

HAZELNUT (*Corylus avellana* 'Jefferson')
Eastern Filbert Blight; *Anisogramma anomala*

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Progression of eastern filbert blight cankers on 'Jefferson' hazelnuts, 2011 - 2014.

The objective of this trial was to document the progression of EFB cankers in a 'Jefferson' hazelnut orchard infected with *Anisogramma anomala*. The 'Jefferson' cultivar has a single dominant gene for resistance to EFB. Cankers have been observed on other selections that carry this same gene. These cankers are different from normal EFB cankers in that they occur at a very low rate, are smaller, do not develop stromata and heal over in subsequent growing seasons.

A 25 acre orchard of 'Jefferson' was initially planted on a 20x20 foot spacing in 2007. Additional trees were planted between the original trees in 2008 for a final 10x20 foot spacing. The trees were self-propagated, in a traditional way, as sucker sprouts from older trees. The orchard was located near Newburg OR, with a heavily infected 'Ennis' orchard across the highway to the west and adjacent to a heavily infected 'Barcelona' orchard to the east. The 'Ennis' orchard was removed in 2009.

Cankers were first observed during the fall of 2010 on widely scattered trees. Preliminary surveys in Jan 11 found some cankers with stromata confirming eastern filbert blight. A few cankers with and without stromata were taken to the lab, thin sectioned, stained with 0.05% trypan blue (1:1 water to lactic acid) and examined for the presence of mycelia. Stromata from these cankers were sectioned and stained with a 0.05% trypan blue in lactoglycerol (1:1:1 of water, lactic acid, and glycerol) to determine ascospores viability.

All 6,097 trees were inspected for EFB cankers on 22 Feb 11, 1 Mar 11 and 14 Apr 11 with notes taken on missing and replanted trees. Prominent cankers on 143 trees were marked with red spray paint for further evaluation. Cankers on these trees were measured on 30 Mar 11 and compared with measurements taken on 15 Sep 11, 8 Nov 12, 14 Nov 13 and 20 Nov 14.

A few cankers were found that resembled those caused by *Anisogramma anomala*. Cankers found prior to the 2011 growing season averaged slightly over 7 cm (Table 1) and were characterized by longitudinal cracks, flat and/or slightly sunken areas on the trunks. Some of these cankers had stromata which were smaller and less numerous than on susceptible cultivars. Host tissues around stromata were discolored but individual mycelia were not observed. Viable ascospores were observed. None of the cankers were typical of a multi-year perennial cankers suggesting they had all developed during the 2010 growing season.

Only 1.8% of the trees planted in 2007 were found to have cankers while 5% of the 2008 trees had cankers (Table 1). Figures 1 and 2 show the pattern of infected trees found among trees planted in 2007 and 2008. The pattern for the older trees is consistent with a distribution one might get from natural spread of the pathogen. However, Figure 2 has many north/south runs of consecutively infected trees indicating that some infections may have occurred before being planted in this location.

A majority of the cankers (90%) increased in size during the 2011 growing season to an average of 21 cm for older trees and 18 cm for the younger trees (Table 1). Three cankers were observed to develop new stromata by Aug 11 but most cankers did not develop stroma and those that did produced only one or two. Only one canker was observed to produce the typical perennial canker shape typical of susceptible cultivars. Although cankers were longer by Sep 11 they appeared to have substantial callus formation indicating a strong wound healing response. There were 11 cankers that developed weeping or oozing symptoms by Sep 11. This was not observed in Aug 11. Weeping cankers are not normal EFB symptoms but are indications of a wound response. Long sunken weeping cankers are more typical of bacterial blight (*Xanthomonas* sp.) on older trees and limbs. It is not known if any of these cankers were originally incited by bacterial blight but these cankers did not kill branches, which is not consistent with bacterial blight.

A majority of the cankers (75%) decreased in size during the 2012 growing season to an average of 15 cm for older trees and 13.5 cm for the younger trees (Table 1). Several cankers (21%) had healed over completely while many others could only be recognized by superficial cracks, indentations or scar tissue. The degree of canker healing appeared related to topography and vigor of the trees. Several other cankers (22%) increased in size, continued to weep, impacted tree growth and would need to be removed in the future.

Overall canker size increased during the 2013 growing season to similar sizes as recorded in 2011. Most cankers stayed the same size (32.4%) or got smaller (22.8%), however, there was significant growth in 44.9% of the cankers.

Some trees (16%) were healed over completely but 7% of the trees that were healed over the previous year had an average increase of 5.8 cm. No stroma were observed on any cankers and no new cankers were observed on any trees.

Canker size also increased during the 2014 growing season. Most cankers stayed the same size (30.1%) or got smaller (33.8%), however, 34.6% of the cankers increased. A third of the trees (30.9%) were healed over completely. No stroma were observed on any cankers and no new cankers were observed on any trees. Comparison between initial cankers in 2010 and cankers in 2014 indicate 50% will continue to get larger but there is no indication of which cankers will increase.

When planting Jefferson trees in high inoculum conditions it is recommended that fungicides be used the first spring after planting and removal (replacement) of those few trees that develop cankers.

Table 1. Average EFB canker size on ‘Jefferson’ hazelnuts.

Tree Planting	Trees Infected	Ave. Canker Size (cm)				
		30 Mar 11	15 Sep 11	8 Nov 12	14 Nov 13	20 Nov 14
2007	1.8 %	7.2	21.1	14.9	24.6	31.4
2008	5.0 %	7.3	18.1	13.5	17.2	20.0

Figure 1. Location of trees, planted in 2007, with EFB-like symptoms. Orchard was planted with 37 rows west to east (x-axis) and 76 to 93 trees south to north (y-axis). The first 15 rows from the west had 93 trees per row while the next 22 rows had 76 trees per row. Additional trees were inter-planted in 2008 for a total of 185 trees in the first 15 rows and 151 trees in the next 22 rows.

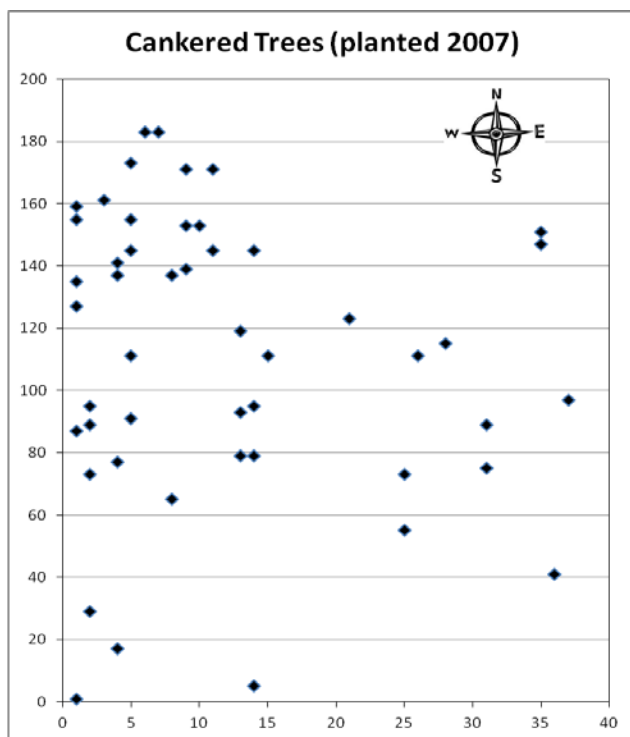
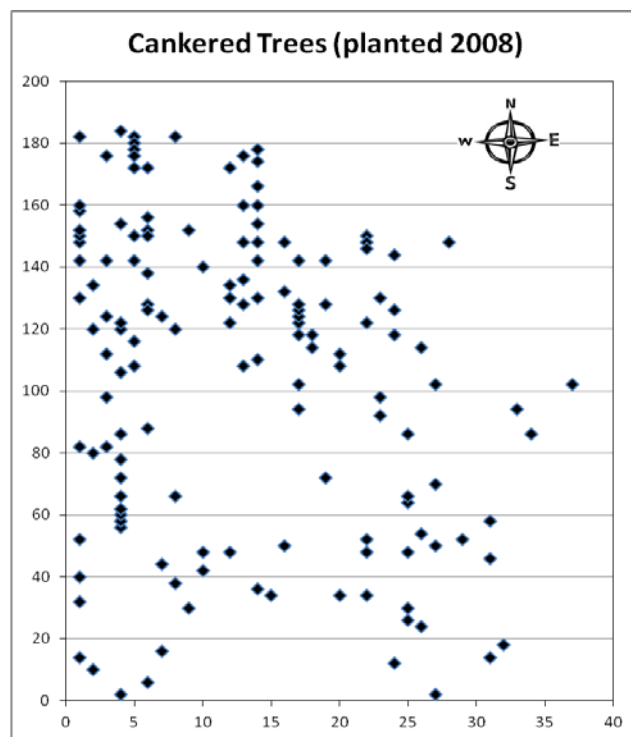


Figure 2. Location of trees, inter-planted in 2008, with EFB-like symptoms. Orchard was inter-planted with 37 rows west to east (x-axis) and 75 to 92 trees south to north (y-axis). The first 15 rows from the west had a final count of 185 trees per row while the next 22 rows had a final count of 151 trees per row.



Note: Write up is almost the same as found in last year's booklet except for the addition of the canker size data for 2014.