Greenhouse Strawberry Production

Strawberry Species

- Origin: Temperate regions

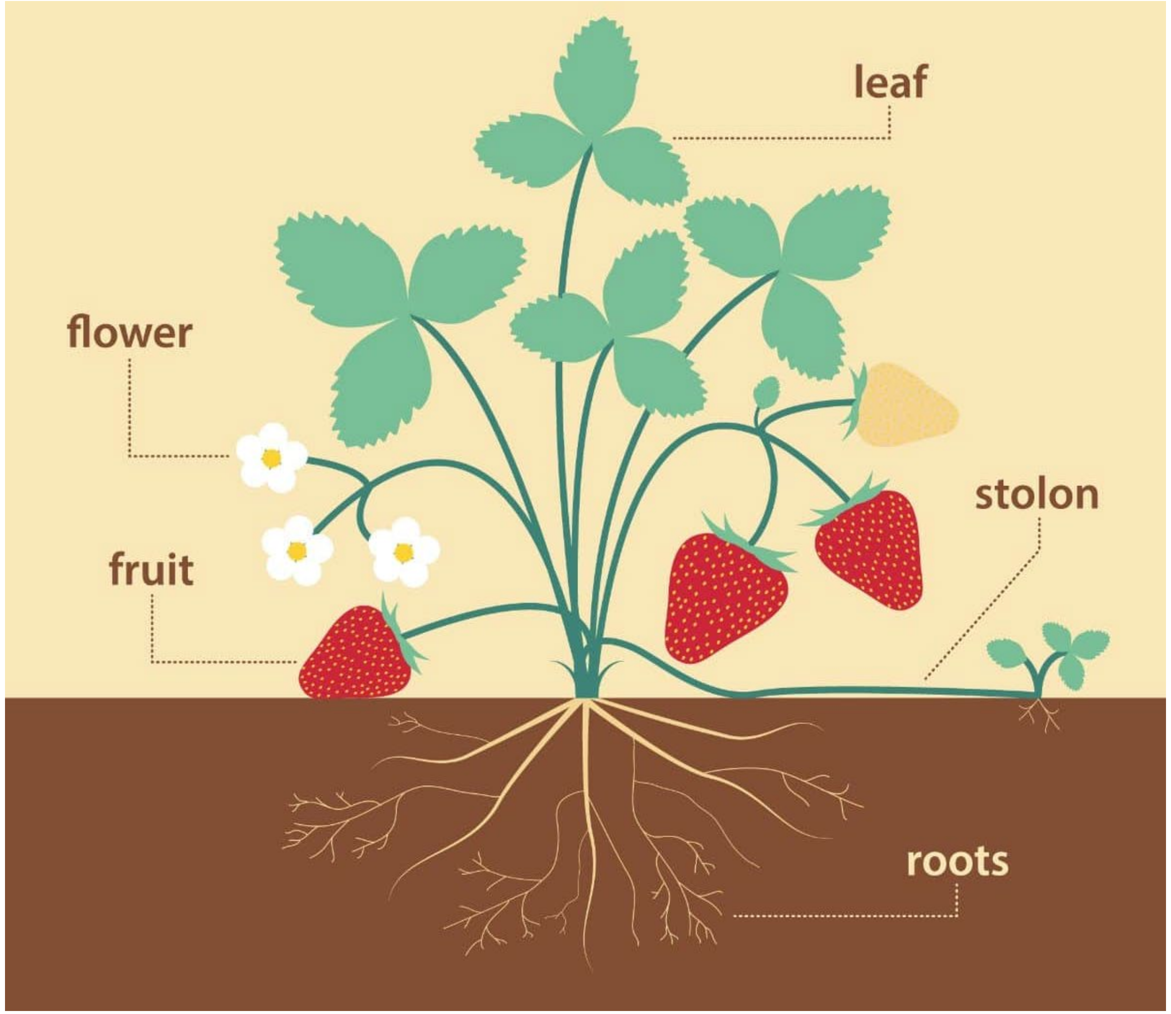
- ***Scientific Name: Fragaria*** species

- *Fragaria × ananassa,* the popular hybrid, is a cross between *Fragaria × chiloensis* and *Fragaria × virginiana*
- *Fragaria × sylvestris* var. *semperflorens* has ever-bearing habit
- *Fragaria × vesca and Fragaria × chiloensis* crossed with *Fragaria × ananassa* to produce white strawberries or pineberries

- Fruit is consumed fresh, high in vitamin C (jams, juice, pie, ice cream, milkshakes, chocolate, cookies)

Strawberry Plant

- Herbaceous plant
- Trifoliate leaves originating from crown
- Flowers originate from leaf axils
- Stolon (horizontal underground stem) or runners for propagation



Source: strawberryplants.org

Flowers and Pollination

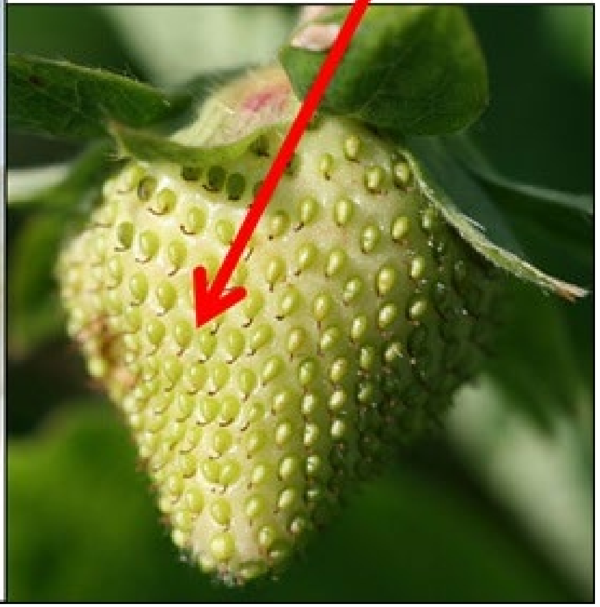
Strawberry flowers have separate male and female organs

Strawberry can be self-pollinated, but wind and insect pollination is important for proper fruit set

After pollination, pistils develop into ‘achenes’ or seeds

The fleshy part of strawberry is a receptacle that holds several achenes

Improper pollination can lead to misshapen fruits



Source: NC Sate Extension

Strawberry Production

- Most (90%) of the strawberries in the US are produced in the field (California-90%, Florida-5%)
- Top strawberry producing countries: China, US, Mexico
- Lot of strawberry is imported from Mexico
- Issues with field-grown strawberries:
    - Soil-borne pathogens
    - Increased labor costs
    - Fruit available during spring-summer-fall (less in winter)
    - Long-distance transport (modified atmosphere storage needed)

Greenhouse Strawberry Production

- Strawberries can be produced in high tunnels, with protection from rain and wind. However, lack of heating/ cooling in high tunnels limit production time similar to field
- Controlled environment (mainly climate-controlled greenhouses) allow for year-round production
- Industry is not as large as greenhouse tomato production, but steadily increasing (CA, MI, OH, TN, and Canada)
- Factors such as local demand, grocery chain push, better flavor fruit are driving forces for greenhouse strawberry production

Environmental Conditions

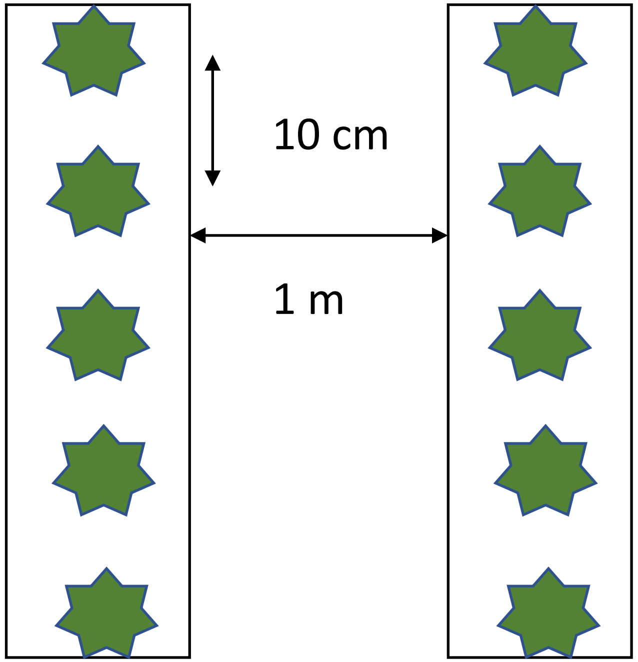
- Light intensity : 20-25 mol/m^2/day
- Night temperature (Fruiting): 55 °F
- Day temperature: 75 °F for vegetative growth
- Average daily temperature: 65 °F for flowering

- Photoperiod:
  - Short-day (June bearers). These varieties require short-day or long night period for flower initiation (day length <13 h)
  - Day Neutral Strawberries. Not affected by photoperiod but do well when 16 hours of light is provided

- Spacing: 10 cm between plants in a row, 1 m between rows (gutters, channels)

- Peat or Coir-based media in containers or cubes

- Fertilizer EC of 1.0 to 1.5 dS/m with 10-15% N in the fertilizer



Propagation Materials

Bare root

Runners

Plug plant

Tray Plant

Jan-Apr

Jul-Aug

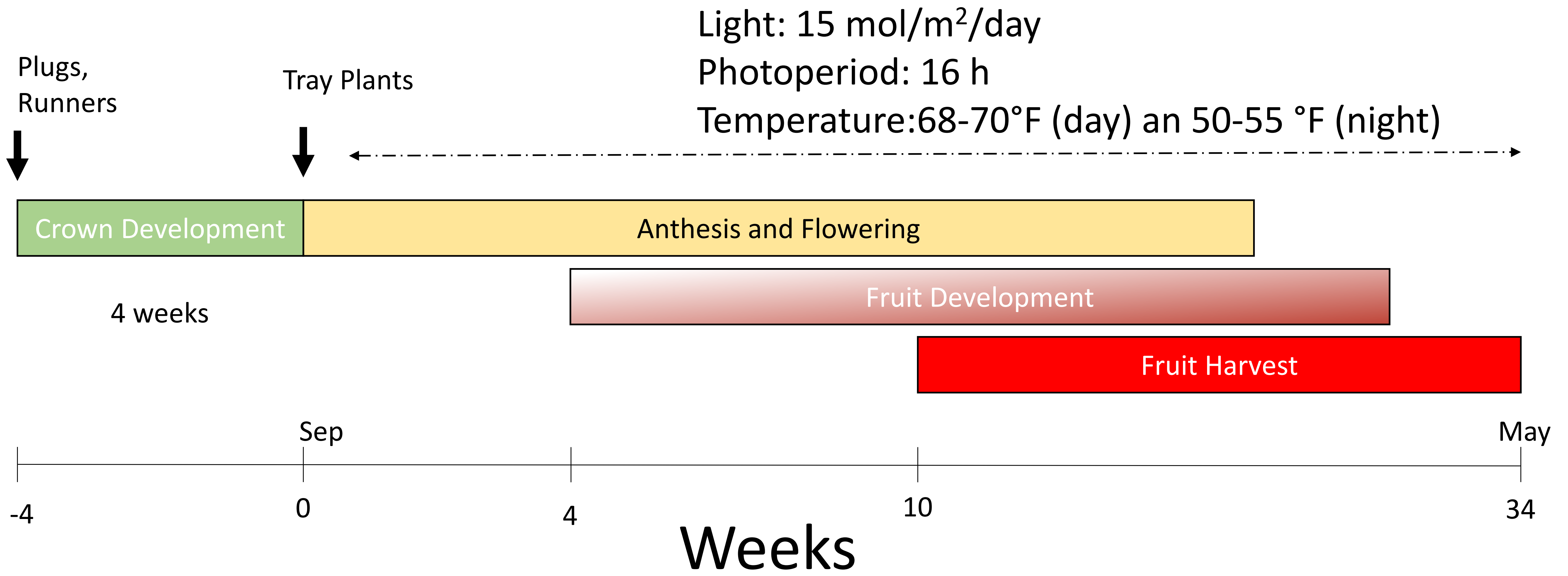
Aug-Sep

Sep

Availability

(Tray plants are larger in size with a crown and can quickly become productive)

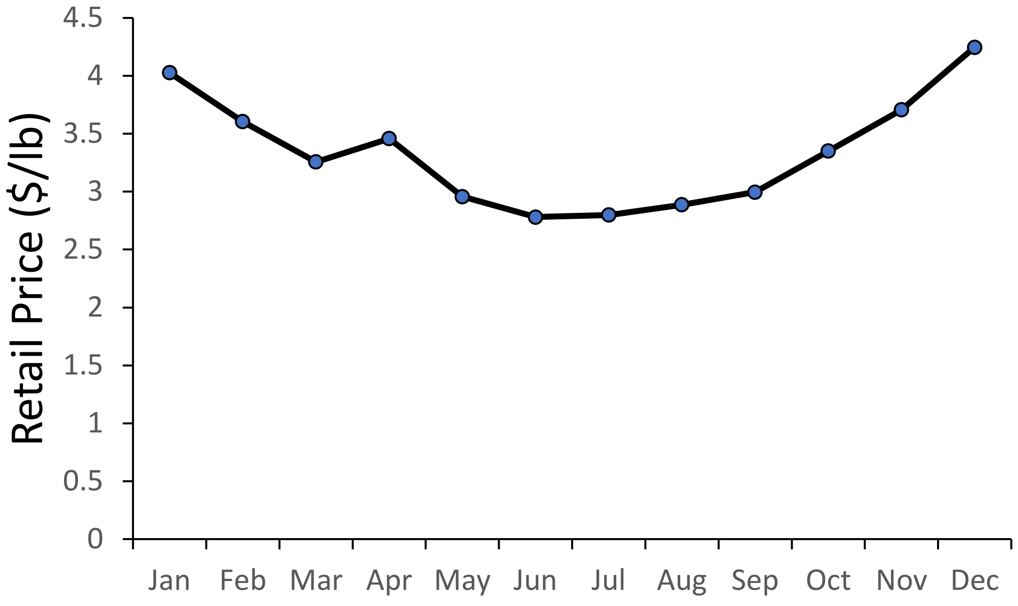
Day-neutral varieties are recommended for greenhouses

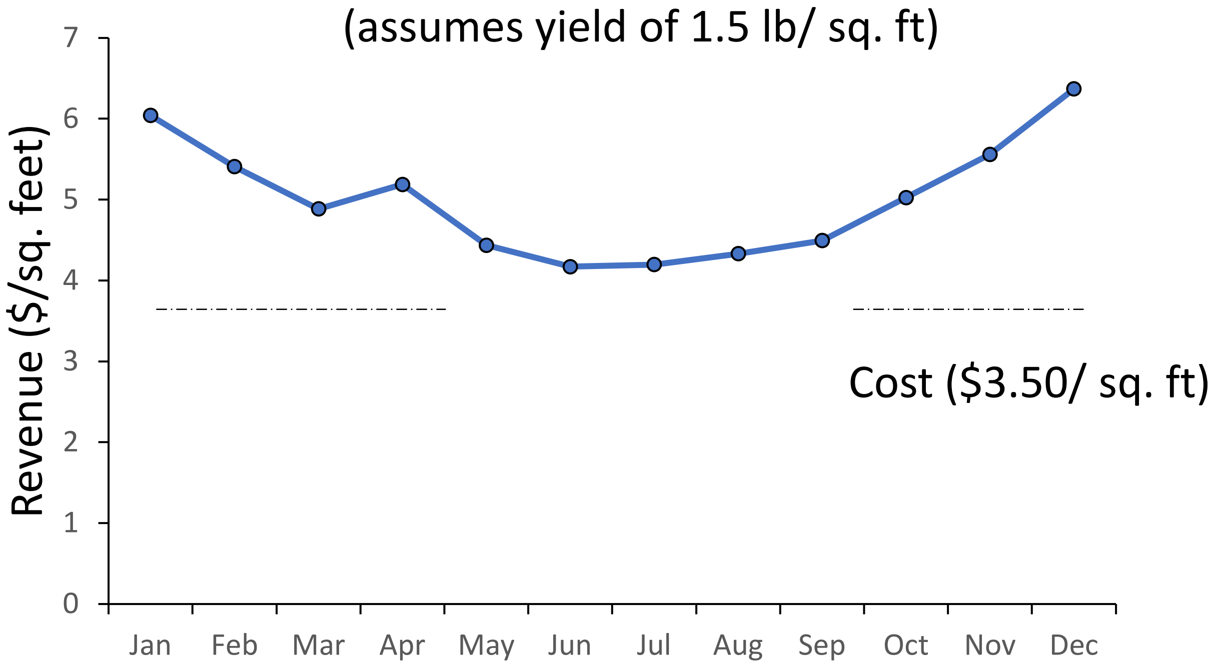


Preferred strawberry qualities

1. Brix or soluble solids : 8-10%
2. Acidity : < 8 g/L
3. Fruit size: 15-20 g
4. Firm
5. US No. 1 grade in shape
6. Color development requires some UV light
7. Yield: 1-2 lb/plant or sq. feet

Revenue and Costs





Strawberry Pruning

1. Leaf pruning: Remove old leaves that are not glossy or turn yellow to allow light to penetrate inside canopy and better air circulation

2. Runner pruning: Runners consume sugars from photosynthesis intended for fruit growth. Runner growth should be minimal during flowering. Excess nutrients, temperature can cause unwanted runner growth

3. Flower pruning: Remove flowers when vegetative growth is preferred or when there are too many small flowers per cluster. Usually 7-10 flowers are left on a cluster

Tip Burn and Calyx Burn

Lack of calcium to support fast growth of tissue

Source: The Ohio State University

Insects and diseases affecting greenhouse strawberry production

https://www.youtube.com/watch?v=prYl8v1oe1g