

Appendix A Summary information of 139 SSR markers used in *Ae. tauschii* and hexaploid wheat varieties

Marker	Location	Chr.	<i>Aegilops tauschii</i>			<i>Triticum aestivum</i> L.		
			Allele No	Gene diversity	PIC	Allele No	Gene diversity	PIC
<i>gpw315</i>	81	1D	5	0.77	0.73	10	0.88	0.86
<i>gpw5082</i>	159.6	1D	18	0.93	0.93	10	0.89	0.88
<i>gpw5149</i>	39.8	1D	10	0.86	0.84	10	0.86	0.84
<i>gpw5162</i>	109.8	1D	13	0.91	0.91	7	0.82	0.80
<i>wmc732</i>	77.3	1D	14	0.92	0.91	7	0.84	0.82
<i>wmc609</i>	113	1D	10	0.87	0.86	11	0.88	0.87
<i>wmc216</i>	55	1D	13	0.90	0.89	8	0.86	0.85
<i>wmc222</i>	26	1D	10	0.87	0.86	7	0.81	0.78
<i>wmc429</i>	53	1D	15	0.91	0.91	8	0.83	0.81
<i>wmc590</i>	56.8	1D	17	0.93	0.92	9	0.85	0.84
<i>wmc93</i>	76.6	1D	13	0.90	0.89	7	0.78	0.76
<i>gwm642</i>	75.4	1D	12	0.88	0.86	7	0.82	0.79
<i>cfid27</i>	164	1D	10	0.84	0.82	6	0.77	0.74
<i>cfid28</i>	84	1D	11	0.88	0.87	7	0.82	0.79
<i>cfid32</i>	129	1D	12	0.88	0.87	8	0.82	0.79
<i>cfid63</i>	180	1D	9	0.86	0.84	9	0.86	0.85
<i>cfid72</i>	84	1D	13	0.87	0.86	10	0.87	0.85
<i>cfid282</i>	114	1D	12	0.89	0.88	9	0.87	0.86
<i>gdm33</i>	8.3	1D	13	0.90	0.90	10	0.85	0.83
<i>gpw308</i>	105	2D	8	0.83	0.81	4	0.71	0.65
<i>gpw300</i>	107	2D	14	0.91	0.90	9	0.83	0.81
<i>gpw313</i>	169.5	2D	7	0.74	0.71	7	0.82	0.79
<i>gpw338</i>	107	2D	11	0.88	0.87	8	0.83	0.81
<i>gpw341</i>	32	2D	6	0.73	0.68	8	0.79	0.77
<i>gpw361</i>	41	2D	13	0.90	0.89	6	0.80	0.76
<i>gpw5020</i>	131.6	2D	10	0.83	0.81	5	0.76	0.72
<i>gpw5041</i>	182.6	2D	9	0.86	0.84	8	0.86	0.85
<i>gpw5122</i>	52	2D	17	0.93	0.92	8	0.79	0.77
<i>gpw5141</i>	135.9	2D	14	0.90	0.89	6	0.78	0.75
<i>gpw5143</i>	182.4	2D	11	0.84	0.82	6	0.77	0.73
<i>gpw5163</i>	184.1	2D	12	0.89	0.89	7	0.80	0.77
<i>wmc702</i>	83.8	2D	14	0.91	0.90	10	0.86	0.85
<i>wmc111</i>	13	2D	9	0.80	0.77	9	0.88	0.87
<i>wmc167</i>	110	2D	15	0.92	0.91	8	0.85	0.83
<i>wmc245</i>	67	2D	11	0.90	0.89	6	0.77	0.74
<i>wmc453</i>	100	2D	15	0.90	0.90	7	0.83	0.81
<i>wmc601</i>	140.9	2D	17	0.93	0.92	10	0.85	0.84
<i>gwm210</i>	26	2D	10	0.87	0.85	6	0.80	0.77
<i>gwm311</i>	147.4	2D	13	0.91	0.90	10	0.86	0.84
<i>cfid44</i>	90	2D	16	0.92	0.92	12	0.89	0.88
<i>cfid70</i>	52	2D	11	0.87	0.86	9	0.82	0.80

<i>cfdl68</i>	187	2D	12	0.89	0.88	5	0.71	0.65
<i>gdm148</i>	69.9	2D	10	0.89	0.88	3	0.47	0.41
<i>gwm102</i>	108.9	2D	12	0.89	0.87	8	0.85	0.83
<i>gpw322</i>	29	3D	13	0.90	0.89	8	0.84	0.82
<i>gpw5001</i>	134.4	3D	5	0.54	0.56	6	0.76	0.73
<i>gpw5064</i>	130.5	3D	15	0.90	0.90	10	0.89	0.87
<i>gpw5067</i>	131.6	3D	10	0.89	0.88	8	0.83	0.81
<i>gpw5094</i>	131.7	3D	17	0.93	0.93	9	0.86	0.84
<i>gpw5104</i>	74.4	3D	14	0.91	0.90	10	0.86	0.84
<i>gpw5166</i>	76.5	3D	10	0.86	0.85	6	0.77	0.74
<i>gpw5177</i>	45.4	3D	12	0.87	0.86	9	0.84	0.82
<i>wmc656</i>	100.7	3D	12	0.88	0.86	7	0.79	0.76
<i>wmc631</i>	157.4	3D	14	0.91	0.90	6	0.78	0.74
<i>wmc375</i>	109.4	3D	12	0.89	0.88	7	0.74	0.70
<i>wmc492</i>	70.1	3D	13	0.90	0.90	4	0.71	0.66
<i>wmc552</i>	46.3	3D	9	0.85	0.83	7	0.83	0.80
<i>wmc43</i>	53.2	3D	11	0.89	0.88	5	0.74	0.70
<i>cfld4</i>	34	3D	12	0.89	0.88	9	0.83	0.81
<i>cfld34</i>	43	3D	10	0.88	0.87	8	0.84	0.83
<i>cfld35</i>	0	3D	14	0.90	0.90	10	0.85	0.84
<i>cfld223</i>	27.9	3D	7	0.74	0.70	5	0.75	0.71
<i>gdm8</i>	73.9	3D	12	0.89	0.88	8	0.85	0.83
<i>gdm128</i>	92.4	3D	12	0.89	0.88	6	0.76	0.73
<i>gpw311</i>	45.3	4D	8	0.66	0.79	6	0.77	0.73
<i>gpw336</i>	14.9	4D	7	0.74	0.76	10	0.86	0.85
<i>gpw345</i>	78.7	4D	6	0.79	0.70	9	0.86	0.84
<i>gpw5062</i>	14.8	4D	11	0.82	0.88	10	0.84	0.82
<i>gpw5072</i>	14	4D	10	0.85	0.84	7	0.82	0.79
<i>gpw5133</i>	-18.8	4D	9	0.86	0.83	9	0.83	0.81
<i>gpw5185</i>	14.9	4D	14	0.86	0.90	7	0.78	0.75
<i>gpw5191</i>	26.8	4D	12	0.86	0.90	7	0.84	0.81
<i>wmc723</i>	25.3	4D	6	0.87	0.63	6	0.80	0.78
<i>wmc720</i>	27.2	4D	10	0.88	0.86	7	0.80	0.78
<i>wmc285</i>	0	4D	16	0.88	0.91	13	0.91	0.90
<i>wmc331</i>	60	4D	17	0.89	0.90	7	0.82	0.79
<i>wmc457</i>	47	4D	9	0.90	0.84	6	0.80	0.77
<i>wmc574</i>	24.8	4D	15	0.90	0.92	7	0.77	0.74
<i>wmc48</i>	23.9	4D	13	0.90	0.90	7	0.78	0.74
<i>cfld39</i>	42	4D	11	0.91	0.87	6	0.78	0.75
<i>gdm61</i>	45.3	4D	10	0.91	0.84	6	0.77	0.73
<i>gdm129</i>	41.6	4D	11	0.92	0.87	5	0.69	0.65
<i>gpw298</i>	115.1	5D	9	0.83	0.82	8	0.77	0.74
<i>gpw302</i>	20.3	5D	5	0.76	0.72	8	0.82	0.80
<i>gpw326</i>	0	5D	7	0.79	0.76	9	0.84	0.82
<i>gpw5098</i>	69.6	5D	8	0.81	0.79	11	0.87	0.86
<i>gpw5171</i>	127.1	5D	15	0.92	0.92	12	0.89	0.88

<i>gpw5189</i>	18.8	5D	11	0.88	0.86	7	0.78	0.75
<i>wmc640</i>	93.1	5D	16	0.93	0.92	9	0.85	0.83
<i>wmc636</i>	77.6	5D	14	0.91	0.91	5	0.71	0.67
<i>wmc160</i>	77	5D	6	0.77	0.74	6	0.80	0.77
<i>wmc289</i>	60.2	5D	11	0.88	0.87	9	0.86	0.84
<i>wmc357</i>	78	5D	11	0.89	0.88	8	0.83	0.81
<i>gwm159</i>	27.5	5D	11	0.87	0.86	6	0.78	0.75
<i>gwm182</i>	51	5D	11	0.88	0.87	7	0.77	0.75
<i>gwm205</i>	35.5	5D	9	0.78	0.75	6	0.76	0.73
<i>gwm271</i>	61	5D	11	0.86	0.85	5	0.77	0.73
<i>gwm292</i>	69	5D	13	0.90	0.89	6	0.76	0.72
<i>gwm565</i>	99	5D	10	0.87	0.85	4	0.66	0.61
<i>gwm583</i>	45	5D	11	0.89	0.88	8	0.86	0.84
<i>cfa2141</i>	79.4	5D	12	0.90	0.89	6	0.70	0.66
<i>cfid3</i>	52	5D	12	0.84	0.83	8	0.81	0.79
<i>cfid10</i>	98.4	5D	12	0.90	0.89	4	0.58	0.51
<i>cfid12</i>	54.9	5D	12	0.89	0.88	6	0.78	0.74
<i>cfid40</i>	17	5D	9	0.86	0.85	7	0.81	0.79
<i>cfid52</i>	62.4	5D	12	0.89	0.88	7	0.84	0.82
<i>cfid79</i>	53.6	5D	13	0.90	0.89	8	0.84	0.83
<i>cfid266</i>	34.4	5D	12	0.89	0.88	5	0.73	0.68
<i>gpw306</i>	95.2	6D	5	0.70	0.65	4	0.62	0.55
<i>gpw312</i>	103.2	6D	8	0.81	0.79	4	0.58	0.52
<i>gpw5076</i>	103.2	6D	19	0.94	0.94	11	0.88	0.87
<i>gpw5125</i>	181.3	6D	12	0.89	0.88	8	0.83	0.81
<i>gpw5135</i>	95.3	6D	11	0.89	0.88	5	0.70	0.66
<i>gpw5170</i>	94.7	6D	12	0.88	0.87	11	0.88	0.87
<i>gpw5172</i>	86.9	6D	9	0.87	0.86	6	0.78	0.74
<i>gpw5176</i>	23.9	6D	11	0.88	0.87	8	0.84	0.82
<i>gpw5179</i>	181.2	6D	8	0.82	0.80	11	0.85	0.84
<i>gpw5182</i>	13.2	6D	13	0.91	0.91	9	0.84	0.82
<i>wmc113</i>	60.6	6D	17	0.90	0.89	6	0.76	0.72
<i>wmc416</i>	77	6D	10	0.87	0.85	8	0.78	0.76
<i>barc183</i>	15	6D	12	0.86	0.85	9	0.88	0.87
<i>barc54</i>	46.9	6D	10	0.81	0.79	9	0.87	0.85
<i>cfid60</i>	156	6D	11	0.88	0.87	8	0.84	0.82
<i>cfid188</i>	88	6D	10	0.86	0.85	9	0.86	0.85
<i>cfid287</i>	90	6D	13	0.90	0.90	10	0.86	0.85
<i>gpw334</i>	180.8	7D	12	0.89	0.88	8	0.77	0.74
<i>gpw5137</i>	228.3	7D	13	0.90	0.89	9	0.86	0.85
<i>gpw5181</i>	146.1	7D	15	0.91	0.90	4	0.40	0.37
<i>gpw5187</i>	102.1	7D	8	0.84	0.82	10	0.84	0.83
<i>gpw5192</i>	183.4	7D	11	0.89	0.88	4	0.62	0.57
<i>wmc671</i>	114.5	7D	12	0.88	0.87	12	0.90	0.90
<i>wmc634</i>	224.4	7D	18	0.93	0.93	12	0.90	0.89
<i>wmc182</i>	101.9	7D	5	0.77	0.73	7	0.83	0.81

<i>wmc405</i>	97	7D	12	0.88	0.87	3	0.55	0.49
<i>wmc463</i>	71.7	7D	16	0.91	0.90	8	0.82	0.80
<i>Xpsp3123</i>	170	7D	9	0.80	0.78	8	0.84	0.82
<i>Xpsp3113</i>	124	7D	16	0.91	0.90	3	0.61	0.52
<i>barc184</i>	28.2	7D	14	0.91	0.91	8	0.80	0.78
<i>gwm130</i>	72.1	7D	9	0.85	0.83	5	0.58	0.50

Appendix B The accession, geographic origin of *Aegilops tauschii* and *Triticum aestivum* and sub-group by model-based population

Species	Accession No.	Source ^a	County	Sub-group
<i>Aegilops tauschii</i>	Jing Y198	CGRIS	Unknown	1
<i>Aegilops tauschii</i>	RM000188	CGRIS	Afghanistan	1
<i>Aegilops tauschii</i>	RM000198	CGRIS	Afghanistan	1
<i>Aegilops tauschii</i>	RM000190	CGRIS	Pakistan	1
<i>Aegilops tauschii</i>	RM000194	CGRIS	Pakistan	1
<i>Aegilops tauschii</i>	RM000204	CGRIS	U.S.A.	1
<i>Aegilops tauschii</i>	RM000205	CGRIS	U.S.A.	1
<i>Aegilops tauschii</i>	RM000206	CGRIS	U.S.A.	1
<i>Aegilops tauschii</i>	RM000207	CGRIS	U.S.A.	1
<i>Aegilops tauschii</i>	RM000208	CGRIS	U.S.A.	1
<i>Aegilops tauschii</i>	RM000209	CGRIS	U.S.A.	1
<i>Aegilops tauschii</i>	RM000210	CGRIS	U.S.A.	1
<i>Aegilops tauschii</i>	RM000211	CGRIS	U.S.A.	1
<i>Aegilops tauschii</i>	RM000212	CGRIS	Mexico	1
<i>Aegilops tauschii</i>	RM000213	CGRIS	Mexico	1
<i>Aegilops tauschii</i>	RM000214	CGRIS	Mexico	1
<i>Aegilops tauschii</i>	RM000215	CGRIS	Mexico	1
<i>Aegilops tauschii</i>	RM000217	CGRIS	Mexico	1
<i>Aegilops tauschii</i>	RM000218	CGRIS	Mexico	1
<i>Aegilops tauschii</i>	RM000219	CGRIS	Mexico	1
<i>Aegilops tauschii</i>	RM000201	CGRIS	Netherlands	1
<i>Aegilops tauschii</i>	RM000200	CGRIS	Romania	1
<i>Aegilops tauschii</i>	RM000186	CGRIS	Russian	1
<i>Aegilops tauschii</i>	RM000189	CGRIS	Russian	1
<i>Aegilops tauschii</i>	RM000197	CGRIS	Russian	1
<i>Aegilops tauschii</i>	RM000199	CGRIS	Russian	1
<i>Aegilops tauschii</i>	RM000187	CGRIS	Iran	1
<i>Aegilops tauschii</i>	RM000191	CGRIS	Iran	1
<i>Aegilops tauschii</i>	RM000192	CGRIS	Iran	1
<i>Aegilops tauschii</i>	RM000195	CGRIS	Iran	1
<i>Aegilops tauschii</i>	RM000157	CGRIS	Canada	2
<i>Aegilops tauschii</i>	RM000158	CGRIS	Canada	2
<i>Aegilops tauschii</i>	RM000174	CGRIS	U.S.A.	2
<i>Aegilops tauschii</i>	RM000175	CGRIS	U.S.A.	2
<i>Aegilops tauschii</i>	RM000176	CGRIS	U.S.A.	2
<i>Aegilops tauschii</i>	RM000161	CGRIS	Russian	2
<i>Aegilops tauschii</i>	RM000162	CGRIS	Turkey	2
<i>Aegilops tauschii</i>	PI 603252	NSGC	Iran	2
<i>Aegilops tauschii</i>	PI 603246	NSGC	Israel	2
<i>Aegilops tauschii</i>	RM000179	CGRIS	unkown	2
<i>Aegilops tauschii</i>	RM000177	CGRIS	China	2

<i>Aegilops tauschii</i>	RM000178	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000163	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000164	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000165	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000181	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000166	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000167	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000169	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000171	CGRIS	China	2
<i>Aegilops tauschii</i>	RM000172	CGRIS	China	2
<i>Aegilops tauschii</i>	PI 268210	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 276985	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 317394	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 369627	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 428563	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 431603	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 486265	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 486268	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 486272	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 486275	NSGC	Unknown	3
<i>Aegilops tauschii</i>	PI 317392	NSGC	Afghanistan	3
<i>Aegilops tauschii</i>	PI 276980	NSGC	Caucasia	3
<i>Aegilops tauschii</i>	PI 499265	NSGC	U.S.A.	3
<i>Aegilops tauschii</i>	PI 276975	NSGC	Russian	3
<i>Aegilops tauschii</i>	PI 499264	NSGC	Russian	3
<i>Aegilops tauschii</i>	PI 349037	NSGC	Azerbaijan	3
<i>Aegilops tauschii</i>	PI 428564	NSGC	Azerbaijan	3
<i>Aegilops tauschii</i>	PI 431599	NSGC	Azerbaijan	3
<i>Aegilops tauschii</i>	PI 431600	NSGC	Russian	3
<i>Aegilops tauschii</i>	PI 431601	NSGC	Russian	3
<i>Aegilops tauschii</i>	PI 431598	NSGC	Turkmenistan	3
<i>Aegilops tauschii</i>	PI 431602	NSGC	Turkmenistan	3
<i>Aegilops tauschii</i>	PI 486266	NSGC	Turkey	3
<i>Aegilops tauschii</i>	PI 486267	NSGC	Turkey	3
<i>Aegilops tauschii</i>	PI 486271	NSGC	Turkey	3
<i>Aegilops tauschii</i>	PI 486274	NSGC	Turkey	3
<i>Aegilops tauschii</i>	PI 452130	NSGC	China	3
<i>Aegilops tauschii</i>	PI 452131	NSGC	China	3
<i>Aegilops tauschii</i>	PI 508264	NSGC	China	3
<i>Aegilops tauschii</i>	PI 508263	NSGC	China	3
<i>Aegilops tauschii</i>	PI 499262	NSGC	China	3
<i>Aegilops tauschii</i>	PI 511367	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 511375	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 511381	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 542277	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 542278	NSGC	Unknown	4

<i>Aegilops tauschii</i>	PI 554310	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 554311	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 554313	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 554315	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 554320	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 554323	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 560534	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 560535	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 560536	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 560754	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 560755	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 574465	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 574467	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 574468	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 574469	NSGC	Unknown	4
<i>Aegilops tauschii</i>	PI 511363	NSGC	Afghanistan	4
<i>Aegilops tauschii</i>	PI 511366	NSGC	Afghanistan	4
<i>Aegilops tauschii</i>	PI 511378	NSGC	Azerbaijan	4
<i>Aegilops tauschii</i>	PI 511365	NSGC	Pakistan	4
<i>Aegilops tauschii</i>	PI 554314	NSGC	Turkey	4
<i>Aegilops tauschii</i>	PI 554318	NSGC	Turkey	4
<i>Aegilops tauschii</i>	PI 603220	NSGC	west Asia	4
<i>Aegilops tauschii</i>	PI 511368	NSGC	Iran	4
<i>Aegilops tauschii</i>	PI 511369	NSGC	Iran	4
<i>Aegilops tauschii</i>	PI 511379	NSGC	Iran	4
<i>Aegilops tauschii</i>	PI 511380	NSGC	Iran	4
<i>Aegilops tauschii</i>	PI 511383	NSGC	Iran	4
<i>Aegilops tauschii</i>	Jing Y302	CGRIS	Unknown	5
<i>Aegilops tauschii</i>	Jing Y303	CGRIS	Unknown	5
<i>Aegilops tauschii</i>	Jing Y305	CGRIS	Unknown	5
<i>Aegilops tauschii</i>	Jing Y2263	CGRIS	Unknown	5
<i>Aegilops tauschii</i>	Jing Y2280	CGRIS	U.S.A.	5
<i>Aegilops tauschii</i>	RM000225	CGRIS	Mexico	5
<i>Aegilops tauschii</i>	RM000227	CGRIS	Mexico	5
<i>Aegilops tauschii</i>	RM000228	CGRIS	Mexico	5
<i>Aegilops tauschii</i>	RM000231	CGRIS	Russian	5
<i>Aegilops tauschii</i>	RM000242	CGRIS	Russian	5
<i>Aegilops tauschii</i>	RM000248	CGRIS	Russian	5
<i>Aegilops tauschii</i>	RM000249	CGRIS	Russian	5
<i>Aegilops tauschii</i>	RM000251	CGRIS	Russian	5
<i>Aegilops tauschii</i>	RM000233	CGRIS	Iran	5
<i>Aegilops tauschii</i>	RM000234	CGRIS	Iran	5
<i>Aegilops tauschii</i>	RM000235	CGRIS	Iran	5
<i>Aegilops tauschii</i>	RM000236	CGRIS	Iran	5
<i>Aegilops tauschii</i>	RM000237	CGRIS	Iran	5
<i>Aegilops tauschii</i>	RM000238	CGRIS	Iran	5

<i>Aegilops tauschii</i>	RM000239	CGRIS	Iran	5
<i>Aegilops tauschii</i>	RM000250	CGRIS	Iran	5
<i>Aegilops tauschii</i>	Jing Y309	CGRIS	China	5
<i>Aegilops tauschii</i>	Jing Y306	CGRIS	China	5
<i>Aegilops tauschii</i>	Jing Y307	CGRIS	China	5
<i>Aegilops tauschii</i>	Jing Y308	CGRIS	China	5
<i>Aegilops tauschii</i>	PI 220326	NSGC	Unknown	6
<i>Aegilops tauschii</i>	Clae 3	NSGC	Afghanistan	6
<i>Aegilops tauschii</i>	Clae 4	NSGC	Afghanistan	6
<i>Aegilops tauschii</i>	Clae 5	NSGC	Afghanistan	6
<i>Aegilops tauschii</i>	Clae 6	NSGC	Afghanistan	6
<i>Aegilops tauschii</i>	PI 220641	NSGC	Afghanistan	6
<i>Aegilops tauschii</i>	PI 220642	NSGC	Afghanistan	6
<i>Aegilops tauschii</i>	Clae 68	NSGC	U.S.A.	6
<i>Aegilops tauschii</i>	Clae 72	NSGC	U.S.A.	6
<i>Aegilops tauschii</i>	PI 210987	NSGC	U.S.A.	6
<i>Aegilops tauschii</i>	Clae 30	NSGC	Japan	6
<i>Aegilops tauschii</i>	Clae 71	NSGC	Turkey	6
<i>Aegilops tauschii</i>	Clae 8	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 9	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 10	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 11	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 14	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 15	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 17	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 19	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 21	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 23	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 24	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 25	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 26	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 27	NSGC	Iran	6
<i>Aegilops tauschii</i>	Clae 28	NSGC	Iran	6
<i>Aegilops tauschii</i>	PI 486276	NSGC	Unknown	NA
<i>Aegilops tauschii</i>	Clae 2	NSGC	Afghanistan	NA
<i>Aegilops tauschii</i>	PI 220331	NSGC	Afghanistan	NA
<i>Aegilops tauschii</i>	PI 476874	NSGC	Afghanistan	NA
<i>Aegilops tauschii</i>	RM000183	CGRIS	Afghanistan	NA
<i>Aegilops tauschii</i>	RM000185	CGRIS	Afghanistan	NA
<i>Aegilops tauschii</i>	PI 603233	NSGC	Azerbaijan	NA
<i>Aegilops tauschii</i>	PI 603235	NSGC	Azerbaijan	NA
<i>Aegilops tauschii</i>	Clae 1	NSGC	Pakistan	NA
<i>Aegilops tauschii</i>	PI 603255	NSGC	U.S.A.	NA
<i>Aegilops tauschii</i>	Jing 2282	CGRIS	U.S.A.	NA
<i>Aegilops tauschii</i>	RM000220	CGRIS	Mexico	NA
<i>Aegilops tauschii</i>	RM000221	CGRIS	Mexico	NA

<i>Aegilops tauschii</i>	RM000223	CGRIS	Mexico	NA
<i>Aegilops tauschii</i>	RM000226	CGRIS	Mexico	NA
<i>Aegilops tauschii</i>	RM000180	CGRIS	France	NA
<i>Aegilops tauschii</i>	PI 603224	NSGC	Russian	NA
<i>Aegilops tauschii</i>	RM000159	CGRIS	Russian	NA
<i>Aegilops tauschii</i>	RM000182	CGRIS	Russian	NA
<i>Aegilops tauschii</i>	RM000245	CGRIS	Russian	NA
<i>Aegilops tauschii</i>	PI 603225	NSGC	Turkmenistan	NA
<i>Aegilops tauschii</i>	PI 603221	NSGC	West Asia	NA
<i>Aegilops tauschii</i>	PI 511382	NSGC	Iran	NA
<i>Aegilops tauschii</i>	PI 603223	NSGC	Iran	NA
<i>Aegilops tauschii</i>	PI 603249	NSGC	Iran	NA
<i>Aegilops tauschii</i>	RM000160	CGRIS	Iran	NA
<i>Aegilops tauschii</i>	RM000173	CGRIS	China	NA
<i>Triticum aestivum</i> L.	PI 573733	SDAU	U.S.A.	1
<i>Triticum aestivum</i> L.	Shannongfu 63	SDAU	Shandong China	1
<i>Triticum aestivum</i> L.	Jinan No.2	SDAU	Shandong China	1
<i>Triticum aestivum</i> L.	Changle No.5	SDAU	Shandong China	1
<i>Triticum aestivum</i> L.	Jinmai 23	SDAU	Shanxi China	1
<i>Triticum aestivum</i> L.	Yumai 14	SDAU	Henan China	1
<i>Triticum aestivum</i> L.	Misuixiaomai	SDAU	Italy	1
<i>Triticum aestivum</i> L.	Lumai No.9	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Lumai 19	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Kexin No.8	SDAU	Tianjin China	2
<i>Triticum aestivum</i> L.	Biyumai (Wugong 14)	SDAU	Shaanxi China	2
<i>Triticum aestivum</i> L.	Lumai 23	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Xuzhou 5034	SDAU	Jiangsu China	2
<i>Triticum aestivum</i> L.	Zhouyuan 218	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Jabin	SDAU	U.S.A.	2
<i>Triticum aestivum</i> L.	Laura	SDAU	U.S.A.	2
<i>Triticum aestivum</i> L.	Taishan 23	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Youmai No.3	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Jinan 17	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Funo	SDAU	Italy	2
<i>Triticum aestivum</i> L.	Annong 0487	SDAU	Anhui China	2
<i>Triticum aestivum</i> L.	Annong 04144	SDAU	Anhui China	2
<i>Triticum aestivum</i> L.	Yannong 685	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Lumai No.2	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Youmai No.2	SDAU	Shandong China	2
<i>Triticum aestivum</i> L.	Huixianhong	SDAU	Henan China	2
<i>Triticum aestivum</i> L.	Jinmai No.6	SDAU	Henan China	3
<i>Triticum aestivum</i> L.	Zhoumai 22	SDAU	Henan China	3
<i>Triticum aestivum</i> L.	Zhoumai 16	SDAU	Henan China	3
<i>Triticum aestivum</i> L.	Bess	SDAU	U.S.A.	3
<i>Triticum aestivum</i> L.	Abondanza	SDAU	Italy	3
<i>Triticum aestivum</i> L.	Xinong No.1	SDAU	Shaanxi China	3

<i>Triticum aestivum</i> L.	Shijiazhuang No.5	SDAU	Hebei China	3
<i>Triticum aestivum</i> L.	Aimengniu type V	SDAU	Shandong China	3
<i>Triticum aestivum</i> L.	Fengchan No.3	SDAU	Shaanxi China	3
<i>Triticum aestivum</i> L.	U-3-1	SDAU	U.S.A.	3
<i>Triticum aestivum</i> L.	Parshall	SDAU	U.S.A.	3
<i>Triticum aestivum</i> L.	Heng 5	SDAU	Hebei China	3
<i>Triticum aestivum</i> L.	Shiai No.1	SDAU	Hebei China	3
<i>Triticum aestivum</i> L.	Shimai 12	SDAU	HeBei China	3
<i>Triticum aestivum</i> L.	Zhoumai 18	SDAU	Henan China	3
<i>Triticum aestivum</i> L.	Yunong 982	SDAU	Henan China	3
<i>Triticum aestivum</i> L.	Xinxiang 9852	SDAU	Henan China	3
<i>Triticum aestivum</i> L.	Xiaoyan No.6	SDAU	Henan China	3
<i>Triticum aestivum</i> L.	Lumai No.6	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Lumai 15	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Jin 0483	SDAU	Tianjin China	4
<i>Triticum aestivum</i> L.	Apollo	SDAU	U.S.A.	4
<i>Triticum aestivum</i> L.	Ben	SDAU	U.S.A.	4
<i>Triticum aestivum</i> L.	Alsen	SDAU	U.S.A.	4
<i>Triticum aestivum</i> L.	Mazhamai	SDAU	Shaanxi China	4
<i>Triticum aestivum</i> L.	Youzimai	SDAU	Henan China	4
<i>Triticum aestivum</i> L.	Weimai 8	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Taishan 9818	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Yannong 15	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Jimai 22	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Jimai19	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Jinan 16	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Yannong 19	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Lumai 11	SDAU	Shandong China	4
<i>Triticum aestivum</i> L.	Yumai 416	SDAU	Henan China	4
<i>Triticum aestivum</i> L.	Shangcheng 9415	SDAU	Henan China	4
<i>Triticum aestivum</i> L.	Ernie	SDAU	U.S.A.	4
<i>Triticum aestivum</i> L.	Chancellor	SDAU	U.S.A.	4
<i>Triticum aestivum</i> L.	Xuzhou 4043	SDAU	Jiangsu China	4
<i>Triticum aestivum</i> L.	Zhenmai 366	SDAU	Henan China	5
<i>Triticum aestivum</i> L.	Xinmai 9817	SDAU	Henan China	5
<i>Triticum aestivum</i> L.	Zhenfeng No.6	SDAU	Henan China	5
<i>Triticum aestivum</i> L.	Xuzhou 4060	SDAU	Jiangsu China	5
<i>Triticum aestivum</i> L.	Hope	SDAU	U.S.A.	5
<i>Triticum aestivum</i> L.	Klasic	SDAU	U.S.A.	5
<i>Triticum aestivum</i> L.	ND 495	SDAU	U.S.A.	5
<i>Triticum aestivum</i> L.	P 961341	SDAU	U.S.A.	5
<i>Triticum aestivum</i> L.	PI 025w33	SDAU	U.S.A.	5
<i>Triticum aestivum</i> L.	PI 480474	SDAU	U.S.A.	5
<i>Triticum aestivum</i> L.	Jinan 13	SDAU	Shandong China	5
<i>Triticum aestivum</i> L.	Jimai 20	SDAU	Shandong China	5
<i>Triticum aestivum</i> L.	Taishan No.5	SDAU	Shandong China	5

<i>Triticum aestivum</i> L.	Baiyoubao	SDAU	Shandong China	5
<i>Triticum aestivum</i> L.	Taishan No.8	SDAU	Shandong China	5
<i>Triticum aestivum</i> L.	Lumai 12	SDAU	Shandong China	5
<i>Triticum aestivum</i> L.	Qida 195	SDAU	Shandong China	5
<i>Triticum aestivum</i> L.	Taishan No.1	SDAU	Shandong China	5
<i>Triticum aestivum</i> L.	Huaiyang 0454	SDAU	Henan China	5
<i>Triticum aestivum</i> L.	Hengguan 35	SDAU	Hebei China	5
<i>Triticum aestivum</i> L.	Chuanmai 43	SDAU	Sichuan China	5
<i>Triticum aestivum</i> L.	Chuanmai 42	SDAU	Sichuan China	5
<i>Triticum aestivum</i> L.	Chinese Spring	SDAU	Sichuan China	5
<i>Triticum aestivum</i> L.	Reeder	SDAU	U.S.A.	5
<i>Triticum aestivum</i> L.	Ji 8901	SDAU	Hebei China	5
<i>Triticum aestivum</i> L.	Synthetic 16	SDAU	U.S.A.	5
<i>Triticum aestivum</i> L.	VAW 4	SDAU	U.S.A.	6
<i>Triticum aestivum</i> L.	VAW 1	SDAU	U.S.A.	6
<i>Triticum aestivum</i> L.	Zhengzhou 2062	SDAU	Henan China	6
<i>Triticum aestivum</i> L.	Zhengnong 20	SDAU	Henan China	6
<i>Triticum aestivum</i> L.	Roane	SDAU	U.S.A.	6
<i>Triticum aestivum</i> L.	PI 597350	SDAU	U.S.A.	6
<i>Triticum aestivum</i> L.	Han 6172	SDAU	Hebei China	6
<i>Triticum aestivum</i> L.	Guizhou 8131-1	SDAU	Guizhou China	6
<i>Triticum aestivum</i> L.	Zixuan No.2	SDAU	Shandong China	7
<i>Triticum aestivum</i> L.	Shannong 8355	SDAU	Shandong China	7
<i>Triticum aestivum</i> L.	Taishan No.4	SDAU	Shandong China	7
<i>Triticum aestivum</i> L.	Zimai No.2	SDAU	Shandong China	7
<i>Triticum aestivum</i> L.	Synthetic 777	SDAU	U.S.A.	7
<i>Triticum aestivum</i> L.	Synthetic 61	SDAU	U.S.A.	7
<i>Triticum aestivum</i> L.	Xiaoyan 54	SDAU	Henan China	7
<i>Triticum aestivum</i> L.	Lebsock	SDAU	U.S.A.	NA
<i>Triticum aestivum</i> L.	Neepawa	SDAU	Canada	NA
<i>Triticum aestivum</i> L.	Yannong 18	SDAU	Shandong China	NA
<i>Triticum aestivum</i> L.	Lumai 14	SDAU	Shandong China	NA
<i>Triticum aestivum</i> L.	Guomai 301	SDAU	Henan China	NA
<i>Triticum aestivum</i> L.	Zhengmai 7698	SDAU	Henan China	NA
<i>Triticum aestivum</i> L.	Bobwhite	SDAU	Mexico	NA
<i>Triticum aestivum</i> L.	Yangmai 158	SDAU	Jiangsu China	NA
<i>Triticum aestivum</i> L.	Xinmai 18	SDAU	Henan China	NA
<i>Triticum aestivum</i> L.	Largo	SDAU	U.S.A.	NA
<i>Triticum aestivum</i> L.	Glenlea	SDAU	Canada	NA
<i>Triticum aestivum</i> L.	Aikang 58	SDAU	Anhui China	NA
<i>Triticum aestivum</i> L.	PI 283888	SDAU	U.S.A.	NA
<i>Triticum aestivum</i> L.	Jinguangmai	SDAU	Anhui China	NA
<i>Triticum aestivum</i> L.	Jinan No.6	SDAU	Shandong China	NA
<i>Triticum aestivum</i> L.	Lumai 21	SDAU	Shandong China	NA
<i>Triticum aestivum</i> L.	Xinong 979	SDAU	Shaanxi China	NA
<i>Triticum aestivum</i> L.	Shi 026207	SDAU	Hebei China	NA

<i>Triticum aestivum</i> L.	Marquis	SDAU	Mexico	NA
<i>Triticum aestivum</i> L.	Lankao 906	SDAU	Henan China	NA
<i>Triticum aestivum</i> L.	Langdon	SDAU	U.S.A.	NA
<i>Triticum aestivum</i> L.	TA 4152-19	SDAU	U.S.A.	NA
<i>Triticum aestivum</i> L.	Grandin	SDAU	U.S.A.	NA
<i>Triticum aestivum</i> L.	Xinxiang 89019	SDAU	Henan China	NA

^aCGRIS means Chinese Crop Germplasm Resources Information System, Beijing, China. NSGC means National Small Grain Center, USA. SDAU means Shandong Agricultural University, Tai'an, China.

Appendix C The marker-trait association in *Aegilops tauschii*

Trait	Marker	Chr.	P-value				R ² (%)			
			E1	E2	E3	AV	E1	E2	E3	AV
GL	<i>barc183</i>	6D	2.24E-02				2.02			
GL	<i>cf32</i>	1D			3.44E-02	3.33E-02			1.26	1.39
GL	<i>gpw306</i>	6D	7.10E-03		4.79E-02	3.75E-02	2.04		1.03	1.18
GL	<i>gpw315</i>	1D	1.76E-02				2.22			
GL	<i>gpw5094</i>	3D		3.33E-02				2.57		
GL	<i>gpw5179</i>	6D	1.70E-03	4.40E-02	4.33E-04	2.92E-04	3.19	1.84	2.26	2.55
GL	<i>gwm583</i>	5D		6.50E-03	3.51E-02	2.60E-02		2.24	1.57	1.79
GL	<i>wmc111</i>	2D		2.17E-02				2.18		
GL	<i>wmc160</i>	5D	1.34E-02		2.01E-02	2.26E-02	1.14		0.68	0.73
GL	<i>wmc405</i>	7D		3.68E-02				2.42		
GL	<i>wmc574</i>	4D		3.58E-02				2.60		
GW	<i>cf188</i>	6D		2.66E-02				4.57		
GW	<i>cf27</i>	1D		1.91E-02	2.45E-02	1.91E-02		4.16	5.79	5.48
GW	<i>cf28</i>	1D	4.13E-04	1.59E-02	2.10E-03	1.10E-03	10.69	4.35	7.53	7.24
GW	<i>gpw326</i>	5D		2.30E-03	6.40E-03	7.50E-03		5.50	7.32	6.63
GW	<i>gpw5122</i>	2D		2.45E-02	4.43E-02	3.82E-02		6.66	9.05	8.39
GW	<i>gpw5185</i>	4D	1.52E-02		6.60E-03	5.60E-03	8.08		6.86	6.39
GW	<i>psp3113</i>	7D	5.40E-03		1.29E-02	9.50E-03	8.43		6.11	5.78
GW	<i>psp3123</i>	7D		1.94E-02				4.52		
GW	<i>wmc416</i>	6D		1.78E-02				5.36		
GW	<i>wmc601</i>	2D	1.07E-02		1.33E-02	1.56E-02	10.50		8.18	7.37
GW	<i>wmc93</i>	1D		2.44E-02		4.77E-02		3.71		4.48
GLW	<i>gpw306</i>	6D		4.80E-03				1.37		
GLW	<i>gpw341</i>	2D		1.55E-02				0.91		
GLW	<i>gpw5137</i>	7D		1.55E-02				2.08		
GLW	<i>gpw5143</i>	2D		4.85E-02				1.80		
GLW	<i>gwm311</i>	2D		5.00E-03				2.12		
GP	<i>cf223</i>	3D		1.24E-02				1.20		
GP	<i>cf27</i>	1D		2.59E-02				1.23		
GP	<i>cf32</i>	1D	2.25E-02		9.50E-03	1.00E-02	2.02		1.72	1.75

GP	<i>gdm33</i>	1D	2.05E-02		4.05E-02	3.79E-02	2.82		1.98	2.04
GP	<i>gpw306</i>	6D	9.10E-03				1.94			
GP	<i>gpw315</i>	1D	9.10E-03				2.32			
GP	<i>gpw322</i>	3D		3.25E-02	4.99E-02	4.99E-02		1.72	2.07	2.12
GP	<i>gpw338</i>	2D		8.50E-03				1.34		
GP	<i>gpw5067</i>	3D	2.21E-02				3.28			
GP	<i>gpw5094</i>	3D		4.24E-02				1.92		
GP	<i>gpw5179</i>	6D	2.90E-03		1.50E-03	1.40E-03	3.11		2.48	2.55
GP	<i>gwm583</i>	5D		2.00E-03	5.70E-03	5.30E-03		1.92	2.22	2.29
GP	<i>psp3113</i>	7D			3.37E-02	3.44E-02			1.48	1.51
GP	<i>wmc111</i>	2D		1.80E-03	4.80E-02	4.67E-02		2.10	1.97	2.03
GP	<i>wmc160</i>	5D	4.75E-02				0.90			
GP	<i>wmc405</i>	7D		3.76E-02				1.88		
GR	<i>cfdl88</i>	6D		1.17E-02	4.12E-02	3.49E-02		8.20	10.61	9.69
GR	<i>cfdl28</i>	1D	1.82E-02				8.67			
GR	<i>cfdl35</i>	3D	1.40E-03				12.37			
GR	<i>cfdl4</i>	3D			2.72E-02	3.05E-02			9.65	8.71
GR	<i>gdm8</i>	3D			2.49E-02				11.51	
GR	<i>gpw306</i>	6D	2.44E-04			1.40E-03	10.61			9.88
GR	<i>gpw326</i>	5D		1.81E-02		3.13E-02		7.45		9.62
GR	<i>gpw338</i>	2D	9.35E-04				10.76			
GR	<i>gpw5094</i>	3D		2.12E-02				10.72		
GR	<i>gpw5122</i>	2D		3.37E-02				9.88		
GR	<i>gpw5135</i>	6D				4.14E-02				7.76
GR	<i>gpw5137</i>	7D	8.70E-03			1.72E-02	14.24			14.06
GR	<i>gpw5162</i>	1D		4.54E-02				9.37		
GR	<i>gpw5181</i>	7D		6.90E-03		2.39E-02		5.00		5.67
GR	<i>gpw5185</i>	4D				5.80E-03				10.56
GR	<i>gpw5192</i>	7D	1.46E-02				10.25			
GR	<i>gwm102</i>	2D		4.31E-02				7.41		
GR	<i>gwm271</i>	5D			2.84E-02				8.14	
GR	<i>wmc167</i>	2D	3.90E-02				9.73			
GR	<i>wmc453</i>	2D			4.89E-02	1.71E-02			13.11	13.37
GR	<i>wmc574</i>	4D		4.35E-02				10.04		
GR	<i>wmc590</i>	1D		4.76E-02				8.57		
GR	<i>wmc601</i>	2D			1.07E-02	2.40E-03			13.45	13.89
GR	<i>wmc640</i>	5D				4.69E-02				10.05
GR	<i>wmc720</i>	4D				1.26E-02				11.67
GR	<i>wmc723</i>	4D		3.35E-02				4.31		
GA	<i>cfdl223</i>	3D		1.13E-02				0.85		
GA	<i>cfdl27</i>	1D		6.20E-03	3.44E-02	1.95E-02		1.00	1.53	7.38
GA	<i>cfdl32</i>	1D	2.20E-03		1.50E-02	3.90E-03	13.54		1.69	8.77
GA	<i>gdm33</i>	1D	2.35E-02		1.54E-02	1.58E-02	14.33		2.22	10.00
GA	<i>gpw322</i>	3D		3.63E-02	1.78E-02	4.59E-02		1.20	2.31	9.63
GA	<i>gpw338</i>	2D		6.30E-03		4.42E-02		0.94		6.52
GA	<i>gpw5020</i>	2D				3.44E-02				6.20

GA	<i>gpw5179</i>	6D	1.10E-02			1.53E-02	15.12			9.77
GA	<i>gwm583</i>	5D		6.00E-03	1.09E-02	6.50E-03		1.21	2.12	9.96
GA	<i>psp3113</i>	7D	5.30E-03		2.26E-02	7.50E-03	12.26		1.60	8.05
GA	<i>wmc111</i>	2D		8.04E-04	2.07E-02	3.85E-02		1.55	2.21	9.30
GA	<i>wmc48</i>	4D	4.23E-02				10.79			
GA	<i>wmc720</i>	4D	3.41E-02				12.99			
GA	<i>wmc93</i>	1D		3.47E-02		2.07E-02		0.79		6.86
TGW	<i>cfdl168</i>	2D	4.31E-02	4.56E-02	4.97E-02		6.65	6.77	6.52	
TGW	<i>cfd223</i>	3D	2.15E-02				5.55			
TGW	<i>cfd27</i>	1D				2.52E-02				7.46
TGW	<i>cfd287</i>	6D		3.60E-02				5.29		
TGW	<i>cfd32</i>	1D				2.40E-03				9.52
TGW	<i>cfd60</i>	6D	1.41E-02		1.89E-02		6.72		6.44	
TGW	<i>gdm33</i>	1D				1.80E-02				10.32
TGW	<i>gpw306</i>	6D	3.20E-03	6.60E-03	9.30E-03		6.74	6.42	6.05	
TGW	<i>gpw322</i>	3D				4.76E-02				10.06
TGW	<i>gpw326</i>	5D	1.61E-02	5.60E-03	1.90E-03		7.85	8.77	9.33	
TGW	<i>gpw338</i>	2D				4.80E-02				6.74
TGW	<i>gpw341</i>	2D	4.80E-03	6.68E-04	7.10E-03		5.15	6.40	4.91	
TGW	<i>gpw5001</i>	3D	1.70E-02	9.80E-03			4.39	4.82		
TGW	<i>gpw5020</i>	2D				3.61E-02				6.40
TGW	<i>gpw5072</i>	4D		3.60E-03	6.30E-03			10.86	10.23	
TGW	<i>gpw5094</i>	3D	2.91E-02				10.05			
TGW	<i>gpw5166</i>	3D	8.09E-04	1.29E-04	3.18E-04		8.10	9.32	8.51	
TGW	<i>gpw5176</i>	6D		4.53E-02	1.69E-02			6.51	7.16	
TGW	<i>gpw5179</i>	6D	2.57E-02			3.40E-03	7.90			11.62
TGW	<i>gpw5181</i>	7D	9.32E-04	5.70E-03	1.21E-02		6.12	5.19	4.60	
TGW	<i>gwm210</i>	2D			2.33E-02				4.82	
TGW	<i>gwm583</i>	5D				3.40E-03				10.95
TGW	<i>psp3113</i>	7D				7.40E-03				8.40
TGW	<i>wmc111</i>	2D				3.55E-02				9.77
TGW	<i>wmc245</i>	2D			4.23E-02				7.91	
TGW	<i>wmc574</i>	4D	3.32E-02	3.23E-02	3.50E-02		10.50	10.47	10.31	
TGW	<i>wmc609</i>	1D	4.09E-02	3.34E-02	3.98E-02		8.68	9.02	8.72	
TGW	<i>wmc93</i>	1D				3.41E-02				6.70

Appendix D The marker-trait association in hexaploid wheat varieties

Trait	Marker	Chr.	P-value				R ² (%)			
			E1	E2	E3	AV	E1	E2	E3	AV
GL	<i>cfdl188</i>	6D	4.56E-02	4.32E-02			11.68	9.00		
GL	<i>cfd39</i>	4D			4.20E-02				8.77	
GL	<i>cfd4</i>	3D				4.86E-02				11.62
GL	<i>cfd40</i>	5D				2.36E-02				10.62
GL	<i>cfd72</i>	1D	2.36E-02				14.87			
GL	<i>gdm33</i>	1D		2.10E-03	4.92E-02	1.14E-02		14.33	12.99	16.30
GL	<i>gpw312</i>	6D		4.45E-02				4.33		
GL	<i>gpw361</i>	2D		2.57E-02				7.11		
GL	<i>gpw5125</i>	6D	4.93E-02				11.81			
GL	<i>gpw5179</i>	6D	1.00E-03		4.20E-03	8.10E-03	19.99		17.32	16.41
GL	<i>gwm271</i>	5D				3.94E-02				7.63
GL	<i>gwm583</i>	5D	1.77E-02			1.14E-02	12.78			13.19
GL	<i>gwm642</i>	1D				4.91E-02				9.09
GL	<i>wmc167</i>	2D	1.43E-02		3.40E-02	3.29E-02	13.01		11.02	11.26
GL	<i>wmc216</i>	1D	4.81E-02				11.17			
GL	<i>wmc43</i>	3D				3.27E-02				7.54
GL	<i>wmc640</i>	5D		4.80E-02				9.13		
GW	<i>cfa2141</i>	5D		3.04E-02				7.16		
GW	<i>cfid3</i>	5D	2.59E-02		8.10E-03		11.30		12.99	
GW	<i>cfid32</i>	1D		2.68E-02				9.23		
GW	<i>cfid34</i>	3D			3.59E-02				10.26	
GW	<i>cfid40</i>	5D		1.99E-02				8.59		
GW	<i>cfid63</i>	1D	3.70E-03	8.90E-03		1.10E-03	15.69	11.46		13.61
GW	<i>gdm33</i>	1D		1.57E-02	2.62E-02	8.70E-03		12.31	13.08	11.93
GW	<i>gpw315</i>	1D	3.61E-02				12.77			
GW	<i>gpw338</i>	2D	2.00E-03				15.73			
GW	<i>gpw5098</i>	5D	4.48E-02				14.19			
GW	<i>gpw5122</i>	2D	2.16E-02				11.27			
GW	<i>gpw5137</i>	7D	3.64E-02	2.14E-02			14.18	12.22		
GW	<i>wmc216</i>	1D	1.38E-02				12.94			
GW	<i>wmc222</i>	1D	4.51E-02				8.90			
GW	<i>wmc43</i>	3D			3.55E-02				6.79	
GW	<i>wmc48</i>	4D	1.17E-02		2.23E-02	9.00E-03	11.30		9.94	8.44
GLW	<i>cfid12</i>	5D		2.04E-02				10.32		
GLW	<i>cfid282</i>	1D				1.94E-02				1.96
GLW	<i>cfid3</i>	5D			6.10E-03	1.90E-03			11.21	2.20
GLW	<i>cfid39</i>	4D		2.81E-02		3.62E-02		10.36		1.41
GLW	<i>cfid4</i>	3D				2.08E-02				2.32
GLW	<i>cfid60</i>	6D				8.80E-03				2.11
GLW	<i>gpw312</i>	6D				4.73E-02				0.92
GLW	<i>gpw5041</i>	2D			1.35E-02	5.30E-03			10.16	2.30

GLW	<i>gpw5067</i>	3D				3.61E-02				8.66
GLW	<i>gpw5122</i>	2D		1.89E-02		4.98E-02		13.05		1.57
GLW	<i>gpw5137</i>	7D		1.52E-02		1.82E-02		18.08		2.80
GLW	<i>gpw5191</i>	4D				2.86E-02				1.62
GLW	<i>gwm210</i>	2D				2.72E-02				1.44
GLW	<i>wmc416</i>	6D		4.08E-02				11.39		
GLW	<i>wmc429</i>	1D				3.46E-02				2.01
GLW	<i>wmc48</i>	4D		3.77E-02		1.69E-02		10.53		1.73
GLW	<i>wmc609</i>	1D				3.92E-02				2.28
GLW	<i>wmc640</i>	5D		1.02E-02				16.15		
GP	<i>cf188</i>	6D	3.03E-02					12.49		
GP	<i>cf32</i>	1D		3.31E-02				8.68		
GP	<i>cf40</i>	5D		4.46E-02		4.29E-02		7.33		7.11
GP	<i>cf63</i>	1D			4.75E-02	2.57E-02			11.85	9.83
GP	<i>gdm33</i>	1D	4.01E-02	8.28E-04	1.70E-03	1.10E-03	13.76	16.18	19.55	15.52
GP	<i>gpw326</i>	5D	4.59E-02				11.53			
GP	<i>gpw338</i>	2D	1.15E-02				13.35			
GP	<i>gpw361</i>	2D		1.94E-02				7.58		
GP	<i>gpw5020</i>	2D			4.85E-02				6.74	
GP	<i>gpw5179</i>	6D	8.20E-03		4.50E-03	1.24E-02	16.46		17.36	11.97
GP	<i>gpw5182</i>	6D	4.11E-02				12.26			
GP	<i>gwm565</i>	5D	2.34E-02				6.85			
GP	<i>gwm583</i>	5D	3.88E-02		2.63E-02	1.75E-02	11.50		11.87	9.33
GP	<i>wmc167</i>	2D	3.52E-02				11.30			
GP	<i>wmc216</i>	1D	2.72E-02				12.17			
GP	<i>wmc429</i>	1D		4.69E-02				9.09		
GP	<i>wmc43</i>	3D	3.89E-02			3.70E-02	7.25			5.69
GR	<i>cfa2141</i>	5D				3.87E-02				5.84
GR	<i>cf12</i>	5D	1.05E-02	3.37E-02		9.10E-03	8.95	7.43		7.98
GR	<i>cf282</i>	1D				2.59E-02				9.08
GR	<i>cf3</i>	5D	1.40E-03		2.01E-04	4.06E-04	13.66		15.33	12.70
GR	<i>cf39</i>	4D	8.90E-03	5.70E-03	1.97E-02	2.90E-03	9.64	10.51	7.96	9.50
GR	<i>cf4</i>	3D		3.05E-02		1.96E-02		10.51		9.71
GR	<i>cf44</i>	2D		2.63E-02				13.34		
GR	<i>cf60</i>	6D			4.75E-02	3.82E-02			8.48	8.19
GR	<i>cf63</i>	1D	3.88E-02				10.00			
GR	<i>gdm61</i>	4D		4.69E-02				6.79		
GR	<i>gpw302</i>	5D		4.28E-02				9.71		
GR	<i>gpw322</i>	3D	1.61E-02			2.16E-02	11.81			9.59
GR	<i>gpw5020</i>	2D	7.90E-03				8.10			
GR	<i>gpw5041</i>	2D			8.80E-03				10.46	
GR	<i>gpw5064</i>	3D	3.97E-02	2.66E-02		8.90E-03	10.64	11.23		10.56
GR	<i>gpw5067</i>	3D	6.10E-03	4.72E-02		1.08E-02	11.84	8.66		9.38
GR	<i>gpw5094</i>	3D	1.40E-03	9.20E-03	3.84E-02	1.21E-02	14.99	11.99	9.31	9.96
GR	<i>gpw5104</i>	3D	1.51E-02				13.17			
GR	<i>gpw5122</i>	2D	9.60E-03			5.50E-03	11.06			10.00

GR	<i>gpw5125</i>	6D			2.29E-02					10.86
GR	<i>gpw5135</i>	6D		4.78E-02				5.87		
GR	<i>gpw5137</i>	7D	4.80E-02	1.15E-02		7.50E-03	12.28	15.15		14.02
GR	<i>gpw5149</i>	1D	2.58E-02				11.94			
GR	<i>gpw5189</i>	5D	4.63E-02				7.78			
GR	<i>gpw5191</i>	4D	3.85E-02			2.05E-02	8.15			7.74
GR	<i>gwm210</i>	2D		2.80E-03		2.79E-02		11.00		6.57
GR	<i>gwm271</i>	5D			1.07E-02	4.12E-02			7.75	5.44
GR	<i>gwm642</i>	1D			7.10E-03	4.44E-02			10.02	6.63
GR	<i>psp3113</i>	7D	3.59E-02				3.99			
GR	<i>wmc289</i>	5D	2.49E-02	3.60E-03		8.70E-03	10.31	13.47		10.41
GR	<i>wmc357</i>	5D	2.22E-02				9.61			
GR	<i>wmc416</i>	6D	7.70E-03	1.50E-03	2.76E-02	2.38E-04	11.34	13.68	8.88	13.51
GR	<i>wmc48</i>	4D			4.20E-03	2.22E-02			10.31	7.07
GR	<i>wmc601</i>	2D			1.27E-02				12.07	
GR	<i>wmc634</i>	7D	3.63E-02	2.80E-02		2.00E-03	13.28	13.68		15.35
GR	<i>wmc640</i>	5D	3.70E-03	1.26E-02		2.64E-02	14.20	12.24		9.65
GR	<i>wmc702</i>	7D	1.92E-02				12.17			
GR	<i>wmc723</i>	4D		1.75E-02				8.36		
GR	<i>wmc93</i>	1D		4.65E-02				7.95		
GA	<i>gdm33</i>	1D		7.10E-03	6.60E-03	3.40E-03		13.04	12.43	13.64
GA	<i>gpw315</i>	1D	1.97E-02				10.91			
GA	<i>gpw338</i>	2D	2.24E-02				9.09			
GA	<i>gpw361</i>	2D		3.63E-02				6.65		
GA	<i>gpw5179</i>	6D	2.74E-02			2.99E-02	10.83			10.55
GA	<i>wmc216</i>	1D	3.47E-02				8.67			
GA	<i>wmc429</i>	1D		3.99E-02				9.35		
TGW	<i>barc54</i>	6D			4.18E-02					11.72
TGW	<i>cf40</i>	5D			4.48E-02					8.68
TGW	<i>gdm8</i>	3D		3.81E-02	4.11E-02	4.37E-02		9.61	9.73	9.60
TGW	<i>gpw334</i>	7D			3.47E-02					11.06
TGW	<i>gpw5149</i>	1D	3.40E-02	3.85E-02		3.96E-02	12.27	11.91		12.12
TGW	<i>gpw5181</i>	7D	3.69E-02	4.11E-02		4.71E-02	5.49	5.28		5.20
TGW	<i>gwm182</i>	5D	2.61E-02	2.40E-02	2.66E-02	2.50E-02	9.41	9.42	9.49	9.57
TGW	<i>psp3113</i>	7D	3.36E-02	2.89E-02		3.69E-02	4.40	4.54		4.33