Alternative Method of Primocane Management for Primocane-fruiting Blackberry and Raspberry[1]


Fumiomi Takeda[2] and Ann Rose[3]
Appalachian Fruit Research Station, USDA-ARS
Kearneysville, WV 25430

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[2]Research Horticulturist. E-mail: Fumi.Takeda@ars.usda.gov
[3]Horticulturist. E-mail: Ann.Rose@ars.usda.gov
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Abstract: A study was conducted on 'Prime-Ark 45' and 'Prime-Ark Traveler' to determine the effects of primocane bending and defoliation on subsequent flowering and fruit development. Our findings indicated that leaf removal stimulated more of the buds to push. The shoots that developed on bent primocanes were reproductive and produced a cluster of flowers in one month after bending and defoliation. An increase in flower shoot numbers on bent and defoliated primocanes was also observed in primocane-fruiting red raspberry. Of the two cultivars evaluated in this study, 'Prime-Ark Traveler' responded more favorably to the alternative primocane management by developing more fruiting shoots on bent primocanes. We also observed that the initial flush of spring-emerging primocanes responded quite differently to cane bending then the primocanes from the second flush. Additional studies are needed to better understand the underlying factors of cane manipulation leading to varied plant responses to cane manipulation.

In most northern areas blackberries cannot be commercially grown unless the canes are protected from severe winter conditions. This limitation can be overcome by: 1) protecting floricane-fruiting varieties from winter conditions in heated tunnels; 2) growing plants on the Rotating Cross-Arm (RCA) trellis and covering them with heavy rowcover in winter (Takeda et al., 2008), or 3) growing new primocane-fruiting (PF) blackberries. To date, pruning and tipping practices have been used to increase yield in PF blackberries (Drake and Clark, 2003; Strik et al., 2008; Thompson et al., 2009). Typically, unpruned or untipped primocanes produce a single inflorescence (flower cluster). Growers have used a combination of pruning back the primocanes and then tipping the lateral shoots prior to bloom to increase branching and plant yield (Thompson et al., 2009). We thought that primocane-fruiting (PF) blackberries can be

manipulated by other means to enhance their cropping potential, thus eliminating the need for hard pruning and soft tipping. Lateral shoot numbers can be increased by bending the primocane as previously shown with floricane-fruiting blackberries (Takeda and Peterson, 1999).

The objectives of this study were: 1) Study the effects of bending primocanes, forcing them to grow horizontally on a static post with two cross arms, and soft-tipping primocanes when they have grown horizontally for 1 to 1.5 m; 2) Study the effects of removing leaves from horizontally-oriented primocanes on side shoot emergence; and 3) Compare yield and harvest time of blackberries grown using different primocane management methods.

A patent method was used to train the primocanes of 'Prime-Ark 45' and 'Prime-Ark Traveler' blackberry (Fig. 1).

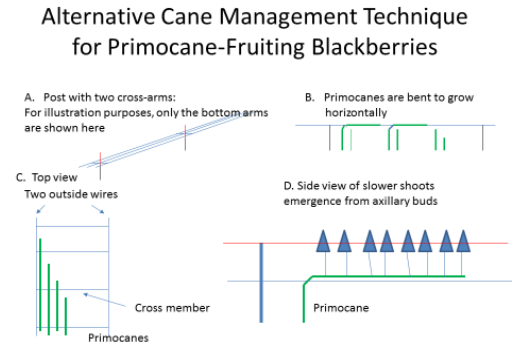

Fig. 1. Illustrations showing the process of primocane manipulation and the potential change in the development of fruiting shoots on bent primocanes.

Fig. 2. This photograph shows bent primocanes with most of their leaves removed. Many of the buds at the leaf axil broke within several weeks.

In addition, to bending the primocanes, the leaves were taken off from the bent primocanes (Fig. 2). Our findings indicated that leaf removal stimulated more of the buds to push. The shoots that developed on bent primocanes were reproductive and produced a cluster of flowers in one month after bending and defoliation. An increase in flower shoot numbers on bent and defoliated primocanes was also observed in primocane-fruiting red raspberry (Fig. 3).

The study conducted in 2016 indicated that 'Prime-Ark Traveler' responded more favorably to the alternative primocane management by developing more fruiting shoots on bent primocanes. We also observed that the initial flush of spring-emerging primocanes responded quite differently to cane

bending then the primocanes from the second flush. The primocanes from the first flush usually terminated in a large inflorescence upon reaching a height of no more than 1.5-m-tall whereas the primocanes from the second flush grew 2-m tall or more before an inflorescence developed terminally. When the primocanes from the second flush growth were bent and defoliated once they had grown to 2 m or more, many flower shoots developed (Fig. 2). In the case of primocane-fruiting red raspberry, cane bending and defoliation stimulated flower shoots along the entire length of 2.5-m-long bent primocanes. As many as 25 flower shoots were observed.

Fig. 3. Left: Tipped primocanes with several lateral shoots. Center: Bent primocanes with many flower shoots. Right: Bent primocanes of primocane-fruiting raspberry showing the development of flower shoots from near the soil-line to the distal end of 2.5 m long primocanes.

The findings from this research represents an important step towards the development of horticultural practices for primocane-fruiting blackberries. These horticultural tools will enable growers to advance or delay harvest time and potentially help in increasing yields. Our research has also provided new information to assist research activities geared towards canopy management strategies for berry crops that improve production efficiency, quality, and tolerance of abiotic stresses. Products that will be derived from this project include lower risk of crop loss through a better understanding of the biology underlying plant response to cane manipulation. Findings could lead to increasing blackberry production in non-traditional production areas.

Literature cited

Drake, C.A. and J.R. Clark. 2003. Effects of pruning and cropping on field-grown primocane-fruiting blackberries. HortScience 38:260-262.

Strik, B., et. al. 2008. Management of primo-cane-fruiting blackberry to maximize yield and extend the fruiting season. Acta Horticulturae 777:423-428.

Takeda, F., et. al. 2008. Row covers improve winter survival and production of western trailing 'Siskiyou' blackberry in the Eastern United States. HortTechnology 18:575-582.

Takeda, F. 2016. Method and apparatus for primocane management. US Patent No. 9,357,716 (issued June 7, 2016)

Thompson, E., et. al. 2009. High tunnel versus open field: Management of primocane-fruiting blackberry using pruning and tipping to increase yield and extend the fruiting season. HortScience 44:1581-1587.