

Growing Hazelnuts in the Pacific Northwest

Hazelnut Varieties



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The tables in this publication summarize characteristics of the main hazelnut varieties produced commercially in the United States, list varieties' susceptibility to eastern filbert blight (EFB), and show varieties' compatibility with each other for pollination.

Barcelona is the principal hazelnut variety grown in the Pacific Northwest, accounting for more than 60% of the acreage in Oregon. It is used in both the kernel market and the in-shell market, which favors its round shape and superior flavor. Barcelona kernels have a coarse, brown, skin-like pellicle (outer coating), which is very difficult to remove completely, even after roasting. However, some processors have found ways to remove the pellicle. Many characteristics of Barcelona are undesirable for commercial producers. Barcelona

trees tend to bear a heavy crop only every other year and produce a high percentage of blank nuts.

The variety Daviana had been used extensively as a pollinizer for Barcelona. However, it is very susceptible to EFB and should no longer be planted. It also is susceptible to filbert bud mite (*Phytocoptella avellanae* Nal.), which causes blasted or deformed flower and vegetative buds. We recommend replacing Daviana with York, a variety with the same pollen shed timing and the EFB resistance gene.

The Oregon State University hazelnut breeding program is continually developing varieties that have EFB resistance, good annual production, and more desirable kernel characteristics, such as fewer blanks and kernel defects.

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Table 1. Nut and kernel characteristics of hazelnut varieties with the Gasaway gene for resistance to eastern filbert blight

| Variety | Alleles | Nut wt. (grams) | Kernel ¹ (%) | Nut shape | Grade size | Blanching ² | Good nut (%) | Kernel fiber ³ |
|-----------|---------|-----------------|-------------------------|-----------|------------|------------------------|--------------|---------------------------|
| Dorris | 1, 12 | 3.4 | 43 | Round | Medium | 2.4–2.9 | 79–81 | 2.0 |
| Jefferson | 1, 3 | 3.7 | 45 | Round | Medium | 4–5 | 76–84 | 3.0 |
| Yamhill | 8, 26 | 2.3 | 49 | Round | Small | 4.4–5.0 | 75–91 | 2.5 |
| Wepster | 1, 2 | 2.4 | 46 | Round | Small | 3.0 | 80 | 2.5 |
| Felix | 15, 21 | 2.5 | 50 | Round | Small | 1.8 | 95 | 3 |
| York | 2, 21 | 2.8 | 44 | Round | Small | 4.4–4.8 | 81–84 | 3 |
| Eta | 11, 26 | 2.8 | 48 | Round | Small | 3.0 | 75 | 3.5 |
| Theta | 5, 15 | 2.3 | 50 | Round | Small | 2.5 | 85–93 | 2.5 |
| Gamma | 2, 10 | 2.5 | 52 | Round | Small | 6.0 | 80 | 3 |

¹ Percentage of nut weight that is from the kernel.

² Scale is 1–7, with 1 = 100% removal of the pellicle and 7 = no pellicle removal after roasting at 266°F–302°F (130°C–150°C) for 15 minutes.

³ Scale is 1–4, with 1 = no fiber and 4 = much fiber.

Table 2. Nut and kernel characteristics of hazelnut varieties susceptible to eastern filbert blight

| Variety | Alleles | Nut wt. (grams) | Kernel ¹ (%) | Nut shape | Grade size | Blanching ² | Good nut (%) | Kernel fiber ³ |
|----------------------|---------|-----------------|-------------------------|-----------|-----------------|------------------------|--------------|---------------------------|
| Barcelona (standard) | 1, 2 | 3.3–3.8 | 39–43 | Round | Medium to large | 4–5 | 70–85 | 3 |
| Casina | 10, 21 | 1.4–2.2 | 50–53 | Round | Small | 6.0 | 78–89 | 2 |
| Clark* | 3, 8 | 2.5–2.8 | 48–51 | Round | Small | 2.6–3.5 | 69–81 | 2 |
| Ennis | 1, 11 | 3.1–4.6 | 43–46 | Oblong | Large | 6–7 | 64–92 | 2 |
| Gem | 2, 14 | 4.7–5.0 | 37–42 | Long | Large | 6.5–7.0 | 67–83 | 2 |
| Hall's Giant | 5, 15 | 3.3–4.5 | 38–44 | Round | Medium | 3.0 | 79–95 | 2 |
| J-5 | 2, 3 | 3.4–3.6 | 50–51 | Round | Medium | 6.0 | 34–45 | 2.5 |
| Lewis* | 3, 8 | 2.7–2.9 | 46–48 | Round | Small | 4–5 | 83–90 | 1–2 |
| Sacajawea*^ | 1, 22 | 2.8 | 48–50 | Round | Small | 2.5–3.5 | 84 | 1 |
| Tonda di Giffoni^ | 2, 23 | 2.7–3.2 | 45–50 | Round | Medium | 2.5–3.5 | 71–79 | 2 |

¹ Percentage of nut weight that is from the kernel.

² Scale is 1–7, with 1 = 100% removal of the pellicle and 7 = no pellicle removal after roasting at 266°F–302°F (130°C–150°C) for 15 minutes.

³ Scale is 1–4, with 1 = no fiber and 4 = much fiber.

* Developed by Oregon State University.

^ Sacajawea and Tonda di Giffoni exhibit moderate resistance to EFB but do not carry the Gasaway gene for resistance. They are suitable for planting in locations where disease pressure is low, but EFB preventative sprays are required.

Table 3. Tree and orchard characteristics of hazelnut varieties with the Gasaway gene for resistance to eastern filbert blight

| Variety | Vigor (%) ¹ | Growth habit | Cumulative yield ² | Yield efficiency ³ | Harvest date ⁴ | Filbert bud mite ⁵ |
|---|------------------------|--------------------|-------------------------------|-------------------------------|---------------------------|-------------------------------|
| Barcelona (standard; susceptible to EFB) ⁶ | 100 | Upright | Medium | Medium | Oct. 10–21 | 1 |
| Dorris | 60 | Moderate spreading | Medium | High | –3 to +3 | 2.5 |
| Jefferson | 70 | Upright | Medium | High | –3 to +3 | 2 |
| Yamhill | 60–70 | Moderate spreading | High | High | –7 to –10 | 3 |
| Wepster | 80–110 | Upright | High | High | –7 to –10 | 1 |
| Gamma | 100+ | Upright, spreading | Medium | Medium | –7 to –10 | 2 |
| York | 75 | Moderate spreading | Medium | Medium | –7 to –10 | 2.5 |
| Felix | 100+ | Upright | Low | Low | –7 to –10 | 2 |
| Eta | 75 | Upright | Medium | Low | –7 to –14 | 1 |
| Theta | 100 | Upright | Low | Low | 0 to +5 | 2 |

Note: Shaded rows indicate varieties released as pollinizers.

¹ As compared to the trunk cross-sectional area (TCSA) of Barcelona. TCSA is an indirect measure of tree size.

² Sum of all yields to date in a given year.

³ Yield efficiency is a function of yield and tree size. Most new varieties produce more nuts on a smaller tree than the Barcelona standard.

⁴ Expressed in days before (–) or after (+) the average harvest time for Barcelona in the Willamette Valley, Oregon.

⁵ Scale is 1–5, with 1 = no mites and 5 = many blasted buds (big bug mite damage).

⁶ Barcelona is the standard against which other varieties are typically compared.

Table 4. Tree and orchard characteristics of hazelnut varieties susceptible to eastern filbert blight

| Variety | Vigor (%) ¹ | Growth habit | Cumulative yield ² | Yield efficiency ³ | Husk length ⁴ | Harvest date ⁵ | Filbert bud mite ⁶ | EFB suscep. ⁷ |
|-----------------------------------|------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------|---------------------------|-------------------------------|--------------------------|
| Barcelona (standard) ⁸ | 100 | Upright | Medium | Medium | 4 | Oct. 10–21 | 1 | 3 |
| Casina | 90–110 | Moderate spreading | High | Medium | 6 | –3 to –5 | 2.5 | 3 |
| Clark | 70 | Upright | High | High | 5 | –7 to –10 | 2 | 2 |
| Ennis | 60–70 | Moderate spreading | High | High | 4 | 0 to +3 | 3 | 3 |
| Gem | 90–100 | Moderate spreading to upright | Low | Low | 4 | +7 | 3 | 3 |
| Hall’s Giant | 80–110 | Upright | Low | Low | 4 | +7 | 1 | 2 |
| J-5 | 100+ | Upright | Low | Low | 4 | +7 to +10 | 2 | 3 |
| Lewis | 75 | Moderate upright | High | High | 5 | –5 to –7 | 2.5 | 2 |
| Sacajawea | 85 | Upright spreading | High | High | 2 | –7 to –10 | 1 | 1 |
| Tonda di Giffoni | 55 | Upright | Medium | High | 4 | 0 | 1 | 1 |
| Willamette | 100 | Moderate spreading | Medium | High | 6 | +5 to +7 | 3 | 3 |

¹ As compared to the trunk cross-sectional area (TCSA) of Barcelona. TCSA is an indirect measure of tree size.

² Sum of all yields to date in a given year.

³ Yield efficiency is a function of yield and tree size. Most new varieties produce more nuts on a smaller tree than the Barcelona standard.

⁴ Relative to nut length. Scale is 2–8, with 2 = husk half as long as the nut and 8 = husk twice as long as the nut.

⁵ Expressed in days before (–) or after (+) the average harvest time for Barcelona in the Willamette Valley, Oregon.

⁶ Scale is 1–5, with 1 = no mites and 5 = many blasted buds (big bug mite damage).

⁷ Scale is 0–3, with 0 = highly resistant with Gasaway gene, 1 = exhibits some resistance under low disease pressure, 2 = susceptible, and 3 = highly susceptible.

⁸ Barcelona is the standard against which other varieties are typically compared.

Table 5. Eastern filbert blight susceptibility ratings

| Highly susceptible | Susceptible | Some resistance | Highly resistant (have the Gasaway resistance gene) | |
|-------------------------------------|--------------------|----------------------|---|---------|
| Ennis (++++++) | Barcelona (++++) | Clark (++) | Dorris | |
| Daviana (++++++) | Butler (++++) | Lewis (++) | Jefferson | |
| DuChilly (++++++) | Hall’s Giant (+++) | Tonda di Giffoni (+) | Wepster | |
| Tonda Gentile delle Langhe (++++++) | Willamette (+++) | Sacajawea (+) | Yamhill | |
| Tonda Romana (++++++) | Gem (+++) | | Eta | York |
| Casina (++++) | | | Felix | Epsilon |
| Negret (++++) | | | Gamma | Delta |
| | | | Theta | Zeta |

Note: Plus symbols (+) indicate relative susceptibility within each column. For example, in the “Some resistance” column, Sacajawea and Tonda di Giffoni are more resistant than Lewis and Clark. Shading indicates varieties released as pollinizers.

Table 6. Compatibility of hazelnut varieties with the Gasaway gene for resistance to eastern filbert blight

| Female parent ² (alleles expressed in female flowers) | Pollen source ¹ (alleles expressed in pollen) | | | | | | | | | |
|--|---|-------------------|----------------|-------------------|----------------|------------------|---------------|--------------------|------------------|-------------------|
| | Yamhill (8) | Dorris (1, 12) | Gamma* (10) | Sacajawea^ (1) | Wepster (1) | Jefferson (3) | York* (21) | Felix* (15, 21) | Eta* (11, 26) | Theta* (5, 15) |
| Sacajawea^ (1, 22) | +M | | | | | | +L | | | |
| Yamhill (8, 26) | | | +M | | +L | +M-L | +L | | | |
| Wepster (1, 2) | +E | | +M | | | | +M | +L | | |
| Dorris (1, 12) | +E | | | | | | +E | +M-L | | |
| Jefferson (1, 3) | | | | | | | +E | +M | +M-L | +L |
| Gamma* (2, 10) | +E-M | | | +E | +M-L | +M | +M | +L | | |
| York* (2, 21) | +E | +E-M | +M | +E-M | +L | | +L | | | |
| Felix* (15, 21) | +E | +M | +M | +M | +M-L | | +L | | | |
| Eta* (11, 26) | | | | | +E | +E | +E | +M | | +L |
| Theta* (5, 15) | | | | | | +E | | | +M | |

Note: + symbol indicates a compatible cross. Letters indicate the time of pollen shed relative to bloom of the female parent (E = early, M = mid, L = late). Nuts will not set when either of the alleles in the female flower matches either of the alleles in the pollen.

¹ Pollen source varieties are listed in order of earliest to latest pollen shed by calendar date.

² Female parent varieties are listed in order of earliest to latest female bloom.

* Should be planted as a pollinizer only, not for main crop production.

^ Sacajawea has quantitative resistance, which means it does not have the EFB resistance gene but does have some resistance to EFB infection. Scouting and spraying for EFB infections are still required.

Table 7. Compatibility of hazelnut varieties susceptible to eastern filbert blight

| Female parent ² (alleles expressed in female flowers) | Pollen source ¹ (alleles expressed in pollen) | | | | | | | | | | | |
|--|---|------------------|---------------|-----------------|-------------------|-----------------|--------------|----------------|--------------------|-------------------------|-------------|----------------------|
| | Tonda di Giffoni (2) | Barcelona (1) | Butler (3) | Clark (3, 8) | Willamette (3) | Lewis (3, 8) | Ennis (1) | Daviana (3) | Casina (10, 21) | Hall's Giant (5, 15) | Gem (14) | Jemtegaard #5 (3) |
| Tonda di Giffoni (2, 23) | - | +M | +L | +M | +M | + | +M | +L | +L | +L | + | + |
| Barcelona (1, 2) | - | - | +M | - | +M | - | +M | +L | +L | +L | + | + |
| Butler (2, 3) | - | +E | - | - | - | - | +M | +M | +M | +M | - | - |
| Willamette (1, 3) | +M | - | - | - | - | - | - | +M-L | +M-L | +M-L | +L | - |
| Lewis (3, 8) | +E | +E | - | +E | - | - | - | +M | +M | +M | +M-L | - |
| Ennis (1, 11) | + | - | +M | - | +E | +M | - | +E | +M | +L | +L | +L |
| Daviana (3, 11) | +E | - | - | - | - | - | +E | +M | +E | +E | - | - |
| Casina (10, 21) | +E | +E | +E | + | +E | + | + | +E | - | +M | +M | + |
| Gem (2, 14) | - | + | + | + | + | + | + | + | + | + | - | + |
| Hall's Giant (5, 15) | +E | + | +M | + | + | + | + | +M | + | - | + | + |
| Jemtegaard #5 (2, 3) | - | + | + | - | - | + | - | + | + | + | + | - |
| Clark (3, 8) | | | - | - | - | - | - | +E | +E | +E | + | - |

Note: + symbol indicates a compatible cross. - symbol indicates an incompatible cross. Letters indicate the time of pollen shed relative to bloom of the female parent (E = early, M = mid, L = late). Nuts will not set when either of the alleles in the female flower matches either of the alleles in the pollen.

¹ Pollen source varieties are listed in order of earliest to latest pollen shed by calendar date.

² Female parent varieties are listed in order of earliest to latest female bloom.

For More Information

Many Oregon State University Extension publications on hazelnut production are available through the OSU Extension Catalog: <http://extension.oregonstate.edu/catalog/>



The Oregon State University hazelnut breeding effort dates back to the 1960s. Horticulture professor and breeder Shawn Mehlenbacher (pictured above) leads the program and works with a team of plant breeders and Extension scientists to develop new high-quality, highly productive, disease-resistant varieties.

The “Growing Hazelnuts in the Pacific Northwest” series of publications replaces OSU Extension publication EC 1219, *Growing Hazelnuts in the Pacific Northwest*.

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