

Improvement of Prunus and Vitis Scions for Fruit Quality and Pest Resistance

ARS LOCATION:

Crop Diseases, Pests and Genetics Research Unit
9611 South Riverbend Avenue
Parlier, CA 93648

PRINCIPAL INVESTIGATORS:

David W. Ramming, Research Horticulturist
Phone: 559-596-2823; E-mail: david.ramming@ars.usda.gov

PROJECT OBJECTIVES:

1. Continue evaluation of existing high-quality scion selections of table and raisin grapes with large seedless fresh fruit that stores and ships well; natural 'dried on the vine' raisin trait, economic production levels with spur pruning; and enhanced anthocyanin content for fresh and processing markets.
2. Identify *Vitis* accessions resistant to powdery mildew and evaluate existing table grape and raisin breeding populations and selections for high fruit quality with host-plant disease resistance.

MAJOR ACCOMPLISHMENTS (2007-2010):

Evaluation and selection of high quality table and raisin grapes:

- a. Identified grapes with berries ranging from 8 to 12 grams with seed traces as small as parthenocarpic seedless grapes. This sets a new standard for large berry size and very small unnoticeable seed traces. Fifty-two table grape selections are in various stages of testing in cultural trials to determine their commercial potential. One white, one red, and one black selection have shown good potential for commercial production. Deliverables – improved table grape cultivars.
- b. One natural DOV raisin selection has consistently dried on the vine without cutting canes. It continues to look promising as a new cultivar for mechanical harvest for raisin production. Three new natural DOV selections look promising enough to be placed in a 27 vine advanced plot, two of which have neutral flavor like Thompson Seedless. Deliverables – raisin cultivars with the natural DOV capability that will reduce grower costs by eliminating cane cutting.
- c. Raisin types with red flesh have been developed. Tests will continue to determine their raisin quality and health benefits. A leaf disk assay has been verified that makes possible selection of red flesh seedlings while they are immature plants in the greenhouse. Deliverables – novel raisins with increased health benefits due to increased anthocyanins that should increase raisin sales.

Identification of powdery mildew resistant germplasm and improvement of fruit quality:

- a. Six different grape species have been identified as resistance sources for powdery mildew. Collaborative work is in progress to develop and use molecular markers to pyramid powdery mildew resistance. The pyramiding of resistance sources will make germplasm that is more durable in maintaining its resistance. Powdery mildew resistance in *Vitis rotundifolia* was found to be loosely linked to seedlessness.

Deliverables – molecular markers for selecting powdery mildew resistant germplasm and germplasm with pyramided sources of resistance.

b. The first powdery mildew resistant white table grape selection has been planted in the 27 vine advanced production plot. Four tray dry and 14 DOV raisin selections with powdery mildew resistance are promising enough to be put in production trials. Deliverables – table and raisin cultivars with powdery mildew resistance that will reduce pesticide use and increase profitability for growers.

TECHNOLOGY TRANSFER/OUTREACH:

- Meet with California Table Grape Commission Research committee and grower four to five times each summer so they can evaluate the advanced table grape selections.
- Presentation at CDPG stakeholder meeting, Parlier, CA, September 2010.
- Posters at the 10th International Conference on Grapevine Breeding and Genetics, Geneva, NY, August 2010.
- Presentation at the 6th International Table Grape Symposium, Davis, CA, June 2010.
- Presentation at the San Joaquin Valley Grape Symposium, Easton, CA, January 2010.
- Presentation at CA Rare Fruit Grower Annual meeting, Santa Rosa, CA, August 2009.
- Presentation to San Joaquin Valley Technical grape group, Fresno, CA November 2008.
- Presentation about grape breeding program to FPS annual meeting, Davis, CA, November 2008.
- Baldo, A., P. Cousins, D. Ramming and. Garris, A. J. Reconstructing the pedigree of a phylloxera-resistant rootstock. American Journal of Enology and Viticulture. 2009. Poster at Plant & Animal Genome Jan. 10-14, 2009
- Patents:
Australian Plant Breeder's certificates awarded for:
 - Sweet Scarlet Certificate No. 3512 Grant date 29 April 2008;
 - Princess Certificate No. 3510 Grant date 29 April 2008;
 - Autumn King Certificate No. 3509 Grant date 29 April 2008;
 - Summer Royal Certificate No. 3511 Grant date 29 April 2008; and
 - Scarlet Royal Certificate No. 3508 Grant date 29 April 2008.

EXTERNAL SUPPORT:

- California Table Grape Commission
- California Raisin Marketing Board
- California Competitive Grants Program Research Viticulture and Enology
- Viticulture Consortium West
- Consolidated Central Valley Table Grape Pest & Control District

COLLABORATORS:

Lance Cadle-Davidson, Gan-Yan Zhong, Chris Owens, and Peter Cousins, ARS Geneva, NY; Carmen Gispert, University of California, Cooperative Extension, Indio, CA; Matthew Fidelibus, University of California, Kearney Agricultural Center, Parlier, CA; Gary Takeoka and Andrew Breksa, ARS Albany, CA.

RECENT PUBLICATIONS:

- Breksa III, A. P., G. R. Takeoka, M. B. Hidalgo, A. Vilches, J. Vasse and D. W. Ramming. 2010. Antioxidant Activity and Phenolic Content of Sixteen Raisin Grape Cultivars and Selections. *Food Chemistry* 121:740-745.
- Ramming, D. W. 2010. The USDA/ARS Table Grape Breeding Program. 6th International Table Grape Symposium Proceedings p. 107-110. June 24-26, Davis, CA.
- Ramming, D. W. 2010. The USDA/ARS Raisin Grape Breeding Program. San Joaquin Valley Grape Symposium Proceedings p. 8-11. January 7, Easton, CA.
- Ramming, D. W. 2010. Drying rate of fresh berries from natural dry-on-the-vine (DOV) grape germplasm. X International Conference on Grapevine Breeding and Genetics, Geneva, NY August 2-5, 2010. Proceedings p. 172
- Ramming, D. W. and P. S. Cousins. 2010. Development of table and raisin grapes with high anthocyanins using a leaf disk assay. X International Conference on Grapevine Breeding and Genetics, Geneva, NY August 2-5, 2010. Proceedings p. 174.
- Mahanil, S., A. Garris, C. Owens, D. Ramming, L. Cadle-Davidson. 2010. Development of molecular markers for powdery mildew resistance in grapevines. X International Conference on Grapevine Breeding and Genetics, Geneva, NY August 2-5, 2010. Proceedings p. 29.
- Ramming, D. W. 2010. Greenhouse Screening of Grape Rootstock Populations to Determine Inheritance of Resistance to Phylloxera. *Am. J. Enol. and Vitic.* 61(2):234-239
- Summaira Riaz, Alan C. Tenschler, Rachel Graziani, Alan F. Krivanek, D.W. Ramming and M. Andrew Walker. 2009. Using Marker-Assisted Selection to Breed Pierce's Disease-Resistant Grapes. *Am. J. Enol. and Vitic.* 60(2):199-207.
- Garris, A. J., P. Cousins, D. Ramming and Baldo, A. 2009. Parentage analysis of Freedom rootstock. *American Journal of Enology and Viticulture. Am. J. Enol. and Vitic.* 60:357-361.
- Ramming, D. W. 2009. Water loss from fresh berries of raisin cultivars under controlled drying conditions. *American Journal of Enology and Viticulture. Am. J. Enol. and Vitic.* 60:208-214.