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, 2014.

The goal of this trial is to evaluate yield protection and fungicides 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 3rd tree in every 3rd 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 indicate that these trees have 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 nontreated trees, trees treated with 4 applications of chlorothalonil at 64 fl oz/A, and trees treated with the Best Management Practice. For 2014, the best management practice consisted of an application of Echo 720 (64 fl oz/A) at bud break, then Quadris Top at 14 fl oz/A, 2 weeks after bud break, then Stratego at 15 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 100 psi and at a rate of 135 water/A such that approximately 13.5 gal of a spray suspension were applied per set of 9 trees. Fungicide treatments were applied on 12 Mar (bud break), 27 Mar, 12 Apr, and 26 Apr. Suckers were cut by hand on 2 and 3 Jul. Weeds were sprayed with Makaze (32 oz/A) plus Reckon (64 oz/A) on 24 Mar and 28 Apr. There was no application for control of big bud mite. Asana XL (16 fl oz/A) was applied on 8 Jul for filbert worm control. Trees were pruned in the dormant period by selectively removing the tallest branches and water sprouts from the center of each tree. There was no supplemental irrigation applied this year. The orchard was fertilized with 46-0-0 at 200 lb/A on 16 Apr. The orchard floor was "floated" on 2 Sep to remove dead weeds and blanks, respectively. Trees were scouted for EFB cankers during the dormant and summer growing seasons. Plots were harvested on 2 Oct 14 by raking nuts into windrows, then placed in wooden tote boxes using a Mc Nair 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 nontreated 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 nontreated trees has increased greatly since 2011 (Figures 1 and 2). Cumulative canker number also increased for all fungicide treated trees but not nearly as much. 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 nontreated blocks were significantly higher than the cankers found in fungicide treated blocks (Figure 3). There was no significant difference in canker number between the two different fungicide treated blocks in 2011, 2012 or 2013.

Field run weight was 9, 27 and 33 lb/tree for the nontreated, 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 all trees but greatest for nontreated trees (Table 1). This was only the second year overall yield per tree was significantly lower for nontreated trees when compared to fungicide treated trees (Table 1). The change in yield from 2013 to 2014 was not significantly different among the treatments.

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

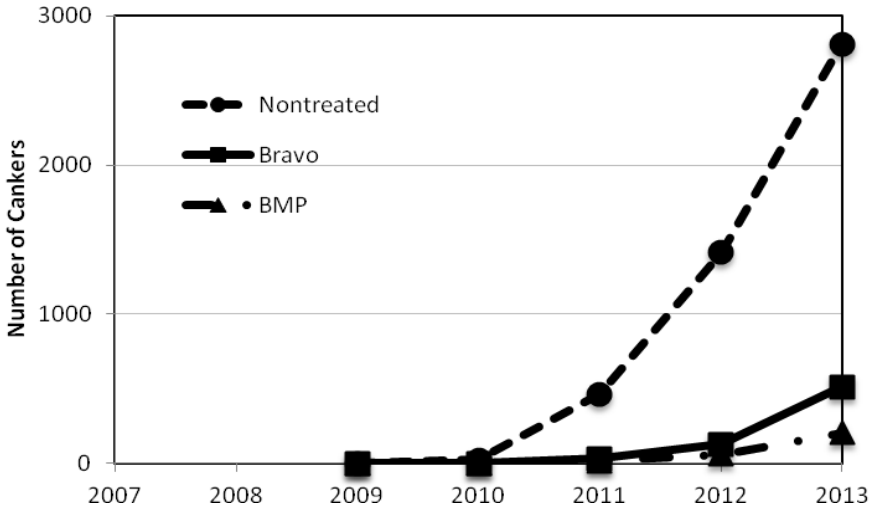

Figure 2. Adjusted cumulative number of cankers found each year on ‘Ennis’ trees in nontreated, Bravo treated or Best Management Practice (BMP) blocks. Numbers are adjusted to account for 2 to 3 year old cankers that could have been found one or two years earlier.

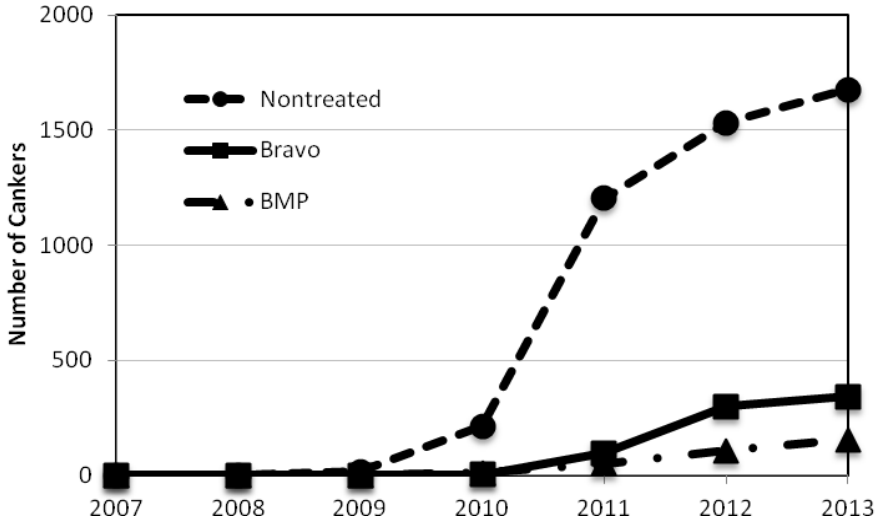

Figure 3. Number of cankers found on ‘Ennis’ trees in nontreated, Bravo treated or Best Management Practice (BMP) blocks.

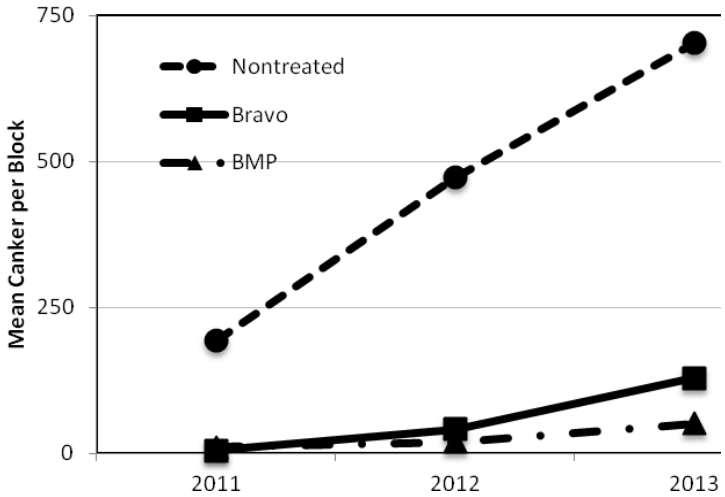

Table 1. Fungicide treatments and clean dry weight yield for 2013 and 2014.

Treatment	Ave Yield/Tree 2013* (lbs)	Ave Yield/Tree 2014* (lbs)	Ave. change from 13 to 14* (%)
Non-treated ……...……...……	18.2 b	6.7 b	-65.7 a
Echo 720 (4 applications).....	24.7 a	20.1 a	-23.6 b
Best Management Practice……	27.6 a	24.3 a	-22.3 b

* 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 2014.

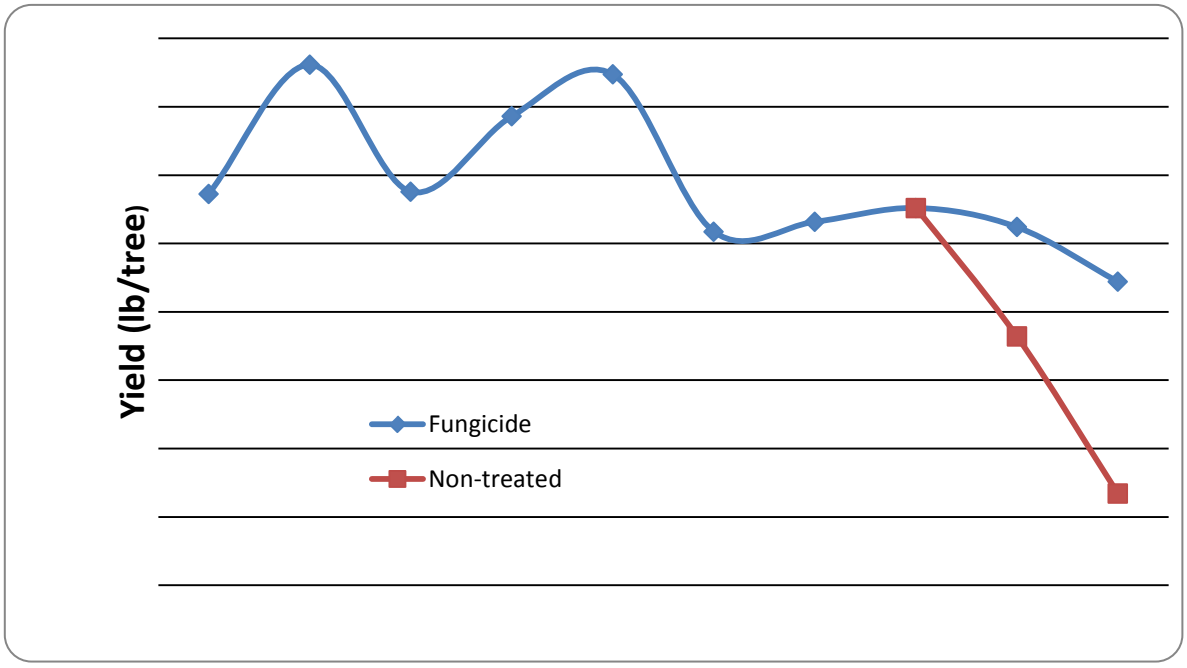

Table 2. Best Management Practice used each year.

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)	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
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)	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
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)	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
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)	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
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)	2014	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
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		