FINAL PROJECT REPORT

Project Title: Consulting to the WTFRC for apple improvement

PI: Fredrick A. Bliss
Organization:
Telephone: (530) 756-5154
Email: fbliss@dcn.org
Address: 214 Inca Pl.
City: Davis
State/Zip: CA 95616

Cooperators: Jim McFerson, Kate Evans, Cameron Peace, Amit Dhingra, YanMin Zhu

Total Project Funding: $7500

Budget History:

Item	2013		
Salaries			
Benefits			
Wages			
Benefits			
Equipment			
Supplies			
Travel	$4,000		
Plot Fees			
Miscellaneous	$3,500		
Total	$7,500		

*Project funded at a reduced amount of $6825

ORIGINAL OBJECTIVES:

- Provide analysis and critique of technical aspects of proposals and reports for competitive funding of research and development related to apple improvement.
- Provide ideas and analysis of approaches and methods to facilitate adoption of new apple cultivars by clientele groups in the apple production and delivery pipeline.
- Facilitate adoption and use of technology and materials from the RosBREED project to support apple improvement.
- Interact with WSU and ARS scientists and PNW growers on scientific matters related to apple improvement for the region.

SIGNIFICANT ACTIVITIES AND FINDINGS

- Provided insight and analyses to the WTFRC about apple improvement
    - Reviewed and commented on research proposals and reports to the Board
    - Provided feedback to apple team members
        - Individual submissions to competitive grants program
        - Pre-proposals and proposals from individuals prior to submission.

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

- Participated in the RosBREED annual review attended Plant & Animal Genome Conference in San Diego, CA, January 2013.
    - Member of RosBREED Scientific Advisory Panel
    - Evaluated results and outcomes of RosBREED project
    - Evaluated impacts of specific RosBREED projects

- Provided R&D information to apple team members.

- Participated in the 2013 Apple Research review and Apple GGB workshop.

- Submitted invoices for expenditures on a quarterly basis and a final project report.

RESULTS & DISCUSSION

I continued to review and critique proposals submitted to the WTFRC for funding and reports of continuing and finished projects. I also provide review and input on proposals being prepared by members of the GGB team. Researchers continue to submit good proposals that are competitive and are being funded at a level commensurate with other public institutions.

I served on the Scientific Advisory Panel for the RosBREED project which is winding down. Overall this has been an excellent project that will continue to provide many resources to PNW scientists and the WABP. Several scientists associated with the WABP have played key roles in the success of RosBREED and the ongoing Genome Database for Rosaceae (GDR). The latter will have a continuing impact on the ultimate success of apple improvement and support the development and release of outstanding new apple cultivars. The WTFRC has been key a supporter of these initiatives,

providing a way to further leverage local support for R&D from federal funds and gain from extensive international collaboration. WSU faculty and ARS scientists are involved in planning a sequel proposal to utilize the information and technology for continued research and cultivar development.

Along with the research and extension, RosBREED projects provided opportunities to train and prepare the next generation of breeders and genetic support scientists. Grad students and post doctoral researchers have key roles in the programs. I continue to work with faculty to review curriculum and program components of plant breeder education and training.

There is continuing progress to implement a 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.   That along with the Breeders' Toolbox will allow effective use of the large amount of data being collected in the breeding program and the various collaborative programs such as RosBREED.

DNA-based information and technology are critical plant breeding capacity elements for successful cultivar development. Diagnostic marker-locus-trait (M-L-T) associations are available for an increasing number of fruit quality traits and physiological disorders. Molecular genotyping provides the opportunity for marker assisted selection of parent and preferred new genotypes along with genetic verification of selected phenotypes, and genetic fingerprinting of elite selections for intellectual property protection.

New methods, tools and materials are being incorporated effectively into the WABP to enhance standard breeding practices and promising elite selections in the pipeline are being evaluated for commercial potential. MAB is being implemented for parental selection and seedling selection with use of markers for storability, crispness & juiciness, acidity, skin color, and bitter pit incidence. Use of genomics-enhanced breeding will continue to gain momentum for breeding and cultivar development and evaluation. The WABP is using new genomics and genetics resources to enhance selection efficiency and effective evaluation for release of new materials to benefit the Washington apple industry.

I continue to work with Cameron on critical issues related to marker assisted breeding. There is considerable work 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. The information gained from different segments of the industry about valuable traits is should provide additional insight into selection strategies that breeders and researchers should employ for effective apple improvement.

Advancement of promising new selections into pre-commercial testing and evaluation is progressing very well, so an effective and efficient procedure for evaluating elite selections for commercialization is critical. New elite selections will be identified each year in the breeding cycle. Thus, it is important to have a strategy to utilize phenotypic and molecular marker information along with grower evaluations and feedback from various stage trials to decide whether to either discard/discontinue selections or introduce and release them as new commercial cultivars.

EXECUTIVE SUMMARY
Title: Consulting to the WTFRC for Apple Improvement
PI: Fredrick A. Bliss
WTFRC Funding: $6825

The project objectives were to: 1) Provide analysis and critique of technical aspects of proposals and reports for competitive funding of research and development related to apple improvement, 2) provide ideas and analysis of approaches and methods to facilitate adoption of new apple cultivars by clientele groups in the apple production and delivery pipeline, 3) facilitate adoption and use of technology and materials from the RosBREED project to support apple improvement, and 4) interact with WSU and ARS scientists and PNW growers on scientific matters related to apple improvement for the region.

I provided consultation to the Washington apple breeding program about developing new cultivars to enhance the global competitiveness of the Washington apple industry. I critiqued scientific content of competitive grant requests and evaluated proposals to the WTFRC for funding.

The breeding program is using DNA-based information to complement classical breeding methods. MAB is being implemented for parental selection and seedling selection using markers for storability, crispness & juiciness, acidity, skin color, and bitter pit incidence. It is expected that expanded use of genomics-enhanced breeding will continue to gain momentum for breeding and cultivar development and evaluation. The program is making use of the new genomics and genetics resources to enhance selection efficiency and effective evaluation of elite selections as potential new cultivars to benefit the Washington apple industry.

The WABP is producing many elite selections that are being evaluated in stage 2, 3 and 4 trials at on station-plots and in growers' fields to identify putative new commercial cultivars. Thus, it is important to have a strategy to utilize phenotypic and molecular marker information along with grower evaluations and feedback from various stage trials to decide whether to either discard/discontinue selections or introduce and release them as new commercial cultivars.
I have helped explore how to implement an efficient action plan 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.

The RosBREED project which is winding down has been an excellent project that will continue to provide useful resources to PNW scientists and the WABP. Scientists associated with the WABP have played key roles in the success of RosBREED and the ongoing Genome Database for Rosaceae (GDR). The WTFRC has been key a supporter of these initiatives, providing a way to further leverage local support for R&D from federal funds and gain from extensive international collaboration. WSU faculty and ARS scientists are involved in planning a sequel proposal to utilize the information and technology for continued research and cultivar development.