Strawberry Basics – History and Propagation

Topics covered:
1. Project overview
2. Phenology (not phrenology)
3. Anatomy
4. Planting and care
5. History and culinary aspects
6. Varieties being evaluated
7. Distribution of plant materials

Co-operative Extension Tahoe Basin Master Gardeners
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Who we are

Master Gardeners are community members who have been trained under the direction of the University of California (Davis) Cooperative Extension.

Each volunteer has completed more than 50 hours of formal classroom training.

Master Gardeners, agents of the University of California, assist the UC Cooperative Extension by providing practical, scientific gardening information to the home gardeners in the Lake Tahoe Basin.

The Lake Tahoe Master Gardeners offer research-based information by:
  - Answering questions via email hotlines, farmers markets and at community events.
  - Offering workshops and classes
  - Publishing articles in newsletters, local newspapers and social media.

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What we do

Garden Lectures and Workshops

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University of California
Agriculture and Natural Resources
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Help with public gardens and hands-on workshops

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Phenology and grow-out trials involving fruits and vegetables

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Tahoe Daily Tribune Photo

Assist with school gardening programs
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Answer Gardening Questions at Farmers’ Markets

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Altitude – Distance between object and ground surface

Elevation – vertical distance from ground surface to sea level

High Elevation Gardening

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Lake Tahoe 6225’

Lockheed SR-71 Blackbird

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Phenology

Phenology looks at growth and development differences between plant varieties that are due to weather and climate. 

Varietal Comparative Phenology (VCP) looks at growth and development differences between plant varieties that are due to weather and climate.

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The importance of Varietal Comparative Phenology:

1. Method *may* be used in identifying early mid and late season varieties
2. Can be the basis of defining a new variety
3. Provides important information on plant development to growers
4. May have importance in IPM strategies
5. Important consideration for bringing produce to market

Malwina
Nourse Farm Photo
The wild strawberries found in the Tahoe basin are either *Fragaria vesca*, the wood strawberry (alpine strawberry) or *Fragaria virginiana*, the mountain strawberry. There also undoubtedly a number of escaped cultivars of our commercial berries (*F. x ananassa*). Field identification between the species can be problematic, as overlap occurs. The main differences are in leaf characteristic. *F. vesca* leaves are slightly more serrated (12-21 above and below the middle) and the leaf petiole shorter to the individual leaflets. *F. virginiana* has fewer serrations above the middle of the leaf (7-13), and a slightly longer petiole to the individual leaflets.
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A Note on strawberry genetics

Strawberries, a member of the *Rosaceae* family, can be segregated based on chromosome numbers.

The multiplying of the chromosomes is called polyploidy and is fairly common in plants, with any number of examples found in the *Rosaceae* family. What causes polyploidy has been greatly discussed, with a number of environmental, chemical, and hybridization opportunities as contributing factors.

- *F. vesca* 2N=14
- *F. virginiana* 2N=56
- *F. chileenesis* 2N=56
- *F. x ananassa* 2N=56
- *F. moschata* 2N=42
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Varietal Comparative Phenology **Does Not** Typically

1. Look at disease resistance
2. Plant appearance
3. Plant or produce growth habits

*Mara des Bois*
*Nourse Farms Photo*

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Primary vegetative structures of a strawberry plant

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Planting Options

Seeds – Require conditioning for best results
Crown Divisions – Higher mortality, sets back development
Bareroot – Most economical, easy to source plants
Plant Plugs – Limited availability for home gardens
One Year old plants – Commonly available at nurseries
Daughter Plants – Only from varieties that have runners
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Strawberry seeds require conditioning prior to planting. Most commercial cultivars of *F. x ananassa* will not be true to variety.
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Daughter Plants form at the nodes of stolons.
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Plant plugs are current year plants that are grown in greenhouses for transplanting to the field or garden. For cultivars of commercial berries (F. x ananassa) tissue culture is a common method to produce plant plugs.
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**Planting**

Moderately fertile soil – pH 6.5 – 8.0

Well drained soil

Consistent moisture, especially during berry development

Planting depth to mid point of crown

Good soil contact with roots.

Bonnie Plants image

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Seascape berries on Plastic mulch

Straw mulch

Mulching keeps the berries from soil contact

usberryplants.com

Bonnie Plants photo

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Diseases
  Diseases (gardener cannot control)
  red stele
  verticillium wilt
  anthracnose
  nematodes

Solution – select resistant varieties

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www.omafra.gov.on.ca
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Diseases

Diseases (gardener can control)
- powdery mildew
- grey mold
- fruit rots
- crown rots

Solution – Garden management practices

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www.extension.umn.edu
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Pests
- Aphids/mites/weevils/lygus bug/earwigs
- Snails/slugs (uncommon in Tahoe/Truckee)
- Pill bugs
- Birds
- Mice/squirrels/chipmunks/gophers/rats
- Rabbits/raccoons/deer/bear

Solution – Garden management practices

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**Photoperiodism (the effects of length of daylight to organisms)**

- For most plants it is the amount of non daylight that affects plant development

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**June Bearing**
- Early Midseason – Brunswick
- Midseason – Flavorfest
- Late season – Malwina

**Ever-Bearing**
- Fort Laramie
- Mara des Bois

**Day neutral**
- Alpine
  - Yellow Wonder
    - (Everbearing)
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June Bearing Strawberries
Produce a single crop over about a 2 week period

Everbearing strawberries
Produce fruit 2-3 times during the growing season

Day Neutral Strawberries
Produce a few fruit continually during the year

Alpines are everbearing strawberries

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Planning for next year

Consider pinching off most of the flowers the first year
Only keep 1 – 2 daughter plants per parent (stoloniferous)
Pin daughter plants into bare areas within row
Remove most leaves once plant is dormant after several freezes
Remove unproductive plants

Consider mulching for over wintering

Baker Rare Seed photo

Yellow Wonder

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Fertilizing

Prior to planting incorporate a phosphorus based fertilizer (bone meal or equivalent) ½ pound/100 square ft. of bed.

Fertilize with a balanced fertilizer (10-10-10)
1 pound / 100 sq. ft. spring
½ pound / 100 sq. ft. after harvest.
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The Strawberry Store specializes in both *F. vesca* and *F. moschata*, the musk strawberry.

Suppliers

Michael Wellik of the Strawberry Store

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Suppliers

Nate, Tim and Mary Nourse

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Fragaria virginiana

Portland Nursery photo

Fragaria chiloensis

Keir Morse photo
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A little history

Greek and Romans report on plant- medicinal

By middle ages grown for berries (*F. vesca*)

New World varieties brought to Europe (1600s)

Crosses of *F. chiloensis* and *F. virginiana* (1700s)

Hieronymous Bosch painted his Garden of Earthly Delights about 1510

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French King Charles V (Charles the wise) had 1200 strawberries planted into the royal gardens at the Louvre near Paris.

Richard III had a penchant for strawberries, but may have been allergic to them.
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While Henry VIII greatly enjoyed and popularized strawberries and cream it was Cardinal Wolsey who is credited with inventing the combination.
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A Short History of the Modern Strawberry – *Fragaria x ananassa*

*F. ananassa* is a cross between *F. virginiana* and *F. chiloensis*

Cultivation of Alpine strawberry and Musk strawberry about 1000 AD

**AD 916,** when Charles III, King of West Francia meets with Cardinal Clemens de Monte Alto (Italy) in Lyons France to resolve a dispute. Following successful negotiations a feast with entertainment was held. A local citizen presents the king and guests with dishes of ripe strawberries, which pleased the Cardinal no end, stating that such fine fruit would be a rarity in Rome, especially so early in the season. In gratitude, King Charles knights the local, changing his name to Fraise (Strawberry in French) and giving him a coat of arms with two diagonal quadrants containing 3 strawberry flowers, the other two having a variation on the crown. The name change was a bit ironic since the newly knighted Sir Fraise name was Julius de Berry.
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A little over a hundred years later members of the Strawberry Clan immigrated to Scotland at the request of the French King, Henry to assist the Scottish King Malcolm III to subdue a renegade noble – Macbeth. The Fraise name was anglicized (or the Scottish equivalent) to Frazer.
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Fast forward a couple hundred years and the politics in Scotland (think Braveheart) get too hot and there is a movement of the Frasers back to France and but now having the French version of Frazer - the name Frézier. Enter one Amédée François Frézier born in 1682 to a prominent lawyer father, he studied both theology and science – and was keen on architecture and fortifications. He also liked to dabble with pyrotechnics.

Perfect qualifications for a French spy, who in 1712 was in Chile to check on Spanish fortifications.
On a tour of the beaches he encountered large fields planted in the beach strawberry (F. chiloensis), where he collected a few plants to take with him back to France. His spying was a success, so much so that his Journal was translated into several languages – each a possible enemy of Spain. His five beach strawberry plants became the basis of a number of experimental crosses with European and other strawberries from the New World including F. virginiana, which directly led to the modern strawberry we know today.
Somewhat interestingly, the French approach to hybridization was more academic in their attempts, while the British were driven to commercialization of promising cultivars. As a consequence English varieties were the common market berries in England, the continent and eventually the United States.
And now this odd story

The *modern strawberry* was introduced to Germany by George II in 1751. George II was king of Hanover (Germany) but was also King of England and Ireland (George II was the last British monarch not born in England and also the last British king to lead troops on the battlefield.)
Beginning about 1870 the Goescke father and son team (Gottlieb and Franz) introduced successful German cultivars derived from *F. x ananassa* to the marketplace. Franz was the Royal Horticultural Director at Proskau until about 1912. Their work was followed by Otto Schindler who continued breeding and cultivar introductions until the Nationalist Socialist Party comes to power in 1933.
Sengbusch a talented botanist, though ambitious, somewhat arrogant, and a difficult person to work with, soon was at odds with his Kaiser-Wilhelm Institute superiors, leaving in 1937 to start a private institute, funded by a tobacco company (through a subsidiary) H.f. & Ph. F. Reemtsma GmbH which had extremely close ties to the Nazi elite.
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Throughout the war years strawberries were grown and cultivars developed at the Sengbusch’s institute fields in Luckenwalde. Even as late as 1944-5 strawberry production and research continued with 10,000 seedlings grown and evaluated for both fresh and frozen applications.

The selection of Luckenwalde for field growing was either good planning or luck because a POW prison and an internment camp were there so labor was never an issue for Sengbusch. Even after the Soviets occupied Luckewalde, Sengbush continued his work - but now with oversight by curious Russians who wondered why such importance was given to growing strawberries during a war.
After the war Sengbush was given a position at the Max Plank Institute of Plant Research (The new name for the Kaiser-Wilhelm Institute) where he continued work on Strawberries, very quickly developing one of the most famous European cultivars, the Senga Sengana – all based on his war time research. It was introduced and copyrighted (patented) by Sengbush in 1954.
In 1954 Sengbusch founded the Sengana GmbH to manage the commercial production and promotion of this cultivar – all while employed at the Max Plank Institute, where he retired from in 1968 (the Max Plank Institute for Plant Breeding closed about the same time).
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What’s Inside The Strawberry Patch
Lessons Planning Chart for Strawberry Patch
Activities Strawberry Lunch Party Video

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