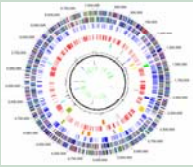
# Horticulture Crops Research Unit, Corvallis, Oregon

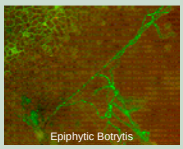
The mission of the Horticultural Crops Research Unit is to solve problems confronted by the nursery and small fruit industries through research on these horticultural crops. Our research focuses on (1) biology and management of plant diseases and insect pests; (2) plant growth and physiology, especially as influenced by mycorrhizal fungi; (3) germplasm evaluation and genetic improvement; and (4) production horticulture

**Bob Martin, Research Plant Pathologist; Subject Area: Characterization, identification and control of viruses in small fruit crops; Contact: (541) 738-4041; Bob.Martin@ars.usda.gov**
Bob's research focus is on the characterization, detection and control of virus diseases of small fruit crops. Many viruses of these crops are only known as graft or vector transmitted agents. Areas of emphasis are the characterization and identification of these unknown pathogens, development of detection methods to improve certification programs, the study of their epidemiology and development of control strategies. Controls strategies include production of virus-free nuclear stock materials, identification and management of vectors, and genetic engineering virus resistance.

**Niklaus Grunwald, Research Plant Pathologist; Subject Area: Biology and control of *Phytophthora* pathogens in nursery and small fruit crops; Contact: (541) 738-4049; Nik.Grunwald@ars.usda.gov**
Nik's research focus is on the biology and control of *Phytophthora* diseases affecting horticultural crops with particular emphasis on the Sudden Oak Death pathogen, *Phytophthora ramorum*. *P. ramorum* is a devastating exotic pathogen of many forest and nursery crops. Specific research objectives include: 1. Characterize epidemiology and genetics of *Phytophthora* spp. affecting nursery crops; 2. Functional genomics of *P. ramorum*; and 3. Integrate cultural, biological, and chemical control methods for management of *Phytophthora* diseases.

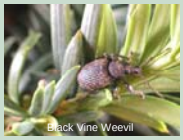

*Pseudomonas fluorescens* Pf-5 Genome

**Joyce Loper, Research Plant Pathologist; Subject Area: Molecular Mechanisms of Biological Control of Plant Disease Contact: (541) 738-4057; Joyce.Loper@ars.usda.gov**
The goal of Joyce's research is to develop knowledge of mechanisms by which bacterial biological control agents protect plants from infection by bacterial or fungal plant pathogens. She uses molecular approaches to identify the characteristics, genes and gene products of biocontrol agents that are involved in disease suppression. Working with The Institute for Genomic Research, she recently completed the genomic sequence of the biological control agent *Pseudomonas fluorescens* Pf-5, which suppresses many soilborne diseases when applied to crops as a seed inoculant. Current studies are focused on identifying factors influencing gene expression by Pf-5 using microarrays.




**Walter Mahaffee, Research Plant Pathologist**
**Subject Area: Biology and control of foliar and fruit diseases of horticultural crops; Contact: (541) 738- 4036; Walt.Mahaffee@ars.usda.gov**
The foliar pathology group is focused improving the economical and environmental sustainability of horticulture crop production systems. Projects include the development of methods for assessing inoculum presence and quantity in grower fields and correlation to disease levels, disease forecasting of powdery mildews, improving the efficacy of biological controls agents through the use of tank adjuvants, and the role epiphytic growth of *Botrytis cinerea* in Botrytis blight and fruit rot.

**Jack Pinkerton, Research Plant Pathologist; Subject Area: Biology and management of plant-parasitic nematodes in small fruit and nursery crops; Contact: (541) 738-4076; Jack.Pinkerton@ars.usda.gov**
Jack's research program is focused on the development of economic thresholds and management strategies for plant-parasitic nematodes and soilborne plant pathogens affecting grape, strawberry, raspberry, and *Vaccinium* species. Development of non-chemical and sustainable management options is a goal of this research. Management strategies being investigated include modified cultural practices (crop rotation, green manures and soil amendments, and soil solarization), the use of biological control organisms and compounds, and the identification of genotypes with host plant resistance.




**Denny Bruck, Research Entomologist**
**Subject Area: Biology and control of insect pests;**
**Contact: (541) 738-4026; Denny.Bruck@ars.usda.gov**
The long-term objectives of our group are to develop new concepts fundamental to understanding the biology of diseases of arthropod pests of nursery crops. Research is focused on understanding how microbial communities form and interact to achieve biological control, developing techniques for establishing, conserving, augmenting and manipulating microbial communities, and understanding entomopathogen etiology and how it relates to insect management.

**Jana Lee, Research Entomologist; Subject Area: Biology and control of insect pests; Contact: (541) 738-4110; Jana.Lee@ars.usda.gov**
Jana's goal is to improve biologically-based methods for pest management of foliar pests. Research focuses on the ecology, physiology, feeding and dispersal behavior of pests and natural enemies. Understanding pest-natural enemy dynamics will enable us to develop cultural, biorational, habitat manipulation, or augmentative tools for growers.

**Chad Finn, Research Geneticist; Subject Area: Cultivar development and germplasm research in blackberry, red and black raspberry, blueberry and strawberry; Contact: (541) 738-4037; Chad.Finn@ars.usda.gov**
Chad's research program has two broad, overlapping goals. First is to develop new cultivars of blackberry, raspberry, blueberry and strawberry, primarily for the Pacific Northwest commercial berry industry. The second goal is to collect and evaluate *Rubus*, *Vaccinium* and *Fragaria* germplasm from around the world. Then, as appropriate, this germplasm is incorporated into breeding material for our program as well as other breeding programs.

**David Bryla, Research Horticulturist; Subject Area: Physiology and production of small fruit crops; Contact: (541) 738-4094; David.Bryla@ars.usda.gov**
David's overall research objectives are to develop and evaluate horticultural practices for growing berry crops in the Pacific Northwest. Specific areas of study include: irrigation, fertilization, and soil management; pruning and cropping practices; pest, disease and weed management; cultivar selection; and identification of new small fruit crops. Results of this research will be the basis for modifications and improvements in production strategies used by growers of berry crops, and will clarify the impact of specific production factors on yield and quality of these crops.

**Carolyn Scagel, Research Plant Physiologist;**
**Subject Area: Physiology; Contact: (541) 738-4063;**
**Carolyn.Scagel@ars.usda.gov**
Carolyn's program investigates the influence of nutrition, hormone status, and root-associated organisms on root growth, productivity, and quality of small fruit crops. This research has three primary objectives: 1) Characterize changes in plant metabolism (nitrogen, hormones) associated with adventitious root formation, 2) Describe critical environmental aspects influencing regulation of fertilizer use and nutrition of woody ornamentals, and 3) Investigate physiological roles of beneficial root-associated organisms on root initiation and growth, and nutrient use efficiency.

**Paul Schreiner, Research Plant Physiologist; Subject Area: Below-Ground Physiology of grapevines and small fruit crops; Contact: (541) 738-4084; Paul.Schreiner@ars.usda.gov**
Paul's research focus is on the nutritional requirements of grapevines and the factors that control root and mycorrhiza function (growth, nutrient and water uptake, nutrient storage) in small fruit production systems. An improved understanding of the nutrient requirements needed to produce high quality fruit, and the factors that affect the ability of roots to supply those needs will lead to more sustainable production systems.

**Jungmin Lee, Research Food Technologist; Subject Area: Characterization, identification, and application of factors to improve wine quality; Contact: (208-722-6701 ext 282); jungmin.lee@ars.usda.gov**
Jungmin Lee's food chemistry program focuses on plant secondary metabolites. Her program works toward understanding and defining the quality of fruit and fruit products by analytical method development, compositional analysis, and its relationship to improving quality. Current projects examine the management of polyphenolics, evolution of tannins, and investigate the influence of cultivar, vine physiology, cultural practices, plant diseases, and nutrients on the chemical components of food.

**Julie Tarara, Research Horticulturist; Subject Area: Microclimate and grapevine biology; Vineyard production systems; Contact: (509) 786-9392; jtarara@wsu.edu**
Julie's research focuses on grapevines (juice and wine grapes) and their response to the environment (temperature, radiation, humidity, wind). As in many horticultural crops, cultural practices are used by grape growers to modify the microclimate of the vineyard. Their goal in so doing is to improve the quality of the grapes at harvest. Maximum quality can be more important than maximum yield for juice and wine-grape growers alike. Julie collaborates with plant physiologists and food chemists to conduct experiments in the vineyard to increase our knowledge of how the vineyard environment affects grapevine biology.

**Krista Shellie, Research Horticulturist; Subject Area: Viticulture (Wine Grapes); Contact: (208) 722-6701; kshellie@uidaho.edu**
The goal of Krista's research is to identify viticulture practices that optimize wine grape productivity & fruit quality. Her program addresses wine grape production physiology under warm, short-season, semi-arid growing conditions with risk of winter cold injury. Current projects include: deficit irrigation strategies that optimize water use efficiency, particle film application for alleviation of heat stress, and genotype evaluation.