Colorado State University
Knowledge to Go Places

Western PhytoWorks

Western Colorado Research Center

Spring 2005

Susan Baker Receives Agricultural Experiment Station Award

In January 2005, Susan Baker, Accounting Technician with the Western Colorado Research Center received the Agricultural Experiment Research Center Staff Award in recognition for significant contributions to WCRC by taking leadership in a support position, contributing to the Center's outcomes, working with clientele and exhibiting a broad interest in the Center's success. This award was presented at the annual AES meeting on the campus of Colorado State University in Fort Collins.

Susan was raised in Puerto Rico and is fully bilingual and bicultural. She earned a BA in sociology at Manchester College in Manchester, Indiana in 1969, completed a BS in Construction Management in 1988 from CSU, and completed a four-year theological program by extension in 1994 from the Seminary—leading to her ordination as an Episcopal priest. Her work experience includes banking in Puerto Rico, work in the Mesa County Health Department, and as a pastoral care provider at the Church of the Nativity. From her roots as the daughter of Presbyterian missionaries, Susan has devoted a significant part of her life to teaching Christian education classes for children and has a deep involvement with the Hispanic Community in the Grand Valley.

For over eight years, Susan has been employed by WCRC serving three sites at Orchard Mesa (Grand Junction), Fruita, and Rogers Mesa (Hotchkiss). Susan provides accounting support for research projects, as well as operating and administrative accounts associated with the seven faculty, five field support personnel, and the WCRC manager. This work includes account reconciliation, document preparation, payroll, reimbursements, billings and collections, receipts and deposits, budget oversight and resolution, and ongoing work with the various University computer applications. Susan's job requires her to be aware of program and project objectives and to be in continual communication with researchers and staff at all three sites.

One of the potential downsides to working at a distant off-campus research center is the possibility that the site and personnel will be left out of the campus communication loop or fail to receive critical information in a timely matter. Susan has been extremely persistent in working to overcome such obstacles by establishing and maintaining contacts in key departments on campus.

Susan's creativity is a very valuable asset to WCRC. She sought and obtained training on Dreamweaver website design software to move the WCRC website from basic maintenance to a functional tool designed to highlight WCRC and provide higher quality information to clientele in an easy to use format. During the spring of 2004, Susan redesigned our website, developed content pages and link strategies, sought staff input, and then launched the new improved sight with minimal problems. The utilization of this forum to communicate with clientele is increasing as a result of her efforts, and we have received several comments on the professional quality of the site and its ease of use. In addition, Susan created new WCRC brochures that are both attractive and up to date with program information, and her successful design of our annual report cover has lead to this becoming one of her responsibilities. In short, we are benefiting from Susan's creativity in the professional manner in which WCRC is portrayed to clientele through electronic and print formats.

Susan is an enthusiastic, hardworking staff member who has had an immense impact on ensuring the improvement and smooth running of management systems at all three WCRC sites. The many positive comments we have received in response to workshops, seminars and other outreach activities at WCRC are a direct result of Susan's efforts and "behind the scenes work" that ensures that these critical events will run smoothly and accomplish their objectives. Her proactive nature and responsiveness to unplanned events and potential problems is a tremendous asset to WCRC that allows us to accomplish the mission of the center. Congratulations Susan! For more information on this article, please contact Frank Kelsey (frank.kelsey@colostate.edu).

Susan Baker accepts award from Dr. Frank Johnson, Agricultural Experiment Station.

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Editor: Dr. Ron Godin

Direct questions and comments to:
Susan E. Baker
Phone: 970-434-3264, Ext. 201
Fax: 970-434-1035
E-mail: susan.baker@colostate.edu

Residual Herbicides: A Looming Problem in the Transition from Fruit to Vegetable and Forage Production

Rick Zimmerman, WCRC-Rogers Mesa and Holli Linman, Student, Hotchkiss High School

In 2004, a tomato and pepper trial was established at WCRC-Rogers Mesa into ground that had previously been planted in apple production for over 20 years. The apples that were removed from this block in 2001 were managed conventionally. The objectives of the vegetable trial were to evaluate a mix of heirloom and hybrid varieties under local conditions and determine the dynamics of the insect pest complex. Tomatoes and peppers were planted as transplants into the old orchard ground. After 3 weeks, symptoms of what initially appeared to be mineral deficiencies started to be expressed in the pepper plants. The symptoms exhibited by the plants were white veins and stems. Upon closer observations, we noted that the symptoms were expressed by those plants which were planted in the old tree rows. Pepper plants which were planted in the alleyways of the old apple block were normal with green veins and stems. Herbicide injury was difficult to assess in the tomato planting due to infections of curly top disease in the tomatoes. After investigating spray records, we suspected the symptoms were caused by herbicides which had been applied during the course of managing the apple block.

Solicam injury on peppers.

Solicam affect on pepper growth Affected peppers, top. Non affected peppers, bottom.

Spray records revealed that in 2001, the herbicide Solicam (common name: norflurazon) was applied in the tree rows for weed control. Solicam (Syngenta Crop Protection, Inc.) is registered for use in tree fruits, nuts, asparagus and grapes. Norflurazon is also sold under the names Zorial and Evital. Norflurazon provides broad spectrum control of grass and broadleaf weeds. Norflurazon was applied as a band alongside the trees at the rate of 5 lbs per acre to produce a weed free strip. Norflurazon is absorbed by the roots of weeds as they germinate and is translocated to the growing parts, where it inhibits carotenoid biosynthesis, resulting in chlorophyll photodegradation in susceptible species. On emergence from the soil, the weed seedlings turn white or pinkish, become necrotic and die. The pepper plants affected by the norflurazon were stunted with white stems and white veins in the leaves. Some plants did die. Peppers produced on the affected plants were significantly smaller than the peppers produced on those plants which were not exposed to the noraflurazon (see photos).

Noraflurazon is known to have a long residual life in the soil and it does not readily leach. The longevity of the residual activity of norflurazon is increased in alkaline soils, such as those found in Western Colorado. Norflurazon has a high affinity for organic matter, becoming bound and unavailable to plant roots. Western Colorado soils typically have less than 2 percent organic matter. An experiment was designed and conducted in order to determine the best protocol for remediating the noraflurazon contaminated soil. Two methods were persued in the experiment: 1) adsorption of noraflurazon to activated charcoal particles and 2) binding of noraflurazon to organic matter incorporated via cover crops and soil amendments. Soil was collected from contaminated areas within the pepper block and uncontaminated soil was collected from an area where there has been no known applications of herbicide. Soil from both sites was placed into one quart plastic pots in our greenhouse. The activated charcoal was applied as a surface application and incorporation into the top two inches of soil. The cover crops were then planted into the both the contaminated and uncontaminated pots and buckwheat, fava beans, oats, field peas and garden peas were seeded into the pots. There was also a compost treatment. All treatments were replicated. The cover crops were allowed to grow for eight weeks. At this the time, the above-ground biomass was chopped into small pieces and incorporated into the soil. After 1 week, cucumber seeds were planted into ¼ of the pots (contaminated and non contaminated soil). This was repeated after 2 and 4 weeks. Cucumber seedlings were used because they readily take up herbicides, thus making excellent indicator plants. All treatments, including the activated charcoal, incorporated cover crops and compost were watered twice daily for several minutes for the duration of the experiment. This allowed for potential movement of norflurazon in the soil. This would theoretically lead to the adsorption of the noraflurazon molecules to the activated charcoal particles, and the decomposing cover crop.

All treatments failed to deactivate the noraflurazon molecules in the soil. The cucumber seedlings in the activated charcoal treatments, the compost treatment and the 1 and 2 week biomass treatments displayed symptoms of noraflurazon "poisoning". Most of the seedling planted in these treatments died before reaching the true leaf stage. The cucumbers planted into the cover crop treatments which had been left to decompose for 4 weeks, did not show symptoms from the norflurazon until well into first leaf stage.

Laboratory tests conducted by the Syngenta Corporation Analytical laboratory found that norflurazon was present at 0.14 ppm in the soil collected from around affected pepper plants. This residual level of norflurazon is clearly still biologically active nearly 4 years after the last application.

The affected block will be continuously cover cropped for the 2005 growing season. The purpose is to significantly increase the organic matter of soil in order to bind the remaining noraflurazon molecule. Norflurazon has been widely used in western Colorado fruit orchards. At the present time, many of these orchards are being converted to other types of cropping systems such as vegetables, forages and pastures. We have seen symptoms of norflurazon in the forage plots which were planted into other old apple blocks at the Rogers Mesa site. Growers may misdiagnose affected plants as having mineral deficiencies. This would not only cost the grower immediate economic loss, but future crop and economic losses.

For more information please contact Rick Zimmerman (Rick.Zimmerman@colostate.edu)

Colorado State University Joins Local High School Science Students

Rick Zimmerman –WCRC – Rogers Mesa

Colorado State University's Western Colorado Research Center (Rogers Mesa site) is providing mentoring and laboratory space to science students who attend Hotchkiss High School. During the past three years, several students working out of the entomology lab at the research center have place first or second among all scientific categories at the Western Regional Science Fair in Grand Junction. A few of these students have gone on to win a state title in categories such as microbiology and zoology. Also, 4 students who have conducted experiments at Rogers Mesa have won all-expense paid trips to compete in the INTEL- ISEF International Science and Engineer Fair. The science and engineering fair is attended by competitors from around the world. The topics which students have worked on include grape mealybug parasites, soil biology, bacteriology, biological control of mosquitoes, biological control of corn sap beetles and environmental remediation of agricultural pesticides. This year two students, DJ Horton and Holli Linman (both sophomores) won first and second place overall at the Western Regional Science Fair with their science fair projects. DJ Horton is studying the potential for controlling sap beetle with entomogenous (insect predatory) nematodes. Holli Linman conducted the norflurazon remediation study that is discussed in this issue of Western Phytoworks. DJ won second place overall and Holli won fourth place in the plant biology category at the 2005 Colorado State Science Fair held on the Colorado State University campus. DJ also won the poster competition at the Utah Intermountain Junior Science and Humanities Symposium and was awarded a trip to the International Junior Science and Humanities Symposium in San Diego. Both students will be competing at the INTEL-ISEF International Science & Engineering Fair in Phoenix, Arizona in May 2005.

A majority of high school students never get this type of exposure and interaction with university research scientists. This not only leads to the development of potential scientists, but also reinforces the role and impact that Colorado State University can have on high school students in rural communities such as Hotchkiss.

For more information please contact Rick Zimmerman (Rick.Zimmerman@colostate.edu)

Research Projects for 2005

Below is a list of the WCRC researchers and their on-going and up-coming projects for 2005.

Dr. Horst W. Caspari

Viticulture and enology programs for the colorado wine industry (Colorado Wine Industry Development Board; H. Larsen & R. Zimmerman, CSU)*

Short- and long-term effects of Partial Rootzone Drying on tree physiology, fruit quality and yield of apples (Washington Tree Fruit Research Commision; M. Whiting, Washington State University)

Methods to delay bud break in grape (Viticulture Consortium East; H. Larsen & C. Stushnoff, CSU, and I. Dami, Ohio State University)

Methods to delay bud break in grape, apple, and peach (Valent Biosciences Corp.; H. Larsen, CSU)

Application of crop modeling for sustainable grape production (Environmental Protection Agency; H. Larsen, CSU)

Dr. Ron Godin

Native Seed Production for Crop Diversification (WSARE,sponsor, Uncompahgre Plateau Project, USFS, BLM, Public Lands Partnership, C&C Roberts Farm and Herz Farm, cooperators).

Irrigation Water and Soil Acidification Project on Sweet Corn. (Del Mesa Farms, sponsor, Olathe Sweet Corn, W. Cooley, CSU Cooperative Ext., NRCS, cooperators).

Organic Weed Control in Vegetables (US-EPA, sponsor)

Brewing hops variety trial.

Organic seedless table grape variety trial.

*Sponsors/Cooperators are noted in parenthes

Dr. Harold Larsen

Stone fruit replant problem studies (9 field studies (last fall) + greenhouse studies (spring 05)

Grape bud burst delay studies (H. Caspari, CSU)

Grape powdery mildew control studies (H. Caspari, CSU)

Computer modeling for crop & pest & disease management (using weather data) -- (grapes w/ H. Caspari, CSU).

Alleviation of fruit tree chlorosis (Jim Miller orchard & R. Godin, CSU).

Nematode control options (lab & cooperator locations).

Update Tree Fruit Guide + Grape Guide.

Revise both the Fruit Production Resource CD & the Master Gardener Fruit Resource CD.

Dr. Calvin H. Pearson

Winter wheat cultivar performance test - Hayden (Mike and Dutch Williams, Dr. Scott Haley, C.J. Mucklow)
Spring wheat cultivar performance test - Hayden (Mike and
Dutch Williams, Dr. Scott Haley, C.J. Mucklow)
Using polyacrylamide to increase yield in winter wheat - Hayden (Mike and Dutch Williams, C.J. Mucklow)
Long season corn grain hybrid performance test - Fruita (Dr. Jerry Johnson, seed companies)
Short season corn grain hybrid performance tests - Fruita, Delta (Wayne Brew, Dr. Jerry Johnson, seed companies)
Corn forage hybrid performance tests – Fruita and Olathe (Earl Seymour, Dr. Jerry Johnson, seed companies)
Sweet corn inbred flowering trial - Fruita (Syngenta)
Alfalfa variety performance test (2005-2007) - Fruita (Dr. Jerry Johnson, seed companies, breeding companies, private industry)
Alfalfa germplasm evaluations, 2004-2006 - Fruita (Dr. Peter Reisen of Forage Genetics)
Evaluation of Roundup-Ready alfalfa, (2005-2007) - (Forage Genetics and Monsanto)
Pinto bean cultivar performance test - Montrose (Keith Catlin, CDBAC, Dr. Jerry Johnson)
Hybrid poplar performance tests (2000-2005) - Fruita, Orchard Mesa, and Hotchkiss (Dr. Matt Rogoyski, Dr. Ron Godin, Frank Kelsey, and staff)
National winter canola variety trial – Fruita
Performance of three plant species grown in three potting mixes (2004-2005) – Grand Junction
Sunflower seed burial study (2005-2007) – (Dr. Allison Snow, Ohio State University)
Development of sunflower as an industrial, natural rubber-producing crop (Drs. Katrina Cornish and Colleen McMahan, USDA-ARS, Albany, CA; Dr. Jay Keasling, U.C. Berkeley; Dr. Dennis Ray, University of Arizona; Dr. John Vederas, University of Edmonton, USDA-CSREES)

*Cooperators/collaborators/sponsors are noted in parentheses.

Dr. Matt Rogoyski

Water Conserving and Labor Efficient Irrigation System For Container-Grown Crops.
Control of Weeds in Container-Grown Herbaceous Perennials. (IR-4 USDA in cooperation with Dr. Klett, CSU in Fort Collins).
Multi-site Evaluation of Woody Plants for Colorado. (in cooperation with Plant Select ® and Rob McDonald, who is Dr. Klett's graduate student).

Dr. Rick Zimmerman

Survey natural enemy complex in sweet corn.
Investigate life history of the onion thrips.
Determine population dynamics of grape mealybug on western Colorado wine grapes, including the evaluation of narrow spectrum insecticides and biological control. (H. Caspari, Harold Larsen, CSU & RMAVV)
Insecticide Trials: evaluate insecticides for the control of onion

State and Federal Budget Update

Frank Kelsey, Manager, WCRC

The latest federal budget proposal for the fiscal year that begins October 1, 2005 calls for significant changes to the funding model for land-grant universities such as Colorado State University. If implemented, this budget proposal would reduce agricultural research funding (known as Hatch funds) and forestry research funding (known as McIntire-Stennis funds) by 50% in fiscal year 2006, and eliminate those funds completely in fiscal year 2007. These cuts, combined with the proposed elimination of Animal Health and Disease funds in fiscal year 2006, would result in a 27% cut in base funding to the Agricultural Experiment Station at CSU. The university has projected that elimination of these base funds will result in the elimination of 18 faculty, 24 support staff, and 17 graduate student positions, and require closure of approximately 50% of the off campus research centers in Colorado. The potential impact on CSU and other land-grant universities has been summarized and is available on the web at http://www.nasulgc-bac.com/.

The federal budget proposal calls for a shift to a competitive grants program in lieu of the current funding system. Some potential drawbacks associated with such a change include the loss of base support for research in the control of complex livestock diseases, management of forest and range ecosystems, IPM, biological control, irrigation efficiency and salinity research, and crop production and variety development. Another concern is that a shift to a national competitive grants program could result in a significant shift in resources to research that does not support projects critical to Colorado clientele.

The overall federal budget proposal will receive considerable attention by Congress and is almost certain to be modified significantly from the initial proposal. It is not known at this time if the proposed changes to Agricultural Experiment Station funding will proceed as proposed, with modification, or be rejected.

At the state level, the Colorado legislature is moving toward a ballot measure that would address the current ratchet effect caused by the interaction of the Taxpayer Bill of Rights (TABOR), Amendment 23, and the Gallagher Amendment. The combined impact of these amendments is that a higher percentage of the State General Fund must be used to fund increases in mandated and protected programs such as K-12, Medicaid and Medicare. Approximately 85% of the state's budget is allocated to such programs. Higher education is the largest single expenditure of the remaining 15% of the state budget that can be cut to balance the budget. This scenario has led to significant budget reductions at CSU and the Agricultural Experiment Station in recent years. It is possible that there will be more than one measure to vote on dealing with the state's financial crisis, as there are a few private groups with various proposals actively working to address this issue on the ballot in the November election. The Agricultural Experiment Station will provide more information on the potential impact of the various initiatives on existing programs when the ballot is finalized and the details of the various options is known. For more information on this article, please contact Frank Kelsey at frank.kelsey@colostate.edu.

WCRC's Cooperation with IR-4

Bryan Braddy and Clark Oman

The Program

The IR-4 program continues to perform vital research on specialty crops in Colorado through cooperation with the Western Colorado Research Center. IR-4 is successfully driven by Dr. Sandra McDonald and Clark Oman of CSU's Department of Bioagricultural Sciences and Pest Management. Examples of work in the program are visible center-wide.

-Bob Hammond and Dr. Rick Zimmerman are performing efficacy and residue trials on onions

-Dr. Matt Rogoyski is participating in the study of weed control in containerized systems

-Staff at the Rogers Mesa site are participating in the program by continuing their training and applying IR-4 study compounds in cooperator orchards

IR-4 was established in 1963 as a partnership among researchers, producers, and federal agencies. The purpose of the entity was to increase the pest management options for minor crops. Field and laboratory residue data can be submitted to the EPA to gain clearance for use of new pest management options on minor crops. A minor crop is one that is grown on 300,000 total acres or less in the U.S. This includes most fruits and vegetables, nuts, herbs, and more recently greenhouse/nursery grown crops. It is interesting to note that minor crops account for 40% ($40 billion annually) of the total agriculture income in the U.S. To date, IR-4 has obtained 7,200 new chemical clearances for minor crops and over 10,000 clearances for green industry crops.

Operation

Today, IR-4 is recognized as a highly collaborative organization involving the USDA, the land grant university system, crop protection industry, the EPA, growers and grower commodity groups. In order to facilitate a new chemical clearance, this organization must decide how to implement many steps. First, there must be an identification of need. This can be a request made by specialty crop growers, commodity groups, land grant university and extension personnel, or USDA scientists. After a formal request is made, the afore mentioned groups meet at Food Use and Ornamental Workshops to prioritize the most important needs. Then the IR-4 National Research Planning Meeting is held to develop the final work plan. Implementation of the work plan commences when the protocols are developed and assigned to Field Research Centers based on the EPA's geographical requirements. Crops are grown, pesticides are applied, and samples are harvested for chemical residue analysis (green industry crops only require plant toxicity and efficacy data). Once the data is collected, it is scientifically reviewed, summarized, and prepared as a petition at IR-4 Headquarters based on the results obtained from the field or laboratory. Final approval must be given by the EPA before the pesticide can become available and/or be relabeled by the manufacturer for those specific uses for the minor crop grower.

Grower Cooperators and WCRC

One of the most integral pieces of the IR-4 puzzle is the grower cooperator. Many times, the most relevant research is conducted in true agricultural situations. The cooperator allows IR-4 trained personnel to apply test pesticides on their farm. The cooperator is reimbursed for the crop used by the program. In order to be selected as a cooperator, the farm's records must be current and thorough. Records need to include chemicals applied on the farm, irrigation history, harvest info, etc. Bob White of White Ranches on Rogers Mesa recently was nationally recognized as an outstanding grower/cooperator by IR-4. Mr. White

has allowed staff at the WCRC-Rogers Mesa to apply IR-4 pesticides on some his sour cherry crop in Hotchkiss. This aids the IR-4 staff at CSU as well because they don't need to travel across the state to apply a 100 gallon spray. This reduces operating costs, ensuring that research support funds can be used in the most efficient manner to benefit the entire program. George Osborn and Bryan Braddy at the Rogers Mesa site have been trained in Good Laboratory Practices (GLP) and attend annual training workshops to stay compliant with guidelines for IR-4 applicator/handlers.

Other IR-4 Facts

IR-4 strives to stay compliant with EPA's Food Quality and Protection Act. FQPA is an act that aims to lower toxic exposure of chemicals to humans, wildlife, beneficial plants, and groundwater. In fact, 80% of chemicals cleared under the program fall under this relatively new act. This is a double benefit as the new clearances actually replace the old formulations lost due to FQPA.

This article was a collaborative effort by Bryan Braddy, Clark Oman, and information that can be found on the IR-4 website. For more information, contact Bryan at bryan.braddy@colostate.edu, Clark at coman@lamar.colostate.edu, or visit the IR-4 website at www.ir4.rutgers.edu.

Jim Rohde and Kim Schultz planting native crop seed.