

Appendix QTLs detected for nine agronomic traits in the RILs population

Trait ^a	Environment ^b	QTL	chromosome	Marker interval	Bin locus ^c	Position ^d	LOD	R ² % ^e	A ^f	
PH	ZZ	qPH-4-1	4	dupssr28-umc1313	4.08-4.09	200.01	3.11	6.57	5.54	
		qPH-5-1	5	bnlg1287-umc2111	5.04-5.05	122.61	5.78	9.21	6.59	
		qPH-6-1	6	umc1018-umc2314	6.00-6.01	17.31	3.27	8.54	6.28	
		qPH-7-2	7	bnlg339-umc1112	7.03	117.41	3.52	6.63	-5.55	
		qPH-8-2	8	phi115-bnlg2046	8.03-8.04	100.11	9.85	15.94	-8.57	
	WX	qPH-1-1	1	umc1269-phi427913	1.01	14.41	3.14	4.21	-5.05	
		qPH-1-2		bnlg1556-phi039	1.07-1.08	265.21	3.44	7.61	6.72	
		qPH-2-1	2	phi402893-umc1227	2.00-2.01	6.01	3.09	5.12	5.49	
		qPH-5-1	5	bnlg1287-umc2111	5.04-5.05	122.61	5.36	8.83	7.21	
		qPH-7-1	7	bnlg1070-bnlg339	7.03	99.71	3.51	4.87	-5.38	
		qPH-8-2	8	phi115-bnlg2046	8.03-8.04	102.11	9.19	16.28	-9.82	
		XX	qPH-1-2	1	bnlg1556-phi039	1.07-1.08	269.21	3.12	7.71	6.29
			qPH-4-1	4	dupssr28-umc1313	4.08-4.09	198.01	3.01	6.2	5.67
			qPH-5-1	5	bnlg1287-umc2111	5.04-5.05	122.61	6.81	12.65	8.05
			qPH-7-1	7	bnlg1070-bnlg339	7.03	99.71	3.59	5.5	-5.34
	qPH-8-1		8	phi119-umc1904	8.02-8.03	51.61	6.26	15.33	-8.94	
	Average	qPH-9-1	9	umc2371-bnlg1911	9.05-9.06	157.01	4.69	10.07	7.18	
		qPH-1-2	1	bnlg1556-phi039	1.07-1.08	267.21	3.61	8.36	6.3	
		qPH-2-1	2	phi402893-umc1227	2.00-2.01	8.01	3.01	4.93	4.82	
		qPH-4-1	4	dupssr28-umc1313	4.08-4.09	198.01	3.21	6.66	5.65	
qPH-5-1		5	bnlg1287-umc2111	5.04-5.05	122.61	6.8	11.16	7.25		
qPH-7-1		7	bnlg1070-bnlg339	7.03	99.71	4.44	6.06	-5.37		
qPH-8-2		8	phi115-bnlg2046	8.03-8.04	100.11	9.87	16.14	-8.76		
qPH-9-1		9	umc2371-bnlg1911	9.05-9.06	157.01	3.98	8.12	6.21		
EH		ZZ	qEH-1-1	1	umc2047-umc2189	1.09-1.10	334.11	4.85	7.95	4.2
	qEH-3-2		3	umc1273-umc2152	3.08-3.09	61.61	5.14	9.17	-4.52	
	qEH-5-1		5	bnlg1287-umc2111	5.04-5.05	122.61	6.68	12.04	5.15	
	qEH-7-1		7	bnlg339-umc1112	7.03	113.41	3.55	6.88	-3.9	
	qEH-10-1		10	umc2122-umc1196	10.06-10.07	102.11	4.5	8.52	-4.34	
	WX	qEH-1-1	1	umc2047-umc2189	1.09-1.10	334.11	6.84	11.54	4.88	
		qEH-3-1	3	umc1844-umc2275	3.07-3.08	38.51	3.35	4.92	-3.18	
		qEH-5-1	5	bnlg1287-umc2111	5.04-5.05	122.61	8.88	16.11	5.77	
		qEH-8-2	8	phi119-umc1904	8.02-8.03	51.61	2.99	6.67	-3.71	
		qEH-10-1	10	umc2122-umc1196	10.06-10.07	102.11	4.44	8.52	-4.18	
	XX	qEH-1-1	1	umc2047-umc2189	1.09-1.10	332.11	7.98	13.38	5.18	
		qEH-2-1	2	phi402893-umc1227	2.00-2.01	8.01	3.56	6.16	3.51	
		qEH-3-2	3	umc1273-umc2152	3.08-3.09	61.61	5.68	10.51	-4.61	
		qEH-5-1	5	bnlg1287-umc2111	5.04-5.05	124.61	6.82	12.49	4.99	
		qEH-10-1	10	umc2122-umc1196	10.06-10.07	102.11	6.02	11.8	-4.84	
	Average	qEH-1-1	1	umc2047-umc2189	1.09-1.10	332.11	6.75	11.55	4.69	
		qEH-2-1	2	phi402893-umc1227	2.00-2.01	10.01	3.14	5.35	3.18	
		qEH-3-2	3	umc1273-umc2152	3.08-3.09	61.61	5.65	10.03	-4.38	

		qEH-5-1	5	bnlg1287-umc2111	5.04-5.05	122.61	8.75	15.33	5.38
		qEH-7-2	7	umc1936-phi328175	7.03-7.04	153.91	3.29	8.66	-4.06
		qEH-8-1	8	umc1327-phi119	8.01-8.02	25.71	3.49	7.19	-3.71
		qEH-8-2		phi119-umc1904	8.02-8.03	49.61	3.55	7.32	-3.73
		qEH-10-1	10	umc2122-umc1196	10.06-10.07	102.11	6.62	12.19	-4.79
TH	ZZ	qTH-4-2	4	umc1313-bnlg589	4.09-4.10	219.61	3.17	6.87	3.48
		qTH-5-2	5	umc1502-umc1941	5.05-5.06	162.71	4.03	8.83	3.96
		qTH-6-1	6	umc1018-umc2314	6.00-6.01	11.31	3.08	6.79	3.45
		qTH-6-2		umc1296-umc2165	6.07	214.41	3.07	3.86	2.63
		qTH-8-1	8	phi115-bnlg2046	8.03-8.04	102.11	4.25	7.75	-4.25
	WX	qTH-1-1	1	bnlg1556-phi039	1.07-1.08	261.21	3	5.18	3.27
		qTH-3-1	3	bnlg1452-umc1773	3.04	110.21	3.43	4.54	-3.06
		qTH-7-1	7	bnlg1070-bnlg339	7.03	99.71	3.33	4.48	-3.05
		qTH-8-1	8	phi115-bnlg2046	8.03-8.04	102.11	12.97	22.35	-6.81
		qTH-10-1	10	umc2021-umc1038	10.07	146.71	2.95	4.17	2.95
	XX	qTH-4-2	4	umc1313-bnlg589	4.09-4.10	221.61	2.98	7	3.89
		qTH-5-2	5	umc1502-umc1941	5.05-5.06	162.71	3.89	9.28	4.45
		qTH-7-1	7	bnlg1070-bnlg339	7.03	99.71	4.26	6.88	-3.86
		qTH-8-1	8	phi115-bnlg2046	8.03-8.04	102.11	8.84	17.01	-6
	Average	qTH-4-1	4	dupssr28-umc1313	4.08-4.09	200.01	3.28	6.19	3.39
		qTH-5-2	5	umc1502-umc1941	5.05-5.06	164.71	3.92	9.06	3.9
		qTH-7-1	7	bnlg1070-bnlg339	7.03	99.71	3.29	4.61	-2.8
		qTH-8-1	8	phi115-bnlg2046	8.03-8.04	102.11	14.04	24.85	-6.45
THPH	ZZ	qTHPH-1-1	1	umc2047-umc2189	1.09-1.10	332.11	7.24	14.58	-0.02
		qTHPH-3-2	3	umc1273-umc2152	3.08-3.09	61.61	4.5	8.7	0.02
		qTHPH-10-1	10	umc2122-umc1196	10.06-10.07	100.11	6.38	13.66	0.02
	WX	qTHPH-1-1	1	umc2047-umc2189	1.09-1.10	332.11	11.52	18.33	-0.02
		qTHPH-3-1	3	umc1844-umc2275	3.07-3.08	40.51	6.44	9.1	0.01
		qTHPH-5-1	5	bnlg1287-umc2111	5.04-5.05	122.61	5.83	9.24	-0.01
		qTHPH-10-1	10	umc2122-umc1196	10.06-10.07	102.11	6.2	11.31	0.01
	XX	qTHPH-1-1	1	umc2047-umc2189	1.09-1.10	332.11	8.93	14.58	-0.02
		qTHPH-3-1	3	umc2275-umc1273	3.07-3.08	49.01	6.1	9.77	0.02
		qTHPH-10-1	10	umc2122-umc1196	10.06-10.07	102.11	5.13	10.01	0.02
	Average	qTHPH-1-1	1	umc2047-umc2189	1.09-1.10	332.11	11.38	18.73	-0.02
		qTHPH-3-1	3	umc2275-umc1273	3.07-3.08	49.01	6.26	9.44	0.01
		qTHPH-10-1	10	umc2122-umc1196	10.06-10.07	102.11	7.58	13.55	0.02
SD	ZZ	qSD-1-4	1	umc1906-umc2083	1.05-1.06	197.81	3.55	6.34	0.05
		qSD-5-2	5	umc1389-umc1162	5.03-5.04	110.71	6.01	11.51	-0.06
		qSD-8-1	8	umc1289-bnlg2082	8.03	66.01	5.4	7.81	-0.05
	WX	qSD-1-1	1	bnlg1007-umc1403	1.02-1.03	45.11	3.33	6.53	-0.05
		qSD-1-2		umc1403-phi001	1.03	82.01	4.58	28.4	0.11
		qSD-1-3		phi001-umc2227	1.03-1.04	127.31	3.89	20.41	0.09
		qSD-1-4		umc1676-umc1906	1.05	190.71	3.48	5.72	0.05
		qSD-5-2	5	umc1389-umc1162	5.03-5.04	106.71	3.3	5.54	-0.05

		qSD-8-2	8	umc1724-umc1384	8.06-8.07	173.51	3.38	8.5	0.06
	XX	qSD-7-1	7	phi057-umc1409	7.01	52.01	3	6.66	0.05
	Average	qSD-1-4	1	umc1906-umc2083	1.05-1.06	195.81	3.73	6.05	0.04
		qSD-5-1	5	bnlg565-phi109188	5.02-5.03	89.41	3.08	9.59	-0.05
		qSD-5-2		umc1389-umc1162	5.03-5.04	108.71	4.18	7.48	-0.04
		qSD-8-3	8	umc1384-umc1933	8.07-8.08	196.41	3.27	7.05	0.04
LNE	ZZ	qLNE-3-2	3	bnlg1647-umc2259	3.02-3.03	67.61	3.31	5.49	0.14
		qLNE-4-2	4	nc005-bnlg1265	4.05	98.71	4.99	7.06	-0.16
		qLNE-5-2	5	umc1478-bnlg565	5.01-5.02	43.51	11.14	23.85	0.28
		qLNE-6-1	6	umc1572-umc1105	6.02-6.04	70.91	3.31	7.81	0.16
	WX	qLNE-3-1	3	umc2275-umc1273	3.07-3.08	47.01	2.95	4.12	0.13
		qLNE-5-2	5	umc1478-bnlg565	5.01-5.02	47.51	6.41	12.52	0.24
		qLNE-5-3		bnlg565-phi109188	5.02-5.03	71.41	5.23	15.2	0.25
		qLNE-6-1	6	umc1572-umc1105	6.02-6.04	68.91	5.33	13.1	0.23
		qLNE-10-1	10	umc1196-phi323152	10.05-10.07	118.41	3.29	6.53	0.17
	XX	qLNE-2-1	2	bnlg1329-bnlg2077	2.07-2.08	187.01	3.84	11.81	0.2
		qLNE-3-3	3	umc2258-umc1012	3.03-3.04	80.21	3.01	5.29	0.14
		qLNE-3-4		umc1644-bnlg1160	3.06	2.01	3.65	5.43	0.14
		qLNE-5-3	5	bnlg565-phi109188	5.02-5.03	73.41	5.5	16.68	0.24
		qLNE-6-1	6	umc1572-umc1105	6.02-6.04	70.91	3.53	9.34	0.18
	Average	qLNE-2-1	2	bnlg1329-bnlg2077	2.07-2.08	187.01	3.05	9.04	0.17
		qLNE-3-3	3	umc2258-umc1012	3.03-3.04	80.21	3.52	6.13	0.14
		qLNE-4-1	4	bnlg1126-umc1117	4.03-4.04	73.71	3.51	7.65	-0.16
		qLNE-5-1	5	umc1097-nc007	5.00-5.01	19.01	2.91	6.1	0.15
		qLNE-5-3		bnlg565-phi109188	5.02-5.03	71.41	6.81	19.2	0.25
		qLNE-6-1	6	umc1572-umc1105	6.02-6.04	68.91	3.68	8.99	0.17
LA	ZZ	qLA-2-1	2	phi402893-umc1227	2.00-2.01	8.01	5.6	9.85	25.1
		qLA-4-1	4	dupssr28-umc1313	4.08-4.09	198.01	8.4	18.96	35.2
		qLA-4-2		umc1313-bnlg589	4.09-4.10	219.61	8	17.24	33.47
		qLA-7-1	7	bnlg2233-umc1068	7.02	20.01	3.85	9.47	24.94
		qLA-8-2	8	phi115-bnlg2046	8.03-8.04	102.11	8.77	14.05	-30
	WX	qLA-1-1	1	umc2047-umc2189	1.09-1.10	332.11	3.78	6.78	-18.88
		qLA-2-1	2	phi402893-umc1227	2.00-2.01	10.01	4.2	8.71	21.33
		qLA-2-2		bnlg1017-umc1776	2.02-2.03	38.91	3.25	13.73	26.77
		qLA-4-1	4	dupssr28-umc1313	4.08-4.09	200.01	6.64	15.91	29.19
		qLA-5-1	5	umc1502-umc1941	5.05-5.06	168.71	3.66	7.85	20.41
		qLA-7-2	7	umc2057-umc1567	7.02-7.03	77.21	3.43	7.13	19.52
		qLA-7-3		bnlg1070-bnlg339	7.03	101.71	4.08	6.94	19.28
		qLA-7-4		umc1936-phi328175	7.03-7.04	157.91	3.04	8.05	-20.77
		qLA-8-2	8	phi115-bnlg2046	8.03-8.04	100.11	7.44	12.32	-25.52
	XX	qLA-2-1	2	phi402893-umc1227	2.00-2.01	10.01	4.01	7.48	22.01
		qLA-2-2		bnlg1017-umc1776	2.02-2.03	36.91	3.6	11.52	27.31
		qLA-4-1	4	dupssr28-umc1313	4.08-4.09	200.01	5.9	12.89	29.12
		qLA-7-1	7	bnlg2233-umc1068	7.02	18.01	7.1	21.71	38.23

		qLA-7-3		bnlg1070-bnlg339	7.03	101.71	4.32	6.51	21.24
		qLA-7-5		umc2332-phi069	7.04-7.05	180.71	3.13	7.22	-21.77
		qLA-8-1	8	umc1327-phi119	8.01-8.02	17.71	3.02	6.07	-20.28
		qLA-8-2		phi115-bnlg2046	8.03-8.04	100.11	7.95	12.52	-28.56
	Average	qLA-2-1	2	phi402893-umc1227	2.00-2.01	10.01	5.31	9.52	22.89
		qLA-2-2		bnlg1017-umc1776	2.02-2.03	36.91	3.69	12.17	25.88
		qLA-4-1	4	dupssr28-umc1313	4.08-4.09	198.01	8.52	19.09	32.73
		qLA-5-1	5	umc1502-umc1941	5.05-5.06	168.71	3.05	6.29	18.75
		qLA-5-2		umc1941-bnlg1346	5.06-5.07	194.11	3.61	7.6	20.73
		qLA-7-1	7	bnlg2233-umc1068	7.02	20.01	4.9	11.91	25.94
		qLA-7-3		bnlg1070-bnlg339	7.03	101.71	3.41	5.21	17.44
		qLA-7-4		umc1936-phi328175	7.03-7.04	159.91	3.15	6.41	-18.88
		qLA-8-2	8	phi115-bnlg2046	8.03-8.04	102.11	8.71	14.07	-27.89
TL	ZZ	qTL-1-1	1	bnlg1007-umc1403	1.02-1.03	47.11	3.02	5.81	-0.98
		qTL-6-1	6	umc1572-umc1105	6.02-6.04	70.91	3.15	7.07	-1.09
		qTL-7-1	7	bnlg2233-umc1068	7.02	18.01	3.38	8.94	1.23
		qTL-8-2	8	phi115-bnlg2046	8.03-8.04	100.11	9.15	15.84	-1.62
	WX	qTL-4-3	4	umc1964-bnlg1621	4.05-4.06	113.01	4.44	8.59	1.2
		qTL-6-3	6	phi364545-phi299852	6.07	192.61	5.97	11.13	-1.45
		qTL-6-4		umc2165-bnlg1136	6.07	222.81	3.56	8.36	1.32
		qTL-7-1	7	bnlg2233-umc1068	7.02	24.01	2.93	7.01	1.09
		qTL-8-2	8	phi115-bnlg2046	8.03-8.04	102.11	7.05	12.78	-1.46
	XX	qTL-4-2	4	nc005-bnlg1265	4.05	98.71	3.2	4.51	0.95
		qTL-5-1	5	umc1502-umc1941	5.05-5.06	168.71	4.26	9.93	1.42
		qTL-5-2		umc1941-bnlg1346	5.06-5.07	192.11	3.88	9.47	1.39
		qTL-6-1	6	umc1572-umc1105	6.02-6.04	68.91	3.33	8.09	-1.29
		qTL-8-2	8	phi115-bnlg2046	8.03-8.04	102.11	6.14	11.13	-1.49
		qTL-8-3		umc1384-umc1933	8.07-8.08	200.41	3.78	6.99	1.19
	Average	qTL-1-1	1	bnlg1007-umc1403	1.02-1.03	49.11	3.29	6.46	-1.02
		qTL-4-1	4	bnlg1126-umc1117	4.03-4.04	73.71	3.85	8.62	1.18
		qTL-6-2	6	umc1105-umc1014	6.04	86.11	3.09	4.2	-0.83
		qTL-7-1	7	bnlg2233-umc1068	7.02	18.01	3.85	10.48	1.32
		qTL-8-1	8	umc1741-umc1360	8.02-8.03	79.91	6.69	10.56	-1.31
		qTL-8-2		phi115-bnlg2046	8.03-8.04	100.11	8.22	13.95	-1.51
		qTL-8-3		umc1933-umc1069	8.08	209.41	2.98	4.49	0.87
TB	ZZ	qTB-3-1	3	phi104127-umc2049	3.01	25.51	3.01	4.49	0.71
		qTB-4-1	4	phi072-umc1757	4.01	16.01	4.62	16.67	1.3
		qTB-5-2	5	bnlg1346-bnlg2305	5.07	210.91	3.4	6.33	-0.82
	WX	qTB-3-2	3	umc2258-umc1012	3.03-3.04	76.21	3.07	5.29	-0.55
		qTB-4-1	4	phi072-umc1757	4.01	12.01	3.63	11.2	0.78
		qTB-8-1	8	umc1384-umc1933	8.07-8.08	198.41	3.55	8.07	0.67
	XX	qTB-4-2	4	dupssr28-umc1313	4.08-4.09	196.01	3.02	7.52	0.8
		qTB-5-1	5	umc1478-bnlg565	5.01-5.02	45.51	4.03	9.23	0.89
		qTB-8-1	8	umc1384-umc1933	8.07-8.08	196.41	4.05	9.8	0.93

	qTB-10-1	10	umc1677-umc2122	10.05-10.06	79.71	4.29	11.73	-1
	qTB-10-2		umc2122-umc1196	10.06-10.07	100.11	4.91	10.2	-0.94
Average	qTB-4-1	4	phi072-umc1757	4.01	16.01	3.42	13.1	0.94
	qTB-8-1	8	umc1384-umc1933	8.07-8.08	198.41	3.39	7.54	0.73
	qTB-10-2	10	umc2122-umc1196	10.06-10.07	100.11	3.72	7.85	-0.73

^a PH, plant height; EH, ear height; TH, top height; THPH, top height/plant height; SD, stalk diameter; LNE, number of leaves above the top ear; LA, leaf area; TL, the length of tassel; TB, number of tassel branches.

^b ZZ, Zhengzhou; WX, Wenxian; XX, Xinxiang.

^c in locations of the flanking markers from MaizeGDB (<http://www.maizegdb.org>).

^d Genetic map position by cM.

^e R² means percent of phenotypic variance explained by each QTL.

^f A means additive effect of QTL, positive values indicated that alleles from Dan232 increased the trait score.