Proposal Summary

Proposal Name: Developing the California Fresh Fig Industry

Abstract

A fresh fig program is being developed at the University of California and based at Kearney Agricultural Center. It will have the goal of understanding the biology of new cultivars, extending their marketing period, and maintaining their postharvest quality. As a first step, we will consolidate domestic and overseas information and make it available to our growers. We will also establish a fig research plot with a grower cooperator that will include current fresh fig cultivars as well as promising varieties available through the USDA and commercial sources in Europe. This planting will be used as a demonstration plot for growers and allow us to observe promising cultivars under San Joaquin Valley conditions. It will also form the basis for preharvest and postharvest research studies. The fresh fig industry is growing rapidly, and is working to establish a marketing order for 2005. Establishing a UC research and outreach program will greatly benefit this new industry and encourage its development.

Priority Core Issues

- **Sustainability and Viability of Agriculture**
  Developing and implementing effective strategies to ensure the ecological sustainability of California agriculture that focus on the opportunities and challenges associated with:
  Transition to organic production techniques;
  New crops and breeds;
  Biotechnology.

Current Workgroup: No workgroup selected

Total Amount of ANR Support Requested: $13,510

Project Justification:

Provide a succinct justification for the activity, including:

1. Identify the core issue and target opportunity to be addressed and outline the specific aspects that will be the focus of the project.
2. Describe the importance and how this project will make significant contributions to successfully addressing core issue and target opportunity. Include brief background information and review of previous and current related ANR and other relevant research and extension efforts (Include URL(s) and/or attach list of literature cited in text proposal);
3. Provide rationale for the proposed project teams' capacity and comparative advantage to address this issue(s) and target opportunity(ies).

Due to low prices and increasing competition from other crops and countries, California growers producing traditional crops in the San Joaquin Valley are facing difficult economic times. Therefore, growers are looking for economically viable alternatives to traditional crops. Fresh fig, an environmentally friendly crop, is showing a lot of promise. The current challenges are the limited number of fresh fig cultivars available, the need to develop a preharvest technology to synchronize harvest, the need to find ways to reduce production costs, and the need to apply postharvest technologies to maintain quality and extend shipping/marketing potential. The fresh fig growers are working to establish a marketing order by 2005. By providing leadership in the development of technology prior to the creation of a Fresh Fig Commission, UC will create a positive long-term relationship with this group. At this point, the petition to create a fresh fig commission is being reviewed in Sacramento by the USDA.

Our proposed team includes the current and long-term dry fig liaison, Dr. Louise Ferguson. She has responsibilities within the UC for figs, and over her career has developed the expertise that will assure the positive development of this program. Mr. Andris and Mr. Holtz are farm advisors in the two counties where figs are currently produced. Mr. Andris and Mr. Holtz have production and pathology expertise that will benefit the development of this program. Dr. Michailades is a UC Davis plant pathologist stationed at the Kearney Agricultural Center (KAC). Dr. Michailades has been working with figs for several years with support from the Fig Institute. Mr. Bentley is a resident entomologist at KAC. Thus, Dr. Michailades and Mr. Bentley will be excellent on site experts for any problems that we observe in the field or during storage. Dr. Stover is the new curator at the USDA Germplasm Repository, where a fig collection is available. Dr. Stover will provide currently available fig material and coordinate any potential introductions from overseas. Dr. Crisosto is a UC Davis postharvest physiologist stationed at KAC since 1990; Mr. Garner and Ms. Crisosto are part of Dr. Crisosto's team working on postharvest physiology and technology since 1992. This interdisciplinary and balanced group includes most of UC personnel that have been and could be working on fresh figs.

Describe the budget in terms of:

- General statement of need for ANR funding (Note: funding request not to exceed $35,000 except in instances that can be clearly and richly justified);
- Other support available for the project and explanation of relationship to current proposal;
- Plans for leveraging additional support.

Figs have long been grown for drying. However, there is little information available for handling the fruit fresh. Since the current fig marketing order does not cover fresh fruit, growers have organized to create a fresh fig marketing order for 2005. Once in place, this marketing order will generate a budget for the basic research that this industry needs to develop. To give this industry a kick-start, we are requesting ANR funding as "seed money" for an expected long-term research program. Our expectation is for the new commission to continue funding this research after the first year. Because of the industry's immediate needs, the lack of current information, and the potential marketing opportunity for this commodity group, we believe that this ANR project will have a tremendous impact in the short term as well as in the long term.

For the 2005 season, we received $15,000 support from the fig growers to start this program. In addition, they will provide plant materials for the research plot as well as care for the planting.

By establishing a research and demonstration plot in the main production area of California and generating immediately useful posharvest handling information, we will attract future funding for all aspects of fig production from the fresh fig commission. The fresh fig marketing order continues to move forward and it is under review by the USDA in Sacramento. In general, fig growers have been very supportive of the research component of the marketing order and in particular are interested in postharvest shelf life.

Budget Details:

Using the following format, detail budget for 2005 and 2006:		
Expenditure Category (Include descriptions- 150 chars max- as appropriate below)		**Total $ Requested** Feb 1, 2005-Jun 30, 2006
Staff Salaries:	SRA-II, 50% for 6 months	$9,450
Justification	SRA-II (Garner)50% for 6 months; Mr. Garner is located at Kearney Ag Center and will conduct studies on fig postharvest biology and physiology,	
Staff Benefits		$2,835
Supplies & Expenses:	Packaging and Gases	$700
Justification	Fruit packaging ($200) and gases for controlled atmosphere storage($500).	
Travel:	Vehicle mileage	$525
Justification	Travel estimated as the following: -KAC to UC Davis germplasm repository. 360 miles in each RT. -KAC to plot site in Madera. 150 miles in each RT.	
Equipment:	None	$0
Justification		
	Grand Total	**$13,510**

Project Goals and Outcomes:

1. Overall purpose, goals and specific objectives proposed for the project (Number objectives and limit them to one sentence each);
2. Potential benefits/impacts and ultimate outcomes of the proposed project, including how the project serves the 'public good' and how the project will help build ANR's capacity in critical program component(s) area.

The main goal of this program is to create a relationship with the industry and among UC peers with interests in fresh fig that will help to develop a research and outreach program. ANR funding will support activities in the first and part of the second year. We expect subsequent activities to be supported by the fresh fig commission. We are proposing the following objectives:

1. Consolidate domestic and foreign information on figs (first and second year).
2. Establish a research plot with a grower cooperator (first and second year).
3. Visit production areas frequently during the growing season and observe fruit behavior during storage (first and second year).
4. Evaluate market life for current commercial fresh fig varieties (first and second year).
5. Describe fig antioxidant capacity and quality changes during ripening and storage (first and second year).
6. Introduce European fig varieties to the research and demonstration plot (second year).
7. Study fig deterioration factors in the field and storage (ongoing).
8. Evaluate cooling and temperature management benefits on market life of different fig cultivars (second and third year).
9. Study the use and practical implementation of controlled atmosphere storage and modified atmosphere packaging on fig market life (second and third year).
10. Compare the effects of different packaging systems on fig physical damage and deterioration (second and third year).

The development of a fresh fig industry will benefit many growers whose livelihoods depend on the economic success of their crops. It will also give the opportunity to consumers to eat an environmental friendly and highly nutritious fruit. This research and outreach program will help to initiate a joint venture with a group that historically has loyally supported UC extension.

Project Action Plan and Methodology:

1. Approach to the project, methods to be used and time line, including (1-2 pages is recommended);
2. The nature and extent of collaboration, including listing of ANR and non-ANR collaborators and specific roles;
3. Evaluation plan including description of the process to determine that the expected outcomes and impacts have been achieved. Describe the information to be collected, when, how and from what sources.

Approach. Objectives 1, 2, 3, 4, 5 and 6 will be initiated during the first year of this project. Planting recommendations will be obtained from the industry and discussed with UC experts. During the first and second year, Dr. Stover and I will be searching for European cultivars and coordinate the importation process (Objective 3).

Chemical and physical changes of 'Black Mission', 'Brown Turkey', 'Kadota', and 'Calimyrna' fig will be measured during ripening and storage. Fruit will be harvested at different periods during ripening and immediately transported to the Kearney Agricultural Center for quality evaluations and storage. Quality evaluations will include measures of fruit firmness, color, soluble solids concentration, antioxidant potential and others using methodology modified from Colelli et al. (1991).

During the second season, objectives 7, 8, 9 and 10 will be initiated.

Collaboration. Dr. Crisosto will be responsible for executing and overseeing the project. He and his team (Mr. Garner and Ms. Crisosto) will collect domestic and European fresh fig information. Information with the pertinent limitations will be distributed in our industry. Crisosto's team will carry out the postharvest research described in the objectives above. With the help and advice of Dr. Ferguson and Dr. Stover, Dr. Crisosto will supervise the introduction and establishment of the fig plot. The day-to-day supervision of the plot will be assigned to Dr. Ferguson, Mr. Andris, Mr. Holtz, and industry members. They will coordinate field operations with industry representatives.

Evaluation. As this industry is just starting, our group will generate a summary of potential problems and recommended research areas to develop. The results of our initial quality evaluations (antioxidant activity, market life) will be posted on our web sites and distributed to the industry. The establishment of a research plot on a grower's property (by March 2006) will serve as a measure of our progress as well.

During the second year, we will be able to track the number of people visiting our web sites for fresh fig information. New research supported by funding from the fresh fig commission will also indicate program success.

Project Dissemination Plan:

Indicate how and where the results of the proposed project will be disseminated in a form that is available to a broader audience and identify key constituencies that will be targeted for receiving project results and benefits.

Initially we will extend the information through direct consultation, laboratory open houses and workshops with individual companies, articles in our newsletters (the *Central Valley Postharvest Newsletter* and the *Perishables Handling Quarterly*), and development of a fresh fig quality resource area on our websites (http://www.uckac.edu/postharvest.html; http://fruitsandnuts.ucdavis.edu/). Based on information from this season's work , a fresh fig web site was created which is under construction and our first fresh fig day took place during our harvesting season.

These web sites already include many articles relevant to our fresh fig growers, packers, shippers and handlers. Farm advisors will also be active participants in the extension of this information. As a group, we expect to initiate an annual fresh fig research meeting after the first year of research.

Items below here do not count towards 10 page limit

Project Team

PI	Name	Email	Title
		Location	Appointment
PI	Carlos H. Crisosto	carlos@uckac.edu	Postharvest Physiologist
(559) 646-6596		UC Davis (KAC), Dept. of Plant Sciences	Joint AES/CE 60% CE 40% OR

Role Dr. Crisosto will supervise all of the aspects of the project related to the postharvest physiology of figs, as well as be responsible for overall project coordination in cooperation with Dr. Ferguson.

Pubs Brummell, D.A., V.D. Cin, S. Lurie, C.H. Crisosto and J.M. Labavitch. 2004. Cell wall metabolism during the development of chilling injury in cold-stored peach fruit: association of mealiness with arrested disassembly of cell wall pectins. Journal of Experimental Botany 55(405): 2041-2052. Crisosto, Carlos H., David Garner, Harry L. Andris, and Kevin R. Day. 2004. Controlled delayed cooling extends peach market life. HortTechnology 14:99-104. Crisosto, Carlos H., David Garner, Gayle M. Crisosto, and Earl Bowerman. 2004. Increasing 'Blackamber' plum (Prunus salicina Lindell) consumer acceptance. Postharvest Biology and Technology 34: 237-244. Crisosto, Carlos H., David Garner, and Gayle Crisosto. 2002. High carbon dixoide atmospheres affect stored 'Thompson Seedless' table grapes. HortScience 37(7):1074-1078. Crisosto, Carlos H., R. Scott Johnson, and Ted DeJong. 1997. Orchard factors affecting postharvest stone fruit quality. HortScience 32(5):820-823.

Co-PI	Louise Ferguson	Louise@uckac.edu	Pomologist
(559) 646-6541		UC Davis (KAC), Dept. of Plant Sciences	CE Specialist 100% CE

Role Dr. Ferguson will provide expertise in the field cultivation of figs. She, along with Dr. Crisosto, will provide general oversite of the project.

Pubs Doyle, J.F., Louise Ferguson and K. Herman. 2001. Fig cultivar development and evaluation. International Society of Horticultural Science Second International Symposium on Fig, Cacares, Spain, May 7-11, 2001. Acta Hort. 605:29-32. 2. Ferguson, Louise, Maria Mariscal, Heraclio Reyes, Paul Metheney, and Kevin Herman. 2001. Using trunk girdling to improve Black Mission fig size. International Society of Horticultural Science Second International Symposium on Fig, Cacares, Spain, May 7-11, 2001. Acta Hort. 605:167-169. 3. Chao, C.T., D.E. Parfitt, L. Ferguson, C. Kallsen, and J. Maranto. 2004. Genetic analyses of phonological traits of pistachio (Pistacia vera L.) Euphytica 00:1-5. 4. Wu, Laosheng, Guanglong Feng, John Letey, Louise Ferguson, Jeff Mitchell, Blake McCullough-Sanden, Gary Markegard. 2003. Soil management effects on the nonlimiting water range. Geoderma 114:401-414. 5. Ferguson, L. 2003. Progress in breeding subtropical fruit crops. Proceedings, XXVI IHC Genetics and Breeding of Tree Fruits and Nuts. Acta Hort. 622:45-56.

Coop.	Brent Holtz	baholtz@ucdavis.edu	Farm Advisor, Madera
(559) 675-7879		UCCE Madera County	CE Advisor 100% CE

Role Brent Holtz is the Farm Advisor responsible for figs in Madera County. He has expertise in fig production and pathology. He will be responsible for helping to establish the demonstration plot and for extension of information to his clientele.

Pubs 1. Holtz, B.A., McKenry, M.V., and Caesar-TonThat, T.C. 2004. Wood chipping almond brush and its effect on the almond rhizosphere, soil aggregation, and soil nutrients. Acta Horticulturae 638:127-134. 2. Holtz, B. A. and Hoffman, E. W. 2004. Evaluation of fungicides for control of brown rot, 2003. Fungicide and Nematicide Tests Vol 59:STF011 (online), 2 pages, The American Phytopathological Society (APSnet, http://www.apsnet.org/), St. Paul, MN. 3. Holtz, B. A. 2003. Wood chipping of prunings to reduce air pollution and build soil organic matter. University of California Delivers, Agriculture and Natural Resources http://ucanr.org/delivers. 4. Holtz, B.A., Teviotdale, B.L., and Hoffman, E.W. 2002. Predicting the occurrence of fire blight in the San Joaquin Valley of California. Acta Horticulturae 590:167-174. 5. Holtz, B., S. Sibbett, C. Kallsen, L. Hendricks, B. Beede, T. Michailides, B. Teviotdale, and L. Ferguson. 2002. Evaluation of prunning and fungicide sprays to control Botryosphaeria Blight of pistachio. Acta Horticulturae 591:569-576.

Coop.	David Garner	dtgarner@uckac.edu	Staff Research Associate
(559) 646-6586		UC Davis (KAC), Dept. of Plant Sciences	Other UC

Role David Garner is a staff research associate located at the Kearney Agricultural Center. He has expertise in applying postharvest technologies to increase marketlife of soft fruits. He will be responsible for conducting storage and packaging trials along with Stephanie Dollahite.

Pubs 1. Crisosto, C.H., D. Garner, G.M. Crisosto, and E. Bowerman. 2004. Increasing 'Blackamber' plum (Prunus salicina Lindell) consumer acceptance. Postharvest Biology and Technology, in press. 2. Crisosto, C.H., D. Garner, H.L. Andris, and K.R. Day. 2004. Controlled delayed cooling extends peach market life. HortTechnology 14:99-104. 3. Crisosto, C.H., D. Garner and G.M.

Crisosto. 2003. Developing optimum controlled atmosphere conditions for 'Redglobe' table grapes. Acta Horticulturae 600: 803-808. 4. Crisosto, C.H., L. Palou, D. Garner, and D.A. Armson. 2002. Concentration by time product and gas penetration after marine container fumigation of table grapes with reduced doses of sulfur dioxide. HortTechnology 12(2):241-245. 5. Garner, D., C.H. Crisosto, and E. Otieza. 2001. Controlled atmosphere storage and aminoethoxyvinylglycine postharvest dip delay post cold storage softening of 'Snow King' peach. HortTechnology 11: 598-601.

Coop. Ed Stover	ewstover@ucdavis.edu	Curator and Research Leader
(530) 752-7009	USDA Nat. Clonal Germplasm Repository, Davis	Non-ANR

Role Dr. Stover is the curator of the USDA Germplasm Repository in Davis where a fig collectoin is available. He will provide fig materials for the research plot and coordinate any potential importations from overseas.

Pubs 1. Stover, E., Pelosi, R., Burton, M., Ciliento, S., Ritenour, M. 2004. Performance of 'Oroblanco' and 'Melogold' pummelo x grapefruit hybrids on nine rootstocks on a calcareous poorly drained soil. HortScience 39:28-32. 2. Stover, E.W., Watkins, C.B., Fargione, M.J., Iungerman, K.A. 2003. Harvest management of Marshall 'McIntosh' apples: Effects of AVG, NAA, ethephon and summer pruning on preharvest drop and fruit quality. HortScience 38:1093-1099. 3. Stover, E., Castle, W. 2002. Citrus rootstock usage in the Florida Indian River region. HortTechnology 12:143-147. 4. Stover, E.W. 2000. Relationship of intensity of flowering and cropping in fruit species. HortTechnology 10:729-732. 5. Stover, E.W., Swartz, H.J., Burr, T.J. 1997. Susceptibility of a diverse collection of Vitis genotypes to crown gall caused by Agrobacterium vitis. J. Amer. Soc. Enol. Vitic. 48(1):26-32.

Coop. Gayle Crisosto	gayle@uckac.edu	Staff Research Associate
(559) 646-6586	UC Davis (KAC), Dept. of Plant Sciences	Other UC

Role Gayle Crisosto is a staff research associate located at the Kearney Agricultural Center. She has expertise in the sensory analysis of fruits. She will be responsible for physical and sensory evaluations of figs at harvest and after storage.

Pubs 1. Crisosto, Carlos H. and Gayle M. Crisosto. 2002. Understanding American and Chinese consumer acceptance of 'Redglobe' table grapes. Postharvest Biology and Technology 24:155-162. 2. Crisosto, Carlos H. and Gayle H. Crisosto. 2001. Understanding consumer acceptance of early harvested 'Hayward' kiwifruit. Postharvest Biology and Technology 22:205-213. 3. Crisosto, Carlos H., David Garner, Gayle M. Crisosto, G. Steven Sibbett, and Kevin R. Day. 1994. Early harvest prevents internal browning in Asian pears. California Agriculture 48(4):17-19. 4. Crisosto, Carlos H., R. Scott Johnson, Juvenal G. Luza, and Gayle M. Crisosto. 1994. Irrigation regimes affect fruit soluble solids concentration and rate of water loss of 'O'Henry' peaches. HortScience 29(10):1169-1171. 5. Neufeld, Howard S., David A. Grantz, Frederick C. Meinzer, Guillermo Goldstein, Gayle M. Crisosto, and Carlos Crisosto. 1992. Genotypic variability in vulnerability of leaf xylem to cavitation in water-stressed and well-irrigated sugarcane. Plant Physiology 100:1020-1028.

Coop. Harry Andris	hlandris@ucdavis.edu	Farm Advisor, Fresno County
(559) 456-7557	UCCE Fresno Co.	CE Advisor 100% CE

Role Harry Andris is the Farm Advisor responsible for figs in Fresno County. He has expertise in fig production and pathology. He will be responsible for helping to establish the demonstration plot and for extension of information to his clientele.

Pubs 1. Leavitt, George, Marvin Gerdts, Gary Obenauf, P. Gordon Mitchell, Harry Andris. Ethephon Hastens Ripening of Japanese Plums. California Agriculture, Vol. 31, No. 6, June 1977, p. 18-19. 2. Harry L. Andris and Carlos Crisosto, Improvement of Fuji Apple Color and Fruit Size Using Reflective Materials, HortScience, Volume 30, Number 4, July 1995. 3. Harry L. Andris, Carlos H. Crisosto, and Yaffa L. Grossman. The Use of Reflective Films to Improve the Apple Fruit Red Color, Plasticulture, Vol. 19, 1999. 4. Carlos Crisosto, R. Scott Johnson, Kevin R. Day, Bob Beede, and Harry Andris, Contaminants and Injury Induce Inking on Peach and Nectarine, California Agriculture, Vol. 53, No. 1, 1999. 5. R. Scott Johnson, Rich Rosecrance, Steve Weinbaum, Harry Andris, Jinzheng Wang, Can We Approach Complete Independence on Foliar-Applied Urea Nitrogen in an Early-Maturing peach? Journal of the American Society for Horticultural Science, Vol. 126, No. 3, 2001.

Coop. Themis Michailides	themis@uckac.edu	Plant Pathologist
(559) 646-6546	UC Davis (KAC), Dept. of Plant Pathology	AES Scientist 100% OR

Role Dr. Michailides is a plant pathologist stationed at the Kearney Agricultural Center. He has been working for several years on the pathology of dried figs. He will provide expertise on any pathological condition we observe in the field or during storage.

Pubs 1. Ma, Z., and Michailides, T. J. 2004. A real-time PCR assay for the detection of azoxystrobin-resistant Alternaria populations from pistachio orchards in California. Crop Protection 23:1259-1263. 2. Elmer, P.G.A., and T.J. Michailides. 2004. Epidemiology of Botrytis cinerea in orchard and vine crops. Pages 243-272 in: Botrytis: Biology, Pathology and Control. Y. Elad et al. (eds.), Kluwer Academic Publishers, The Netherlands. 3. Ahimera, N., Gisler, S., Morgan, D.P., and T. J. Michailides. 2004. Effects of single-drop impactions and natural and simulated rains on the dispersal of Botryosphaeria dothidea conidia. Phytopathology 94:1189-1197. 4. Ma, Z., and Michailides, T. J. 2004. Characterization of iprodione-resistant Alternaria isolates from pistachio in California. Pesticide Biochemistry and Physiology 80:75-84. 5. Michailides, T. J., and Morgan, D. P. 2004.

Panicle and shoot blight of pistachio: A major threat to the California pistachio industry. APSnet, Feature Story January 2004: http://www.apsnet.org/online/feature/pistachio/

Coop. Walt Bentley | walt@uckac.edu | UC IPM Entomologist

(559) 646-6527 | Kearney Agricultural Center | CE Specialist
100% CE

Role Walt Bentley is a resident entomologist at the Kearney Agricultural Center. He will provide expertise on any insect problem we encounter in the field or during fruit storage.

Pubs 1. Grant, J., W. Bentley, C. Pickel, and J. Groh-Lowrimore. 2003. BIOS approach tested for controlling walnut pests in San Joaquin Valley. Cal. Ag. 57(3):86-92. 2. Bentley, W.J., and K.R. Day. 2002. Insects and mites. UC IPM Pest Management Guidelines: Pests of Nectarine. Ohlendorf, B., and M.L. Flint, editors. UC ANR Publication 3451. 3. Bentley, W.J., and K.R. Day. 2002. Insects and mites. UC IPM Pest Management Guidelines: Pests of Plum. Ohlendorf, B., and M.L. Flint, editors. UC ANR Publication 3462. 4. Badenes-Perez, F.R., F.G. Zalom, and W.J. Bentley. 2002. Are San Jose scale (Homo., Diaspididae) pheromone trap captures predictive of crawler densities? J. Appl. Ent. 126:1-6. 5. Badenes-Perez, F.R., F.G. Zalom, and W.J. Bentley. 2002. Effects of dormant insecticide treatments on the San Jose scale (Homopterea: Diaspididae) and its parasitoids Encarsia perniciosi and Aphytis spp. (Hymenoptera: Aphelinidae). International J. of Pest Mgmt, 2002. 48(4):291-296.
