

Impact of Rootstock-scion-virus Interactions on Grape Yield and Quality Attributes

ARS LOCATION:

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PRINCIPAL INVESTIGATORS:

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PROJECT OBJECTIVE:

Evaluation of the affects of grapevine leafroll-associated viruses and Rupestris stem pitting associated virus on yield parameters and quality attributes of self-rooted Pinot Noir and grafted onto four phylloxera-resistant rootstocks in Oregon.

MAJOR ACCOMPLISHMENTS (2007–2010):

Impacts of grapevine viruses on vine yield and berry quality:

This project conducted research to address which rootstocks are most sensitive to graft incompatibility issues when the scions are infected with grapevine leafroll-associated viruses (GLRaVs) and grapevine rupestris stem pitting-associated virus (GRSPaV), to examine the affects of virus infections x scion x rootstocks on grapevine establishment and longevity, and on grape yield components and fruit quality. A research vineyard has been established at the Botany and Plant Pathology research farm at Oregon State University, Corvallis, Oregon. The Pommard clone of Pinot Noir was grafted on to four rootstocks, namely Couderc 3309, MGT 101-14, 420A, and Riparia Gloire as well as self-rooted vines. The vineyard was two budded in the spring of 2008 and chip-bud grafted in May of 2009 and 2010. Single vines from each plot will be destructively harvested to assess graft union integrity in the fall of 2010, as well as all grapevines virus tested to ensure virus infection was successful by the field grafting. This vineyard will be maintained for several additional years to examine impact of rootstock on fruit quality when infected with these viruses and virus combinations. Fruit analysis of Pinot noir from commercial vineyards with GLRaV infections were carried out as preliminary studies to assess the impact of virus infection on fruit quality. In these studies each vineyard was managed separately making it difficult to draw comparisons between rootstocks or virus combinations. Therefore, the research vineyard established at Corvallis, Oregon will help to assess the impact of viruses under defined conditions.

Studies were also conducted to measure the impact of grapevine leafroll disease (GLRD) on grape yield and quality in own-rooted grapevines planted under cool-climate conditions. For this purpose, grapevines were identified in a self-rooted Merlot block in Eastern Washington in such a way that individual vines exhibiting typical GLRD symptoms and tested positive for GLRaV-3 were adjacent to healthy vines in a given row to minimize error in sampling and experimental results due to variations in growing conditions. Sixteen vines with GLRaV-3 infection and an equal number of

virus-free vines were included in this study. Data on total yield per vine and cluster number per vine and weight of each cluster was collected from individual vines at the time of harvest in 2008 and 2009 seasons. In addition, juice extracted from berry samples from each vine was used to measure °Brix. Cane prunings were collected from each vine in January 2009 and 2010. The results have shown significant negative impacts on vine performance, grape yield and quality.

TECHNOLOGY TRANSFER/OUTREACH:

- Naidu, R.A. 2010. Grasping the true ‘colors’ of grapevine leafroll disease. Workshop “Pest management – What’s damaging your portfolio?” Washington State Association of Wine Grape Growers annual meeting, Seminar & Trade Show. February 2-5, 2010, Kennewick, WA.
- Gutha, L.R., Alabi, O.J., Mekuria, T.A., Harbertson, J.F., Ringer, K., Keller, M. and Naidu, R.A. 2010. Impact of grapevine leafroll-associated virus-3 on the performance of own-rooted Merlot grapevines (*Vitis vinifera* L.) in cool climate viticulture. 7th International Symposium on Cool Climate Viticulture and Enology. June 20-22, 2010, Seattle, WA.
- Gutha, L.R., Alabi, O.J., Mekuria, T.A., Harbertson, J.F., Keller, M. and Naidu, R.A. 2010. Assessing the impacts of grapevine leafroll disease on own-rooted wine grapes under cool-climate conditions. WSU Academic Showcase, March 26, 2010, Pullman.
- Gutha, L.R., Alabi, O.J., Mekuria, T.A., Harbertson, J.F., Keller, M. and Naidu, R.A. 2010. Assessing the impacts of grapevine leafroll disease on own-rooted wine grapes under cool-climate conditions. Washington State Association of Wine Grape Growers annual meeting, Seminar & Trade Show. February 3-5, 2010, Kennewick, WA.
- Naidu, R.A. 2009. Grapevine leafroll disease - two sides of the coin: Viruses associated with grapevine leafroll disease. Washington State Grape Society annual meeting. November 20, 2009, Grandview, WA.
- Naidu, R.A. 2008. Combating grapevine leafroll disease. A pod cast for vineyard managers posted at <http://wine.wsu.edu/virology/>.
- Lee, J. and Martin, R.R. 2008. Impact of *Grapevine leafroll associated virus -2* and *-3*, on phenolic compounds: commercial vineyard example. XXIVth International conference on Polyphenols (ICP). Salamanca, Spain.
- Workshops and tailgate meetings were conducted for the benefit of regulatory agencies, certified nurseries and growers in Washington, Oregon, and Idaho.

EXTERNAL SUPPORT:

The Washington Wine Commission’s Wine Advisory Committee

COLLABORATOR:

Dr. Jungmin Lee, ARS, Parma, ID 83660.

RECENT PUBLICATIONS:

- Lee, J. and Martin, R.R. 2010. Analysis of grape polyamines from *grapevine leafroll associated viruses* (GLRaV-2 and -3) infected vines. *Food Chem.* 122:1222-1225.

- Lee, J. and Martin, R.R. 2009. Influence of Grapevine leafroll associated viruses (GLRaV-2 and -3) on the fruit composition of Oregon *Vitis vinifera* L. cv. Pinot noir: Phenolics. *Food Chem.* 112:889-896.
- Lee, J., Keller, K.E., Rennaker, C., and Martin, R.R. 2009. Influence of *grapevine leafroll associated viruses* (GLRaV-2 and -3) on the fruit composition of Oregon *Vitis vinifera* L. cv. Pinot noir: free amino acids, sugars, and organic acids. *Food Chem.* 117:99-105.