Population Genetic Analysis of a Bread Wheat Panel from Northern and Huang-Huai Ecological Regions in China

Supplementary Materials and Methods

1. Population structure analysis

Before STRUCTURE v.2.3.4 (Pritchard et al., 2000) was run to infer the genetic ancestry of each accession with predetermined number of clusters (K) from 2 to 7, we set the main parameter file (mainparams) in linux as follows:

....

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KEY PARAMETERS FOR THE PROGRAM structure.   YOU WILL NEED TO SET THESE
IN ORDER TO RUN THE PROGRAM.   VARIOUS OPTIONS CAN BE ADJUSTED IN THE
FILE extraparams.
"(int)" means that this takes an integer value.
"(B)"     means that this variable is Boolean
          (ie insert 1 for True, and 0 for False)
"(str)" means that this is a string (but not enclosed in quotes!)


Basic Program Parameters

#define MAXPOPS    7          // (int) number of populations assumed
#define BURNIN     100000     // (int) length of burnin period
#define NUMREPS    200000     // (int) number of MCMC reps after burnin


Input/Output files

#define INFILE     infile     // (str) name of input data file
#define OUTFILE    outfile    //(str) name of output data file


Data file format

#define NUMINDS       302      // (int) number of diploid individuals in data file
#define NUMLOCI       13705      // (int) number of loci in data file
#define PLOIDY         2      // (int) ploidy of data
#define MISSING        -9      // (int) value given to missing genotype data
#define ONEROWPERIND 1        // (B) store data for individuals in a single line
```

```
#define LABEL        1        // (B) Input file contains individual labels
#define POPDATA     1        // (B) Input file contains a population identifier
#define POPFLAG     0        // (B) Input file contains a flag which says
                                       whether to use popinfo when USEPOPINFO==1
#define LOCDATA     0        // (B) Input file contains a location identifier

#define PHENOTYPE 0         // (B) Input file contains phenotype information
#define EXTRACOLS 0         // (int) Number of additional columns of data
                                    before the genotype data start.

#define MARKERNAMES        0    // (B) data file contains row of marker names
#define RECESSIVEALLELES 0    // (B) data file contains dominant markers (eg AFLPs)
                                    // and a row to indicate which alleles are recessive
#define MAPDISTANCES        0    // (B) data file contains row of map distances
                                    // between loci
```

Advanced data file options

```
#define PHASED                1 // (B) Data are in correct phase (relevant for linkage model only)
#define PHASEINFO             0 // (B) the data for each individual contains a line
                                       indicating phase (linkage model)
#define MARKOVPHASE           0 // (B) the phase info follows a Markov model.
#define NOTAMBIGUOUS   -999 // (int) for use in some analyses of polyploid data
```

Command line options:

```
-m mainparams
-e extraparams
-s stratparams
-K MAXPOPS
-L NUMLOCI
-N NUMINDS
-i input file
-o output file
-D SEED
```

....

Furthermore, we used the default extra parameter file (extraparam) combined the mainparams file to run STRUCTURE v.2.3.4. in linux:

....

for i in {2..7}; do structure -i 302_structure.in -K ${i} -o out${i};done

Supplementary Tables

Table S1. List of 302 wheat accessions of the panel.

Code	Cultivars	Resource	Region	Breeding year	Ancestral coefficient		
					A	C	B
18-583	Wannong 306	Anhui-China	other	2016	0.3248	0.1948	0.4804
18-584	Ningfeng 518	Anhui-China	other	2012	0.196	0.277	0.527
19-2630	Lemai z651	Anhui-China	other	2016	0.062	0.624	0.314
18-582	Wan 981	Anhui-China	other	2016	0.0117	0.3313	0.657
18-610	Huacheng 3366	Anhui-China	other	2013	0.001	0.7105	0.2885
19-2319	Baofeng 10-82	Anhui-China	other	2006	0	0.7325	0.2675
18-1128	Nongda 211	Beijing-China	NW	2007	0.6109	0.0592	0.3299
20ZY273	Jingdong 8	Beijing-China	NW	1999	0.6029	0.365	0.0321
18-1039	Jingmai 15	Beijing-China	NW	2019	0.5009	0.287	0.2121
18-113	Jinghua 9	Beijing-China	NW	2007	0.5462	0.3479	0.106
Sun-02	Beijing 8686	Beijing-China	NW	1993	0.58	0.0851	0.3349
18-406	Fengkang 13	Beijing-China	NW	1980	0.412	0.302	0.286
ZYJ036	Zhongmai 113	Beijing-China	NW	2013	0.581	0.218	0.201
Sun-12	Jingshuang 2	Beijing-China	NW	1975	0.3801	0.2074	0.4125
18-1194	Lunxuan 518	Beijing-China	NW	2007	0.378	0.243	0.379
18-407	Fengkang 15	Beijing-China	NW	1983	0.182	0.052	0.766
Sun-07	Dongxie 2	Beijing-China	NW	1980	0.501	0.455	0.044
18-412	Jing 411	Beijing-China	NW	1992	0.1245	0.1432	0.7322
19-2737	Hangmai 186	Beijing-China	NW	2018	0.0683	0.5174	0.4143
18-553	Zhongzhongmai 145	Beijing-China	NW	2015	0.051	0.8041	0.1449
18-1027	Zhongzhongmai 20	Beijing-China	NW	2016	0.881	0	0.119
Sun-17	Xifeng 20	Gansu-China	other	1994	0.416	0.404	0.18
20ZY272	Lantian 17hao	Gansu-China	other	2005	0.2147	0.2307	0.5546
18-201	Lantian 081	Gansu-China	other	2018	0	0.635	0.365
18-125	Nongda 399	Hebei-China	NW	2007	1	0	0
18-148	Jifeng 717	Hebei-China	NW	2015	1	0	0
18-186	Jinhe 9123	Hebei-China	NW	2008	1	0	0
18-639	Shimai 22	Hebei-China	NW	2011	1	0	0
18-841	Jimai 817	Hebei-China	NW	2018	1	0	0
19-2425	Jimai 26	Hebei-China	NW	1988	1	0	0
19-2526	Shimai 28	Hebei-China	NW	2018	1	0	0
19-2587	Shi h09-7075	Hebei-China	NW	2013	1	0	0
ZYJ030	Shi 4185	Hebei-China	NW	1999	1	0	0
19-2650	Heng 11-6021	Hebei-China	NW	2015	0.9576	0.0424	0
18-424	Shimai 12	Hebei-China	NW	2004	0.942	0.058	0
18-426	Shimai 14	Hebei-China	NW	2004	0.9393	0.0607	0
19-2518	Kenong 1002	Hebei-China	NW	2021	0.8811	0.0269	0.092
18-1169	Jimai 161	Hebei-China	NW	2015	0.8545	0.1041	0.0414
19-2517	Kenong 8162	Hebei-China	NW	2021	0.8409	0.0321	0.127
18-726	Jimai 120	Hebei-China	NW	2016	0.8201	0.039	0.1409
18-210	Kenong 1006	Hebei-China	NW	2013	0.805	0	0.195
19-2224	Jimai 518	Hebei-China	NW	2013	0.7291	0.1169	0.154
18-1046	Bomai 8	Hebei-China	NW	2017	0.7186	0.1414	0.1401
18-1171	Heng 136	Hebei-China	NW	2009	0.7031	0.002	0.2949
18-524	Shimai 16	Hebei-China	NW	2009	0.7025	0.1706	0.1269
18-1038	Tonggeng 1	Hebei-China	NW	2014	0.6999	0.218	0.0821
18-528	Hansheng 730	Hebei-China	NW	2016	0.6831	0.065	0.2519
19-2735	Hengguan 35	Hebei-China	NW	2004	0.6263	0.1597	0.2141
19-2303	Zhongmai 175	Hebei-China	NW	2011	0.581	0.302	0.117
18-219	Shixin 633	Hebei-China	NW	2013	0.5762	0.0236	0.4002
19-2730	Jimai 42	Hebei-China	NW	2010	0.5661	0.088	0.3459
19-2337	Bomai 7	Hebei-China	NW	2018	0.558	0.209	0.233

18-070	Ji 7369	Hebei-China	NW	2003	0.528	0.279	0.193
19-2507	Kenong 2011	Hebei-China	NW	2016	0.501	0.207	0.292
19-2437	Jimai u68	Hebei-China	NW	2019	0.521	0.065	0.414
19-2657	Hannong 1812	Hebei-China	NW	2016	0.5863	0.046	0.3677
18-516	Jinuo 58	Hebei-China	NW	2013	0.8888	0.0051	0.1061
18-682	Jinuo 200	Hebei-China	NW	2007	0.5416	0.2962	0.1622
18-1273	Jimai U75	Hebei-China	NW	2020	0.435	0.218	0.347
18-023	Kenong 2009	Hebei-China	NW	2010	0.43	0.12	0.45
18-981	Yuanmai 758	Hebei-China	NW	2015	0.428	0.276	0.296
18-068	Hengyou 18	Hebei-China	NW	2004	0.4199	0.2599	0.3201
19-2567	Dongmai 35	Hebei-China	NW	2017	0.4192	0.2567	0.3241
18-816	Han 4589	Hebei-China	NW	2001	0.3741	0.3071	0.3188
18-633	Dongmai 15	Hebei-China	NW	2015	0.37	0.313	0.317
ZYJ025	Jimai 21	Hebei-China	NW	1986	0.3608	0.2371	0.4021
18-381	Jishi 1107	Hebei-China	NW	2011	0.3518	0.0213	0.6269
18-002	Henong 9311	Hebei-China	NW	2009	0.3462	0.3185	0.3352
19-2209	Henong 4198	Hebei-China	NW	2005	0.343	0.234	0.423
18-081	Gaoyou 2018	Hebei-China	NW	2005	0.297	0.272	0.431
18-1178	Hengke 6021	Hebei-China	NW	2016	0.2956	0.3272	0.3772
18-332	Shixin 549	Hebei-China	NW	2017	0.2561	0.6178	0.1261
18-561	Shi u11-349	Hebei-China	NW	2011	0.2287	0	0.7713
19-2462	Hanmai 7	Hebei-China	NW	2005	0.2281	0.5229	0.249
19-2318	Lande c31305	Hebei-China	NW	2016	0.207	0.791	0.002
18-246	Shiluan 08-2	Hebei-China	NW	2008	0.1945	0.058	0.7475
18-537	Shi u10-4045	Hebei-China	NW	2013	0.1922	0	0.8078
18-176	Hanyou 1	Hebei-China	NW	2007	0.1787	0	0.8213
18-1305	Jimai 031	Hebei-China	NW	2017	0.1638	0	0.8362
18-151	Ji 5265	Hebei-China	NW	2009	0.155	0.2	0.645
18-079	Gaoyou 503	Hebei-China	NW	2001	0.14	0	0.86
19-2689	Longmai 2	Hebei-China	NW	2017	0.119	0.732	0.149
19-2272	Heng s13-5022	Hebei-China	NW	2013	0.1085	0.0118	0.8797
19-2533	Hanmai 4	Hebei-China	NW	2000	0.1066	0.7493	0.144
ZYJ012	Jizifu 85-271	Hebei-China	NW	1985	0.0988	0.143	0.7582
18-325	Shiyou 09-4366	Hebei-China	NW	2014	0.0909	0.8501	0.059
18-660	Wo mai 4176	Hebei-China	NW	2017	0.0572	0.6802	0.2626
19-2687	Shimai 26	Hebei-China	NW	2018	0.051	0.798	0.151
18-973	Jimai 511	Hebei-China	NW	2017	0.039	0.912	0.049
18-043	Jimai 738	Hebei-China	NW	2016	0.036	0.468	0.496
18-1008	Younongmai 887	Hebei-China	NW	2013	0.0262	0.9008	0.073
19-2559	Jiqumai 26	Hebei-China	NW	2003	0.006	0.994	0
18-372	Shi b10-7074	Hebei-China	NW	2003	0.0032	0.4133	0.5835
18-355	Lunxuan 192	Hebei-China	NW	2020	0.003	0.924	0.073
18-972	Jiafeng 80	Hebei-China	NW	2016	0.002	0.9944	0.0036
18-019	Gaoyou 5218	Hebei-China	NW	2014	0.001	0.14	0.859
18-1303	Jimai 520	Hebei-China	NW	2017	0.001	0.9733	0.0257
18-1090	Yingbo 700	Hebei-China	NW	2012	0	1	0
18-117	Shi 4366	Hebei-China	NW	2014	0	0.898	0.102
18-375	Hannong 1412	Hebei-China	NW	2016	0	1	0
18-670	Zhongxinmai 98	Hebei-China	NW	2015	0	1	0
18-727	Jimai U80	Hebei-China	NW	2017	0	0.9318	0.0682
18-818	Jixing 868	Hebei-China	NW	2018	0	1	0
19-2230	Liangsheng 101	Hebei-China	NW	2016	0	1	0
19-2422	Jimai 631	Hebei-China	NW	2016	0	0.83	0.17
19-2651	Jimai 138	Hebei-China	NW	2009	0	1	0
19-2720	Letu 808	Hebei-China	NW	2019	0	1	0
19-2736	Zhaonong 1147	Hebei-China	NW	2011	0	1	0
19-2330	Zhengmai 366	Henan-China	HH1	2005	1	0	0
19-2592	Zheng mai 004	Henan-China	HH1	2004	0.765	0.2	0.035
19-2581	Zhoumai 27	Henan-China	HH1	2011	0.528	0.001	0.471
19-2365	Minxing 375	Henan-China	HH1	2016	0.509	0.374	0.117
18-689	Zhongmai 998	Henan-China	HH1	2008	0.442	0.041	0.517

19-2325	Zhengyumai 0519	Henan-China	HH1	2013	0.4403	0.1486	0.411
18-1195	Lunxuan 988	Henan-China	HH1	2009	0.378	0.163	0.459
18-703	Yujiao 5	Henan-China	HH1	2011	0.372	0.0211	0.6069
18-078	Zhengnong 17	Henan-China	HH1	2004	0.3688	0.04	0.5912
19-2411	Luohan 6	Henan-China	HH1	2006	0.322	0.047	0.631
19-2410	Luohan 2	Henan-China	HH1	2001	0.3207	0.047	0.6323
18-1094	Bainong 4199	Henan-China	HH1	2017	0.2565	0.1011	0.6424
Sun-19	Yumai 48	Henan-China	HH1	1997	0.2549	0.2343	0.5108
18-698	Xuke 316	Henan-China	HH1	2011	0.2503	0	0.7497
18-556	Qiule 2122	Henan-China	HH1	2014	0.247	0.001	0.752
18-075	Yumai 47	Henan-China	HH1	1997	0.246	0.1119	0.6422
19-2500	Luohan 13	Henan-China	HH1	2009	0.2452	0.033	0.7218
18-716	Quanmai 890	Henan-China	HH1	2017	0.241	0	0.759
18-705	Fumai 2008	Henan-China	HH1	2006	0.2371	0.042	0.7209
19-2384	Yumai 66	Henan-China	HH1	2000	0.2312	0.3645	0.4042
19-2653	Xinmai 19	Henan-China	HH1	2006	0.217	0.0113	0.7717
18-531	Tianhe 3hao	Henan-China	HH1	2012	0.195	0.096	0.709
18-547	Fengdecunmai 4	Henan-China	HH1	2013	0.172	0.775	0.053
19-2335	Zimai 608	Henan-China	HH1	2020	0.1672	0.241	0.5919
18-713	Zhengmai 7698	Henan-China	HH1	2011	0.164	0.101	0.735
19-2619	Fusui 1	Henan-China	HH1	2018	0.1622	0.5877	0.2501
18-1167	Xinmai 26	Henan-China	HH1	2010	0.1427	0.2711	0.5862
18-135	Zhongmai 895	Henan-China	HH1	2013	0.1422	0.124	0.7339
18-693	Luomai 8	Henan-China	HH1	2007	0.1383	0.131	0.7308
18-1150	Zhoumai 18	Henan-China	HH1	2005	0.1261	0.0695	0.8044
19-2698	Tianmin 298	Henan-China	HH1	2016	0.1181	0.139	0.7429
18-518	Shenmai 1	Henan-China	HH1	2004	0.116	0.1687	0.7153
18-1115	Yujiaohei 1	Henan-China	HH1	2010	0.0976	0.1281	0.7743
18-094	Xinmai 28	Henan-China	HH1	2014	0.095	0.0124	0.8926
18-065	Yumai 34	Henan-China	HH1	1982	0.08	0.3824	0.5376
18-261	Yunong 059	Henan-China	HH1	2019	0.0737	0.313	0.6133
18-575	Yufeng 1679	Henan-China	HH1	2016	0.0691	0.7328	0.1982
18-605	Fengyuan 2017	Henan-China	HH1	2017	0.066	0.076	0.858
18-710	Yangao 21	Henan-China	HH1	2017	0.06	0.3107	0.6293
18-1036	Longjingmai 5	Henan-China	HH1	2013	0.0554	0.2488	0.6958
19-2218	Xun 2016	Henan-China	HH1	2011	0.0474	0.09	0.8626
19-2486	Zhoumai 16	Henan-China	HH1	2003	0.045	0.092	0.863
18-687	Yimai 6	Henan-China	HH1	2011	0.0253	0.0935	0.8812
19-2555	Dunmai 258	Henan-China	HH1	2020	0.016	0.217	0.767
19-2664	Dunfeng 801	Henan-China	HH1	2015	0.0152	0.001	0.9838
18-049	Cunmai 8	Henan-China	HH1	2014	0.01	0.0021	0.9879
18-714	Kaimai 21	Henan-China	HH1	2011	0.0028	0.2086	0.7886
18-717	Luomai 24	Henan-China	HH1	2013	0.001	0.487	0.512
18-999	Zhuoke 5	Henan-China	HH1	2017	0.001	0.856	0.143
19-2716	Xinmai 11	Henan-China	HH1	2003	0.001	0.997	0.002
18-018	Fengdecunmai 10	Henan-China	HH1	2015	0	0.1822	0.8178
18-1050	Cunmai 619	Henan-China	HH1	2020	0	1	0
18-110	Zhengmai 9023	Henan-China	HH1	2001	0	0.1099	0.8901
18-1113	Xianmai 10	Henan-China	HH1	2012	0	0.1592	0.8408
18-1160	Aikang 58	Henan-China	HH1	2005	0	0	1
18-576	Zhengyumai 9989	Henan-China	HH1	2007	0	0.0014	0.9986
18-618	Zhoumai 35	Henan-China	HH1	2008	0	0	1
18-697	Cunmai 12	Henan-China	HH1	2016	0	0.174	0.826
18-876	Yingman 208	Henan-China	HH1	2018	0	1	0
19-2448	Zhumai 395	Henan-China	HH1	2018	0	0.3502	0.6498
18-696	Zhongyu 10	Henan-China	HH1	2007	0.41	0.046	0.544
20ZY266	Huamai 2566	Hubei-China	other	2009	0.2388	0.2068	0.5544
18-428	Xiaobingmai 33	Heilongjiang-China	other	1995	0.449	0.298	0.2531
ZYJ011	Fu 162	Heilongjiang-China	other	2020	0.465	0.1119	0.423
20ZY258	Wuhan 1	Hubei-China	other	#N/A	0.2298	0.2917	0.4785
20ZY276	Xiangmai 55	Hubei-China	other	2009	0.226	0.107	0.667

20ZY267	Een 5	Hubei-China	other	1999	0.211	0.411	0.378
18-226	Emai 170	Hubei-China	other	2014	0.1654	0.1578	0.6769
20ZY270	Een 6	Hubei-China	other	2003	0.1459	0.3567	0.4974
20ZY269	Emai 27	Hubei-China	other	2010	0.129	0.287	0.584
20ZY261	Jingzhou 66	Hubei-China	other	1975	0.0723	0.2808	0.6469
18-336	Xumai 0031	Jiangsu-China	other	2013	0.4488	0.1306	0.4206
18-1118	Zhongmai 816	Jiangsu-China	other	2013	0.4484	0.2789	0.2726
20ZY268	Ning 7840	Jiangsu-China	other	1981	0.3938	0.161	0.4451
18-317	Huamai 8	Jiangsu-China	other	2016	0.2612	0.2409	0.4979
18-1079	Ningmai 13	Jiangsu-China	other	2006	0.196	0.297	0.507
18-1104	Huaimai 25	Jiangsu-China	other	2007	0.1653	0.6115	0.2232
20ZY257	Yangmai 158	Jiangsu-China	other	1993	0.0819	0.3638	0.5543
20ZY260	Yangmai 14	Jiangsu-China	other	2004	0.07	0.1931	0.7369
18-104	Lianmai 2	Jiangsu-China	other	2005	0.069	0.796	0.135
18-069	Huaimai 18	Jiangsu-China	other	1999	0.066	0.82	0.114
18-095	Yangmai 23	Jiangsu-China	other	2013	0.061	0.307	0.632
18-056	Longmai 28	Jiangsu-China	other	2016	0.001	0.121	0.878
18-058	Nongmai 1	Jiangsu-China	other	2015	0	0.456	0.544
ZYJ018	Baihulutou	Landrace China	--	Unkown	0.5886	0.047	0.3644
Sun-26	Shuangfengshou	Landrace China	--	Unkown	0.447	0.172	0.381
Sun-24	Baiqimai	Landrace China	--	1950	0.438	0.295	0.267
Sun-01	Bawangbian	Landrace China	--	Unkown	0.258	0.364	0.378
Sun-08	Hongheshang	Landrace China	--	Unkown	0.18	0.106	0.714
ZYJ020	Xiaobaimang	Landrace China	--	Unkown	0.1445	0.2628	0.5926
Sun-15	Mazhamai	Landrace Shaanxi-China	--	1936	0.6209	0.038	0.3411
ZYJ001	Shijiazhuang 75	Landrace Hebei-China	--	Unkown	0.2358	0.3737	0.3905
Sun-23	Chinesesring	Landrace Sichuan-China	--	1900	0.573	0.062	0.365
ZYJ004	Hengdalihong	Landrace-Hebei-China	--	Unkown	0.359	0.351	0.29
ZYJ003	Laofulin 10	Landrace-Romania	--	1971	0.4483	0.4596	0.092
ZYJ024	Songhuajiang 1	Landrace-United Mexican States	--	Unkown	0.4311	0.3049	0.2641
20ZY275	Ningchun 43	Ningxia-China	other	2007	0.3029	0.113	0.5841
20ZY280	Ningchun 47	Ningxia-China	other	2008	0.3012	0.0479	0.6509
20ZY271	Ningchun 4	Ningxia-China	other	1980	0.289	0.045	0.666
18-035	Jinmai 1	Shaanxi-China	HH1	2014	0.6161	0.058	0.3259
ZYJ009	Xibei 54	Shaanxi-China	HH1	1954	0.465	0.032	0.503
19-2418	Shan 253	Shaanxi-China	HH1	2001	0.2733	0.057	0.6697
18-063	Yanmai 8911	Shaanxi-China	HH1	2001	0.1508	0.085	0.7642
18-1083	Shanken 224	Shaanxi-China	HH1	2014	0.126	0	0.874
19-2703	Xinong 556	Shaanxi-China	HH1	2012	0.119	0.202	0.679
18-1146	Xinong 928	Shaanxi-China	HH1	2008	0.1057	0.198	0.6963
18-1084	Shannong 78	Shaanxi-China	HH1	2002	0.077	0.237	0.686
ZYJ022	Xiaoyan 54	Shaanxi-China	HH1	1999	0.0634	0.117	0.8196
18-1088	Xinong 2208	Shaanxi-China	HH1	2003	0	0.0602	0.9398
18-869	ubing 3737	Shaanxi-China	HH1	2018	0	1	0
19-2635	Taishan 5366	Shandong-China	HH2	2010	0	1	0
18-838	Hefeng 1402	Shandong-China	HH2	2017	1	0	0
18-422	Shannong 14	Shandong-China	HH2	2006	0.938	0.062	0
19-2403	Wennong 20	Shandong-China	HH2	2018	0.644	0.05	0.306
18-154	Liangxing 66	Shandong-China	HH2	2002	0.5288	0.255	0.2162
19-2254	Jimai 44	Shandong-China	HH2	2018	0.447	0.0412	0.5118
Sun-03	Changle 5	Shandong-China	HH2	1993	0.446	0.401	0.153
18-116	Taishan 21	Shandong-China	HH2	2003	0.3812	0.2659	0.353
18-1077	Liaomai 19	Shandong-China	HH2	2007	0.3693	0.3888	0.2419
19-2214	Shannong 05584	Shandong-China	HH3	2015	0.4452	0.3725	0.1823
18-435	Tai 95-1	Shandong-China	HH2	1995	0.351	0.461	0.188
18-188	Shannong 8355	Shandong-China	HH2	2005	0.345	0.232	0.423
18-062	Taishan 27	Shandong-China	HH2	2012	0.328	0.1412	0.5308
19-2556	Yanmai 98	Shandong-China	HH2	2010	0.242	0.691	0.067
18-1108	Lumai 5	Shandong-China	HH2	2006	0.226	0.368	0.4059
19-2742	Hemai 06-77	Shandong-China	HH2	2006	0.198	0.141	0.661
18-083	Jimai 4	Shandong-China	HH2	2005	0.1785	0.7357	0.0858
20ZY							

18-680	Taikemai 33	Shandong-China	HH2	2018	0.1558	0.5073	0.3368
19-2385	Yangguang 503	Shandong-China	HH2	2013	0.133	0.867	0
18-055	Laizhou 95021	Shandong-China	HH2	2001	0.126	0.7431	0.1309
19-2378	Zhouyuan 9369	Shandong-China	HH2	2007	0.1228	0.7045	0.1727
18-1198	Jimai 19	Shandong-China	HH2	2001	0.1149	0.7223	0.1628
18-937	Luyuan 890	Shandong-China	HH2	2016	0.1149	0.7891	0.096
19-2250	Jimai 229	Shandong-China	HH2	2016	0.1117	0.55	0.3383
18-1061	Luyan 213	Shandong-China	HH2	2017	0.0981	0.8762	0.0257
18-679	Zimai 28	Shandong-China	HH2	2001	0.0889	0.8741	0.037
18-433	Deyou 061	Shandong-China	HH2	2014	0.0859	0.7379	0.1762
18-850	Keyuan 026	Shandong-China	HH2	2015	0.077	0.9	0.023
19-2671	Wennong 5	Shandong-China	HH2	2003	0.057	0.817	0.126
18-536	Taishan 28	Shandong-China	HH2	2013	0.0542	0.4715	0.4743
18-152	Zhongmai 875	Shandong-China	HH2	2014	0.049	0.776	0.175
18-138	Luyuan 502	Shandong-China	HH2	2011	0.0476	0.7882	0.1642
18-1087	Taishan 24	Shandong-China	HH2	2005	0.0402	0.2784	0.6814
18-085	Kexin 9	Shandong-China	HH2	2009	0.035	0.2675	0.6975
19-2314	Daimai 2251	Shandong-China	HH2	2014	0.0344	0.9656	0
19-2241	Shannong 411603	Shandong-China	HH2	2016	0.029	0.7179	0.2531
18-598	Denghai 51306	Shandong-China	HH2	2015	0.02	0.4578	0.5222
18-1196	Yannong 836	Shandong-China	HH2	2010	0.0164	0.8605	0.1231
19-2240	Jimai 60	Shandong-China	HH2	2018	0.0143	0.925	0.0607
19-2322	Yannong 1212	Shandong-China	HH2	2018	0.0142	0.5797	0.4061
18-140	Tanmai 98	Shandong-China	HH2	2009	0.0078	0.5931	0.3991
18-074	Yangguang 10	Shandong-China	HH2	2013	0.0069	0.8621	0.131
18-1107	Lumai 16	Shandong-China	HH2	1990	0.0058	0.4291	0.5651
18-054	Jining 16hao	Shandong-China	HH2	2001	0.002	0.372	0.626
18-1010	Xinmai 807	Shandong-China	HH2	2019	0.001	0.98	0.019
Sun-14	Lumai 14	Shandong-China	HH2	1990	0.001	0.999	0
18-1013	Qingnong 9	Shandong-China	HH2	2020	0	1	0
18-1110	Qingmai 6	Shandong-China	HH2	2007	0	1	0
18-114	Yannong 21	Shandong-China	HH2	2002	0	1	0
18-350	Liangxing 99	Shandong-China	HH2	2006	0	1	0
18-436	Jimai 22	Shandong-China	HH2	2006	0	1	0
18-674	Shannong 24	Shandong-China	HH2	2013	0	1	0
18-845	Jingyang 670	Shandong-China	HH2	2016	0	0.847	0.153
18-930	Yimai 1	Shandong-China	HH2	Unkown	0	0.875	0.125
19-2221	Shannong k32561	Shandong-China	HH2	2016	0	1	0
19-2317	Yimai 2	Shandong-China	HH2	1978	0	0.868	0.132
19-2607	Shannong 27	Shandong-China	HH2	2014	0	1	0
19-2682	Shannong 2149	Shandong-China	HH2	2009	0	1	0
Sun-09	Jinan 13	Shandong-China	HH2	1980	0	0.161	0.839
19-2383	Hedongwumai	Shanxi-China	NW	1997	0.9569	0.04	0.0031
Sun-22	Hanxuan 10	Shanxi-China	NW	1966	0.586	0.177	0.237
19-2231	Jinmai 79	Shanxi-China	NW	2006	0.5795	0.2039	0.2166
18-388	Keyi 6014	Shanxi-China	NW	2013	0.543	0.051	0.406
18-1126	Jinmai 85	Shanxi-China	NW	2008	0.523	0.137	0.34
18-1091	Yongmai 3hao	Shanxi-China	NW	2008	0.5119	0.215	0.2731
18-1210	Jinmai 47	Shanxi-China	NW	1995	1	0	0
19-2532	Zhang 6878	Shanxi-China	NW	2002	0.5289	0.2751	0.1961
Sun-04	Zhang 6154	Shanxi-China	NW	2003	0.4127	0.3147	0.2726
18-1212	Linhan 6	Shanxi-China	NW	2006	0.412	0.234	0.354
18-071	Jinmai 92	Shanxi-China	NW	2012	0.5823	0.2264	0.1913
18-1213	Linyuan 8	Shanxi-China	NW	2010	0.345	0.282	0.3729
18-077	Yunhan 805	Shanxi-China	NW	2011	0.2846	0.4036	0.3118
19-2299	Longmai 1	Shanxi-China	NW	2019	0.245	0.2508	0.5042
Sun-05	Zhangwu 131	Shanxi-China	NW	1989	0.229	0.3099	0.4611
18-1106	Lin y7287	Shanxi-China	NW	2009	0.1016	0.7364	0.1621
19-2757	Zemai 2	Shanxi-China	NW	2004	0.048	0.864	0.088
18-027	Jinmai 95	Shanxi-China	NW	2014	0.0192	0.9035	0.0773
18-016	Shunmai 1718	Shanxi-China	NW	2007	1	0	0

18-974	Kemai 3hao	Sichuan-China	other	2007	0.4891	0.267	0.244
18-037	Mianyang 33	Sichuan-China	other	2003	0.3779	0.1971	0.425
18-060	Shumai 482	Sichuan-China	other	2008	0.331	0.072	0.597
20ZY274	Chuanmai 43	Sichuan-China	other	2004	0.331	0.189	0.4801
18-084	Jinnong 6	Tianjin -China	NW	2010	0.249	0.333	0.4179
18-347	Jinmai 27	Tianjin -China	NW	2015	0.0106	0.2017	0.7877

Table S2. Summary of the annotated SNPs of the landrace-cultivar groups that share common genotypes.

Count	Landrace1-Hebei	Landrace2-Hebei	Landrace1-Henan	Landrace2-	Landrace1-	Landrace2-
SNP numbers	2353	3704	1720	4337	1423	4634
SNP numbers in chromosomes	2270	3574	1656	4188	1381	4463
intergenic_region	1463	2306	1088	2681	884	2885
downstream_gene_variant	234	341	154	421	140	435
upstream_gene_variant	319	469	206	582	187	601
3_prime_UTR_variant	67	113	65	115	38	142
5_prime_UTR_variant	6	13	4	15	6	13
intron_variant	89	161	62	188	62	188
missense_variant	48	63	36	75	37	74
synonymous_variant	36	92	34	94	21	107
stop_gained	1	5	2	4	1	5
stop_retained_variant	1	0	1	0	1	0

Supplementary figures

Step 1: Group samples into batches. For each batch, perform the following:

Step 2: Generate Sample DQC values

Step 3: QC samples based on DQC values

Step 4: Generate sample QC call rate

Step 5: QC samples based on QC call rate over QC SNPs in the step1.Axiom GT1 probe set list

Step 6: QC the plates

Step 7: Genotype passing samples & plates over recommended SNPs in the step2.Axiom GT1 probe set list

Step 8: QC the SNPs and sort into six SNP categories

Step 9 (as needed): OTV caller and Supplemental analysis for further classification

Figure S1. A workflow for filtering raw data of the 15K SNP array.