SCAR markers linked with disease resistance traits in common bean (*Phaseolus vulgaris*)
Updated: December 2010

SCAR Name	Marker of Origin	Pathogen	Size (bp) / orientation	Sequences of SCARS	Tagged Locus	LG	Reference
SAP6	AP6	Common Bacterial Blight (CBB)	820 cis	GTC ACG TCT CCT TAA TAG TA GTC ACG TCT CAA TAG GCA AA	Major QTL (GN#1 sel 27)	10	Miklas et al., 2000b,c
BAC6	BC409	CBB	1250 cis	TAG GCG GCG GCG CAC GTT TTG TAG GCG GCG GAA GTG GCG GTG	Major QTL (GN#1 sel 27)	10	Jung et al., 1999
SU91	U9	CBB	700 cis	CCA CAT CGG TTA ACA TGA GT CCA CAT CGG TGT CAA CGT GA	Major QTL (XAN 159)	8	Pedraza et al., 1997
LG5 syn. BC420	BC420	CBB	900 cis	GCA GGG TTC GAA GAC ACA CTG G GCA GGG TTC GCC CAA TAA CG	Major QTL (XAN 159)	6	Yu et al., 2000
R7313		CBB	700 cis	ATT GTT ATC GTC GAC ACG AAT ATT TCT GAT CAC ACG AG	Major QTL (OAC 88-1)	8	Bai et al., 1997 ; Beattie et al., 1998
R4865		CBB	950 cis	TCC AAA GCC ATT CTA GTT CAG CTA CTT TCA AAC	Major QTL (OAC 88-1)		Bai et al., 1997; Beattie et al., 1998

				TGG G			
SR13	R13	Halo bacterial blight (HBB)	1150 cis	GGA CGA CAA GGA ACA TAT TCA GGA CGA CAA GGC TGC AAG AAC CAT	*Pse-1*	10	Miklas et al., 2009
ST8	T8	HBB	1350 cis	AAC GGC GAC ATC AGT GTA AAG G AAC GGC GAC AAC CGA CCA TGT TTT AC	*Pse-1*	10	Miklas et al., 2009
SH11	H11	HBB	800 cis	CTT CCG CAG TCG AGA GAT CTT CCG CAG TAG CAC C	*Pse-1*	10	Miklas et al., 2009
SB10	B10	HBB	525 cis	CTG CTG GGA CAA TCA CCA AGT C CTG CTG GGA CTC TCT TAC	*Pse-Unnamed*	4	Fourie et al., 2004
*S*W13	W13	Bean Common Mosaic Virus (BCMV) & HBB	690 cis	**CAC AGC GAC A**TT AAT TTT CCT TTC CAC AGC GAC AGG AGG AGC TTA TTA	*I* *Pse-3*	2	Haley et al., 1994 Melotto et al., 1996 Fourie et al., 2004
ROC11	C11	BCMV	420 trans	CCA ATT CTC TTT CAC TTG TAA CC GCA TGT TCC AGC AAA CC	*bc-3*	6	Johnson et al., 1997

eIF4E	CAP marker Requires Rsal restriction	BCMV	381/541 codominant	ACC GAT GAG CAA AAC CCT A CAA CCA ACT GGT ATC GGA TT	*bc-3*	6	Naderpour et al., 2010
SG6	OG6	BCMV	595	**GTG CCT AAC C**GA GTT ATC TAG AGT GTG CCT AAC CCT CCT AAA TGA CCT	*Bc-3*	6	Mukeshimana et al., 2005
*S*BD5	BD5	BCMV	1250 cis	GTG CGG AGA GGC CAT CCA TTG GTG GTG CGG AGA GTT TCA GTG TTG ACA	*bc-1*^{2}	3	Miklas et al., 2000a
*S*R2	R2	Bean Golden Yellow Mosaic Virus (BGYMV)	530 / 570 codominant	CAC AGC TGC CCT AAC AAA AT CAC AGC TGC CAC AGG TGG GA	*bgm-1*	3	Urrea et al., 1996; Beebe, PC, 1996; Blair et al., 2007
*S*W12	W12	BGYMV	700 cis	TGG GCA GAA GTT CTA GCA TGT GGC TGG GCA GAA GCA CAG TAT GAT TTG	Major QTL (DOR 364)	4	Miklas et al., 2000c ; Singh et al. 2000
SAS8	AS08	Beet curly top virus (BCTV)	1550 cis	GGC TGC CAG TAT CTT GTC TAA CAC C GGC TGC CAG TGA CGC AAT TCT GCA G	*Bct*	7	Larsen and Miklas, 2004

Q14	SQ14	BCTV	973	**GGA CGC TTC A**TG ACA TTG GAT GAA CAG GGA CGC TTC ACC CTT TGT GGT ATT G	QTL BCT6.1 (G122)	6	Larsen et al., 2010
*S*K14	K14	Rust	620 cis	CCC GCT ACA CAC CAA TAC CTG CCC GCT ACA CTT GAT AAA ATG TTA G	*Ur-3*	11*	Haley et al. 1994 Nemchin. & Stavely, 1998 *Miklas et al., 2002
SA14	A14	Rust	1079 / 800 codominant	CTA TCT GCC ATT ATC AAC TCA AAC GTG CTG GGA AAC ATT ACC TAT T	*Ur-4*	6*	Miklas et al. 1993 Miene et al. 2004 *Miklas et al., 2002
*S*I19	I19	Rust	460 cis	AAT GCG GGA GAT ATT AAA AGG AAA G AAT GCG GGA GTT CAA TAG AAA AAC C	*Ur-5*	4*	Haley et al., 1993; Melotto et al., 1998 *Miklas et al., 2000c
SBC6	BC06	Rust	308 cis	GAA GGC GAG AAG AAA AAG AAA AAT GAA GGC GAG AGC ACC TAG CTG AAG	*Ur-6*	11*	Park et al., 2003b, 2004b *Miklas et al. 2002
SAD12	AD12	Rust	537 cis	AAG AGG GCG TGA GAT CGT CG AAG AGG GCG TCT TGA AGG TT	*Ur-7*	11	Park et al., 2003a, 2004a, 2008

SAE19	AE19	Rust	890 trans	CAG TCC CTG ACA ACA TAA CAC C CAG TCC CTA AAG TAG TTT GTC CCT A	*Ur-11*	11*	Johnson et al., 1995 Queiroz et al., 2004c *Miklas et al., 2002
UR11-GT2	GT02	Rust	450 cis	CGC ACT TAG GAG CAC AAA TGG TGG GTC CCA TAT TTT G	*Ur-11*	11*	Boone et al., 1999 ; *Miklas et al., 2002
KB126	E-AAC/M-ACC	Rust	405 / 430 codominant	GAA TTC AAC CTC GGC CAC TAC C TTA AAC CTT CCG GAG GAT TC	Ur-13	8	Mienie et al., 2005
SF10	F10	Rust	1072 cis	GGA AGC TTG GTG AGC AAG GA GGA AGC TTG GCT ATGATG GT	Ouro Negro	4*	Correa et al., 2000; *Miklas et al., 2002
SBA8	BA8	Rust	530 cis	CCA CAG CCG ACG GAG GAG GCC ATG TTT TTT GTC CCC	Ouro Negro	4*	Correa et al., 2000; *Miklas et al., 2002
Phs	Phaseolin 'T' & 'S' alleles	White Mold & Common Bacterial Blight CBB	Multiple	AGC ATA TTC TAG AGG CCT CC GCT CAG TTC CTC AAT CTG TTC	Major QTL (WM7.1) (G 122) & (BAT 93)	7	Kami et al., 1995; Nodari et al., 1993 Miklas et al., 2001

SAU5	AU05	White mold	1350 cis	GAG CTA CCG TCA GTT TAC TAA GAG CTA CCG TGG CTT TTT TCT	QTL (WM6.1) NY6020-4	6	Miklas et al., 2003
SS18	S18	White mold	1650 cis	CTG GCG AAC TGT ACA TGC AAC ATA C CTG GCG AAC TGA TTC ATA CAT TTT G	QTL (WM8.3) NY6020-4	8	Miklas et al., 2003
SF13R10	F13R10 SRAP	White mold	410 cis	GAC ACC GTA CGA ATT AAC TCA TTT TG CGA ATC TTA GCC GGC ACC GAA ATG G	QTL WM8.3 VA19		Soule et al., 2011
SMe1Em5	Me1Em5 SRAP	White mold	110 cis	CCA AAC CGG ATA GTC TAA AC GTA CGA ATT AAC TGA CTA TG	QTL WM2.2 (VA19)	2	Soule et al., 2011
SF12R9	F12R9 SRAP	White mold	350 trans	ATC TTA GCC GGA GCT GAG AC ACG AAT TTG AGA TGG TTT AC	QTL WM2.2		Soule et al., 2011
SF6Em3	SF6Em3 SRAP	White mold	220 trans	GCG TAC GAA TTG ACA TAC ACC CAC AAG CCG GAT ATA TCT TAT C	QTL WM2.2		Soule et al., 2011
SF13R15	SF13R15 SRAP	White mold	290 trans	AGC TCC GTA ATT CCA CAT TCT CC	QTL WM2.2		Soule et al., 2011

				CGG CAC TGA TAA AAT TTG			
SF18R7	SF18R7	White mold	410/415 codominant	ACC GTA CGA ATT TGC TTA AGT G GAT CCA GTT ACC GGA AT	QTL WM7.3 I9365-31	7	Soule et al., 2011
	SE_{ACT}/M_{CCA}	Anthracnose	codominant	AAT TCA CTT ATA AAA AAT AAA ATT AAC CAT AAC TGT TAT CAG ACC	*Co-1*^{2}	1	Vallejo and Kelly, 2008
SCAreoli	H20	Anthracnose	1000	GGG AGA CAT CCA TCA GAC AAC TCC GTA TCC ATT TGAA GGA GCT	*Co-2*	11	Geffroy et al., 1998 Adam-Blondon et al., 1994
SQ4	OQ4 **AGT GCG CTG A**	Anthracnose & Rust	1440	CCT TAG GTA TGG TGG GAA ACG A TGA GGG CGA GGA TTT CAG CAA GTT	*Co-2,* *Ur-11*	11	Awale et al., 2008 Young and Kelly, 1996
*S*W12	W12	Anthracnose	700 cis	TGG GCA GAA GTT CTA GCA TGT GGC TGG GCA GAA GCA CAG TAT GAT TTG	Co-3 /Co-9	4	Miklas et al., 2000c Singh et al. 2000 Rodríguez-Suárez et al., 2008

SY20	Y20	Anthracnose	830 cis	AGC CGT GGA AGG TTG TCA T CCG TGG AAA CAA CAC ACA AT	*Co-4*	8*	Queiroz et al., 2004b *Kelly et al., 2003
SC08	C08	Anthracnose	910 cis	AGA ATG CCT TTA GCT GTT GG CAG AGA GGC TAG GCT TAT CG	*Co-4*	8*	Queiroz et al., 2004b *Kelly et al., 2003
SAS13	AS13	Anthracnose	950 cis	**CAC GGA CCG A**AT AAG CCA CCA ACA CAC GGA CCG AGG ATA CAG TGA AAG	*Co-4*^{2}	8*	Young et al., 1998 *Kelly et al., 2003
SH18	H18 **GAA TCG GCC A**	Anthracnose	1100 cis	CCA GAA GGA GCT GAT AGT ACT CCA CAA C GGT AGG CAC ACT GAT GAA TCT CAT GTT GGG	*Co-4*^{2}	8*	Awale and Kelly, 2001 *Kelly et al., 2003
SBB14	BB14	Anthracnose	1150/1050 codominant	**GTG GGA CCT G**TT CAA GAA TAA TAC GTG GGA CCT GGG TAG TGT AGA AAT	*Co-4*^{2}	8*	Awale and Kelly, 2001 *Kelly et al., 2003
SAB3	AB-3	Anthracnose	400 cis	**TGG CGC ACA C**AT AAG TTC TCA CGG TGG CGC ACA CCA TCA AAA AAG GTT	*Co-5*	7	Vallejo and Kelly, 2001 Campa et al., 2005

SZ20	Z20	Anthracnose	845 cis	ACC CCT CAT GCA GGT TTT TA CAT AAT CCA TTC ATG CTC ACC	*Co-6*	7*	Queiroz et al., 2004b *Kelly et al., 2003
SZ04	Z04	Anthracnose	567 trans	GGC TGT GCT GAT TAA TTC TGG TGC TCA TTT TAT AAT GGA GAA AAA	*Co-6*	7*	Queiroz et al., 2004b *Kelly et al., 2003
SB12	B-12	Anthracnose	350 cis	CCT TGA CGC ACC TCC ATG TTG ACG ATGGG TTG GCC	*Co-9*	4	Mendez de Vigo et al., 2002
SF10	F10	Anthracnose	1072 cis	GGA AGC TTG GTG AGC AAG GA GGA AGC TTG GCT ATGATG GT	*Co-10*	4	Correa et al., 2000 Alzate-Marin et al., 2003
SH13	H13	Angular leaf spot ALS	520 cis	GAC GCC ACA CCC ATT ATG TT GCC ACA CAG ATG GAG CTT TA	*Phg-1*		Queiroz et al., 2004a
SN02	N02	ALS	890 cis	ACC AGG GGC ATT ATG AAC AG ACC AGG GGC AAC ATA CTA TG	*Phg-2*	8*	Nietsche et al., 2000 *Miklas, PC, 2002

	E-ACA/M-CTT_{330}	ALS	280 / 305 codominant	CTT GTT CTG AGT CAT TTA CCT TGC GAA TTC ACA GTC CAA ACT CTA ATC	G 10474 Dominant gene		Mahuku et al., 2004
SAA19	AA19	ALS	650 cis	TGA GGC GTG TCA ATG GAT ATA A GAG GCG TGT TGA TAA TTC TGG	Ouro Negro dominant gene		Queiroz et al., 2004a
SBA16	BA16	ALS	560 cis	TTC CAC GTC TAT TTT GCA TCA CAC GCA TCA CGC AGA ACT	Ouro Negro dominant gene		Queiroz et al., 2004a
SM02	M02	ALS	460 cis	CAA CGC CTC ATT AAA TTG GA CGC CTC TAA ACG GGA GAA AC	Ouro Negro dominant gene		Queiroz et al., 2004a
SU20	U20	Fusarium wilt	750	ACA GCC CCC ATT GTG AAT TGT AT ACA GCC CCC ACA CTT ATG GCA	A55	10	Brick et al., 2006 Fall et al., 2001
PYAA19	AA19	Pythium	800 cis	TTA GGC ATG TTA ATT CAC GTT GG TGA GGC GTG TAA GGT CAG AG	Dominant gene in AND 1062		Muhuku 2006

SW6-800R	OP W-06	Bean pod weevil, *Apion godmani*	520 cis	AGG CCC GAT GCC CCC TTA T TGG AGT CGG TCA AAC CCA TGT T	Agm? J-117	11	Blair et al., 2006

Original RAPD sequences are underlined in bold in SCAR sequence. – Otherwise sequence is shown under RAPD marker column

If the forward and reverse sequences are similar in the SCAR, assume the sequence corresponds to the original RAPD marker sequence

SCAR Name	PCR Protocol
*S*AP6	34 cycles of 10s at 94°C, 40s at 55°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
BC409	34 cycles of 10s at 94°C, 60s at 70°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
*S*U91	34 cycles of 10s at 94°C, 40s at 58°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
BC420/LG5	35 cycles of 30s at 94°C, 30s at 50°C, and 60s at 72°C; followed by one cycle of 5 minutes at 72°C
R7313	34 cycles of 10s at 94°C, 40s at 60°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
R4865	34 cycles of 10s at 94°C, 40s at 60°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
SR13	95°C 5 min for 1 cycle, 30 cycles of 60s at 94°C, 60s at 60°C, and 60s at 72°C; followed by one cycle of 7 minutes at 72°C
STB	95°C 5 min for 1 cycle, 30 cycles of 10s at 94°C, 40s at 65°C, and 120s at 72°C; followed by one cycle of 7 minutes at 72°C
SH11	95°C 5 min for 1 cycle, 30 cycles of 10s at 94°C, 40s at 67°C, and 120s at 72°C; followed by one cycle of 7 minutes at 72°C
SB10	94°C 5 min for 1 cycle, 30 cycles of 10s at 94°C, 40s at 65°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
*S*W13	34 cycles of 10s at 94°C, 40s at 67°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
ROC11	34 cycles of 10s at 94°C, 40s at 55°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
*S*BD5	34 cycles of 10s at 94°C, 40s at 65°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
*S*R2	34 cycles of 10s at 94°C, 40s at 60°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C 60°C annealing = codominant; 65°C annealing = dominant
*S*W12	1 cycle of 60s at 94°C; 30 cycles of 30s at 94°C, 30s at 70°C, and 60s at 72°C; followed by one cycle of 5 minutes at 72°C
SAS8	1 cycle of 5 min at 94°C; 30 cycles of 60s at 94°C, 60s at 68°C, and 60s at 72°C; followed by one cycle of 7 mins at 72°C
*S*K14	34 cycles of 10s at 94°C, 40s at 63°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
SA14	1 cycle of 5 min at 94°C; 35 cycles of 60s at 94°C, 60s at 55°C, and 90s at 72°C; followed by one cycle of 5 minutes at 72°C
*S*I19	34 cycles of 10s at 94°C, 40s at 67°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
SBC6	94°C 2 min; 30 cycles of 30s at 94°C, 60s at 59 or 65°C?, and 120s at 72°C; followed by one cycle of 7 minutes at 72°C
SAD12	Annealing temperature of 71°C
SAE19	94°C 5 min; 35 cycles of 15s at 94°C, 60s at 58°C, and 90s at 72°C; followed by one cycle of 7 minutes at 72°C

UR11-GT2	60°C annealing = codominant; 65°C annealing = dominant
KB126	1 cycle 94C for 5 min; 35 cycles at 94C 1 min, 45C 1 min and 72_C for 1 min, final elongation step of 5 min at 72°C
SF10	1 cycle of 94°C of 3 min: 35 Cycles at 15s at 94°C, 60s at 65°C and 90s at 72°C; followed by 1 cycle of 7 min at 72°C
SBA8	1 cycle of 94°C of 3 min; 35 Cycles at 15s at 94°C, 60s at 65°C and 90s at 72°C; followed by 1 cycle of 7 min at 72°C
Phs	34 cycles of 10s at 94°C, 40s at 50°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
SAU5	34 cycles of 10s at 94°C, 40s at 60°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
SS18	34 cycles of 10s at 94°C, 40s at 63°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
SQ4	34 cycles of 10s at 94◦C; 40s at 59◦C, 2 min at 72◦C, followed by one cycle of 5 min at 72◦C
SCAreoli	58°C annealing temperature followed by *Dra*I digestion
SY20	35 cycles of 30s at 94°C, 60s at 65°C, and 90s at 72°C
SC08	35 cycles of 30s at 94°C, 60s at 65°C, and 90s at 72°C
S*A*S13	34 cycles of 10s at 94°C, 144s at 72°C; followed by one cycle of 5 minutes at 72°C
SH18	34 cycles of 10s at 94°C, 40s at 62°C, and 120s at 72°C; followed by one cycle of 5 minutes at 72°C
SBB14	34 cycles of 10s at 94°C, 40s at 67°C, and 120s at 72°C: followed by one cycle of 5 minutes at 72°C
SAB3	1 cycle of 3 mins at 94°C; 30 cycles of 10s at 94°C, 30s at 65°C, 2 minutes at 72°C; followed by 1 cycle of 5 mins at 72°C
SZ20	35 cycles of 30s at 94°C, 60s at 60°C, and 90s at 72°C
SZ04	45 cycles of 30s at 94°C, 120s at 45°C, and 90s at 72°C
SB12	1 cycle of 94°C of 2 min: 35 Cycles of 60s at 94°C, 60s at 68°C, and 60s at 72°C; followed by 1 cycle of 7 min at 72°C
SF10	1 cycle of 94°C of 3 min: 35 Cycles at 15s at 94°C, 60s at 65°C and 90s at 72°C; followed by 1 cycle of 7 min at 72°C
SU20	30 Cycles at 60s at 94°C, 30s at 70°C and 60s at 72°C
SH13	35 cycles of 30s at 94°C, 60s at 59°C, and 90s at 72°C
SN02	30 Cycles of 30s at 94°C, 60s at 65°, and 90s at 72°C
G10474	1 cycle of 94°C of 5 min: 35 Cycles of 30s at 94°C, 45s at 60°C, and 30s at 72°C; followed by 1 cycle of 10 min at 72°C
SAA19	35 cycles of 30s at 94°C, 60s at 56°C, and 90s at 72°C
SBA16	35 cycles of 30s at 94°C, 60s at 58°C, and 90s at 72°C
SM02	35 cycles of 30s at 94°C, 60s at 58°C, and 90s at 72°C
eIF4E	40 cycles of 20s at 94°C, 20s at 69°C and 20s at 72°C after an initial denaturation at 95 °C for 3 min

SQ14	a single cycle of 2 min at 95°C followed by 30 cycles of 1 min at 94°C, 1 min at 69°C, and 1 min at 72°C
SF13R10	94°C for 2 min, 35 cycles of 94°C for 60s, 60°C for 40s, and 72°C for 40s followed by 1 cycle at 72°C for 2 min
SMe1Em5	94°C for 2 min, 35 cycles of 94°C for 60s, 55°C for 40s, and 72°C for 40s followed by 1 cycle at 72°C for 2 min
SF12R9	94°C for 2 min, 35 cycles of 94°C for 60s, 65°C for 40s, and 72°C for 40s followed by 1 cycle at 72°C for 2 min
SF6Em3	94°C for 2 min, 35 cycles of 94°C for 60s, 60°C for 40s, and 72°C for 40s followed by 1 cycle at 72°C for 2 min
SF13R15	94°C for 2 min, 35 cycles of 94°C for 60s, 67°C for 40s, and 72°C for 40s followed by 1 cycle at 72°C for 2 min
SF18R7	94°C for 2 min, 35 cycles of 94°C for 60s, 45°C for 40s, and 72°C for 40s followed by 1 cycle at 72°C for 2 min
PYAA19	unknown

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