KENTUCKY STATE UNIVERSITY
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INFO SHEET

Kentucky State University Cooperative Extension Connections

Benefits of Elderberry in Alley Cropping Agroforestry Systems

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American elderberry (*Sambucus canadensis*) is a medium to large shrub that grows 5 to 12 feet tall and belongs to the Adoxaceae family (Kaiser & Ernst, 2018). It is native to the eastern and central parts of North America, including Kentucky, and has been found in both wild and cultivated forms for centuries. It has a long history of medicinal use and thrives in various soil and climate conditions, making it suitable for sustainable agriculture (Bulatovic-Danilovich, 2022). It produces clusters of small, creamy white, edible, and aromatic flowers that bloom in early summer, which develop into green-to-dark purple clusters of berries. It has many common names, including elderberry, American elder, American elderberry, and common elder. It thrives in full sun but can tolerate some shade. It grows well across various soil types, prefers rich, moist, slightly acidic conditions, and is highly tolerant of pests and diseases. This multi-stemmed shrub features weak stems with a white pith when young, while older stems are mostly hollow.

It can be planted in naturalized areas, such as hedges, woodlands, roadside plantings, or along streams and ponds. It is a good addition to butterfly, edible, native plant, pollinator, and rain gardens. It is effective for erosion control in moist sites. It typically begins producing fruit within 1 to 4 years and yields better results when cross-pollinated with a different variety.

Elderberry flowers may also bloom again later in the growing season, offering an additional food source for pollinators in the cropping system. Leaves, stems, roots, unripe berries, and raw ripe berries should not be consumed because elderberry tissues contain compounds that can be toxic, especially in new growth (USDA NRCS, 2002). For food use, harvest only fully ripe berries, remove stems, leaves, and unripe fruit, and thoroughly cook the berries before consumption (Akers-Campbell, 2024). These berries are rich in vitamins and antioxidants.

Elderberry in Alley Cropping

Agroforestry is the intentional integration of trees and shrubs into crop and livestock farming systems to generate environmental, economic, and social benefits (USDA, 2019). Among various agroforestry practices, five recognized practices are prevalent in the United States: riparian/upland forest buffers, windbreaks, alley cropping, silvopasture, and forest farming.

Alley cropping is the cultivation of trees or shrubs in rows with considerable spacing, allowing for the growth of various crops in the spaces between these rows, known as “alleys” (Wolz & DeLucia, 2018). The resilient and versatile nature of elderberry plants makes them a feasible option for farmers in alley cropping. They can adapt to various sites and soils, have potential economic value, and create suitable microenvironments for alley crop growth. Elderberry is an emerging specialty crop with promising commercial value.

Benefits of Elderberry

1. Elderberry-based alley cropping was associated with improved growth and yield.

A USDA-funded study was conducted on an elderberry-based alley cropping system at Kentucky State University’s West Farm in Frankfort, Kentucky. This research was designed to compare the potential benefits of elderberry-based alley cropping with non-alley cropping, with a primary focus on growth, yield, and soil parameters. Three bell pepper varieties were interplanted as the alley crop.

Bell peppers grown in association with elderberry had a higher leaf area index throughout the measurement periods. This suggests that the alley-cropping system may create favorable conditions for bell pepper growth (Figure 1).

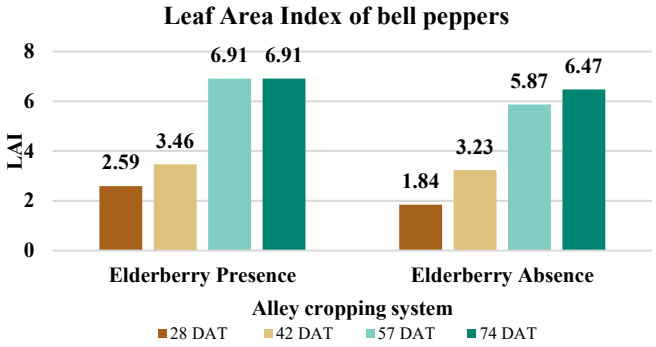

Figure 1: Measurement of leaf area index of bell peppers.

The alley cropping system also produced an elderberry yield of 645 kg/ha, an addition to the crop mix that non-alley-cropping plots did not have. Combined with a slightly higher bell pepper yield in the alley-cropping treatment, this resulted in a greater total crop yield than the non-alley-cropping system (Figure 2).

Figure 2: Bell pepper and elderberry yield under alley-cropping and no-alley-cropping systems. Bell pepper yield was slightly higher in the alley-cropping treatment, with additional elderberry yield contributing to total system productivity.

2. Elderberry-based alley cropping system was associated with improved soil health indicators.

Preliminary soil analysis results suggest that planting elderberry could improve the soil's physical, chemical, and biological properties. The initial results (Figure 3) demonstrated that the presence of elderberry plants (E) is related to notable increases in primary nutrients, specifically nitrogen (N), phosphorus (P), and potassium (K), compared to the areas with no elderberry (NE). The presence of elderberry plants was also associated with increases in water-holding capacity (WHC), permanganate oxidizable carbon (POXC), and organic matter (OM) at the study site.

IHED Lab
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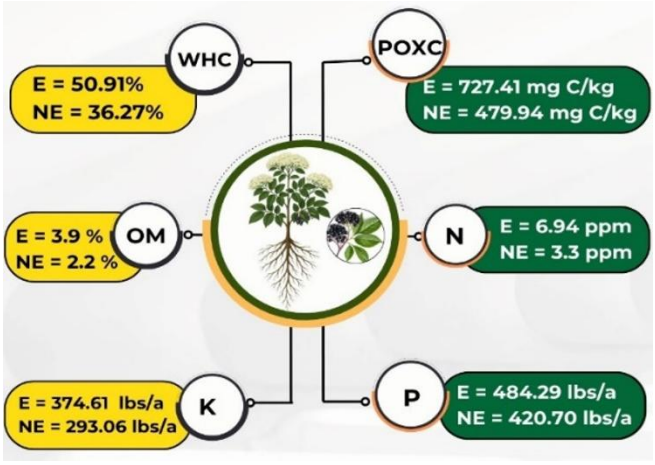

Figure 3: Measured soil health parameters in the areas with elderberry presence (E) and no elderberry (NE). Note: unit conversion for P, K: 1 lb/a = 1.12 Kg/ha.

Conclusions

Preliminary research suggests that elderberry can offer agronomic and commercial benefits in alley cropping systems. At Kentucky State University's West Farm, elderberry-based alley cropping was associated with improved bell pepper growth, added elderberry yield, and improved soil-health indicators. Additional studies and on-farm trials are needed, but early results suggest elderberry may be a promising option for Kentucky producers interested in agroforestry.

Acknowledgment

This work was supported by USDA NIFA Capacity Building Grant No. 1028631 and the USDA Evans-Allen Project, accession no. 7007252.

Sources

Akers-Campbell, H. (2024). American elderberry: Commercial production guide. Alabama Cooperative Extension System. Retrieved from: https://www.aces.edu/blog/topics/crop-production/american-elderberry-commercial-production-guide

Bulatovic-Danilovich, M. (2022). Elderberry. West Virginia University Extension. Retrieved from: https://extension.wvu.edu/agriculture/horticulture/elderberry

Kaiser, C., & Ernst, M. (2018). Elderberry. University of Kentucky. Retrieved from: https://publications.mgcafe.uky.edu/ccd-cp-5

USDA (2019). Agroforestry strategic framework. Retrieved from:https://www.usda.gov/sites/default/files/documents/usda-agroforestry-strategic-framework.pdf

USDA NRCS (2002). American elder. Retrieved from: https://plants.sc.egov.usda.gov/DocumentLibrary/factsheet/pdf/fs_sanic4.pdf

Wolz, K. J., & DeLucia, E. H. (2018). Alley cropping: Global patterns of species composition and function. Agriculture, Ecosystems & Environment, 252, 61-68. https://doi.org/10.1016/j.agee.2017.10.005