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A Three-Year Study on the Effect of Trellis Type on Yield, Fruit Size, and Economics of Blackberry Production in Georgia

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Tissue-culture propagated “Chickasaw” blackberry plants were set four feet apart in April of 2000 as part of a five-year trellising trial near Reidsville, Georgia. There were five treatments: an untrellised control, posts with plastic baling string on both sides, posts and three vertical wires, “raspberry” V trellis, and Limited Arm-Rotation Shift-Trellis (eliminated in 2003). There were four replications with twenty feet for each treatment per replication, for a total of 80 feet per treatment. Primocanes were tipped at 3.5 to four feet and re-tipped several times during the summer when new growth exceeded about 12 inches. Mature plant height at the end of the growing season was about five feet. Starting in the third growing season, yield data was collected from a ten-foot section of each replication. The highest-yielding trellis systems over a three-year period were Post and String and Raspberry V. The Post and String was an inexpensive trellis system, but it was more difficult to remove primocanes. The Raspberry V trellis offered advantages for management and PYO harvest. The Post and Wire trellis yields were not impressive, but it was easier to find the all the ripe fruit for distant shipping.

Thorny, erect blackberries are often grown in the U.S. without trellises. However, in the first year, thorny erect blackberries are usually semi-trailing and low to the ground without trellising. From the second year on, canes are more erect but are prone to partial collapse near harvest if not given some support. It is difficult to locate the ripe fruit on collapsed canes. In addition, sand splashing onto the fruit of low canes can be a serious problem. Sand may splash as high as 18 inches or more during summer thunderstorms in southern Georgia. Another problem on non-trellised blackberries is weed control. Without trellises, uniform application of weed control chemicals is difficult, and significant plant damage may occur on low-hanging canes. Trellis type should be sufficient to meet the needs of the plant but not “over-engineered,” given the short life of the crop in South Georgia due to viruses. In an effort to determine what type of trellis is most cost effective on thorny, erect blackberries, several types of trellis were tested.

Materials and Methods

The trial was conducted at the University of Georgia Vidalia Onion and Vegetable Research Station near

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Reidsville, Georgia. Tissue-cultured “Chickasaw” blackberry plants were set four feet apart in April of 2000. No data was collected in the second year. In years two and three, primocanes were tipped at 3.5 to four feet and retipped several times during the summer when new growth exceeded about 12 inches. Total plant height at the end of the second and third seasons was about five feet.

There were five treatments: an untrellised control, post and baling string, post and three vertical wires, raspberry V trellis, and Limited Arm-Rotation Shift-Trellis (LARS) (Stiles 1999). There were four replications, with twenty feet of each treatment per replication. Starting in the third growing season, yield data was collected from a ten-foot section of each replication. The Post and String trellis consisted of a string of high-strength plastic baling twine down each side of the row at about 3.5–4 feet. The string was tied to a post every twenty feet. The Post and Wire treatment consisted of wires at 1.5, 3.0, and 4.25 feet. Canes were tied to the wires with string and a MaxTapener. The Raspberry V trellis consisted of six foot metal “T” posts spaced 1.5 feet apart at ground level and 3.8 feet apart at the top. Posts were set eight feet apart in the row. Wires were located 16 inches and three feet above ground level. The Stiles shift trellis (Limited Arm-Rotation Trellis) had a swinging arm five feet in length that could be moved from the horizontal to a nearly vertical position.

Results and Discussions

Good yields were produced in 2002. Even the lowest-yielding treatment was equivalent to 7,586 pounds per acre at a 12-foot row spacing. No treatments were significantly different from the control, but there was a trend for Post and String, Raspberry V, and Stiles Shift trellis to produce the highest yields (Table 1). The Limited Arm-rotation Shift-trellis (LARS) was very difficult to use with "Chickasaw" blackberries, since the canes are very stiff. It was abandoned in 2003. There was a trend for Post and Wire to produce lower yields than the control. Fruit size at first harvest was significantly

smaller on the Post and Wire than on the control (Table 1). Smaller fruit size can be beneficial in distant shipping with large fruited cultivars such as "Chickasaw."

In 2003 there was no significant difference in yield between treatments. There was a trend for Post and String to have the highest yield, equivalent to about 7,898 pounds per acre (Table 2). In 2004, the highest yields were produced by the Post and String and Raspberry V trellises. This was equivalent to 5,835 pounds per acre at a 12-foot spacing for the Post and String trellis system. Yields declined over time, probably due to virus infection (Table 3).

Mean yield over three years was highest with the

Table 1. Effect of Trellis Type on "Chickasaw" Blackberry Fruit Size (G) and Total Yield per 10 Feet of Row, 2002.

Treatment	Fruit size ^z			Total yield (lbs.)
	29 May	7 June	24 June	
Control	7.5a ^x	5.5a	5.4a	22.6ab
Post and string	6.9ab	5.8a	5.6a	29.9a
Post and wire	6.2b	5.8a	5.7a	20.9b
Raspberry V	7.4ab	5.5a	5.5a	25.5ab
Stiles Shift trellis	6.9ab	5.0a	5.0a	25.4ab
LSD	1.30	2.10	1.99	8.3

^z = 25 berries sampled on 25 May, 50 berries on 7 June and 24 June

y = Sum of five harvests (29 May, 7, 10, 14, 24 June)

x = Mean with the same letter in a column are not significantly different ($P > 0.05$) according to the DIFF option in PROC MIXED (SAS, 2000) with the Satterthwaite option on the model statement.

Table 2. Effect of Trellis Type on the Yield of "Chickasaw" Blackberry, 2003.

Treatment	Yield in lbs. per 10 ft. or row				Total
	30 May	5 June	10 June	16 June	
Control	2.63 a	4.70 a	4.90 a	3.25 ab	15.48 a
Post & string	3.48 a	7.30 a	4.85 a	6.30 a	21.93 a
Post & wire	3.50 a	6.20 a	3.70 a	2.85 a	16.25 a
Raspberry V	3.48 a	5.45 a	3.15 a	1.85b	13.92 a

a = Data analyzed using Proc Mixed (SAS 9.1) with the option DDFM = SATTERTH (Satterthwaite method for computing degrees of freedom in split plots)

Between treatments within a date, LSD = 3.01; between dates within a treatment, LSD = 2.59; between treatments under total yield, LSD = 9.49.

Post and String (8,226 pounds per acre), followed by Raspberry V and the control (6,297 pounds per acre), and Post and Wire (5,314 pounds per acre) (Table 4).

The Post and String trellis and Raspberry V trellis produced wide canopies (about five to six feet), while the Post and Wire produced a narrower canopy (about three feet). This probably accounted for the differences in yield. The Raspberry V trellis was considered by both the picking crew and the cane removal crew to be the most user-friendly. The fruit were prominently displayed and easy to pick. Since there is some natural separation of the primocanes (in the middle) and the floricanes (leaning on the wires), it was relatively easy to remove the floricanes after harvest. An excessive number of metal "T" posts were probably used. A set of posts every 20 feet with a stay in between probably would have been sufficient. This trellis system would be excellent for PYO, but has the disadvantage of relatively high cost and more-difficult removal during

renovation of the planting.

The Post and String trellis was very low cost and easy to install, but floricanes removal was more difficult than with the Raspberry V trellis. The Post and String trellis worked well with the very erect cultivar "Chickasaw," but may not be substantial enough for semi-erect types. This type of trellis is relatively easy to remove during renovation.

The Post and Wire Trellis yields were not impressive, but it was easier to find all the ripe fruit for distant shipping with a narrow canopy. This is an important advantage where soft fruit are not allowed in the package. Blackberry prices averaged about \$12.30 in 2004 and 2005 for a five-pound flat of 12 half-pints.

Conclusion

Thorny, erect blackberries have usually been grown in the U.S. without trellises. During the first year, thorny erect blackberries are usually semi-trailing

Table 3. Effect of Trellis Type on the Yield of "Chickasaw" Blackberry, 2004.

Treatment	Yield in lbs. per 10 ft. of row						Total
	2 June	7 June	10 June	14 June	17 June	22 June	
Control	0.53 a	1.06 b	1.24 b	1.15 c	0.75 b	1.03 a	5.76 c
Post & string	1.43 a	2.30 ab	4.17 a	3.33 a	2.47 a	2.33 a	16.03 a
Post & wire	1.22 a	1.09 b	1.09 b	1.73 bc	0.72 b	1.03 a	6.68 bc
RaspberryV	1.33 a	2.80 a	2.60 ab	3.13 ab	1.47 ab	1.07 a	12.40 ab

a = Data analyzed using Proc Mixed (SAS 9.1) with the option DDFM = SATTERTH (Satterthwaite method for computing degrees of freedom in split plots)

Between treatments within a date, LSD = 1.59; between dates within a treatment, LSD (Control) = 1.25; LSD (other treatments) = 1.44; between treatments under total yield, LSD = 6.38.

Table 4. Effect of Trellis Treatments on the Mean Yield in lbs. of "Chickasaw" Blackberry, 2002–2004.

	2002	2003	2004	3-year mean yield in lbs. per 10 ft. of row
	Control	22.6	15.5	5.8
Post & string	29.9	21.9	16	22.6
Post & wire	20.9	16.3	6.7	14.6
Raspberry V	25.5	13.9	12.4	17.3
LSD	8.3	9.5	6.38	8.16

and low to the ground without trellising. From the second year on, canes are more erect but are prone to partial collapse near harvest if not given some support. This trial was conducted at the University of Georgia Vidalia Onion Research Station near Reidsville, Georgia. Good yields were produced in 2002. Even the lowest yielding treatment was equivalent to 7,586 pounds per acre at a 12-foot row spacing. The Post and String treatment and Raspberry V trellises produced wide canopies (about five to six feet), while the post and wire produced a narrower canopy (about three feet). The Raspberry V trellis was considered by both the picking crew and the cane removal crew to be the most user-friendly.

In summary, it appears that different trellises may be recommended for different uses. For PYO

the high-yielding Post and Sting and Raspberry V trellises appear to be most desirable, with the Post and String offering an advantage in areas where a short life is expected from viruses. For distant shipping, the Post and Wire trellis offers advantages in locating all ripe fruit and reducing the number of soft fruit in the pack.

References

- Stiles, H. D. 1999. "Limited Arm-Rotation Shift Trellis (LARS) and Primocane Management Apparatus (PMA) for Raspberries and Blackberries." Bulletin 99-1. Virginia Agricultural Experiment Station.