

Update - Growing Blackberry Production and Sales in Missouri project Patrick Byers

Blackberries are a viable commercial fruit crop for farmers in Missouri and other states in the Midwestern region of the United States. Recent advances in blackberry cultivar development and production practices have greatly enhanced the profit potential of this crop for farmers, and several markets (on farm sales, farmers markets, wholesale markets, and institutional markets) are clamoring for locally grown blackberries.

A blackberry planting was established at the University of Missouri Southwest Research Center (SWRC) in Mount Vernon, Missouri, USA in March 2016. Funding for the project was provided by a MDA Specialty Crop Block Grant. The planting highlights recent blackberry cultivar and production technology developments and is a powerful demonstration site for adult learning. The planting features:

- Seven thornless blackberry cultivars ('Natchez', 'Osage', 'Ouachita', 'Apache', 'Triple Crown', 'Prime-Ark® Freedom', 'Prime-Ark® Traveler') planted in 2016 in a completely randomized design, with three replications of each cultivar and three plants per replication. We collected data on fruit yield, fruit size, and ripening time in 2017 and 2018; the data highlight the potential of these cultivars for profitable production in Missouri.
- The rotating cross arm (RCA) trellis, an innovative trellis design that allows farmers to change the orientation of the blackberry plant and overcome several factors that limit blackberry profitability in Missouri. The trellis design allows farmers to concentrate the berry crop on the shady side of a supported canopy that effectively divides the floricanes from the primocanes. The trellis allows farmers to protect plants from winter conditions with rowcovers, reduce fruit loss from sunscald, and improve pest management and harvest efficiency. Details on the design and use of the RCA trellis are found at <https://web.extension.illinois.edu/mms/downloads/47252.pdf>
- Innovative production practices, including the use of tissue culture plug plants, raised beds, drip irrigation, spotted wing drosophila (SWD) trapping, weed barrier fabric mulch for weed control, and floating row cover for winter protection.



RCA trellis, showing the winter/spring position (left) and the summer/fall fruiting position.

The planting consists of 3 rows that are 12 feet apart, oriented east to west. Plants are planted 5 feet apart in plots of 3 plants per cultivar, with 3 plots per cultivar in the planting. The plants are on raised beds that are 36” wide and 8” high. We covered the beds with woven landscape fabric, and placed a single 18mm dripline per row, with 18” emitter spacing. We followed standard cultural practices with regard to preplant soil testing and soil modification, planting establishment, pest management, and weed management between rows (which were in sod). The planting was fertigated weekly from April to September, for an equivalent of 80 total lbs/acre of nitrogen per growing season.

The RCA trellis system offers huge benefits as described above, but we learned that timely management is critical to see these benefits. We carried out the following practices:

- **Mid March:** remove the floating row covers; apply delayed dormant lime sulfur fungicide, raise and then lower the trellis to mow as needed.
- **Late April:** raise the trellis from the horizontal position to the fruiting position as soon as the flower clusters have a fixed upright position. Don't delay, or the primocanes will have too much upright growth and will be difficult to tie into the horizontal position.

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- **Late April through May:** immediately begin tying the early emerging primocanes to the horizontal position along the training wire on the primocane side of the trellis. Use rubber bands, and handle primocanes gently as they are brittle. A minimum of 3 strong primocanes are needed; consider tying 1-2 extra primocanes. Tie primocanes at least twice a week until the primocanes reach the neighboring plant, then tip the primocanes. Primocane training will conclude in early June.
- **June through August:** fruit harvest. Trap for SWD, and apply protective sprays as needed.
- **August through September:** promptly remove floricanes as harvest ends. Tie primocane laterals into position on the fruiting side of the trellis. Space laterals 6" apart.
- **Late November through early December:** rotate the trellis to the horizontal position for the winter, and cover the plants with protective rowcover.

Results from the 2017 harvest season

The demonstration blackberry planting at SWRC, including the seven thornless blackberry cultivars trained to the RCA trellis, produced an initial, significant fruit crop in 2017, just one year after establishment. Data collected on the 2017 fruit yield, fruit size, and harvest season are presented in Table 1 and Figure 1. Floricane harvest began on June 9 ('Natchez', 'Prime-Ark® Traveler') and continued through August 1 ('Apache'). Primocane harvest commenced on July 26 and continued through October 6 for both 'Prime-Ark® Traveler' and 'Prime-Ark® Freedom'. Impressive first year floricanes yields were noted for 'Natchez', 'Ouachita', and 'Prime-Ark® Traveler'. 'Apache' and 'Prime-Ark® Freedom' produced the largest floricanes berries. First year primocane yields were modest for both 'Prime-Ark® Traveler' and 'Prime-Ark® Freedom', though the berry size of 'Prime-Ark® Freedom' was impressive. Figure 2 illustrates a peak volume of floricanes berries produced among the cultivars in early July, followed by a second peak (though of less volume) in early August.

A peak in volume of primocane berries was noted in late September. Worth noting is that while 'Prime-Ark® Traveler' produced berries that were smaller than several cultivars, it produced a continual summer-long harvest (June 9 to October 6), with floricanes and primocane fruit production overlapping, resulting in season-long fruit yields that were the highest among all cultivars.

Results from the 2018 harvest season

Data collected on the 2018 fruit yield, fruit size, and harvest season are presented in Table 1, and represent what we would consider to be a full crop. The sequence of ripening and the length of season were similar to 2017 (dates not shown). We noted impressive floricanes yields for 'Natchez', 'Osage', 'Triple Crown', and 'Prime-Ark® Traveler'. As in 2017, 'Apache' and 'Prime-Ark® Freedom' produced the largest floricanes berries. 2018 primocane yields were disappointing for both 'Prime-Ark® Traveler' and 'Prime-Ark® Freedom', and data were not collected.

Discussion

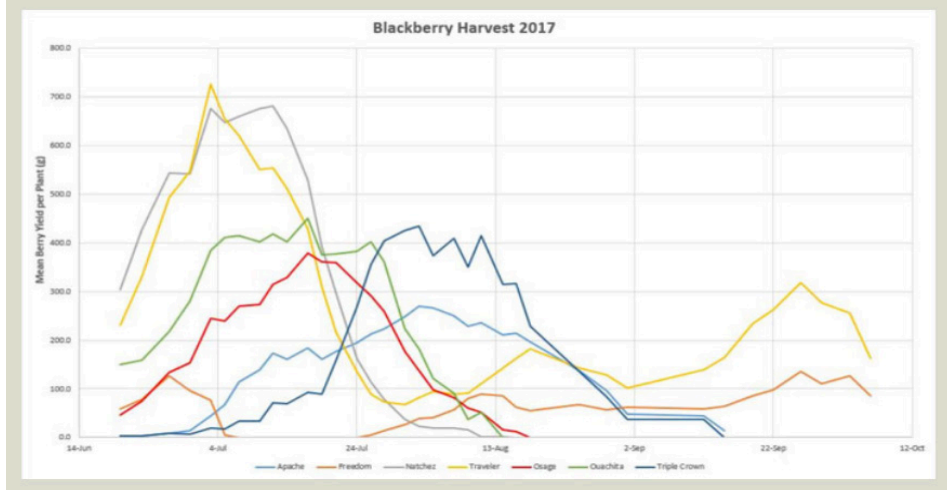
The RCA trellis requires a lot of attention from a management standpoint, and practices must be done in a timely fashion. In particular, training the primocanes to the horizontal position must be done when the shoots are small and flexible. We also strive to remove the floricanes as soon as possible after harvest, and transfer the primocane laterals to the fruiting side of the trellis. Among the cultivars under trial, 'Natchez' and 'Triple Crown' have a growth habit that works well with the RCA system. Based on two years' harvest information, 'Natchez', 'Prime-Ark® Traveler', and 'Triple Crown' would be good choices for Missouri blackberry farmers. Other challenges noted during the trial include management of SWD and Japanese beetle. Our experience with the primocane crop has been disappointing. Additional information on the study is available from the author. Farmers are welcome to visit the demonstration planting at the SWRC. Check the website <http://www.webbcityfarmersmarket.com/grower-training.html> for upcoming blackberry production workshops.

Table 1 Floricane yield and berry size for 7 thornless blackberry cultivars, 2017 and 2018.

Cultivar	2017 Yield (lbs/plant)	2017 Berry Size (g)	2018 Yield (lbs/plant)	2018 Berry Size (g)
Prime-Ark® Freedom	1.03 e*	8.8 a	7.72 d	7.3 a
Prime-Ark® Traveler	14.72 ab	4.9 e	17.25 ab	4.0 c
Apache	9.50 d	8.1 b	10.63 cd	6.4 ab
Natchez	16.76 a	7.4 c	20.28 a	6.2 b
Osage	10.34 cd	5.1 e	15.62 abc	4.7 c
Ouachita	13.64 abc	6.2 d	12.17 bcd	4.5 c
Triple Crown	11.37 bcd	4.6 e	20.31 a	4.0 c

* Means within columns with the same letters are not different according to Fisher's Least Significant Difference test ($P < 0.05$).

Figure 1 Harvest dates for 7 thornless blackberry cultivars, 2017.



Importance of Following Pesticide Label Directions

David Trinklein

Many people seem to have the attitude “if a little is good, more is better.” This somewhat is understandable, when we consider that occasionally we hear individuals such as scientists recommend things like taking mega-doses of vitamins or minerals to ward off illness. While the scientific community debates the wisdom of the latter, we definitely can advise those involved with plant production that, when it comes to pesticide use, more is not better. In fact, more can be quite harmful to people, plants and the environment.

In recent years, I have witnessed on several occasions the unfortunate results when growers did not follow label directions and applied pesticides at concentrations far above recommended rates. In all cases, the result was near-to-total loss of the crop they were attempting to protect. The fact is that the plant injury and economic loss incurred most likely could have been avoided if the grower only had taken the time to read and follow pesticide label directions.

Pesticide labels serve an important purpose and are the way by which pesticide manufacturers communicate with growers. They are developed by the manufacturer and approved by the Environmental Protection Agency (EPA) as part of the pesticide’s registration process. Pesticide labels contain detailed information on how to use the product in question correctly and legally. This includes the crops to which they may be applied and the rates (concentrations) at which they should be used. Following label instructions allows growers to minimize risks to plants while maximizing the benefits from using the pesticide.

Applying a pesticide at concentrations greater than dictated by the label can lead to a number of unfortunate results; the first being phytotoxicity. The latter might express itself as leaf burn, necrosis, chlorosis, distorted growth or stunting. A precaution that can be taken to help avoid phytotoxicity is to make one or more preliminary spray applications of a new pesticide to a few plants of the species being treated at the rate to be used when treating the entire crop.

Another consequence of applying pesticides excessively is the development of resistance by the target pest. Resistance occurs when pests (e.g. insects) develop the

ability to withstand exposure to a pesticide because of a heritable genetic adaptation. The more often a pest is exposed to a particular pesticide, the more likely a resistant strain of the pest will develop.

Finally, applying pesticides at excessive rates wastes money. The newer pesticides, while effective, tend to be rather expensive. Applying them at a concentration greater than necessary uses more product and adds to the cost of treating for a particular pest. If the label for a pesticide recommends a range (e.g. two to four ounces per 100 gallons of water) start in the middle of the range and go from there.

In conclusion, the following recommendations concerning pesticide use were developed by the National Pesticide Information Center. The latter is a joint venture between Oregon State University and the EPA.

- Always read the label carefully before you buy a product and make sure the product is intended for your specific use.
- Use the appropriate amount of pesticide for your job. Applying more pesticide than the label directions indicate can waste money and may harm people, pets or the environment. It may even be less effective at controlling the pest.
- Do not assume a pesticide purchased for one type of treatment can be used in another setting without first checking the label; many pesticides have similar names and ingredients despite being intended for very different uses.
- Buy only what you need. Storing and disposing of leftover pesticides can lead to unnecessary risks. Review the storage and disposal section of the label for information on how the product should be stored and disposed of, including the empty container.
- Re-read the label before using or re-using a pesticide, don’t rely on your memory.
- Do not use pesticides in any manner other than those specifically listed on the label; it is against the law.
- Never remove a pesticide label from the container, or use unlabeled pesticides.
- Store all pesticides safely out of reach of children and pets.

20th Central Missouri Vegetable and Greenhouse Farm Tour

Mark your calendar for Wednesday, August 28th. We’ll hold the 20th Central Missouri Vegetable and Greenhouse Farm Tour, on its typical date of the Wednesday before Labor Day weekend and traditional start, the Central Missouri Produce Auction (37808 Highway E, Fortuna, MO). Arrive anytime up until 11:30 to check in. The auction starts at 10 and is pretty active by 9 with grower deliveries. There will be some announcements, grab lunch from the food stand when you want, the goal is to leave by noon to visit area farms, still to be determined. More info will be available in August. To register, contact the Morgan County Extension Center 573-378-5358.

A Fall 2019 FSMA Training Date Has Been Set

Many farm visits around the state are being conducted by Missouri Department of Agriculture and MU Extension, mostly the 'On-Farm Readiness Reviews', so awareness is being raised to some on the need for food safety trainings. To help folks who might like to get that taken care of we set up a training in a reasonably central location in the state, well in advance.

November 13th 8 AM to 5 PM

18761 Kelsay Rd.

(Morgan County Seeds)

Barnett, MO 65011

573-378-5358

Morgan County Extension Center

\$20 per person*, lunch is included and all participants will receive a training certificate along with a PSA Training Manual. Please consider this training if interested. Since it is being advertised will in advance, it may fill up early. As with last year, there will be a number of other trainings held around the state, often much closer to your community.

** The Missouri Department of Agriculture is providing generous support to offset the costs of this training so it is available at a reduced price for Missouri growers.*

Primo Red hard to beat at KSU high tunnel tomato trials James Quinn

This July I was invited to present at a tomato workshop held at the Kansas State University's horticulture research farm at Olathe (just SW of Kansas City), so got to tour their facilities and get an update on the research. For our area of the Midwest, they are doing the best/most applied research regarding high tunnels and tomatoes. KSU professor Cary Rivard has a great team, farm and facilities and I wanted to bring attention to some specific work on high tunnel tomato trials that have been conducted.

A primary question many growers have is 'which is the best tomato variety'. KSU conducted a high tunnel variety trial for FIVE years in a row (2013-2017) and Primo Red was tops in in one or both categories for each of those years. Presented below is just some of that information. Growers might ask, what are some other promising varieties, and ones that seem to be rising to the top are 'Red Morning' and BHN 589 (Dr. Rivard's personal favorite). Red Deuce and Scarlet Red are already well known and have done well. Tasti Lee has held its own and has a specific quality trait getting some interest. See note below.*

Many growers might not be aware that university vegetable trials are occurring throughout the Midwest. They used to be available in annually published booklet, but now are place on a website: <https://ag.purdue.edu/bla/fruitveg/Pages/MVVTRB.aspx>.

Provided below are some excerpts from the 2016 and 2017 postings (2018 didn't contain much on tomatoes). The '2016 Evaluation of Determinate Tomato Varieties for High Tunnel Production in Kansas' contained this summary paragraph:

- We conducted a variety trial of determinate tomatoes grown in a high tunnel to determine which cultivar is best suited for hoop house cultivation in the Great Plains. Ten commercially available varieties were tested and yields ranged from 15.0 to 21.6 lbs of total fruit per plant. The three varieties with the highest marketable fruit weight per plant in order from highest number were 'Primo Red', 'Red Morning', and 'Red Deuce'. 'Red Deuce' had the largest marketable fruit size this season as well as in 2014 and 2015. 'Primo Red' had the highest percentage marketability by fruit number and weight this season as well as in our other similar variety trials in 2013, 2014 and 2015

This marketing comment ran in the '2017 Evaluation of Determinate Tomato Varieties for High Tunnel Production in Kansas'.

- Several varieties showed good potential for early-season production, which can be advantageous for high tunnel growers. During late July (data not shown), 'Primo Red,' 'Red Morning,' and 'Red Deuce' showed higher yields than the other varieties. In late August, 'Skyway,' 'Red Deuce' and 'Red Morning' showed higher yields than the other varieties, which may be useful for growers looking to cater to late markets.

The same varieties were grown in both 2016 and 2017, and the results were quite similar, so presented below are the 2017 tables for yield and fruit size.

Variety	Average Fruit Size (lb)		Percent Marketability	
	Marketable	Total	Number	Weight
Red Deuce	0.65 e	0.59 e	70.7 ab	77.9 bc
Red Morning	0.58 cd	0.53 c	74.7 bc	81.7 cd
Primo Red	0.57 c	0.53 cd	78.8 cd	84.2 cd
Summerpick	0.47 b	0.45 b	77.0 bcd	81.0 bcd
Skyway	0.45 ab	0.42 ab	70.9 ab	75.3 ab
Scarlet Red	0.44 ab	0.41 ab	78.0 cd	82.4 cd
Tasti Lee	0.43 ab	0.40 ab	78.2 cd	83.8 cd
BHN589	0.42 ab	0.39 a	65.7 a	69.6 a
Richmond	0.41 a	0.39 a	81.9 d	86.1 d
Fletcher	0.41 a	0.38 a	79.9 cd	85.2 d
LSD (0.05)	0.06	0.06	6.86	6.31

Table 1. Marketable and total per plant fruit yield of tomato varieties grown in a three-season high tunnel in Olathe, Kansas. (2016)

Variety	Marketable		Total	
	Number	Wt (lb)	Number	Wt (lb)
Primo Red	37.2 d	21.0 e	57.4 c	27.6 e
Red Morning	34.3 bcd	19.7 de	59.0 c	27.7 e
Red Deuce	26.2 a	17.0 cd	48.9 abc	25.3 de
Scarlet Red	37.3 d	16.1 bc	53.0 bc	20.6 bc
BHN589	35.8 cd	15.0 abc	57.5 c	22.0 cd
Tasti Lee	34.2 bcd	14.6 abc	48.4 abc	18.4 abc
Summerpick	30.8 abcd	14.4 abc	44.3 ab	18.7 abc
Fletcher	34.5 bcd	14.2 abc	46.2 ab	17.2 ab
Skyway	28.2 ab	12.7 ab	42.9 ab	17.5 ab
Richmond	29.7 abc	12.0 a	39.6 a	14.5 a
LSD (0.05)	6.59	3.49	10.81	4.20

Table 2. Mean tomato fruit size (lb) and marketability of tomato varieties grown in a three season high tunnel in Olathe, Kansas.

* ‘Tasti Lee’ is known for its high lycopene levels and had average marketable and total fruit size of 0.43 and 0.40 lb respectively. Dr Rivard noted that in the Southeastern US it is getting more marketing attention for the lycopene levels and nutritional value. He is going to try grafting it on a number of different rootstocks to see if he can increase its fruit size and yield to be competitive with the top performers.

For complete info, see:

https://ag.purdue.edu/hla/fruitveg/MidWest%20Trial%20Reports/2017/10-03_Oxley_Tomato.pdf
https://ag.purdue.edu/hla/fruitveg/MidWest%20Trial%20Reports/2016/09-02_Oxley_Tomato.pdf

What about Flavor & Fruit Quality?

Many growers may remember Lewis Jett, who is now at West Virginia University. In 2017, he conducted a yield trial on 12 fresh market varieties in the open field, which included taste testing. Presented below are only the taste test results. His summary paragraph many may find noteworthy:

‘Brandy Boy’, ‘Red Deuce’, and ‘BHN 589’ were the highest yielding cultivars evaluated. ‘Brandy Boy’ is a pink/red beefsteak-type hybrid cross between ‘Brandywine and ‘Better Boy’ tomato. ‘Brandy Boy’ is relatively soft, but has good fruit quality and yield. This variety was ranked very high for flavor and overall appearance (Table 2). ‘Red Deuce’ had acceptable flavor and appearance and produced a very high yield of firm, uniform tomatoes. ‘BHN 1021’ exhibited high marketable yields with better flavor than ‘BHN 589’ but did not differ in overall appearance. The indeterminate varieties examined included ‘Big Dena’, ‘Big Beef’, ‘Mt. Merit’, and ‘WV63’. ‘Big Dena’ is better suited to greenhouse or high tunnel production whereas ‘Big Beef’ and Mt. Merit’ out-yielded the other indeterminate

Table 2. Quality parameters of slicing tomatoes.

Cultivar	Days to maturity	Flavor ²	Brix ^o	Overall appearance ^v
BHN 589	75	3.0	4.5	4.0
BHN 871	74	2.8	4.3	3.7
BHN 1021	76	3.5	4.7	3.9
BHN 964	75	3.0	3.7	3.4
Big Beef	75	3.2	3.1	3.5
Big Dena	77	2.9	4.6	3.1
Brandy Boy	78	3.9	5.3	4.5
Celebrity	72	2.4	3.2	3.2
Mt. Merit	75	3.2	4.6	3.6
Red Deuce	71	3.2	3.7	3.6
Skyway 687	78	2.9	3.1	4.0
WV63	78	3.9	4.6	3.0
Standard error		0.1	-	0.2

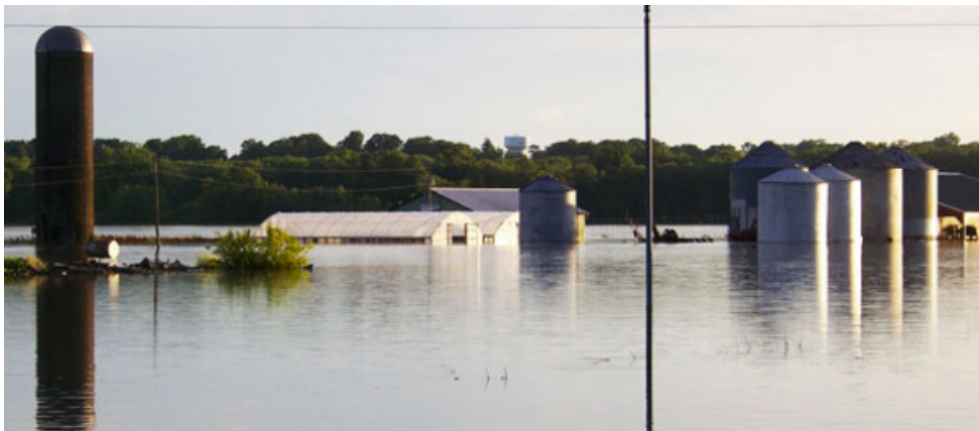
²Scale 1-5; 1=poor quality or flavor, 5=excellent quality and flavor.

cultivars. ‘Mt. Merit’ had slightly better overall appearance but did not differ in flavor from the other indeterminate cultivars. ‘WV63’ had very good flavor but yield per plant was relatively low. ‘Skyway 687’ had acceptable yield but did not score very high for flavor.

For complete information go to: https://ag.purdue.edu/hla/fruitveg/MidWest%20Trial%20Reports/2017/Jett_Tomato_2017.pdf

Missouri Ag Struggles to Recover from Record May Rainfall

James Quinn



High tunnel flooded just outside of Jefferson City in the Missouri River bottoms.
Photo by James Quinn

Missouri's average rainfall in May was the greatest since 1895, when records were first kept. MU Extension climatologist Pat Guinan said it was 200% of normal. Not only the amount of rain was difficult, but the longevity of it plagued normal activities such as putting up hay and planting row crops, the latter being at delayed rates not seen in years. Planting progress in June should restore the planted acres, but the yields are likely to be reduced. This coupled with low commodity prices and catastrophic flooding has many concerned about the health of the overall Midwest farm economy.

Most areas around produce auctions had to deal with the rain, but didn't suffer from devastating flooding. That wasn't the case for a number of vegetable producers nearby rivers. The Jefferson City area had 4 or 5 producers who lost substantial fields of sweet corn, cantaloupes and watermelons. One long time producer just outside of Jeff City lost all their production, including two high tunnels and the area's only U-pick pumpkin field. It is very sad to see something like this and one upland grower noted that there could also be a marketing consequence to their farmers market. Given the supply of some key produce items will be little to none, will the customers show up with the typical enthusiasm? We know the quantity and diversity of vegetables at farmers markets across the state will be delayed. For those with something to sell, high tunnels are likely proving their value once again.

MU Extension has created a one-stop shop of online resources for crop farmers coping with flooding and persistent rains. The website is at: <https://extension2.missouri.edu/programs/flood-resources/crops-and-soils-flood-resources>. Print materials are available upon request; check with your area specialist if interested.

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