Developing an online toolbox for tree fruit breeding

Kate Evans, Sook Jung, Taein Lee, Nnadozie Oraguzie, Cameron Peace and Dorrie Main





Breeding programs generate a lot of data!



Year after year after year....



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		11 Oct/	06 Oct/10	9427	T19	17-111	3	2	9.0	DARK			5	1	3	3 3	3 2	3			
INDEXCOLOR		2 Sep/	15 Sep/19	9427	T19	17-15	3	1	4.0				2	3	3	3 4	4 3.5	3			
PLANTING DATES not us		25 Oct/	13 Oct/17	7 9427	T19	21-101	2	3	6.0		DULL		4	1	3	4	4 4	3			
PLANTING DATES HOLUS		23 Sep/	15 Sep/19	9 9427	T19	22-4	2	3	4.0		DULL		3.5	1	. 2	1.5	5 2	3			
SEEDLING COUNT		15 Oct/	13 Oct/17	7 9401	T19	37-19	4	3	8.0		BRIGHT		5	1	3	5 5	5 2	4			د مد خرد م
		13 Oct/	06 Oct/10	9401	T19	37-49	3.5	4	7.0				4	2	3	3 4	4 3	3.5			5
		12 Oct/	06 Oct/10	9401	T19	37-98	3.5	4	7.0				4	3	2	2 5	5 2	3.5			1
		8 Sep/	29 Oct/03	3 9423	T19	39-87	3.5	5	8.0		BRIGHT		5	2.5	3	5 5	5 2.5	3			
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		4 Sep/	22 Sep/20	5 9434	T19	46-95	4	4	7.0				4	1	2	2 4	4 2	4			
		22 Sep/	15 Sep/19	9435	T19	9-66	3	4	9.5	DARK		BLOOM	5	1	2	2 4	4 3	3			
		17 Oct/	22 Oct/24	4 9530	T21	25-13	3	3	5.0		DULL			1	1	4	4 3	3			
		14 Oct/	06 Oct/10	9530	T21	25-19	2.5	3	7.0			BLOOM	5	1	2.5	3.5	5 3	3			
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Outline

- Washington apple breeding program & database needs
- Specific goals for a breeders toolbox
- Progress report
- Further work



Washington State







WSU apple breeding program

Relatively new – started in 1994









Approx 15,000 fruiting seedlings



Specific goals for a breeders toolbox

•Provide a secure, private database management system

•Fully integrated with GDR to enable use of public marker/trait/genomics data

Integrated analysis capabilities



Progress

- 1. Database schema developed in Chado
- 2. Excel template for database created



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Eva	ns_apple_2009	WSU 19	9 3B			10/29/09	11/05/09	F	RA		KE; BK; LI	B; NB	3	3.5	3	7.00				5	1	L 2
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Eva	ns_apple_2009	WSU 5	3B			09/24/09	10/01/09	F	RA		KE; BK; LI	B; NB	3	4	3	7.00		BRIGHT	BLOOM	5	2.5	5 3
Eva	ns_apple_2009	WSU 5	3B			09/27/09	11/24/09	S	RA		KE; BK; LI	B; NB	3	4.5	2.5	9.00		BRIGHT	BLOOM	5	3	3 3
Eva	ns_apple_2009	WSU 5	3B			09/30/09	10/01/09	F	RA		KE; BK; LI	B; NB	3	4	4	7.00			BLOOM	5	3	-
Eva	ns_apple_2009	WSU 5	3B			09/30/09	11/24/09	S	RA		KE; BK; LI	B; NB	3	4.5	3	6.50				5	2.5	i 3
Eva	ns_apple_2009	WSU 2	3B			09/30/09	10/01/09		RA		KE; BK; LI	B; NB	3	4	2	6.00				4	1	L 2
Eva	ns_apple_2009		3B			09/30/09	11/24/09		RA		KE; BK; LI	B; NB	3	4	2.5		DARK			5	1	. 3
	ns_apple_2009		3B			10/07/09	10/08/09		RA		KE; BK; L	B; NB	3	4	2	7.50		BRIGHT		5	1	. 3
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### Collecting lab data



## Progress

- 1. Database schema developed in Chado
- 2. Excel template for database created
- 3. Existing data converted into templates
- 4. Scripts created to upload data in template to Chado
- 5. Data uploaded to Chado
- Interfaces for browse, search and data download under development



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Breeders Toolbox admin

#### Browse projects with sites

Display all the project names with the project type "breeding" and the sites where the stock was planted.

project name	sites		
Evans_apple_2009	Columbia View 04	Columbia View 05	Columbia View 06
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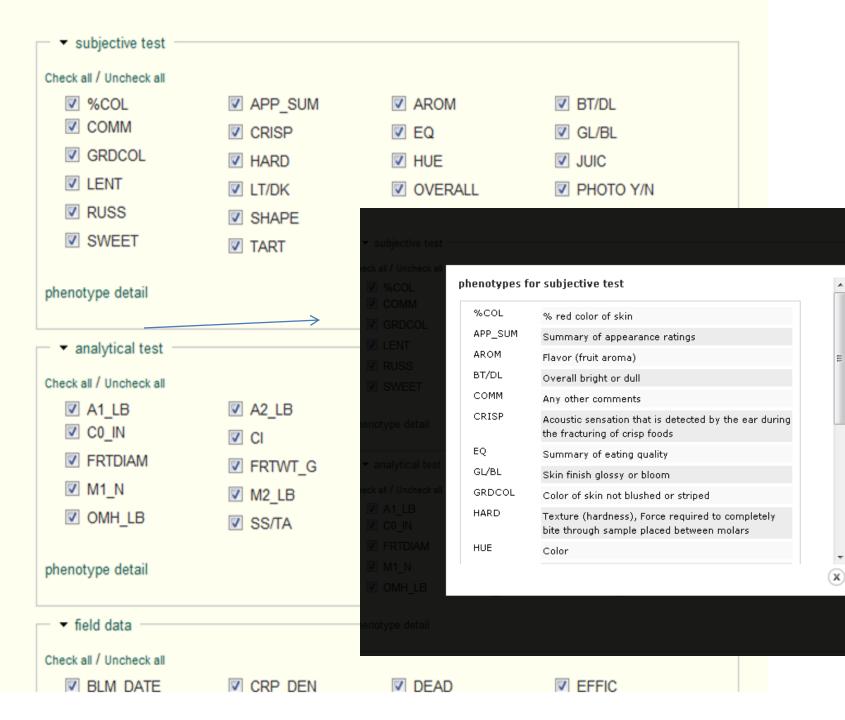
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Breeders Toolbox admin

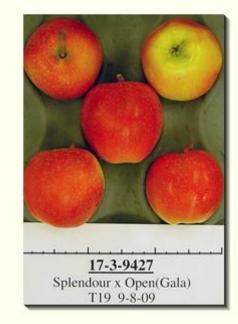
germplasm information

Information about T19-17-3-9427

alias WSU 2, 917-3-9427, 2-F04-01, 2 cross number 9427

mother Splendour Gala

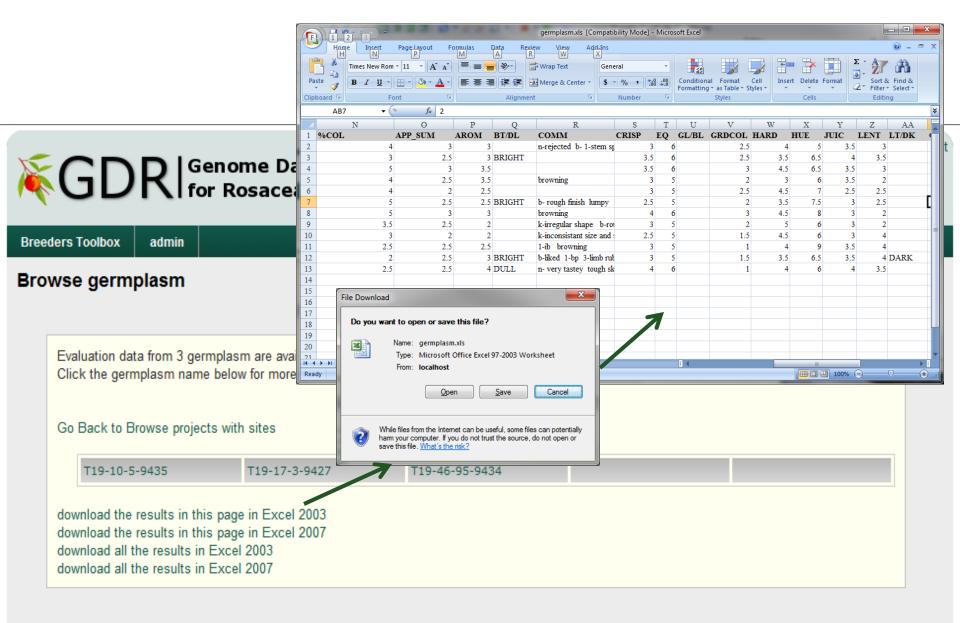
Download evaluation data in Excel file





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### Progress

- 1. Database schema developed in Chado
- 2. Excel template for database created
- 3. Existing data converted into templates
- 4. Scripts created to upload data in template to Chado
- 5. Data uploaded to Chado
- Interfaces for browse, search and data download under development
- 7. Private web management system created for breeding programs



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Home Page of WSU Apple Breeding Program

Page Home Page of WSU Apple Breeding Program has been updated.



#### **Breeding Program Outline**

The Washington State University apple breeding program began in 1994 to develop new varieties suitable to the unique climate of central Washington. Washington is the leading apple producing state with over 50% of U.S. production. Unfortunately, many of the new varieties developed in the world are not well adapted to growing conditions in central Washington or available to the majority of Washington growers.

The goal is to produce apples of a high eating quality with particular factors of outstanding flavor, texture and juiciness. The breeding program is a traditional breeding program, hybridizing parents with desirable traits. Promising seedlings are selected from large populations and their fruit is evaluated in the laboratory for eating quality and suitability for long-term storage. This program is one of the 12 core US breeding programs of the SCRI RosBREED project, enabling the application of marker-assisted breeding within the 4 years of the project.

The first release from the program, 'WA 2', was offered to Washington State growers for evaluation in December 2009. Several other elite selections have been planted in commercial grower trials in central Washington.

#### Screenshot

View

Edit

Groups: Kate's Apple Breeder Group



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#### Kate's Apple Breeder Group

- Create Calendar Event
- Create Group Document
- 6 members
- · Manager: cho
- · My membership





## Further work

- 1. More web interface
- 2. Development of online data uploading system
- 3. Integrate with GDR and GRIN
- 4. Integrate with breeding analysis tools such as PBA





# Acknowledgements

#### Funding sources:



United States Department of Agriculture National Institute of Food and Agriculture





#### Main lab bioinformatics members Ilhyung Cho Ping Zheng Stephen Ficklin

WA breeding program lab members Lisa Brutcher Bonnie Konishi Nancy Buchanan



Rosaceae community

