

Supplementary tables

Table S1. Average monthly air temperatures and monthly total precipitation for the growing season.

Years	Temperature [°C]							Average
	IV	V	VI	VII	VIII	IX	X	
2016	9.6	16.3	19.9	20.3	19.0	17.3	8.4	15.8
2017	7.3	13.7	17.4	18.0	18.9	13.3	10.6	14.2

Years	Rainfall [mm]							Suma
2016	47.3	47.3	123.8	132.8	50.3	4.6	105.0	511.1
2017	40.6	56.8	58.2	168.0	82.0	45.6	91.8	553.0

Table S2. Simple sequence repeat (SSR) markers motifs (<https://www.maizegdb.org/>).

Primer code	Motif	Primer code	Motif	Primer code	Motif
phi001	AG	phi049	ACT	phi079	AGATG
phi002	AACG	phi054	AG	phi080	AGGAG
phi008	GGC	phi056	CCG	phi085	AACGC
phi015	AAAC	phi061	TTCT-GTAT	phi112	AG
phi021	AG	phi064	ATCC	phi113	GTCT
phi026	CT	phi068	AT	phi116	ACTG/ACG
phi036	AG	phi070	AGCTG	phi119	AG
phi041	AGCC	phi072	AAAC	phi120	AAG
phi042	CATA	phi073	AGC	phi127	AGAC
phi047	ATC	phi076	AGCGGG	phi129	ATAC

Table S3. Molecular markers associated with SPAD.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi127/3	71.4	31.6	0.045	25.5
	phi083/2	71.4	31.6	0.045	25.5
	phi054/3	71.4	31.6	0.045	25.5
	phi068/1	-52.9	23.3	0.044	25.7
	phi058/1	71.4	31.6	0.045	25.5
	phi056/2	56.9	22.4	0.028	31.2
	phi080/2	40.9	16.3	0.029	30.7
	phi116/4	-51.6	18.5	0.018	36.1
2017	phi072/1	51.9	22.9	0.044	25.7

Table S4. Molecular markers associated with the number of plant after germination.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi079/3	-0.170	0.074	0.043	26.1
	phi026/4	0.371	0.127	0.014	38.8
	phi068/3	-0.291	0.089	0.007	44.7
	phi073/1	0.371	0.127	0.014	38.8
	phi021/3	-0.371	0.127	0.014	38.8
	phi036/3[#]	0.394	0.120	0.007	44.8
	phi056/2	0.371	0.127	0.014	38.8
	phi120/1	0.371	0.127	0.014	38.8
2017	phi127/2	0.808	0.311	0.025	32.4
	phi085/3	-1.453	0.595	0.033	29.3
	phi047/4	0.853	0.300	0.016	37.2
	phi076/2	-1.604	0.252	<.001	76.7
	phi036/3	1.488	0.587	0.028	31.2
	phi080/4	1.300	0.254	<.001	67.8

[#] - SSR markers with significant effect in both years of experiment were marked by bold

Table S5. Molecular markers associated with the number of plants before harvest.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi079/3	-0.209	0.054	0.003	53.6
	phi068/3	-0.242	0.089	0.020	35.0
	phi042/3	-0.261	0.083	0.009	42.4
	phi036/3[#]	0.363	0.110	0.007	45.1
	phi064/3	-0.170	0.074	0.042	26.4
2017	phi127/2	0.792	0.304	0.024	32.5
	phi085/3	-1.423	0.582	0.032	29.4
	phi047/4	0.822	0.296	0.018	35.8
	phi076/2	-1.581	0.240	<.001	77.9
	phi036/3	1.476	0.570	0.025	32.3
	phi080/4	1.279	0.246	<.001	68.5

[#] - SSR markers with significant effect in both years of experiment were marked by bold

Table S6. Molecular markers associated with moisture of grain.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi046/4	1.684	0.576	0.014	38.6
	phi068/1	-2.610	0.711	0.004	51.0
	phi073/5[#]	-2.052	0.665	0.010	41.5
	phi061/2	1.993	0.874	0.044	25.9
2017	phi073/5	-1.399	0.595	0.038	27.4
	phi061/2	1.676	0.686	0.033	29.3
	phi120/2	-1.361	0.603	0.045	25.4

- SSR markers with significant effect in both years of experiment were marked by bold

Table S7. Molecular markers associated with yield of grain.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi079/2	-15.87	7.18	0.049	24.4
	phi047/4[#]	16.97	6.95	0.033	29.2
	phi001/4	19.99	6.47	0.010	41.6
	phi002/2	20.19	8.20	0.032	29.6
	phi068/1	-27.29	8.64	0.009	42.8
	phi073/2	-18.25	7.53	0.034	28.9
	phi021/4	-23.74	9.54	0.030	30.2
	phi041/1	17.78	7.63	0.040	27.0
	phi056/3	-24.04	9.47	0.028	31.2
	phi120/3	17.78	7.63	0.040	27.0
2017	phi054/1	15.19	6.5	0.039	27.1
	phi047/4	9.00	3.27	0.019	35.3
	phi064/4	15.19	6.50	0.039	27.1

- SSR markers with significant effect in both years of experiment were marked by bold

Table S8. Molecular markers associated with weight of 1000 grains.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi127/3[#]	-60.7	19.0	0.008	43.5
	phi083/2	-60.7	19.0	0.008	43.5
	phi054/3	-60.7	19.0	0.008	43.5
	phi001/4	-27.4	11.8	0.041	26.6
	phi058/1	-60.7	19.0	0.008	43.5
	phi056/2	-42.2	14.8	0.015	37.4
2017	phi127/3	-66.2	22.8	0.014	38.3
	phi083/2	-66.2	22.8	0.014	38.3
	phi054/3	-66.2	22.8	0.014	38.3
	phi068/4	-50.8	16.3	0.010	42.0
	phi058/1	-66.2	22.8	0.014	38.3

- SSR markers with significant effect in both years of experiment were marked by bold

Table S9. Molecular markers associated with length of ears.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi046/4	-0.662	0.276	0.035	28.4
	phi061/2[#]	-1.150	0.318	0.004	50.2
	phi061/5	-0.866	0.306	0.016	36.8
2017	phi076/2	1.770	0.677	0.024	32.7
	phi061/2	-1.722	0.689	0.029	30.5
	phi061/5	-1.424	0.601	0.037	27.8

- SSR markers with significant effect in both years of experiment were marked by bold

Table S10. Molecular markers associated with diameter of ears.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi070/2[#]	0.349	0.123	0.016	37.1
	phi083/3	0.441	0.174	0.028	31.0
	phi047/4	0.217	0.097	0.048	24.8
	phi046/4	0.224	0.096	0.039	27.1
	phi072/4	0.441	0.174	0.028	31.0
	phi076/3	0.327	0.080	0.002	57.0
	phi036/2	0.441	0.174	0.028	31.0
	phi036/4	0.252	0.093	0.020	34.6
	phi041/1	0.336	0.076	0.001	60.7
	phi061/4	0.441	0.174	0.028	31.0
	phi120/3	0.336	0.076	0.001	60.7
2017	phi070/2	0.210	0.093	0.046	25.3
	phi068/3	0.238	0.087	0.019	35.2
	phi076/3	0.190	0.067	0.016	36.9
	phi041/1	0.207	0.062	0.007	45.6
	phi120/3	0.207	0.062	0.007	45.6

- SSR markers with significant effect in both years of experiment were marked by bold

Table S11. Molecular markers associated with the number of rows in ear.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi079/3	1.307	0.470	0.018	35.9
	phi068/2	-1.217	0.552	0.050	24.4
	phi068/3	2.018	0.590	0.006	47.1
	phi064/3	1.235	0.548	0.046	25.4
2017	phi083/4	-1.213	0.391	0.010	41.8
	phi068/4	1.355	0.595	0.044	25.9
	phi056/1	1.099	0.420	0.024	32.7

Table S12. Molecular markers associated with the number of kernels in row.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi021/4[#]	-2.750	1.080	0.027	31.6
	phi042/2	-2.458	0.902	0.020	34.8
2017	phi021/4	-2.570	1.120	0.043	26.0
	phi061/5	-2.163	0.969	0.047	24.9

- SSR markers with significant effect in both years of experiment were marked by bold

Table S13. Molecular markers associated with the number of grains in ear.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
	phi079/3	66.1	19.9	0.007	45.6
	phi047/4	58.1	22.0	0.023	33.2
2016	phi021/4[#]	-86.4	28.9	0.012	39.8
	phi056/3	-74.7	31.7	0.038	27.5
	phi064/3	65.8	23.0	0.016	37.3
2017	phi021/4	-66.3	29.7	0.048	24.9

- SSR markers with significant effect in both years of experiment were marked by bold

Table S14. Molecular markers associated with leaf weight.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
	phi127/4	24.8	9.2	0.021	34.4
2016	phi001/3[#]	24.6	10.0	0.032	29.5
	phi042/1	-44.8	16.9	0.022	33.6
	phi116/3	31.2	12.9	0.034	28.9
2017	phi001/3	19.4	8.7	0.047	25.1
	phi068/3	-25.1	11.0	0.044	25.9

- SSR markers with significant effect in both years of experiment were marked by bold

Table S15. Molecular markers associated with stems weight.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
	phi127/2	48.0	18.8	0.027	31.6
	phi079/3	47.5	18.9	0.029	30.8
	phi047/4	60.3	15.2	0.002	55.3
	phi072/2	68.9	25.3	0.020	34.9
2016	phi073/3	65.9	16.1	0.002	56.6
	phi076/3	56.1	19.2	0.014	38.6
	phi036/4	64.1	14.7	0.001	60.1
	phi080/2	52.6	17.6	0.012	39.9
	phi080/4	52.7	23.1	0.043	26.0
	phi116/2	50.0	19.0	0.024	33.0
2017	phi068/4	-79.7	35.0	0.044	25.9
	phi021/1	65.1	26.7	0.033	29.1

Table S16. Molecular markers associated with ears weight.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi042/2	-29.0	8.3	0.005	48.5
	phi127/2	-45.9	15.5	0.013	39.3
	phi070/1	-49.2	14.5	0.006	46.6
	phi079/4	-56.9	23.0	0.031	29.8
	phi002/1	-56.9	23.0	0.031	29.8
	phi002/2	-46.7	20.2	0.041	26.6
2017	phi073/3	-43.4	18.2	0.037	28.0
	phi042/1	-77.4	31.1	0.030	30.2
	phi076/1	-46.0	20.3	0.045	25.5
	phi036/4	-40.9	17.4	0.038	27.6
	phi041/2	-56.9	23.0	0.031	29.8
	phi061/3	-56.7	17.7	0.008	43.6

Table S17. Molecular markers associated with fresh weight of one plant.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi047/4	69.9	21.7	0.008	43.9
2017	phi008/3	91.5	31.8	0.015	37.8

Table S18. Molecular markers associated with share of leaves in the mass of the plant.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi127/4	2.557	0.935	0.019	35.0
	phi083/4	2.375	0.978	0.033	29.0
	phi042/1	-4.950	1.630	0.011	40.6
	phi041/3	2.380	1.060	0.046	25.3
	phi116/1	2.379	0.977	0.033	29.1
	phi049/4	1.976	0.731	0.021	34.5
2017	phi127/2	1.691	0.766	0.049	24.4
	phi001/3	1.836	0.825	0.048	24.8
	phi068/3	-2.941	0.911	0.008	44.0
	phi076/2	-3.036	0.882	0.006	47.5
	phi036/3	3.820	1.280	0.012	39.7
	phi080/4	2.497	0.786	0.009	43.1

Table S19. Molecular markers associated with damage of maize caused by *P. nubilalis*.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi083/4	-2.595	0.654	0.002	55.1
	phi079/2	-1.961	0.801	0.032	29.4
	phi047/4	1.938	0.806	0.035	28.5
	phi001/2	2.425	0.923	0.024	33.0
	phi001/4	2.547	0.671	0.003	52.8
	phi026/3	-2.111	0.797	0.023	33.4
	phi036/4	2.015	0.819	0.032	29.6
	phi041/1	1.997	0.891	0.046	25.1
	phi041/3	-2.733	0.69	0.002	55.0
	phi056/1	2.568	0.664	0.003	53.8
	phi116/1	-2.191	0.777	0.017	36.7
	phi116/4	-2.454	0.916	0.021	34.0
	phi119/4	2.884	0.632	<.001	62.3
	phi120/3	1.997	0.891	0.046	25.1
2017	phi073/2	1.603	0.724	0.049	24.5
	phi061/3	-1.966	0.747	0.023	33.0
	phi116/2	-2.062	0.544	0.003	52.7
	phi119/3	-1.686	0.707	0.036	28.1

Table S20. Molecular markers associated with infection of maize by *Fusarium* spp.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi070/2	1.058	0.260	0.002	56.4
	phi083/3	1.648	0.252	<.001	77.7
	phi001/2	0.724	0.277	0.024	32.7
	phi002/2	0.726	0.276	0.023	33.0
	phi072/4	1.648	0.252	<.001	77.7
	phi076/3	0.629	0.260	0.034	28.8
	phi036/2	1.648	0.252	<.001	77.7
	phi041/1	0.629	0.260	0.034	28.8
	phi061/4	1.648	0.252	<.001	77.7
	phi120/3	0.629	0.260	0.034	28.8
2017	phi068/2	-3.020	1.170	0.025	32.3
	phi021/1	-3.020	1.170	0.025	32.3
	phi061/3	-3.100	1.330	0.039	27.1
	phi116/1	2.840	1.110	0.027	31.4

Table S21. Molecular markers associated with infection of maize by *Ustilago maydis* Corda.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi049/4	-1.327	0.592	0.046	25.2
	phi070/2	1.885	0.778	0.034	28.9
	phi083/3	3.491	0.770	<.001	62.0
	phi079/3	1.347	0.567	0.037	27.9
	phi068/3	1.992	0.753	0.023	33.3
	phi072/4	3.491	0.770	<.001	62.0
	phi073/3	1.813	0.518	0.005	48.4
	phi076/3	1.801	0.522	0.005	47.7
	phi036/2	3.491	0.770	<.001	62.0
	phi036/4	1.621	0.521	0.010	42.0
	phi061/4	3.491	0.770	<.001	62.0
	phi120/2	1.789	0.624	0.015	37.5
2017	phi127/1	11.220	1.820	<.001	75.4
	phi054/2	11.220	1.820	<.001	75.4
	phi054/5	11.220	1.820	<.001	75.4
	phi079/4	5.780	2.240	0.026	32.0
	phi002/1	5.780	2.240	0.026	32.0
	phi041/2	5.780	2.240	0.026	32.0
	phi061/3	5.020	1.900	0.023	33.3

Table S22. Molecular markers associated with the number of ears.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi083/1	1.386	0.587	0.038	27.6
	phi079/2	-0.990	0.243	0.002	56.5
	phi001/4	0.732	0.327	0.047	25.1
	phi026/3	-0.802	0.312	0.026	31.8
	phi068/1	-1.059	0.426	0.030	30.2
	phi073/2	-0.795	0.340	0.039	27.1
	phi073/3	0.780	0.343	0.044	25.8
	phi076/2[#]	-1.011	0.436	0.041	26.7
	phi036/3	1.38	0.588	0.039	27.3
	phi041/3	-0.786	0.342	0.042	26.3
	phi056/1	0.791	0.314	0.029	30.7
	phi116/2	0.896	0.288	0.010	42.1
2017	phi127/2	0.680	0.292	0.040	26.9
	phi047/4	0.768	0.271	0.016	36.9
	phi076/2	-1.345	0.280	<.001	64.8
	phi036/3	1.388	0.520	0.022	33.8
	phi080/4	1.179	0.227	<.001	68.3
	phi116/2	0.788	0.278	0.016	37.1

[#] - SSR markers with significant effect in both years of experiment were marked by bold

Table S23. Molecular markers associated with plant density.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi079/2	-0.957	0.419	0.043	26.0
	phi026/1	-1.562	0.522	0.012	39.8
	phi026/4	2.060	0.722	0.016	37.3
	phi068/4	1.577	0.518	0.011	40.8
	phi058/3	1.283	0.462	0.018	35.9
	phi073/1	2.060	0.722	0.016	37.3
	phi021/3	-2.060	0.722	0.016	37.3
	phi056/1	1.278	0.352	0.004	50.4
	phi056/2	2.060	0.722	0.016	37.3
	phi120/1	2.060	0.722	0.016	37.3
2017	phi047/4	0.368	0.122	0.012	40.5
	phi002/3	0.694	0.226	0.011	41.2
	phi058/2	0.694	0.226	0.011	41.2
	phi072/3	0.694	0.226	0.011	41.2
	phi073/4	0.694	0.226	0.011	41.2
	phi036/1	0.694	0.226	0.011	41.2
	phi061/1	0.411	0.151	0.020	35.0
	phi064/3	0.349	0.144	0.033	29.0
	phi119/1	0.446	0.141	0.009	42.7
	phi119/4	0.366	0.140	0.024	32.7

Table S24. Molecular markers associated with content of chlorophyll *a*.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi042/1	-0.724	0.175	0.002	57.4
	phi076/1	-0.482	0.101	<.001	64.7
	phi080/1	-0.368	0.117	0.009	42.5
2017	phi001/4	0.249	0.100	0.030	30.1
	phi002/2	0.303	0.112	0.021	34.3
	phi073/2	-0.277	0.102	0.021	34.5
	phi041/1	0.264	0.105	0.029	30.5
	phi120/3	0.264	0.105	0.029	30.5

Table S25. Molecular markers associated with content of chlorophyll *b*.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi042/1	-0.213	0.048	<.001	61.1
	phi076/1	-0.139	0.028	<.001	66.2
	phi080/1	-0.103	0.034	0.012	40.1
2017	phi054/1	-0.111	0.048	0.041	26.6
	phi073/2	-0.065	0.027	0.036	28.3
	phi064/4	-0.111	0.048	0.041	26.6
	phi116/2	0.060	0.026	0.044	25.7
	phi119/3	0.072	0.026	0.018	35.7

Table S26. Molecular markers associated with content of chlorophyll *a+b*.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi042/1	-0.938	0.222	0.001	58.4
	phi076/1	-0.623	0.129	<.001	65.1
	phi080/1	-0.472	0.151	0.010	42.0
2017	phi054/1	-0.525	0.236	0.048	24.7
	phi001/4	0.303	0.126	0.035	28.5
	phi002/2	0.362	0.143	0.028	31.0
	phi073/2	-0.343	0.128	0.021	34.1
	phi041/1	0.325	0.132	0.031	29.7
	phi064/4	-0.525	0.236	0.048	24.7
	phi120/3	0.325	0.132	0.031	29.7

Table S27. Molecular markers associated with content of chlorophyll *a/b*.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi042/1	0.396	0.120	0.007	45.3
	phi076/1	0.279	0.066	0.001	58.5
2017	phi068/3	0.364	0.165	0.050	24.3
	phi036/3	-0.563	0.208	0.020	34.6
	phi119/3	-0.361	0.110	0.007	44.7

Table S28. Molecular markers associated with carotenoids content.

Year	Marker symbol	Effect	Standard error	<i>p</i> -value	The proportion of total phenotypic variance explained by the marker
2016	phi046/4	-1.176	0.464	0.028	31.1
	phi073/2[#]	-1.188	0.519	0.043	26.1
	phi042/1	-2.822	0.686	0.002	57.0
	phi076/1	-1.509	0.520	0.014	38.2
	phi064/3	-1.368	0.478	0.015	37.5
2017	phi127/1	2.007	0.614	0.007	44.7
	phi054/2	2.007	0.614	0.007	44.7
	phi054/5	2.007	0.614	0.007	44.7
	phi001/4	1.004	0.362	0.018	35.8
	phi002/2	1.154	0.420	0.019	35.4
	phi073/2	-0.915	0.414	0.049	24.5
	phi073/3	1.044	0.386	0.020	34.5
	phi076/3	0.949	0.407	0.040	27.0
	phi041/1	1.149	0.357	0.008	43.8
	phi116/2	1.015	0.359	0.017	36.8
	phi119/3	1.008	0.394	0.027	31.5
phi120/3	1.149	0.357	0.008	43.8	

[#] - SSR markers with significant effect in both years of experiment were marked by bold