

### Supplementary Material

#### **Potential use of random and linked SSR markers in establishing the true heterotic pattern in maize (*Zea mays*)**

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Table S1: Mean yield, BLUP values and SCA effects of diallel crosses based on multi-location evaluation, and genetic distance (GD) based on DNA makers

Sl. No.	Hybrid	Cross	Mean Yield <sup>#</sup> (t/ha)	BLUP values	SCA effects	GD (Linked marker )	GD (Random marker)
1	MHD1	G2 ×G1	3.73	3.98	-0.23	0.53	0.7
2	MHD2	G3 ×G1	6.36	6.02	2.12	0.6	0.61
3	MHD3	G4 ×G1	2.90	3.35	-0.89	0.48	0.73
4	MHD4	G5 ×G1	3.52	3.82	-1.22	0.62	0.7
5	MHD5	G6 ×G1	6.23	5.92	2.06	0.62	0.59
6	MHD6	G7 ×G1	5.09	5.03	0.80	0.52	0.71
7	MHD7	G8 ×G1	3.92	4.13	0.16	0.67	0.69
8	MHD8	G9 ×G1	5.81	5.60	0.72	0.6	0.67
9	MHD9	G10 ×G1	3.92	4.13	-1.10	0.62	0.76
10	MHD10	G11 ×G1	2.60	3.11	-2.73	0.58	0.56
11	MHD11	G12 ×G1	4.61	4.67	0.04	0.48	0.63
12	MHD12	G13 × G1	4.00	4.19	-1.74	0.56	0.7
13	MHD13	G14 ×G1	3.95	4.16	-0.46	0.57	0.52
14	MHD14	G15 ×G1	9.95	8.79	4.44	0.55	0.66
15	MHD15	G16 ×G1	4.15	4.31	0.53	0.61	0.63
16	MHD16	G17 ×G1	2.85	3.20	-2.40	0.57	0.55
17	MHD17	G18 ×G1	5.66	5.48	1.03	0.48	0.55
18	MHD18	G19 ×G1	4.30	4.14	-1.11	0.54	0.47
19	MHD19	G3 ×G2	5.06	5.02	1.11	0.5	0.7
20	MHD20	G4 ×G2	4.84	4.84	1.33	0.57	0.71
21	MHD21	G5 ×G2	6.02	5.76	1.57	0.53	0.66
22	MHD22	G6 ×G2	5.05	5.00	1.16	0.56	0.68
23	MHD23	G7 ×G2	4.22	4.37	0.35	0.59	0.64
24	MHD24	G8 ×G2	3.57	3.86	0.10	0.53	0.76
25	MHD25	G9 ×G2	5.71	5.51	0.90	0.68	0.85
26	MHD26	G10 ×G2	1.20	1.83	-3.96	0.63	0.74
27	MHD27	G11 ×G2	5.31	5.21	0.28	0.55	0.64
28	MHD28	G12 ×G2	4.78	4.79	0.49	0.59	0.72
29	MHD29	G13 ×G2	4.07	4.25	-1.38	0.49	0.72
30	MHD30	G14 ×G2	3.10	3.50	-1.03	0.52	0.65
31	MHD31	G15 ×G2	5.17	5.10	-0.06	0.62	0.66
32	MHD32	G16 ×G2	3.61	3.90	0.27	0.59	0.73
33	MHD33	G17 ×G2	3.63	3.91	-0.94	0.62	0.73
34	MHD34	G18 ×G2	4.77	4.79	0.42	0.63	0.69
35	MHD35	G19 ×G2	4.37	4.48	-0.38	0.57	0.67

36	MHD36	G4 ×G3	5.41	5.28	1.62	0.58	0.78
37	MHD37	G5 ×G3	4.43	4.52	-0.30	0.63	0.56
38	MHD38	G6 ×G3	5.90	5.66	1.74	0.52	0.62
39	MHD39	G7 ×G3	2.55	2.99	-1.70	0.59	0.7
40	MHD40	G8 ×G3	2.26	3.17	-2.43	0.56	0.69
41	MHD41	G9 ×G3	3.76	3.98	-1.18	0.71	0.71
42	MHD42	G10 ×G3	6.83	6.38	1.82	0.62	0.74
43	MHD43	G11 ×G3	2.42	2.98	-2.89	0.54	0.64
44	MHD44	G12 ×G3	3.61	3.89	-0.95	0.58	0.62
45	MHD45	G13 ×G3	4.98	4.95	-0.75	0.67	0.78
46	MHD46	G14 ×G3	6.09	5.81	1.69	0.7	0.74
47	MHD47	G15 ×G3	4.82	4.83	-0.68	0.61	0.53
48	MHD48	G16 ×G3	1.18	1.81	-2.77	0.58	0.74
49	MHD49	G17 ×G3	7.37	6.80	2.53	0.55	0.67
50	MHD50	G18 ×G3	4.53	4.60	-0.09	0.57	0.66
51	MHD51	G19 ×G3	6.15	5.86	1.12	0.71	0.75
52	MHD52	G5 ×G4	4.77	4.79	0.49	0.55	0.57
53	MHD53	G6 ×G4	4.49	4.57	0.77	0.52	0.71
54	MHD54	G7 ×G4	3.53	3.83	-0.18	0.54	0.58
55	MHD55	G8 ×G4	2.59	3.10	-0.72	0.54	0.62
56	MHD56	G9 ×G4	5.58	5.42	0.94	0.6	0.78
57	MHD57	G10 ×G4	1.33	2.04	-3.42	0.64	0.56
58	MHD58	G11 ×G4	5.01	4.97	0.14	0.66	0.64
59	MHD59	G12 ×G4	1.22	1.98	-3.13	0.64	0.82
60	MHD60	G13 ×G4	5.88	5.65	0.60	0.58	0.69
61	MHD61	G14 ×G4	4.46	4.55	0.50	0.67	0.73
62	MHD62	G15 ×G4	5.50	5.35	0.44	0.38	0.58
63	MHD63	G16 ×G4	3.29	3.65	0.12	0.55	0.67
64	MHD64	G17 ×G4	2.96	3.37	-1.23	0.44	0.74
65	MHD65	G18 ×G4	5.51	5.36	1.33	0.42	0.82
66	MHD66	G19 ×G4	5.89	5.66	1.31	0.55	0.71
67	MHD67	G6 ×G5	5.63	5.45	0.97	0.44	0.71
68	MHD68	G7 ×G5	1.67	2.27	-3.07	0.3	0.69
69	MHD69	G8 ×G5	4.73	4.76	0.47	0.55	0.63
70	MHD70	G9 ×G5	4.81	4.82	-0.77	0.48	0.71
71	MHD71	G10 ×G5	7.10	6.59	1.59	0.53	0.65
72	MHD72	G11 ×G5	9.12	8.15	3.31	0.61	0.52
73	MHD73	G12 ×G5	4.79	4.80	-0.28	0.69	0.63
74	MHD74	G13 × G5	5.89	5.68	0.01	0.54	0.73
75	MHD75	G14 ×G5	3.63	3.90	-1.28	0.61	0.73
76	MHD76	G15 ×G5	5.71	5.52	-0.29	0.58	0.52
77	MHD77	G16 ×G5	4.45	4.54	0.33	0.65	0.64

78	MHD78	G17 ×G5	5.85	5.62	0.50	0.61	0.69
79	MHD79	G18 ×G5	3.99	4.18	-1.14	0.54	0.76
80	MHD80	G19 ×G5	4.36	4.55	-0.89	0.54	0.74
81	MHD81	G7 ×G6	4.64	4.69	0.56	0.55	0.49
82	MHD82	G8 × G6	3.55	3.84	-0.14	0.65	0.64
83	MHD83	G9 ×G6	4.26	4.39	-0.76	0.74	0.72
84	MHD84	G10 ×G6	2.42	2.87	-2.55	0.67	0.7
85	MHD85	G11 ×G6	3.73	3.99	-1.52	0.59	0.61
86	MHD86	G12 ×G6	4.94	4.92	0.44	0.62	0.63
87	MHD87	G13 ×G6	5.25	5.18	-0.08	0.52	0.72
88	MHD88	G14 ×G6	4.87	4.87	0.53	0.64	0.64
89	MHD89	G15 ×G6	3.70	3.93	-1.56	0.62	0.66
90	MHD90	G16 ×G6	4.38	4.48	0.82	0.67	0.72
91	MHD91	G17 ×G6	4.47	4.56	-0.30	0.51	0.71
92	MHD92	G18 ×G6	1.85	2.42	-3.00	0.59	0.65
93	MHD93	G19 ×G6	5.83	5.60	0.87	0.62	0.65
94	MHD94	G8 ×G7	5.65	5.47	1.98	0.57	0.57
95	MHD95	G9 ×G7	4.18	4.33	-0.82	0.44	0.71
96	MHD96	G10 ×G7	4.77	4.79	-0.16	0.52	0.7
97	MHD97	G11 ×G7	5.41	5.28	0.18	0.62	0.56
98	MHD98	G12 × G7	4.97	4.90	0.55	0.6	0.69
99	MHD99	G13 ×G7	9.70	8.66	4.35	0.5	0.61
100	MHD100	G14 ×G7	4.95	4.93	0.62	0.58	0.7
101	MHD101	G15 ×G7	4.33	4.45	-1.09	0.46	0.72
102	MHD102	G16 ×G7	3.25	3.62	-0.29	0.54	0.69
103	MHD103	G17 ×G7	3.02	3.43	-1.74	0.58	0.71
104	MHD104	G18 ×G7	7.83	7.15	3.29	0.49	0.74
105	MHD105	G19 ×G7	1.31	2.11	-3.64	0.61	0.65
106	MHD106	G9 ×G8	6.13	5.84	1.52	0.63	0.65
107	MHD107	G10 ×G8	5.98	5.73	1.45	0.56	0.71
108	MHD108	G11 ×G8	4.28	4.41	-0.55	0.58	0.64
109	MHD109	G12 ×G8	5.43	5.30	1.34	0.6	0.69
110	MHD110	G13 ×G8	3.03	3.44	-2.22	0.67	0.7
111	MHD111	G14 ×G8	3.79	4.03	-0.14	0.71	0.74
112	MHD112	G15 ×G8	2.98	3.41	-2.04	0.56	0.77
113	MHD113	G16 ×G8	2.87	3.32	-0.28	0.57	0.65
114	MHD114	G17 ×G8	3.31	3.66	-1.06	0.62	0.73
115	MHD115	G18 ×G8	5.65	5.47	1.50	0.6	0.75
116	MHD116	G19 ×G8	5.60	5.43	1.05	0.59	0.78
117	MHD117	G10 ×G9	6.66	6.25	0.80	0.68	0.73
118	MHD118	G11 ×G9	7.04	6.54	0.87	0.62	0.7
119	MHD119	G12 ×G9	1.13	1.98	-4.29	0.66	0.73

120	MHD120	G13 ×G9	4.03	4.21	-2.55	0.59	0.76
121	MHD121	G14 ×G9	6.10	5.82	0.84	0.53	0.69
122	MHD122	G15 ×G9	6.90	6.44	0.55	0.66	0.82
123	MHD123	G16 ×G9	3.24	3.61	-1.23	0.64	0.75
124	MHD124	G17 ×G9	6.56	6.17	0.87	0.68	0.73
125	MHD125	G18 ×G9	4.63	4.68	-0.84	0.61	0.58
126	MHD126	G19 ×G9	10.30	9.06	4.42	0.64	0.69
127	MHD127	G11 ×G10	6.45	6.09	0.36	0.61	0.68
128	MHD128	G12 ×G10	7.76	7.10	2.42	0.65	0.84
129	MHD129	G13 ×G10	6.96	6.48	0.45	0.59	0.74
130	MHD130	G14 ×G10	6.39	6.04	1.20	0.68	0.72
131	MHD131	G15 ×G10	5.41	5.28	-0.87	0.64	0.72
132	MHD132	G16 ×G10	7.64	7.01	3.24	0.59	0.82
133	MHD133	G17 ×G10	5.32	5.22	-0.30	0.61	0.76
134	MHD134	G18 ×G10	5.13	5.07	-0.27	0.63	0.72
135	MHD135	G19 ×G10	5.13	5.06	-0.68	0.64	0.69
136	MHD136	G12 ×G11	7.00	6.51	1.35	0.53	0.67
137	MHD137	G13 ×G11	7.91	7.21	1.10	0.54	0.7
138	MHD138	G14 ×G11	4.03	4.22	-1.46	0.52	0.62
139	MHD139	G15 ×G11	6.98	6.50	0.39	0.63	0.63
140	MHD140	G16 ×G11	4.23	4.37	-0.47	0.56	0.65
141	MHD141	G17 ×G11	6.47	6.10	0.54	0.6	0.75
142	MHD142	G18 ×G11	4.73	4.76	-0.98	0.61	0.61
143	MHD143	G19 ×G11	8.19	7.44	2.08	0.63	0.62
144	MHD144	G13 ×G12	6.61	6.21	0.55	0.57	0.68
145	MHD145	G14 ×G12	3.84	4.07	-0.90	0.63	0.7
146	MHD146	G15 ×G12	6.02	5.75	0.18	0.6	0.75
147	MHD147	G16 ×G12	3.51	3.81	-0.45	0.5	0.61
148	MHD148	G17 ×G12	6.02	5.76	0.84	0.53	0.59
149	MHD149	G18 ×G12	5.42	5.29	0.46	0.58	0.67
150	MHD150	G19 ×G12	6.72	6.29	1.36	0.63	0.61
151	MHD151	G14 ×G13	6.75	6.27	0.79	0.44	0.63
152	MHD152	G15 ×G13	7.47	6.87	0.47	0.58	0.77
153	MHD153	G16 ×G13	6.49	6.12	1.37	0.45	0.69
154	MHD154	G17 ×G13	5.75	5.55	-0.59	0.57	0.69
155	MHD155	G18 ×G13	5.91	5.67	-0.21	0.52	0.77
156	MHD156	G19 ×G13	6.36	6.02	-0.16	0.53	0.69
157	MHD157	G15 ×G14	5.78	5.58	0.26	0.68	0.76
158	MHD158	G16 ×G14	1.52	2.28	-2.28	0.58	0.65
159	MHD159	G17 ×G14	5.10	5.04	0.08	0.67	0.56
160	MHD160	G18 ×G14	5.65	5.47	0.85	0.68	0.68
161	MHD161	G19 ×G14	5.39	5.27	0.19	0.56	0.69

162	MHD162	G16 ×G15	3.90	4.12	-0.99	0.47	0.68
163	MHD163	G17 × G15	6.83	6.38	0.72	0.47	0.69
164	MHD164	G18 × G15	7.30	6.75	1.41	0.4	0.7
165	MHD165	G19 ×G15	5.03	4.99	-1.27	0.55	0.72
166	MHD166	G17 ×G16	6.91	6.40	2.64	0.51	0.69
167	MHD167	G18 ×G16	2.87	3.25	-1.05	0.6	0.68
168	MHD168	G19 ×G16	4.90	4.89	0.48	0.73	0.69
169	MHD169	G18 ×G17	6.17	5.87	0.93	0.48	0.69
170	MHD170	G19 ×G17	4.54	4.61	-1.10	0.62	0.53
171	MHD171	G19 ×G18	1.94	2.55	-3.64	0.41	0.57
<b>Mean</b>			<b>4.91</b>	<b>4.89</b>	<b>0.00</b>	<b>0.58</b>	<b>0.68</b>
<b>Minimum</b>			<b>1.13</b>	<b>1.81</b>	<b>-4.29</b>	<b>0.3</b>	<b>0.47</b>
<b>Maximum</b>			<b>10.30</b>	<b>9.06</b>	<b>4.44</b>	<b>0.74</b>	<b>0.85</b>
<b>CD (5%)</b>			<b>2.32</b>	<b>1.45</b>	<b>0.46</b>		

# Average of three locations

Table S2: List of linked markers used for polymorphic survey

Sl. No.	Marker	Trait	Reference
1.	bnlg1208,bnlg1700,bnlg1720,bnlg1890,bnlg2057,bnlg2248,mmc282,phi073,umc1630,umc1659,umc1737,umc1738,	Grain yield	Liu et al. (2006)
2.	bnlg1083,bnlg1178,bnlg1660,bnlg1953,umc1365,dupssr12,	Plant height	
3.	bnlg1045bnlg1108,bnlg128,bnlg1525,bnlg1526,bnlg1721,bnlg279,bnlg439,bnlg657,dupssr10,dupssr17,mmc111,umc1528,umc1528,umc1827,	Ear height	
4.	phi034,umc1109,umc1792,umc2025,		Ma et al. (2007)
5.	bnlg1450,bnlg1523,bnlg1538,bnlg1556,bnlg1598,bnlg1740,bnlg1754,bnlg1879,bnlg1904,bnlg2086,bnlg2162,bnlg2190,bnlg2244,	Ear diameter	Yang et al. (2011)
6.	bnlg2305,bnlg2323,bnlg244,bnlg589,bnlg666,dupssr13,phi046,phi053,phi064,phi069,phi070,phi108411,	Ear length	
7.	phi114,phi452693,umc1014,umc1019,umc1033,umc1061,umc1069,umc1083,umc1149,umc1162,	Ear weight per plant	
8.	umc1169,umc1173,umc1267,umc1320,umc1323,umc1350,umc1384,umc1389,	Grains per row	
9.	umc1392,umc1395,umc1400,umc1417,umc1425,umc1433,umc1494,umc1506,umc1548,umc1562,umc1603,umc1653,umc1655,umc1657,umc1662,umc1679,umc1688,umc1689,umc1703,umc1722,	100-grain weight	
10.	umc1728,umc1732,umc1733,umc1757,umc1771,umc1773,	Kernel ratio	
11.	umc1936,umc1942,umc1960,umc2026,umc2049,umc2057,umc2083,umc2098,umc2115,umc2122,umc2123,umc2127,umc2150,umc2166,umc2237,umc2246,umc2259,umc2263,umc2286,umc2407,	Rows per ear	

Table S3: Summary statistics of random markers

S.No.	Marker	Major allele frequency	No of allele	Genediversity	Heterozygosity	PIC
1	umc1200	0.82	2	0.29	0.00	0.25
2	bnlg176	0.95	2	0.10	0.00	0.09
3	umc2229	0.78	2	0.35	0.00	0.29
4	umc1297	0.58	2	0.49	0.00	0.37
5	umc2149	0.63	2	0.47	0.00	0.36
6	umc1177	0.65	3	0.49	0.00	0.42
7	umc1292	0.61	3	0.54	0.00	0.47
8	mmc0111	0.58	2	0.49	0.00	0.37
9	umc1261	0.95	2	0.10	0.00	0.09
10	bnlg1613	0.42	4	0.66	0.22	0.59
11	umc1042	0.59	3	0.57	0.18	0.50
12	umc2184	0.82	2	0.29	0.00	0.25
13	phi10104 9	0.54	3	0.60	0.15	0.53
14	umc 2214	0.60	3	0.55	0.13	0.48
15	umc2127	0.47	3	0.60	0.00	0.52
16	umc 2258	0.44	4	0.68	0.06	0.62
17	phi 53	0.53	3	0.59	0.00	0.51
18	umc1825	0.69	4	0.47	0.63	0.42
19	bnlg 1505	0.50	5	0.68	0.08	0.64
20	umc1180	0.88	2	0.22	0.13	0.19
21	phi21398 4	0.59	2	0.48	0.06	0.37
22	umc1758	0.63	2	0.47	0.00	0.36
23	bnlg 1043	0.41	5	0.68	0.06	0.62
24	phi078	0.56	3	0.54	0.00	0.45
25	umc1474	0.95	2	0.10	0.00	0.09
26	umc1014	0.66	5	0.53	0.05	0.50
27	umc1083	0.75	4	0.41	0.06	0.38
28	phi89	0.59	3	0.55	0.00	0.48
29	umc1799	0.37	5	0.75	0.20	0.71
30	umc1066	0.56	3	0.54	0.00	0.44
31	umc1412	0.47	3	0.64	0.00	0.56
32	umc1134	0.61	3	0.55	0.00	0.49
33	umc1671	0.50	3	0.55	0.00	0.45
34	umc1068	0.53	3	0.58	0.06	0.50
35	bnlg1073	0.78	3	0.37	0.06	0.34
36	umc2289	0.53	3	0.54	0.00	0.44
37	bnlg2046	0.94	2	0.11	0.00	0.10



38	bnlg1131	0.47	3	0.63	0.00	0.56
39	umc1032	0.44	5	0.67	0.31	0.62
40	umc1670	0.68	2	0.44	0.06	0.34
41	bnlg 1019	0.68	5	0.51	0.09	0.48
42	umc1716	0.57	2	0.49	0.00	0.37
43	bnlg1729	0.70	3	0.46	0.33	0.42
44	bnlg1237	0.86	2	0.24	0.00	0.21
45	umc1444	0.71	2	0.41	0.00	0.32
46	umc1897	0.43	3	0.64	0.00	0.57
47	bnlg2191	0.47	5	0.66	0.00	0.60
48	umc1359	0.36	3	0.66	0.00	0.59
49	umc1202	0.53	3	0.60	0.33	0.53
50	phi014	0.57	2	0.49	0.00	0.37
	<b>Mean</b>	<b>0.62</b>	<b>3</b>	<b>0.49</b>	<b>0.07</b>	<b>0.42</b>
	<b>Min.</b>	<b>0.36</b>	<b>2</b>	<b>0.10</b>	<b>0.00</b>	<b>0.09</b>
	<b>Max.</b>	<b>0.95</b>	<b>5</b>	<b>0.75</b>	<b>0.63</b>	<b>0.71</b>

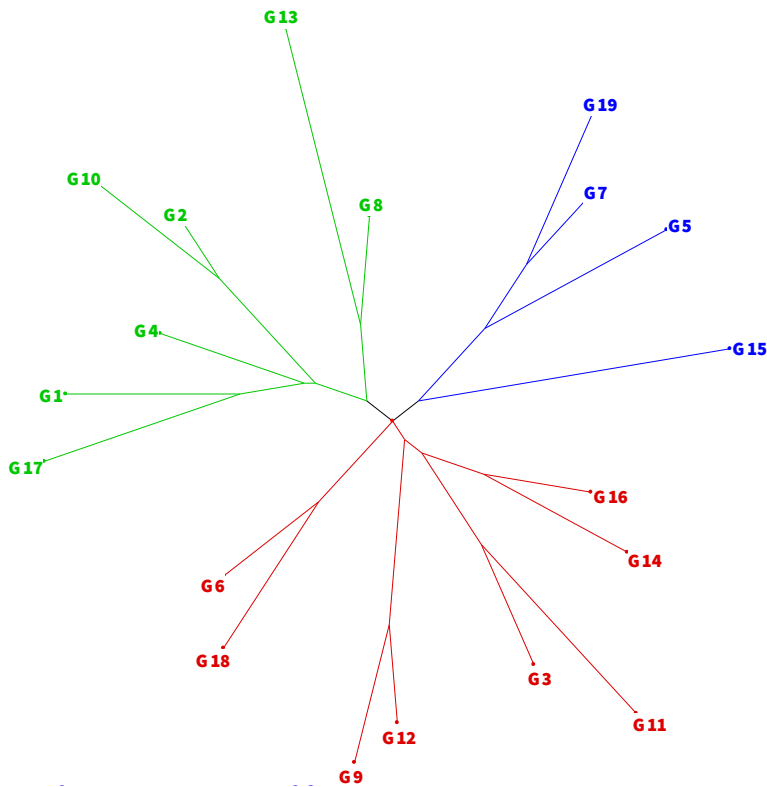


Figure S1: Heterotic grouping using BLUP values of yield data