Project Updates from OSU's Woodhall Vineyard – Fall 2022

Oregon State University's Woodhall III Vineyard is the only research farm dedicated solely to viticulture and enology research. It is an important facility for the Oregon Wine Research Institute and its core faculty. Located south of the OSU main campus in Alpine, Oregon, the vineyard has served as an important research facility since 1986. Here we describe current projects during 2022 and other vineyard updates.

Trunk Disease Pruning Protectant Trial. Dr. Achala KC, Assistant Professor in OSU's Department of Botany and Plant Pathology, is leading a project to evaluate pruning wound protectants for their efficacy in preventing trunk disease pathogen infection. Trunk diseases are a major concern for vineyard productivity and longevity, and winter pruning is an important time for preventative control. This project is being conducted at Woodhall Vineyard in collaboration with Dr. Patty Skinkis, Professor and Viticulture Extension Specialist. The project is also duplicated at OSU's Southern Oregon Research and Extension Center (SOREC) in Central Point, Oregon where Dr. KC is located. The dual location will help determine whether products have greater efficacy in the two different growing regions and climates. The trial began in February 2022 with four pruning wound protectants being applied individually or in combinations to grapevines immediately after pruning. The applications were then followed by trunk disease spore inoculations. Wood will be collected this winter 2022-2023 to evaluate the recovery of inoculated trunk disease pathogens, disease incidence, and efficacy of the treatments. This project is funded by the Oregon Wine Board.

Weed Control Product Testing. Dr. Marcelo Moretti, Assistant Professor in the Department of Horticulture at OSU, has multiple projects at Woodhall Vineyard. Most of his trials are evaluating product efficacy, and these are necessary in supporting new herbicide product registration for grapes in Oregon. These studies must be done in an experimental vineyard, as new products not registered for grapes require "crop destruct," that is fruit cannot be harvested and consumed. One project is evaluating a new herbicide, tiafenacil (DCC-3825), that is now labeled in grapes. It is a replacement for paraquat or glyphosate, and it is a post-emergent herbicide that has efficacy on grasses and broadleaf weeds with negligible soil activity. The research at Woodhall Vineyard supported the product being registered for use in vineyards. Dr. Moretti is also evaluating tiafenacil for grape sucker control since 2021. He evaluated different rates of tiafenacil compared to an untreated control. He also compared tank mixes with other herbicides. No crop injury was noted with tiafenacil as a sucker spray. Tank mixes of glufosinate and tiafenacil were found to be the most effective weed and sucker control, and this may be a good control option for glyphosate resistant weeds.

Another project led by Dr. Morettis is evaluating grape tolerance to quinclorac (Quinsar 4L), a synthetic auxin herbicide. This active ingredient is effective in controlling field bindweed and some grasses. This research is funded by USDA IR-4 Project in a two-year project that will support registration if the product shows promising efficacy for vineyards. A third project also began in 2022 to evaluate grape tolerance and weed control with fluridone, a preemergence herbicide. Stay tuned for the results from these product trials.

Canopy Architecture and Vine Density Trial. Dr. Paul Schreiner, Plant Physiologist with the US Department of Agriculture– Agriculture Research Service (USDA-ARS) Hort Crops Research Unit in Corvallis, is evaluating canopy architecture and vine density to see how they impact Pinot noir productivity and fruit quality.

The project compares the typical vertically shoot positioned canopy (VSP) to a wide VSP that reduces shoot overlap by using cross arms with permanent wires **(Figure 1)**. The idea is that greater solar interception of the wide VSP canopy could increase yield while also maintaining fruit quality. Vine density is also being evaluated with either three- or six-foot vine spacing while maintaining the same number of shoots per linear foot of row. Higher density vines are expected to have a greater root density which may increase access to soil water. This could be a benefit if the wider VSP system needs more water. If higher density performs better, then the benefits could offset the added planting costs at establishment. The project began in earnest in 2021 when vines were 7 years-old, and crop load was adjusted to either one or two clusters per shoot. Due to the frost impact in April 2022, the cluster thinning treatments were not imposed this year, and the training system and density treatments did not differ in yield or basic berry composition. The first-year results (2021) also showed that the training system and density did not impact yield. However, the higher cropped vines had greater yield (2.8 versus 2.0 tons/acre) and slightly lower total soluble solids at harvest (by 0.46˚ Brix), but there were no impacts on pH or TA. Also, the wide VSP had greater overall growth, as evidenced by higher pruning weights in 2020 and 2021. This is an interesting project to monitor over time, as a slight modification of the canopy training may not influence productivity or quality until the effects are compounded over multiple years, or the increased solar capture by the canopy in the wide VSP system may only benefit vegetative growth and not improve fruitfulness or fruit composition.

Rootstock Trial. Dr. Patty Skinkis, Professor and Viticulture Extension Specialist in the Department of Horticulture, has been evaluating Pinot noir and Chardonnay grafted to rootstocks over the past few years. The vines were planted in 1997 as part of a larger rootstock trial that includes Pinot noir, Chardonnay, Pinot gris, and Merlot grafted to different rootstocks. Pinot noir is grafted to the most rootstocks of any cultivar in the trial, including 19 rootstocks and own-rooted Pinot noir vines (Wädenswil). The goal is to understand how different rootstocks affect Pinot noir vine growth and fruit composition under dry-farmed conditions. The Pinot noir rootstock plots have been evaluated since 2019. The biggest impact of rootstock is on vegetative growth and vigor **(Figure 2)**. The most vigorous rootstocks based on dormant pruning weight are 1616, 5BB, 161-49, and 125AA while the lowest vigor rootstocks are 44-53 and Riparia Gloire. Despite large differences in growth, there are no major impacts on vine phenology (growth stage) throughout the growing season. The vineyard was impacted by the April 2022 freeze event, but the vines bounced back to their highest yield since 2019. Over the past 4 years, yields were similar for most rootstocks, but the major differences were between 420A (highest yield) and 44-53 and Riparia Gloire (lowest yields). Differences in berry ripeness exist at harvest, but 2022 was the first year since 2019 when minimum total soluble solids (TSS) were lower than 23 Brix, likely due to the 2-fold greater yield compared to a typical season. The highest yielding rootstocks resulted in lower TSS (420A at 21.5 Brix, and 125AA at 21.4 Brix), but the majority of rootstocks had TSS greater than 23 Brix. Skinkis held an open house in September 2022 to allow growers to see the rootstock trial first-hand. Many attendees commented that the visual impacts of rootstock are striking and will help them know which rootstocks to pursue or avoid in future plantings. This annual rootstock trial open house will continue as long as the trial remains active.

Over the past two growing seasons (2021-2022), Skinkis expanded the Rootstock Trial to monitor plant water stress of a subset of rootstocks grafted to Pinot noir and Chardonnay (Dijon 95). Standard Oregon rootstocks (101-14 MG, 3309C, Riparia Gloire) were compared to drought-tolerant rootstocks (110R, SO4, 140R, 1616, and 1103P). The Skinkis Lab staff monitored soil moisture undervine and plant water stress from post-bloom to ripening (e.g., stem water potential and stomatal conductance). The drought tolerant rootstocks consistently had less water stress over the two seasons compared to the standard Oregon rootstocks. The higher vine growth and yield that results from the drought tolerant rootstocks may be an effective strategy for growers to achieve good productivity on vineyard sites with limited water resources. The research team includes graduate research assistant (MS student), Jeremy Schuster. The project is funded by the Oregon Wine Board.

Smoke Exposure Trials. Dr. Elizabeth Tomasino, Associate Professor in the Department of Food Science & Technology, is leading a controlled smoke-exposure trial at Woodhall Vineyard. This study has been in place since 2021. The goal is to determine which smoke-derived chemicals show up in the grape berry and wine. To accomplish this, they burned carbon-13 (13C) labeled barley to produce smoke that was piped into mini-greenhouse like structures that encased vines during ripening in the vineyard **(Figure 3)**. Pinot noir and Chardonnay grapevines were included in the trial during September 2021 and 2022. Smoke density of particles > 1 µm was maintained at 5-20 mg/m3 for six hours, simulating a wildfire event in close proximity. This rate was used to provide enough smoke exposure for easy detection in wine. The fruit and wine produced from these experiments are being tested using a combination of gas chromatography-mass spectrometry, liquid chromatography-mass spectrometry, and carbon-13 nuclear magnetic resistance methods (e.g., GC-MS, LCMS, and 13C-NMR) to identify smoke-derived chemicals. A better understanding of the chemicals involved in smoke will provide new targets for better amelioration of negative sensory characteristics and better targets to track the impact of smoke on grapes and wine. The research team includes co-principal investigator, Dr. Michael Penner, Dr. D. Cole Cerrato, Lindsay Garcia (PhD student). Funding is provided by USDA-ARS, USDA-National Institute of Food and Agriculture (USDA-NIFA), Northwest Center for Small Fruits, and the American Vineyard Foundation.

Film Coating to Prevent Smoke Uptake. Dr. Elizabeth Tomasino is also working with Dr. Alec Levin and Dr. Yanyun Zhao to evaluate innovative films coatings to prevent smoke compounds from entering grapes during smoke exposure. The edible coatings were made using cellulose nanofiber (CNF) as a coat-forming matrix. Other functional ingredients were incorporated into CNF to develop four film types. The team is evaluating each film's impact on grape physiology and efficacy in reducing smoke taint in wines. Pinot noir grapes at SOREC and Woodhall Vineyard were spray-coated on the vine at three grape growth stages in 2022. At Woodhall, grapes were smoked for 6 hours using a smoke chambers in the vineyard. The grapes in southern Oregon (at SOREC) went through at least two natural smoke events in 2022, so no deliberate smoking was conducted. After harvest, half of the grapes were washed to determine whether smoke compounds bind or are blocked by the coatings. Wines made from these grapes are almost through fermentation as of this reporting, and smoke compounds (free phenols, bound phenols and thiols) will be analyzed in grape juice and wine in the coming months. The research team includes Dr. Michael Penner, Dr. D. Cole Cerrato, Dr. Jooyeoun Jung, Lindsay Garcia (PhD student), and Trung Tran (MS student). Funding is provided by USDA-NIFA and Oregon Department of Agriculture.

Vineyard Updates. A small (0.3-acre) block was planted in February 2022. This block consists of clone 17 Riesling grafted onto 101-14 rootstock. Vines were planted as magnum vines donated by Duarte Nursery. The block is being planted for Dr. Elizabeth Tomasino's Lab to produce aromatic wines for wine analytics and sensory research in the future.

Justin Litwin joined OSU as the farm manager for Woodhall in April 2022. He received his BS and MS degrees in the Department of Horticulture at OSU and worked in the Oregon wine grape industry prior to taking this position. He brings experience in vineyard production, applied viticulture, farming, and research to this position. If you are interested in visiting Woodhall Vineyard to see the research plots, please connect with Justin and the researchers.

Learn more. If you are interested in learning more about these research projects, please contact any one of the researchers listed above, Justin Litwin, or Denise Dewey, OWRI Program Coordinator.

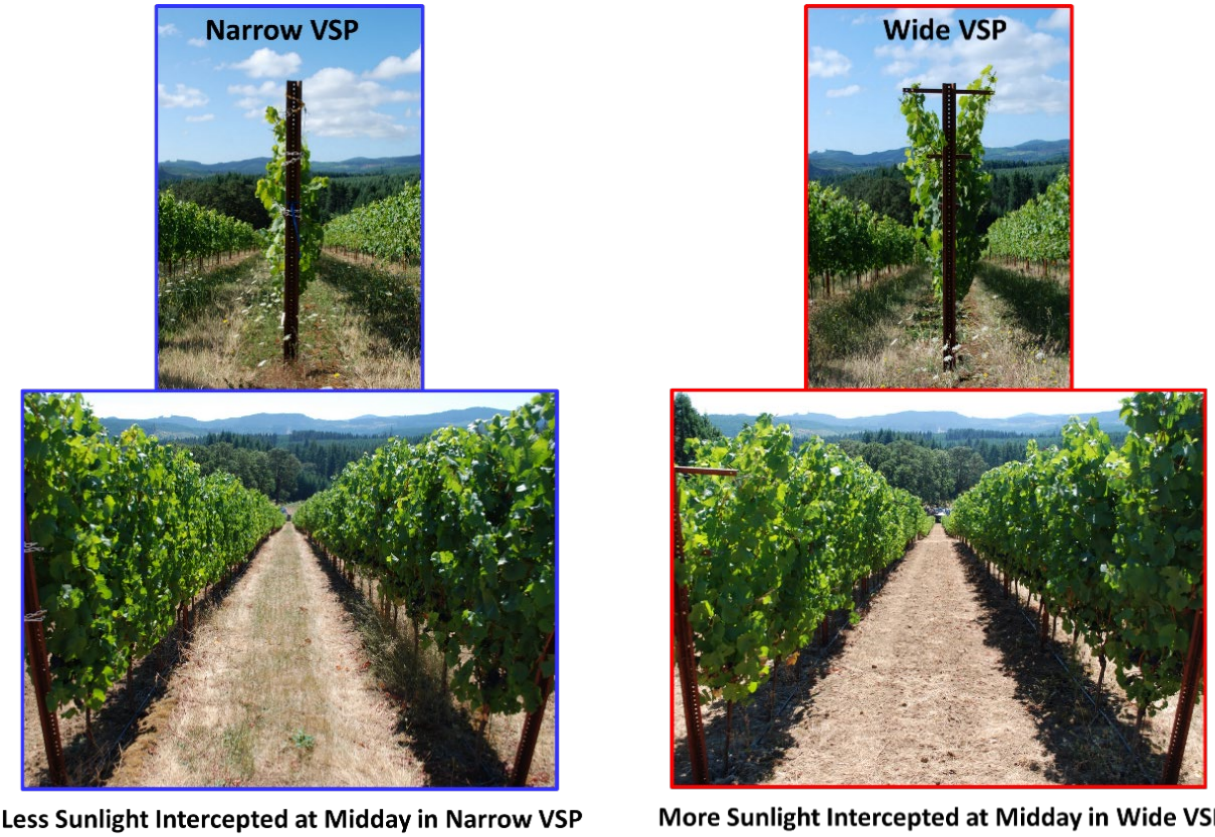

Figure 1. Pinot noir vines in the canopy architecture x vine density trial being led by Dr. Paul Schreiner, plant physiologist, USDA-ARS. Variations on the VSP trained canopy are shown with cross-arms used to widen the canopy (right, red border) compared to the traditional VSP (left, blue border). Photo courtesy of Paul Schreiner.

Figure 2. Pinot noir vines are shown here on Riparia Gloire rootstock (left) and 1103P rootstock (right) that are directly adjacent in the research trial. This photo was taken before harvest (13 Oct 2022). Visual differences between the rootstocks include canopy size (shoot length) and leaf color. Photos courtesy of Patty Skinkis.

Figure 3. A poly-structure encases grapevines at OSU's Woodhall Vineyard to trap smoke around vines in a smoke-exposure trial during September 2022. A black shade cloth was placed over the poly structure to avoid over-heating due to solar radiation. The trial is being conducted by Elizabeth Tomasino's Lab. Photo courtesy of D. Cole Cerrato.