Table 1. Molecular mapping of agriculturally important genes in crop plants

Crop	Pathogen/Trait	Gene	Marker(s)	Reference
1. Disease resistance				
Rice	*Pyricularia oryzae*	*Pi-2,4*	RFLP	[18]
		Pi11	RFLP	[139]
		Pi-5(t), Pi–7(t)	RFLP	[140]
		Pi-Z^{-6}	RFLP	[141]
		Pi-10	RFLP	[142]
		Pi-12(t)	RFLP	[143]
		Pi-18(t)	RFLP	[144]
		Pib	RFLP	[145]
		Pik^{m}	RFLP	[146]
		Pita-2, Pita	RFLP	[147]
		Pi-5 (t)	AFLP	[148]
		Pi20	RFLP	[149]
		Pi44	RFLP	[150]
		Pb1	RFLP	[151]
	Pyricularia grisea	*Pi-1(t)*	RFLP	[152]
		QTL (1)	RFLP	[153]
	Xanthomonas oryzae pv. *oryzae* (Bacterial blight)	*Xa-1, Xa-3, Xa-4*	RFLP	[20]
		Xa-5	RFLP	[19]
		Xa-13	RFLP	[154]
		Xa-21	RFLP	[155]
		Xa-1	RAPD	[156]
		Xa3, Xa4, Xa5, Xa10	RFLP	[156]
		Xa13	RFLP	[157]
		Xa22(t)	RFLP	[158]
		Xa-1	RAPD	[159]
		Xa 23 (t)	SSR	[160]
	Rice yellow mottle virus	*RYMV (QTL)*	RFLP	[161]
		RYMV	RFLP & STS	[162]
	Rice stripe	*Stv-b*^{i}	RFLP	[163]
	Tungro	*RTSV*	RFLP	[164]
	Puccinia striiformis f. sp. *tritici*	*Yr5*	RGA	[165]
	Rhizoctonia solani Kuhn	*Rsb1*	RFLP, RAPD, AFLP, SSR	[166]
Wheat	*Erysiphe graminis* p.v. *tritici*	*Pm1, Pm2, Pm3b, Pm4a*	RFLP	[167]
		Pm1, Pm2	RFLP	[168]
		Pm2	RFLP	[169]
		Pm3b, Pm4a	RFLP	[170]
		Pm2	RFLP	[171]
		Pm1	RFLP	[172]
		Pm12	RFLP	[173]
		Pm21	RAPD	[174]
		Pm	RFLP	[175]
		Pm4b	AFLP	[176]

Crop	Pathogen/Trait	Gene	Marker(s)	Reference
		Pm4a & Pm4b, Pm6	STS, RFLP	[177]
		Pm13	RFLP, RAPD, STS, DDRT-PCR	[178]
		MlG	SSR	[179]
	Adult plant resistance to powdery mildew	*APR*	STMS, RFLP	[180]
	Common bunt	*Bt-10*	RAPD	[181]
		Bt-11	RAPD	[182]
	Karnal bunt	*KB*	RFLP	[183]
	Durable stem rust	*Sr2*	RFLP	[169]
		Sr2	STS	[184]
		Sr2	RFLP	[185]
		Sr22	RFLP	[186]
	Puccinia recondite	*Lr9*	RFLP, RAPD	[187]
		Lr18	N-band	[188]
		Lr1	RFLP	[189]
		Lr9	RFLP	[190]
		Lr 19	RFLP	[190]
		Lr24	RFLP	[190]
		Lr24	RAPD	[191]
		Lr 29	RAPD	[192]
		Lr32	RFLP	[190]
		Lr34	RFLP	[169]
		Lr24	RAPD, SCAR	[193]
		Lr10	STS	[194]
		Lr10	RFLP	[195]
		Lr23	RFLP	[195]
		Lr27	RFLP	[195]
		Lr31	RFLP	[195]
		Lr34	RFLP, RAPD	[195]
		Lr34	RFLP	[196]
		Lr13	RFLP, STMS	[197]
		Lr35	PCR	[197]
		Lr28	RAPD, STS	[37]
		Lr3	RFLP	[198]
		Lr3	mRNA fingerprinting, cDNA cloning	[199]
	Stripe rust	*Yr15*	RFLP	[200]
		Yr15	RAPD, STMS	[201]
		YrH52	STMS, RFLP	[40]
	Loose smut	*T19*	Monoclonal antibody	[202]
		T10	RAPD, RFLP	[203]
	Septoria nodorum	–	RAPD	[204]
	Septoria tritici	–	AFLP	[205]
	Fusarium head blight	–	AFLP, RFLP	[206]
		–	AFLP	[207]
	Yellow rust	*YrMoro*	AFLP, STS	[208]

(Contd)

Table 1. *(Contd)*

Crop	Pathogen/Trait	Gene	Marker(s)	Reference
	Tilletia indica	*QTL (1)*	SSR, AFLP	[209]
	Wheat streak mosaic virus	*Wsm1*	STS, RAPD	[210]
Maize	*Heliminthosporium turcicum*	*Ht1*	RFLP	[211]
	Maize dwarf mosaic virus	*mdm1*	RFLP	[212]
	Cercospora zeamaydis	*QTL (>10)*	–	[213]
	Maize streak virus	*QTL (1)*	RFLP	[214]
	Maize mosaic virus	*QTL (1)*	RFLP	[215]
	Maize stripe virus	*QTL (1)*	RFLP	[216]
	Sugarcane mosaic virus	*Scm1*	RFLP, SSR	[217]
		Scmv1, Scmv2	RGA-CAPs	[218]
		Scmv1, Scmv2	AFLP, SSR	[219]
Barley	*Erysiphe graminis*	*QTL (2)*	RFLP	[220]
		Rar1	AFLP	[221]
	Rynchosporium secalis	*Rrs 13*	RFLP	[222]
	Puccinia hordei	*Rph Q*	RAPD	[223]
		QTL-Rphq (6)	AFLP	[224]
		Rph7.g	RFLP	[225]
	Xanthomonas campestris pv. *hordei*	*QTL (3)*	–	[226]
	Puccinia striiformis f.sp. *hordei*	*QTL (1)*	–	[227]
	Barley yellow dwarf Luteovirus	*Yd2*	AFLP	[228]
	Barley yellow mosaic virus	*rym5*	CAPs, SSR	[229]
	Cochliobolus sativus	*Vhv1*	AFLP	[230]
	Pyrenophora graminea	*QTL (2)*	–	[231]
Sorghum	*Sporisorium reilianum*	*Shs*	RFLP/RAPD	[232]
Tomato	*Stemphylium vesicarum*	*Sm*	RFLP	[233]
	Cladosporium fulvum	*cfa*	RFLP	[234]
	Fusarium oxysporum	I_2	RFLP	[235]
	Pseudomonas syringae	*Pto*	RFLP	[236]
	Leveillula tourica	*Lv*	RAPD/RFLP	[237]
	Verticillium dahliae	*Ve*	RAPD	[238]
		Ve	RFLP	[239]
	Medoidogyne sp.	*Mi*	RFLP	[240]
	Psuedomonas solanacearum	*QTL (3)*		[241]
	Oidium lycopersicum	*Ol-1*	RFLP, RAPD, SCAR	[242]
	Alternaria solani	*QTL (1)*	RFLP, RGA	[89]
Potato	Potato virus X	Rx_1, Rx_2	RFLP	[243]
		Nb	AFLP	[244]
	Phytophthora infestans	*QTL (11)*	RFLP	[97]
		R2	AFLP	[99]
	Potato X potexvirus	Nx_{phu}	RFLP	[245]
	Potato Y potyvirus	Ry_{adg}	RFLP	[246]

Crop	Pathogen/Trait	Gene	Marker(s)	Reference
Soybean	*Phytophthora sojai*	*Rps 1*	RFLP	[247]
	Soybean mosaic virus	*Rsv*	RFLP/SSR	[248]
	Pseudomonas syringae pv. *glycinea*	*Rpg 1*	RFLP	[249]
Common bean	*Uromyces appendiculatus*	*PI 181996*	RAPD	[250]
		Ur-9, Fin	RAPD	[251]
	Potyvirus	*I*	RAPD	[252]
	Xanthomonas campestris	*QTL (7)*	RFLP	[253]
	Colletotrichum lindemut hianum	*Co-4*^{2}*, Co-7*	RAPD, SCAR	[254]
Pea	Pea seed borne mosaic virus	*sbm-1*	RFLP	[255]
	Ascochyta pisi	*QTL (3)*	RFLP	[256]
Tobacco	*Chalara elegans*	*Brr*	RAPD	[257]
Apple	*Venturia inaequalis*	*Vf*	RAPD	[258]
		Vf	AFLP & SCAR	[259]
Melon	*Fusarium* sp.	*Form 2*	RAPD	[260]
Mungbean	*Erysiphe polygoni*	*QTL (3)*	RFLP	[261]
Cocoa	*Phytophthora palmivora*	*QTL (5)*	AFLP	[262]
Oil palm	*Fusarium* sp.	*QTL (1)*	SSR & AFLP	[263]
Rubber	*Microcyclus ulei*	*QTL (8)*	–	[264]
	Phyllochora herberi	*Phr*	Isozyme	[265]
Sugarcane	*Puccinia melanocephala*	–	RFLP	[266]
Brassica	*Leptosphaeria maculans* (Desm.) Ces.et de Not	*QTL (10)*	–	[267]
	Plasmodiophora brassicae	*Pb-Bn1, QTL (2)*	–	[268]
	Sclerotinia sclerotiorum	*QTL (1)*	RFLP, AFLP, SSR, RAPD	[269]
Chick pea	*Fusarium* sp.	*Race 4*	ISSR (Inter-Simple Sequence repeat)	[270]
Pearl millet	*Puccinia substriata* var. *indica*	Rr_1	RAPD,RFLP	[271]
Rose	*Diplocarpon*	*Rdr1*	RAPD, AFLP	[272]
Grape	Powdery mildew	*Run1*	AFLP	[273]
Pepper	Potato virus Y	*Pvr4*	RAPD, SCAR	[274]
Cassava	Cassava Mosaic Virus	*CMD2*	SSR, RFLP	[275]
Rye	Rust	*Lr26* *Sr31* *Yr9* *SrR*	AFLP, RGA, STS	[276]
Banana	Banana Streak Virus	–	AFLP	[277]
Tobacco	*Ralstonia solanacearum*	*QTL (1)*	AFLP	[278]
Lentil	*Colletotrichum truncatum*	*LCt-2*	RAPD, AFLP	[279]

(Contd)

Table 1. *(Contd)*

Crop	Pathogen/Trait	Gene	Marker(s)	Reference
2. Nematode and insect resistance				
Potato	*Globodera rostochiensis*	*QTL (2)*	–	[280]
	Globodera rostochiensis, G. pallida	*Grp1*	AFLP, CAPs & RFLP	[281]
	G. pallida	*QTL (1)*	AFLP, SSR	[282]
		QTL (1)	AFLP	[283]
Tomato	*Globodera rostochiensis*	*Hero*	SSR	[284]
	Meloidogyne spp.	*Mi-1*	RFLP	[285]
Sorghum	Head bug	*B2/b2*	RFLP, SSR	[286]
	Schizaphids graminum	*QTL (1)*	RAPD, SSR	[287]
Soybean	*Helicoverpa zea* Boddie	*QTL (1)*	RFLP	[77]
	Heterodera glycines Ichinohe	*QTL (1)*	RFLP	[288]
Wheat	*Diuraphis noxia* Mordvilko	*Dn2*	RAPD, SCAR	[289]
		Dn2, Dn4	RFLP	[290]
		Dn4	SSR	[291]
		Dn6		
	Hessian fly	*H23, H24*	RFLP	[292]
		H3, H5, H6, H9- H17	RAPD	[293, 294]
		H21	RAPD	[295]
		H6	RAPD, STS	[296]
	Pratylenchus neglectus	*Rlnn1*	AFLP, RFLP	[297]
	Cereal cyst nematode resistance	*Cre1*	RFLP	[298]
		Cre1	RFLP	[127]
		Ccn-D1	RAPD, RFLP	[299]
Maize	*Ostrinia nubilalis*	*QTL (1)*	RFLP, SSR	[300]
Rice	*Orseolia oryzae* (Gall midge)	*Gm2*	RFLP	[14]
		Gm4(t)	RFLP	[118]
		Gm7	AFLP, SCAR	[301]
	Brown planthopper	*Bph1*	RFLP	[302]
		Bph10	RFLP	[303]
		Bph(t)	RFLP	[23]
	Green leafhopper	*GLH*	RFLP	[17]
		Grlp3	RFLP	[304]
		Grlp11	RFLP	[304]
		Grh1	RFLP	[305]
	Whitebacked planthopper	*WBPH*	RFLP	[306]
		WBPH	RFLP	[307]
Apple	*Dysaphis devecta* Wlk.	*Sd-1*	AFLP, SSR, RFLP	[308]
3. Abiotic stresses				
Rice	Submergence tolerance	*Sub1*	RFLP	[24]
	Salt tolerance	*Salt*	RFLP	[25]
		OSA3	RFLP	[26]

Crop	Pathogen/Trait	Gene	Marker(s)	Reference
	Phosphorus uptake	*QTL (1) (Pup1)*	RFLP	[27]
	Aluminium tolerance	*QTL (1)*	–	[28]
Wheat	Thermosensitive earliness *per se*	*Eps-A^{m}1 (QTL)*	RFLP	[309]
	Aluminium tolerance	*Alt2*	RFLP	[310]
		Alt$_{BH}$	RFLP	[311]
	Tolerance to salt stress	*Kna1*	Protein poly morphism	[312]
Barley	Aluminium tolerance	*Alt (QTL)*	AFLP, SSR	[313]
4. Male sterility, wide compatibility and fertility restoration				
Petunia	Restorer of fertility	*Rf*	RAPD, AFLP	[314]
Rice	Male sterility and fertility restoration	*tgms1.2*	RFLP	[29]
		tms2	RFLP	[30]
		tms3	RFLP	[31]
		tgms	RFLP	[32]
		tgms-vn1 (tms4)	RFLP	[33]
		pms1	RFLP	[315]
		pms2	RFLP	[315]
		pms3	RFLP	[316]
		ms-h(t)	RFLP	[317]
		Rf-1	RFLP	[318]
		Rf?	RFLP	[319]
		Rf2	RFLP	[320]
		Rf3	RFLP	[321]
		Rf5	RFLP	[322]
		Rfu	RFLP	[323]
		Rf?	RFLP	[114]
	Hybrid breakdown	*Hwd1, hwd2*	RFLP	[324]
	Wide compatibility	*S5*	RFLP	[325]
Wheat	Fertility restoration	*Rf4, Rf3*	RFLP	[326]
Rye	CMS	*Rfg1*	RFLP, RAPD	[227]
	Self-fertility	*S1Z1S5*	Isozyme, RFLP	[228]
Brassica	CMS restorer	*Rfp1*	RFLP, RAPD	[229]
Sorghum	Fertility restorer	*rf4 (QTL)*	AFLP	[330]
Sunflower	Fertility restoration	*Rf1*	RAPD, AFLP, SCAR	[331]
Cotton	CMS fertility restoration	*Rf1*	RAPD, SSR	[332]
Coffee	Pollen viability restoration	*QTL (3)*	AFLP	[333]
5. Grain quality				
Sorghum	Grain quality and yield components	*QTL (6)*	RFLP, AFLP & SSR	[334]
Rice	Grain aroma	*Fgr*	RFLP	[34]

(Contd)

Table 1. *(Contd)*

Crop	Pathogen/Trait	Gene	Marker(s)	Reference
	Cooked-kernel elongation	*KNE*	RFLP	[35]
	Amylose	*Wx*	RFLP	[335]
Wheat	Flour colour	*QTL (1)*	RFLP, AFLP	[336]
	Grain yield	*QTL (1)*	RFLP	[337]
	Red grain colour	*R3, R1*	RFLP	[169]
	High molecular weight glutanin	*Glu-D1*	PCR-based	[338]
	Grain protein content	*QTL (1)*	STMS, RFLP	[44]
		QTL (1)	SSR	[339]
	Kernel hardness	*ha*	RFLP	[169]
		ha	RFLP	[340]
	Bread making quality	*Glu-D1(1Dx5)*	PCR	[341]
	Amylose content	*Wx-B1*	RFLP	[342]
Sunflower	Grain oil content	*QTL(2)*	AFLP, SSR	[343]
6. Yield, its components and other traits				
Eucalyptus	Wood density, stem growth and stem form	*QTL (1)*	RAPD	[110]
	Lignification genes	*EgHypar* and *EgTub A1*	SSCP (Single Strand Confirnation Polymorphism)	[344]
Oil palm	Fruit morphology and fertility	*Sh*	AFLP	[263]
Carnation	Flower type	*QTL (1)*	RAPD, SCAR & RFLP	[345]
Soybean	Specific leaf weight and leaf size	*QTL (1)*	RFLP	[346]
	Stearic acid content	*Fas*	SSR	[80]
Wheat	Plant height	*Rht-B1*		
		Rht-D1	RFLP	[347]
	Dwarfing genes	*Rht12*	STMS, RFLP	[43]
		Rht8	SSR	[41]
		Rht-B1, Rht-D1	RFLP	[348]
		Rht-B1, Rht-D1	RFLP	[347]
	Haploid formation	*QTL (1)*	AFLP	[349]
	Green plant formation	*QTL (1)*	AFLP	[349]
	Semi-dwarfing genes Rht-D1b (Rht2)	*Rht-B1b (Rht-1)*–	PCR-based	[350]
	Ear emergence time, plant height	*QTL (1)*	RFLP	[351]
	Preharvest sprouting tolerance	*QTL (1)*	RFLP	[352]
		Major gene	STMS, STS	[45]
	Vernalization response	*Vrn1*	RFLP	[353]
		Vrn1	RFLP	[169]
		Vrn1	RFLP	[43]
		Vrn-A^{m}1, Vrn-A^{m}2	RFLP	[354]
		Vrn-D1	STMS	[355]

Crop	Pathogen/Trait	Gene	Marker(s)	Reference
	Cadmium uptake	*Cdu1*	RAPD	[356]
	ABA production and response	–	RFLP	[357]
	Coleoptile pigmentation	*Rc1*	RFLP	[169]
	Milling yield	–	RFLP, STMS	[358]
	Eyespot	*Pch2*	RFLP	[359, 360]
	Tan spot	–	RFLP	[361]
	Na^+/K^+ discrimination	–	RFLP	[362]
Apple	Growth and development in juvenile apple trees	*QTL (1)*	RAPD	[363]
Potato	For foliar glycoalkaloid and aglycones	*QTL (1)*	RFLP	[364]
Peach	Fruit quality	*QTL (1)*	Isozymes, RAPD, RFLP, AFLP	[365]
Rose	Recurrent blooming, double corolla, thorn density of the shoots	*QTL (1)*	AFLP	[366]
Grape	Seedlessness, berry weight	*QTL (1)*	AFLP, SSR, isozyme, RAPD, SCAR	[367]
Barley	Intermedium spike-C and non-brittle rachis1	*int-c* *btr-1 (QTL)*	AFLP	[368]
Pea	Rhizobium nodulation	*sym9, sym 10*	AFLP, RFLP	[369]
Sugarbeet	Sucrose content, yield and quality	*QTL (1)*	RFLP, AFLP	[370]
Rice	Photoperiod sensitivity	*Se1*	RFLP	[371]
	Semidwarf gene	*sd1*	RFLP	[122]
		Sdg	RFLP	[372]
	Shattering-resistance gene	*Sh2*	RFLP	[122]
		Sh4	RFLP	[373]
		Sht	RFLP	[374]
	Seed dormancy, heading date	*QTL (5)*	RFLP	[375]
	Heading date	*QTL-Hd-1, Hd-2 & Hd-3*	RFLP	[376]
	Yield	*QTL (1)*	SSR, STS	[36]
	Root morphology	*QTL (1)*	–	[377]
Pinus palustris Mill. × *P. elliottii* Engl.	Early height growth	*QTL (1)*	RAPD	[105]
Maize	Popping explosion volume	*QTL (4)*	SSR	[378]
Cotton	Fibre strength	*QTL (2)*	SSR, RAPD	[379]
Sunflower	Agronomic traits [grain weight by plant (GWP), 100-grain weight (TGW), percentage of oil in grain (POG), sowing to flowering date (STF)]	*QTL (1) for TWP, QTL (6) for POG, QTL (2) for STF*	AFLP, SSR	[341]