

Warren J. Baker Endowment
for Excellence in Project-Based Learning



Robert D. Koob Endowment for Student Success

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Proposal Cover Page

PROVOST AND VICE PRESIDENT
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Title of Project:

Effect of Grape Rootstock Parentage on Non-structural Carbohydrates and Establishment Factors

Proposal Author: Samantha Stauch

Email: sstauch@calpoly.edu

Student ID: 009980499

Dept.: Agricultural and Environmental Plant Sciences

Signature (Optional):

[Handwritten Signature]
Signature provides permission to check financial aid eligibility.

Previous Baker/Koob Endowment funding? (circle one):

Yes No

Is this request to support a Senior Project or thesis? (circle one):

Yes No

Team Member(s)	Signature	Cal Poly Email	Department
Rachel Martin	<i>[Handwritten Signature]</i>	<i>cmack@gmail.com</i>	WVIT
Vegas Riffle	<i>[Handwritten Signature]</i>	<i>vriffle@calpoly.edu</i>	AEPS

Anticipated Start Date: January 2019

Anticipated End Date: September 2019

Total Funds Requested: \$3,595.00

Faculty Advisor: Dr. Jean Dodson Peterson

Department: Wine and Viticulture

Faculty Advisor email: jdodsonp@calpoly.edu

Telephone: 805-756-2770

Signature of Faculty Advisor:

Date:

[Handwritten Signature]
11/5/18

PROPOSAL NARRATIVE

(Max. of 3 pages including figures/tables but excluding budget page, 1" margins, 12-point font. See Sec. XII of RFP for more details.)

Proposals not complying with format guidelines will not be considered.

I. Effect of Grape Rootstock Parentage on Non-structural Carbohydrates and Establishment Factors

II. Abstract

The purpose of this study is to evaluate first-year growth of grapevines and determine the influence of rootstock selection on vineyard establishment and performance of green-growing benchgrafts. Green-growing bench grafts are thought to have lower amounts of carbohydrate reserves compared to dormant bare-rooted benchgrafts. Carbohydrate reserves are often attributed to the establishment time, success and longevity of a vineyard. With winegrape production on the rise, especially on California's Central Coast, nurseries are unable to meet the demands for dormant bare-rooted benchgrafts. Unfortunately, green-growing benchgrafts have not been studied thoroughly as a function of rootstock. During this study factors such as dormant non-structural carbohydrates, internode length and diameter and stomatal density will be evaluated.

III. Objective(s)

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 rootstock (green-growing, dormant) during vineyard establishment. 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, 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 of higher capacity and vigor. Vine vigor is a measure of growth over time while vine capacity is a measure of total yearly biomass (vegetation and fruit) produced. Earlier studies have shown a relationship between vine vigor and capacity indices as a function of root and trunk carbohydrate reserves. This study will explore carbohydrate reserves as a function of rootstock and type of planting stock of green-growing bench grafts. Developmental factors will also be tracked and correlated to these carbohydrate reserves. Understanding the relationship between rootstock parentage selection and the graft compatibility and success rate of establishment of green-growing bench grafts, would encourage the increased use of green-growing grafts over dormant benchgrafts in industry without sacrificing vineyard establishment and success rates while ensuring the continued growth and quality standards of new vineyard plantings. Determining if non-structural carbohydrate storage is a reflection of rootstock establishment success in green-growing vines, growers would be able to select stronger materials, improve establishment success and improve the economic viability the California wine industry would.

Objectives:

1. To determine the effect of rootstock selection and parentage on non-structural carbohydrate reserves of newly grafted vines over the course of the growing season.
2. To evaluate various developmental factors such as internode length and diameter, total shoot length, stomatal density and size.

IV. Methodology

This study will use five commercially available rootstock selections, of various parentage, grafted onto *Vitis vinifera* L. cv. Sauvignon blanc. The research vineyard has been designed as a randomized block design with rows aligned in the North-South direction on 1.8 x 2.5 meter (vine x row) spacing. Since initial planting (July 2018) pre-grafting and pre-planting non-structural carbohydrates have been collected and are in the process of analysis. Once fully dormant, root samples ranging from 4 to 10 mm in diameter will be collected from near the base of the vine and later washed and recut to remove all soil and dead tissue. For non-structural carbohydrates (TNC) analysis the procedure by Smith and Holzapfel (2009) will be followed. Trunk wood samples from the vines will also be collected and analyzed for TNC. Pruning weights will also be collected in order to construct a clear representation of yearly biomass produced by these young vines. Vine development will be tracked on a until the time of vine dormancy. Shoot length, internode length and diameter will be measured on a weekly basis. Stomatal conductance, density and size will be determined by using nail varnish to make stamps of the stomata to be assessed under a microscope using Leica LAS software. Transparent nail polish will be brushed on the underside of each leaf to left of the right vein in the interveinal region. Nail polish will be allowed to dry then carefully peeled off and wrapped with aluminum foil for preservation until examination. By carefully assessing these developmental factors of the newly grafted vines we hope to understand the significance of rootstock parentage and type on vineyard success and vine health.

V. Timeline

- Jan - March 2019 Dormant Non-structural Carbohydrate Collection and Analysis
- March – Sept 2019 Assess and Monitor Vine Development
 - Shoot Length
 - Shoot Internode Length and Diameter
 - Stomatal Conductance
 - Stomatal Density and Size

VI. Final Products and Dissemination

The results of this work will go towards one Masters Degree Thesis and two senior projects. This data will be reported and disseminated through industry and professional conferences, as well as contribute to a peer-reviewed publication. Outlets for this work include:

1. American Society of Enology and Viticulture Annual Meeting 2019 (Napa California)
2. Paso Robles Viticulture Technical Group Industry Meetings
3. Central Coast Grape Expo (Paso Robles California)
4. Calaveras County Grape Growers Association (Murphys California)
5. ASEV Catalyst: Discovery in Practice (peer reviewed publication)

VII. Budget Justification

The following expenses are necessary for the data collection and analysis of vine developmental factors and non-structural stored carbohydrates, as well as for conference travel for students.

Travel:	\$890
▪ Conference Registration	\$120 (\$60 per Student)
▪ Hotel for Two Nights	\$240 (\$400 per Night)
▪ Conference Meals	\$240 (\$60 per Student per Day)
▪ Conference Mileage	\$290 (53.5 Cents/Mile 545 miles)
Operating Expenses:	\$2,705
▪ Grind of Plant Material Fee	\$1800 (\$60/sample, 30 samples)
▪ Enzymatic Analysis Kit	\$350 (100 Sample Kit)
▪ Laboratory Consumables	\$180 (Gloves, Microscope Slides, Tin Foil)
▪ Nail Polish	\$15 (For Stomatal Density Analysis)
▪ Poster Printing	\$60 (Campus or Kinkos Poster Printing)
▪ Microscope Imaging Software	\$300 (Leica Scope Compatible)
TOTAL REQUEST	\$3,595

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CAL POLY

PROPOSAL BUDGET

Student Applicant(s):	
Faculty Advisor:	
Project Title:	Requested Endowment Funding
Travel <i>subtotal</i>	\$770
Travel: In-state	\$770
Travel: Out-of-state	\$
Travel: International	\$
Operating Expenses <i>subtotal</i>	\$ 1,025
Non-computer Supplies & Materials	\$545
Computer Supplies & Materials	\$
Software/Software Licenses	\$300
Printing/Duplication	\$60
Postage/Shipping	\$
Registration	\$120
Membership Dues & Subscriptions	\$
Multimedia Services	\$
Advertising	\$
Journal Publication Costs	\$
Contractual Services <i>subtotal</i>	\$1,800
Contracted Services	\$1800
Equipment Rental/Lease Agreements	\$
Service/Maintenance Agreements	\$
TOTAL	\$3,959

CAL POLY

SAN LUIS OBISPO

Wine & Viticulture

Wine and Viticulture Department

College of Agriculture, Food & Environmental Sciences

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Dear Reviewers,

It is my pleasure to endorse Samantha Stauch, who is currently enrolled as an undergraduate in agricultural and environmental plant science with a concentration in fruit science. Samantha has been one of the most outstanding students I have ever had the pleasure of having in my classes, as a student researcher and hopefully a future graduate student here at Cal Poly. Samantha has taken Basic Viticulture, Advanced Viticulture Winter and Advanced Viticulture Spring Quarter with me. She is also going to complete her senior project with me. Her sincere passion and enthusiasm about grapevine physiology and the wine industry was evident to me from our first interaction two years ago. Since that time, Samantha has volunteered her time working in my laboratory with my graduate students on research entitled, *The Effects of Cluster Thinning Timing in Cool Climate Pinot noir*. She has also proactively involved herself in my research laboratory meetings and mentored other undergraduate researchers in my laboratory. In addition to that, Samantha has demonstrated both analytical skills and a clear understanding viticultural practices and the scientific method. Samantha is also a genuinely caring, kind and outspoken individual. All of these factors make her the perfect candidate for funded undergraduate research. With the support of the Baker Koob Endowment, she will be the first student to complete a research project at the newly redeveloped Cal Poly Wine and Viticulture Trestle Teaching Vineyard. This project would also serve as the jumping off point for her to develop her master's thesis research, of which she plans on starting in Fall of 2019. Her project is entitled *Effect of Grape Rootstock Parentage on Non-structural Carbohydrates and Establishment Factors*. This first year of the project will also compliment her senior project research. It is with my enthusiastic support that I recommend Samantha Stauch for this endowment under my advisement.

Respectfully,



Jean Dodson Peterson, Ph.D.

Assistant Professor of Viticulture

Wine & Viticulture Department

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College of Agriculture, Food & Environmental Sciences

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