



# 'Santiam' Hazelnut (OSU 509.064)

R.L McCluskey, S.A. Mehlenbacher, D.C. Smith, and A.N. Azarenko

'Santiam' (OSU 509.064) was developed and evaluated at Oregon State University, Corvallis, Oregon, and it was released in February 2005. This cultivar has complete resistance to eastern filbert blight (EFB) caused by *Anisogramma anomala* (Peck) E. Müller. Resistance is conferred by a single dominant gene from 'Gasaway.' Compared to 'Barcelona,' 'Santiam' is a smaller tree and has higher yield efficiency, higher percent kernel, and smaller nuts. Nuts mature and fall free of the husk about 2 weeks before 'Barcelona.'

## Horticultural characteristics

**Tree growth habit.** Trees have a slightly rounded, yet upright growth habit with multiple scaffolds and strong branch angles (Figure 1). Trees are about 25 percent smaller than 'Barcelona,' and slightly smaller than 'Lewis,' as measured by trunk cross-sectional area (Figure 3, page 2).

**Yield and yield efficiency.** Although 8-year-old trees of 'Santiam' are smaller than 'Barcelona,' nut yields are similar (Figure 4, page 2). While not precocious, yield increased incrementally with tree size, and trees have not shown a biennial bearing tendency. Yield efficiency, which adjusts for differences in tree size, is higher for 'Santiam' than for 'Barcelona' (Figure 5, page 2). In 2 out of 4 years, the marketable kernel yield has exceeded 'Barcelona' (Figure 6, page 2).

**Harvest time.** Nuts fall free of the husk at maturity and have consistently been harvested 2 weeks before 'Barcelona.' In most years, harvest of 'Santiam' will be completed before the beginning of 'Barcelona' harvest.

**Nut and kernel quality.** Nuts of 'Santiam' are suited for the kernel market but are too small for the in-shell market (Figure 2). Nuts are smaller than 'Barcelona' but have fewer poorly filled and shriveled kernels, and twins are rare. Kernels are similar in size to 'Clark,' slightly smaller than 'Lewis.' Kernel texture, flavor, and appearance are acceptable for many end uses, as are those of 'Barcelona,' but are insufficient to command a premium price. Kernels blanch similar to 'Barcelona' and 'Lewis.' The incidence of moldy kernels has been less than 5 percent in 6 out of 7 years of study. In the seventh year, the incidence of moldy kernels was 10 to 25 percent.<sup>1</sup>

**Propagation.** Layers are smaller in caliper than 'Barcelona' but root easily and abundantly, and they are easy to handle in the nursery. 'Santiam' has also been established *in vitro* for micropropagation on a commercial scale.

**Pest and disease tolerance.** One of the major strengths of this cultivar is that it carries EFB resistance from 'Gasaway.' It has been inoculated under greenhouse conditions and remained free of the disease. This level of resistance is higher than the quantitative resistance found in 'Lewis' and 'Clark.' Pruning and fungicide applications to control the disease should not be necessary in

<sup>1</sup>In 2004, there were several rains in early September while nuts were still on the ground, and the incidence of moldy kernels was 10 to 25 percent. Incidence of mold to this extent is not expected to be a problem when nuts are harvested in a timely manner.



Figure 1.—Tree growth habit after 8 years.



Figure 2.—Nuts, raw kernels, and blached kernels of 'Santiam.'

orchards planted with 'Santiam.' It has moderate resistance to big bud mite, similar to that of 'Lewis,' but not quite as good as 'Barcelona.'

**Flowering characteristics.** Female bloom occurs approximately 3 weeks later than 'Barcelona.' 'Santiam' has a shorter pollen shed period than either 'Barcelona' or 'Daviana' and sheds pollen early midseason with 'Daviana.'

**Pollinizer selection.** Female flowers of 'Santiam' express alleles  $S_3$  and  $S_{15}$ . The planting of three pollinizers is recommended. The pollinizers should be cultivars that shed pollen at different times during the period when female flowers are receptive.

The pollinizers 'Epsilon' ( $S_1S_4$ ) and 'Zeta' ( $S_1S_{15}$ ) express  $S_1$  in their pollen and shed pollen late enough to overlap female bloom of 'Santiam.' Pollen of 'Barcelona' ( $S_1S_2$ ) and 'Gamma' ( $S_2S_{10}$ ) is also compatible with 'Santiam'; however, pollen shed likely is too early for good pollination, and 'Barcelona' trees are susceptible to EFB. Additional suitable pollinizers will be identified soon.

Cultivars whose pollen expresses either  $S_3$  or  $S_{15}$  are **not** compatible with 'Santiam' (e.g., 'Willamette' [ $S_1S_3$ ], 'Lewis' [ $S_3S_8$ ], 'Clark' [ $S_3S_8$ ], 'Hall's Giant' [ $S_5S_{15}$ ], 'Delta' [ $S_1S_{15}$ ], and most VR selections).

**Development**

'Santiam,' tested as OSU 509.064, resulted from a cross of OSU 249.159 x VR 17-15 made in 1989 by Dr. Shawn Mehlenbacher and David Smith at the OSU research farm in Corvallis, Oregon. Initial screening began in 1990, and in 1998 'Santiam' was included in two advanced selection trials that included 'Barcelona' and 'Lewis' as industry standards. Data presented in this report were obtained from the two trials located in Corvallis.

■ Santiam    □ Lewis    ■ Barcelona

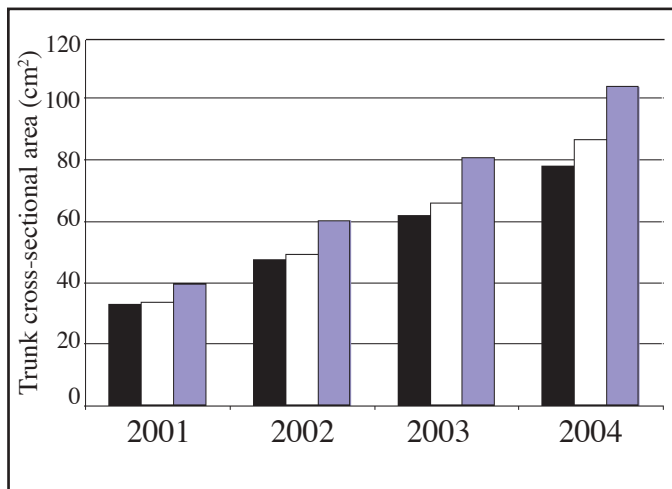


Figure 3.—Trunk cross-sectional area.

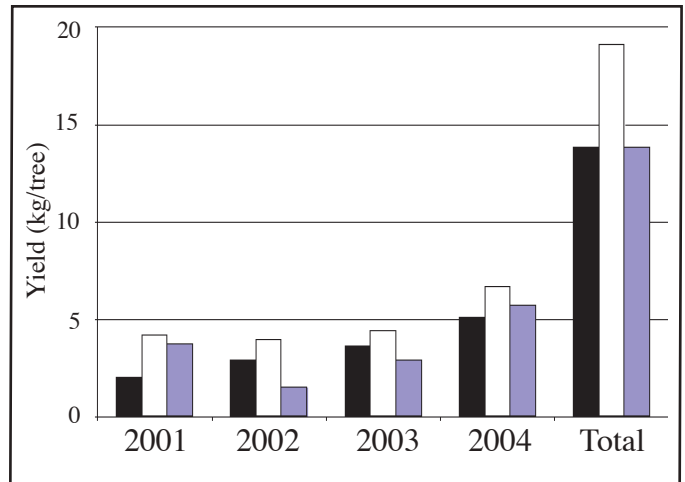


Figure 4.—Nut yield.

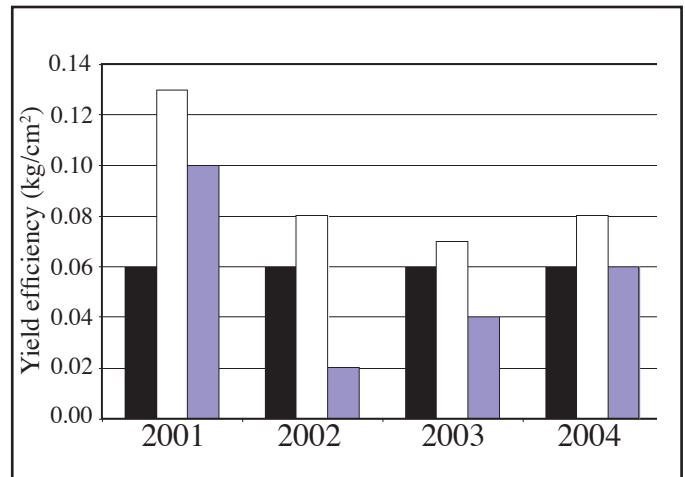


Figure 5.—Yield efficiency.

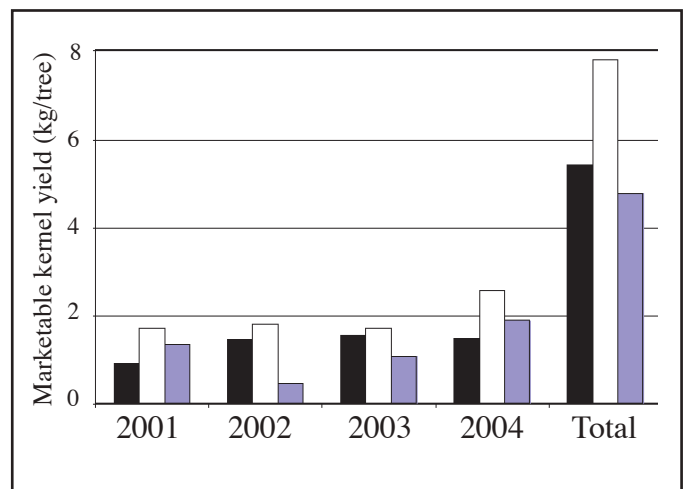


Figure 6.—Marketable kernel yield.

# ‘Santiam’ (OSU 509.064)

## Flowering characteristics

Incompatibility alleles:  $S_3S_{15}$ —both alleles are expressed in female flowers, but only  $S_3$  is expressed in the pollen

## Time of pollen shed

Early midseason (about the same time as ‘Daviana’ and ‘Barcelona’)

## Catkin density

Produces large amount of pollen, has potential as pollinizer

## Duration of pollen shed

Short–intermediate

## Pollinizer recommendations

‘Epsilon’ ( $S_1S_4$ )—late pollen shed

‘Zeta’ ( $S_1S_1$ )—very late pollen shed

## Estimated time of harvest

10 to 15 days earlier than ‘Barcelona’; more than 90 percent of nuts on ground by the end of September

## Nut and kernel quality (2001–2004)<sup>a</sup>

	‘Santiam’	‘Lewis’	‘Barcelona’
Nut weight (g)	2.0–2.1	2.6–2.9	3.4–3.8
Kernel weight (g)	1.0–1.1	1.1–1.4	1.4–1.5
Kernel percentage (%)	48–52	43–48	39–42
Blanching rating (1–7; 1=100% removal of pellicle)	4.9–5.2	3.6–4.8	4.8–4.9
Cumulative marketable kernel yields (kg/tree)	5.4	7.8	4.8
Nuts free of defects (%)	89–96 <sup>b</sup>	82–96	79–88
Defects <sup>c</sup> (%)			
Blank	1.6–3.0	0–1.4	6.2–11.0
Mold	0.4–4.0	3.4–9.8	1.1–3.5
Shrivel	1.1–3.0	0.5–3.0	1.0–7.1
Poor fill	0–3.0	0–8.0	0.5–6.5

<sup>a</sup>Based on 100-nut samples from the 1998 advanced selection trial.

<sup>b</sup>Values shown are for 2001–2003. See footnote on page 1 regarding moldy kernels in 2004.

<sup>c</sup>Unmarketable kernels; does not include kernels that may be slightly shriveled or poorly filled but are still usable.

## Pest tolerance

Eastern filbert blight: Complete resistance inherited from ‘Gasaway’

Kernel mold: 1–4 percent in most years; was very high in 2004

Big bud mite: Intermediate (rated 2 on a scale of 1–5)

## Important note

‘Santiam’ has been released in response to the immediate need for EFB-resistant varieties. Performance of young trees has been acceptable, but testing has been limited. It should be viewed as a transition variety with potential to double as a pollinizer variety for future releases.