Title: Vegetation-free Strip Width in Blackberry

Progress Report

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Research

Principle Investigators:
Katie M. Jennings (katie_jennings@ncsu.edu)
Wayne Mitchem (mitchem@ncsu.edu)
David W. Monks (david_monks@ncsu.edu)

North Carolina State University
Department of Horticultural Science
Campus Box 7609
Raleigh, NC 27695

Objectives:
1) To determine the optimum vegetation-free strip width for established blackberry with regards to plant vigor, primocane thinning, yield, fruit quality, and income potential.

Justification and Description:

Blackberry production in the Southeastern United States has grown rapidly in recent years. Between 1997 and 2007 acreage and farm number have increased 132 and 211%, respectively (USDA-NASS 1998, 2008). Growth in the Southeast at that time exceeded national growth of 109 and 79% in farm number and acreage, respectively (USDA-NASS 1998, 2008). As of 2007 blackberry production in the Southeast consisted of 1,950 acres on 1,150 farms (USDA-NASS 2008). This production equaled 20 and 13% of the blackberry growing farms and acreage, respectively, in the United States (USDA-NASS 2008). With such rapid growth, cultural management practices, including those that pertain to field floor management, may vary greatly among growers and require further understanding.

Commercial blackberry production consists of planted rows and between row spaces. Management of the two spaces differs significantly. Areas within the planted row are often treated to remove or exclude weeds using organic or synthetic mulches and/or herbicides. Between row spaces often consist of existing vegetation and/or a sod strip. However, as the vegetation strip encroaches toward the weeded row, it can compete with the blackberry crop for water and nutrients. To limit interference of the vegetation strip, an optimal herbicide strip or vegetation-free strip width (VFSW) must be determined.

Two VFSW studies were initiated in 2011 at the Sandhills Research Station in Jackson Spring, N.C. to evaluate the influence of six VFSWs (0, 1, 2, 4, 6, and 8 ft) on 'Navaho' blackberry establishment and development (Steve L. Meyers Ph.D project). Strip widths were established in late summer-early fall and baseline data (primocane number, diameter, length) collected. Vegetation between rows consisted of existing weed species

(annual and perennial grasses, sandbur, yellow nutsedge, and broadleaf weeds). Plant growth parameters and fruit yield and quality parameters were measured in 2012.

In September 2012 a grower location was identified in western NC (Killdeer Farm) and was added to the project to determine the relationship in a different environment (western NC). Grass seed (fescue) was planted in the row middles in 2012 and the VFSW treatments were established. This study was part of a Master of Science thesis project for Nick Basinger, a student who began in January 2013. Funding from SRSFC will be used to continue monitoring the study in western NC through 2015.

Materials and Methods:

Field studies were initiated in 2011 at two locations at the Sandhills Research Station near Jackson Springs, NC to determine the influence of vegetation-free strip width (VFSW) on the growth of newly planted 'Navaho' blackberry plants, and the yield and quality of blackberry fruit. Soil at Location 1 consisted of Candor (sandy, siliceous, thermic Arenic Paleudults) and Fuquay sands (loamy, siliceous, thermic Arenic Plinthic Kandiudults). Soil at Location 2 was a Candor sand. Both locations had a field history consisting of sorghum-Sudangrass (*Sorghum* x *drummondii*) in 2009 and peanut (*Arachis hypogaea* L.) in 2010. A fall rye cover crop was planted on 10 Nov. 2010. Rye was killed on 8 Mar. 2011 with an application of glyphosate. 'Navaho' blackberry plugs (50 per flat) were planted on 29 Mar. 2011 with in-row and between-row spacing of 1.2 and 3.7 m, respectively. Plots were maintained weed-free by shallow cultivation within 0.6 m of both sides of the planted row until 9 June 2011. A V-trellis was installed on 14 June 2011. VFSW treatments were established on 5 Aug. 2011 at location 1 and 18 Oct. 2011 at location 2. Between-row vegetation consisted of existing weed and turf-grass species and included Bermudagrass [*Cynodon dactylon* (L.) Pers.], carpetweed (*Mollugo verticillata* L.), cutleaf evening primrose (*Oenothera laciniata* Hill), horseweed [*Conyza canadensis* (L.) Cronquist], large crabgrass [*Digitaria sanguinalis* (L.) Scop.], long-spined sandbur [*Cenchrus longispinus* (Hack.) Fernald], spotted spurge [*Chamaesyce maculate* (L.) Small], volunteer peanut (*Arachis hypogaea* L.), and yellow nutsedge (*Cyperus esculentus* L.).

In Fall 2012 a third field study was established at Killdeer Farm near Kings Mountain, NC. On November 2, 2012 'Kentucky 31' fescue was planted beneath established three-year-old 'Navaho' blackberries. VFSW's of 0, 2, 3, 4, and 6 feet were established on March 5, 2013 with an application of Sinbar (terbacil) plus Gramoxone SL (paraquat).

Vegetation-free strips were maintained weed-free with the applications of a Gramoxone SL or Rely (glufosinate). Poast or Select was applied to control emerged grasses within the designated VFSW area at all locations. All herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 187 L ha^{-1} with a single 8003EVS nozzle tip at 20 psi. All applications contained an inert blue spray indicator dye.

Data collected included primocane number, floricane number, yield, individual fruit weight, fruit pH, soluble solids content (SSC), and titratable acidity (TA). Due to lower than normal temperatures at Killdeer farm in the winter of 2013-2014 data were collected on bud damage

and death to determine the effect of VFSW on the canes ability to survive extreme winter weather.

At Sandhills location 1 and 2, berries were harvested weekly. Twenty-five berries of 'dull black' and 'shiny black' were removed from each plot during the first two harvests placed in a freezer at 0°C for fruit analysis. At final harvest, remaining unripe berries were counted multiplied by the mean berry weight over the season.

At Killdeer Farm, samples of 25 black berries for 'shiny black' were harvested on two dates and three dates for 'dull black.' These harvests occurred between June and late July 2014. Unlike Sandhills, berries at Killdeer were counted prior to any harvest for the season. All berries were counted for 5 ft of row in each plot. The number of berries was multiplied by the mean berry weight over the season to determine yield potential.

Data was subjected to ANOVA analysis by SAS PROC GLM (SAS 9.3, SAS Institute, Cary, NC). The experimental design was a randomized complete block with four replications.

Results:
Unfortunately blackberry growth and yield from Sandhills location 1 and 2 was poor so these results will not be presented. Only the results from Killdeer farm will be discussed.

Winter bud damage. As VFSW increased there was a decrease in dead buds per cane. With a VFSW less than 4 VFSW there was an average of 3.5 dead buds per cane. At 6 VFSW canes had 1.8 dead buds.

Vegetative growth. Measurements to determine effect of VFSW on vegetative growth showed no significant influence of VFSW on cane length or cane diameter. Primocane number was lowest at 0 VFSW with 19 primocanes per plot. Floricane number increased with increasing VFSW from 14 canes per plot at 0 VFSW to 34 canes per plot at 6 VFSW.

Blackberry yield and quality. Yield showed a positive quadratic response to increased VFSW. As VFSW increased from 0 to 6 berry number increased from 1143 to 2359 berries per plot. Berry size, Brix and titratable acidity were similar among treatments.

Summary. Results from 2014 indicate that wider VFSW produce more primocanes and floricanes. This increase translates to greater yield in the wider VFSW with 6 VFSW resulting in the highest yield. In addition to increased yield and primocane and floricane number, canes in wider VFSW showed less winter damage during the 2013-2014 winter than those in narrower widths. Wider VFSW would be recommended to growers who desire to increase yield and ensure winter hardiness. This study will continue through 2015 to determine if the effect of VFSW is consistent over multiple seasons.