

Table S1 Combined analysis of variances and AMMI stability model

Trait	Factors	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
Plant height	Genotype	6	20140.76	3356.79	79.87	1.07E-52	***
	Location	7	3339.16	477.02	11.35	2.76E-12	***
	Year	1	420.54	420.54	10.01	0.001778	**
	Genotype:Location	42	4131.36	98.37	2.34	3.78E-05	***
	Genotype:Year	6	1676.38	279.40	6.65	1.76E-06	***
	Location:Year	7	3133.20	447.60	10.65	1.52E-11	***
	Genotype:Location:Year	42	5079.32	120.94	2.88	2.84E-07	***
	Residuals	222	9330.29	42.03			
Tillers/plant	Genotype	6	237.58	39.60	4.05	0.000707	***
	Location	7	4743.41	677.63	69.37	2.12E-52	***
	Year	1	50.26	50.26	5.14	0.024278	*
	Genotype:Location	42	724.65	17.25	1.77	0.004774	**
	Genotype:Year	6	117.05	19.51	2.00	0.067205	.
	Location:Year	7	3067.65	438.24	44.86	3.47E-39	***
	Genotype:Location:Year	42	764.34	18.20	1.86	0.002219	**
	Residuals	222	2168.70	9.77			
Grain yield	Genotype	6	8825.92	1470.99	17.11	3.14E-16	***
	Location	7	105443.04	15063.29	175.18	1.05E-86	***
	Year	1	63488.71	63488.71	738.34	1.52E-72	***
	Genotype:Location	42	13218.97	314.74	3.66	1.97E-10	***
	Genotype:Year	6	1870.46	311.74	3.63	0.001883	**
	Location:Year	7	10947.21	1563.89	18.19	4.77E-19	***
	Genotype:Location:Year	42	9342.23	222.43	2.59	4.11E-06	***
	Residuals	222	19089.35	85.99			
Straw yield	Genotype	6	47330.00	7888.33	16.31	1.54E-15	***
	Location	7	296364.52	42337.79	87.52	2.74E-60	***
	Year	1	110145.75	110145.75	227.68	7.03E-36	***
	Genotype:Location	42	58183.81	1385.33	2.86	3.23E-07	***
	Genotype:Year	6	9030.51	1505.09	3.11	0.006028	**
	Location:Year	7	79559.42	11365.63	23.49	9.36E-24	***
	Genotype:Location:Year	42	98556.21	2346.58	4.85	3.97E-15	***
	Residuals	222	107398.57	483.78			

AMMI analysis for year 2020:

Response: Plant height

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)	Proportion	Accumulated
ENV	7	2634.01	376.29	6.47	0.001		
REP(ENV)	16	930.50	58.16	1.89	0.031		
GEN	6	15751.74	2625.29	85.13	3.2E-36		
GEN:ENV	42	3091.03	73.60	2.39	0.00024		
PC1	12	1797.90	149.82	4.86	0	58.2	58.2
PC2	10	702.12	70.21	2.28	0.02	22.7	80.9
PC3	8	440.80	55.10	1.79	0.09	14.3	95.1
PC4	6	100.37	16.73	0.54	0.78	3.2	98.4
PC5	4	31.57	7.89	0.26	0.90	1	99.4
PC6	2	18.27	9.14	0.30	0.74	0.6	100
Residuals	96	2960.40	30.84				
Total	209	28458.72	136.17				

Response: Tiller/plant

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)	Proportion	Accumulated
ENV	7	2740.74	391.53	43.54	3.04E-09		
REP(ENV)	16	143.89	8.99	1.22	0.269		
GEN	6	142.49	23.75	3.22	0.006		
GEN:ENV	42	659.98	15.71	2.13	0.001		
PC1	12	283.96	23.66	3.20	0.001	43	43
PC2	10	198.49	19.85	2.69	0.006	30.1	73.1
PC3	8	104.75	13.09	1.77	0.092	15.9	89
PC4	6	59.82	9.97	1.35	0.243	9.1	98
PC5	4	12.28	3.07	0.42	0.794	1.9	99.9
PC6	2	0.67	0.34	0.05	0.951	0.1	100
Residuals	96	709.07	7.39				
Total	209	5056.15	24.19				

Response: Grain yield

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)	Proportion	Accumulated
ENV	7	58827.33	8403.90	30.33	4.4E-08		
REP(ENV)	16	4433.97	277.12	3.64	3.7E-05		
GEN	6	8742.58	1457.10	19.15	1.5E-14		

GEN:ENV	42	15865.46	377.75	4.96	4.5E-11		
PC1	12	8506.78	708.90	9.32	0	53.6	53.6
PC2	10	3614.56	361.46	4.75	0	22.8	76.4
PC3	8	1992.36	249.05	3.27	0.002	12.6	89
PC4	6	1108.95	184.82	2.43	0.03	7	95.9
PC5	4	613.59	153.40	2.02	0.10	3.9	99.8
PC6	2	29.22	14.61	0.19	0.83	0.2	100
Residuals	96	7305.66	76.10				
Total	209	111040.46	531.29				

Response: Straw yield

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)	Proportion	Accumulated
ENV	7	172993.65	24713.38	23.72	2.6E-07		
REP(ENV)	16	16667.75	1041.73	1.38	1.7E-01		
GEN	6	44552.95	7425.49	9.84	1.9E-08		
GEN:ENV	42	105432.40	2510.30	3.33	6.1E-07		
PC1	12	46688.06	3890.67	5.16	0	44.3	44.3
PC2	10	42681.10	4268.11	5.66	0	40.5	84.8
PC3	8	7279.52	909.94	1.21	0.30	6.9	91.7
PC4	6	5918.94	986.49	1.31	0.26	5.6	97.3
PC5	4	1864.11	466.03	0.62	0.65	1.8	99.1
PC6	2	1000.67	500.34	0.66	0.52	0.9	100
Residuals	96	72433.14	754.51				

AMMI analysis for year 2021:

Response: Plant height

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)	Proportion	Accumulated
ENV	7	3838.35	548.34	3.55	0.017		
REP(ENV)	16	2473.78	154.61	3.70	2.96E-05		
GEN	6	6065.40	1010.90	24.19	2.86E-17		
GEN:ENV	42	6119.65	145.71	3.49	2.26E-07		
PC1	12	4123.03	343.59	8.22	0	67.4	67.4
PC2	10	981.21	98.12	2.35	0.02	16	83.4
PC3	8	476.29	59.54	1.42	0.20	7.8	91.2
PC4	6	290.16	48.36	1.16	0.33	4.7	95.9
PC5	4	224.86	56.21	1.35	0.26	3.7	99.6
PC6	2	24.11	12.05	0.29	0.75	0.4	100

Residuals	96	4011.10	41.78
Total	209	28627.92	136.98

Response: Tiller/plant

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)	Proportion	Accumulated
ENV	7	5070.32	724.33	28.54	6.85E-08		
REP(ENV)	16	406.14	25.38	2.66	1.71E-03		
GEN	6	212.14	35.36	3.70	2.38E-03		
GEN:ENV	42	829.01	19.74	2.06	1.86E-03		
PC1	12	444.59	37.05	3.88	0.0001	53.6	53.6
PC2	10	171.45	17.14	1.79	0.07	20.7	74.3
PC3	8	135.79	16.97	1.78	0.09	16.4	90.7
PC4	6	68.61	11.43	1.2	0.31	8.3	99
PC5	4	5.97	1.49	0.16	0.96	0.7	99.7
PC6	2	2.60	1.30	0.14	0.87	0.3	100
Residuals	96	917.80	9.56				
Total	209	8264.42	39.54				

Response: Grain yield

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)	Proportion	Accumulated
ENV	7	57562.92	8223.27	71.64	6.9E-11		
REP(ENV)	16	1836.65	114.79	1.91	2.8E-02		
GEN	6	1953.79	325.63	5.42	7.3E-05		
GEN:ENV	42	6695.74	159.42	2.65	4.3E-05		
PC1	12	3118.25	259.85	4.33	0	46.6	46.6
PC2	10	1729.26	172.93	2.88	0.0035	25.8	72.4
PC3	8	1226.06	153.26	2.55	0.01	18.3	90.7
PC4	6	511.83	85.31	1.42	0.21	7.6	98.4
PC5	4	79.59	19.90	0.33	0.86	1.2	99.5
PC6	2	30.76	15.38	0.26	0.77	0.5	100
Residuals	96	5767.85	60.08				
Total	209	80512.7	385.23				

Response: Straw yield

Source	Df	Sum Sq	Mean Sq	F value	Pr(>F)	Proportion	Accumulated
ENV	7	202930.29	28990.04	137.05	4.5E-13		
REP(ENV)	16	3384.38	211.52	1.04	4.2E-01		
GEN	6	11807.57	1967.93	9.68	2.5E-08		
GEN:ENV	42	51307.62	1221.61	6.01	2.1E-13		

PC1	12	24433.53	2036.13	10.02	0	47.6	47.6
PC2	10	14334.85	1433.49	7.05	0	27.9	75.6
PC3	8	8773.67	1096.71	5.4	0	17.1	92.7
PC4	6	2825.19	470.86	2.32	0.04	5.5	98.2
PC5	4	899.90	224.98	1.11	0.36	1.8	99.9
PC6	2	40.47	20.24	0.1	0.90	0.1	100
Residuals	96	19510.63	203.24				

Descriptive Statistics

2020							
Traits	CV	Max	Mean	Median	Min	SD	SE
PH	33.9959	145.2	70.2225	68.3	24.8	23.8728	1.8418
NT	25.4004	37.2	20.1994	19.6	10	5.1307	0.3958
GY	11.9551	133.2	103.0929	99	79	12.3249	0.9509
SY	41.7542	276	118.9685	115.4	25.2	49.6744	3.8325
2021							
PH	49.2021	90.8	42.7304	38.2	12	21.0242	1.6221
NT	31.8153	40.2	20.9729	20.8	8	6.6726	0.5148
GY	11.511	131.4	100.8554	98.7	71.2	11.6095	0.8957
SY	50.2621	248.4	82.7571	72.5	26	41.5955	3.2092

Code for name of genotypes and locations grown for two years:

Genotypes	Genotypes code	Locations	Environment Code	Year
GSR-48	G1	Pindi Bhattian	E1	2020, 2021
		Kala Shah Kaku	E2	
		Narowal	E3	
		Swat	E4	
		Islamabad	E5	
		Dera Ismail Khan	E6	
		Muzaffargarh	E7	
		Dokri	E8	
GSR-82	G2	Pindi Bhattian	E1	2020, 2021
		Kala Shah Kaku	E2	
		Narowal	E3	
		Swat	E4	
		Islamabad	E5	
		Dera Ismail Khan	E6	
		Muzaffargarh	E7	
		Dokri	E8	
GSR-112	G3	Pindi Bhattian	E1	2020, 2021
		Kala Shah Kaku	E2	
		Narowal	E3	
		Swat	E4	
		Islamabad	E5	
		Dera Ismail Khan	E6	
		Muzaffargarh	E7	
		Dokri	E8	
GSR-252	G4	Pindi Bhattian	E1	2020, 2021
		Kala Shah Kaku	E2	
		Narowal	E3	
		Swat	E4	
		Islamabad	E5	
		Dera Ismail Khan	E6	
		Muzaffargarh	E7	
		Dokri	E8	
GSR-305	G5	Pindi Bhattian	E1	2020, 2021
		Kala Shah Kaku	E2	
		Narowal	E3	
		Swat	E4	
		Islamabad	E5	
		Dera Ismail Khan	E6	
		Muzaffargarh	E7	
		Dokri	E8	
IRRI-6	G6	Pindi Bhattian	E1	2020, 2021
		Kala Shah Kaku	E2	
		Narowal	E3	
		Swat	E4	
		Islamabad	E5	
		Dera Ismail Khan	E6	
		Muzaffargarh	E7	
		Dokri	E8	

KISSAN BASMATI	G7	Pindi Bhattian	E1	2020, 2021
		Kala Shah Kaku	E2	
		Narowal	E3	
		Swat	E4	
		Islamabad	E5	
		Dera Ismail Khan	E6	
		Muzaffargarh	E7	
		Dokri	E8	