FINAL PROJECT REPORT

Project Title: Consulting for the Washington apple Breeding Project

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Cooperators: Jim McFerson, Kate Evans, Cameron Peace, Amit Dhingra, YanMin Zhu, Gennaro Fazio, David Rudell

Other funding sources: None

WTFRC Collaborative Expenses: None

Total Project Funding:

Budget History:

Item	**2010**		
Salaries			
Benefits			
Wages			
Benefits			
Equipment			
Supplies			
Travel	$2,000		
Miscellaneous	5,500		
Total	$7,500		

Original Objectives:

- Coordinate and lead monthly conference calls among members of the apple team to facilitate discussion of important issues related to apple breeding, genetics and genomics.

- Support work of the program breeder, Kate Evans and that of other supporting scientists through presentation of ideas, evaluation of strategies and plans, assuring focus on commercially-oriented objectives and measurement of progress against project goals.

- Provide analysis and critique of proposals for competitive funding of research and development related to apple breeding.

- Identify other programs, breeders, and scientists in the public and private sectors that can provide collaborative support to the breeding program.

SIGNIFICANT ACTIVITIES AND FINDINGS

- Coordinated conference calls with members of the apple team.
    - Eight conference calls during the year to discuss issues relevant to the apple team activities. Participants included Jim McFerson, Kate Evans, Cameron Peace, Amit Dhingra, YanMin Zhu, Gennaro Fazio, David Rudell.

- Reviewed and critiqued research proposals for apple team members
    - Individual submissions to the NRI competitive grants program
    - Presentations at the 2010 International Horticulture Congress
    - Funding proposals for apple research to the WTFRC

- Facilitated integration of MAS into the Washington apple breeding program.
    - Worked with Cameron and Kate to critique integration of MAB applications.
    - Reviewed procedures to use molecular markers for selection for important traits in the apple breeding program

- Participated as member of the RosBREED Scientific Advisory Panel

- Provided references to apple team members.

- Participated in the 2010 Apple Research review.

- Submitted invoices for expenditures on a quarterly basis.

RESULTS & DISCUSSION

The monthly conference calls help apple team members identify issues and opportunities through group input and bring perspectives from different points of view. During each call there is primary focus on scion and rootstock breeding progress from Kate and Gennaro, respectively followed by discussion of activities by other members that impact breeding. Dorrie Main's participation provides not only updates on her research program at WSU but also progress on developing the breeders' toolbox and activities associated with the Genome Database for Rosaceae. YanMin's participation provides a link with his research as well as continuity with activities of the ARS/USDA scientists in

Washington. Amit provides updates on varied activities associated with Rosaceaous crop genome sequencing, cell and tissue culture and gene discovery. Dave Rudell has discussed genetic control of expression of secondary products especially those in fruit associated with quality, consistency and flavor. Cameron is the leader for critical issues related to all aspects of marker assisted breeding. Jim provides information from the WTFRC, W.S.U. and U.S. National Program activities.

The WABP lead by Kate Evans is well managed and is continuing to incorporate new methods, tools and materials to enhance standard breeding practices. Promising elite selections in the pipeline are being evaluated for commercial potential and progress is being made toward putting in place a procedure for commercializing newly released clones from the breeding program. MAB is being implemented for parental selection and seedling selection with initial use of markers that affect fruit firmness and storability via the ethylene pathways. The program is well positioned to take advantage of the new genomics and genetics resources to make major steps forward in improving selection efficiency and effective evaluation for release of new materials to benefit the Washington apple industry.

Many elite selections at stages 2, 3 and 4 will require thorough evaluation for commercial potential. I have helped with exploring how to develop an efficient plan of action to utilize objective phenotypic data from field trials, molecular information and subjective grower evaluations and consumer opinions about important traits and performance for new clone evaluation. Work is underway toward implementing a suitable data base (e.g., the Breeder Information Management System (BIMS) concept being developed in RosBreed)for collecting, storing and using information about parents and breeding populations, and identifying market-leading cultivars in target markets for use as standards or checks for comparison.

WSU faculty and ARS scientists continue to play important roles in the RosBREED project. This is key to deriving value from the activities supported by that project for cultivar development and to characterize and evaluate genotypes of current cultivars important to Washington Apple production. Members of the GGB team continue to garner funding for competitive programs which extends the value of the support from the WTFRC. I serve on the Scientific Advisory Panel for RosBreed, which meets annually and review activities as requested throughout the year.

I worked with Cameron Peace and his lab to critique ideas about effective use of DNA-based information for marker-assisted breeding and application of the MAS Decision Support spreadsheet tool for assessing the value of MAS and different approaches for integrated trait development. New markers developed through the RosBREED project are becoming available to breeders so there must now be decisions about which ones have value in the WABP. Work is continuing on identifying the most important target traits for breeder selection using combined phenotypic evaluation and MAS so the breeding program can integrate marker-locus-trait targets into selection protocols for cultivar development.

Sequencing the apple genome through the collaborative efforts of Amit Dhingra and other research programs world wide is near completion but more work is required to add documentation of information and make the emerging information easily and widely available. W.S.U. and ARS scientists are anticipating the value of sequence information for various projects thus far information and access has been limited.

EXECUTIVE SUMMARY

I provided consultation to the Washington apple breeding program which is focused on developing new cultivars that will improve the global competitiveness of the Washington apple industry. My project objectives were to: 1) Coordinate and lead monthly conference calls to facilitate discussion of important issues related to apple breeding, genetics and genomics, 2) support work of the program breeder, Kate Evans and of other supporting scientists assuring focus on commercially-oriented objectives and measurement of progress against project goals, 3) provide analysis and critique of proposals for competitive funding of research and development related to apple breeding and 4) identify other programs, breeders, and scientists in the public and private sectors that can provide collaborative support to the breeding program.

Monthly conference calls were held to facilitate sharing ideas, concerns and opportunities among team members about scion and rootstock breeding and research applicable to apple improvement. In addition to scientists from the PNW, participation of Dr. Fazio from Geneva, N.Y. provides information and feedback about apple rootstock development activities to complement the scion breeding work underway in Washington. I helped read and critiqued competitive grant requests to various funding groups at the regional and national levels and to evaluate proposals to the WTFRC for funding.

Use of DNA-based information is expanding in the breeding program to complement classical methods for identifying parents, identifying outstanding selections for further evaluation, testing advanced elite selection for commercial value and identifying clonal materials. Integration of marker assisted selection into the breeding program is progressing, with major input from supporting scientists at WSU and members of the RosBREED project. Work by the GGB team to evaluate traits for developing molecular markers continues with re-evaluation and new priority setting to assure relevance and cost effectiveness for the WABP. The MASS decision tool developed by Peace helps focus priority for DNA technology development and application to apple breeding.

The Washington Apple Breeding Program is functioning smoothly under direction of Dr. Evans. New selection populations with genetic variability for traits important to target markets in Washington are being created each year from crosses among new parents and prior selections from the program. Elite selections are being evaluated in stage 2, 3 and 4 trials at on station-plots and in growers' fields to identify putative new commercial cultivars. A continuing flow of new selections each year will require a well-coordinated evaluation plan using numerical data, molecular information, grower evaluations and consumer input for deciding which should be released. In order to identify new selections with high predictability of commercial utility as efficiently and quickly as possible, molecular tools and information contributing to marker-assisted breeding (MAB) should be combined with classical breeding methods.