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Growing Raspberries in the Home Garden

Gary Gao, Ph.D.
Professor and Extension Specialist
The Ohio State University

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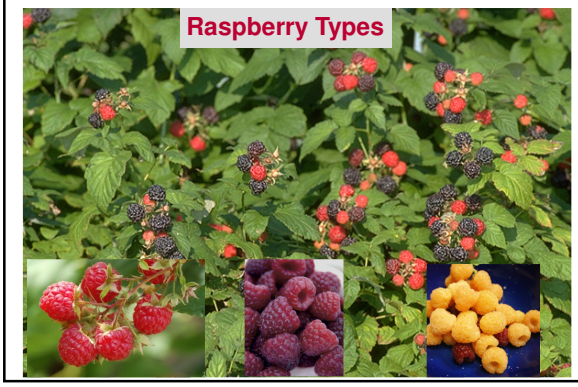
Raspberry Types



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Health Benefits of Raspberries:

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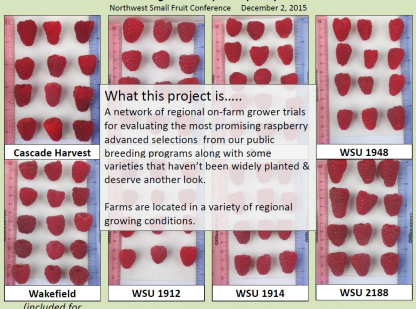
Advanced Cultivars

On Farm Trials of Promising Blackberry & Raspberry Selections & Varieties

Northwest Small Fruit Conference December 2, 2015



Cascade Harvest | WSU 1948 | Wakefield (included for comparison) | WSU 1912 | WSU 1914 | WSU 2188

What this project is.....

A network of regional on-farm grower trials for evaluating the most promising raspberry advanced selections from our public breeding programs along with some varieties that haven't been widely planted & deserve another look.

Farms are located in a variety of regional growing conditions.

Funded by the Washington Red Raspberry Commission

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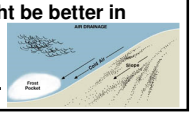
Site selection:

- **Soil:**
  - **Deep, well drained loamy soil with good water holding capacity;**
  - **pH between 6.0 and 6.5**
  - **Organic content of 3% or higher;**
- **Slope:**
  - **North or northeast facing slopes might be better in cold climates;**
- **Avoid low areas where frosts are prone.**



Site selection:

Checklist for a Good Site

- ❑ **A location close to market**
- ❑ **Good soils**
- ❑ **Good soil drainage**
- ❑ **A moderate slope (3 to 5%)**
- ❑ **A source of high-quality water nearby**
- ❑ **No wild brambles in the immediate area**

Poor drainage = *Phytophthora* root rot = Plant Death!

Blackberries are not as susceptible to Phytophthora as raspberries. However, good drainage is still essential for productive blackberry plants.

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Diseases

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Soil Testing

Remove top debris;
Remove sod;
Sample 6 inches deep;
Take multiple cores/samplings;
Air dry soil;
Crumble samplings;
Make a composite sample;
Send the sample to a lab.

Pre-plant Manure and Compost Use

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Raised Beds

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Useful References

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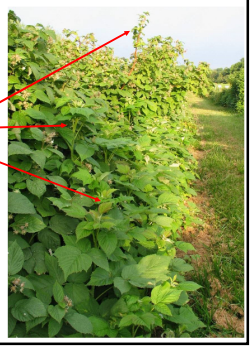
Basics of Raspberry Growth

- Plants are perennial
  - Canes are biennial
  - Floricanes – 2nd year cane
  - Primocanes – 1st year canes



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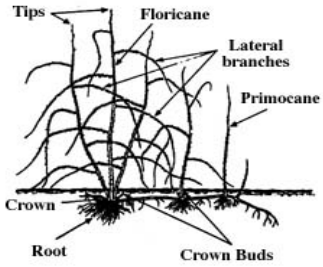
A bramble plant Life Cycle:



✓ **Most raspberry species take 3 years to reach maturity.**
✓ **They remain productive for 8-10 years.**

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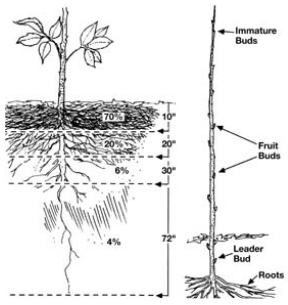
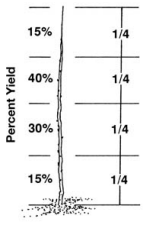
Bramble Roots and Shoots:





Primocane-fruiting Habit

Raspberries: PF occurs in many wild red raspberry types. Breeding in N. America started in NY and resulted in the release of 'Heritage' in 1969.

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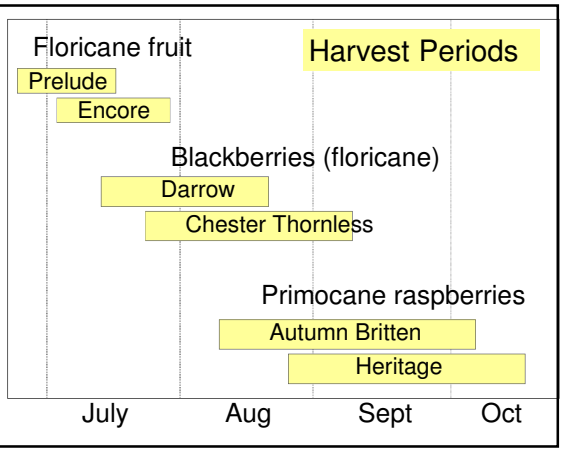
Cultivar Selection

- Fruit color, size, taste, uses and yield;
- Disease tolerance;
- Harvest season;
- Cold hardiness;
- Ease of growing.
- ???



Floricane-fruiting varieties - Early

Boyne: very hardy, high yields, average flavor, softer and smaller

Canby: less hardy, medium yields, exc flavor, large berries but somewhat soft

Nova: very hardy, high yields, medium flavor, medium to large, very firm (some primocane fruit)

Prelude: hardy, high yields, good flavor, medium firmness and size

Floricane-fruiting varieties – Mid-Late

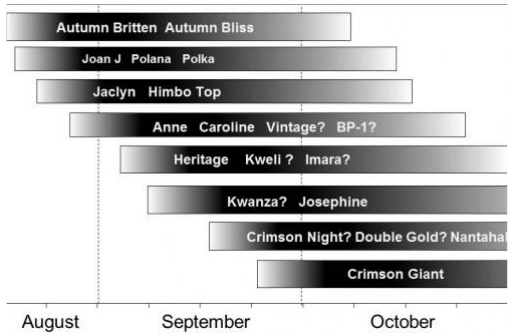
AAC Eden: The strong canes are spineless and shown to be moderately winter hardy. The conical fruit are large, firm, light to medium in color with exceptional flavor. AAC Eden early results show it to be a great mid-season choice to trial when looking for a variety with high productivity and flavor.

Encore: hardy, very high yields, excellent flavor, firm and large

K 81-6: hardy, very high yields, excellent flavor, somewhat soft by very large

Primocane-fruiting Red Raspberries in Nurseries

Autumn Bliss
*Autumn Britten
*Caroline
Crimson Giant
Crimson Night
Double Delight
*Heritage
*Himbo-Top
Indian Summer
*Jaclyn
*Joan J
Joan Irene
*Josephine
Nantahala
Polana
*Polka
Red River
Red Wing
Rosanna
Rudyberry
September
Ukee



Early Primocane-fruiters

Autumn Britten: good flavor, large fruit,
but: low yields and vigor, softer, prone to rot

Jaclyn: large, firm fruit with exc flavor,
but: modest yields, dark color, hard to pick

Polka: large bright red fruit, high yields,
but: attractive to leaf hoppers, Jap. beetles

Joan J: large, firm fruit with exc flavor, high yields
but: very dark color

Mid-late Primocane-fruiters

Caroline: medium-large, exc flavor, v high yields
but: softer

Heritage: very firm with exc flavor, high yields,
but: small berries, later maturing

Himbo Top: large bright red fruit, high yields,
but: softer

Josephine: very large, firm fruit with exc flavor,
but: dark color, later maturing

Very Late Primocane-fruiters

Joan Irene: large, firm, exc flavor, high yields
but: difficult to pick, darker, late maturing

Nantahala: firm with exc flavor, high yields,
but: later maturing

Crimson Giant: very large bright red fruit,
but: poor flavor, prone to rot, very late

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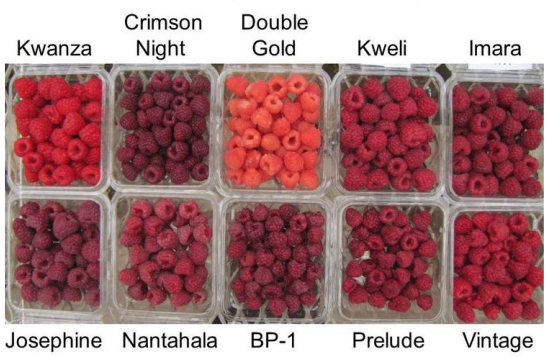

Black Raspberries (all floricane-fruiting)
- Jewel
- Bristol
- Mac Black
- Haut

Purple Raspberries (all floricane-fruiting)
- Royalty
- Brandywine
- Estate

Yellow Raspberries (all primocane-fruiting)
- Anne
- Double Gold
- Fall Gold

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Planting Distances

Plant Spacing:

- Red raspberries (suckering): 2-3 feet
  - Non-Suckering (i.e. Titan): 2 feet
  - Vigorous (Boyne): 4 feet
- Purple Raspberries: 3-5 feet
- Black Raspberries: 3-4 feet

Row Spacing:

10 to 12 feet depending on width of your equipment.

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Planting Techniques

Purchase virus-indexed plants;

If you plant bare rooted plants, new growth may not appear for 4-6 weeks. The cane portion of the plant may never leaf out.

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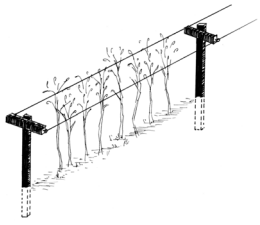
Trellis Installation

Temporary T-trellis used for primocane-fruiting raspberries.



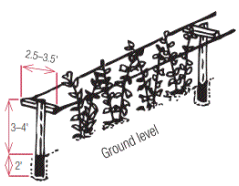
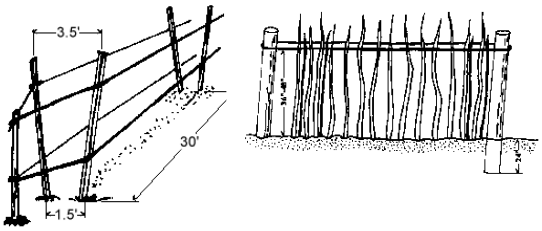


Illustration courtesy of NC State University Cooperative Extension

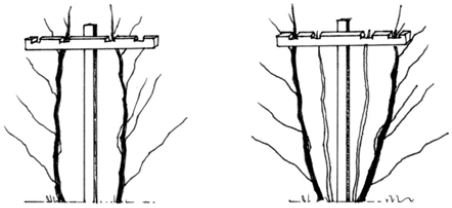
Trellis Installation

Primocane Fruiting Raspberries



Trellis Installation

Floricane Fruiting Raspberries



The Gjerde system used on raspberries in Norway.

Pruning Raspberry Bushes

Pruning Floricane-fruiting Red Raspberries

- ✓ Thin canes to 4-5 per foot of row by removing weak and damaged canes and those farthest from the middle;
- ✓ Top canes taller than 5-6 ft.

Pruning Summer-fruiting Red Raspberries

After harvest (July/Aug), cut spent floricanes at ground level. Remove and destroy canes or chop finely in the row middle.

Pruning Fall-fruiting Raspberries

Mow or cut canes in late winter - early spring

New primocanes grow during summer -

- and produce fruit in late summer or fall

Double-cropping Primocane Fruiting Raspberries

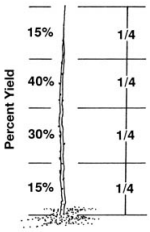
Primocanes die down to the last node that fruited in the fall. If canes are not removed, lower buds will flower and fruit the next summer.

Provides summer and fall crop off the same plants, but:

-requires more pruning.
-yields in the fall are reduced
-summer yields and quality not as high as from floricane fruiting cultivars.

Pruning

The pruning method depends on what you are growing. It is important to know the name of the cultivar(s) to determine what type it is.



Summer Reds ("Lauren" and "Nova"):

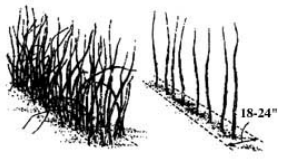
- **Removal of all weak canes and cutting back tall canes (over 5 feet) to 4.5 to 5 feet.**
- **Removal of canes that produced fruits.**

"Heading back" a red raspberry cane. Do not cut more than the top one fourth or yields will be decreased.

Pruning

Everbearing or Fall Red ("Heritage" and "Caroline"):

- **Removal of all weak canes;**
- **Thin canes to 6 inches apart;**
- **Removal of canes that produced fruits.**



Two crops a year vs. one crop.

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Pruning

Everbearing or Fall Red ("Heritage" and "Caroline"):

- **Easy Method – mow everything to the ground in March.**

A fall crop only.

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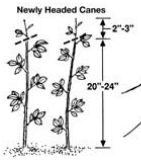
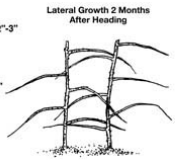
Pruning

Purple and Black Raspberries ("Royalty", "Jewel" and "Bristol"

- **Heading or summer pruning of black and purple raspberries. Black raspberries are headed at 28 to 30 inches and purples at 36 inches.**





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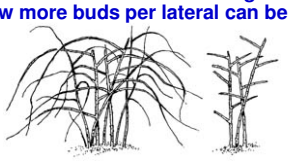
Pruning

Purple and Black Raspberries ("Royalty", "Jewel" and "Bristol"

- **Black and purple raspberries before and after dormant pruning.**
- **With black raspberries, eight to 10 buds (eight- to 12-inches long) per lateral are usually enough. Purple raspberries are somewhat more vigorous than blacks, and a few more buds per lateral can be left.**



Fertilizing

Pre-plant: test soil, incorporate P, K, Mg and lime as needed (do not incorporate N).

Planting year: 20-30 lb N per acre 2-3 wks after planting, repeat in July if needed.
Band or sprinkle by hand in a 2 ft-wide circle plants

N Use – Established Plantings

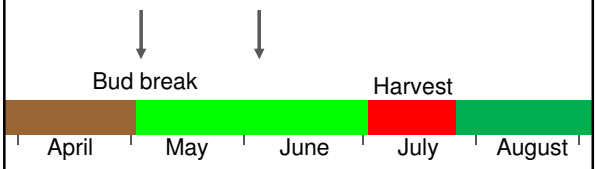
Urea, ammonium nitrate are usually cheapest and best.

Rates (lb N/acre) (higher rates on sandy soils and fall bearing types)	
Yr 2	**Yr 3 and older**
30-60	50-100

Hart et al., 2006. EM 8903-E
Oregon St. Univ. Ext

N Timing – Brambles

1. Heavier, fertile soils: all at bud break (April-May)
2. Sandy soils: half at bud break, half 3-4 weeks later



Raspberry Tissue Sampling

Collect 50-75 mature leaves from middle of primocanes in August

Rinse briefly in tap water, sdy on table top.

Send to reputable lab for nutrient analysis.

Desired leaf nutrient levels, raspberries and blackberries.			
N	2.0 – 2.8 %	B	30-90 ppm
P	0.25 – 0.40 %	Cu	7-20 ppm
K	1.5 – 2.5 %	Fe	60-250 ppm
Ca	0.7 – 1.7 %	Mn	50-200 ppm
Mg	0.3 – 0.5 %	Zn	20-50 ppm

A case for gypsum?

Gypsum ($CaSO_4$) supplies Ca but does not alter pH. It is known to improve flocculation of clay and water infiltration/drainage of saline or sodic soils.

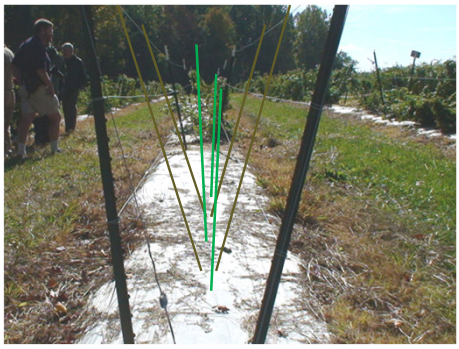
Gypsum reduced raspberry root rot caused *by Phytophthora spp.* in NY (Maloney et al., 2005) and to some extent in WA trials (Pinkerton et al., 2009).

Gypsum also reduced *Phytophthora diseases of avocado* and soybean, apparently due to the inhibitory effect of high Ca concentrations on fungal growth and infection of plant tissues.

Recommendation:

Incorporate 3-6 tons gypsum prior to planting raspberries on sites with a history of Phytophthora root rot.

Simple V-Trellis
(separates primocanes and floricanes)



Other V-trellises designs

V-trellis

Wood flashing tied to metal fence post.
Wire runs through holes in flashing.

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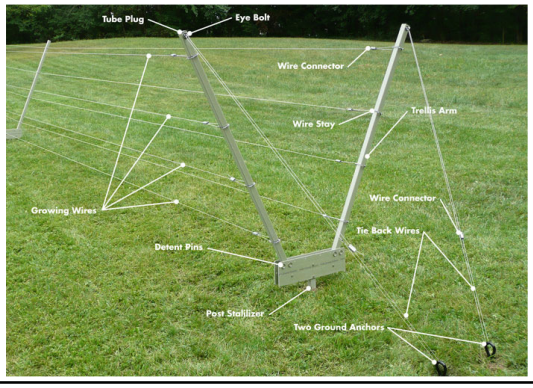

Irrigation is essential for commercial production on most sites

Trickle (drip) systems are preferred
Install during planting year

Over-head sprinklers are more expensive, less efficient, and may cause more disease, but

-can provide spring and fall frost protection and water sod between rows.

Raspberry primocanes damaged by frost

Berries need to be picked by hand for fresh market quality:

Pick on frequent intervals (2-4 days)
Pick in the morning when berries are cooler
Cool berries to 34 °F as soon as possible
Remove, small, over-ripe and damaged fruit
Minimize transfers and handling

Harvest all fruit, separate fresh market quality from small and defective berries.

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Insects (Foliage, Flowers and Fruit)

Japanese Beetles feed on leaves, flowers & fruit.

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Insects (Cane Borers)

- Two cane borers. They are raspberry cane borer and rednecked cane borer. Damages are different;
- Control measures are the same:
  Just before blossoms open, spray with bifenthrin or esfenvalerate or permethrin or pyrethrins + PBO or rotenone + pyrethrins or malathion.

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Insects (Cane Borers)

Raspberry cane borer damages the tip of the shoots.

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Insects


Control of raspberry cane borer is obtained by pruning out the infested canes by cutting a few inches below the oviposition rings or below the larval tunnel.

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Insects

Rednecked cane borer damages the middle of the shoots.

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Insects

Raspberry crown borer causes wilting of the shoots.

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Insects

- Eggs are laid on lower leaf surfaces in late July or August, and the eggs hatch in 30 to 60 days;
- In October, the larvae (dull white with a brown head) hatch and form a hibernation cavity at the base of a cane below the soil line;
- The following spring they tunnel and girdle new canes and the crown, then pass the second winter in the root system of the plant;
- Control: Removal and burn the infested plant.

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Fruit Insects

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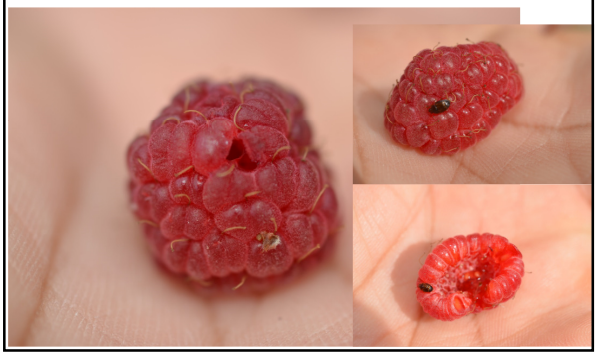
Insects



Spotted Wing Drosophila Management

Trap for adults, scout for damage

Sanitation:

- Timely, thorough harvest
- Keep rows narrow

Insecticides (Pyganic, Entrust):

- Timely sprays, thorough coverage
- Watch label limits and mites

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Diseases

Orange rust on young shoots; spores

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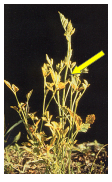
Orange Rust

Symptoms:

- The lower surface of infected leaves become covered with blister-like pustules. Eventually, the pustules turn into bright orange, powdery masses of spores.
- Plants are systemically infected (fungus grows throughout the plant and the plant is infected for life). In years following infection, infected canes will be bushy and spindly as they emerge in the spring.
- New leaves on infected canes are stunted or misshapen and pale-green to yellowish.



Management of Orange Rust

Use healthy planting stock

Site selection

- Select a site with good air movement and sun exposure (promote faster drying).

Canopy control

- Prune to keep row width between 1 or 2 feet in order to encourage air movement and faster drying.
- Control timing and amount of nitrogen fertilizer to prevent excessive growth.

Sanitation

- Remove and destroy infected plants including the roots (important for orange rust).
- Destroy nearby wild brambles that serve as a reservoir for disease.

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Summary

- Build raised beds;
- Select good cultivars;
- Prune at the right time;
- Fertilize regularly;
- Harvest in a timely manner;
- Enjoy your fruits of labor;
- Have fun!

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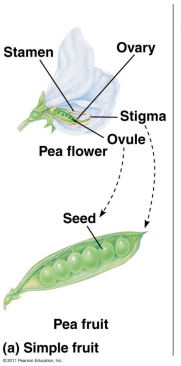
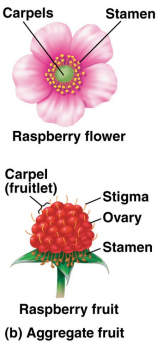
Bonus Materials for Your "Reading Pleasure"

The receptacle of the inflorescence is called as a torus.

Blackberries: The receptacle stays on the fruit.

Raspberries: The receptacle remains on the cane.





Fruit Development:

- Not a true berry;
- 60 to 160 ovaries per flower;
- Two ovules per ovary;
- About 30 – 36 days from pollination;
- Three phases:
  - Rapid cell division;
  - Embryo development and seed coat hardening;
  - Rapid growth due to cell enlargement.
- Fruit size:
  - 1-5 grams

Primocane Growth and Development:

- ✓ Primocanes are produced from buds at the floricane base in a section called the crown (the perennial base of the plant) or from buds on roots;
- ✓ Primocanes produced from the roots are known as suckers and usually are less vigorous than those produced from the crown;
- ✓ Primocane growth or "emergence" starts in the spring;
- ✓ Primocanes grow rapidly from spring until the hotter days of summer. They continue to grow in height more slowly until cold fall weather limits their development;
- ✓ Primocanes produce leaves and axillary buds at slight swellings called nodes. Red raspberries generally have clusters of one to three buds at each node.

Summer-Bearing Varieties:

- ✓ Canes on these cultivars grow 6 to13 feet tall, depending on the cultivar, production practices, and environmental conditions;
- ✓ Primocanes generally are vegetative the first year and bear fruit the second year on the entire length of the Floricane;
- ✓ Flower bud initiation (flower formation for next year's crop) occurs in late summer as the days grow shorter and temperatures become cooler. This process starts at the tip of the primocane and progresses to the base of the cane. The buds at the very base of the cane and those just under the soil do not initiate flower buds and serve as a source of new primocanes the following spring;
- ✓ Primocanes seldom branch unless the apical bud is damaged. During long, hot summers and autumns, the buds at the tips of some cultivars break and produce fruiting laterals in the fall.

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Primocane-fruiting Raspberries

- ✓ Primocane-fruiting raspberries generally produce shorter canes than summer-bearing cultivars, averaging about 4 to 6 feet in height;
- ✓ Fruiting laterals also are shorter than those of summer bearers;
- ✓ Flower bud initiation begins at the tip of the primocane in late spring to early summer and progresses downward.

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Primocane-fruiting Raspberries

- ✓ Unlike summer-bearing cultivars, however, flower bud initiation does not depend on day length and temperature, but rather on the physiological age of the cane;
- ✓ Research with 'Heritage' has shown that flower bud initiation begins when canes have produced about 50 nodes and then proceeds down the canes for about 10 to 12 nodes;
- ✓ The number of nodes that form fruiting laterals during the first season depends on the cultivar;
- ✓ In western Oregon and Washington, flowers on primocanes generally open in July, and the fruiting season runs from late July through October, depending on the cultivar.

Primocane-fruiting Raspberries

- ✓ In and east of the Cascades, flowers typically begin opening in August or September, with harvest from late August until October;
- ✓ Weather can have a major impact on fruiting season as it affects primocane growth and flowering time;
- ✓ Those portions of the primocanes that develop fruit die by the following spring;
- ✓ Buds farther down the primocanes continue to develop into the fall and again during the following spring, and they produce a second crop of fruit on laterals in early summer;
- ✓ The basal buds remain vegetative and are a source for new primocane growth in the spring.

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Dormancy and Cold Hardiness

- ✓ In autumn, leaves turn yellow or yellowish-red, dry up, and fall from the primocanes. Before the leaves fall, some nutrients and biochemicals move from the leaves to the canes and roots, where they are stored for next year's growth. The primocane stems and buds remain alive and enter a condition called dormancy, or rest;
- ✓ Once plants enter dormancy, a certain number of chilling hours, generally considered to accumulate at or below 45^0F (7^0C) are required before the plant can resume normal growth and development. Because chilling requirements depend greatly on variable environmental conditions, they are hard to predict exactly;
- ✓ Extended periods of temperatures between 32^0F and 45^0F are ideal for chilling.

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Dormancy and Cold hardiness

- ✓ Red raspberries are relatively more cold hardy compared to black raspberries and trailing blackberries. Nonetheless, red raspberries can be injured when temperatures of 0°F (17.8°C) to -10°F(-23.3°C) are accompanied by drying winds that desiccate the canes;
- ✓ Not all tissues within the canes or buds are equally cold hardy. Cane tissues have been found to be 3°F to 27°F more cold hardy than buds, depending on the cultivar, time of year, and environmental factors.
- ✓ Within buds, the tissues at the base of the bud (where it attaches to the stem) are less cold hardy than the tissues within the bud scales.

Dormancy and Cold Hardiness

- ✓ Once chilling requirements have been met, relatively short periods of warm temperatures can decrease the canes' cold hardiness. For example, an unusually warm January can cause canes to de-acclimate or lose some of their cold hardiness. If that warm spell is followed by subfreezing temperatures, the canes can be injured.
- ✓ The seriousness of the injury depends on many factors, including cultivar, when the warm spell occurs, how long it lasts, how high temperatures rise, how rapidly and how low temperatures drop, how long the low temperatures last, and cultural practices, such as weed control and fertilization.

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Dormancy and Cold Hardiness

- ✓ The tips of canes de-acclimate more quickly and are more likely to be damaged by cold than tissues farther down the stems. Buds on the upper portions of the canes also break earlier in the spring than those on the basal portions.

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Floricane Growth and Development

- ✓ When growth begins in the spring, the overwintered primocanes become floricanes;
- ✓ Floricanes do not increase in length, but buds break along the canes, producing fruiting laterals;
- ✓ The length of the fruiting laterals and the extent of bud break vary by cultivar. Research in the Pacific Northwest has shown that 'Meeker' never has 100% bud break. Generally, only about 40 to 59 percent of the buds break. In some cultivars, more than one bud sometimes breaks at a node, producing more than one lateral per node.

Floricane Growth and Development

- ✓ Fruiting laterals produce leaves and flowers. The number of flowers on a lateral depends on the cultivar and is influenced by environmental conditions. 'Meeker,' for example, typically produces 9 to 16 flowers per lateral.
- ✓ The inflorescences (flower clusters) at the tips of the laterals develop and open before those nearer the cane. Within an inflorescence, the primary flower at the tip opens first;
- ✓ The range in flower opening times, coupled with slightly earlier emergence of laterals at the tip of the cane, causes fruits to ripen over about 30 days for most summer-bearing cultivars grown in the Pacific Northwest.

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Floricane Growth and Development

- ✓ Following fruit harvest, floricanes start to senesce. As they die (from early August to early September), they export
- ✓ 1 to 2 grams of nitrogen per plant to the crown and roots. This rate equals about 4 to 8 pounds of nitrogen per acre. For this reason, it is best to delay floricane removal
- ✓ until fall, rather than removing canes immediately after harvest, unless earlier removal is desirable for disease management.

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Flowers and Fruit

- ✓ Red raspberry flowers have five green sepals at the base and five white petals;
- ✓ Many stamens (male pollen-producing parts) are arranged around a central, white receptacle containing many pistils (female fruit-producing parts). The receptacle is called a torus.

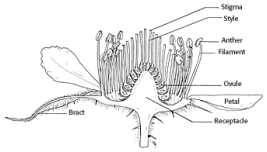

Figure 167. - Longitudinal section of 'Willamette' raspberry flower, x10.

Flowers and Fruit

- ✓ Raspberry fruits require about 30 to 35 days to mature after pollination. The fruits increase in size at a fairly constant rate until about 4 to 5 days before maturity.

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Flowers and Fruit

- ✓ During this final stage of ripening, berries rapidly increase in size;
- ✓ To attain maximum productivity, flavor, and sweetness, raspberries must reach full maturity and full size before harvest. Fruit firmness, however, decreases during the later stages of fruit maturation. Fruit firmness is also cultivar-dependent. Particularly for fresh fruits destined for shipment to distant markets, raspberries may be harvested mature, but not fully ripe, when they are still firm enough to ship well.

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Yield

- ✓ The number of berries and individual berry weights determine total yield.
- ✓ Factors that influence the number of berries are:
  - The number of fruits per lateral;
  - The number of fruiting laterals per cane;
  - The number of canes per acre.
- ✓ Berry weight is influenced by the number of drupelets per berry and drupelet size.

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Raspberry Types By Fruit Color:

- ✓ **Red Raspberries:**
  - ❖ European Red Raspberry (***R. idaeus subsp. vulgatus Arrhen.***)
  - ❖ North American Red Raspberry (***R. idaeus subsp. strigosus Michx.***)
- ✓ **Black Raspberries:**
  The black raspberry (***R. occidentalis L.***) of the eastern USA.
- ✓ **Purple Raspberries:** hybrids of red and blackberries, and these were once given the specific rank of R. neglectus Peck.
- ✓ **Yellow Raspberries:** R. ***idaeus***, caused by a recessive mutation, is also grown on a limited scale for specialty markets.

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Raspberry Types by Fruiting Habits:

- ✓ **'Summer-bearing' Habit**
  - Canes originate from either crown buds or adventitious root buds in early spring;
  - Canes elongate during the growing season, forming fruit buds in the axils of leaves in the autumn when temperatures decrease and day lengths shorten;
  - The plants become dormant for winter, then the buds on the cane grow the following spring once the chilling requirement has been fulfilled. The chilling requirement varies considerably among summerbearing varieties, ranging from a few hundred hours to more than 1,800 hours;

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Raspberry Types by Fruiting Habits:

- ✓ **'Summer-bearing' Habit**
  - The lateral axillary buds on dormant canes contain both leaf and flower primordia;
  - At the onset of warm weather, buds break and flowering occurs about 6 - 10 weeks later. Fruiting occurs in early to late summer, depending on variety, then the entire cane senesces;
  - While these second year canes (floricanes) are flowering, first year canes (primocanes) are growing from the crown or roots;
  - These primocanes will fruit the following year.

Raspberry Types by Fruiting Habits:

✓ **'Summer-bearing' Habit**

- **These primocanes will fruit the following year. More than 40 summer-bearing red raspberries are grown commercially, and these change with the release of new, improved varieties. Among the major varieties originating in North America are 'Boyne', 'Canby', 'Killarney', 'Meeker', 'Reveille', 'Taylor', 'Titan', 'Tulameen', and 'Willamette'. The Glen and Malling series are important varieties from the UK;**
- **The Scottish Crops Research Institute is the leading institution in the world for raspberry variety development.**

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Raspberry Types by Fruiting Habits:

✓ **'Fall Bearing' Habit:**

- **In some varieties, fruiting laterals will develop from the top of first year primocanes after they reach a certain height, without any chilling. If the growing season is sufficiently long, fruit can be harvested from the upper portion of these canes through autumn;**
- **The lower portion of the cane will fruit the following summer, if it is allowed to remain in the field.**
- **The major variety worldwide is 'Heritage'; other important varieties are 'Amity', 'Autumn Bliss', 'Polana', and 'Autumn Britten.'**

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Raspberry Cultivars

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Primocane Bearing Red Raspberry

"Himbo Top" (variety 'Rafzaqu') (Switzerland)

- ✓ Produces good quality, large fruit;
- ✓ The fruit is bright red with good flavor;
- ✓ Plants are vigorous and upright and medium in height with very long fruiting laterals that require trellising;
- ✓ Sucker production is somewhat sparse leading to moderate yields.

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Primocane Bearing Red Raspberry

"Joan J" (Great Britain):

- ✓ It is an early season variety with very firm fruit with a thick texture. The fruit is conic and dark red and will darken with storage;
- ✓ The canes are vigorous, upright and spineless making picking easy;
- ✓ Yield and fruit size is very good. The fruit skin is thin and can be damagedeasily, especially in high temperatures.

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Primocane Bearing Red Raspberry

"Heritage" - [(Milton × Cuthbert) × Durham] 1969

- ✓ Is highly productive;
- ✓ Has good size and color and flavor;
- ✓ Received the 2004 "Outstanding Fruit Cultivar Award" from American Society of Horticultural Science.

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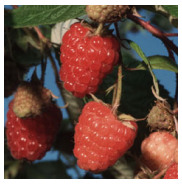
Primocane Bearing Red Raspberry

"Caroline" - " - [(Autumn Bliss × Glen Moy) × Heritage]

- ✓ The New standard;
- ✓ Has larger berries than Heritage;
- ✓ Ripens 1 week earlier than Heritage;
- ✓ Has more tolerance for root rot than "Heritage"



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Primocane Bearing Red Raspberry

"Polana"- (Heritage × Zeva Herbsternte)
(Patent Pending) 1991

- ✓ Ripens 3 weeks earlier than Heritage;
- ✓ Fruits are large and glossy berries with good flavor.

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Yellow Raspberry

"Fall Gold"- [NH 56-1 × (Taylor × Rubus pungens oldhami) F2 open pollinated] 1967

- **Primocane/everbearing;**
- **Fruit is very sweet;**
- **Good for fresh market only;**
- **Plants are vigorous;**
- **Ripen earlier than "Heritage."**

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Yellow Raspberry

"Anne (Amity × Glen Garry) (Plant Patent # 10,411) 1998

- **Primocane/everbearing;**
- **Fruit is very large and super sweet, firmer than "Fall Gold", not as firm as "Heritage";**
- **Canes are semi-erect;**
- **Ripens at the same time as "Heritage."**

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Purple Raspberry

"Royalty" - [(Cumberland × Newburgh) × (Newburgh × Indian Summer)] (Plant Patent # 5,405) 1982

- ✓ **Summer bearing;**
- ✓ **From Geneva program;**
- ✓ **Good for jam;**
- ✓ **Large fruit;**
- ✓ **Good for fresh market**

Black Raspberry

Early: Allen and Bristol

Mid: Jewel

Late: Mac Black:

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Summer Red Raspberry

"Lauren" - (Titan × Reveille) (Plant Patent # 10,610) 1997

- ✓ **Has good flavor;**
- ✓ **Ripen early;**
- ✓ **Has large berries;**
- ✓ **Has better resistance to Phytophthora root rot and 20% higher yield than its parent, "Titan."**

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Summer Red Raspberry

"Nova" - (Southland × Boyne) 1981

- ✓ **Firm berries;**
- ✓ **Fruit color is bright-red and is medium in size;**
- ✓ **Canes are vigorous.**

Summer Red Raspberry

Tulameen (Nootka × Glen Prosen) 1989

From British Columbia. A late raspberry producing very large, glossy, firm fruit. It is very productive with an extended season. Plants are not adequately hardy for field production in northern areas. It is recommended for winter greenhouse production. Has resistance to aphid vector of mosaic virus complex.

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Summer Red Raspberry

Titan [Hilton × (Newburgh × St. Walfried)]

(Plant Patent # 5404) 1985

From New York. Fruits ripen mid-to-late season and are extremely large and dull red, with mild flavor. Berries are difficult to pick unless fully ripe. The plants produce large canes with very few spines, and suckers emerge mostly from the crown, so it is slow to spread. With only fair hardiness, Titan is for moderate climates. Plants are susceptible to crown gall and Phytophthora root rot but are extremely productive. Resistant to raspberry aphid vector of mosaic virus complex.

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Cultural Management

- **Fertilization;**
- **Irrigation;**
- **Pruning;**
- **Pest management**

Summer Red Raspberry

Prelude [(Hilton × (Durham × September)) × Hilton)] (Plant Patent # 11,747) 1998

From New York. Earliest summer-fruiting cultivar available. Fruit is medium sized, round, and firm with good flavor. Plants are vigorous with abundant suckers and strong upright canes. Very resistant to Phytophthora root rot. Good cold hardiness. Moderate late fall crop is to be expected.

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Fertilization

Nitrogen:

Primocane Raspberries:	**60 to 80 lbs/acre**
Summer-Bearing Reds:	**60 to 75 lbs/acre**
Black and purple raspberries:	**60 to 65 lbs/acre**

Note: 20.0 lb. N/acre equals 0.5 lb. N/100 ft. of row in typical plantings

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Fertilization

Phosphorus and Potassium:

Soil Test Status	P2O5 (lb./acre)	K2O (lb./acre)
Low	150	190
Medium	120	150
Good	90	120
High	30	30

Fertilization

Phosphorus and Potassium:

Soil Test Status	P2O5 (lb./acre)	K2O (lb./acre)
Low	150	190
Medium	120	150
Good	90	120
High	30	30

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Recommended Tissue Nutrient Levels

Concentration of Sufficient Nutrients for Raspberries

(Taken from Manitoba Agriculture & Food Fruit Guide)

Nutrient	Sufficiency Range
N	2.2 – 3.5%
P	0.2 – 0.5%
K	1.1 – 3.0%
Ca	0.5 – 2.5%
Mg	0.25 – 0.8%
S	0.2 – 0.3%
Fe	50 – 200ppm
Cu	4 – 20ppm
Zn	15 – 16ppm
Mn	25 – 300ppm
Mo	-