Marker -Trait Associations Known In Rosaceae Crops
(Table and references compiled by Dr. Nnadozie Oraguzie and Dr. Richard Bell)

Species	Trait	Trait locus (QTL, major locus, or known gene sequence) LOD score, map position, % variation	Source/Population	Linked markers	Reference	MAPS and/or MASS ?[a]
APPLE						
Malus ×domestica	Resistance to apple scab	Major locus: *Va;* LG1?	Antonovka PI172623, Fortune x PRI 1841-11; NY489 x PRI 1841-11	RAPD, SCAR	Hemmat et al., 2003	
Malus ×domestica	Resistance to apple scab	Major locus: *Vb;* LG1	Hansen's Baccata #2; Empiere x Hansen's Baccata #2	RAPD, SCAR	Hemmat et al., 2003	
Malus ×domestica	Resistance to apple scab	Major locus: *Vb*; LG12, 7.8	Golden Delicious x Hansens baccata#2	SSR	Erdin et al., 2006.	
Malus ×domestica	Resistance to apple scab	Major locus: *Vd;* LG 10, 2.0	Durello di Forli X Fiesta	RAPD	Tartarini et al., 2004.	
Malus ×domestica	Resistance to apple scab	Major locus: *Vbj*; LG2*;* 5.8	*Malus baccata jackii;* A722-7 x Golden Delicious	SCAR	Gygax et al., 2004.	
Malus ×domestica	Resistance to apple scab	Major locus: *Vd;* LG10; 2.0	Durello di Forlí	RAPD	Tartarini et al., 2004.	
Malus ×domestica	Resistance to apple scab	Gene: *Vf*. LG1	Markers tested in 'Florina' x 'Nova Easygro' progenyand 55 cultivars or	SSR	Vinatzer et al. 2004	

			selections		
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vfh*	*M. floribunda* 821		Bénaouf and Parisi, 2000.
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vg;* LG12; 3.0	Golden Delicious; Prima X Fiesta	RFLP	Durel et al., 2000.
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vh8*; LG2; 1.3, 4.3, 5.1 & 18.5, LODs5 & 3	*M. sieversii* W193B; Royal Gala x M. *Sieversii*W193B	SCAR & SSR	Bus et al., 2005a; New Phytologist 166:1035-1049
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vj*	Jonsib		Korban and Chen, 1992
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vm*, LG17, 0	*M. micromalus*; Golden Delicious x Murray	SSR	Patocchi et al. 2005
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vh2;* 2.5;	Russian apple R12740-7A; Royal Gala x TSR34T15	RAPD	Bus et al., 2005b
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vh2*; LG2; 8.8 with SSR & 5.0 with RAPD-SCAR	Royal Gala x TSR34T15	SSR, RAPD	Bus et al., 2005b
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vr2;* LG2, *0*	Russian apple R12740-7A; GMAL 2473 x Idared	AFLP	Patocchi et al., 2004
Malus ×*domestica*	Resistance to apple scab	Major locus: *Vh4;LG2; 4.0*	Russian apple R12740-7A; Royal Gala x TSR33T239	SCAR	Bus et al., 2005b
Malus ×*domestica*	Resistance to apple scab	Major locus: *VT57*; 2.0	Sciglo x A68R03T057	SSR	Bus et al., 2005b

Malus ×*domestica*	Resistance to apple scab	QTLs: LG 1-46.4 (isolate specific): LOD 8.2-8.9; 16.0-17.8%; LG 11-4.5: LOD 5.4-9.5; 16.5-22.8%; LG 15-20.3 (isolate specific): LOD 3.1-3.3; 5.6-6.0%; LG 17-19.1: LOD 3.6-5.9; 9.4-13.4%	Prima x Fiesta	RAPD, SSR, RFLP, SSR	Durel et al., 2003
Malus ×*domestica*	Resistance to apple scab	Leaf scab: 6 QTLs: LG 6, 7, 10, 11, 12, 17: LOD 2.3-13.2; 4.0-23% Fruit scab**:** 2 QTLs: LG 15, 17: LOD 2.8-4.9; 7.0-9.0%	Fiesta x Discovery	SSRs	Liebhard et al. 2003b.
Malus ×*domestica*	Resistance to apple scab	QTLs: LG 2 (co-locates with Vr and Vn8), 5, 12, 13, 15, 17; LG 1 (co-locates with Vf), 2; 3 major QTL for partial resistance to most isolates: LG 1, 2, 17: LOD 3.16-26.59; 5.1-51.1%, QTL for single isolate resistance, LG 5: LOD 5.4-12.57; 12.5-20.8%	Discovery x TN10-8	SSRs, AFLPs, *Vg* locus	Calenge et al., 2004.
Malus ×*domestica*	Resistance to powdery mildew	Major locus: *Pl-1; LG12, 3-4*	Idared x 78/18-4	CAPS	Lesemann & Dunemann, 2006.
Malus ×*domestica*	Resistance to powdery mildew	Major locus: *Pl-2, LG11; 8.0*	Royal Gala X A689-24	RAPD-SCAR	Gardiner et al., 2003.
Malus ×*domestica*	Resistance to powdery mildew	Major locus: *Pl-d; LG12; 8.0*	Fiesta x A871-14	SSR	James et al. 2004.
Malus ×*domestica*	Resistance to powdery mildew	Major locus: *Pl-m*	Fuji X MISop 93.051 G02-054	SCAR	Gardiner et al. 2003.
Malus ×*domestica*	Resistance to powdery mildew	Major locus: *Pl-w;* LG8	White Angel; Prima X Fiesta	Isozyme	Batlle and Alston, 1996.

Malus ×*domestica*	Resistance to powdery mildew	Major locus: *Pl-w* LG8;	D12 x White Angel	SRR, SCARS	Evans & James, 2003.
Malus ×*domestica*	Resistance to powdery mildew	QTL; A679-2 map; LG 3, 5 & 16: Iduna map LG 2, 3, 5, 7, 8 & 9. % variance explained not shown	Iduna X A679-2	SSRs	Kellerhals et al., 2000.
Malus ×*domestica*	Resistance to powdery mildew	QTL: U211 map: G2- LOD 12.0, 72.1% and LOD12.1, 71.5%; G3-LOD2.6, 37.5% and LOD 8.9; 72.4%; G4=LG12-LOD9.3, 64.9% & LOD8.8, 71.9% and LOD10.8; 72.0%. Idared map: G3=LG2-LOD3.3; 40.6% and LOD2.4; 39.4%, G5=LG15-LOD7.9; 61%	Idared x U211	AFLPs & SSR	Stankiewicz-Kosyl et al., 2005.
Malus ×*domestica*	Resistance to powdery mildew	QTLs: LG 2: LOD 3.0-9.01; 7.4%-22.5%, LG 13: LOD 3.74-9.73; 7.5%-27.4%, LG 1: LOD 3.0, 7.4%, LG 8: LOD 5.27-8.45; 8.9%-19.5%, LG 10: LOD 3.99-4.02; 7.9%-8.3%, LG 14: LOD 3.45; 5.7%, LG 17: LOD 4.36-4.64; 8.8%-10.5%	Discovery x TN10-8	SSRs and AFLPs	Calenge and Durel, 2006.
Malus ×*domestica*	Resistance to fireblight	QTL:26.82; LG7F-52.7; 42.6%	Prima x Fiesta Fiesta x Discovery	RAPD	Calenge et al., 2005.
Malus ×*domestica*	Resistance to fireblight	QTL: 4.09; LG3P-53.8; 7.5%	Prima X Fiesta	SSR	Calenge et al., 2005.
Malus ×*domestica*	Resistance to fireblight	QTL: 3.37; LG3F-0.0; 4.4-4.9%(depending on days of postinfection	Fiesta x Discovery	AFLP	Calenge et al., 2005.
Malus ×*domestica*	Resistance to fireblight	QTL:3.53; LGD12-62.3; 5.4%	Fiesta x Discovery	SSR	Calenge et al., 2005.
Malus ×*domestica*	Resistance to fireblight	QTL; 4.87; LG13D-10.2; 7.9%	Fiesta x Discovery	AFLP	Calenge et al., 2005

Malus ×*domestica*	Resistance to fireblight	QTL: 7.5-8.1; LG7F-46.5-51.5	Fiesta x Discovery	AFLP	Khan et al., 2006
Malus ×*domestica*	Resistance to fireblight	QTL: 9.54; LG3R-42.6	IdaRed X *M* ×*.robusta*	SSR	Peil et al., 2007
Malus ×*domestica*	Resistance to fireblight	QTL: 14.15; LG3R-48.2; 80% jointly with CH03e03	IdaRed X *M* ×*.robusta*	SSR	Peil et al., 2007
Malus ×*domestica*	Resistance to fireblight	QTL: 22.96; LG3R-58.9; 80% jointly with CH03g07	IdaRed X *M* ×*.robusta*	SSR	Peil et al., 2007
Malus ×*domestica*	Resistance to fireblight	QTL: LG7-46	Milwa x 1217	SCAR	Khan et al., 2007
Malus ×*domestica*	Resistance to fireblight	QTL: LG7F-56	Milwa x 1217	SCAR	Khan et al., 2007
Malus ×*domestica*	Resistance to fireblight	QTL: LG7F-46	Milwa x 1217	SSR	Khan et al., 2007.
Malus ×*domestica*	Resistance to wooly apple aphid	Major locus: *Er-1; LG8*	Discovery X TN10-8	SNP	Chagne et al. unpubl
Malus ×*domestica*	Resistance to wooly apple aphid	Major locus -*Er-1;* LG8NS-10.9	Sciglo x Northern Spy	SSR	Chagne et al. unpubl.; Bus et al., 2008.
Malus ×*domestica* rootstock	Resistance to wooly apple aphid	Major locus: *Er-2;* LG17R5-13.6	X3189 × *M.* × *robusta 5*	SSR	Bus et al., 2008.
Malus ×*domestica* rootstock	Resistance to wooly apple aphid	Major locus: *Er-3;* LG8, 12.0	M9 X Aotea	SSR	Chagne et al., unpubl.
Malus ×*domestica*	Resistance to wooly apple aphid	Major locus: *Er-3;* LG8A-10.9	Royal Gala × Aotea 1 F_2 derivative	SNP	Bus et al., 2008.
Malus ×*domestica*	Resistance to rosy leaf	Major locus: *Sd-1*	Cox's Orange Pippin		Alston and Briggs, 1968.

	curling				
Malus ×*domestica*	Resistance to rosy leaf curling	Major locus:*Sd-1*, LG7, E6/M8R1 & 2B12 IcM away; and E6/M6R2, E6/M6R1	Fiesta X Discovery	BACs	Cevik & King, 2000
Malus ×*domestica*	Resistance to rosy leaf curling	Major locus: *Sd-2; LG7; 0*	Double Red Northern Spy x Totem	SCAR, SSR	Cevik & King, 2002.
Malus ×*domestica*	Resistance to rosy leaf curling	Major locus: *Sd-3*	*M.* x *robusta* OP MAL59/9		Alston and Briggs, 1977.
Malus ×*domestica*	Resistance to rosy leaf curling	QTL: Fiesta map; LG17, locus 57.7, heritability 28.3%	Fiesta X Discovery	AFLP	Stoeckli et al., 2008.
Malus ×*domestica*	Resistance to leaf curling midge	QTL: Fiesta LG7; locus4.5, heritability=50.2%	Fiesta X Discovery	AFLP	Stoeckli et al., 2008.
Malus ×*domestica*	Tree habit - 7 components	QTLs: Height increment: LG 6, 7, 9, 10, 11, 12, 21 (3.9- 7.9%), Internode length: LG 5, 6, 9, 10 (4.6-23.1%), Internode no: LG 1, 5, 7, 10, 12, 21 (4.3-16.8%), Base diameter increment: LG 2, 7, 10, 14, 16, 21 (4.0-8.5%), Base diameter: LG 7, 9 (5.5-7.5%), Branch number: LG 7, 10 (7.1-24.3%), Leaf break: LG 3, 6, 7, 9, 11, 12, 15 (3.9-7.3%)	Wijcik McIntosh X NY75441-58	SSRs	Conner et al., 1998.
Malus ×*domestica*	Tree habit in seedlings	QTLs: Stem diam: LG 2, 15, 17 (LOD 3.1-4.8; 6.0-10.0%); Leaf size: LG 9, 17 (LOD 3.0-4.2; 6.0-8.0%)	Fiesta x Discovery	SSRs	Liebhard et al., 2003a.
Malus ×*domestica*	Tree habit in mature	QTLs: Height increment: LG 3, 5, 8, 11, 13, 17 (LOD 2.4-6.2; 5.0-11.0%)	Fiesta x Discovery	SSRs	Liebhard et al., 2003a.

	trees	Stem diam: LG 1, 2, 3, 8, 11, 13, 14, 15, 17 (LOD 1.7-6.5; 4.0-13%)			
Malus ×*domestica*	Terminal bearing	Major locus: *Tb,* LG 6, possible QTL or masked by spurring	Rome Beauty X White Angel	RAPD	Lawson et al., 1995.
Malus ×*domestica*	Tree habit	Many QTLs: LOD 1.0, 1.4 to 55.3% variation.	Braeburn x Telamon	AFLPs and SSRs	Kenis & Keulemans, 2004, 2007.
Malus ×*domestica*	Tree columnar habit	Major locus : *Co;* LG 10	Prima x Fiesta	SSR	Maliepaard et al. 1998.
Malus ×*domestica*	Juvenile phase length	QTLs: LG 3, 15 (LOD 3.2-4.0; 6.0-8.0%)	Fiesta x Discovery	SSRs	Liebhard et al., 2003a.
Malus ×*domestica* (rootstock)	Dwarfing	Major locus: *Dw1*, LG05; LODs 5&1	M9 x Robusta 5	SCAR & SSR	Rushholme-Pilcher et al. 2008
Malus ×*domestica*	Bloom time	QTL: LG 1	Rome Beauty X White Angel	Isozyme	Lawson et al., 1995.
Malus ×*domestica*	Blooming time	QTLs: LG 7, 10, 17 (LOD 2.5-3.6; 5-13%)	Fiesta x Discovery	SSRs	Liebhard et al., 2003a.
Malus ×*domestica*	No. bunches	QTLs: LG 8, 15 (LOD 3.6-5.1; 7.0-10.0%)	Fiesta x Discovery	SSRs	Liebhard et al., 2003a.
Malus ×*domestica*	Self-fertility	Gene : *SI*, LG17	Prima x Fiesta	Isozyme, RFLP	Maliepaard et al., 1998.
Malus ×*domestica*	Fruit harvest date	QTLs: LG 3 (LOD 4.7; 16.0%)	Fiesta x Discovery	SSRs	Liebhard et al., 2003a.
Malus ×*domestica*	Harvest date	QTL: 5.7; LG3D-75; 13%	Fiesta × Discovery	unspecified	Liebhard et al., 2003a.
Malus ×*domestica*	Skin color	Major locus: *Rs* ; LG17	Rome Beauty x White Angel		Weeden et al., 1994.
Malus ×*domestica*	Skin color	Major locus: *Rf*	Rome Beauty x White Angel	Isozyme	Weeden et al., 1994.

Malus ×*domestica*	Skin color	Major locus: *Rf;* LG 9	Prima x Fiesta	SCAR	Maliepaard et al., 1998.	
Malus ×*domestica*	Fruit number	QTLs: LG 5, 15, 16 (LOD 3.2-4.5; 8.0-10.0%)	Fiesta x Discovery	unspecified	Liebhard et al., 2003a.	
Malus ×*domestica*	Fruit weight	QTLs: LG 1, 3, 6, 8, 10, 12, 15, 16 (LOD 2.5-17.0; 7.0-31.0%)	Fiesta x Discovery	unspecified	Liebhard et al., 2003a.	
Malus ×*domestica*	Fruit weight	LG 4 (LOD 4.53; 25.0%),	Prima x Fiesta	unspecified	King et al. 2001	
Malus ×*domestica*	Fruit cortex color, red foliage	Gene: MdMYB10 (*Rni* locus), LG9	Sciros x 91.136B6-77	SNP	Chagne et al., 2008.	
Malus ×*domestica*	Fruit ripening	Gene: *Md-ACS1; LG15*	Prima x Fiesta	SCAR	Costa et al., 2005.	MAPS MASS
Malus ×*domestica*	Fruit ripening	Gene: *Md-AC01; LG10*	Prima x Fiesta Fuji x Mondial Gala	SCAR	Costa et al., 2005.	MAPS
Malus ×*domestica*	Flesh firmness	QTLs: LG 6, 11, 12, 14 (LOD 3.6-12.3; 6.0-27.0%)	Fiesta x Discovery	unspecified	Liebhard et al., 2003a.	
Malus ×*domestica*	Fruit texture – 8 measures	QTLs: Fruit firmness: LG 1, 8, 10 (LOD 4.7-7.4; 16.0-22.0%), Resonant freq: LG 10 (LOD 4.6; 21.0%), Hardness: LG 10, Crispness: LG 1, 5, 10, 12, 13, 16 (LG 16, LOD 6.0; 24%), Juiciness: LG 1, 12, 16 (LG 16, LOD 14.8; 46%), Granularity: LG 2 (LOD 5.1; 24%), Slow breakdown: LG 1, Sponginess: LG 1, 5, 6, 16 (LG 16, LOD 7.7; 30.0%)	Prima x Fiesta	unspecified	King et al., 2000; Maliepaard et al 2001; HiDRAS (unpublished)	
Malus ×*domestica*	Fruit texture – 7 measures	Compression: LG 1, 6, 8, 12, 15 (LOD 4.09-8.62; 16.0-27%), Wedge	Prima x Fiesta	unspecified	King et al. 2001	

		measures: LG 1, 7, 15, 16 (LOD 4.51-9.83; 15.0-32.0%), Specific gravity: LG 6 (LOD 7.99; 28.0%), 16 (LOD 4.54; 15.0%), Stress at first failure (compression): LG 13 (LOD 3.51), Work of fracture (wedge fracture): LG 7 (LOD 4.51), Circularity of cells: LG 3 (LOD 3.3)			
Malus ×*domestica*	Sugar content	QTLs: LG 3, 6, 8, 9, 14 (LOD 3.1-5.1; 3.6-12%)	Fiesta x Discovery	unspecified	Liebhard et al., 2003a.
Malus ×*domestica*	Fruit acidity	QTLs: LG 8, 16 (LOD 4.7-6.2; 42.0-46.0%)(*Ma* locus on LG 16)	Fiesta x Discovery	unspecified	Liebhard et al., 2003a.
Malus ×*domestica*	Malic acid content	Major locus: *Ma; LG16; 0*	Prima x Fiesta	RAPD	Maliepaard et al., 1998.
Malus ×*domestica*	Fruit taste: overall liking	QTLs: LG 12, 16 (LG 16, LOD 11.3; 38.0%)	Prima x Fiesta	unspecified	King et al., 2000
Malus ×*domestica*	Volatile compounds based on PTR-MS	QTL: 10 QTL, LOD 2.5 associated with PTR_MS peaks at m/z= 28, 43, 57, 61, 103, 115 & 145	Fiesta x Discovery	SSR	Zini et al., 2005.
Malus ×*domestica*	Allergens	Major locus: *Mal d 1.05 ;* LG 6	Prima x Fiesta plus Jonathan x Prima	SNP, SSR	Gao et al., 2005a.
Malus ×*domestica*	Allergens	Candidate genes: Family of seven *Mal d 1* genes *;* LG 13	Prima x Fiesta plus Jonathan x Prima	SNP, SSR	Gao et al., 2005a.
Malus ×*domestica*	Allergens	Candidate genes: Family of nine *Mal d 1* genes *;* LG 16	Prima x Fiesta plus Jonathan x Prima	SNP, SSR	Gao et al., 2005a.
Malus ×*domestica*	Allergens	Candidate genes: *Mal d 2.01A;* LG 9	Prima x Fiesta	SNP	Gao et al., 2005b. Genet. 111:1087-1097.
Malus	Allergens	Candidate genes: *Mal d 3.01;* LG	Jonathan x Prima	SNP	Gao et al., 2005c.

×*domestica*		12			
Malus ×*domestica*	Allergens	Candidate genes: *Mal d 3.02;* LG 4	Prima x Fiesta plus Jonathan x Prima	SNP	Gao et al., 2005c.
Malus ×*domestica*	Allergens	Candidate genes: *Mal d 4.01*; LG9	Prima x Fiesta	SNP	Gao et al., 2005b.
Malus ×*domestica*	Allergens	Candidate genes: 2 copies of *Mal* d 4.01; LG9	plus Jonathan x Prima	SNP	van de Weg, pers. comm.
Malus ×*domestica*	Allergens	Candidate genes: *Mal d 4.2A*; LG2	plus Jonathan x Prima	SNP	van de Weg, pers. comm.
Malus ×*domestica*	Allergens	Candidate genes: *Mal d 4.3A*; LG8	plus Jonathan x Prima	SNP, SSR	van de Weg, pers. comm.
PEAR					
Pyrus communis	Red fruit skin and foliage	Major locus: unspecified	Bon Rouge x Packham's Triumph	SSR	Booi et al. 2005.
Pyrus communis	Leaf scab	2 QTLs: LG 3 & 4, both 88%; LOD>10	Abbe Fetel (AF) x Max Red Bartlett (MRB)	AFLPs & SSRs	Pierantoni et al., 2007.
Pyrus communis	Fire blight	QTL: LGHS2a-0.0, QTL : 3.25 ; LGHS2a-9.0 ; 16.4% QTL : 2.06 ; LFHS2b-10.7 ; 9.6% QTL : 2.64 ; LGHSA-9.8 ; 12.0% QTL : 1.85 ; LGHS-21.9 ; 8.5%	Passa Crassane x Harrow Sweet	SSRs, AFLPs, AFLP-RGAs	Dondini et al., 2004.
Pyrus communis and other *Pyrus*	Self-incompatibility	Gene : *S* locus (approx. 30 alleles within the genus)	Various cultivars	PCR of allelic sequences	Sanzol et al. 2008; Zhang et al., 2007
Pyrus communis × *P.* ×*bretschnei*	Dwarf	Major locus: *pcDw* (marker is 8.3 cM away from gene)	Aihuali x Chili	RAPD and SCAR	Jia et al. 2007.

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Pyrus pyrifolia	Asian pear scab resistance	Major locus: *Vn*; LG unspecified – Kin-61.9; marker at 44.5	Kinchaku (R) x Kosui (S)	RAPD	Iketani et al., 2001.
Pyrus pyrifolia	Asian pear scab resistance	Major locus: *Vnk*; LG1; LOD 5.0, 2.4-12.4cM away	Shuurei x 314-32 (Kinchaku x Housui) Housui x 30-38 (Chikusui x Kinchaku)	AFLP-STS RAPD-STS	Terakami et al., 2004.
Pyrus pyrifolia	*Alternaria* black spot susceptibility	Major locus: *A;* LG unspecified-Kin- 66.8; markers at 53.0 and 48.1	Kinchaku (S) x Kosui (R)	RAPD	Iketani et al., 2001.
Pyrus pyrifolia	*Alternaria* black spot susceptibility	Major locus: *A*; marker is 3.1 cM from gene	Osa Nijisseiki open-pollinated	RAPD	Banno et al., 1999; Banno et al. 2002.
Pyrus pyrifolia	*Alternaria* black spot susceptibility	Major locus: *Ani*; LG11Osa-3.4; SSRs at 0.0 and 12.1; LODs 24.5 and 18.1	Osa Nijisseiki x Okusankichi	SSRs	Terakami et al., 2007.
Pyrus pyrifolia	*Alternaria* black spot susceptibility	Major locus: *Ana*; LG11N-2.5, SSRs at 2.5 and 10.1; LODs 12.0 and 7.4	Oushuu x Nansui	SSRs	Terakami et al., 2007.
Pyrus pyrifolia	Fruit ethylene biosynthesis	Genes: *PP-ACS1* (high ethylene) *and PP-ACS2* (moderate ethylene)	F_2 of OT-16 (F_1 of Osa Nijiseiki x Cili)	CAPS: A and B	Itai et al. 2003.
Pyrus pyrifolia	Fruit russet	Major locus: *I* (modifier of *R*); not mapped; marker associated with unrusseted phenotype.	Kousui x Kinchaku; Niitaka x Chikusui	RAPD	Inoue et al. 2006.

Pyrus pyrifolia × *P. communis*	Red leaf color	Major locus: *Re*; LG12O	Osa Nijisseiki x Oharabeni	RAPD	Banno et al. 2002.
Pyrus pyrifolia × *P. ussuriensis*	Fruit hardness	Not mapped	Niitaka x Suhyanri	RAPD, AFLP	Kim et al; 2005.
Pyrus pyrifolia × *P. ussuriensis*	Skin color	Not mapped	Niitaka x Suhyanri	RAPD, AFLPs	Kim et al; 2005.
Pyrus pyrifolia × *P. ussuriensis*	Fruit grit	Not mapped	Niitaka x Suhyanri	AFLPs	Kim et al; 2005.
Pyrus pyrifolia × *P. ussuriensis*	Fruit shape	Not mapped	Niitaka x Suhyanri	AFLPs	Kim et al; 2005.
PEACH					
Prunus persica	Leaf curl resistance	QTLs: 2.5-6.6, LG3D-28, 16-37%; 2.5-4.4, LG6D-28, 6-29%	Summergrande x *P. davidiana* P1908	RFLPs	Viruel et al., 1998.
Prunus persica	Powdery mildew resistance	QTL:2.2-4.3, LG7-21, 13.5-26.5%	(*P. ferganensis* x IF7310828) BC1	RFLP	Verde et al., 2002.
Prunus persica rootstock	Peach Tree Short Life (PTSL)	QTL: n/a; LG1 – 14; QTL: n/a; LG2 - 0-8; 34; 43; QTL: n/a; LG4 - 36; QTL: n/a; LG6 - 44.7	'Guardian® 3-17-7' x 'Nemaguard'	SSRs	Liu et al., 2008.

Prunus persica	Powdery mildew resistance	QTLs: 2.4-3.2, LG1-86,7-11%; 2.6-13.0, LG6-31.85, 5-56% 17, LG8-19.9,32-57%	Summergrand x *P. davidiana* P1908 F_1, F_2,& BC_2 (crossed to Zéphir)	RFLPs	Foulongne et al., 2003
Prunus persica rootstock	Rootknot nematode resistance	Major loci: *Mi* and *Mij*, LG1	Lovell × Nemared	AFLPs	Abbott et al., 1998.
Prunus persica	Internode length	QTL: 4.1, LG1b, 26.2%	*P. ferganensis* x IF7310828) BC1		Verde et al., 2002
Prunus persica	Blooming time	QTL: 5.6-6.1, LG$-59,32.1-35.1% (co-segregates with F gene)	(*P. ferganensis* x IF7310828) BC1	B4C10	Verde et al., 2002.
Prunus persica	Fruit development period	QTL: 9; LG4 – 8; 76.2%	Ferjalou Jalousia x Fantasia	SSR	Etienne et al., 2002.
Prunus persica	Ripening date	QTL: 9; LG4 - 0; 77.7%	Ferjalou Jalousia x Fantasia	SSR	Etienne et al., 2002.
Prunus persica	Fruit maturity (harvest)	QTLs	Suncrest x Bailey	RAPD, AFLPs, RFLP	Abbott et al., 1998.
Prunus persica	Ripening time	QTL: 3.3-5.3, LG6-2, 22.4-30.6%; QTL: 2.6-3.3, LG2-6, 15.8-19.8% QTL: 4.2-4.6, LG6-2, 26.4-28.8%	(*P. ferganensis* x IF7310828) BC1	SSR, RFLP	Verde et al., 2002.
Prunus persica	Fruit skin color	QTL: 2.3-2.7, LG2-6, 14.1-17.5% QTL: 3.3, LG2-8, 19.9%	(*P. ferganensis* x IF7310828) BC1	SSR, RFLP	Verde et al., 2002.
Prunus persica	Fresh weight	QTL: 4.9; LG6 – 59.5; 52%	Ferjalou Jalousia x Fantasia	RFLP	Etienne et al., 2002.
Prunus persica	Fruit weight, fruit diameter	QTLs	Suncrest x Bailey	AFLPs RAPDs	Abbott et al., 1998.

Prunus persica	Fruit softening and flesh-stone adhesion	Gene: endoPG, LG4 (*Freestone-melting flesh* locus)	'Dr. Davis' x 'Georgia Belle'	EST-SSR	Peace et al., 2005.	MAPS
Prunus persica	Fruit fructose and glucose contents	QTLs	Suncrest x Bailey	RFLPs, AFLPs	Abbott et al., 1998.	
Prunus persica	Fruit sugar (SSC) content	QTL: 4.1; LG4; 34% ; QTL: 2.5; LG6 ; 17%	Ferjalou Jalousia x Fantasia	SSR, RFLP	Etienne et al., 2002.	
Prunus persica	Fruit sugar (SSC) content	Candidate gene: *RRUpe Vp2*	Texas (almond) x Earlygold F_2	SSCP	Etienne et al., 2002.	
Prunus persica	Fruit sugar (SSC) content	QTL: 2.0-2.9, LG6-0, 14.4-17.9 QTL: 3.3, LG2-4, 20.9%	(*P. ferganensis* x IF7310828) BC1	SSR, RFLP	Verde et al., 2002.	
Prunus persica	Fruit sweetness: fructose, glucose, sucrose content	QTL: 4.5, LG4-10, 38% QTL: 4.6, LG4-8, 41% QTL: 4.5l LG6-63.8, 39% Major locus 4.1, LG5-23.8, 39%	Ferjalou Jalousia x Fantasia	RFLPS, *D* locus	Etienne et al., 2002.	
Prunus persica	Fruit acidity: malic & citric acid content, TA, pH	Major locus: *D* (low acid): 10.7, LG5-31.4, 72%; 9.1, LG%-33.4, 77%; 10.8, LG5-33.4, 80%; 10.4, LG%-27.4, 86%	Ferjalou Jalousia x Fantasia		Etienne et al., 2002	
Prunus	Fruit quinic	1 QTL on LG8	Ferjalou Jalousia x	RFLP	Etienne et al.,	

persica	acid content		Fantasia		2002.	
Prunus persica	Cold-storage flesh browning	QTL: qP-Brn5.1^{m}, LG5-21; 39% with candidate gene (PpLDOX)	'Dr. Davis' x 'Georgia Belle'	EST-SSR & SNP	Ogundiwin et al., 2008.	
ALMOND						
Prunus dulcis	Self-fertility & cross-compatibility	Gene: S_f-allele; LG6 (same gene as for other *Prunus*)	'Tuono'	CEBASf	Sanchez-Perez et al., 2004.	MAPS
Prunus dulcis	Anther color	Major locus: *Ag*; G3	Texas (almond) x Earlygold (peach)	RFLP	Joobeur 1998	
Prunus dulcis	Blooming time	Major locus: *Lb*; G4	D.3.5 (almond) x Bertina (almond)	RAPD	Ballester et al., 2001	
Prunus dulcis	Flower color	Major locus: *B*; G1	Garfi (almond) x Nemared (peach)	RFLP	Jauregui 1998	
Prunus dulcis	Kernel taste	Major locus: *Sk*; G5	Texas (almond) x Earlygold (peach)	RFLP	Joobeur 1998	
Prunus dulcis	Nematode resistance	Major locus: *Mi*; G2	Garfi (almond) x Nemared (peach)	RFLP	Jauregui 1998	
Prunus dulcis	Shell hardness	Major locus: D; G2	Ferragnés (almond) x Tuono (almond)	RFLP	Arus et al., 1999	
SWEET CHERRY						
Prunus avium	Cross-compatibility	Gene: *SFB* at S locus	Various		Ikeda et al. 2004	MAPS
Prunus avium	Self – fertility	Gene: *SFB4′*, LG6, same gene as above (but specific allele)	JI 2420	SFB4′ CAP marker	Ikeda et al., 2004.	MAPS
SOUR CHERRY						
Prunus cerasus	Bloom time, % pistil death, % pollen	11 QTLs, LOD>2.4, 12.9%-25.9%; 3 QTL for bloom time, % pistil death and % pollen	Rheinische Schattenmorelle (RS) x Erdi Boterno	RFLP	Wang et al., 2000.	

	germination	germination mapped to LG EB1	(EB)			
Prunus cerasus	Fruit weight	See above	RS x EB	RFLP	Wang et al., 2000.	
Prunus cerasus	Fruit % Brix	See above	RS x EB	RFLP	Wang et al., 2000.	
Prunus cerasus	Ripening time	See above	RS x EB	RFLP	Wang et al., 2000.	
APRICOT						
Prunus armeniaca	Plum pox resistance	Major locus: LG1	Goldrich x Currot; Polonais x Stark Early Orange; Lito (Stark Early Orange x Tyrinthos) selfed	SSR and SSCP	Sicard et al. 2008.	
STRAWBERRY						
Fragaria ×ananassa	Day-neutrality	QTL: > 4.8, MI 05-1/MD05/MN 05-2, LG 28, 26.1 %; 5.2, 21.9 %, LG 28, 5.4 %; 5.8, CA05 LG 6, 14.4 %; 2.6, MN05-1, LG 6, 15 %; 2.4, MN05-3, LG 1, 11.5%; 2.4, MN05-4, LG 3, 13.0%	'Tribute' x 'Honeoye'	AFLP, RAPD-SCAR	Weebadde et al., 2008	MASS
Fragaria ×ananassa	Fruit firmness	QTL: 3.7, f379, LG -1, 10 %; 3.3, f211, LG-6, 8 %; 3.3, f211, LG -6, 8 %; 3.9, f389, LG 35, 11 %	Capitola x CF1116	AFLP, SSR	Lerceteau-Köhler et al., 2004.	
Fragaria ×ananassa	Fruit maturity	QTL: 5.4, m574, LG 30, 15 %	Capitola x CF1116	AFLP, SSR	Lerceteau-Köhler et al., 2004	
Fragaria ×ananassa	Fruit fresh weight	QTL: 3.9, m97, LG 4, 9.3 %	Capitola x CF1116	AFLP, SSR	Lerceteau-Köhler et al., 2004.	
Fragaria ×ananassa	Fruit length, diameter	QTL:5.9, m425, LG 5, 12.9 %; 3.5, m563, LG 2b, 7 %; 7.5, m167, LG 5, 15 %; 3.1, m169, LG 7,	Capitola x CF1116	AFLP, SSR	Lerceteau-Köhler et al., 2004	

		6.5 %; 3.3, m307, LG 7, 7 %				
Fragaria ×*ananassa*	Fruit citrate content	QTL: 3.0, m407, LG 6, 7 %	Capitola x CF1116	AFLP, SSR	Lerceteau-Köhler et al., 2004	
Fragaria ×*ananassa*	Fruit sucrose content	QTL: 3.5, f171, LG 37, 9 %; 3.7, f259, LG 7, 8 %	Capitola x CF1116	AFLP, SSR	Lerceteau-Köhler et al., 2004	
Fragaria ×*ananassa*	Fruit sugar content (SSC)	QTL: 3.1, m577, LG 7, 7 %	Capitola x CF1116	AFLP, SSR	Lerceteau-Köhler et al., 2004	
Fragaria ×*ananassa*	Resistance to *C. acutatum*	QTL:2.3, f163, LG 6, 12%; 2.0, f219-f347, LG 11, 8%; 2.3, m193, LG 14, 10 %; m321, 2.8, LG 40, 10%	Capitola x CF1116	AFLP, SSR	Denoyes-Rothan et al., 2004	
Fragaria ×*ananassa*	Resistance to *P. cactorum*	QTL: 2.1, f93, LG 1, 8 %; 2.4, f105-f291, LG 19, 10 %; 3.5, m243-m523, LG 2a, 12 %; 2.1, m671, LG 11, 6 %; 2.2, m153, LG 40, 10 %	Capitola x CF1116	AFLP, SSR	Denoyes-Rothan et al., 2004	
Fragaria ×*ananassa*	Resistance to *P. fragariae*	Major locus?	Md683 x Senga Sengana and Pedigreed set of cultivars and breeding lines	SCAR	Haymes et al. 1997	MAPS MASS in 09
Fragaria ×*ananassa*	Resistance to *P. fragariae*	Major locus? *MMAB,* 1 cM	Redgauntled x Senga Sengana and Pedigreed set of cultivars and breeding lines	SCAR	Van de Weg et al. ms in prep	MAPS MASS in 09
RASPBERRY						
Rubus idaeus	Cane spot	Major locus: *H* (cane pubescence) LG2	Glen Moy x Latham	SSRs	Graham et al. 2006.	

		QTL:LG2L			
Rubus idaeus	Rust	Major locus: *H* LG2 ; QTLs :LG3L-44, LG5L-50	Glen Moy x Latham		Graham et al. 2006.
Rubus idaeus	Botrytis and spur blight	QTLs: 1 on LG1, 1 on LG2, 3 on LG3, 3 on LG5, 5 on LG6	Glen Moy x Latham		Graham et al. 2006.
Rubus idaeus	Cane spininess	QTLs : LG3L-58 & LG2L-59	Glen Moy x Latham		Graham et al. 2006.
Rubus idaeus	Aphid resistance	Major locus: A_1, LG3-53.2	Malling Jewel x Malling Orion	SSR, AFLP	Sargent et al. 2007.
Rubus idaeus	Dwarfness	Major locus: *dw ;* LG6-36.5	Malling Jewel x Malling Orion	AFLPs	Sargent et al. 2007.
Rubus idaeus	RLSV and RVCV viral diseases	Major locus on LG 2 and 8	Glen Moy x Latham		Rusu et al. 2006.
Rubus idaeus	Cane spininess	QTL : Two regions with 16 markers on LG2, 46.5-56.1 cM, 48% ; and 108-120.9 cM, 50%	Glen Moy x Latham	AFLPs, SSRs	Graham et al. 2004.
Rubus idaeus	Root sucker density	QTL: LG8, 53%	Glen Moy x Latham	AFLPs and SSRs	Graham et al. 2004.
Rubus idaeus	Root sucker spread	QTLs: LG?, 79%, LG?, 33%	Glen Moy x Latham	AFLPs and SSRs	Graham et al. 2004.
BLACKBERRY					
	None known				
ROSE					
Rosa x *hybrida*	Black spot resistance	Major locus: Unlinked to *Rdr1;Rdr2* (not yet assigned to linkage group)	'Chorale' x 'George Vancouver' (4x cultivated)	BSA in progress	Whitaker et al., 2008.
Rosa x *hybrida*	Black spot resistance	Major locus: *Rdr1*, LG1	*Rosa multiflora* (4x) x *R. x hybrida*	SSR	Von Malek et al., 2000.

Rosa x *hybrida*	Black spot resistance	Major locus: *Rdr2*, LG1	'Caramba' *Rosa multiflora*	SSR	Hattendorf et al., 2004.
Rosa x *hybrida*	Powdery mildew resistance	Major locus: *Rpp1*, LG3	*Rosa multiflora*	SCAR	Linde et al., 2004.
Rosa x *hybrida*	Powdery mildew resistance	28QTLs: >3.9; seven different linkage groups	*Rosa multiflora*	AFLP, CAPS, SCAR, RGA	Linde et al., 2006.
Rosa x *hybrida*	Powdery mildew resistance, flowering traits	8 QTLs	*Rosa wichuriana*	RAPD, SSR	Dugo et al., 2005.
Rosa x *hybrida*	Blooming date; Petal number	QTL *BD*, LG B4; Major locus: *NP*, LG A4, QTL *NP*, LG B4	*R.* x *hybrida* 'Zambra' (dihaploid) x *R. wichuriana*	SSR	Hibrand-Saint Oyant et al., 2008.
Rosa x *hybrida*	Recurrent bloom	Major locus *r4*, LG B4	*R.* x *hybrida* 'Zambra' (dihaploid) x *R. wichuriana*	AFLP	Crespel et al., 2002.
Rosa x *hybrida*	Flower double corollas	Major locus *d6*, LG A6	*R.* x *hybrida* 'Zambra' (dihaploid) x *R. wichuriana*	AFLP	Crespel et al., 2002.
Rosa multiflora	Double flowers	Major locus: *Blfo*, LG B4	F1 diploid mapping population	RAPD, AFLP	Debener and Matiesch, 1999.
Rosa multiflora	Flower color (pink)	Major locus: *Blfa*, LG B2	F1 diploid mapping population	RAPD, AFLP	Debener and Matiesch, 1999.

Rosa x *hybrida*	Stem thorn number	QTL *t4*, LG B4; QTL *tb4*, LG B4	*R.* x *hybrida* 'Zambra' (dihaploid) x *R. wichuriana*	AFLP	Crespel et al., 2002.
Rosa x *hybrida*	Petiole prickles	Major locus: *Pr*, LG 7	86-7 (*R. wichuraiana* x *R. rugosa*) x *R.* x *hybrida* 'Basye's Blueberry'	AFLP, SSR	Rajapakse et al., 2001.
Rosa multiflora	Plant vigor (10 traits)	42 QTLs: >2.5, 12-35% variation	F1 diploid mapping population	AFLP, SSR, PK, RGA, RFLP, SCAR	Yan et al., 2007.

[a] MAPS = marker-assisted parent selection ; MASS = marker-assisted seedling selection

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