

Washington State Grape and Wine Research Program

FINAL REPORT

PROJECT TITLE: Use of DRZ Subsurface Irrigation to Enhance Establishment of Replacement Vines

WRAC Project Number: 2021.3-CP.JP1

DURATION: FY 21 – FY 23 (July 2020 – June 2023)

PRINCIPAL INVESTIGATOR(S)

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COOPERATOR

Patrick Rawn, Two Mountain and Dineen Vineyards, Zillah, WA

OBJECTIVE(S) of RESEARCH Project: The overall objective was to contrast replacement vine growth under surface drip (SD) and sub-irrigation (DRZ) delivery after replanting. Specific objectives include the following:

- A. Compare the influence of each form of irrigation (SD or DRZ) on young replants subject to interspecific competition from more mature vines.
- B. Establish treatments on two site and determine if subsurface irrigation could provide an advantage for young plants to become established faster than vine irrigated by surface drip irrigation.

SUMMARY OF ACCOMPLISHMENTS

Only one cooperator was found and the treatments were established within the Dineen Vineyards north of Zillah, WA. After three years of observation and collection of end-of-season measurements of growth in replacement vines, no significant differences were found among growth/development of vines irrigated by either irrigation method (surface drip or subsurface drip).

For additional information, please see the following page which summarizes the study.

OVERALL PROJECT SUMMARY

Rogueing of virus-infected vines followed by replanting with healthy cuttings or young plants is practiced for managing virus diseases in vineyards. Replacement of virus infected vines with healthy cuttings often results in retarded growth of replants because of competition from nearby established vines.

The project was initiated during the late summer of 2020 within a 3-year old planting of Merlot grapes within Charlotte's Block in Dineen Vineyards north of Zillah, WA. This block had been earlier rogued to remove vineyards showing evidence of Red Blotch virus and new replacement vines had been planted earlier in the year. Pairs of these replacement vines were selected when in close proximity to one another and DRZ delivery tubes were installed at a depth of 18 inches near the base of one of the pair to apply subsurface drip irrigation while the other received surface drip irrigation at the same rate of water delivery. A second site was intended to be installed but a cooperator was not found.

During 2021 and 2022, field operations were severely impacted by the COVID-19 pandemic which resulted in end of season growth measurements being the only data collected. The PI's requested the study not be funded after the second year, as adequate funding remained to continue observations of the vines. During several visits to the vineyard, observations were made that indicated a number of the replacement vines had died or been replaced again. There was also evidence of mechanical damage to a number of the DRZ delivery tubes in efforts to control a dense understory of weedy grasses, forbs, and weedy vines, especially field bindweed. A number of vines had also been impacted by mechanical weed control efforts. Measurements of stem diameter just below the lower horizontal cordon were made on the surviving pairs of vines and final measurements were made in June 2023. Tubes were removed from the vineyard after this final evaluation and the project was terminated.

No significant differences were found between the stem diameters of vines receiving subsurface drip irrigation or surface drip. Subsurface irrigated vines had slightly higher stem diameter than vines irrigated by surface drip but the difference was very slight, averaging only 0.6 and 0.9 mm greater stem diameter in 2021 and 2022 growing seasons, respectively.

RESEARCH / OUTREACH PRODUCTS

Jacoby, P.W. 2023. Optimising subsurface drip irrigation for effective drought defence.

Adjacent Digital Politics Lt., Crewe, Cheshire, UK

<https://www.openaccessgovernment.org/optimising-subsurface-drip-irrigation-for-effective-drought-defence/162119/>

Jacoby, P.W. 2023. The importance of irrigation systems in enhancing winegrape vineyards resilience. Adjacent Digital Politics Ltd., Crewe, Cheshire, UK

<https://www.openaccessgovernment.org/irrigation-systems-enhancing-winegrape-vineyards-resilience/157257/>

Jacoby, P.W. 2023. Deep Root Zone Irrigation. WA Wine WAVEx webinar. 50 minutes.
<https://www.washingtonwine.org/wave/>

Jacoby, P.W., M. Brain. 2021. *Sub-surface micro-irrigation in vineyards*. Podcast #101: Sustainable Winegrowing with Vineyard Team, Atascadero, CA.
<https://www.vineyardteam.org/podcast/?id=877>

Khot, L.R., A. Chandel, R.T. Peters, C.O. Stockle, and P.W. Jacoby. 2021. *Drone-based grapevine water use mapping*. WSU Vit/Enology Extension News. Spring Issue pp. 6-8.

RESEARCH SUCCESS STATEMENTS

This project contributed to the overall development and application of the Direct Root-Zone (DRZ) method of delivering subsurface irrigation in vineyards. The experience revealed that vineyards using mechanical methods for weed control appear to be incompatible with the use of DRZ delivery tubes unless they are installed in very close proximity to the vine trunk at ground level. Also, the dense growth of the weed known as field bindweed *Convolvulus arvensis* is incompatible with the DRZ system, as this weedy vine attaches to the spaghetti line supplying the irrigation and may cause it to become detached when attempting to control this weed by mechanical removal. This weed was also observed to cause interference with growth and development of the newly planted vines and was observed to grow vigorously within the cardboard protection containers often used when replanting new vines. Lastly, this experiment provided the opportunity to use DRZ delivery tubes equipped with a fiberglass filter to prevent soil clogging and root intrusion which is now a feature used with the DRZ delivery device.

An additional accomplishment from this project was to fund summer internships to three (3) V&E undergraduate students (Mikayla Mars and Madelyn Calderon) in 2021 and Jenni Kowal in 2022. Additional undergraduate students (Callie Judkins and Joshua Perrault) were supported for hourly labor at the WSU Pullman campus during 2022 and 2023. Partial support during one semester in 2022-2023 was provided to Natalie Waters, an M.S. degree graduate student in my program.

FUNDS STATUS – All funds allocated to this project (\$46,555) have been exhausted within the categories presented below.

Personnel

Salaries, wages and benefits for student interns and graduate student 18,643.63

Supplies and Expenses 24,479.49

Travel 3,779.46

TOTAL 46,902.58

NOTE: \$347.58 over-run paid from gift funds

