DEVELOPMENT OF MARKER-BASED BREEDING TECHNOLOGIES FOR PEAR IMPROVEMENT

David Neale, University of California, Davis

ABSTRACT

Traditional pear breeding, like most woody perennial crops, takes a long time due to the breeding cycle time and time to trait evaluation and can be quite expensive due to large land and labor requirements. Marker-based breeding technologies, as are routinely used in nearly all agricultural systems now, can potentially increase pear breeding efficiency. The goal of this project is to obtain a genome-wide genetic variation data from the entire *Pyrus* germplasm collection maintained by the ARS in Corvallis, OR, toward development of marker breeding technologies.

PROCEDURES, RESULTS AND DISCUSION

A leaf tissue sample (around 15 leaves) for each accession in the entire *Pyrus* germplasm collection was collected in June 2014. A subset of 46 samples, covering a wide range of phenotypic and genetic diversity, was selected (Table 1) for the initial round of DNA sequencing using a whole-genome shotgun sequencing strategy. The experience gained for our group (UC Davis) in sequencing and re-sequencing large and complex genomes will make the re-sequencing pear strategy relatively quick and inexpensive. The Pear Genomics group is collaborative group of researchers, all working on some aspect of pear genetics and genomics. The purpose of the group is to facilitate information exchange and foster creativity and innovation toward pear genetic improvement. The complete list of participants is shown below.

UC Davis
Charis Cardeno - cmcardeno@ucdavis.edu
Chuck Langley - chlangley@ucdavis.edu
David Neale - dbneale@ucdavis.edu
Kristian Stevens - kastevens@ucdavis.edu
Marc Crepeau - mcrepeau@ucdavis.edu
Pedro J. Martínez García - pjmartinezgarcia@ucdavis.edu
Randi Famula - rafamula@ucdavis.edu
Rachel Elkins - rbelkins@ucanr.edu

WSU
Amit Dhingra - adhingra@wsu.edu
Katherine Evans - kate_evans@wsu.edu

USDA/ARS Kearneyville
Richard Bell - Richard.Bell@ars.usda.gov

USDA/ARS National Clonal Germplasm Repository, Corvallis
Joseph Postman - Joseph.Postman@ars.usda.gov
Nahla Bassil - Nahla.Bassil@ars.usda.gov

CONCLUSIONS

A total set of 46 samples was selected and sequencing was initiated in January 2015. Sequencing will be completed in mid-2015. At that time, all bioinformatics analyses will be conducted to discover SNPs and estimate genetic diversity. Once completed, an array-based genotyping platform can be designed that can be applied to the entire *Pyrus* germplasm collection.

TABLE 1.

	Clade	Name	Cpyr	Species	Comment
1	Xviii	P. betulifolia shaanxi	2291.001	betulifolia	
2	Xxv	P. calleryana 96107	2588.001	Calleryana	
3	Vi	Beurre d'Anjou	63.001	Communis	
4	Vii	Coscia tardive	159.002	Communis	
5	X	Seckel	519.001	Communis	Fire blight resistant
6	Xii	Gin	246.001	Communis	
7	Xxiii	Zao su li	2594.001	Pyrifolia	
8		P. salicifolia GE-2004-141	2849.001	Salicifolia	
9	Xix	Xiang shui li	2640.002	Ussuriensis	
10		Xuehua li	2681.002	X bretschneideri	Q27647
11	Xxiv	P. ussuriensis Korea	1202.001	Ussuriensis	
12	Xvi	P. syriaca Armenia	920.001	Syriaca	
13	Xiv	Para de zahar de bihor	1663.001	Communis	
14	Xv	Mednik	1549.001	Communis	Psylla resistant
15		Roi Charles de Wurtemburg	489.002	Communis	Fire blight resistant
16		US 309		Communis	Fire blight resistant, dwarf
17	Xvii	Erabasma	1524.002	Communis hybrid	Psylla resistant
18	Xvi	P. communis ssp caucasica	680.001	Communis ssp caucasica	
19		P. communis ssp pyraster alb-2011-024	2965.001	Communis ssp pyraster	
20	V	NY 10353	1660.001	Communis x ussuriensis	Psylla resistant
21		NJ B9 R1 T117		Communis x ussuriensis	Psylla resistant
22	Xv	P. cordata Turkey	1589.001	Cordata	
23	Xviii	P. cossonii	828.001	Cossonii	
24	Xviii	P. elaeagrifolia	765.001	Elaeagrifolia	
25		P. fauriei	772.004	fauriei	
26	Xvi	P. gharbiana 1	787.001	Gharbiana	
27		P. glabra	1205.001	Glabra	
28	Xxi	P. hondoensis Japan	2117.001	Hondoensis	
29	Xx	P. koehnei	825.001	Koehnei	
30	Xx	P. mamorensis	835.001	Mamorensis	
31	Xvi	P. nivalis	256.002	Nivalis	
32	Xx	Naspati	411.001	Pashia	
33		P. pseudopashia	875.001	Pseudopashia	
34	I	Beurre bosc	1165.001	Communis	
35	Ix	Takisha	1675.003	Communis	
36		Dan bae	2623	Pyrifolia	
37		Nijisseiki	413.001	Pyrifolia	
38	Xviii	P. regelii	890.001	Regelii	
39		P. sachokiana GE-2006-115	2882.001	Sachokiana	
40	Vi	Ho mon	2723.001	Sinkiangensis	
41	Xix	P. amygdaliformis Turkey	634.001	Spinosa	
42	Xviii	P. cordata pure	745.001	Cordata	

43		Illinois 76		Ussuriensis (x pyrifolia?)	Fire blight resistant
44		Ya li	1678.001	X bretschneideri	
45		Old Home	431.001	Communis	delete if PFR data available
46		Bartlett	38.001	Communis	delete if PFR data available