

Table S1. Genotypic variances (mean squares) of the measured traits separately for each field environment.

Item	Stress Environments												Control Environments											
	Asendorf (AS)				Poel 2017 (PO17)				Texcoco (TX)				Gross-Gerau (GG)				Poel 2018 (PO18)				San Juan del Río (SJ)			
	df.	Seed Yield Per Panicle (g)	Seed Number	PHI	d.f.	Seed Yield Per Panicle (g)	Seed Number	PHI	d.f.	Seed Yield Per Panicle (g)	Seed Number	PHI	d.f.	Seed Yield Per Panicle (g)	Seed number	PHI	d.f.	Seed Yield Per Panicle (g)	Seed Number	PHI	d.f.	Seed Yield Per Panicle (g)	Seed Number	PHI
Entries	52	598.18***	1303809.42***	0.39	52	1153.37**	2311815.11**	0.2	1	851.56***	992407.46***	0.23***	60	1585.60***	1768664.21***	.026	60	1343.86***	1809251.99***	0.02***	51	2811.84***	2440838.35**	0.07***
Error	193	21.72	50896.65	0.01	180	60.59	109468.75	0.45		73.37	88087.54	0.02	231	208.91	237019.39	.005	241	163.06	224763.25	0.00	189	166.03	171982.80	0.01
Lines	13	87.79***	311651.75***	0.28**	12	331.08***	713971.62**	0.23	10	201.00***	234075.48***	0.19***	13	955.62***	1414720.97***	.015	13	890.72***	1383975.47***	0.06***	13	666.31***	886377.89**	0.04***
Error	51	7.80	29703.46	0.01	48	12.55	42293.48	0.33		32.71	43190.05	0.03	55	155.08	195694.51	.002	55	105.78	275340.16	0.01	53	50.13	79602.04	0.01
Males	6	107.89***	254547.61***	0.32**	6	423.64***	986538.18**	0.2	6	282.00***	337690.85***	0.22***	6	1387.03	1845646.87	0.019**	6	582.29***	763752.60***	0.08***	6	949.13***	1036446.72**	0.06**

								2																
								*																
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Error	25	10.22	26203. 91	0.01	27	15.89	38546. 15	. 0	24	29.38	41069. 18	0.02	2 7	221.9 6	274405 .38	.004	2 7	43.11	58155. 57	0.01	2 7	52.62	78200. 61	0.01
								0																
								.																
Females	6	55.23 ***	386918 .38***	0.15* **	5	86.80***	38327 0.45** *	1 6 *	6	73.36 **	155056 .78***	0.18 ***	6	682.1 1***	116072 2.51***	0.01 1***	6	950.5 1**	138845 2.1**	0.05 ***	6	494.51 ***	86558 0.60** *	0.02 ***
								*																
								*																
								0																
Error	26	5.47	33068. 41	0.01	21	8.26	47111. 48	. 0	23	16.30	20321. 27	0.02	2 8	90.59	119794 .74	.001	2 8	166.2 0	484768 .16	0.00	2 6	47.53	81057. 37	0.00
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								0																
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F vs. M	1	162.5 8**	202676 .73	0.86* **	1	997.04***	73207 8.12*	5 8 *	1	157.6 6	79763. 07	0.28 *	1	8.25	353156 .28	0.01 9*	1	2382. 52**	507845 2.94**	0.00	1	0.16	11074 8.64	0.00
								*																
								*																
								0																
Hybrids (H)	38	731.2 7***	160079 5.71***	0.42* **	39	1274.97* **	26583 79.90* **	. 2 7 *	34	981.6 6***	114699 0.87***	0.25 ***	4 6	1654. 59***	187596 4.65***	0.02 9***	4 6	1297. 94***	169373 4.83	0.00 62* **	3 7	2937.1 7***	25949 59.76* **	0.09 ***
								*																

GCA (F)	6	1579. 38***	371092 0.39***	1.27* **	6	1922.77* **	52491 90.61* **	6	1645. 47***	294025 4.80***	0.73 ***	6	6705. 80***	786758 8.76***	0.14 ***	6	1512. 1***	317241 7.58***	0.01 8***	6	9203.1 5***	96779 65.78* **	0.35 ***
GCA (M)	6	1675. 76***	339396 8.46***	0.51* **	6	3114.59* **	52424 77.07* **	6	1431. 90***	907895 .38***	0.16 ***	6	2427. 63***	122333 8.36***	.012	6	1816. 18***	185503 0.84***	0.00 34* **	6	1776.1 4***	76157 9.43**	0.02 *
SCA (F x M)	26	144.1 9***	355148 .91***	0.11* **	27	483.25***	92760 8.85** *	22	359.4 9***	402292 .22***	0.07 ***	3	648.2 6***	913725 .87***	0.01 3***		1140. 1***	134554 6.04***	0.00 46* **	2	1109.9 9***	81586 1.52** *	0.03 ***
Error	142	26.72	58508. 29	0.01	13 2	78.06	13389 6.13		88.11	104369 .04	0.01	1 7 6	225.7 3	249933 .42	.006	1 8 6	180.0 0	209807 .71	0.00 20	1 3 6	211.20	20798 4.13	0.01
L vs. H	1	2175. 51***	291638 0.37**	0.53 8*	1	6278.69* **	79699 09.80* **	1	2933. 88**	331989 1.29**	0.07 6	1	6602. 12***	143410 6.02	0.05 *	1	9347. 13***	126516 36.32** *	0.13 4***	1	26066. 84***	16946 332.3* **	0.00

Table S2. Heterosis, GCA prediction accuracy and Pearson’s correlation between line *per se* and hybrid performance separately for each field environment.

Item	n	Stress Environments									Control Environments								
		Asendorf (AS)			Poel 2017 (PL17)			Texcoco (TX)			Gross-Gerau (GG)			Poel 2018 (PL18)			San Juan del Río (SJR)		
		Seed Yield Per Panicle	Seed Numbe r	PHI	Seed Yield Per Panicle	Seed Number	PHI	Seed Yield Per Panicle	Seed Number	PHI	Seed Yield Per Panicle	Seed Number	PHI	Seed Yield Per Panicle	Seed Number	PHI	Seed Yield Per Panicle	Seed Number	PHI
[%] of Hybrids with Sign. HPH	38, 37, 47, 47, 39, 40	23.08	15.38	2.94	10	12,5	0	8.11	8.11	0.98	8.51	2.13	0	6.38	2.13	0	23.68	13.16	0
Max. HPH [%]	38, 37, 47, 47, 39, 40	443.21	298.92	2608. 9	163.84	170.71	/	407.51	622.41	380.7	386.36	165.24	/	210.24	180.35	/	197.35	154.82	/
Average MPH [%] (all MPV-Hybrid Comparison)	38, 37, 47, 47, 39, 40	161.32***	88.19**	43.4** *	71.29***	41.01***	18.3** *	115.88**	106.25**	27.2** *	36.3***	11.74	4.9*	35.37***	31.63***	6.5***	92.7***	61.31***	-1.5
GCA Prediction accuracy	38, 37, 47, 47, 39, 40	0.85***	0.83***	0.79** *	0.72***	0.75***	0.73** *	0.72***	0.73***	0.73** *	0.71***	0.64***	0.65** *	0.35***	0.056	0.45***	0.72***	0.75***	0.75** *
Correlation <i>per se</i> M: GCA M	7	0.83**	0.55	0.67	0.75*	0.61	0.8*	0.77	0.45	0.44	-0.27	-0.46	0.28	0.33	-0.32	0.62	0.25	0.08	0.29
Correlation <i>per se</i> F: GCA F	7	0.72	0.71	0.78*	-0.16	0.12	-0.21	-0.02	0.29	0.16	0.43	0.65	0.31	0.68	0.68	0.072	0.83*	0.80*	-0.44

Correlation	38, 37,																		
MPV: hybrid	47, 47,	0.75***	0.63***	0.64**	0.54***	0.44**	0.26	0.42**	0.35*	0.34*	0.09	0.19	0.19	0.30*	0.40**	0.16	0.48***	0.50***	-0.19
performance	39, 40			*															

Table S3. Genotypic variances (mean squares) for the traits pollen amount (cells/ml) and viable pollen number (cells/ml), separately for the environments of Gross-Gerau and Rauischholzhausen.

Item	d.f.	Gross-Gerau (GG)		d.f.	Rauischholzhausen (RH)	
		Pollen Amount (cells/ml)	Viable Pollen Number (cells/ml)		Pollen Amount (cells/ml)	Viable Pollen Number (cells/ml)
Entries	28	15,763,048***	10,141,103***	29	72,806,953***	23,851,385***
Error	77	5,154,386	2,547,797	67	10,833,889	4,769,160
Lines	9	12,510,617***	5,746,160**	9	24,405,486***	20,802,761***
Error	25	2,646,725	1,385,057	20	6,926,159	3,954,682
Males	6	13,689,823**	7,946,948**	6	20,766,032	26,573,697**
Error	17	3,675,259	1,630,711	13	8,588,274	5,378,791
Females	2	11,885,661***	1,854,094	2	32,977,404**	11,812,320**
Error	8	461,090	863,042	7	3,839,374	1,309,908
F vs. M	1	668,5296	325,562	1	29,098,378	4,158,034
Hybrids	18	18,101,005**	10,706,666***	19	90,200,575***	26,518,411***
GCA (F)	2	35,318,923**	51,446,005***	2	449,576,182***	151,729,653***
GCA (M)	6	37,793,183***	13,030,635***	6	29,525,819*	8,061,626
SCA (F*M)	11	14,427,470**	4,717,144	11	56,752,225***	13,203,830**
Error	52	6,359,992	3,106,807	47	12,496,753	5,115,746
L vs. H	1	2,951,708	39,515,456**	1	177,941,319*	615,511

*Significant at 0.05 level; **Significant at 0.01 level; ***Significant at 0.001 level.

Table S4. prediction accuracy and Pearson's correlation (r) between line *per se* and hybrid performance for pollen amount and viable pollen number for the field experiments of Gross-Gerau and Rauischholzhausen.

Item	n	Gross-Gerau (GG)		Rauischholzhausen (RH)		Mean of Both Environments	
		Pollen Amount	Viable Pollen Number	Pollen Amount	Viable Pollen Number	Pollen Amount	Viable Pollen Number
[%] of Hybrids with Sign. HPH	20	6.3	2.1	/	/	6.3	2.1
Max. HPH [%]	20	3	25.5	/	/	393.3	58.4
Average MPH [%] (all MPV-Hybrid Comparison)	20	-0.015	25.5**	23.5*	16.1	17.6*	21.8
GCA Prediction Accuracy (r^2)	20	0.64***	0.76***	0.69***	0.76***	0.74***	0.76***
Correlation <i>per se</i> M: GCA M	7	-0.04	0.37	0.31	0.68	0.39	0.51
Correlation <i>per se</i> F: GCA F	3	0.9	0.85	-0.35	0.68	0.28	0.82
Correlation MPV: Hybrid Performance	20	0.23	0.41	-0.12	0.47*	0.23	0.42

*Significant at 0.05 level; **Significant at 0.01 level; ***Significant at 0.001 level.

Table S5. Descriptive statistical data for the field experiments.

All environments	Min.	Max.	Mean.
Seed Yield Per Panicle (g)	0.00	133.00	29.96
Seed Number	0.00	4502.00	1217.61
PHI	0.00	0.98	0.63
Stress Environments			
Seed Yield Per Panicle (g)	0.00	115.80	14.15
Seed Number	0.00	3405.88	664.77
PHI	0.00	0.97	0.43
Control Environments			
Seed Yield Per Panicle (g)	0.07	133.00	43.33
Seed Number	2.00	4502.00	1667.17
PHI	0.004	0.98	0.79
Asendorf			
Seed Yield Per Panicle (g)	0.00	54.32	9.21
Seed Number	0.00	2625.00	453.33
PHI	0.00	0.97	0.35
Poel 2017			
Seed Yield Per Panicle (g)	0.00	76.32	19.52
Seed Number	0.00	3249.00	999.35
PHI	0.00	0.90	0.52
Poel 2018			
Seed Yield Per Panicle (g)	1.35	121.63	47.47
Seed Number	69.00	4502.00	1958.75
PHI	0.14	0.98	0.82
San Juan del Rio			
Seed Yield Per Panicle (g)	2.00	133.00	41.53
Seed Number	93.75	3800.00	1379.74