

Warren J. Baker Endowment

for Excellence in Project-Based Learning

Robert D. Koob Endowment *for Student Success*

FINAL REPORT

Final reports will be published on the Cal Poly Digital Commons website(<http://digitalcommons.calpoly.edu>).

I. Project Title

The Effect of Grape Rootstock Parentage on Non-structural Carbohydrate Establishment Factors

II. Project Completion Date

December 2019

III. Student(s), Department(s), and Major(s)

(1) Samantha Stauch, Agriculture and Environmental Plant Sciences

(2) Rachel Martin, Wine and Viticulture

(3) Vegas Riffle, Agriculture and Environmental Plant Sciences

IV. Faculty Advisor and Department

Dr. Jean Dodson Peterson, Associate Professor of Viticulture, Wine and Viticulture Department

V. Cooperating Industry, Agency, Non-Profit, or University Organization(s)

California Polytechnic State University, Department of WVIT and Wonderful Nurseries

VI. Executive Summary

The majority of winegrape cultivars (*Vitis vinifera* L.) are susceptible to damage and eventual decline by the root aphid, phylloxera, as well as various species of nematodes. Therefore, commercial winegrapes are typically grafted to hybrid crosses of North American *Vitis* species, which have evolved tolerance to these pest pressures. Rootstock parentage is carefully considered when making a commercial rootstock selection, as well as, the specific type of grafted plant purchased for use in vineyard establishment (green-growing, dormant). Dormant bare-rooted benchgrafts are grafted, callused, and then field grown in a nursery block row for one season before being dug up in the late fall or winter to be sold and planted. Green-growing benchgrafts are first grafted when dormant, callused, potted or put into sleeves, transferred to the greenhouse and eventually moved to a shade house where they acclimate to outdoor conditions for planting in the same year in which they were grafted. Traditionally, dormant bare-rooted bench grafts are considered superior to green-growing benchgrafts based on the assumption that they have higher

capacity and potential vigor. Vine vigor is a measure of growth over time while vine capacity is a measure of total yearly biomass (vegetation and fruit) produced.

Prior studies have shown a relationship between vine vigor and capacity indices as a function of root and trunk non-structural total carbohydrate reserves. The purpose of this study was to evaluate first-year growth of grapevines and determine the influence of rootstock selection on vineyard establishment and performance of green-growing benchgrafts. This study used five commercially available rootstock selections, of various parentage, grafted onto *Vitis vinifera* L. cv. Sauvignon blanc. The research vineyard was designed as a randomized block design with North-South rows on 1.8 x 2.5 meter (vine x row) spacing. Vine development was tracked on a weekly basis beginning at budbreak and was followed until vines reached full dormancy. Total shoot length, cane internode length and cane diameter were measured on a weekly basis during the growing season. Stomatal conductance, density and size are currently in the process of being analyzed. In addition, photosynthetic activity were determined using the LI-6400XT (LICOR Biosynthesis, Lincoln NE). Once vines reached dormancy non-structural carbohydrates were determined by collecting root and trunk wood samples. Pruning weights and trunk diameter were also determined at the time of dormant wood collection.

VII. Major Accomplishments

- (1) Successfully observed and evaluated vine developmental traits throughout the growing season as a function of rootstock.
- (2) Learned how to utilize the LI-6400XT to evaluate leaf gas exchange parameters as a function of rootstock selection.
- (3) Conducted analysis on non-structural carbohydrate status of vines and correlated results to rootstock selection.

VIII. Expenditure of Funds

This project was funded in full at \$3,595. The budget included funding for student conference travel and operation expenses (grinding of plant material, laboratory consumables, and vineyard supplies/materials). Support for this project was essential to its successful completion. The funds were entirely used.

IX. Impact on Student Learning

This research study provided opportunities for collaboration between undergraduate and graduate students. Through the development of new laboratory procedures (stomatal density classification) and use of new equipment (LI-6400XT) our student team was challenged to problem solve and directly practice the 'learn by doing method'. The student team improved their understanding of grapevine physiology, vineyard management, and winegrape research methods. Dr. Dodson Peterson met with our research team on a weekly to ensure the project ran smoothly and everyone had an opportunity to take ownership of sub-components of the project and present at laboratory meetings. We are truly thankful for the funding we received from the Baker Koob Endowment and for this opportunity. This project means a lot to us and has provided us with a great Cal Poly experience. Thank you.