

Supplemental Table 1. Meteorological data for years of experiment

Year	Sum of precipitation (in mm)			Temperature (in °C)		
	May	June	July	May	June	July
2010	109.7	25.8	84.3	11.5	17.4	22.1
2011	38.6	78.5	135.2	13.2	17.3	17.3
2012	44.9	71.5	143.1	14.7	15.8	18.7
Long-term average	56.0	68.2	81.5	14.3	17.2	19.0

Supplemental Table 2. Characteristics of the SSR markers used in the study

Primer	Chromosome	Primer sequence (5'-3')	Tm (°C)	Repeat
Xgwm389	3B	F: ATCATGTTCGATCTCCTTGACG R: TGCCATGCACATTAGCAGAT	60	(CT) ₁₄ (GT) ₁₆
Xgwm533	3B	F: AAGGCGAATCAAACGGAATA R: GTTGCTTTAGGGGAAAAGCC	60	(CT) ₁₈ (CA) ₂₀
Xgwm566	3B	F: TCTGTCTACCCATGGGATTTG R: CTGGCTTCGAGGTAAGCAAC	60	(CA) ₂₁ (GA) ₂ (TA) ₈
Xgwm341	3D	F: TTCAGTGGTAGCGGTCGAG R: CCGACATCTCATGGATCCAC	55	(CT) ₂₆
Xgwm149	4B	F: CATTGTTTTCTGCCTCTAGCC R: CTAGCATCGAACCTGAACAAG	55	(GA) _{23imp*}
Xwmc238	4B	F: TCTTCCTGCTTACCCAAACACA R: TACTGGGGGATCGTGGATGACA	64	(CA) ₂₂
Xgwm304	5A	F: AGGAAACAGAAATATCGCGG R: AGGACTGTGGGGAATGAATG	55	(CT) ₂₂
Xgwm156	5A	F: CCAACCGTGCTATTAGTCATTC R: CAATGCAGGCCCTCCTAAC	60	(GT) ₁₄
Xgwm46	7B	F: GCACGTGAATGGATTGGAC R: TGACCCAATAGTGGTGGTCA	60	(GA) ₂ GC(GA) ₃₃

*iner-MITE polymorphism

Supplemental Table 3 . Estimates of the contrast between mean values of analysed traits for awned and awnless groups of lines in three environments*

Environment	FDK1	FDK2	KWS_C	KWS_I	TKW_C	TKW_I	KWS_R (%)	TKW_R (%)
2010	-0.76	-1.35	0.058*	0.005*	2.78*	1.90*	-2.82	0.11*
2011	-3.93	-4.18	0.041*	0.029*	1.41*	2.36*	1.37*	4.56*
2012	-1.28	-2.35	0.077*	0.016*	1.88*	1.09*	-2.86	0.89*
LSD _{0.05}	2.41	2.60	0.023		0.74		1.86	1.30

*Positive value indicates awned group has higher mean value than awnless group

Supplemental Table 4. Mean values (over 3 years) of analyzed traits in Zebra x Saar RIL population

No. of line	Awned/Awnless	Line	FDK1	FDK2	KWS_I	KWS_C	KWS_R	TKW_I	TKW_C	TKW_R
1	awned	SAAR	33.06	41.23	0.38	0.68	58.54	23.86	33.65	68.97
2	awned	Z/S 4	33.73	47.46	0.31	0.70	43.84	12.61	27.41	45.99
3	awned	Z/S 10	30.27	43.22	0.33	0.82	40.61	18.87	32.27	58.48
4	awned	Z/S 14	31.21	44.38	0.40	1.04	38.84	19.31	36.03	53.58
5	awned	Z/S 15	41.33	50.36	0.34	1.00	33.84	17.35	37.28	46.56
6	awned	Z/S 18	32.51	43.58	0.40	1.10	36.64	19.38	39.24	49.40
7	awned	Z/S 20	31.44	41.31	0.44	1.04	42.18	20.34	36.90	55.12
8	awned	Z/S 21	37.03	48.18	0.39	0.80	49.20	18.26	32.27	56.61
9	awned	Z/S 28	35.00	45.98	0.38	1.06	35.69	18.66	36.95	50.50
10	awned	Z/S 40	24.82	34.40	0.49	0.78	62.52	17.81	30.97	57.51
11	awned	Z/S 41	33.24	45.09	0.42	0.74	57.35	18.87	32.12	58.75
12	awned	Z/S 43	41.43	56.07	0.39	0.76	51.12	18.06	36.05	50.10
13	awned	Z/S 55	37.54	50.40	0.39	0.84	46.77	19.49	34.24	56.93
14	awned	Z/S 65	42.69	52.99	0.34	0.82	41.17	19.24	36.57	52.61
15	awned	Z/S 66	29.08	39.89	0.33	0.81	41.30	18.05	31.80	56.75
16	awned	Z/S 70	20.21	26.42	0.43	0.87	49.81	23.72	36.54	64.93
17	awned	Z/S 75	21.73	30.39	0.44	0.95	45.87	20.25	37.25	54.36
18	awned	Z/S 77	32.31	42.78	0.32	0.73	43.77	16.23	31.21	52.00
19	awned	Z/S 140	37.57	46.99	0.38	0.80	48.15	18.09	31.35	57.72
20	awned	Z/S 182	52.79	63.17	0.35	0.72	48.84	19.40	32.01	60.61
21	awned	Z/S 214	39.39	46.67	0.44	0.86	51.82	21.65	36.48	59.36
22	awned	Z/S 216	34.23	41.84	0.50	1.09	45.95	24.53	39.81	61.60
23	awned	Z/S 217	16.03	22.88	0.48	0.97	49.55	23.32	35.95	64.86
24	awned	Z/S 220	32.90	41.83	0.46	1.20	38.36	26.10	40.41	64.57
25	awned	Z/S 221	21.48	27.02	0.51	0.94	53.53	23.21	36.54	63.52
26	awned	Z/S 222	29.15	38.37	0.51	1.05	48.64	21.59	35.26	61.24
27	awnless	Z/S 9	32.86	42.34	0.34	0.69	49.50	18.38	32.23	57.04
28	awnless	Z/S 26	39.88	52.55	0.34	0.79	42.54	14.72	30.35	48.49
29	awnless	Z/S 27	33.92	46.16	0.35	0.72	48.24	15.05	29.83	50.47
30	awnless	Z/S 39	31.51	42.98	0.36	0.72	50.58	17.91	32.78	54.63
31	awnless	Z/S 42	36.58	50.11	0.40	0.72	55.47	16.70	32.97	50.66
32	awnless	Z/S 44	43.43	54.90	0.37	0.70	53.65	18.49	36.19	51.10
33	awnless	Z/S 45	41.33	52.45	0.30	0.72	41.90	16.66	30.27	55.04
34	awnless	Z/S 67	33.41	46.69	0.36	0.79	46.31	14.92	30.54	48.84
35	awnless	Z/S 87	28.52	39.15	0.35	0.66	53.20	14.52	31.24	46.49
36	awnless	Z/S 190	41.70	54.75	0.39	0.70	55.09	18.32	33.31	55.02
37	awnless	Z/S 215	35.78	48.29	0.39	0.79	49.57	20.40	35.23	57.89
38	awnless	Z/S 218	23.39	30.70	0.54	0.80	67.23	22.59	34.59	65.31
39	awnless	Z/S 219	24.34	26.60	0.43	0.64	66.75	22.84	32.32	70.66
40	awned	Z/S 1	26.22	36.46	0.41	0.72	56.46	15.53	30.25	51.36
41	awned	Z/S 2	19.77	31.51	0.37	0.68	54.54	17.71	35.51	49.88
42	awned	Z/S 3	28.29	39.10	0.41	0.78	52.30	18.03	34.78	51.82
43	awned	Z/S 7	32.23	42.23	0.42	0.82	51.42	19.12	31.91	59.92
44	awned	Z/S 12	21.89	30.53	0.41	0.76	54.43	18.25	31.98	57.08
45	awned	Z/S 16	25.45	34.97	0.44	0.85	52.11	22.19	38.10	58.24

46	awned	Z/S 24	30.48	40.65	0.42	0.85	49.84	20.46	34.94	58.55
47	awned	Z/S 31	40.22	49.63	0.40	0.94	43.02	23.02	36.79	62.57
48	awned	Z/S 33	43.74	50.92	0.40	0.94	43.14	23.37	34.98	66.79
49	awned	Z/S 49	37.69	45.52	0.44	0.95	46.41	26.52	40.30	65.79
50	awned	Z/S 57	35.36	43.90	0.52	0.79	66.15	22.89	35.21	65.00
51	awned	Z/S 58	22.13	24.13	0.57	0.92	62.21	24.54	37.57	65.31
52	awned	Z/S 59	24.45	33.30	0.43	0.80	54.09	20.52	36.48	56.25
53	awned	Z/S 61	40.74	48.09	0.40	0.73	54.99	24.08	37.09	64.93
54	awned	Z/S 62	44.49	55.23	0.38	0.78	48.50	22.06	37.84	58.30
55	awned	Z/S 63	34.79	47.76	0.39	0.91	43.55	19.59	37.92	51.66
56	awned	Z/S 64	28.97	41.37	0.30	0.75	39.96	16.98	34.53	49.17
57	awned	Z/S 68	33.63	44.44	0.43	0.85	50.97	20.75	36.19	57.33
58	awned	Z/S 73	22.65	32.77	0.36	0.77	46.73	18.36	34.56	53.11
59	awned	Z/S 74	31.17	41.54	0.31	0.82	38.12	21.97	38.52	57.03
60	awned	Z/S 83	22.83	34.14	0.40	0.82	48.84	17.98	35.20	51.09
61	awned	Z/S 105	25.62	34.66	0.46	0.78	58.62	18.40	35.29	52.14
62	awned	Z/S 107	39.61	49.27	0.39	0.85	46.29	19.92	37.85	52.62
63	awned	Z/S 108	29.91	38.10	0.45	0.74	60.53	21.35	35.60	59.97
64	awned	Z/S 109	43.74	56.81	0.28	0.74	37.76	13.05	30.82	42.35
65	awned	Z/S 110	37.26	50.03	0.33	0.82	40.37	18.12	34.91	51.90
66	awned	Z/S 209	33.18	41.65	0.46	0.80	58.33	21.67	37.82	57.29
67	awned	Z/S 212	32.59	36.80	0.54	0.92	58.62	28.49	43.76	65.10
68	awned	Z/S 213	25.17	32.38	0.50	0.83	60.37	27.48	38.24	71.88
69	awnless	Z/S 5	24.08	33.97	0.48	0.75	63.85	19.47	35.92	54.19
70	awnless	Z/S 8	36.43	47.89	0.31	0.70	44.03	16.21	29.18	55.54
71	awnless	Z/S 17	30.50	42.30	0.37	0.66	56.73	17.57	33.39	52.63
72	awnless	Z/S 19	29.68	42.67	0.36	0.83	43.71	16.45	32.34	50.87
73	awnless	Z/S 30	45.35	57.87	0.47	1.07	43.53	18.90	34.02	55.55
74	awnless	Z/S 34	46.75	54.62	0.32	0.78	40.96	16.20	30.58	52.97
75	awnless	Z/S 84	27.25	40.99	0.45	0.86	52.01	15.98	32.78	48.74
76	awnless	Z/S 106	29.07	36.54	0.40	0.70	57.02	14.99	35.01	42.82
77	awnless	Z/S 192	31.24	41.00	0.36	0.63	56.61	16.49	30.08	54.84
78	awnless	Z/S 208	35.17	43.38	0.38	0.71	53.60	20.15	32.66	61.69
79	awnless	Z/S 210	39.17	50.62	0.42	0.81	51.89	19.84	35.59	55.74
80	awnless	Z/S 211	30.09	47.02	0.36	0.75	48.15	15.55	30.42	51.13
81	awnless	ZEBRA	20.74	31.42	0.42	0.64	65.48	19.06	30.96	59.92
82	awned	Z/S 13	26.01	34.24	0.56	0.80	70.60	26.38	41.80	63.10
83	awned	Z/S 22	30.29	40.04	0.46	0.80	58.33	21.17	37.21	56.90
84	awned	Z/S 23	37.29	51.10	0.38	0.75	49.79	18.07	34.94	51.70
85	awned	Z/S 29	30.45	39.96	0.48	0.77	61.90	18.16	34.76	52.25
86	awned	Z/S 47	26.50	37.66	0.49	0.74	66.52	21.45	35.34	60.69
87	awned	Z/S 48	33.89	40.50	0.52	0.85	60.92	21.50	36.76	58.48
88	awned	Z/S 50	29.41	37.75	0.48	0.76	63.23	20.71	33.66	61.53
89	awned	Z/S 51	24.86	36.48	0.44	0.69	63.58	19.58	36.81	53.21
90	awned	Z/S 53	25.16	36.25	0.45	0.73	62.22	22.61	39.33	57.50
91	awned	Z/S 54	28.46	38.05	0.45	0.74	61.21	21.78	35.07	62.11
92	awned	Z/S 60	27.23	36.67	0.47	0.77	60.60	23.71	37.48	63.26
93	awned	Z/S 71	21.44	29.25	0.44	0.79	56.26	19.73	35.06	56.26
94	awned	Z/S 72	21.59	30.61	0.51	0.72	70.89	18.77	35.28	53.20
95	awned	Z/S 88	31.18	41.81	0.47	0.82	57.53	16.83	34.56	48.69
96	awned	Z/S 91	35.27	46.45	0.39	0.74	53.20	14.07	30.75	45.75
97	awned	Z/S 93	29.36	38.99	0.35	0.78	44.64	20.63	37.73	54.68
98	awned	Z/S 94	21.66	32.55	0.36	0.84	43.15	19.52	37.91	51.48
99	awned	Z/S 96	31.53	43.22	0.41	0.88	47.29	17.69	34.51	51.26

100	awned	Z/S 97	28.06	37.28	0.39	0.77	51.30	19.63	37.83	51.89
101	awned	Z/S 98	30.76	42.36	0.39	0.73	53.00	19.90	35.81	55.57
102	awned	Z/S 99	28.38	39.20	0.36	0.80	44.88	21.17	37.39	56.62
103	awned	Z/S 100	29.30	40.16	0.32	0.72	44.68	17.51	34.55	50.66
104	awned	Z/S 112	30.18	41.70	0.48	0.77	61.96	19.04	35.49	53.64
105	awned	Z/S 113	20.42	29.07	0.52	0.85	61.05	22.33	36.80	60.69
106	awned	Z/S 115	33.97	43.60	0.42	0.85	49.88	19.71	40.26	48.96
107	awned	Z/S 118	25.46	38.51	0.47	0.75	62.83	19.11	38.23	49.98
108	awned	Z/S 119	23.51	33.15	0.45	0.72	62.87	18.75	32.52	57.65
109	awned	Z/S 120	15.49	24.80	0.55	0.77	71.82	21.25	34.91	60.85
110	awned	Z/S 121	29.91	36.50	0.47	0.76	60.92	21.05	35.40	59.48
111	awned	Z/S 124	28.56	39.09	0.44	0.75	58.14	18.92	33.25	56.91
112	awned	Z/S 125	24.99	35.15	0.42	0.70	59.95	19.21	35.45	54.20
113	awned	Z/S 126	27.08	34.04	0.52	0.77	67.82	22.82	33.31	68.50
114	awned	Z/S 127	29.59	38.43	0.52	0.77	67.24	20.41	33.15	61.57
115	awned	Z/S 128	27.35	35.91	0.40	0.73	55.37	19.31	31.11	62.05
116	awned	Z/S 130	49.35	58.43	0.37	0.77	48.15	19.06	33.01	57.73
117	awned	Z/S 133	44.82	55.30	0.35	0.72	49.05	17.24	31.47	54.78
118	awned	Z/S 134	43.45	52.44	0.38	0.75	50.26	18.34	34.09	53.81
119	awned	Z/S 135	41.56	52.67	0.35	0.79	43.92	20.34	38.23	53.20
120	awned	Z/S 136	41.06	50.01	0.33	0.63	53.15	15.42	30.41	50.71
121	awned	Z/S 145	23.63	32.00	0.45	0.67	67.55	22.66	35.35	64.12
122	awned	Z/S 146	40.21	49.63	0.41	0.64	63.99	20.33	34.37	59.15
123	awned	Z/S 149	33.39	46.10	0.41	0.72	57.26	16.68	33.31	50.08
124	awned	Z/S 152	17.21	24.92	0.49	0.82	59.74	18.20	30.10	60.48
125	awned	Z/S 154	25.21	36.80	0.54	0.99	54.35	17.90	40.28	44.44
126	awned	Z/S 155	25.54	38.82	0.49	0.78	62.59	17.72	35.17	50.38
127	awned	Z/S 156	28.46	39.07	0.42	0.69	60.97	20.48	39.58	51.74
128	awned	Z/S 157	30.76	41.55	0.40	0.62	65.26	19.50	33.53	58.15
129	awned	Z/S 158	51.19	60.10	0.35	0.69	49.89	20.21	36.77	54.97
130	awned	Z/S 159	25.63	39.49	0.39	0.74	53.25	19.08	37.68	50.64
131	awned	Z/S 160	25.51	34.40	0.37	0.63	59.60	19.83	31.40	63.17
132	awned	Z/S 162	32.36	41.20	0.41	0.62	65.62	21.65	33.64	64.36
133	awned	Z/S 163	24.72	38.14	0.43	0.72	59.49	21.90	36.04	60.76
134	awned	Z/S 164	34.69	47.52	0.39	0.87	44.71	18.95	36.80	51.49
135	awned	Z/S 165	30.99	41.03	0.42	0.70	59.20	20.91	36.18	57.78
136	awned	Z/S 168	30.24	39.42	0.49	0.87	56.38	28.82	43.92	65.62
137	awned	Z/S 169	21.83	30.70	0.49	0.79	62.62	17.41	33.62	51.78
138	awned	Z/S 170	32.36	41.78	0.44	0.88	49.78	21.41	35.22	60.78
139	awned	Z/S 172	28.37	37.81	0.43	0.80	53.21	22.03	36.20	60.86
140	awned	Z/S 173	34.59	46.24	0.36	0.80	44.99	17.29	33.19	52.09
141	awned	Z/S 174	48.10	56.53	0.32	0.72	44.39	21.92	35.57	61.61
142	awned	Z/S 176	25.47	32.77	0.48	0.84	56.93	29.27	41.01	71.36
143	awned	Z/S 177	47.07	54.39	0.34	0.78	43.45	21.39	33.41	64.04
144	awned	Z/S 178	43.36	52.12	0.39	0.77	50.28	20.25	33.24	60.93
145	awned	Z/S 181	19.58	24.83	0.44	0.66	66.00	19.99	33.13	60.33
146	awned	Z/S 183	17.48	21.76	0.59	0.78	75.95	23.47	32.86	71.43
147	awned	Z/S 184	39.75	49.98	0.47	0.96	49.39	20.88	38.07	54.85
148	awned	Z/S 185	34.03	43.30	0.42	0.71	59.94	21.94	35.39	61.99
149	awned	Z/S 193	41.87	50.13	0.39	0.80	49.17	22.46	34.32	65.44
150	awned	Z/S 195	24.03	36.07	0.42	0.73	58.11	19.78	35.13	56.30
151	awned	Z/S 196	33.75	44.11	0.42	0.75	56.00	20.25	36.51	55.47
152	awned	Z/S 198	38.69	49.23	0.39	0.73	52.83	18.41	32.33	56.96
153	awned	Z/S 199	53.42	60.60	0.39	0.87	44.26	21.81	38.64	56.44

154	awned	Z/S 200	38.42	49.70	0.36	0.81	44.99	18.60	34.93	53.25
155	awned	Z/S 202	26.88	34.64	0.38	0.62	62.14	19.34	31.60	61.19
156	awned	Z/S 204	27.78	35.56	0.37	0.68	55.15	20.90	33.94	61.58
157	awnless	Z/S 11	29.37	42.50	0.42	0.81	51.96	16.44	35.06	46.89
158	awnless	Z/S 25	32.86	46.11	0.40	0.80	50.01	20.55	35.48	57.94
159	awnless	Z/S 36	24.05	34.58	0.50	0.90	55.49	17.38	32.18	54.02
160	awnless	Z/S 37	50.21	63.59	0.30	0.73	41.28	17.19	34.00	50.56
161	awnless	Z/S 38	26.73	36.44	0.47	0.77	61.30	19.62	34.47	56.92
162	awnless	Z/S 46	24.46	35.58	0.56	0.74	74.64	19.75	36.58	53.99
163	awnless	Z/S 78	26.17	39.66	0.43	0.74	58.93	16.16	35.72	45.24
164	awnless	Z/S 79	29.66	41.85	0.42	0.72	58.90	17.54	33.51	52.35
165	awnless	Z/S 80	27.93	37.07	0.44	0.71	62.00	18.54	32.60	56.87
166	awnless	Z/S 81	29.98	40.34	0.45	0.76	58.69	17.03	34.57	49.26
167	awnless	Z/S 85	23.66	32.75	0.48	0.77	62.21	18.57	33.59	55.30
168	awnless	Z/S 89	35.21	43.25	0.42	0.70	60.07	21.16	37.25	56.81
169	awnless	Z/S 90	32.28	44.45	0.40	0.70	56.70	15.48	36.77	42.09
170	awnless	Z/S 95	32.58	39.95	0.37	0.66	56.93	19.31	35.59	54.26
171	awnless	Z/S 104	24.20	34.88	0.45	0.74	60.00	19.34	37.61	51.44
172	awnless	Z/S 116	36.26	47.79	0.39	0.69	56.62	20.71	40.40	51.25
173	awnless	Z/S 117	26.85	37.59	0.48	0.69	69.97	19.98	37.21	53.70
174	awnless	Z/S 122	32.53	41.00	0.45	0.69	64.68	18.38	33.29	55.22
175	awnless	Z/S 123	24.47	32.69	0.47	0.75	62.88	20.96	31.72	66.06
176	awnless	Z/S 129	54.20	65.93	0.32	0.80	39.77	16.87	32.94	51.23
177	awnless	Z/S 131	34.40	40.35	0.37	0.61	61.13	18.16	30.37	59.79
178	awnless	Z/S 132	36.18	47.36	0.31	0.66	47.17	17.47	33.86	51.59
179	awnless	Z/S 137	29.77	40.23	0.39	0.72	54.63	18.99	32.94	57.67
180	awnless	Z/S 138	30.68	39.58	0.35	0.78	44.65	20.48	32.62	62.77
181	awnless	Z/S 139	28.05	39.18	0.51	0.87	58.57	17.11	31.85	53.73
182	awnless	Z/S 142	39.31	50.11	0.35	0.78	44.27	17.00	31.69	53.66
183	awnless	Z/S 144	48.98	60.81	0.32	0.72	43.67	17.22	32.30	53.31
184	awnless	Z/S 147	43.30	56.10	0.32	0.76	42.41	14.70	32.05	45.88
185	awnless	Z/S 150	39.47	51.47	0.38	0.77	49.28	17.21	32.23	53.38
186	awnless	Z/S 151	53.49	63.52	0.38	0.80	47.96	19.34	30.44	63.55
187	awnless	Z/S 153	33.72	40.44	0.48	0.75	63.48	24.18	33.52	72.12
188	awnless	Z/S 161	45.42	54.16	0.36	0.74	49.04	20.37	32.59	62.51
189	awnless	Z/S 166	22.91	31.02	0.54	0.69	78.00	22.12	34.58	63.96
190	awnless	Z/S 179	18.68	26.32	0.50	0.65	76.17	22.57	32.28	69.94
191	awnless	Z/S 186	27.80	38.67	0.51	0.72	70.61	18.59	34.52	53.85
192	awnless	Z/S 188	46.74	57.27	0.44	0.86	50.91	22.56	35.50	63.55
193	awnless	Z/S 189	31.58	41.99	0.43	0.77	56.35	20.38	33.16	61.46
194	awnless	Z/S 191	19.30	29.09	0.47	0.74	63.13	20.20	35.06	57.62
195	awnless	Z/S 194	29.17	39.98	0.43	0.79	54.80	15.97	33.38	47.83
196	awnless	Z/S 197	48.29	58.33	0.37	0.85	43.47	21.04	38.21	55.06
197	awnless	Z/S 201	31.88	40.33	0.34	0.63	54.66	19.78	32.05	61.72
198	awnless	Z/S 203	23.93	32.47	0.40	0.59	67.84	18.31	31.92	57.38
199	awnless	Z/S 206	36.96	41.35	0.37	0.63	58.21	23.01	33.81	68.07
200	awnless	Z/S 207	31.06	37.58	0.41	0.69	58.90	17.73	30.52	58.11

Supplemental Table 5. Results of statistical analysis of relationships between marker polymorphism and observed traits: *F* test—P-values

Marker	Source of variation	<i>F</i> test—P value					
		FDK1	FDK2	KWS	TKW	KWS_R	TKW_R
Xgwm566	Marker (M)	< 0.001	0.024	0.692	< 0.001	< 0.001	0.055
	M × Year	0.288	0.402	0.165	0.036	0.368	0.978
	M × Treatment	-	-	0.000	0.599		
Xgwm46	Marker	0.002	0.019	0.058	< 0.001	0.015	0.314
	M × Year	0.574	0.545	< 0.001	< 0.001	0.369	0.018
	M × Treatment	-	-	0.002	0.310		
Xgwm389	Marker	< 0.001	0.001	< 0.001	< 0.001	0.137	0.449
	M × Year	0.095	0.271	0.002	0.004	0.884	0.219
	M × Treatment	-	-	0.769	0.036		
Xgwm533	Marker	0.001	0.007	< 0.001	< 0.001	0.912	0.283
	M × Year	0.172	0.325	0.002	0.001	0.878	0.062
	M × Treatment	-	-	0.019	0.145		
Xgwm156	Marker	0.113	0.436	0.480	0.103	0.434	0.003
	M × Year	0.135	0.287	0.263	0.627	0.623	0.833
	M × Treatment	-	-	0.398	0.005		
Xgwm238	Marker	0.902	0.395	< 0.001	< 0.001	0.123	< 0.001
	M × Year	0.001	0.000	0.007	0.277	0.014	0.080
	M × Treatment	-	-	0.886	0.494		
Xgwm341	Marker	0.706	0.512	0.114	0.001	0.614	0.112
	M × Year	0.783	0.285	0.136	0.064	0.440	0.573
	M × Treatment	-	-	0.828	0.019		