



**MIDWEST  
ELDERBERRY  
COOPERATIVE**

June 28, 2022

**2022 Advancing American Elderberry Project & Comprehensive Workshop**

Southwest Research Center & Center for Agroforestry, University of Missouri  
River Hills Harvest / Terry Durham

## Report to American Elderberry Growers

Christopher J. Patton, President

With over twenty presenters and three days of activities and meetings, I can only give you some highlights from my perspective and notes as relates to growing elderberry as a commercial crop. We had over 200 in attendance, and I was happy to connect face-to-face for the first time with a number of you. Others more familiar to me made it to one of Terry's workshops for the first time, which was wonderful.

Since I first attended in 2011, I can tell you that the attendance visually confirmed what I knew from many emails and phone calls: interest in growing and fields in production of Native North American Elder has greatly increased in scale and geographic presence. And there is much more to come.

Andrew Thomas manages the \$5+ million grant that sponsored this event and much of the research reported. This grant continues through 2025 and plans to conclude with a Second International Symposium on Elderberry on June 18-20, 2025 with annual meetings until then the second week of June. This wide ranging grant addresses many of the challenges presented to growing elderberry in scale competitively. You can get a good (and visual) overview from their new website: <https://elderberry.missouri.edu/>.

### HORTICULTURE & ENTOMOLOGY

- ◆ All of the content is summarized from memory and notes, and much of it is subject to more research, local variability of soil, weather and predator conditions.

- ◆ Breeding research has just begun. The *Sambucus canadensis* genome is 24,604 Mbp. Soy is only 2,200 Mbp. As of 2021, 59 different genotypes identified, which demonstrates the great variety found in this ochlo species.
- ◆ 12 different cultivars/genotypes of elder are being grown at five different sites ranging northwards from Springfield, MO for 3-4 years. Plant health relative to soil nutrients, time of flowering and fruiting, tissue samples, harvest weights, and other matters horticulturally.
- ◆ Commercial cultivation of elderberry in Maine has only worked on small scale using Adams, York, Scotia and Nova. They have not succeeded in scaling it up like with wild blueberries (50,000-100,000 lb./annually).
- ◆ Using 15' between rows has become more common. Spacing still depends on the equipment used, as you want to make one pass to mow; however, you also need sufficient space between rows to facilitate harvest. You also do not want the rows to get more than 3-4" thick, or you won't have enough flowing air and sunlight to promote health plants and even ripening of the berries.
- ◆ If your farm usually gets very strong winds in the spring, you may want to plant your rows parallel to prevailing storm winds to reduce potential wind damage to young canes. The first set of canes facing directly into the wind side may be broken, but they will protect the ones behind them.
- ◆ Despite identifying over 80 different insects on elderflowers, wind pollination seems to be the primary method. Research indicates that elderflowers are more receptive to pollen from other cultivars to set berries, while allowing self pollination after 72 hours. This indicates a better berry set if multiple cultivars are in bloom at the same time. How much of a factor this might be has not been quantified.
- ◆ Soaking cuttings in dormant oil greatly reduces the chance of spreading mites, reducing potential infestation that can weaken young plants.
- ◆ OMRI approved miticides are available if you have a big outbreak of mites to control. Mites overwinter on the bud shoots & pencil sized cane stems. If making cuttings, treat with dormant oil - dip cuttings in it.
- ◆ Stink bugs and other sucking insects may be treated with neem oil.

- ◆ Japanese beetles and Spotted Wing Drosophila (SWD) are treated by alternating Entrust (seven days) and Pyganic (12 hours) OMRI insecticides. SWD a problem as soon as color turns.
- ◆ While neem oil may disrupt SWD larva in the soil, **Terry Durham mostly harvests ripening fruit promptly / more often, in addition to keeping grass mowed fairly short, harvesting lower flowers so that there is little fruit close to the ground, and plenty of moving air and sunlight on fruit.**
- ◆ Eldershoot Borer is a brown moth, about 1.5" across, lays eggs on the ends of growing shoots. A black headed white worm with polkadots eats its way down and kills the cane similar to raspberry tip borers. Manage by hand removal. Same for the large, colorful Elder Borer beetle.
- ◆ Elderberry Rust is an early season fungus (wet leaves 48-64F) that requires sedges for part of its lifecycle. Goes away to 80-85F. Remove by hand.
- ◆ Cane Dieback Disease occurs at the shoot tips in the early spring when the plan is growing rapidly. Spray with neem oil.
- ◆ Leaf Spot is a fungus that can reduce the amount of fruit to no fruit. Spraying copper is the solution, spraying in November before leaf drop or later before bud break.
- ◆ We heard from a number of growers who shared their experiences in many aspects of growing and marketing elderberries, far too much to share here.

## COMMERCIAL SCALE ECONOMICS

Constance Carlson present a brief history of Midwest Elderberry Cooperative (MEC) with particular attention its relationship with the University of Minnesota, especially The Forever Green Initiative. She outlined MEC's strategy of decentralized hubs and discussed its economic viability from the perspectives of the grower and the coop. You can read about it in some detail here: **Commercial Hub Development for American Elderberry** (pdf) on <https://grow.midwest-elderberry.coop/presentations.html>, where I will also post this report. Afterwards MEC director Terry Durham encouraged growers to join the coop where it fits.

## ELDERBERRY: A HEALTHY, FUNCTIONAL FOOD INGREDIENT

Dr. Chung Ho Lin (UMO) introduced metabolic analysis of American elderberry's health promoting compounds. Using high resolution spectrographs across 21

cultivars, their team identified 32 health producing compounds of usable quantity (out of 173 bioactive compounds) with antiviral, immunomodulating, antioxidant, anti-inflammatory, antibacterial and insulin-stimulating properties. A key question is how much and how often does a person need to consume to enjoy any of those benefits and to what degree. He also sees strong potential to increase elder berry and flower extracts in cosmetics.

Powder is the ingredient format easiest to store (having a long shelf life) and use by commercial food and beverage makers. Spray or freeze drying elderberries presents two primary challenges: the powder is hydroscopic, absorbing water quickly, which causes clumping, and the anthocyanins are unstable. The berries are consistently high in quercetin, one of the flavonols, and Vitamin C. BRIX consistently ranges between 8-13. Pomace by-product from juicing is another source of powders used in food colorants as a source of cyanidins.



Kiruba Krishnaswamy (UMO) reported positively on the feasibility of spray drying elderberry juice using a screen to remove seeds. Besides being more economical than freeze drying, their research showed that elderberry powder's clumping can be solved by mixing it with a small amount of protein powder. So far the best results come from mixing with 8% soy protein to create a free flowing powder. The proteins migrate to the surface of the dried particles, which reduces their attraction to water. Another processing quality factor: Vitamin C is also very sensitive to oxygen, resulting in discoloration.

## BRAIN HEALTH

### Preliminary investigation of the effects of elderberry juice on cognition in mild cognitive impairment

Ashley F. Curtis, PhD<sup>1</sup>, Amy N. Costa, MA<sup>2</sup>, Bradley J. Ferguson, PhD<sup>3</sup>, Andrew Thomas, PhD<sup>4</sup>, Michael C. Greenleaf, PhD<sup>5</sup>, Joel Shenker, MD<sup>6</sup>, David Q. Beversdorf, MD<sup>7</sup>

<sup>1</sup>Departments of Psychiatry & Psychological Sciences, University of Missouri, Columbia; <sup>2</sup>Department of Psychological Science, University of Missouri, Columbia; <sup>3</sup>Department of Health Psychology, University of Missouri, Columbia; <sup>4</sup>Department of Plant Sciences, University of Missouri, Columbia; <sup>5</sup>Department of Chemistry, University of Missouri, Columbia; <sup>6</sup>Department of Neurology, University of Missouri, Columbia; <sup>7</sup>Departments of Neurobiology, Radiology, and Psychology, University of Missouri, Columbia

**CASH LAB**  
COUNTDOWN TO AGING, BLEED, AND HEALTHY LIVES

#### INTRODUCTION

- Currently, more than 6 million Americans are living with Alzheimer's disease (AD).
- Mild Cognitive Impairment (MCI), a prodromal phase of AD, has been identified as a risk factor for later AD diagnosis<sup>2</sup>.
- Little research, however, has been successful in identifying non-invasive effective treatments to slow the progression of cognitive decline.
- Elderberries have been shown to have anti-inflammatory and antioxidant effects, which shows promise for improving cognition<sup>3</sup>.
- Evaluating the effect of elderberry, a non-invasive nutritional intervention on cognition, is critical to determine whether the course of dementia can be altered in this vulnerable population.

GOAL: To examine the effect of elderberry juice on cognitive function in MCI patients

#### METHODS

**Participants**

- Diagnosed with MCI and aged 50+ years of age
- Clinical Dementia Rating Scale (CDR) score of 0.5
- Mini Mental Status Examination (MMSE) 24+30
- Report no known sensitivity to elderberry products
- No current diagnosis of diabetes, presence of a bleeding disorder, currently pregnant
- No other neurodegenerative diseases (e.g. MS).

**Procedure**

- Participants were randomly assigned to either receive **elderberry juice** (5 ml by mouth, diluted in 8oz of water) or a **placebo juice** (colored, flavored liquid with no nutritional content) three times daily.
- During a total of 3 visits (baseline, 12 weeks after baseline, 6 months after baseline), participants were tested on a variety of cognitive measures.

**Cognitive Measures**

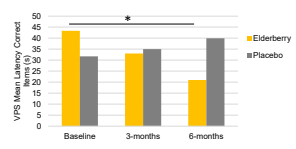
- Hopkins Verbal Learning Test (HVLT)**
  - Assess verbal memory
- Anagrams**
  - Assesses reasoning
- Rey Complex Figure Test**
  - Assess visuospatial ability
- Visuospatial Problem Solving (VPS) Battery**
  - Adapted from "matchstick" problems, assess spatial cognitive flexibility

**Statistical Analyses**

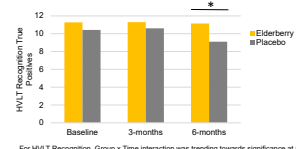
- Multilevel Modelling (SPSS V. 27, AR1 covariance structure) tested fixed effects of group (Elderberry, Placebo), time (baseline, 3-months; baseline, 6-months) and the group by time interaction
- Painwise comparisons within groups over time examined for both significant effects (alpha  $\leq$  .05) and trends (alpha  $\leq$  .10).

#### RESULTS

Variable	Elderberry (n=41)	Placebo Control (n=43)
Age (Mean (SD))	76.45 (8.47)	76.23 (7.73)
Sex (M/F)	8/33	7/36
Race/Ethnicity (n, %)		
White/Caucasian	(11, 100%)	(13, 100%)
Black/African American	(0, 0%)	(0, 0%)
Native American/American Indian	(0, 0%)	(0, 0%)
Education (n, %)		
Less than High School	(0, 0%)	(0, 0%)
High School or Equivalent	(5, 46%)	(3, 23%)
Associate's Degree	(1, 9%)	(0, 0%)
Bachelor's Degree	(1, 9%)	(4, 31%)
Master's Degree	(3, 29%)	(6, 38%)
Doctoral Degree	(1, 9%)	(1, 8%)



For VPS Memory, Group x Time interaction was trending towards significance at 6-months (p = .10). For Elderberry group only, performance was trending towards improvement at 6-months (p = .10).



For HVLT Recognition, Group x Time interaction was trending towards significance at 6-months (p = .10). For Elderberry group only, performance improved at 3-months (p = .01). For HVLT Recognition, Group x Time interaction was trending towards significance at 6-months (p = .09). For Elderberry group only, performance improved at 3-months (p = .01).

#### DISCUSSION

- Preliminary findings suggest that elderberry juice may provide slight benefit to objective cognitive function in patients with MCI.
- Benefits of the supplement appear to be related to recognition memory and visuospatial processing.
- Future planned work will examine the impact of elderberry vs. placebo on blood-based biomarkers of inflammation to better understand potential mechanisms of action.
- Studies with larger samples evaluating longer-follow-up effects are warranted.

**Key Findings**

Elderberry juice may provide some benefit to recognition memory and visuospatial problem solving in MCI patients

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**Author contacts:**  
curtisa@health.missouri.edu; beversdorf@health.missouri.edu

**References**

- Matthews, K.A., et al., 2018.
- National Institute of Aging, 2022.
- Zafra-Stone, S., et al., 2007.

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Dr. Michael Greenlief (UMO) reported on his proteomics studies of the brain's microglial cells. (See the above chart.) In short the quercetin common to all cultivars along with other polyphenol flavonols reduce brain cell inflammation. Their research found that combining quercetin and DHA from fish oil (salmon, for example) was even more effective. Nerve cells degenerate when inflamed, which is considered a primary reason for cognitive loss with aging, so elderberry should help and seems to do so.

The university has done both lab and mouse model studies that indicate positive signaling for functional pathways to indicate potential improved behavior. At this early point in research, Bob Gordon berries seem to be richer in the brain specific nutrients than other cultivars. A few, limited clinical trials with elderberry being consumed by elderly and autistic people support this working hypothesis.

### **MECHANICAL HARVESTING**

The UMO grant includes funding to address the mechanization of harvest and crop handling. Some preliminary work has already started in their Agricultural Engineering dept. Additional research will be coordinated with Penn State U.

The UMO Ag Engineering folks have trialed some mechanized picking assist, metallic claws using 3D cameras combined with color recognition calibrated to ripeness. They also have a berry processing line model that uses an augur to move berries from the destemmer through the cleaning process to the pail.

Three destemmers were on display at the conference: Terry Durham's TED, Dave Buehler's Elder Farms modified grape destemmer and Mike Breckel's Elderberry Destemmer using a rotating cylinder to push the berries against a screen to destem them.