A Winter Protection System for Blackberries

by Fumiomi Takeda

Editors Note: Dr. Takeda will present this topic in greater detail at the upcoming OPGMA Congress, Monday, January 12, 2009. Visit www.opgma.org/events for details.

Winter injury has limited the expansion of commercial blackberry (Genus Rubus subgenus Rubus Watson) production into the more northern latitudes in central and eastern United States. Row cover (RC) and clear polypropylene (PE) sheeting were applied over trailing ‘Baysenberry’ and ‘Skikiyou’ and erect, thornless ‘Triple Crown’ and ‘Apache’ blackberries at Kearneysville, West Virginia (USDA Plant Hardiness Zone 6b) from 2004 to 2007. The daily minimum temperatures under RC, RC + PE, and two layers of RC were as much as 5 to 10°F higher at nights following sunny days, but similar during nights following overcast days. On sunny days, daily maximum temperatures under RC, RC + PE or two layers of RC were as much as 28°F higher than in the open. Under RC, humidity rose more quickly and remained higher during the day than in the open, but was slightly lower at night. Mean vapor pressure deficit in late December, January, February, and early March was generally 200 kPa higher under RC than in the open. RC and RC + PE treatments significantly reduced winter injury and increased yield in ‘Skikiyou’ blackberry plants.

The winter protection techniques described here would provide substantial benefits for growing blackberries in more northern areas where winter injury frequently causes crop failure.

The interest in growing blackberries is high among farmers looking for crops with a market niche and the potential for high returns on investment. As a result there has been a rapid expansion of blackberries for fresh fruit production in the United States. Blackberry acreage has risen 23 percent from 1997 to 2002. In Pennsylvania and surrounding states (OH, NY, WV, MD, NJ, and DE), acreage has increased 83 percent from 262 acres to 478 acres during the same time (USDA-NASS, 2004). The upsurge in blackberry acreage points to the interest in this crop and perceived market potential. Its production, however, is small in areas where sub-zero temperatures (°F) are common during the winter, such as in northern and central Pennsylvania. There, fruit production by field-planted thornless blackberries has been rare (Demchak, 2006). For example, in central Pennsylvania, ‘Chester Thornless’, ‘Navaho’, ‘Arapaho’, ‘Choctaw’, and ‘Shawnee’ blackberries produce vigorous primocanes each growing season, but the buds and canes of these cultivars showed low temperature injury and have not produced fruit. In southeastern Pennsylvania, production of eastern thornless blackberries is hit-or-miss, with winter injury decreasing yields nearly every year. Preventing winter injury in some cultivars may be possible if blackberries are grown under protected cultivation to decrease desiccation damage or prevent dropping of temperatures that will be lethal to them. At Penn State, ‘Triple Crown’ eastern thornless blackberry plants that were established in a 17-foot wide single-bay Ledgewood Farm Greenhouse high tunnel grew successfully and each plant produced about 12 pounds of marketable fruit. Primocane-bearing blackberries may also make blackberry production more consistent; however reliable crop production will be limited to the fall season, and available cultivars do not have good quality or productivity that is equal to traditional, floricanes-fruited cultivars.

High tunnels do allow growers to produce blackberry fruit. But, the high cost (> $35,000 per acre) for high tunnels and other permanent structures may prevent many growers from adapting the system for winter protection.

A New System

A less expensive, non-high tunnel winter protection has been developed. If it can be shown that such a system provides enough winter protection for blackberries, it will offer an opportunity for farmers in the region to grow a new berry crop and fill a market niche for blackberries grown locally.

A new trellis system called the “rotatable cross arm” (RCA) trellis and cane training technique was developed for mechanical harvesting of fresh market quality with the USDA bramble harvester (Takeda and Peterson, 1999). The RCA trellis system is a modified “Y” trellis, similar to one of the variations of shift trellis designs described by Stiles (1999) at Virginia Tech. Our RCA trellis system allows the floricanes to be tied to wires on the rotatable cross arms while the primocanes are trained on a stationary wire on opposite sides of the trellis. The new trellis design positioned more than 95 percent of the fruit underneath the cross arm and improved hand harvest efficiency by 30 percent.

In the absence of suitable, winter hardy, high-chill requirement blackberry varieties, one may modify the aerial environment to decrease winter injury and improve the potential of sustained crop production. Western trailing and eastern erect blackberries are adapted to canopy manipulation of the RCA trellis. Based on the recent research on trellis technology, we hypothesized that the RCA trellis and cane training system could provide a practical technique for growing and protecting blackberries through severe winter conditions. A protection system must prevent the temperatures of buds from falling below -10°F during mid winter, but with minimal exposure of canes and buds to high temperatures with low labor input. During the fruiting phase, the cross arms of the trellis can be rotated to angle the floricanes into a position that makes the fruit easily accessible for harvesting. The same cross arms can be rotated to reposition or lower primocanes in the fall close to the...
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ground so that exposure to winter conditions may be decreased. When canes are positioned near the ground, much of the planting could be protected by snow or by applying a protective cover over the plants as their height would be decreased from over 6 feet to less than 2 1/2 feet.

The study included two trailing ('Siskiyou' and 'Boysenberry') and two semi-erect ('Apache' and 'Triple Crown') blackberries that have been established at Kearneysville, West Virginia (Takeda et al., 2008). Nursery mature transplants were established 5 feet apart in fabric-covered raised beds. The rows were 12 feet apart running in the north-south direction. The RCA trellis assembly has an upright post and a long cross arm with a mechanism at the top of the post that permits the cross arm to be pivoted and rotated as much as 180 degrees. A special cane training practice spatially separated primocanes and floricanes. After tying canes to trellis wires and rotating the cross arms to below horizontal, tied canes were positioned close to the ground. The plants were then covered with a floating row cover (FRC) alone or with the FRC and polyethylene plastic (PE) in early December. Covers were removed in early March and canes remained in the horizontal position until bloom, encouraging flowering laterals to grow upright. After bloom, the cross-arms were raised and pushed beyond vertical or about 70 degrees above horizontal. This positioned the fruit on one side of the row and allowed the newly emerged primocanes to be tied to the training wire.

The results of our study showed that 'Apache' and 'Triple Crown' blackberries did not benefit from winter protection covers in our winter conditions. Covered and unprotected plants showed little bud damage and produced the same yield. The minimum daily temperatures remained above 0°F from December 2004 to March 2005. Normally these erect cultivars do not show winter damage until the temperature drops below -4°F. In January and February 2005, the daily minimum temperatures under the FRC+PE cover treatment were about 6°F higher than in the open. The FRC and FRC+PE covers may also have protected canes against the wind and desiccation.

In trailing blackberries, tissue damage in plants protected with a FRC+PE cover was significantly less than for unprotected plants. In 'Siskiyou' blackberry, more than 90 percent of the axillary buds on lateral canes were killed in unprotected plants compared to only 20 percent in plants covered with FRC+PE. 'Siskiyou' plants that were not protected produced less than 3 pounds of fruit while about 10 pounds of fruit was produced by plants that were covered with FRC alone or in combination with PE. More fruit were harvested from 'Boysenberry' blackberries that were protected compared to plants in the open. The fruit of 'Boysenberry' had poor drupe development, especially among those at the distal end. Harvesting of 'Siskiyou' fruit started on June 20 during the red raspberry harvest season or two to three weeks earlier than that for 'Triple Crown' eastern blackberry.

The RCA trellis which allows the placement of canes close to the ground in winter and installation of FRC over the canes during winter has a potential for mitigating low-temperature stress. In using the RCA trellis for winter protection, the pivot point of the rotatable cross arm should be about 24 inches above the ground. After harvest is finished and the spent floricanes are removed from the trellis, the lateral canes can be tied to the wires on the cross arm. In early winter, the cross arm can be rotated away from the harvest position to tie the remaining laterals that have grown to the other side of the row, and rotate the cross arms so that the tip of the cross arm touches the ground. The sequence of cane tying and cross arm rotation positions all canes at the height of the pivot point or close to the ground. For winter protection, straw mulch can be deposited on top of the horizontally-oriented lateral canes and around the base of the main canes. The straw can be covered with winterizing row covers. Snow cover can provide added insulation. Once such a production system is installed, it helps with the repositioning of the canes without sacrificing the production capacity of the plant and can position nearly all the fruit on one side of the row.

The combination of winter mulch, row cover, and snow cover over the canes and canes positioned close to the ground can theoretically maintain the nightly minimum bud temperatures 6 to 10°F above ambient temperatures. It is suggested that growers pay attention to voles and other rodents under the protective covers and take proper measures to manage these pests.

Will these production modifications allow blackberries to be grown successfully in northern states? Higher capital investment on the trellis material can offset labor needs and raise crop productivity. We have shown that the RCA trellis system can be used to manipulate the canes with little cane breakage and position fruit to improve harvest efficiency. Whether incorporating this trellis system for blackberry production in northern states will be successful depends on its profitability. For example, the price of fresh blackberries in New Hampshire is more than $3 per pint (William Lord, personal communication). Field trials will be started in Maine, New Hampshire, and Pennsylvania to evaluate alternative cultural techniques for improving the sustainability of blackberry production at sites with adverse winter conditions.

This is a brief synopsis of research being conducted at the Appalachian Fruit Research Station. For more information, you are encouraged to read a research paper recently published in HortTechnology 18(4):575-582, which can be accessed at http://horttech.ashpublications.org. The full article can be purchased from the American Society for Horticultural Science for $10.

Literature Cited


Management

Why Did My CAUV Values Increase So Much?

by Larry Gearhardt

Many rural landowners are shocked when they discover the 2008 Current Agricultural Use Values (CAUV). Depending on the soil types, some values increased several hundred percent over 2005 values. As a result, questions arise about the CAUV program. Unlike fair market value appraisals, CAUV values are calculated for each soil type in Ohio (approximately 3,650 soils) by a formula that is based on five factors. The numbers that are inserted in the formula are designed to reflect the true nature of agriculture in the State of Ohio.

What is CAUV?

In 1972, Ohio voters approved a constitutional amendment that allowed qualified agricultural land to be valued at its Current Agricultural Use Value for real property tax purposes rather than fair market value. The home, home site, and outbuildings are still valued at fair market value.

Current agricultural use value can be determined by the capitalization of the typical net income from agricultural crops on a given parcel of land assuming typical management, cropping patterns, and yields for the types of soil present on the tract.

Why Now? Reappraisal and Updates

By law, county auditors are required to reappraise every parcel of land in the county every six years. Further by law, auditors are required to establish the fair market value of each of four components for every parcel. The four components are:

1. The home.
2. A one-acre home site.
3. Any other outbuildings on the property.
4. Any other land.

Fair market value is defined to be the value that land would transfer between a willing seller and a willing buyer in an arm's-length transaction. Foreclosure sales, public auctions, and sales between family members are not considered arm's-length transactions.

Because property values were rapidly increasing in the 1960s and 1970s, a law was passed in 1976 that established the triennial update. This law requires county auditors to adjust property values every third year after a reappraisal. The difference between a reappraisal and a triennial update is that the reappraisal is based upon an inspection of the property, while a triennial update is determined in the auditor's office and is based upon sales of property in the county.

The Ohio Department of Taxation calculates CAUV values annually and sends the values out to the auditors. The auditors then use the CAUV values, as determined by the Ohio Department of Taxation, for those years when the county does a reappraisal or an update.

The counties performing a reappraisal in 2008 are Ashtabula, Athens, Butler, Clermont, Fulton, Greene, Knox, Madison, Montgomery, Noble, Summit, and Wayne.

The counties performing a triennial update in 2008 are Auglaize, Clinton, Darke, Defiance, Delaware, Franklin, Gallia, Geauga, Hamilton, Hardin, Harrison, Henry, Jackson, Licking, Mahoning, Mercer, Morrow, Perry, Pickaway, Pike, Preble, Putnam, Richland, Seneca, Shelby, Trumbull, Van Wert, and Wood.

How is CAUV Calculated?

The CAUV values are based upon a formula containing five factors applied to four crops: corn, soybeans, wheat, and hay.

The five factors are:

1. Cropping pattern – based upon the slope of the soil: level ground weighted toward corn and beans; steep slope weighted toward wheat and hay.
2. Crop prices – based upon a survey of elevators in Ohio.
3. Crop yields – based upon FSA yields per acre for each soil type.
4. Non-land production costs – based upon farmer surveys by Ohio State University.

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