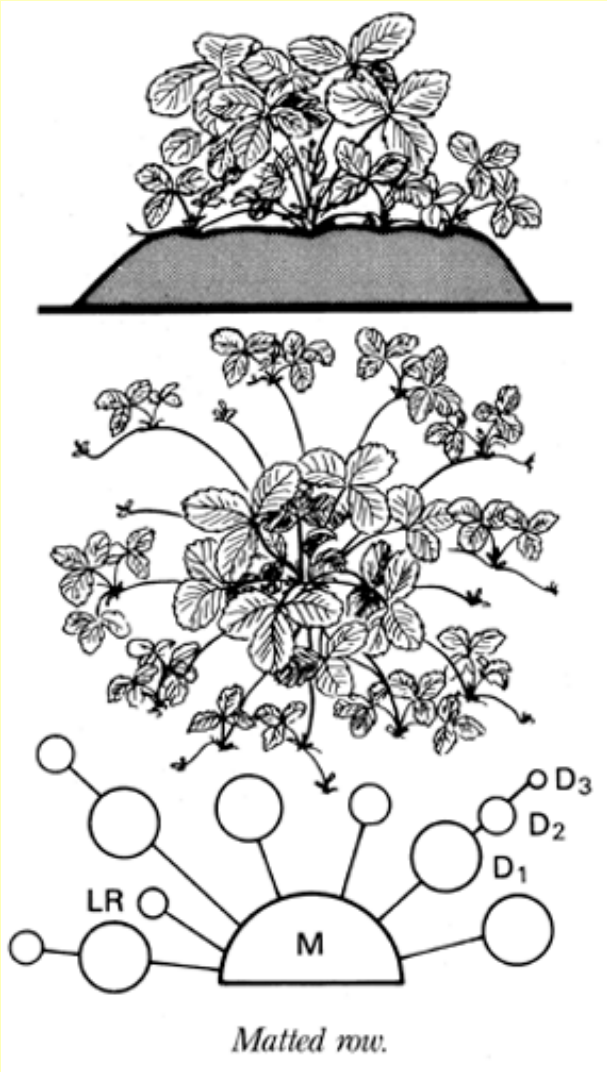


Spaced matted row.



Matted row.

Annual Hill Plasticulture

Why Use the Annual Plasticulture Production System in the South?

- Larger berries throughout the harvest season
- More berries / A
- Earlier harvest (10+ days earlier)
- Extended harvest season (10+ days longer)
- Cleaner berries, since berries never touch the soil
- Easier harvest
  - Plants are separated
  - Contrast of red ripe fruit on black plastic

Everybody likes nice big sweet berries!

Strawberries Types

Spring Bearing

or

Day Neutral

(Everbearing)

Spring Bearing Strawberry Varieties

MATTED ROW

- Early Glow
- Honeoye
- Allstar
- Jewel
- Cardinal

PLASTICULTURE

- Chandler
- Camarosa
- Sweet Charlie

Day Neutral or Ever-Bearing Varieties

- Interest in extending the season through the summer:
  - 'Albion'
    - Good size, but inconsistent yield.
  - 'Evie II'
    - Excellent quality and good yield in the heat.
  - 'Seascape'
    - Generally good yield, but marginal berry size.

Types of Transplants

- Matted Row
  - Dormant Bare Root Plants

- Plasticulture
  - Fresh Dug Bare Root Plants
  - Plug Plants

Total Crop Requirements:

- 120 lbs. N
- 60 lbs. P
- 120 lbs. K

Fall Fertilization

- Apply fertilizer in mid-August according to soil test recommendations.
- Rule of thumb:
  - Apply 1/2 of total N in the fall (60 lbs./A)
  - Apply all of the phosphate in the fall (60 lbs./A)
  - Apply 1/2 of potash in the fall (60 lbs./A)
- Incorporate thoroughly in the soil used to form beds.
- Boron on sandy soils? (1.0 lb./A Boron)

Fertigation

- The application of a portion of the fertilizer requirements of a crop through drip irrigation

Nitrogen and Potassium are the main nutrients of concern.

At least 60 lbs. Total N and K needed

- 1.0 – 1.5 lbs./day (7.0 – 10 lbs./wk.)
- Reduce to .75 lb. when harvest begins.
- Usually covers 100 day period.
  - Feb. 25– April 15 (1 lb./day)
  - April 15 – May 30 (.75 lb./day)

Most Growers say that Camarosa requires more than Chandler

- 10 lbs./A

When to begin injecting fertilizer?

- Start soon new growth begins.
  - Late Feb. to Early March in N. Alabama
  - January in coastal Alabama
- Frequency of injection:
  - Can be daily, weekly, or in between.
    - At least weekly
  - Lots of opinions, but no research has shown clear cut advantages.
  - Usually determined by how often you need to irrigate or your convenience.

Fertigation Equipment

- Injector: mazzei, dositron, pump.
- Mixing container
- Backflow preventer

Water soluble fertilizers

- **Ammonium nitrate**
  - 33-0-0
  - Very hard to find
- **Calcium nitrate** (greenhouse grade)
  - 15-0-0 + 15% Calcium
  - Very soluble, calcium helps with fruit quality
- **Potassium nitrate** (greenhouse grade)
  - -13-0-46
  - Mainly used as potassium source, expensive
- **UAN 32**: Urea/Ammonium Nitrate mixture
  - 32% N, about 3.5 lbs N/gal
- **Water soluble 20-20-20**
  - Most expensive, but does supply P and some micronutrients
- **Other commercial formulations** (check costs; avoid excess B)
- **Organic options**
  - Fish emulsion 2-3-1 and various others. Compare cost per unit N
  - Sodium Nitrate 16-0-0. limits and cautions
- **Epsom Salts** (for Mg and Sulfur)
- **Be very careful when combining products.**
  - **Can cause clogging.**

Healthy Plug Plant

Strawberries at Home

Matted Row

Containers

Innovation and Imagination

Mulching

Drip Irrigation

- Water applied to the soil near the plant at low flows
- Application is over longer periods of time than conventional irrigation
- Only the root zone is irrigated
- Applications are more frequent to maintain the proper moisture level in the root zone.

Strawberry Diseases

- Botrytis
- Anthracnose
  - Fruit rot
  - Crown rot
- Phytopthera crown rot
- Leaf spot

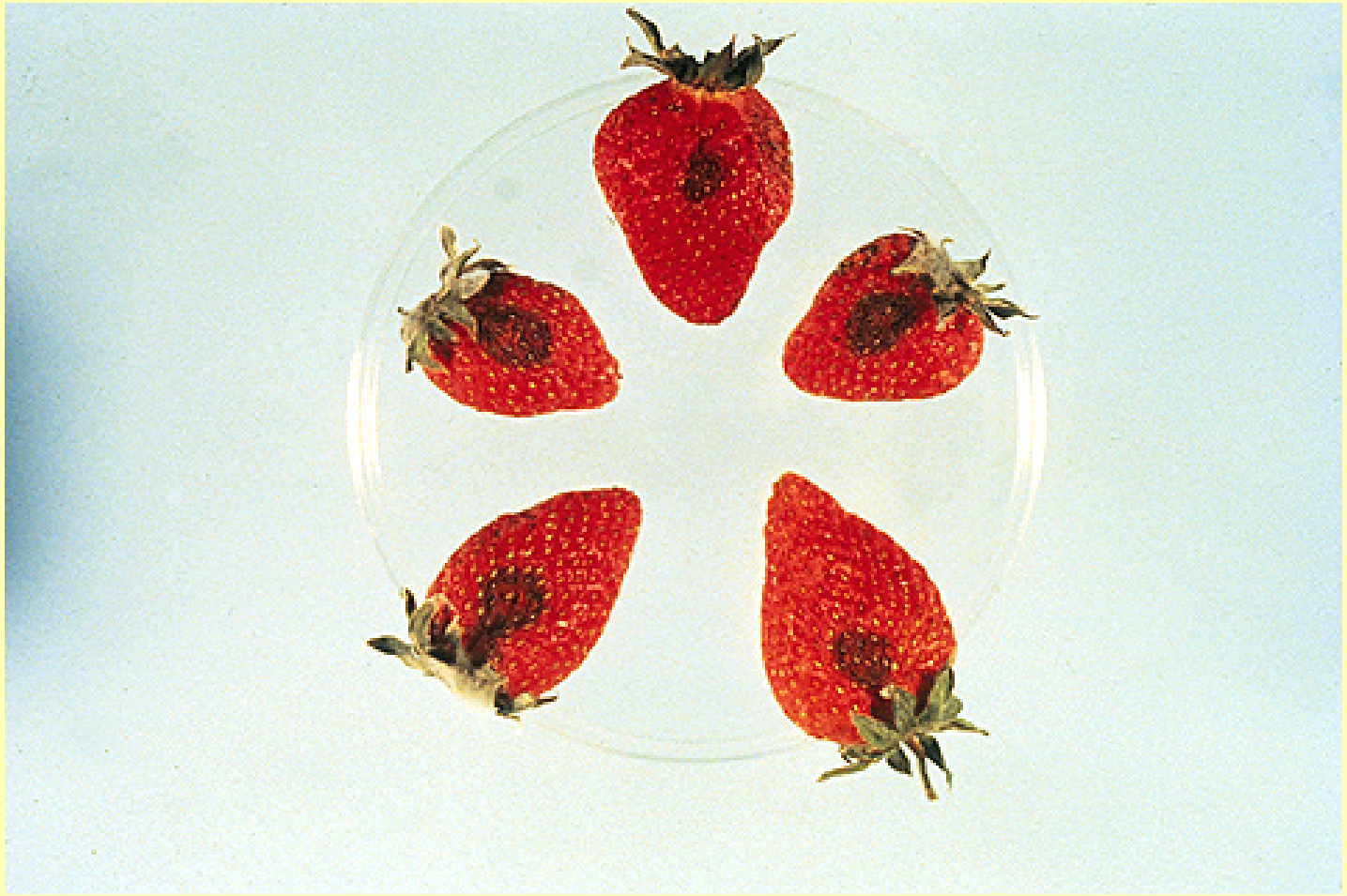
Botrytis (Gray Mold)

Botrytis on Leaf

Gray Mold (Botrytis)Fungicides

Fungicide	Effectiveness
Captan	+++
Topsin M	++++
Switch	+++++
Elevate	+++++
CaptEvate	+++++
Pristine	++++

Anthracnose Fruit Rot



Anthracnose Fungicides

Fungicide	Effectivness
Abound	++++
Pristine	++++
Cabrio	++++
Captan	+++

Strawberry Leaf Spot
-captan gives good control

Cultural Practices for Disease Control

- Raised Bed
- Mulching
- Remove dead plant tissue before bloom.
- Remove bad fruit from the field.

Insects of concern

- Strawberry Clipper
  - Lorsban before bloom

- Tarnished Plant Bug
  - Brigade

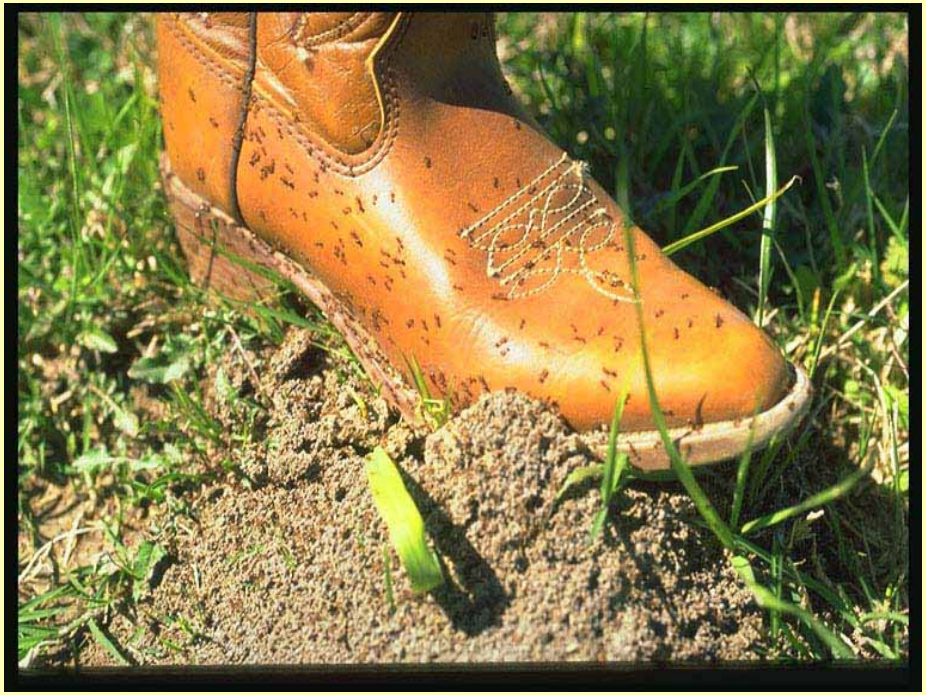
Watch out for mites!

Cultural Practices for Insect Control

- Keep winter broadleaf weeds out of field and borders.

Fire Ant Management

- Apply fire ant baits as soon as ants start foraging in the spring.
  - Esteem Fire Ant Bait



Be Ready to Frost Protect!

Frost Damage

Frosty Strawberry Blossom

Frost/Freeze Protection Methods

1. Overhead irrigation
2. Row covers
3. “I Hope it doesn’t get that cold!”

Overhead Irrigation

- Protects because of the "heat" released by water continually freezing on the plants.
- Can maintain the temperature of plant tissue at about 32 degrees.
- Critical temperatures for strawberries:
  - Open blossom: 30
  - "popcorn" blossom: 26.5
  - Tight emerged bud: 22

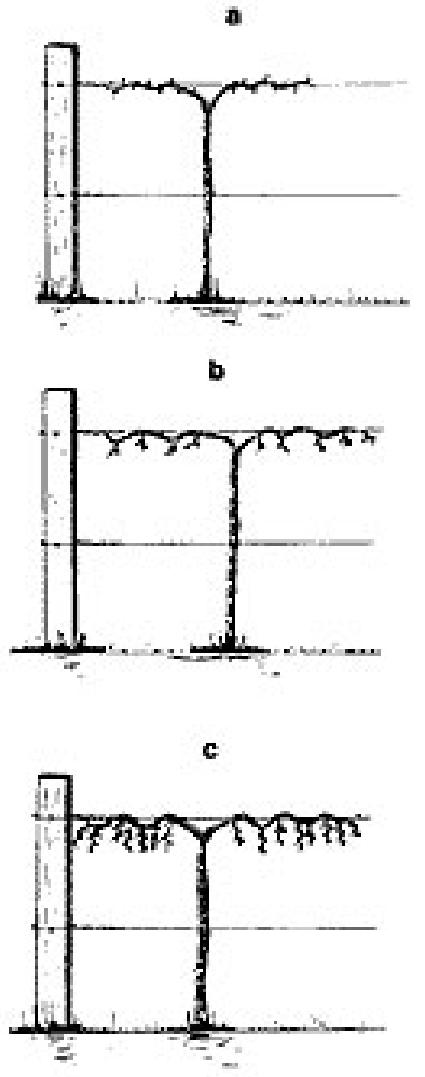
Types of Grapes

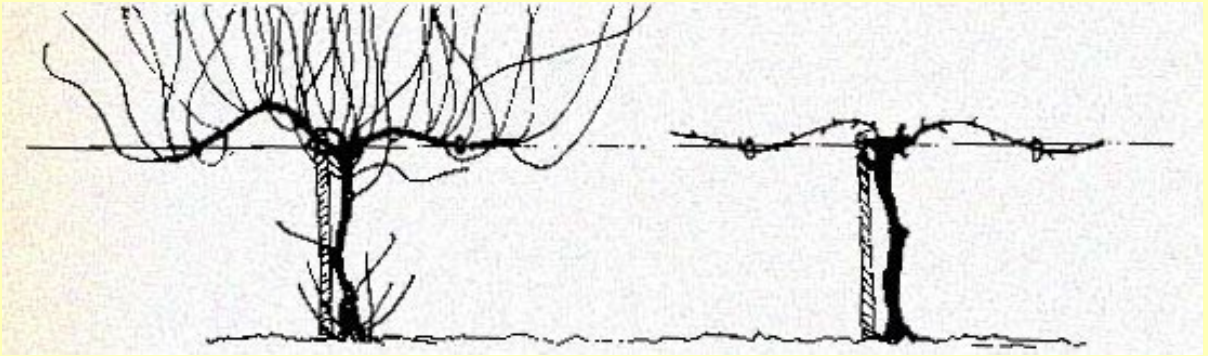
- European bunch grapes (*Vitus vinifera*)
  - California wine grapes, Thompson Seedless
  - Requirements: long growing season, high temps, low humidity, mild winter, ripen with no rain
- American bunch grapes (*Vitus labrusca*)
  - Concord
- French/American Hybrids
  - Villard blanc, newer Arkansas varieties
  - America saved the French grape industry (late 1800's)
- Muscadines (*Vitus rotundifolia*)

Bunch Grapes

- *Vitus vinifera* or *Vitus labrusca* or Hybrid Varieties –Mars, Venus, Neptune, Saturn, Jupiter, Reliance. University of Arkansas releases

Single wire is still probably the best for bunch grapes

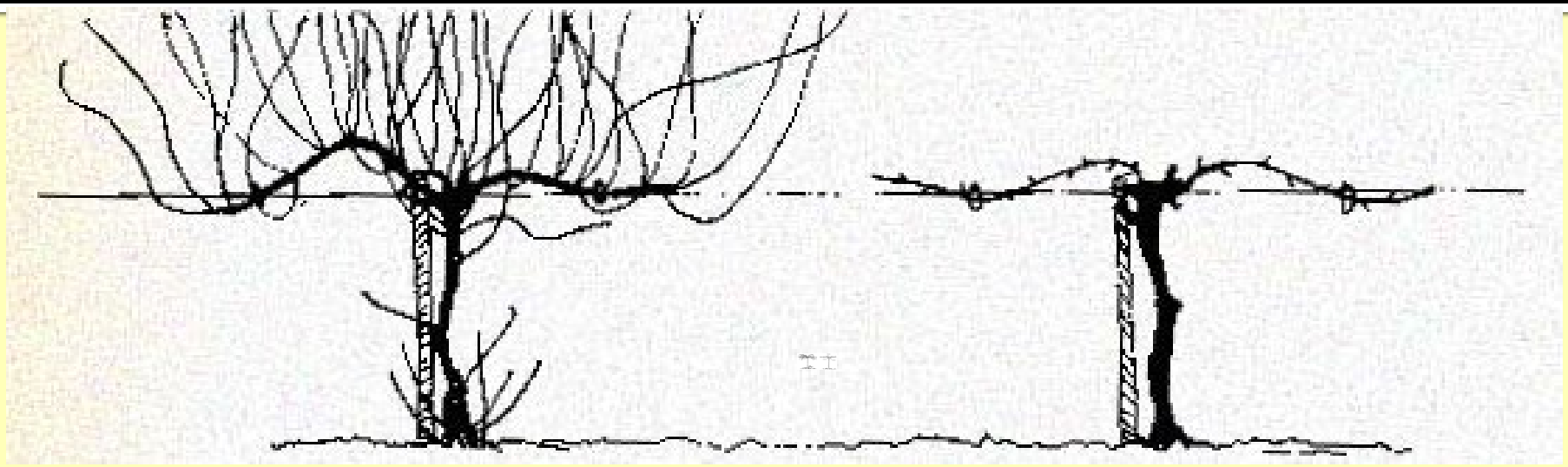




Leave fruiting spurs 6-12 inches apart on the cordon with 3-5 buds per spur.

Adjust pruning to the vigor of the vine.

Pruning Bunch Grapes



-TRAIN TO A SINGLE WIRE

-LEAVE ABOUT 10 SPURS/CORDON (ABOUT 1 FT APART)

-LEAVE ABOUT 3 BUDS/SPUR

-ADJUST PRUNING TO VINE VIGOR

Bunch Grapes in the "perfect world"

Long growing season; high summer temperatures; mild winter temperatures; low humidity; ripening season free of rain

Challenges for Growing Bunch Grapes in the Southeast

- Pierce's disease
  - A bacterium spread by leafhoppers and spittlebugs.
  - Some varieties have limited resistance
  - Some new chemicals available (Imadacloprid)
- Foliar diseases and fruit rots
  - Black rot, powdery mildew, downey mildew
  - Can be controlled with fungicide sprays on a regular basis

Why muscadines and not bunch grapes?

- Less disease problems…less spraying reguired
- More varieties to choose from
- More adapted to conditions in the Southeast…because they're native

History

- *Vitis rotundifolia* was the first american grape species to be cultivated.
- First recognized cultivar was a bronze variety found in Tyrell County, NC in 1760.
- It was later named Scuppernong after the area in which it was found.

Uses of Muscadines

- Fresh fruit
  - Using different varieties can stretch harvest time.
- Wine and juice
- Jellies and sauces

Establishing a vineyard

- Choose a well drained soil.
- Good air drainage will help with frost
- Kill perennial weeds and grasses the summer before planting.
- Soil test. Lime and fertilize accordingly
- Run rows north and south
- Have a water source

Example

- Muscadine
  - 100 vines
  - Two 2 gph **emitters**/vine
- Total flow needed
  - 200 gph or 3.33 gpm.
- Run time for 6 gal/plant
  - System furnishes 4 gal/hr/plant
  - Run for 1.5 hrs/day
  - Irrigate every day unless you get at least .25 in. of rain that day.
  - Decrease towards harvest (every third day)

Example

- Muscadines
  - 100 vines
  - 2,000 ft. of **Inline**
  - 36 in. spacing (6/plant)
  - .5 gph/emitter
- Total flow needed
  - 333 gph or 5.56 gpm.
- Run time for 6 gal/plant
  - System furnishes 3 gal/hr/plant
  - Run for 2.0 hr./day
  - Irrigate every day unless you get at least .25 in. of rain that day. Decrease towards harvest.

Muscadine fruitfullness

- Self-fertile or Perfect-flowered varieties
  - Can be productive if planted alone
- Female varieties
  - Must be planted with a perfect flowered variety to ensure pollination
- All varieties are listed by the nurseries as Self-fertile (SF) or Female (F)

Muscadine Cultivar Performance

- Research by John H. Braswell, Ph.D.
  - Mississippi State University
- Rated fresh market and wine/juice cultivars according to:
  - Yield
  - Fruit Quality
  - Berry size
  - Scar
  - Fruit pH
  - Brix

Muscadine varieties

- Purple skinned fresh market cultivars
  - Ex. Black Beauty
- Bronze skinned fresh market cultivars
  - Ex. Sweet Jenny
- Purple skinned wine/juice cultivars
  - Ex. Noble
- Bronze skinned wine/juice cultivars
  - Ex. Magnolia

Purple skinned muscadines for fresh market use

- Alachua, Black Beauty, Cowart, Ison, Jumbo, Nesbit, Pollyanna, Southland, sugargate
- Highest yield: Nesbit, Jumbo
- Largest berry: Black Beauty
- Most sugar: Sugargate
- Dry scar: Southland, Alachua, Cowart, Ison & Nesbit.

Bronze skinned muscadines for fresh market use

- Darlene, Fry, Higgins, Janebell, Pineapple, Redgate, Summit, Sweet Jenny, Tara, Triumph.
- Yield: Janebell, Redgate
- Largest berry: Darlene,Sweet Jenny
- Most sugar: Darlene, Triumph
- Dry scar: Tara, Pineapple, Triumph, Summit & Higgins.

Purple skinned muscadine varieties for wine and juice

- Albermarle, Burgaw, Dulcet, Hunt, Magoon, Noble, Regale, Tarheel
- Highest yield: Noble
- Largest berry: Albermarle, Hunt, Regale
- Most sugar: Albermarle, Magoon
- Highest pH: Tarheel, Noble
- Albermarle: in the top 5 in all catergories
- Noble: Excelled in all categories except Brix

Bronze skinned muscadine varieties for wine or juice

- Carlos, Dixie, Dixieland, Doreen, Magnolia, Roanoke, Scuppernong, Sterling, Watergate, Welder
- Highest yield: Carlos, Welder
- Largest berry: Watergate, Dixieland
- Most sugar: Dixie, Sterling
- Highest pH: Dixie, Dixieland, Sterling
- Sterling & Watergate: in top 6 of all catergories

- Probably the MOST important thing you can do when establishing your vineyard is:
- **Purchase the right varieties from reputable nurseries.**

Planting

- Give vines 12 to 20 feet of space
- Plan row width to fit your equipment
- Plant dormant plants in late winter to early spring
- Prune back all suckers and branches, leaving only 2-4 buds on the main stem

The trellis

- End post should be 3-5 in. in diameter and well anchored.
- In-row post should be about every 20 ft.
- A single wire system is easiest to establish and maintain
- A 9 gauge wire is typically used

Single wire trellis

Get off to a good start

Grow tubes

Protect young vines and encourage growth.

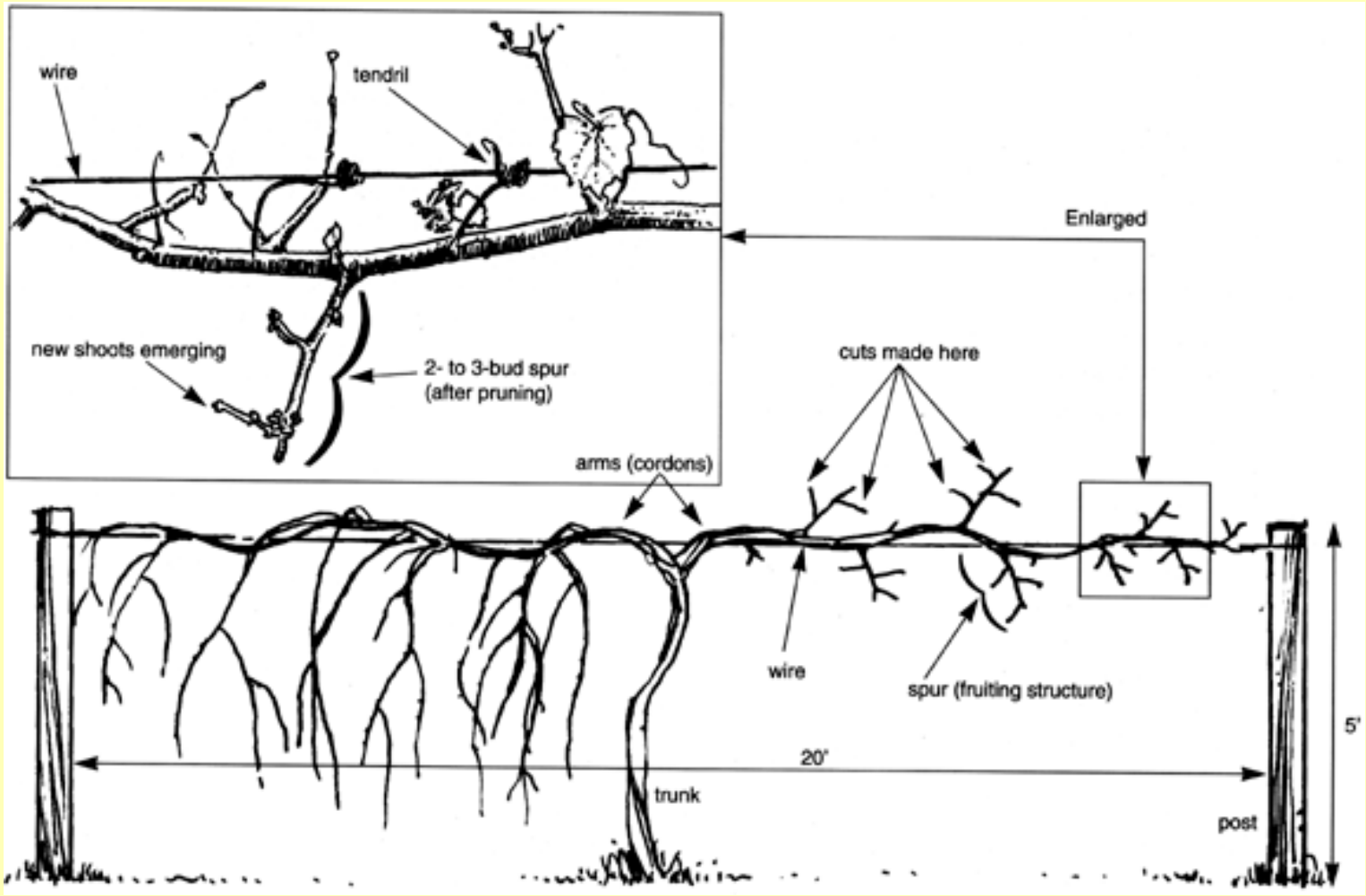
A good tool to use in weed control

Fertilization

- Start with a soil test
- General recommendations (per vine)
  - First year: ¼ lb. 13-13-13 after planting (late April. Repeat every 6 weeks until July.
  - Second year: ½ lb. 13-13-13 early March, May, and June.
  - Bearing vines: 1-2 lbs. 13-13-13 early March, Then 1 lb. in mid-June.
  - Reduce fertilizer the next year if new growth exceeds 3-4 ft.

Training and Pruning ?

Training and Pruning Muscadines



Muscadines can be very vigorous

Pruning mature vines

before

after

Leave fruiting spurs of 1 year old wood, with 2-3 buds

Blackberries

- Trailing vs thorny erect vs thornless erect
- Young, Boysen - trailing
- Kiowa, Shawnee - thorny erect
- Arapaho, Apache - thornless erect

Training and pruning

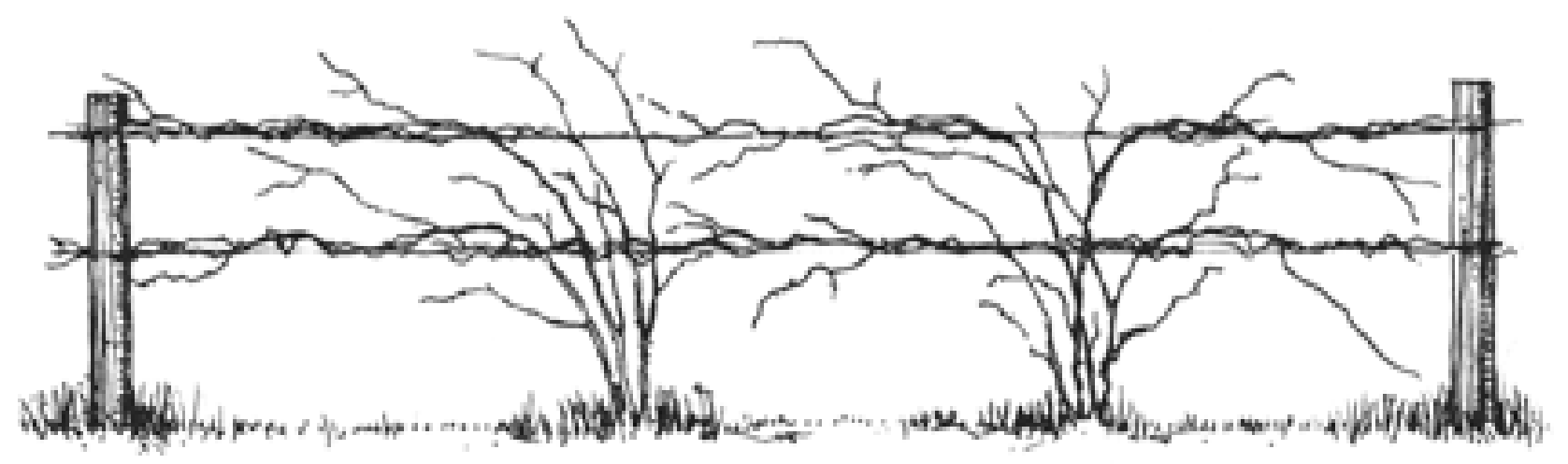
Primocanes?

Floricanes?

Pruning Blackberries

- **Before** harvest, prune **new** canes to a height of 30-36".
- **After** harvest, remove **old** canes.
- Option- after 2-3 years, cut the entire plant back to the ground. Production will be reduced the following year.

Training Trailing Brambles



Blackberries

- Ease of culture- light to moderate
- insects and disease- not many
- good choice for chemical free fruit


CHICKASAW


ARAPAHO


KIOWA


Ouachita

Univ. of Arkansas Blackberries

- http://www.aragriculture.org/horticulture/fruits_nuts/Blackberries/default.htm

Raspberries

- Varieties-
  - Latham, Dormared
- Train like trailing blackberries
- Do not hold up well to Alabama heat and drought.

Blackberry/Raspberry Growers Information Portal

- http://ncsu.edu/enterprises/blackberries-raspberries/production/growing-blackberries-and-raspberries/production-guides/

ARE YOU STILL AWAKE?

THIS WILL WAKE YOU UP!


Growing
Blueberries

Blueberries

- Rabbiteye
- Northern Highbush
- Southern Highbush

Blueberry Types

- Rabbiteye: *Vaccinium ashei*
- Northern Highbush: *Vaccinium corymbosum*
- Southern Highbush: cross between northern highbush, rabbiteye, and a native southern species called 'Darrow's evergreen'

Steps to Successful Blueberry Production

- Site Selection
- Soil Test
- Soil Preparation
- Cultivar Selection
- Plant Source and Quality

THINGS TO DO THE YEAR BEFORE PLANTING

- Soil test - Adjust soil pH to 4.5 to 5.0 in advance of planting
- Cultivar Selection
- Contact a reputable nursery and place your order
- Think about your irrigation system and water source
- Kill the weeds in the rows before planting (plant cover crop)

Site Selection

- Full sun is best (production will go down in partial shade)
- Freeze damage may occur in low areas
- A planting on the south side of a slope is a very good place
- They do need moisture but will not tolerate standing water (may need raised beds)
- How far is the water source from the plants?

Raised Beds

- Improves drainage and aeration
- 8 to 12 inches high
- 4 feet wide

Soil Test!!

- PH 4.5-5.3
- Phosphorus (P)
- Potassium (K)
- Calcium (Ca)
- Magnesium (Mg)

Site Preparation

- Start 1 year before planting
- Control Perennial Weeds
- Till planting area
- Add Organic Matter

Plant Quality

- Use Container Plants
- Free of Disease
- Good Root System
- True To Type

SETTING THE PLANTS

- Plant during the dormant season (Nov. – March) – container plants can be set out other times of the year but should be given more attention (irrigation)
- Dig planting hole at least 4 or 5 inches wider than the root ball
- Commercial growers may subsoil the rows
- Mix native soil with peat moss or other organic matter to a 50/50 mixture
- Cut slits in the side of the root ball in about 4 places to encourage root spread
- Do not plant any deeper than the plant was growing in the pot.

Mulch

- Weeds growing around the plant will slow plant growth
- Mulch can be placed 2 ½ feet or more around each plant and about 4 inches deep. If plants are in a row mulch the entire row.
- Usually we do not mulch very deep right up against the plant.

- Pine needles
- Pine bark
- Wheat straw


WHATCOM
Manufacturing
Inc.
Mulch Spreader

Fertilization of Blueberry Plants

- Fertilize when plants start growing and after harvest (broadcast it in the root zone)
- Blueberries are sensitive to fertilizer burn
- Smaller growers can use an azalea or camellia fertilizer
- Use a nitrogen source with ammonia sulfate or urea instead of ammonia nitrate
- Urea is often found in mixed fertilizer formulations

Fertilization

- Blueberry plants do not like a high phosphorus content (H-L-M)
- A complete fertilizer such as 13-13-13 may not hurt, but it will not help
- 16-4-8 Lawn and Garden Fertilizer has mostly a urea form of nitrogen instead of nitrate (can be found at many retail stores)
- The lawn fertilizers such as 24-3-6??? sometimes has the ammonia sulfate form of nitrogen (herbicide?)


PARKER'S
QUALITY FERTILIZERS SINCE 1904
Super SOILIFE®
LAWN & GARDEN FERTILIZER
FERTILIZANTE PARA CESPED Y JARDIN
16-4-8
An all-purpose fertilizer with the benefits of TRIKOTE® slow-release nitrogen
Fertilizante multiuso con los beneficios de TRIKOTE® una fuente de nitrógeno de liberación continua
For use on new lawns, shrubs, trees and vegetable gardens
Para uso en nuevos céspedes, arbustos, árboles y jardines de hortalizas
Feeds Longer Than Regular Fertilizers*
TRIKOTE® TECHNOLOGY INSIDE
Net Wt 33 lb (14.9 kg)

COVERS UP TO

GUARANTEED ANALYSIS

Total Nitrogen (N) .....
1.57% Ammoniacal Nitrogen
14.43% Urea Nitrogen*
Available Phosphate (P_2O_5) .....
Soluble Potash (K_2O) .....

Derived from: Polymer-coated Sulfur-coated Urea,

*2.7% slowly available Urea Nitrogen from coate

How Much Fertilizer Per Season

- Year one – 1.5 ounces of 12-4-8
- Year two – 3.0 ounces of 12-4-8
- Year three – 4.0 ounces of 12-4-8
- Year four – 6.0 ounces of 12-4-8
- Year five – 8.0 ounces of 12-4-8
- Year six & older – 10 ounces of 12-4-8

One application could be when plant start to grow (first of April), again 6 weeks later (mid June), again 6 or so weeks after that (August).

Organic Fertilizers

- Cottonseed meal – 6-3-2 two ounces/plant/year age of plant up to 12 or so ounces per plant
- Cottonseed meal and azalea and camellia fertilizer are great for a small grower but are probably too expensive for a commercial grower
- One study reported that a 36 year old planting grew and fruited well after receiving no fertilizer for 14 years

Rabbiteye Irrigation Requirements

YOUNG PLANTS

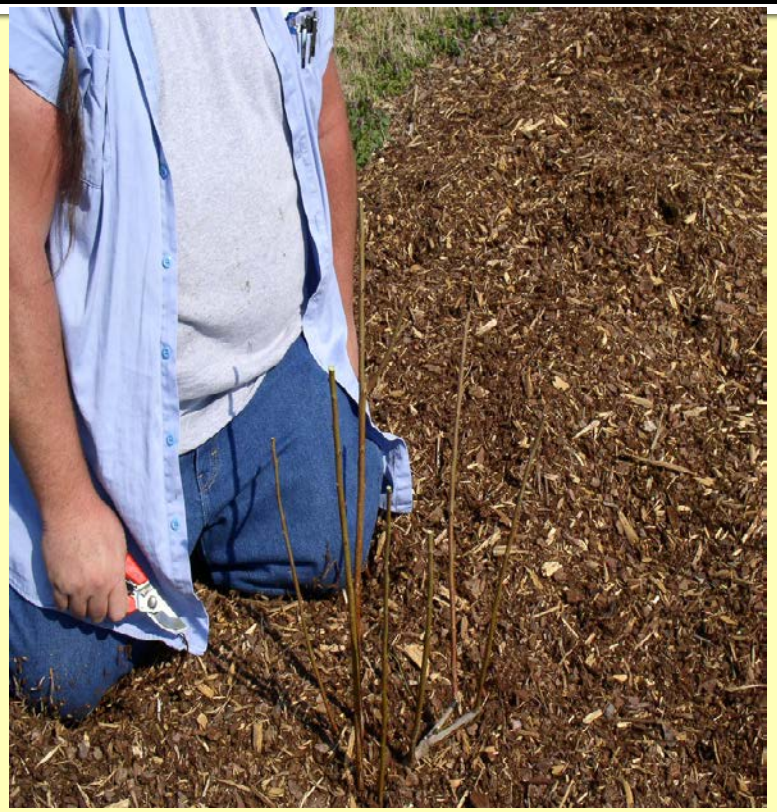
- Have a shallow root system
- More Susceptible to drought
- Need 3-4 gallons water per plant per day during peak season (1815 gal/ac)

MATURE PLANTS

Need 6-8 gallons of water per plant (3630 gal/ac) during the peak season.

Uniform watering can reduce berry splitting

Pruning Young Blueberries



Why Prune?

- Develop plant structure
- Control plant size
- Control fruit number and size
- Aid in harvesting
- Aid in disease and insect control

No pruning for 17 years

When to Prune

- At planting
- During establishment – years 2 and 3
- After harvest – July to August
- For renewal – late February
- Sprout removal - anytime
- To remove damaged or dead branches - anytime

At planting

Pruning Blueberries

- After fifth season, remove one or two old canes and allow new ones to replace them.
- Top at 5-7 feet.

Recommended Rabbiteye Blueberry Cultivars

Climax – early	Georgia 1976
Premier – early	N. Carolina 1978
Brightwell – early	Georgia 1981
Tifblue – midseason	Georgia 1955
Powder Blue – midseason	N. Carolina 1978
Baldwin – late season	Georgia 1985
Centurion – late season	N. Carolina 1978

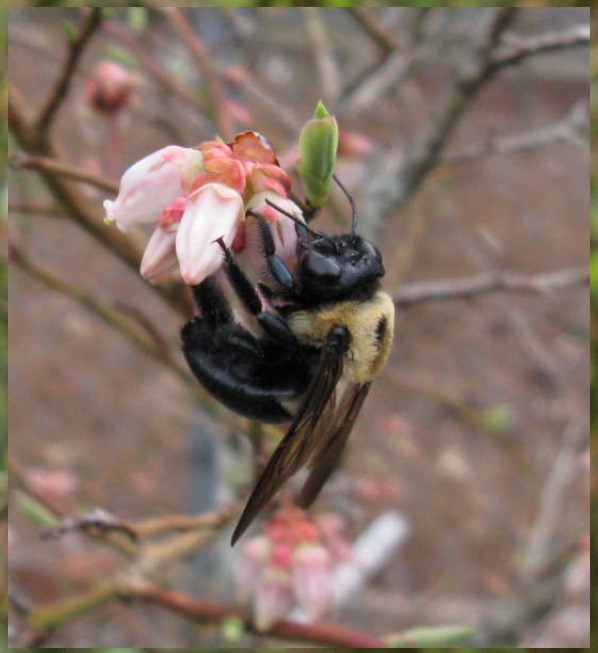
Some of these cultivars are hard to find so you may want to contact a nursery well in advance of the planting season.

Rabbiteye Blueberry Cultivars

- Alapaha E
- Baldwin M-L
- Brightwell E-M
- Climax E
- Columbus E-M
- Ira E-M
- Montgomery E-M
- Ochlockonee L
- Onslow M
- Powder Blue L
- Premier E-M
- Tifblue M
- Yadkin M
- Vernon E

Pollination

- Larger fruit, better set, and earlier ripening are obtained if cross pollination with other cultivars occurs
- The pollination of the rabbiteye blueberries are mostly done by a ground nesting bee
- The honey bee has a short mouth part and can not get to the nectar



Blueberry Yields Depends on Many Factors

- 2nd year - 1 pint/plant
- 3rd year – 2 pints/plant
- 4th year – 8 pints/plant – 1 gallon/plant
- 5th year – 12-14 pints/plant
- 6th year – 20-25 pints/plant - about 2-2 ½ gallons/plant

Spring Freezes

- Open blueberry blooms and new young fruit will freeze at 29°F

Questions

Figs

- An old southern fruit, but a unique fruit.
- Varieties:
  - Celeste
  - Brown Turkey
  - LSU Purple
  - LSU Gold

Training and pruning figs

Figs are easy to propagate

Figs

- Ease of culture - light
- Don’t’ over-fertilize
- Insect and disease - few
- Great fruit for the homeowner, if you like them.

Nitrogen Recommendations for Small Fruits

- Strawberries – .3 lb N/100 ft of row in Oct., Feb., and June
- Figs, Grapes- .04 lb. N/plant/yr. of age. Max.-.5 lb
- Blueberries- .02 lb. N/plant/yr. of age. Max- .14 lb. Split application in Feb. and July. Use ammonium sulfate
- Blackberries- 1.0 lb. N/100 ft of row in Feb.
  .5 lb N/100 ft of row after harvest

Drip Irrigation

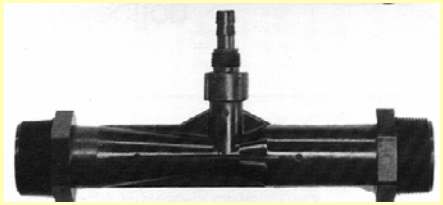
- Water applied to the soil near the plant at low flows
- Application is over longer periods of time than conventional irrigation
- Only the root zone is irrigated
- Applications are more frequent to maintain the proper moisture level in the root zone.

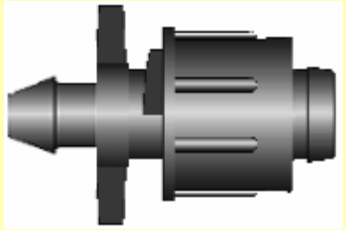
Why irrigate at all?

- Remove some of the risk of producing fruits and vegetables.
- Increase yields and quality
- If it's worth growing…it's worth irrigating!

Basic Components of a Drip System

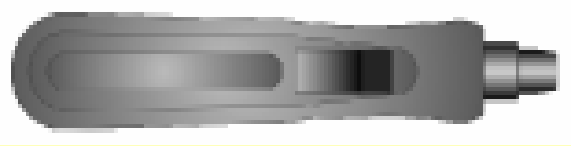
- Pump
- Check valve
- Filters
- Mainline
- Sub-main
- Drip tape or laterals with emitters
- Fertilizer injector
- Pressure control valves
- Drip tape connectors





Emitter for orchard crops

- Inline or punch-in
- Output measured in GPH.
- Usually .5 to 2 GPH
- Emitters can be added as orchard matures



Reference Material for Small Fruit

www.smallfruits.org

IPM Guides and Production Guides for:
Blueberries, Brambles, Bunch Grapes, Muscadines and Strawberries

Visit Extension's website for more information on fruits and vegetables

Click on:

- Publications
  - Agriculture
    - Horticulture

Thanks for your attention,

and have a fruitful year!