

## Performance of New Hazelnut Cultivars in British Columbia

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### Introduction

Hazelnuts have been grown commercially in British Columbia since 1905. By 2000, BC produced over a million pounds of hazelnuts per year, mostly in the Fraser Valley. The recent introduction of eastern filbert blight (EFB; *Annisogramma anomala*) has devastated our industry, but new cultivars from the breeding program at Oregon State University are highly resistant to the disease.

The BC Hazelnut Grower's Association began a trial of six of these cultivars in 2011 and 2013. The goals of this project are to compare performance of three hazelnut main crop cultivars and three pollinizer varieties at six sites in SW BC.

## SUMMARY OF CULTIVARS

EFB Resistance	Nut size	Small	Medium	Large	Jumbo
Highly Resistant (0)		Yamhill, (Eta, Gamma ,Theta)*		Jefferson	
Resistant (1,2)			Sacajawea		
Susceptible (3)				Barcelona	
Highly Susceptible (5)					Ennis

Nut Drop: early medium late \* pollinizer ~~Not in trial~~

**Figure 1.** Cultivars planted in this trial compared to two old industry standards.

### Methods

Six sites were planted with the cultivars 'Jefferson', 'Eta' and 'Theta' in 2011 and again in 2013, with the addition of 'Sacajawea', 'Yamhill' and 'Gamma'. Sites were planted at high density (spacing ~9'x18') with about 1/4 to 1/2 acre per main crop cultivar. Sites were located in the Fraser Valley (Agassiz, Chilliwack, Greendale) and Hornby Island.

Management varied considerably by each farmers practice. For example, only one of the sites received fungicide the first few years after planting, and several sites had alley crops (garlic, hedging cedars) between the rows of hazelnut trees for some of the trial. Symptoms of drought were observed at one site in 2017;

another site suffered fertilizer burn in 2015. One site changed ownership during the trial and was removed by the new owner (this site is not included in the results below).

At each site we observed flower and pollen shed timing, disease occurrence and measured growth and nut production.

## Results

### Disease & Other Challenges

EFB was observed at four sites on two cultivars. When the trial began, all of the affected sites were in the Fraser Valley and had adjacent older orchards that were infected with EFB. EFB has not been observed at the site on Hornby Island (where EFB is not yet known to occur). Virtually all ‘Sacajawea’ became infected with EFB at the Fraser Valley sites, but of the other cultivars EFB has only been found on ‘Jefferson’, only a few trees at three sites. Farmers have employed more control measures (pruning, fungicide) the past few years.

Additional disease symptoms, not due to EFB, were found by BC Ministry of Agriculture pathologists to be due to *Phomopsis* sp. (trunk canker) on a few trees at each of four sites and *Phytophthora* sp. (root rot) on several trees at one site.<sup>4</sup>

Other issues at some sites included damage from beavers, drought, flooding, ice and wind.

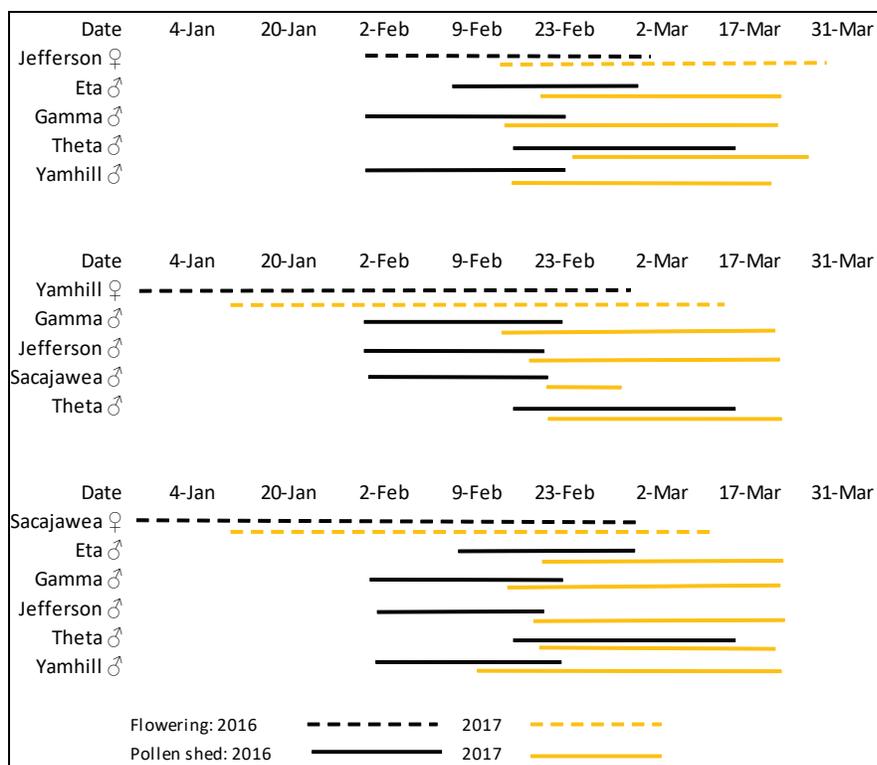
### Flowering

We recorded flowering and pollen shed at seven to ten day intervals in January until the end of flowering, from 2014 through 2017. Overlap of pollen shed by compatible cultivars with female flowering was of longer duration than reported from Oregon. For example, ‘Jefferson’ shed pollen for at least three weeks during the flowering of ‘Yamhill’ at Fraser Valley sites, while in Oregon ‘Jefferson’ tends to shed only at the end of ‘Yamhill’ flowering time. This is consistent for other cultivars, with even the latest shedding pollinizer, ‘Theta’, overlapping for several weeks with the early blooming ‘Yamhill’; ‘Yamhill’ tends to finish flowering before ‘Theta’ sheds in Oregon<sup>5</sup>.

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<sup>4</sup> Sakalauskas, this volume.

<sup>5</sup> McCluskey, Mehlenbacher, and Smith. 2011. Jefferson Hazelnut. Oregon State University Extension Service EM-9028.



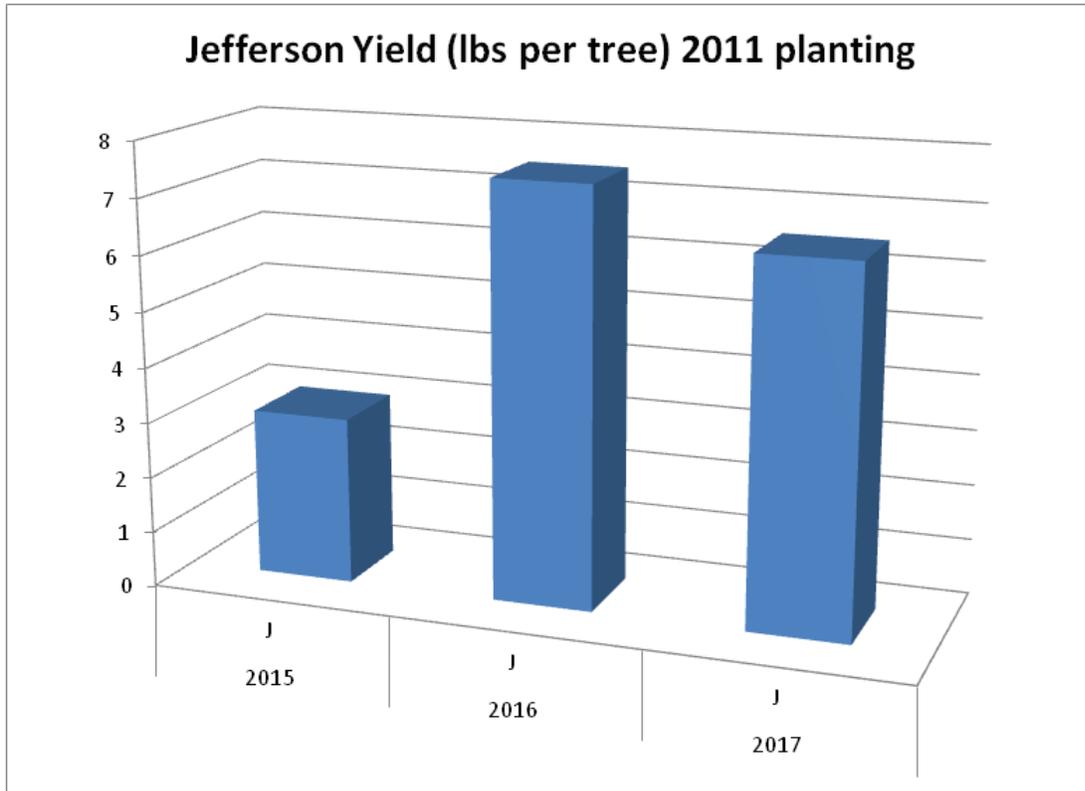
**Figure 2.** Timing of female flowering in relation to compatible pollinizers in Fraser Valley, 2016 and 2017.

### Yield

Yield estimates are based on a sample of four representative trees per cultivar at each farm; trees were chosen as neither the best nor the worst in each orchard. Nuts were collected by hand, cleaned of husks, dried to 6% moisture and weighed. Some data were lost in 2017 due to nuts being harvested by the farmer before we could gather them.

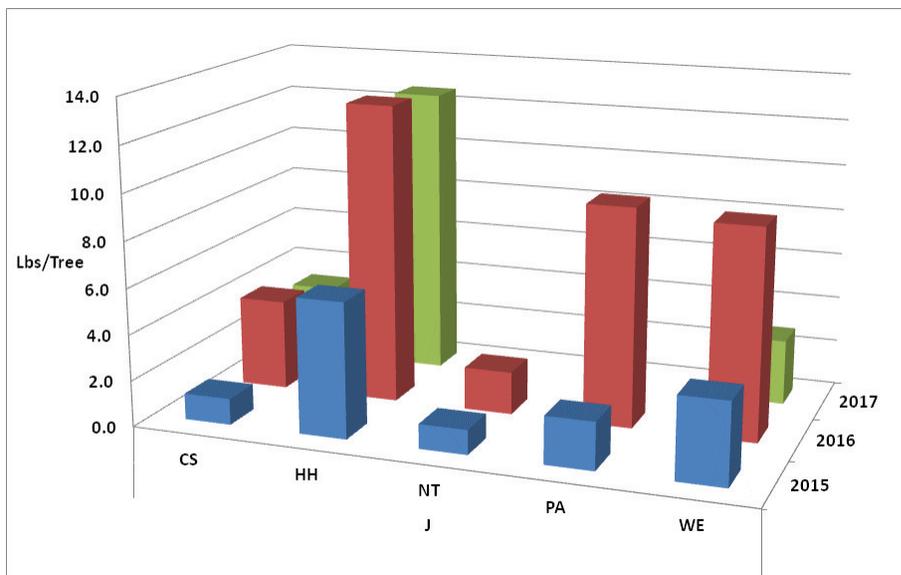
Yield varied by farm, planting age, and cultivar. In general the oldest plantings had the highest yields and, of the main crop cultivars, ‘Jefferson’ and ‘Yamhill’ out-yielded ‘Sacajawea’ at any given site.

Yields of ‘Jefferson’ planted in 2011, averaged across all five farms, were 3.0, 7.5 and 6.5 pounds per tree in 2015, 2016 and 2017 respectively. These represent approximately fourth through sixth leaf, but these trees were planted in late June and July so they could be considered younger for the purpose of evaluating yield.



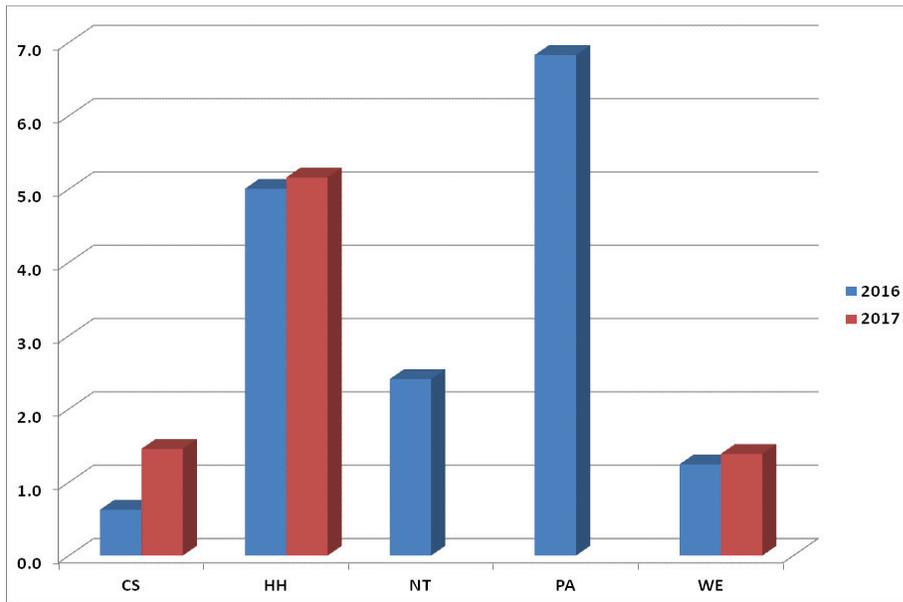
**Figure 3.** On an individual farm basis, 'Jefferson' yields from the 2011 planting averaged up to 12 lbs per tree in 2016 and 2017. These yields equal those reported from Oregon for trees of similar age.

**Jefferson Yield  
By farm, 2011 Planting**



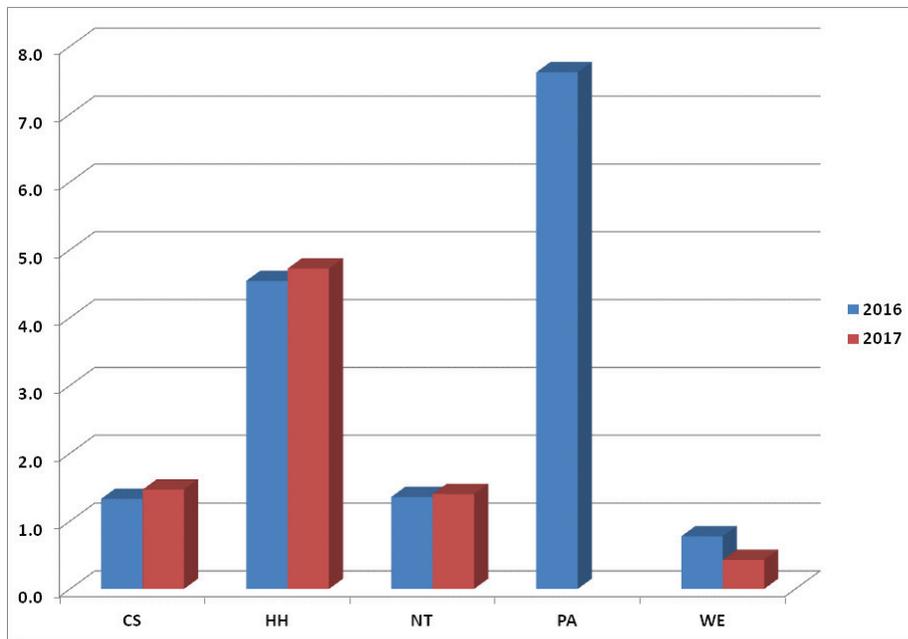
**Figure 4.**

**Average lbs. per tree Jefferson, 2013 planting**



**Figure 5.** Average yields of ‘Jefferson’ planted in 2013 ranged from less than one to over six pounds per tree in 2016 and 2017 (third and fourth leaf); ‘Yamhill’ planted the same year had similar to slightly higher yields.

**Average lbs. per tree Yamhill, 2013 Planting**



**Figure 6.** Of the main crop cultivars, ‘Sacajawea’ had the lowest yield, with a maximum of about 2.5 pounds per tree at one farm. It is important to note that the cultivar is more susceptible to EFB than the others planted and yields are potentially higher with more proactive disease management.

Average lbs. per tree Sacajawea 2013 Planting

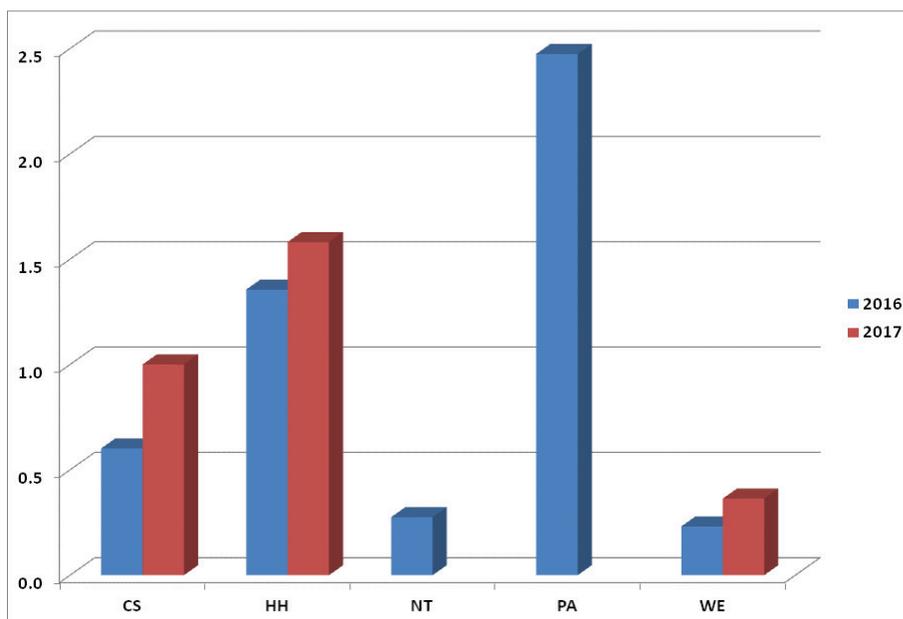


Figure 7.

### What Affects Yield?

So many factors affect yield that without large studies, replicated over many kinds of site, it is impossible to identify any single one of them as chiefly responsible for the differences seen among these sites.

Factors likely affecting yield include:

- Microclimate (elevation, aspect, air drainage, topographic position);
- Soil (fertility, texture, drainage);
- Cultivar; management practices (fertilization, pest & disease management, water, pruning/canopy management, etc.).

We have much to learn to create the most productive hazelnut orchards for this region.

### **Summary**

Several hazelnut cultivars can produce commercial yields in Fraser Valley conditions by year 3 or 4 on some sites. Sites are not equally productive, and how much of the variation is due to inherent site characteristics versus management practices is not yet clear.

Blight resistant doesn't mean immunity; two cultivars developed EFB, one ('Sacajawea') was seriously affected. There are other challenges to good hazelnut production besides EFB, including a couple of potential emergent diseases.<sup>6</sup>

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<sup>6</sup> Sakalauskas, this volume.

This trial has led to increased interest in hazelnuts as a crop all over BC and over two hundred acres of new orchards have been planted.<sup>7</sup>

### **Disease Prevention in Hazelnut Orchards**

Check the BC Ag Ministry Plant Health web pages for most current recommendations.<sup>8</sup>

Practices to prevent EFB and other diseases:

- Plant resistant varieties;
- Remove old hazelnut trees of susceptible cultivars and hedgerow ‘volunteers’ that host the disease;
- Scout for disease and dead limbs during leaf-out and in summer;
- Prune out and burn affected parts;
- Have diseased plants diagnosed by experts if you're not certain it's EFB;
- Use approved fungicides in spring, during and after bud break.

### **Acknowledgements**

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<sup>7</sup> Mittelstaedt, this volume.

<sup>8</sup> <https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/plant-health/insects-and-plant-diseases/nuts> (accessed 25 Feb. 2018).

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