

Growing Berries

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https://ext.vt.edu/small-fruit.html

The screenshot shows a web browser window displaying the Virginia Cooperative Extension website. The browser's address bar shows the URL www.ext.vt.edu/topics/agriculture/commercial-horticulture/small-fruit/index.html. The website header includes a navigation menu with links for Home, Jobs, Volunteering, Internships, Giving, Local Offices, News, and About. The main logo for Virginia Cooperative Extension is prominently displayed, along with the text "Virginia Tech • Virginia State University". A search bar is located in the top right corner, with the text "What do you need?" and "Use the search below to search the site or find your local unit office." Below the search bar is a "GO" button. A horizontal navigation bar lists various categories: Agriculture, Community & Leadership, Natural Resources, Family, Food & Health, Lawn & Garden, and 4-H / Youth. The main content area features a large image of a strawberry field with the text "Small Fruit" overlaid. Below the image is a paragraph of text: "This page focuses on crop production and marketing aspects pertaining to small fruits (strawberry, blueberry, blackberry, raspberry, and other exotic berries). Information on cultivar recommendations, cultural practices including pruning, training, and trellising, plant and soil sanitation practices, and pest management can be found here." To the right of the main content is a sidebar with several sections: "Follow VCE" with social media icons for Facebook, Twitter, Pinterest, and RSS; "Need help?" with a location pin icon and the text "Find your city or county's local office"; "Publications and Resources" with a book icon; "Events and Calendars" with a calendar icon; and "Explore more Extension resources:" with a magnifying glass icon. At the bottom of the page, there is a "Featured Publications" section with two links: "2015 Commercial Vegetable Production Recommendations" and "Pest Management Guide: Horticultural and Forest Crops, 2015". Below this is a "Related Topics" section. At the bottom left, there is a "Resources" section with three tabs: "Resources", "Websites", and "Publications". Under the "Resources" tab, there are three links: "2014 Southeast Regional Strawberry Integrated Management Guide", "2014 Southeast Regional Caneberries Integrated Management Guide", and "Breeding and Production Physiology at UC Davis, Department of Plant Sciences". The Windows taskbar at the bottom of the screen shows the date and time as 10:49 AM on 2/23/2015, along with various application icons.

File Edit View History Bookmarks Tools Help

Small Fruit | Virginia Coop... x +

www.ext.vt.edu/topics/agriculture/commercial-horticulture/small-fruit/index.html

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Small Fruit

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- » [2014 Southeast Regional Caneberries Integrated Management Guide](#)
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10:49 AM 2/23/2015

2018 Southeast Regional Strawberry Integrated Pest Management Guide

2018 Southeast Regional Caneberries Integrated Management Guide



the Southern Region
small fruit consortium



IPM/Production Guides

- **Blueberries**
 - [Southeast Regional Blueberry Integrated Management Guide](#)
 - [Southeast Regional Blueberry Horticulture and Growth Regulator Guide](#)
 - [Southeast Regional Organic Blueberry Pest Management Guide](#)
- **Caneberries**
 - [Southeast Regional Caneberries Integrated Management Guide](#)
 - [Southeast Regional Caneberry Production Guide](#) (PDF)
 - [Southeast Regional Caneberry Production Guide](#) (Online Version)
- **Bunch Grapes**
 - [Southeast Regional Bunch Grape Integrated Management Guide](#)
- **Muscadines**
 - [Southeast Regional Muscadine Grape Integrated Management Guide](#)
- **Strawberries**
 - [Southeast Regional Strawberry Integrated Management Guide](#)
 - [Southeast Regional Strawberry Plasticulture Production Guide](#)

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Flanagan Farm



Fresh from our farm to your table!



Farm Planning

- ✓ Put sufficient time and thought into planning process.
- ✓ Know your farm operations well.

Questions to ask yourself:

- Do I have the labor to manage strawberry production from start to finish?
- Do I have a market where I can sell berries?
- In the past three years, have I been able to sell majority of berries produced?
- Are there berries that go unpicked at my site each year ?
- What has been the average profit I made in the past three years with berry production?
- What are some of the pests that I faced in the past three years?

Fumigation for growers:

Realize that Pic-Clor 60 is not the only preplant tool option.

Know your site history for pest pressure to understand what preplant options you need.

1,3- D and Chloropicrin are both heavily regulated.

Things to keep in mind when selecting a preplant treatment:

Is your site in close proximity to water?

Are you located nearby other residents, hospitals, day care, or other heavily human populated areas?

If so, read label carefully for your desired choice of fumigant.

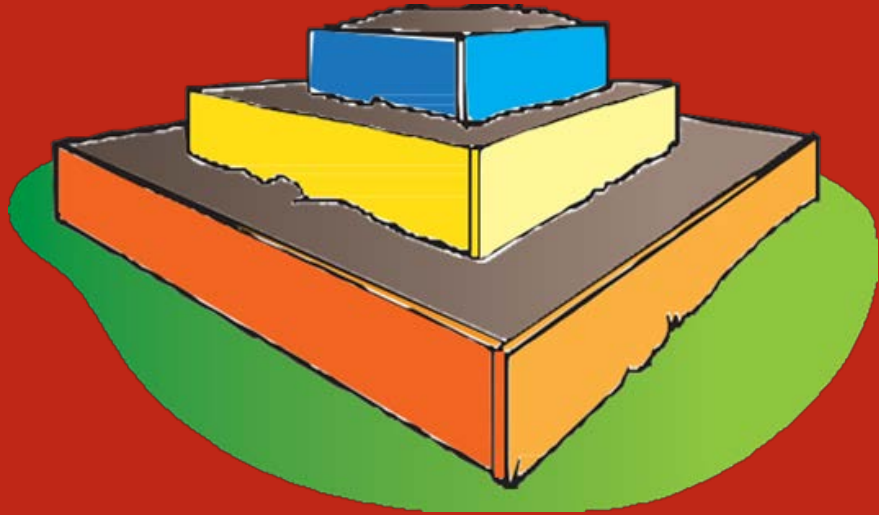
Print a copy of the **2018 Southeast Regional Strawberry IPM Guide** and keep it handy for the season.

Carefully read the label before making any fumigant or other pesticide application.

Site Selection: Home Garden

- Locate small fruit planting as part of or near vegetable garden.
- Free from frost pocket and high wind.
- Integrate with ornamentals where space is limited.
- Strawberry: avoid sites previously under cultivation with tomato, potato, or eggplant.

Limited space gardens: Plants can be grown in pyramid setting, or a barrel in home garden.



Soils

- Fertile, sandy loam soil.
- Clay or rock soils difficult to bed
- Slope of 5 to 7% ideal
- Raised beds
- Drip irrigation is recommended.

Strawberry pH: 6.0-6.5

Caneberries pH: 6.0 to 6.5



Preplant preparation: Growers

- Soil test to determine how much limestone needs added.
- Apply 60 lbs. N, 60 P₂O₅ and 120 K₂O lb/acre if no soil test conducted.

Strawberry fertilizer: Home garden

- If no soil test conducted, broadcast 4 lbs of 10-10-10 fertilizer for 100 linear ft. of row, 2 to 3 weeks before planting.
- If additional fertilizer needed, sidedress with 1.5 lbs. ammonium nitrate per 100 ft. linear row.
- In late January or February, suggested rate of $\frac{3}{4}$ lb of ammonium nitrate per 100 ft. linear row.

Propagation

Plugs: Runner tips rooted in peat based media and feature intact root ball. Most widely used method of starting plants in the field. Also the most expensive.



Fresh dug: vegetative foliage retained. Transplanted by hand.

Cut offs: vegetative foliage mowed prior to digging off the propagation bed.

Strawberry Plant Types

- Short day or June bearing types:

Fruit harvested in May-June season. Flower buds initiated in fall or short days in spring (March) less than 14 hours daylight or when temperatures are below 60 °F. e.g. Chandler, Camino Real.

- Day-neutral or everbearing:

Perform well in cooler regions. Produce flower buds throughout season however initiation can be hindered when temperatures are high. e.g. San Andreas, Albion.

Planting depths- Left: Too shallow; Center: Correct; Right: Too deep





Chandler

- UC Davis cultivar released in 1983.
- June bearing.
- Adaptable to eastern U.S. including matted row production.
- Susceptible to diseases.
- Fruit size is medium to large, with medium firmness.
- Good for pick your own farms.
- Most reliable yielding variety for the upper piedmont, foothills, and coastal plains in Virginia and North Carolina.

Sweet Charlie

- Univ. Florida variety. Selected in 1986 and has 'Pajaro', a UC variety as one of its parents.
- June bearing, early season variety.
- Fruits are medium in size with high sugar-acid ratio, so berries are sweet to taste.
- Tolerant to Anthracnose fruit rot.
- 'Sweet Charlie typically bears 5 to 10 days prior to 'Chandler' in the growing season.
- Good for U-pick operations and home growers.

Camarosa

- UC Davis variety. Released in 1992.
- June bearing variety.
- Moderate to high plant vigor.
- Good disease profile except susceptible to Verticillium wilt (*Verticillium dahliae*).
- Fruit is large and firm, and holds well in the rains. Suitable for shipping and local market consumption.
- Fruit tastes best when it is picked darker in color, past the glossy bright red stage.

Camino Real

- UC Davis variety. Patented and released 2001.
- June bearing.
- Compact growth habit.
- Resistant to *Verticillium* (*Verticillium dahliae*) and *Phytophthora* (*Phytophthora cactorum*). Relatively resistant to Anthracnose crown rot (*Colletotrichum acutatum*).
- Attractive, mostly symmetrical conic fruit.
- ‘Camino Real’ has good flavor and is suitable for fresh market and processing.
- Darker color (internal and external) compared to ‘Camarosa’.



CAMINO REAL

Benicia

- UC Davis variety. Released in 2010.
- June bearing variety.
- Moderate to high plant vigor with an open canopy.
- Good disease profile except susceptible to Verticillium wilt (*Verticillium dahliae*) and moderately susceptible to Anthracnose crown rot (*Colletotrichum acutatum*).
- Fruit is large and firm, and plant is a heavy bearer. In California, fruits were produced earlier in the season than 'Camarosa'.
- Good for fresh market, processing, and home gardens.



BENECIA

Flavorfest

- USDA Beltsville, Maryland variety. Released in 2012.
- June bearing
- Moderate yielding variety with good plant vigor.
- Fruits are attractive, bright red, with excellent flavor.
- Berry size is larger compared with ‘Chandler’.
- Suited for both annual plasticulture and matted row production systems.
- Resistant or tolerant to stem or leaf diseases.

Space Requirement, Yield, Bearing Age, and Life Expectancy of Small Fruits.

Fruit Expectancy	<u>Minimum Distance</u>		Annual Yield per Plant	Average Bearing Age	Life expectancy
	Between Rows	Between Plants			
	feet	feet	Lbs.	years	years
Blackberry (erect)	10	5	5-10	1	5-12
Blackberry (trailing)	8	6	5-10	1	5-12
Blueberry	6	5	4-6	3	20-30
Raspberry (red)	8	3	3-5	1	5-12
Raspberry (black)	8	4	3-5	1	5-12
Raspberry (purple)	8	4	3-5	1	5-12
Strawberry (June bearing and day neutral)	3	1	1-2*	1	1-2
Strawberry (ever bearer)	3	1	3/4 -1	1/3	2

* per parent plant grown in the matted row system.

Pests

- Weeds
- Deer
- Anthracnose
- Phytophthora
- Mites
- Botrytis
- Spotted wing drosophila



Strawberry Clipper weevil (*Anthonomus signatus*) damage





Strawberry Clipper



Voles can chew off plants at the roots



Chandler Strawberry 2014/2015

**Ultrasonic Solar Pest Repeller –
deterrent for rodents**



Caneberries



Caneberry Culture

- Sun/Shade - Full Sun
- Pollination - Self Pollinating
- Soil pH Level : 6.0 – 6.8
- Years to bear: 1-2 years
- Fertilizer: No fertigation needed on rich fertile soil. Add 2 to 3 lbs of ammonium nitrate per 100 ft of row.



Caneberry plants are biennial in nature; the crowns are perennial. New canes grow from buds at the crown each year. The new shoots called 'primocanes' will produce vegetative growth the first season, go through a dormant winter season, and then are referred to as 'floricanes' the second year.

Primocane bearing varieties produce fruit on first year canes (shoots). The base of these primocanes will survive, while the top portion of the cane will die off after fruiting.

Training

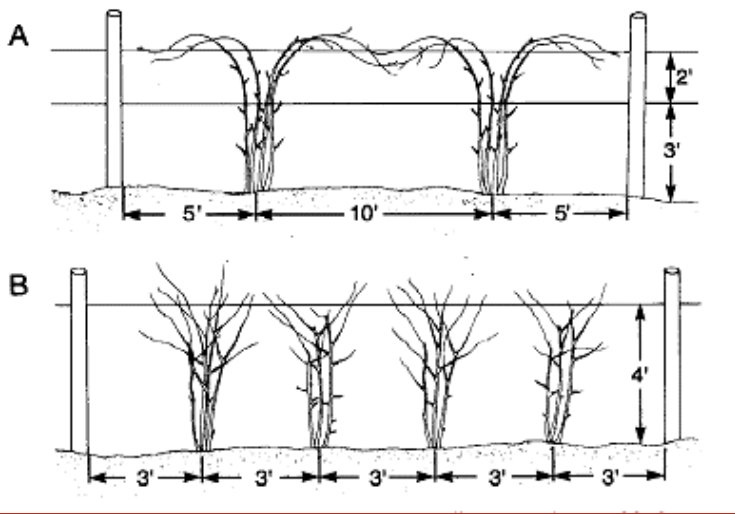
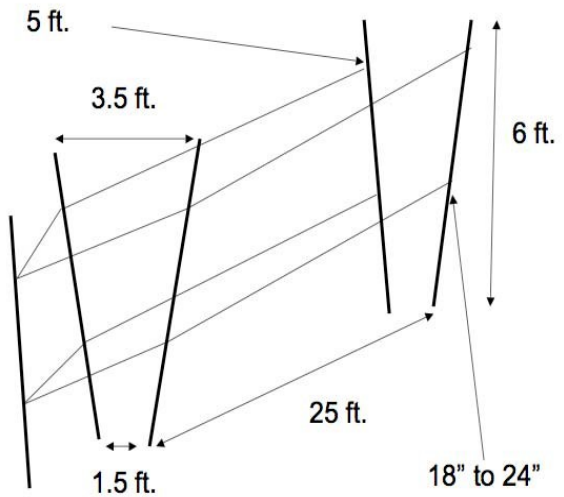


Figure 1. (A) Train trailing plants to a two-wire trellis. (B) Train erect blackberry plants to a one-wire trellis. (Source: NC Cooperative Extension)



Figure. V-trellis for blackberry or raspberry support. Typical V-trellis design with steel posts set 20 to 30 degrees from vertical. Estimated cost.\$3800 per acre.



Stiles shift trellis

This trellis (Figures 5a and b) was designed by researchers at Virginia Tech.

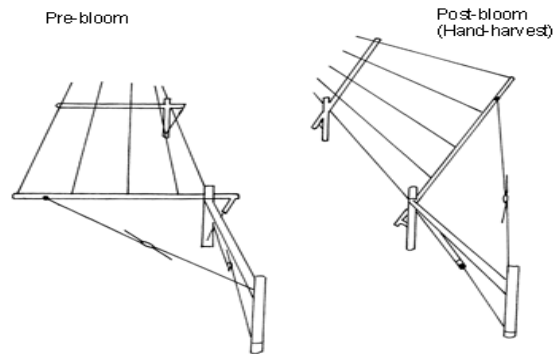
Advantages

- Easier harvest, all fruit is on one side of the canopy.
- Less sunscald.

Disadvantages

- Expensive. Estimated cost: \$5800/acre
- Harder to learn how to train and prune.

Figure Shift trellis. The shift is a pivoting trellis, which means it moves in an arc from one side of the row to the other. At bloom, the canopy is positioned parallel to the ground to concentrate flower development on the upper part of the canopy. As the fruit begins to mature, the arm is moved to 120 degrees from the horizontal prebloom position and slanted westward.



(Slide credit: North Carolina State Univ.)

Pruning: Floricane bearing varieties

Cut tips when blackberry primocanes reach 30 to 36 inches in height. Cut the laterals again in winter to 12 to 14 inches length for larger berry size.

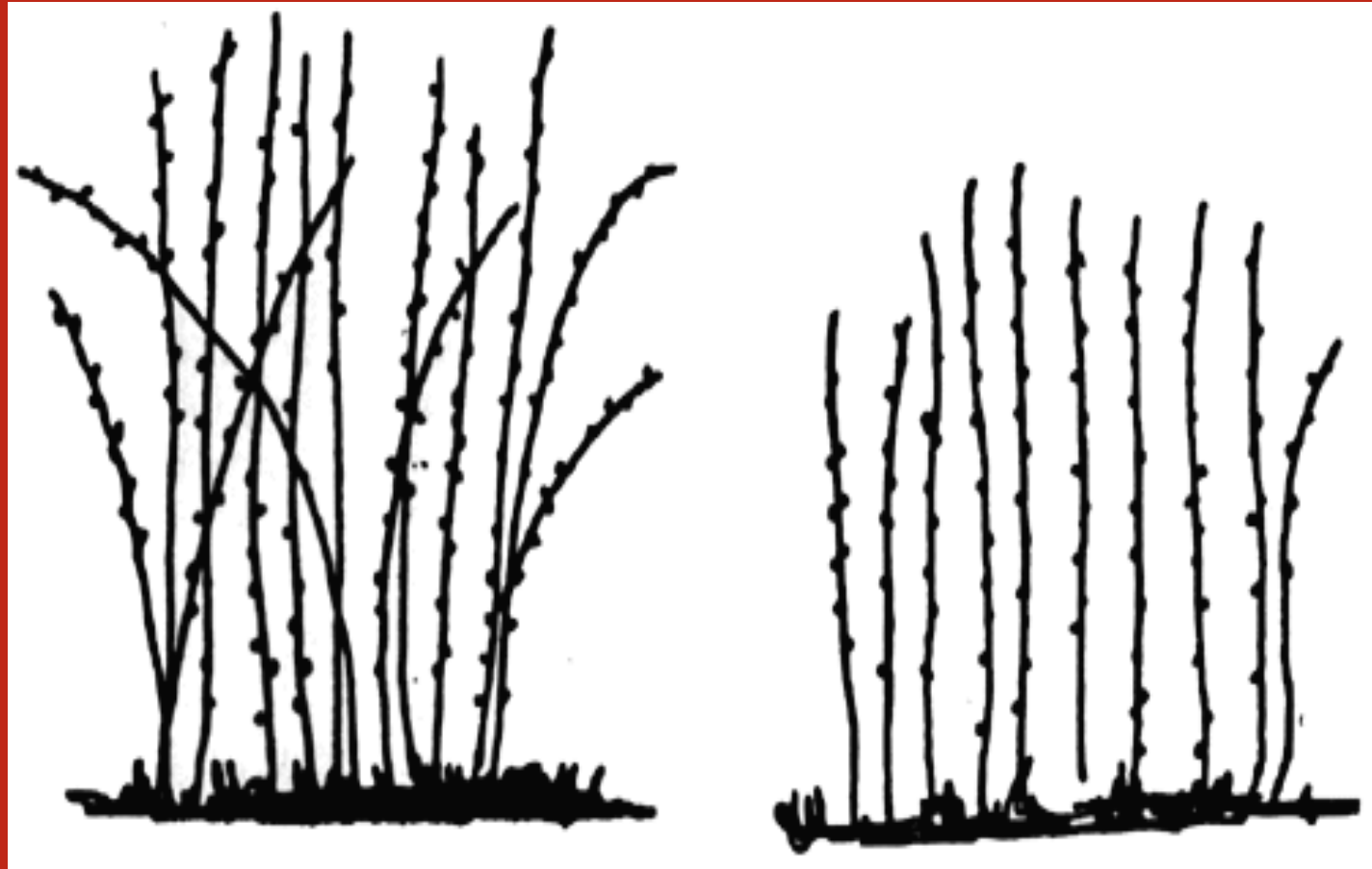
Leave 4 to 6 canes per linear ft.



An unpruned blackberry plant (left). Once plants are dormant, only retain four to five best canes (right).

Where possible, fruiting canes 1/2 inch or more in diameter are selected. Cut the lateral branches of the blackberry to 15 to 18 inches long.

If the plants are grown in hedgerows, keep the width of the rows to 18 inches or less and remove all plants outside the row areas. Thin the canes within the hedgerows to 6 to 8 inches apart, saving the best canes.



Chester Thornless



- Semi-erect Thornless
- Zone Range - 5 – 8
- Bloom Color – Pink
- USDA cultivar
- Yield – High
- Harvest – July through Sept
- Chill Hours – 900

Photo courtesy Stark Bros.

Navaho



Photo courtesy MicroFamily Farm

- Erect Thornless.
- Zone Range - 5 – 10
- Bloom Color – White
- Fruit Size - Medium
- Yields - Moderate to High
- Harvest – Mid-June
- Chill Hours – 800

Natchez



Photo courtesy Stark Bros.

- Erect Thornless
- Zone Range - 6 – 8
- Bloom Color – White
- Fruit Size – Large
- Yield – Moderate to High
- Harvest – Mid-June
- Chill Hours – 500

Arapaho



Photo courtesy Stark Bros.

- Erect Thornless.
- Zone Range - 6-8
- Bloom Color – White
- Fruit Size – Medium
- Yield – Moderate (**Low**)
- Harvest – Mid-June
- Chill Hours – 500

Ouachita



Photo courtesy Stark Bros.

- Erect Thornless
- Zone Range 5 – 9
- Bloom Color - Purple, red
- Fruit Size – Medium
- Yield – Moderate to Low
- Harvest - Mid June
- Chill Hours – 300

Prime-Ark® Freedom



- World's first primocane thornless cultivar. Released 2013
- Very Erect, thornless
- Zone Range – 6 – 8
- Fruits– Very Lg. (9 g), good flavor
- Harvest - Late May and in fall
- Good for local market shipping
- Floricane fruits early, 1-2 weeks before Natchez and Ouachita
- Chill Hours - Not confirmed

Prime Ark® Traveler



Photo courtesy University of Arkansas Agriculture Research and Extension

- The second erect thornless-primocane fruiting blackberry
- Zone Range - 5-9
- Bloom Color – White
- Fruit Size – Med-Large
- Harvest – Two harvests
- Yield – 1 yr. Sensitive to high heat
- Yield – 2 yr. canes, Very Good
- Chill Hours – Not confirmed
- Good handling and storage – for commercial production

Von



Photo courtesy Team Rubus; NC State University

- Erect Thornless
- Zone Range - 5-9
- Bloom Color – White
- Fruit Size – Med w/ small drupelet
- Yield – High
- Harvest – Mid June
- Years to Bear – 2
- Sweet, low acid
- Chill Hours – 500



Japanese Beetle
(*Popillia japonica*)



Green June Beetle
(*Cotinis nitida*)

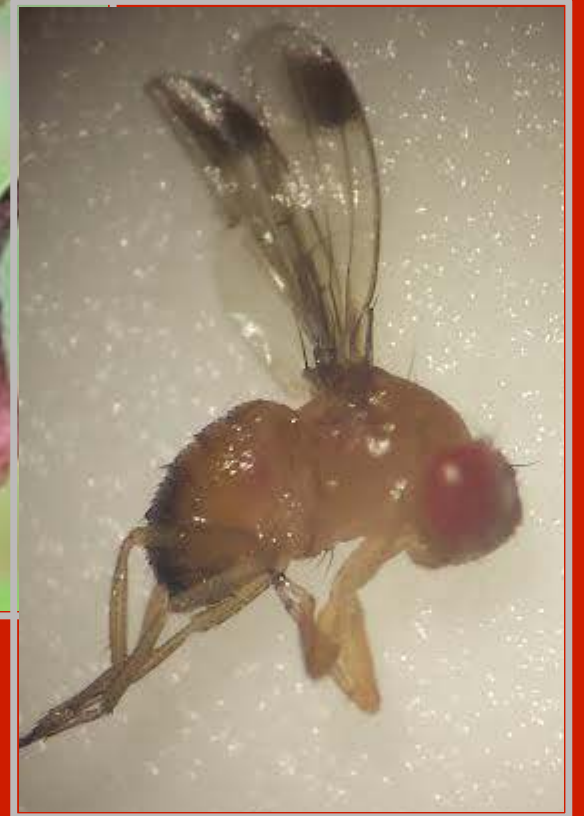
Spotted Wing Drosophila

- Small flies (1/6-1/8th inch) with red eyes and pale brown thorax and abdomen with black stripes on abdomen.
- Males: black spot towards the tip of each wing; females have large and serrated ovipositor.
- Tiny white cylindrical larvae/maggots (about 1/8th inch) are found feeding on fruit.
- Up to 10 generations/year.
- Trapping can be done by using apple cider vinegar or yeast and sugar slurry.
- Controlled by Spinosad and pyrethroids.



South Dakota State Univ.

Spotted winged drosophila (*Drosophila suzukii*) - SWD





Sap Beetle

(Coleoptera: Nitidulidae)



E. Beers, 2010

SWD larvae can render a harvest useless, even for jam berries.

Harvesting and Field Handling



Maturity selection: Overripe berries for processing. Flavor does not improve after harvest.

Minimize fruit injury while harvesting.

Grading to eliminate injured, diseased and defective fruit. Berries are normally picked with their caps.

Protection from warming.

Promptness to move fruit from field to cooler.

Packed for shipment in corrugated fiberboard crates that hold variety of baskets. Clear, thermoformed plastic clamshell baskets most common.

Red Raspberry (*R. idaeus*) Varieties

Heritage (Cornell Univ., 1969): Medium sized fruit, firm, disease resistant, and of good quality. Good for freezing and fresh consumption. Thorny.

Himbo Top (Switzerland, 2003): Large, firm, bright red, conic fruit. Good flavor and tolerance to Phytophthora root rot disease. Plant is upright and medium in height. Long fruiting laterals. Requires trellising.

Joan J (U.K., 2002): Fruit is firm, glossy, dark red and darkens further in storage. Canes are vigorous, upright, and spineless. Fruit skin is thin subject to damage.

Red Raspberry Varieties

Jaclyn (University of Maryland, 2005): Early season variety. Dark red in color and darkens further in storage. Large fruit, excellent flavor. Fruit adheres to the plant until it is fully ripe. Susceptible to potato leaf hopper and yellow leaf rust. Fresh consumption.

Josephine (University of Maryland, 2001): Dark red, large, excellent flavor, shelf life. Fresh consumption. Upright and needs little support. Resistant to leaf hopper and Phytophthora root rot.

Caroline (Univ. of Maryland, 1999): Medium size, conical fruit, excellent taste. Fruiting laterals are short. Moderate to good resistance to Phytophthora fruit rot. Overly vigorous. Fresh/Process use.

Black raspberry varieties (*R. occidentalis*)

Black raspberries (floricane bearing) are very susceptible to viral diseases.

Cumberland: Plants are vigorous and productive, but not cold hardy.

Jewel (Cornell Univ., 1973): has firm, glossy, flavorful fruits. Cold hardy, vigorous, and resistant to most diseases. Weeping form.

New Logan: has glossy fruits of good quality. Tolerant to mosaic and other diseases.

Purple raspberries (Red x Black)

Brandywine (Cornell Univ., 1976): Fruit is firm, ripe, and quite tart. Reddish purple in color. Berries are used for processing. Susceptible to crown gall but partially resistant to other diseases. Canes are tall with thorns.

Royalty (Cornell Univ., 1982): Most widely planted purple variety. Soft fruit, reddish-purple to dull purple in color. Sweet flavor, high productivity. Can be eaten fresh or for processing. Canes are upright, have thorns, but extremely productive. Resistant to raspberry aphid which reduces probability of mosaic virus infection.

Blueberries

- Rabbit eye and southern highbush suited for hot summers.
- Chilling requirement for rabbiteye: 250-600 hours.
- Northern highbush: 1000 hours.

Rabbiteye varieties:

Early season - Alapaha, Climax, Premier, Titan, and Vernon.

Mid-season - Brightwell, Powderblue, and Tifblue.

Late season - Centurion and Ochloknee

Rabbiteye (Early season):

Alapaha (Univ. Georgia, 2002): Named after Alapaha river in S. Georgia. Late flowering. Early ripening of fruit. Medium size fruit, dark blue, ideal for fresh and frozen packs. Resists fruit cracking. Companion variety Vernon.

Vernon (Univ. of Georgia, 2004): Good yields, excellent plant vigor. Large berries, firm.

Climax (USDA, Univ. of Georgia, 1974): Berries are small to medium size, good color, flavor. Poor leafing, spring freeze damage. Concentrated harvest. Recommended cross pollinating variety: Premier.

Premier (NCSU release, 1978): Produces medium to large size fruit, medium firmness, good flavor, dark blue color. Canes on the plant may not support heavy load. Susceptible to blueberry gall midge.

Titan: Fruits are larger than Vernon or Premier. Good flavor and color but subject to cracking under rain. Companion variety is Vernon.

Rabbiteye (Mid season):

Brightwell (Univ. of Georgia, 1983): Medium to large size fruit. Susceptible to splitting under wet conditions. Recommended cross pollination with Premier. Bush is vigorous, productive and upright.

Powderblue (NCSU, 1978): Medium size, light blue fruit, good firmness. Cracks less than Tifblue. Recommended pollination with Tifblue or Brightwell.

Tifblue (USDA/Univ. of Georgia, 1955): Small to medium size fruit, must be fully ripe or else tart. Will split under rainy conditions.

Southern Highbush (Early season)

Recommended for central and southern Virginia

Suziblue (Univ. of Georgia, 2009): large fruit-2.2 to 2.8 g/berry, light blue color, good flavor, bush vigorous

Palmetto (Univ. of Georgia, 2003): early variety, medium size fruit, medium blue color, outstanding flavor, good plant vigor, bush is open with medium vigor

O'Neal (NCSU, 1987): medium size fruit, popular worldwide

Southern Highbush (Mid-season)

Camellia (Univ. of Georgia, 2005): large size fruit, sky blue color, good fruit color and plant vigor

Jubilee: small size fruit, moderate growth habit, relatively pest resistant

Magnolia: small fruit, medium size, productive, good flavor, firmness

Northern Highbush (Early season)

Duke: good flavor, mid size fruit, fruit bland if picked late

Earliblue: very early, good flavor, large fruit

Patriot: heavy producer, large size berry, winter hardy but sensitive to frost, tolerant to heavy soils

Spartan: good flavor, large berry size, late bloom date avoids frost, but still produces early crop, resistance to mummy berry

Northern Highbush (Mid season)

Bluecrop: most widely planted mid season cultivar in world, high yield, firm fruit, good flavor, hardy, drought resistant, weepy canes

Blueray: large, dark fruit, flavorful, weepy canes, good winter hardiness

Legacy (Rutgers/USDA, 1993): adaptable, highly vigorous, fruit light blue, firm, berries maintain flavor even when overripe, high yields once established, requires pruning to manage stem canker disease.

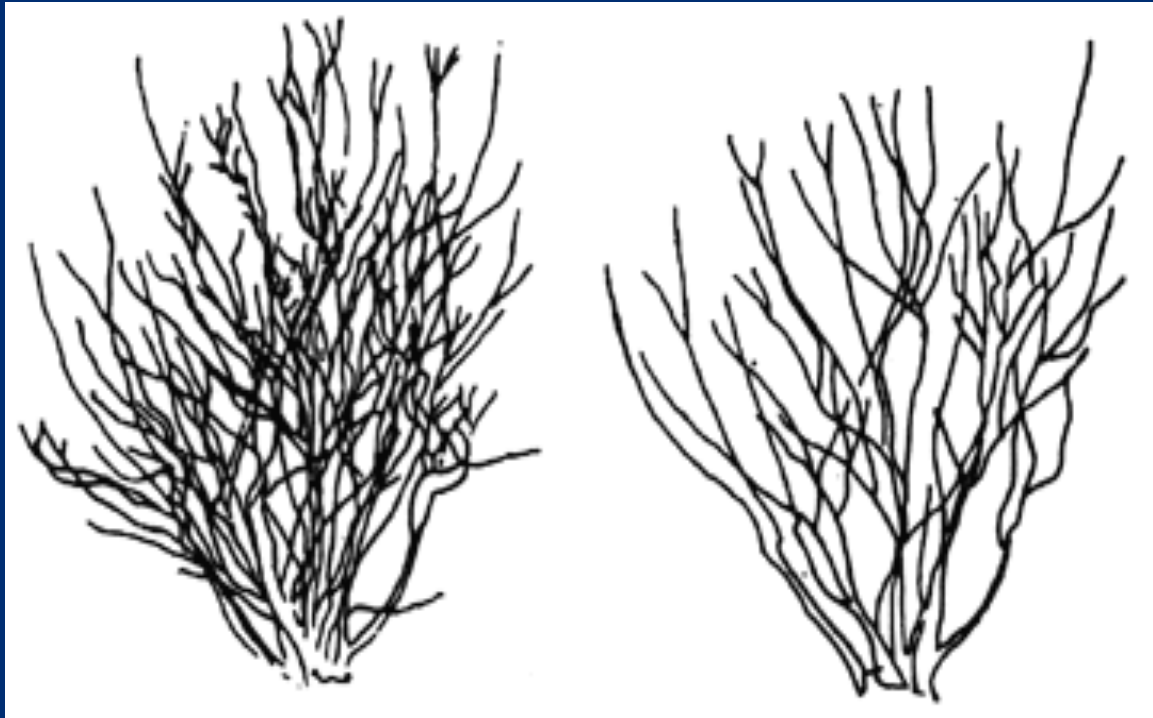
Northern Highbush (Late season)

Elliott (Michigan/USDA, 1973): large, good flavor, can turn tart if berries turn blue before they become ripe, upright cluster, can form dense center that should be pruned to improve air circulation. Resistant to mummy berry, phomopsis canker, and anthracnose fruit rot

Jersey (1928): adapted to wide range of soils, medium, dark berries, upright plant that forms dense center

Fertilizer Blueberry

- 2 ounce of ammonium sulfate per plant starting year 2. Each year add one ounce to maximize at 8 ounce.
- When sawdust is used as a mulch; additional ammonium sulfate per plant: 12 ounce per mature plant



Unpruned blueberry plant on left. After pruning, a mature blueberry bush should have ten to fifteen canes as seen on right side.

As the bushes come into bearing, regular annual pruning will be necessary.

Timing. from leaf fall until before growth begins in the spring.

A mature blueberry plant should produce three to five new canes per year.

Locate the oldest canes and prune out one of every six existing canes; cut as close to the ground as possible. A mature blueberry bush should have ten to fifteen canes: two to three canes each of one-, two-, three-, four-, and five year old canes.

Avoiding diseases and insects

- Use of virus free plants.
- Choose well drained soils; follow crop rotation.
- Remove berries instantly to reduce fruit rots.
- Remove older foliage and canes.
- Avoid keeping older plantings for too long (strawberries).

Picking

- Pick berries early in the morning.
- Transport berries to room temperature as quickly as possible.
- Take advantage of the shade in your garden.
- Keep damaged berries separate from firm, quality berries.