

HAZELNUT (*Corylus avellana* ‘Ennis’ and ‘Butler’)  
Eastern Filbert Blight; *Anisogramma anomala*

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### **Whole orchard evaluation of fungicides for management of eastern filbert blight, 2013.**

The goal of this trial is to evaluate yield protection and fungicide efficacy for EFB management on mature, commercial sized hazelnut trees (rather than 2 to 3 year old transplants). A 1-acre block of Ennis hazelnuts with Butler pollenizers (every 3<sup>rd</sup> tree in every 3<sup>rd</sup> row) planted in 1986 was selected at the Botany and Plant Pathology Field Laboratory. Trees had been planted on a 10 x 20 foot spacing but every other tree was removed in Dec 99 for a final spacing of 20 x 20 feet. This block was selected since it had been sprayed 2 to 3 times each year with chlorothalonil since 2000 for EFB before any known infections had occurred. EFB cankers discovered during the 2004 growing season in a nearby block planted at the same time, with identical stock, indicated that these trees had been exposed to ascospores each year since 2001 or 2002. In the spring of 2004, a fungicide trial was established in this block. Treatments were arranged in a randomized complete block design. Each treatment consisted of 4 blocks (replicates) containing a group of 9 trees, (8 Ennis and 1 Butler). Each set of 9 trees was composed of 3 consecutive trees in a row and in 3 consecutive rows. Fungicide treatments consisted of non-treated trees, trees treated with 4 applications of chlorothalonil at 64 fl oz/A, and trees treated with the Best Management Practice. For 2013, the best management practice consisted of an application of Echo 720 (64 fl oz/A) at bud break, then Stratego at 15 fl oz/A, 2 weeks after bud break, then Quadris Top at 14 fl oz/A, 4 weeks after bud break, then Echo 720 (64 fl oz/A), 6 weeks after bud break. Past fungicide treatments can be found in Table 2. Fungicides were applied using a hydraulic handgun sprayer at 110 psi and at a rate of 136 to 164 gal water/A such that approximately 11 to 13.5 gal of a spray suspension were applied per set of 9 trees. Fungicide treatments were applied on 27 Mar (bud break), 8 and 26 Apr, and 10 May. Suckers were cut by hand on 17 Jun. Weeds were sprayed with Rely (2 qt/A) on 6 May. There was no application for management of big bud mite or filbert worm. There was no supplemental irrigation applied this year. The orchard was fertilized with 46-0-0 at 200 lb/A on 19 Apr. The orchard floor was “floated” on 29 Aug to remove dead weeds, blanks and level the orchard floor. Trees were scouted for EFB cankers during the dormant and summer growing seasons. Plots were harvested on 27 Sep 13 by raking nuts into windrows, then placed in wooden tote boxes using a Flory Hazelnut Harvester. The harvester was designed to allow soil and dirt to fall between conveyor belt chains and to blow or suck away leaves, husks and some blank nuts. Nuts were then conveyed into large wooden bins and weighed using a Vishay Celtron model Digital Summit 3000 scale.

Cankers of eastern filbert blight were first observed in this block on 16 Aug 10. Cankers were found in a single non-treated tree as well as a single tree treated with the best management practice. More intensive scouting indicated that cankers were thought to be 2-3 years old indicating infection was likely in 2007. The cumulative number of cankers from all non-treated trees increased greatly in both 2011 and 2012 (Figures 1 and 2). Cumulative canker number also increased for all fungicide-treated trees but at a lower rate. It is very difficult to find every canker on every tree and thus there are 2-3 year old cankers found each year. Figure 2 is the cumulative canker number adjusted for the year canker symptoms first appeared. The number of cankers found in non-treated blocks was significantly higher than the cankers found in fungicide-treated blocks only in 2012 (Figure 3). There was no significant difference in canker number between the two different fungicide-treated blocks any year prior to 2012.

Field run weight was 33, 45 and 50 lb/tree for the non-treated, Echo 720 and BMP treatments, respectively. Yield data, however, were normalized for moisture content to make year-to-year comparisons. Average dry weight yield per tree decreased for non-treated trees and increased for fungicide-treated trees (Table 1). This is the first year overall yield per tree was significantly lower for non-treated trees when compared to fungicide-treated trees (Table 1). The change in yield from 2012 to 2013 was not significantly different among the treatments mostly due to wide variation in non-treated plots.

Figure 1. Cumulative number of cankers found each year on 'Ennis' trees in non-treated, Bravo treated or Best Management Practice (BMP) blocks.

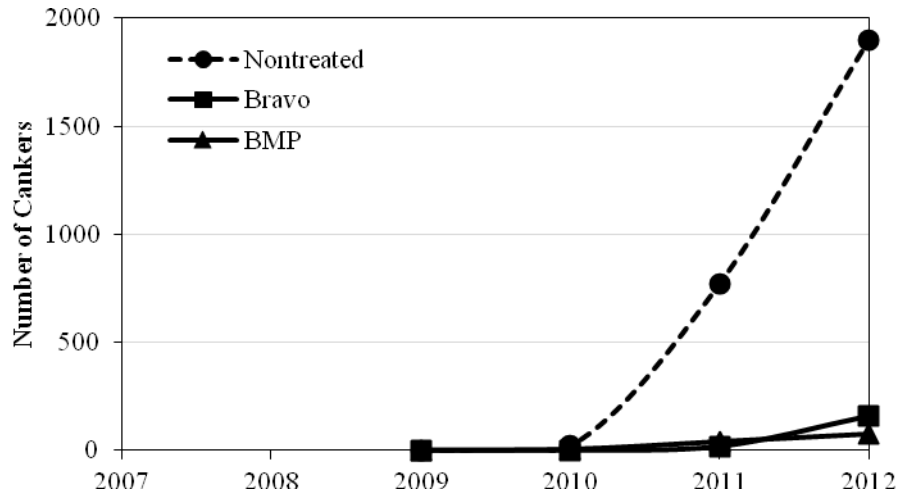


Figure 2. Adjusted cumulative number of cankers found each year on 'Ennis' trees in non-treated, Bravo treated or Best Management Practice (BMP) blocks. Numbers are adjusted to account for 2 to 3 year old cankers that could have been found one or two years earlier.

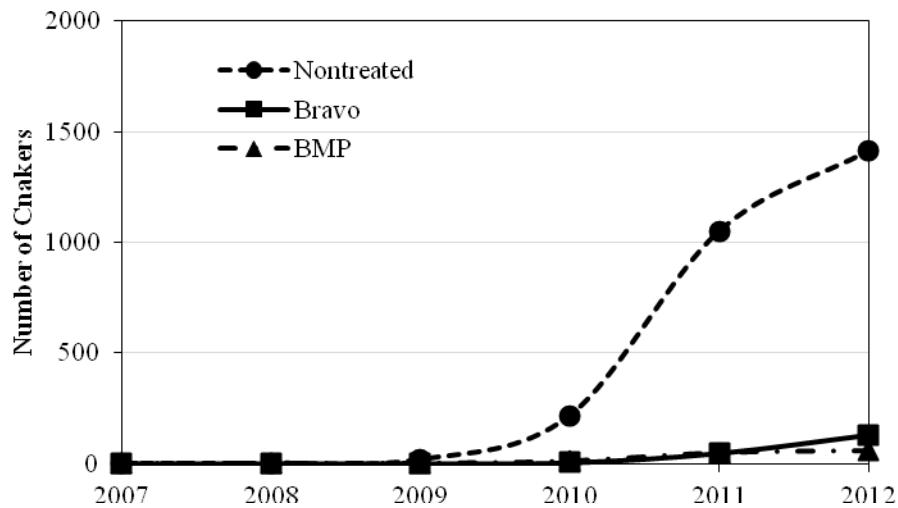


Figure 3. Number of cankers found within blocks of 9 'Ennis' trees in non-treated, Bravo treated or Best Management Practice (BMP) blocks in 2011 and 2012.

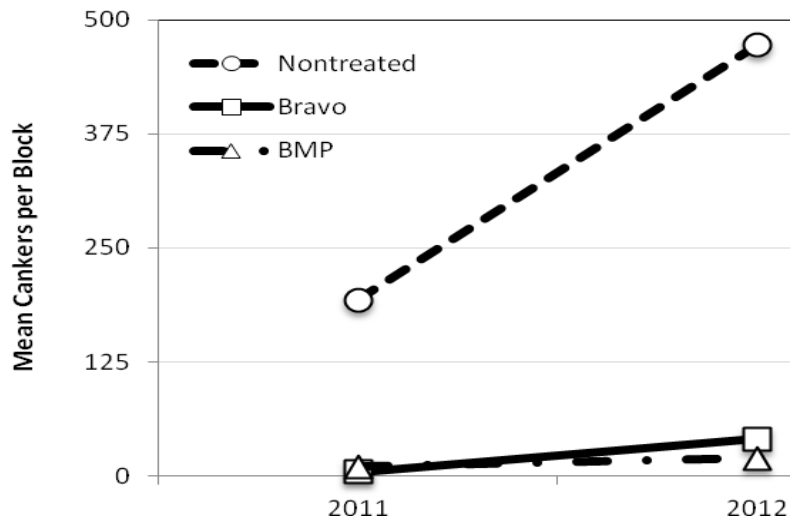


Table 1. Fungicide treatments and clean dry weight yield for 2012 and 2013.

Treatment	Ave Yield/Tree 2012* (lbs)	Ave Yield/Tree 2013* (lbs)	Ave. change from 12 to 13* (%)
Non-treated .....	26.5	18.2 b	-35.6 b
Echo 720 (4 applications).....	27.7	24.7 a	-10.5 a
Best Management Practice.....	28.6	27.6 a	-0.7 a

\* Means followed by the same letter do not differ significantly based on Fisher's protected LSD (P=0.05). Means without letters are not significantly different.

Figure 4. Clean and dry weight yield per tree from 2004 to 2013.

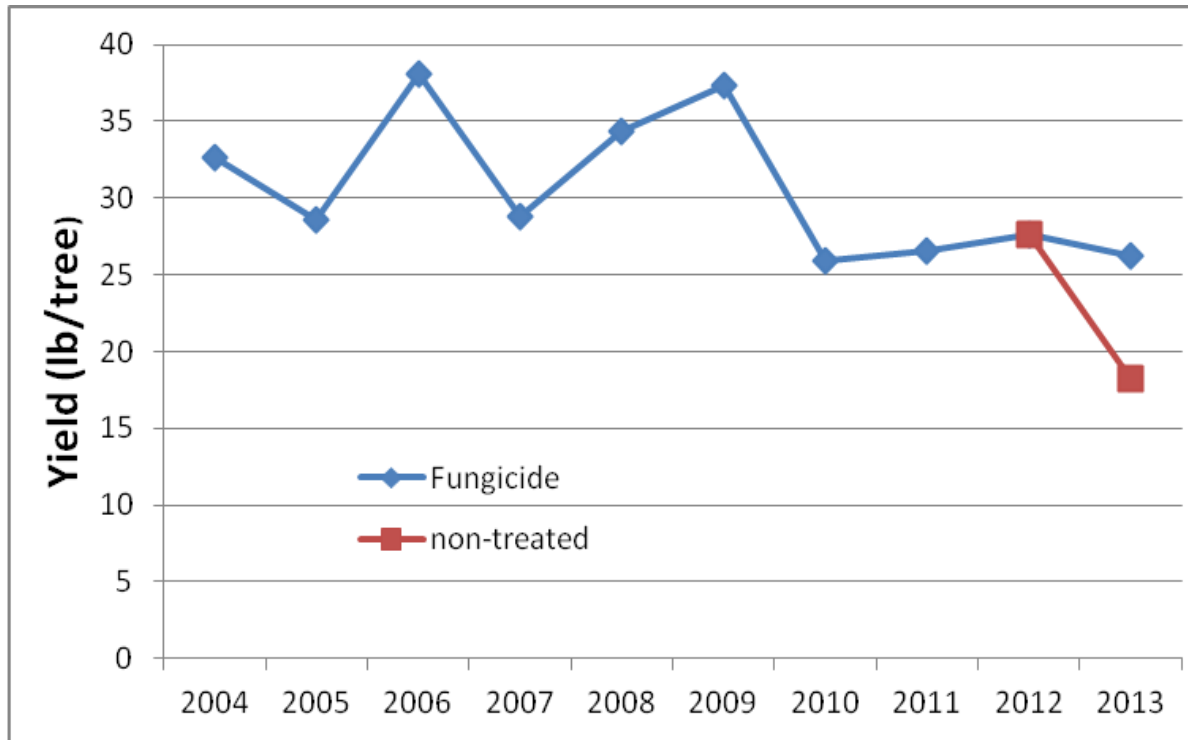


Table 2. Best Management Practice used each year.

Year	Best Management Practice	Year	Best Management Practice
2004	Bravo Weather Stik at 32 fl oz/100 gal then Flint 50 WG at 1 oz/100 gal then Orbit 3.6 EC at 4 fl oz/100 gal  (1 application each)	2009	Bravo Weather Stik at 64 fl oz/A then Gem 500 SC at 8 fl oz/A plus Bravo Weather Stik at 32 fl oz/A then Orbit 3.6 EC at 8 fl oz/A plus Bravo Weather Stik at 32 fl oz/A then Cabrio EG at 8 oz/A plus Bravo Weather Stik at 32 fl oz/A
2005	Bravo Weather Stik at 32 fl oz/100 gal then Flint 50 WG at 2 oz/100 gal then Orbit 3.6 EC at 4 fl oz/100 gal then Cabrio EG at 4.3 oz/100 gal  (1 application each)	2010	Bravo Weather Stik at 64 fl oz/A then Gem 500 SC at 3.8 fl oz/A plus Bravo Weather Stik at 32 fl oz/A then Orbit 3.6 EC at 8 fl oz/A plus Bravo Weather Stik at 32 fl oz/A then Cabrio EG at 8 oz/A plus Bravo Weather Stik at 32 fl oz/A
2006	Bravo Weather Stik at 32 fl oz/100 gal then Flint 50 WG at 4 oz/A then Orbit 3.6 EC at 8 fl oz/A then Cabrio EG at 9.5/A plus Break-Thru at 4 oz/100 gal  (1 application each)	2011	Bravo Weather Stik at 64 fl oz/A then Gem 500 SC at 2 fl oz/A plus Bravo Weather Stik at 32 fl oz/A then Tilt EC at 8 fl oz/A plus Bravo Weather Stik at 32 fl oz/A then Cabrio EG at 5 oz/A plus Bravo Weather Stik at 32 fl oz/A
2007	Bravo Weather Stik at 32 fl oz/100 gal then Gem 500 SC at 8 fl oz/A plus Silwet L-77 at 6.4 oz/100 gal then Orbit 3.6 EC at 8 fl oz/A then Cabrio EG at 8 oz/A plus Silwet L-77 at 6.4 oz/100 gal  (1 application each)	2012	Echo 720 at 64 fl oz/A then Quadris Top at 14 fl oz then Stratego at 15 fl oz then Echo 720 at 64 fl oz/A
2008	Bravo Weather Stik at 32 fl oz/100 gal then Gem 500 SC at 3 fl oz/A then Orbit 3.6 EC at 8 fl oz/A then Cabrio EG at 8 oz/A plus Silwet L-77 at 6.4 oz/100 gal  (1 application each)	2013	Echo 720 at 64 fl oz/A then Stratego at 15 fl oz then Quadris Top at 14 fl oz then Echo 720 at 64 fl oz/A