

2025 R-18 Final Report

Title: Early-ripening Blueberry Production Using High Tunnel in Central Alabama

Name, Mailing and Email Address of Principal Investigator(s):

James Spiers
111 Funchess Hall
Dept of Horticulture, Auburn University
Auburn, AL 36849
Jds0017@auburn.edu

Marlee Trandel-Hayse
121 Funchess Hall
Dept of Horticulture, Auburn University
Auburn, AL 36849
Mat0141@auburn.edu

Public Abstract:

Thirteen southern highbush (*Vaccinium corymbosum* hybrids) cultivars and 2 rabbiteye (*V. virgatum*) cultivars were established in a randomized complete block design (n = 8) inside a high tunnel and in adjacent open field in 2022 March. Maximum air temperatures were greater in high tunnel compared to field; however, minimum temperatures were similar in high tunnel compared to field during freeze events. Propane heaters were used to enhance frost protection inside high tunnel during spring freeze events. High tunnel conditions did expedite bloom and ripening for most cultivars. In 2025, spring frost injury was not significant for this location (Tallasse, AL). Yields were ~15% greater in high tunnel for 2025. ‘Arcadia’, ‘Avanti’, ‘Chickadee’, ‘Indigocrisp’, ‘Meadowlark’, and ‘Optimus’ had substantial yields in April in high tunnel conditions, while peak production occurred in May for these cultivars in the field. ‘Optimus’, ‘Gumbo’, ‘Indigocrisp’, ‘Arcadia’, and ‘Meadowlark’ experienced the greatest yields in 2025 inside the high tunnel. In the field study, ‘Gumbo’, ‘New Hanover’, ‘Legacy’, and ‘Arcadia’ experienced the greatest yields in 2025. Berry weight was greater overall under high tunnel conditions for almost all cultivars.

Introduction:

Identifying blueberry cultivars that are best suited for particular regions of the state is a critical need. The performance of early-ripening blueberry cultivars in open field and high tunnel cultivation will be evaluated to determine feasibility of expanding blueberry marketing windows. Spring frost is the most limiting factor for production of blueberries in central Alabama. Many stakeholders are excited about the new releases of southern highbush blueberries with enhanced fruit quality and production traits. These are not recommended for Alabama because of their susceptibility to spring frost. High tunnels can potentially be used to protect and enhance early-fruiting blueberry cultivars. This project will involve determining the yield and fruit quality of early-fruiting blueberry cultivars in these two systems.

Materials and Methods:

Research plots were prepared to have suitable soil pH (~4.8) and amended with pine bark in January 2022. Raised beds were amended with additional 4 cm of pine bark and covered with black landscape fabric. Blueberry plants were planted in March 2022. Plants used in this study consisted of one-year-old 2.84 L (1 trade gal) southern highbush blueberry (*Vaccinium corymbosum* L. interspecific hybrids) cultivars ‘Arcadia’, ‘Avanti’, ‘Chickadee’, ‘Farthing’, ‘Gumbo’, ‘Indigocrisp’, ‘Keecrisp’, ‘Legacy’, ‘Meadowlark’, ‘New Hanover’, and ‘Optimus’ (Island Grove Ag Products, Winter Haven, FL), and two rabbiteye blueberry (*Vaccinium virgatum*) cultivars, ‘Krewer’ and ‘Titan’ (Bottoms Nursery, Concord, GA). Southern highbush cultivars ‘Bluecrisp’ and ‘Colossus’ (Island Grove Ag Products, Winter Haven, FL) were also planted in this study, but were younger plants and therefore much smaller in size when held in comparison to the one-year-old southern highbush and rabbiteye cultivars. We established two studies, open field and high tunnel. Both field and high tunnel plots were planted in a randomized complete block design with eight blocks. There were 15 treatments (13 southern highbush cultivars and 2 rabbiteye cultivars) with one single-plant replication per block. Both field and high tunnel contained 120 plants each, totaling 240 plants combined.

Preliminary data

Prior to the current study, we collected two years of data on growth and establishment, environmental data, and preliminary yield data for 2nd and 3rd year after planting. In summary, bloom and harvest times were expedited in high tunnel conditions. The high tunnel was not effective enough during spring frost conditions experienced in first year to provide adequate protection from frost injury, so we incorporated 2 propane heaters. These provided adequate protection. Plant growth was greater in field for first year, and greater overall in high tunnel by end of 2nd year. For the one year of yield data, yield was much greater in high tunnel, primarily because spring frost injury was more severe for plants in the field. Based off the results of these first few years of establishment and one season of production, potential early, high-performing cultivars for fruit production in the

high tunnel include ‘Arcadia’, ‘Chickadee’, and ‘Meadowlark’, as well as ‘Farthing’ and ‘New Hanover’. Cultivars that performed the best in the field for fruit production include ‘Gumbo’, ‘Legacy’, and ‘Titan’.

Results and Discussion:

As observed in preliminary data, bloom and harvest times were earlier in high tunnel conditions. The high tunnel had higher air and soil temperatures overall, and less photosynthetic active radiation. Though we expected to experience spring frost injury on the early-ripening cultivars in the field, we did not experience severe spring frost injury in the two years of this study. Hence, we were able to determine differences between the two production systems in the absence of cold injury. Yields were greater overall in the high tunnel for both years: 30% greater yield in high tunnel for 2024, and 15% greater in 2025. ‘Arcadia’, ‘Avanti’, ‘Chickadee’, ‘Indigocrisp’, ‘Meadowlark’, and ‘Optimus’ had substantial yields in April in high tunnel conditions in both years, while peak production occurred in May for these cultivars in the field (very low yield, if any in April). ‘Krewer’, ‘Indigocrisp’, ‘Avanti’, and ‘Optimus’ had among the greatest yields in the high tunnel in 2024. ‘Optimus’, ‘Gumbo’, ‘Indigocrisp’, ‘Arcadia’, and ‘Meadowlark’ experienced the greatest yields in 2025 inside the high tunnel. ‘Gumbo’, ‘New Hanover’, ‘Optimus’, and ‘Arcadia’ had among the greatest yields in the field in 2024. ‘Gumbo’, ‘New Hanover’, ‘Legacy’, and ‘Arcadia’ experienced the greatest yields in 2025. Berry weight was greater overall under high tunnel conditions for both years for almost all cultivars. ‘Avanti’, ‘Colossus’, ‘Optimus’ and ‘Titan’ had similar berry weight in 2024. ‘Titan’, ‘Krewer’ and ‘Legacy’ had similar berry weight in field and high tunnel conditions in 2025. All other cultivars experienced greater berry weight in the high tunnel. ‘Arcadia’, ‘Chickadee’, ‘Indigocrisp’, ‘Krewer’, ‘Meadowlark’, and ‘Titan’ had the greatest berry weight. Soluble solids content (soluble sugars) was similar under the two environmental conditions.

In summary, high tunnel cultivation of early-ripening blueberries provides many advantages. Protection from cold injury with the addition of heaters inside the tunnel is a big advantage. Though cold injury was not severe during the two years of this study, spring frost injury should be expected for many of the early-ripening cultivars observed in this study. Protection from rainfall enhances fruit quality, as few split berries were observed under the high tunnel. The enhanced heat provided by the high tunnel allows for increased

growth and expedites flower and fruit development, for earlier and greater yields. Heat stress in the summertime was a concern for this study but was not realized. We did keep the high tunnel sides open throughout the year and only closed during freezing events. Growers could close sides during winter months to potentially speed up production, but we did not do for this study. Many of the cultivars used in this study are of very high quality and would make great additions to our current blueberry cultivars in production. Though harvest is quite early for ‘Optimus’ and ‘Arcadia’, the yields were great for both high tunnel and field in the absence of spring frost conditions during the two years of this study. The later-blooming cultivars tended to perform best in the field, even in the absence of severe spring frost injury. Of these, ‘Gumbo’ appears to be the best choice for field production to obtain good yields in May. ‘Indigocrisp’ and ‘Keecrisp’ have a firm and “crunchy” texture that is attractive to growers and consumers. Likely well-suited for mechanical harvest and postharvest longevity. They both performed quite well in the high tunnel, but also at or above average in field conditions.

The big question of whether high tunnels are economical depends on the market and scale. High tunnels have significant upfront costs. However, they provide the insurance of saving your crop consistently compared to other strategies. In addition, you can get greater yields, larger sized fruit, less culls due to split berries and other fruit rot issues that come with rainfall, and earlier fruiting.