Elderberries in Oklahoma

2018-2020 Trial Results

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Elderberries have a long history of use in both Europe and North America. The European variety, Sambucus nigra*, has a strong accepted market presence in Europe. Medicines, teas, food coloring, and wines are all available.*

Research has demonstrated that elderberries exhibit anti-viral properties. During the 2020 COVID-19 pandemic, elderberry products were sold out in many locations.

*While the European market is well developed, the market in the United States in much smaller and generally is more local in nature. North American elderberry production is based on the American elderberry (*Sambucus canadensis *or* Sambucus nigra *subsp.* canadensis*).*

Small operations and some co-ops process and market elderberry products. The biggest barriers to growing a market are the lack of knowledge on how to consistently produce a reliable crop, the cost of production, processing, and marketing.

Kerr Center Trials

In 2015, George Kuepper, retired horticulturalist at the Kerr Center, set up a planting of elderberries to evaluate their potential in Oklahoma. The Kerr Center received a specialty crop block grant in 2018 to evaluate the varieties in the trial. The first planting was established on February 10, 2015. The planting contains five named varieties: Adams, Bob Gordon, Ranch, Wyldwood 1, and Wyldwood 2. Each planting contained ten plants of each variety, replicated once. The cuttings were obtained from Terry Durham, of River Hills Harvest in Missouri.

The second planting was made on March 16, 2016, containing five varieties selected from the wild by Brent Madding, of 360 Farms in Webbers Falls, Oklahoma. The varieties were named Dog Branch (sold as Oklahoma John), Smokey, George Fork, South Fork, and West Road. The second planting was from

In 2018 the Kerr Center received a FY17 USDA Specialty Crop Block Grant through the Oklahoma Department of Agriculture for a three-year project to evaluate elderberry varieties for production in Oklahoma.

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potted cuttings. The cuttings were not pruned in 2016, but were pruned per University of Missouri recommendations each year of the trial.

Based on observation, it was decided to not collect data on Adams, Wyldewood 1, or Wyldewood 2. Ranch and Bob Gordon seem much better adapted to our location, and allowed us to compare the new varieties from 360 Farms to known releases.

Data for the trial were collected beginning in 2018. Hard pruning dates, flowering dates, flower size, yield, 100-berry count weight, and brix were taken for Bob Gordon, Ranch, Dog Branch, Smokey, George Fork, South Fork, and West Road. Observational data were collected on insect and disease pressure, as well as uniformity of ripening and berry shattering.

Production

Current recommendations are largely based on work conducted at the University of Missouri (see box below). The university has a variety trial in place and has released some of the currently recommended varieties. It has also developed

AGROFORESTRY IN ACTION

University of Missouri Center for Agroforestry

Growing and Marketing Elderberries in Missouri

For more information on production recommendations, see the University of Missouri publication, *Growing and Marketing Elderberries in Missouri.*

https://extension2.missouri.edu/media/wysiwyg/Extensiondata/Pub/pdf/agguides/agroforestry/af1017.pdf

fertilization recommendations and pruning techniques to enhance production and reduce insect and disease pressure.

We did note, in 2019, evidence of nitrogen deficiencies at harvest, even after applying the equivalent of 50 lbs. actual N per acre using feather meal. Feather meal was chosen as a slower release nitrogen fertilizer source. One possible cause of the nitrogen deficiency was heavy rainfall leaching the nutrient out. As a result, we increased fertilization rates to 120 lbs. actual N per acre in split applications in 2020. We are seeing no evidence of N deficiencies during harvest in 2020, despite heavy rainfall levels until the beginning of June.

We attempted to evaluate flower production potential by measuring blossom size and converting to the average square inches of flower per variety. It was quickly determined this would not be an effective way to compare blossom yield, since varieties varied on the density of the blossom. West Road had some of the largest blossoms, but they were loose and open, unlike Ranch, which was dense. We collected the data measurements as outlined in the study for two years.

In future studies looking at blossom yield for tea production, it would be better to harvest and dry the blossoms and weigh them for yield comparisons. This is not possible in a study looking at berry yield levels, since it would eliminate any berry yield.

Two major issues with yield results during the study included shattering and uneven berry ripening. (Shattering refers to berries dropping before or after ripening, but before harvest.) While it is difficult to quantify the impact of shattering loss on yields, we did observe significant shattering on South Fork and West Road. There was some shattering, but to a lesser extent, on Dog Branch. Uneven ripening was observed on George Fork and West Road.

Insects

While plants in the trial remained relatively insect free, there are some insects that can cause yield loss. The one causing the most problems in the Kerr Center study is the eriophyid mite, a microscopic insect which causes leaf curling, and, during the 2020 season, affected blossoms.

Control recommendations include pruning to the ground during the dormant season, and removal of the pruning from the field. Preferably, the prunings are disposed of away from the planting. Burning the prunings may also be used to reduce mite population numbers. Very little research has been done on controlling the mite using insecticides. Some suggestions include a dormant oil spray or neem oil.

Spotted-wing drosophila can also present problems, since it attacks ripe fruit. We have not seen evidence of spotted wing drosophila in the Kerr Center trials yet, so we have no experience with this potential pest. Japanese beetles can cause damage, but have not been found on the Kerr Center site. Elderberry cane borer was also identified, but has not seemed to impact production to date.

Diseases

The main disease we have seen is bacterial spot on the lower leaves. It does not appear to cause much of a problem in our planting to date. Of the varieties in the trial, it was most prevalent on West Road.

Figure 1. Eriophyid mite damage to leaves on a Ranch plant in Trial 1.

Figure 2. Eriophyid mite damage to leaves on a Smokey plant .

Figure 3. Heavy eriophyid mite damage to fruit set on a South Fork plant in Trial 1.

Trial Results

Results of the study are presented in several tables divided between beginning and ending harvest dates, yield, blossom size, brix, and 100-count berry weight.

The 2020 trail results are presented in separate tables. This was done due to a complete crop loss from the standpoint of commercial production. The eriophyid mite damage during the 2020 growing

Table 1. Harvest Beginning and End Dates, 2018-2019

	Trial 1				Trial 2			
	Beginning		End		Beginning		End	
Variety	2018	2019	2018	2019	2018	2019	2018	2019
Ranch	7/23	7/22	7/25	7/30	7/23	7/22	7/25	7/26
Bob Gordon	7/23	7/26	8/6	8/5	7/23	7/26	8/6	8/5
Dog Branch	7/31	8/2	8/20	8/19	8/13	8/2	8/20	8/19
Smokey	8/13	8/12	8/20	8/19	7/31	8/12	8/9	8/19
George Fork	7/25	8/2	8/6	8/5	7/31	7/26	8/9	8/5
South Fork	7/25	7/26	8/20	8/19	7/25	7/26	8/20	8/19
West Road	7/25	7/26	8/27	8/19	8/6	8/2	8/17	8/19

Table 2. Yields and Brix, 2018-2019

		Total Yield (lbs., oz.)		Yield per Plant		Average Brix	
Variety	Trial	2018	2019	2018	2019	2018	2019
Ranch	1	27 lbs. 4 oz.	24 lbs. 15 oz.	3 lbs. 5.5 oz.	3 lbs. 2 oz.	12.5	13.0
	2	30 lbs. 0 oz.	33 lbs. 8 oz.	3 lbs. 12 oz.	4 lbs. 3 oz.	12.5	12.0
Bob Gordon	1	23 lbs. 8 oz.	29 lbs. 5 oz.	2 lbs. 15 oz.	3 lbs. 11 oz.	12.5	11.0
	2	31 lbs. 0 oz.	38 lbs. 2 oz.	3 lbs. 14 oz.	4 lbs. 12 oz.	12.5	11.0
Dog Branch	1	19 lbs. 6 oz.	22 lbs. 2 oz.	2 lbs. 6 oz.	2 lbs. 12 oz.	10.0	9.5
	2	20 lbs. 6 oz.	29 lbs. 0 oz.	2 lbs. 8 oz.	3 lbs. 10 oz.	11.0	11.0
Smokey	1	15 lbs. 9 oz.	12 lbs. 6 oz.	1 lb. 15 oz.	1 lb. 9 oz.	9.0	10.0
	2	19 lbs. 11 oz.	19 lbs. 12 oz.	2 lbs. 7 oz.	2 lbs. 6 oz.	12.0	10.0
George Fork	1	20 lbs. 15 oz.	14 lbs. 12 oz.	2 lbs. 9 oz.	1 lb. 13 oz.	12.0	10.0
	2	22 lbs. 11 oz.	12 lbs. 10 oz.	2 lbs. 13 oz.	1 lb. 9 oz.	12.0	10.0
South Fork	1	34 lbs. 5 oz.	28 lbs. 15 oz.	4 lbs. 4 oz.	3 lbs. 10 oz.	11.0	10.0
	2	22 lbs. 2 oz.	23 lbs. 6 oz.	2 lbs. 12 oz.	2 lbs. 15 oz.	11.0	9.0
West Road	1	18 lbs. 2 oz.	21 lbs. 4 oz.	2 lbs. 4 oz.	2 lbs. 11 oz.	11.0	10.5
	2	15 lbs. 10 oz.	26 lbs. 10 oz.	1 lb. 15 oz.	3 lbs. 5 oz.	12.0	11.0

Table 3. Average Flower Size (sq. in.), 2018-2019

	Trial 1		Trial 2		Average, both trials	
Variety	2018	2019	2018	2019	2018	2019
Ranch	74	72	98	68	86	70
Bob Gordon	93	82	89	88	91	85
Dog Branch	72	41	64	50	68	46
Smokey	60	47	60	47	60	47
George Fork	58	79	73	49	66	64
South Fork	95	57	101	73	98	65
West Road	119	73	101	72	110	73

season exploded on all varieties. It impacted the blossoms, making them look like cauliflower heads.

Due to the study, we did not make any attempt to control the mites. Though it will be outside the study period, during 2021, half of the plants will be hard pruned and all plants will be sprayed with dormant oil spray, in an attempt to determine how effectively it controls mites. **While the results from 2020 are presented to complete the data collected, they are not included in the discussion, due to the uniformly low yield levels and plant damage from mites.**

All varieties were hard pruned based on University of Missouri recommendations. The pruning time is based on when the plants are dormant but just before budbreak. In our case, the pruning date varied tremendously from year to year. The pruning dates were as follows 2018: January 10; 2019: February 13; 2020: January 7.

As you can see, the dates varied by as much as one month. We also noted that our plants were slow to go completely dormant, usually after Thanksgiving each year. Whether this was due to climate issues or our southern location is not clear. What is clear is the need to watch the plants closely and make sure

Table 4. Harvest Beginning and End Date, 2020

	Trial 1		Trial 2	
Variety	Beginning	End	Beginning	End
Ranch	7/28	7/28	7/28	7/28
Bob Gordon	7/28	8/3	7/28	8/3
Dog Branch	8/17	8/17	8/14	8/14
Smokey	8/10	8/17	8/14	8/10
George Fork	8/3	8/7	8/3	8/10
South Fork	8/3	8/10	8/3	8/10
West Road	8/7	8/7	No yield	No yield

Table 5. Yields and Brix, 2020

	Yield		Brix	
Variety	Trial 1	Trial 2	Trial 1	Trial 2
Ranch	6 lbs. 10 oz.	7 lbs. 0 oz.	13.0	13.0
Bob Gordon	3 lbs. 6 oz.	11 lbs. 2 oz.	11.0	11.0
Dog Branch	1 lb. 4 oz.	2 lbs. 1 oz.	10.0	10.0
Smokey	2 lbs. 8 oz.	2 lbs. 3 oz.	9.0	9.0
George Fork	2 lbs. 4 oz.	2 lbs. 5 oz.	11.0	11.0
South Fork	1 lb. 12 oz.	1 lb. 0 oz.	11.5	11.5
West Road	3 lbs. 4 oz.	No yield	7.0	7.0

Table 6. 100-Berry Count Weight (g), 2019-2020

	Trial 1		Trial 2	
Variety	2019	2020	2019	2020
Ranch	8.04	4.60	9.37	7.60
Bob Gordon	7.74	5.83	8.49	8.70
Dog Branch	7.31	6.40	8.17	5.60
Smokey	5.85	5.25	6.40	6.00
George Fork	7.26	7.85	6.95	7.40
South Fork	6.39	6.65	7.06	6.30
West Road	8.02	7.50	9.43	0.00

Karlee Pruitt taking a brix reading

you are ready to prune once the plants are fully dormant.

Harvest began at the end of July each year of the study (Tables 1 and 4). The beginning and ending harvest dates show how evenly ripening Ranch is. In some cases, harvest was complete in one week with two harvest days. Both Ranch and Bob Gordon were the first varieties to have ripe berries. The other varieties started one to two weeks later, and harvest was stretched out over a longer time period of time.

Yields on average were higher for Ranch and Bob Gordon, followed by Dog Branch (Tables 2 and 5). The data presented show high yield for South Fork; however, this was due to being forced to harvest when most berries were ripe, but before all were ripe, due to heavy shattering on this variety. There are concerns on why shattering occurs. Is it a result of uneven pollination, or maybe a soil fertility issue, or is it site-specific? More research is needed.

Brix levels were consistently higher on Ranch and Bob Gordon, but the differences were small (Tables 2 and 5). The brix levels over the entire study during 2018-2019 ranged from 9.0 - 12.5.

Blossom size is presented since it was part of the data collection (Table 3). Mite damage did not allow for good flower measurements during 2020. As explained earlier, flower size is not a good indicator of yield for tea production.

Conclusions

Elderberries are a promising native crop for Oklahoma. It is a low-margin crop in terms of profit, due to the high labor needs at harvest and during pruning.

The Ranch variety has proven to be almost a determinate crop at our location, with a very short harvest window. Bob Gordon ripened over a longer time period, but yielded well.

Based on our study, more work needs to be done to learn how to manage the eriophyid mite. We hard-pruned based on current recommendations to control the mite. However, this proved ineffective during 2020. Did increasing the nitrogen fertilizer cause a problem with the mites, or was it simply a bad year due to weather conditions? Eriophyid mites need to be controlled early, due to the rapidly increasing damage we observed over the 2020 growing season.

Fertility management under high rainfall situations needs to be researched. We feel that high rainfall events, along with the hard pruning technique, resulted in nutrient stress from leaching during the 2019 harvest season.

Per conversations with other Oklahoma growers, as well as growers throughout the United States, elderberries are proving to be a very site-specific crop. This means that two different growers may have very different results growing the same varieties. The current recommendation is to plant two to five varieties on your site and evaluate them before expanding the size of your

production area.

While you are evaluating the varieties at your location, start preparing the planting site using tillage, cover crops, irrigation, and soil testing to add nutrients as needed. Raised beds are a good practice in our experience with elderberries.

To date, weed pressure has not been an issue in our trial early in the season. Crabgrass becomes more prevalent after harvest. We are beginning to notice woody plant encroachment, and other growers report weed problems. Be sure to control such plants early while they are young.

Birds have not been a problem in our planting, but other growers have had problems with birds. Evaluate how you will control birds if they become a problem.

Be sure to research markets for your crop. Understand how to implement good food handling practices in your operation, and if you plan to freeze the berries, set up a freezer for your product ahead of time. Elderberries are a processing crop, so if you plan on value adding by processing yourself, determine the costs and labor needs before making a decision.

The market continues to grow for elderberries. Becoming a successful grower, however, is no different than with any other crop . Research and evaluate varieties, your growing site, markets, prices, equipment costs, and labor needs to determine the potential success of your new crop.