

Table S6 Gene action of QTLs identified by CIM in MARBCF₁ population across four environments

Trait ^a	QTL ^b	Env. ^c	Position ^d	A ^e	D ^e	A+D ^e	D/A or 2 D /(A+D) ^f		GA ^g	Population
FL	qFL-C02-1	2014Bg	41.21		-2.15				OD	MARBCF ₁ MPH
	qFL-Chr05-3	2014Bg	11.21	-1.16						RIL
	qFL-Chr05-4	2014Bg	40.01	-0.32						RIL
	qFL-Chr05-1	2014Yc	45.31	-0.37						RIL
	qFL-C05-2	2014Bg	46.91			0.03			A	MARBCF ₁
	qFL-Chr05-2	2014Yc	52.11	-0.33						RIL
	qFL-C06-1	2014Bg	27.81		-2.47				OD	MARBCF ₁ MPH
	qFL-C06-2	2015Yc	49.21			1.08			A	MARBCF ₁
	qFL-Chr09-1	2014Bg	3.81	-0.30						RIL
	qFL-Chr10-1	2014Yc	44.51	0.29						RIL
		2014Bg	44.51	0.26						RIL
	qFL-Chr12-1	2014Yc	16.21	-0.33						RIL
	qFL-C13-3	2015Yc	42.51			-0.22			A	MARBCF ₁
	qFL-C14-1	2014Bg	4.01		-2.61				OD	MARBCF ₁ MPH
	qFL-C14-2	2015Bg	13.81			-0.82			A	MARBCF ₁
	qFL-Chr14-1	2014Yc	14.21	-0.50						RIL
	qFL-C14-3	2014Yc	20.91			-0.19	3.15		OD/PD	MARBCF ₁
		2015Bg	20.91			-1.09	0.84			MARBCF ₁
		2015Yc	18.41		-0.30					MARBCF ₁ MPH
	qFL-Chr14-2	2014Yc	20.91	-0.41						RIL
	qFL-Chr14-3	2014Yc	23.31	-0.46						RIL
		2014Bg	25.71	-0.27						RIL
	qFL-C14-4	2015Bg	24.71			-1.18			A	MARBCF ₁
		2014Yc	28.21			-0.66				MARBCF ₁
	qFL-Chr15-1	2014Yc	13.11	-0.36						RIL
		2014Bg	12.31	-0.38						RIL
	qFL-C17-2	2014Bg	42.31			0.15			A	MARBCF ₁
	qFL-C18-1	2014Bg	58.61		-2.30				OD	MARBCF ₁ MPH
	qFL-C19-2	2015Yc	20.81			0.38			A	MARBCF ₁
	qFL-Chr19-1	2014Yc	22.51	0.46						RIL
	qFL-C19-3	2015Yc	27.61			2.15			A	MARBCF ₁
	qFL-C20-4	2014Bg	41.51			0.33			A	MARBCF ₁
		2015Yc	41.51			0.12				MARBCF ₁
	qFL-C22-1	2014Yc	7.51		0.86				OD	MARBCF ₁ MPH
	qFL-C22-2	2014Bg	16.71		-2.24				OD	MARBCF ₁ MPH
	qFL-C24-1	2015Bg	5.41		-1.27				OD	MARBCF ₁ MPH
FU	qFU-Chr01-1	2014Bg	14.51	-0.61						RIL
	qFU-C02-2	2014Yc	48.31			-0.27			A	MARBCF ₁
	qFU-Chr05-1	2014Bg	45.31	-0.22						RIL
	qFU-C06-3	2014Yc	49.21			0.70			A	MARBCF ₁

MIC	qFU-Chr09-1	2014Yc	3.81	-0.24				RIL
		2014Bg	3.81	-0.29				RIL
	qFU-Chr09-2	2014Yc	47.11	-0.24				RIL
		2014Bg	47.11	-0.24				RIL
	qFU-Chr09-3	2014Yc	52.61	0.30				RIL
		2014Bg	52.61	0.29				RIL
	qFU-Chr09-4	2014Yc	61.41	-0.20				RIL
	qFU-Chr09-5	2014Bg	18.11	-0.24				RIL
	qFU-C13-1	2014Yc	29.11		2.32		A	MARBCF ₁
	qFU-Chr19-1	2014Yc	20.81	-0.22				RIL
	qFU-C21-1	2015Bg	44.61		-1.43		OD	MARBCF ₁ MPH
	qFU-C21-2	2015Yc	59.91		0.63		OD	MARBCF ₁ MPH
	qFU-C22-3	2014Yc	40.31		-0.57		A	MARBCF ₁
	qFU-C23-1	2015Bg	0.01		-1.10	2.39	OD	MARBCF ₁
		2015Bg	0.01		-1.32			MARBCF ₁ MPH
	qFU-C26-1	2015Bg	1.01		-0.59		OD	MARBCF ₁ MPH
	qFU-C26-2	2014Bg	35.01		0.42		A	MARBCF ₁
	qMIC-C01-1	2015Bg	6.21		-0.22		A	MARBCF ₁
	qMIC-Chr01-1	2014Yc	14.51	0.24				RIL
	qMIC-C02-1	2015Yc	35.81		0.73	0.92	PD	MARBCF ₁
		2015Yc	35.81		0.33			MARBCF ₁ MPH
	qMIC-C02-2	2015Yc	44.51		-0.74		A	MARBCF ₁
	qMIC-Chr05-1	2014Yc	12.61	-0.25				RIL
	qMIC-C05-1	2015Bg	44.11		0.42		A	MARBCF ₁
		2014Yc	44.41		0.07			MARBCF ₁
		2014Bg	47.21		0.08			MARBCF ₁
	qMIC-C05-2	2014Bg	60.51		0.03		OD	MARBCF ₁ MPH
	qMIC-Chr07-1	2014Bg	59.31	0.10				RIL
	qMIC-C10-1	2014Yc	43.71		0.33		A	MARBCF ₁
	qMIC-Chr10-1	2014Yc	62.61	0.16				RIL
	qMIC-C13-1	2015Yc	7.41		0.29		A	MARBCF ₁
	qMIC-Chr14-1	2014Yc	23.31	0.08				RIL
		2014Bg	20.91	0.11				RIL
	qMIC-C14-2	2014Yc	25.71		0.13		A	MARBCF ₁
		2015Bg	30.51		0.27			MARBCF ₁
	qMIC-C14-3	2015Bg	40.21		0.19		A	MARBCF ₁
		2015Yc	41.01		0.10			MARBCF ₁
	qMIC-C16-2	2015Bg	48.91		0.46		A	MARBCF ₁
		2014Bg	51.61		0.13			MARBCF ₁
	qMIC-Chr16-1	2014Bg	49.31	0.09				RIL
		2014Yc	51.01	0.08				RIL
	qMIC-Chr16-2	2014Yc	57.01	0.09				RIL
		2014Bg	57.41	0.15				RIL
	qMIC-C16-3	2014Bg	61.31		0.19		A	MARBCF ₁

FE	qMIC-Chr17-1	2014Bg	44.81	0.12				RIL
	qMIC-C19-1	2015Bg	26.51		1.91		A	MARBCF ₁
	qMIC-C19-2	2014Yc	35.81		-0.15		OD	MARBCF ₁ MPH
	qMIC-C24-1	2014Bg	13.71		-0.21		A	MARBCF ₁
	qMIC-Chr24-1	2014Bg	16.81	-0.11				RIL
	qMIC-Chr24-2	2014Bg	73.31	0.44				RIL
	qFE-C01-1	2015Yc	11.71		0.16		A	MARBCF ₁
	qFE-C05-1	2015Yc	58.91		0.07		A	MARBCF ₁
		2015Bg	58.91		0.05			MARBCF ₁
	qFE-C06-1	2014Yc	8.81		-0.46		A	MARBCF ₁
	qFE-C09-1	2015Yc	20.51		-0.03		OD	MARBCF ₁ MPH
	qFE-C09-2	2015Bg	25.01		0.39		A	MARBCF ₁
	qFE-C09-4	2014Yc	57.61		0.47		OD	MARBCF ₁ MPH
	qFE-C10-1	2015Bg	38.01		-0.08	-2.33	OD	MARBCF ₁
		2015Bg	38.01		0.09			MARBCF ₁ MPH
	qFE-Chr11-1	2014Bg	5.31	1.16				RIL
	qFE-C13-1	2014Bg	33.41		-0.13		A	MARBCF ₁
	qFE-Chr14-2	2014Bg	1.11	1.09				RIL
	qFE-C14-1	2015Bg	5.31		-0.36	2.68	OD	MARBCF ₁
		2015Bg	5.31		-0.48			MARBCF ₁ MPH
	qFE-Chr14-3	2014Bg	6.31	0.25				RIL
	qFE-C14-2	2014Yc	9.51		0.22		A	MARBCF ₁
	qFE-C14-3	2014Yc	15.81		0.32		A	MARBCF ₁
	qFE-Chr14-1	2014Yc	16.81	0.30				RIL
		2014Bg	15.71	0.26				RIL
	qFE-C14-4	2014Yc	22.11		-0.07		A	MARBCF ₁
	qFE-C14-5	2015Bg	45.01		-0.11		OD	MARBCF ₁ MPH
	qFE-C15-1	2015Yc	25.31		0.06		OD	MARBCF ₁ MPH
	qFE-Chr16-1	2014Bg	1.11	1.17				RIL
	qFE-C16-1	2015Bg	4.31		0.04		A	MARBCF ₁
	qFE-Chr17-1	2014Bg	42.31	0.18				RIL
	qFE-C19-1	2015Yc	51.51		0.11		A	MARBCF ₁
	qFE- Chr18-1	2014Bg	57.51	0.76				RIL
	qFE-Chr20-1	2014Yc	41.51	0.20				RIL
		2014Bg	47.11	0.44				RIL
	qFE-C21-1	2015Bg	9.91		-0.04	-4.93	OD	MARBCF ₁
		2015Yc	10.91		0.10			MARBCF ₁ MPH
	qFE-C22-1	2015Bg	10.71		0.03		A	MARBCF ₁
	qFE-C24-1	2014Bg	27.01		0.22		A	MARBCF ₁
	qFE-C24-2	2014Bg	38.11		-0.28		OD	MARBCF ₁ MPH
	qFE-Chr24-1	2014Yc	73.31	0.75				RIL
		2014Bg	73.31	0.62				RIL
	qFE-C26-1	2015Bg	50.21		-0.02	29.56	OD	MARBCF ₁
		2015Bg	51.31		-0.35			MARBCF ₁ MPH

FS	qFS-C03-1	2014Yc	78.81		-0.22	11.05	OD	MARBCF ₁
		2014Yc	78.81		-1.19			MARBCF ₁ MPH
	qFS-Chr05-1	2014Bg	54.81	0.52				RIL
	qFS-C07-1	2015Bg	21.91		0.06		OD	MARBCF ₁ MPH
		2015Yc	23.21		1.46			MARBCF ₁ MPH
	qFS-C07-2	2014Yc	43.11		2.59		A	MARBCF ₁
	qFS-C09-3	2015Yc	59.01		0.98		OD	MARBCF ₁ MPH
	qFS-C13-1	2015Bg	20.41		0.19		A	MARBCF ₁
	qFS-C13-2	2015Yc	32.41		0.61		OD	MARBCF ₁ MPH
	qFS-Chr14-1	2014Yc	6.71	-0.21				RIL
	qFS-Chr14-2	2014Yc	14.21	-0.28				RIL
	qFS-Chr14-3	2014Yc	21.61	-0.26				RIL
	qFS-Chr14-4	2014Yc	40.11	-0.20				RIL
	qFS-C16-1	2014Bg	45.61		-1.48		A	MARBCF ₁
	qFS-C17-1	2014Yc	31.01		0.75		A	MARBCF ₁
	qFS-C18-1	2014Yc	20.11		1.87		OD	MARBCF ₁ MPH
	qFS-Chr19-1	2014Bg	22.51	0.51				RIL
	qFS-Chr19-2	2014Bg	27.81	0.61				RIL
	qFS-C19-2	2014Bg	52.21		0.87		A	MARBCF ₁
	qFS-Chr20-1	2014Yc	42.11	-0.50				RIL
	qFS-Chr20-2	2014Yc	59.61	-0.48				RIL
	qFS-C20-2	2014Bg	68.61		-2.14		A	MARBCF ₁
	qFS-C24-1	2015Yc	59.01		1.23		OD	MARBCF ₁ MPH
		2015Bg	60.61		-0.83			MARBCF ₁ MPH

^a FL: fiber length; FU: fiber uniformity; MIC: micronaire; FE: fiber elongation; FS: fiber strength

^b QTLs in bold are those identified by CIM in RILs in our previous study (Li et al. 2016), which was just used to estimate the gene action of MARBCF₁ population

^c 2014Yc: Yacheng of Hainan Province in 2014; 2014Bg: Baogang of Hainan Province in 2014; 2015Yc: Yacheng of Hainan Province in 2015; 2015Bg: Baogang of Hainan Province in 2015

^d Position of QTL located on chromosome: as cM distance from the top of each chromosome

^e The genetic expectation of a QTL effect obtained is the additive effect (A) from the RILs, the additive and dominance effects (A+D) from the BCF₁s, and the dominance effect (D) from the MPH values

^f |D/A|: |dominance/additive|; 2|D|/(A+D): 2|dominance|/(additive + dominance)

^g GA: gene action; PD/D partial dominance (|d/a| ≤ 1 or 2|d|/(a+d) ≤ 1); OD overdominance (|d/a| > 1 or 2|d|/(a+d) > 1), here, 2|d|/(a+d) > 1 same to 2|d| > |a + d|; A: when QTL detected only in BCF₁ or both BCF₁ and RIL was referred to as additive (A).