

## 2022 SR SFC Final Project Report

Proposal Category:  Research     Outreach

Proposal Status:  New (Extended) Proposal     Previously funded by SRSFC

Title: **Investigating the Potential of Disease Resistant *Vitis vinifera* (European Grape) Progeny for the Southeast**

### Name, Mailing and Email Address:

#### Principal Investigator:

Elina Coneva, Ph.D.  
Extension Specialist and Professor  
101 Funchess Hall  
Auburn University  
Auburn, AL 36849  
[Edc0001@auburn.edu](mailto:Edc0001@auburn.edu)

#### Co-PIs: (left the UGA in early spring of 2020)

Kassie Conner, Ph.D.  
Extension Plant Pathologist  
Alabama Cooperative Extension System  
Auburn University, AL 36849  
[connekn@auburn.edu](mailto:connekn@auburn.edu)

Eric Stafne, Ph.D.  
Extension/Research Professor  
810 Hwy 26 West  
Poplarville, MS 39470  
Ph.: 601-403-8939  
[eric.stafne@msstate.edu](mailto:eric.stafne@msstate.edu)

Ebrahiem Babiker, Ph.D.  
Research Geneticist, USDA-ARS  
810 Hwy 26 West  
Poplarville, MS 394700287  
Phone: (601) 403-8769  
[ebrahiem.babiker@usda.gov](mailto:ebrahiem.babiker@usda.gov)

## **Objectives:**

The purpose of this applied research project is to investigate the production potential of newly developed Pierce's Disease (PD) resistant 94% *Vitis vinifera* grape selection in Alabama where the PD pressure is high. Studies are focused to evaluate vine performance at three planting densities of 605, 519 and 454 vines/acre (corresponding to planting distance of 6' X 12', 7' X 12', and 8' X 12' respectively), where phenological, cropping and vegetative responses are measured and fruit quality and vine field PD resistance is assessed. Vines are trained to the relatively new, high-cordon divided canopy Watson training system utilized for improved vineyard management practices, improved canopy environment, and enhanced fruit quality. The UC Davis developed PD resistant, predominantly *Vitis vinifera* selection '502-20' is being tested at the Chilton Research and Extension Center (CREC), Clanton, Alabama. The outcomes of this research can serve to promote viticultural diversification and sustainability in Alabama, aid in the development of technology for *V. vinifera* production in Alabama and the southeastern region and can support the development of In-service agent training modules in sustainable viticultural production practices in the region.

## **Activities**

To determine the feasibility of sustainable production of newly developed PD resistant 94% *Vitis vinifera* selection '502-20', an experimental site was utilized at the Chilton Research and Extension Center near Clanton, Alabama. The effect of three planting densities of 605, 519, 454 vines/acre corresponding to 6' X 12'; 7' X 12', and 8' X 12' planting distances on vine growth, development, productivity, crop efficiency, and fruit quality were evaluated. The experimental design is a CRD with 3 replications and 3 vines per block. Vines were planted in 2017 and trained to a divided canopy Watson trellis system.

During the early spring of 2020-2022, vines were dormant pruned to 12 spurs per vine (6 spurs/cordon) with two buds per spur retained for a total number of 24 buds retained per vine. The dormant pruning weights were recorded for each individual plant and vine flowering progression was observed. Young shoots were trained and tied to the support wires as soon as they reached the proper length. Shoot thinning was conducted in early spring to maintain the desirable shoot number in the

canopy. Cluster flowering progression was recorded for each vine in 2021 and 2022. A 30-leaves per vine sample was collected to determine treatment effect on Leaf Area Index. Petiole samples were submitted to the Plant Diagnostic Lab where Dr. Conner conducted a PCR test to establish the presence of *Xf* infection in the experimental vines.

The final stages of berry veraison and fruit maturity were documented during the summer. Fruit was harvested on August 7, 2020 and on August 13, 2021. Each season, the total yield per vine and the total cluster number per vine were measured and recorded. A five cluster per vine sample was collected to determine mean cluster weight. Other fruit quality attributes such as mean berry weight was determined on a sub-sample of 50 berries per vine. To record berry soluble solids content, the juice from 10 berries was extracted.

**RESULTS:**

Our data on dormant pruning weight per vine suggests planting distance did not significantly affect the vigor of 502-20 vines, which was relatively uniform for all treatments in 2019-2021, while during the 2022 season the 6' X 12' planting distance resulted in the highest vine vigor based on the results for plant dormant pruning weight (Table 1).

Table 1. Effect of planting distance on dormant pruning weight (lb) of predominantly *V. vinifera* selection 502-20 grown at the CREC, Clanton, AL, 2020-2022.

| Planting Distance | Dormant Pruning Weight, lb/vine |      |      |        |
|-------------------|---------------------------------|------|------|--------|
|                   | 2019                            | 2020 | 2021 | 2022   |
| 6' X 12'          | 1.4                             | 1.1  | 1.1  | 3.2 a  |
| 7' X 12'          | 1.3                             | 1.0  | 0.8  | 1.7 b  |
| 8' X 12'          | 1.2                             | 1.0  | 1.2  | 2.3 ab |

Data on planting distance treatment effect on 502-20 grape phenological development suggests no significant treatment difference on vines growth and development expressed as a number of the growth stage according to Eichhorn – Lorenz (1977) grapevine phenology chart (Figure 1).

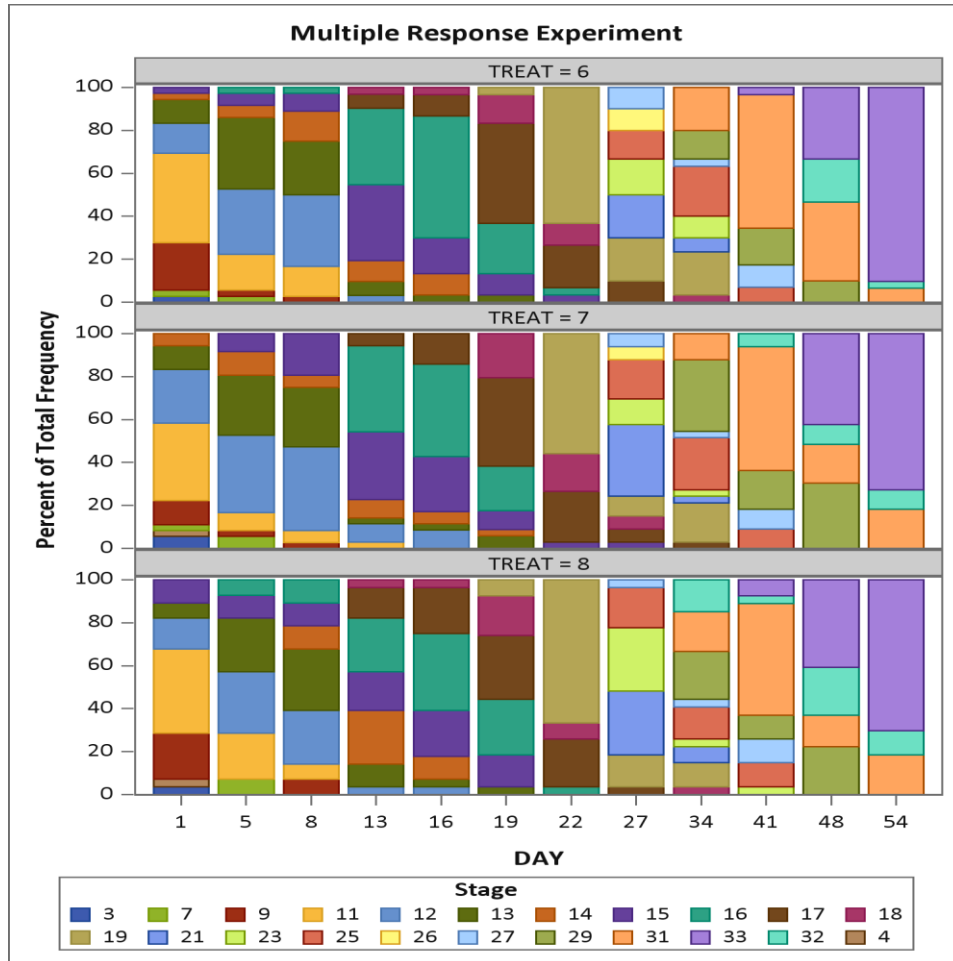


Figure 1. Effect of planting distance on 502-20 grapevine phenological development during spring of 2022, CREC, AL.

Results for total yield per vine (Figure 2) suggest similar cropping level (between 8.5 and 8.8 kg/vine) regardless of planting distances during 2019-2020. During the 2021-2022 season, vines planted at a distance of 8' X 12' outperformed the other treatments and resulted in significantly higher crop of up to 17.4 kg/vine in 2022.

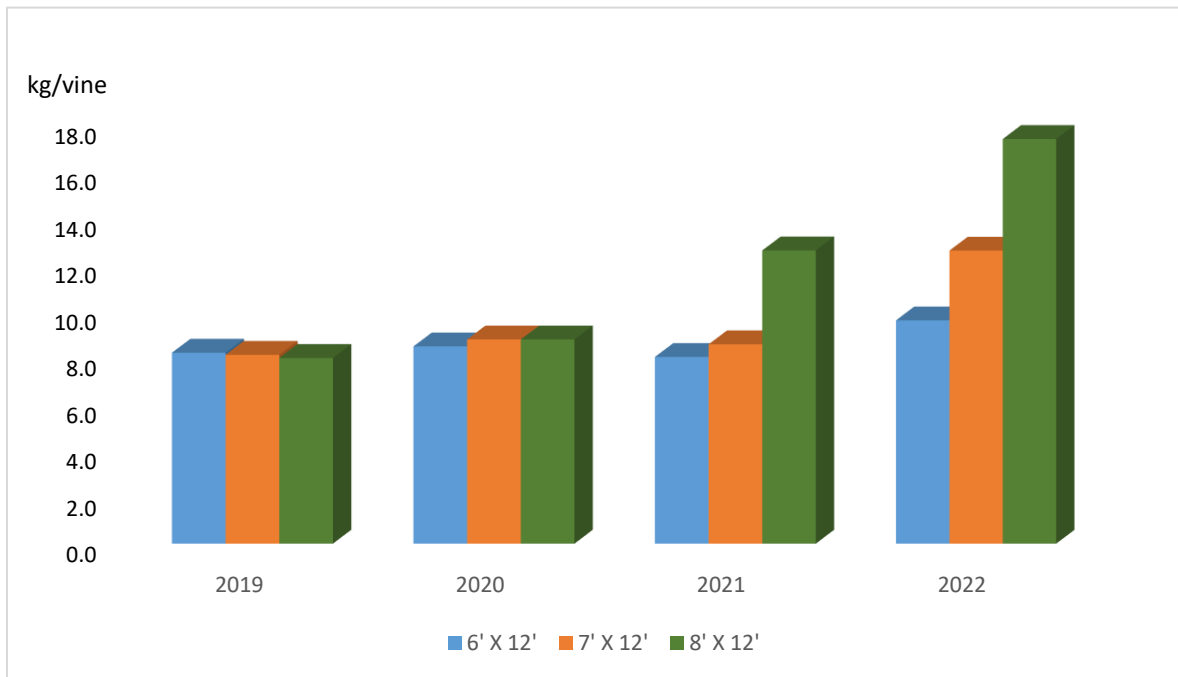


Figure 2. Effect of planting distance on 502-20 total yield/vine, 2019-2022, CREC, AL.

Average number of clusters/vine was not statistically different during the 2019-2021 period, and was significantly higher for the 8' X 12' treatment in 2022, when the vines produced 53 clusters on average. Planting distance treatment of 7' X 12' produced similar number of clusters/ (Table 2). Mean cluster weight varied between 320.0 g for vines planted at 6' X 12' in 2019 to 621.2 g for vines planted at 7' X 12' during the 2021 season, although no significant planting distance effect on mean cluster weight was found during the reported period (Table 2).

Table 2. Effect of planting distance on 502-20 grape number of clusters/vine and mean cluster weight, 2019-2022, CREC, AL.

| Planting density | Average No. of clusters/ vine |      |      |       | Mean cluster weight, g |       |       |       |
|------------------|-------------------------------|------|------|-------|------------------------|-------|-------|-------|
|                  | 2019                          | 2020 | 2021 | 2022  | 2019                   | 2020  | 2021  | 2022  |
| 6' X 12'         | 22                            | 28.0 | 35   | 38 b  | 320.0                  | 367.2 | 569.0 | 441.2 |
| 7' X 12'         | 20                            | 27.7 | 35   | 44 ab | 332.2                  | 394.3 | 621.2 | 470.0 |
| 8' X 12'         | 23                            | 31.6 | 54   | 53 a  | 328.1                  | 377.0 | 597.9 | 540.2 |

No statistical treatment difference was found on the soluble solids content of 502-20 grapevines during 2019, 2020, and 2022, while during 2021 the 8' X 12' treatment resulted in significantly sweeter berries (Table 3) and 7' X 12' treatment resulted in berries with the lowest soluble solids content of 16.3%.

**Table 3. Effect of planting distance on SSC of '502-20' grape, 2020-2022, CREC, AL.**

| Planting distance | SSC  |      |         |      |
|-------------------|------|------|---------|------|
|                   | 2019 | 2020 | 2021    | 2022 |
| 6' X 12'          | 17.4 | 18.7 | 17.1 ab | 17.3 |
| 7' X 12'          | 17.7 | 18.5 | 16.3 b  | 17.3 |
| 8' X 12'          | 18.6 | 18.4 | 18.1 a  | 17.9 |

Petiole samples were collected from each individual vine after harvest in mid-October, 2021 and 2022 to test for the presence of *Xylella fastidiosa* infection. The conducted PCR analysis returned negative results in 2021. No Pierce's disease infected vines were found from the PD resistant predominantly *V. vinifera* selection 502-20 after five years of cultivation in the high PD risk zone of central Alabama, while the adjacent PD tolerant American and French-American hybrid bunch grapevines were showing 37% infected plants in 2021 and the infection rate was 45.2% in 2022. One 502-20 vine tested *X.f.* positive in 2022.