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### Supplementary Material

#### **Development of improved genotypes for extra early maturity, higher yield and Mungbean Yellow Mosaic India Virus (MYMIV) resistance in soybean (*Glycine max*)**

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**Table S1. Climate, soil and other characteristics of Indore and Ludhiana locations**

<b>Agro-meteorological parameters</b>	<b>Indore 2020</b>	<b>Indore 2021</b>	<b>Ludhiana 2021</b>
Agro-climatic zone	Malwa plateau	Malwa plateau	Trans-Gangetic Plains
Climate	Tropical wet and dry/Savanna climate	Tropical wet and dry/Savanna climate	Humid subtropical climate
Major cropping system	Soybean-wheat, Soybean-potato, Soybean-chickpea	Soybean-wheat, Soybean-potato, Soybean-chickpea	Rice-wheat, Maize-wheat, Rice/Maize-Mustard
Cropping intensity (%)	165.1	165.1	194
Kharif Soybean area (Hectare)	2,39,086	2,39,086	--
Soil type	Medium to deep black soils	Medium to deep black soils	Shallow to medium sandy loam soils
Soil texture	Clayey	Clayey	Sandy loam
Bulk density (Mg m <sup>-3</sup> )	1.44	1.44	-
Maximum temperature (°C)	32.3	33.4	32-34
Minimum temperature (°C)	19.8	19.8	22-24
Relative humidity (%)	80.9	59.2	70-75
Total rain fall (mm)	1056.8	1228.4	500-750
Soil pH	8.03	8.03	7.5-8
Ec (dS m <sup>-1</sup> )	0.18	0.18	0.1-.015
Organic carbon content (g kg <sup>-1</sup> soil)	4.2	4.2	0.20-0.30
Mineral N (mg kg <sup>-1</sup> )	6.8	6.8	-

Available P (mg kg <sup>-1</sup> )	3.9	3.9	-
Exchangeable K (mg kg <sup>-1</sup> )	246	246	-
Available S (mg kg <sup>-1</sup> )	4.20	4.20	-
Location	22° 4'37"N latitude and 75° 52'7"E longitude	22° 4'37"N latitude and 75°52'7"E longitude	30.9010° N latitude and 75.8071° E longitude

**Table S2. List of material used in the present study**

<b>Sl no</b>	<b>Code</b>	<b>Pedigree</b>
1	E 13-5	MACS 330 x NRC 86
2	E 21-4	JS 95-60 x EC 572048
3	E 7-2	MACS 330 x NRC 86
4	E 7-1	MACS 330 x NRC 86
5	E 21-2	JS 95-60 x EC 572048
6	E-13-4	MACS 330 x NRC 86
7	E 21-2-2	JS 95-60 x EC 572048
8	E 7-1-1	MACS 330 x NRC 86
9	E 21-6	JS 95-60 x EC 572048
10	E 65-2	Type 49 x EC538828
11	YMV 16	JS 335 x <i>G. soja</i>
12	YMV 11	JS 335 x <i>G. soja</i>
13	E 65-1	Type 49 x EC538828
14	E 38-5	JS 335 x EC 538828
15	E 54-1	JS335 x EC 538828
16	YMV 2	JS 335 x <i>G. soja</i>
17	YMV 1	JS 335 x <i>G. soja</i>
18	8-77	Multiparent cross
19	JS 20-69	JS 97-52 X SL 710
20	JS 20-29	JS 97-52 x JS 95-56
21	JS 20-34	JS 98-63 x PK 768
22	JS 335	JS 78-77 X JS 71-5
23	NRC 130	EC 538828 x EC 390977
24	NRC 131	EC 538828 x EC 390977
25	NRC 136	JS 97-52x NRC 37

**Table S3. Pooled ANOVA**

Source	DF	DTM		PHT		BRC		POD		HSW		YLD	
		SS	F cal	SS	F cal	SS	F cal	SS	F cal	SS	F cal	SS	F cal
ENV	2	867.19 (15.01) <sup>#</sup>	600.36 <sup>*</sup> **	718 (9.18)	15.75 <sup>**</sup> *	0.26 (0.63)	0.34	86.3 (0.57)	1.03	29.52 (9.09)	30.60 <sup>***</sup>	322.0 (20.14)	29.01 <sup>***</sup>
REP(ENV)	6	2.67 (0.04)	0.61	123 (1.57)	0.90	2.17 (5.29)	0.94	253.5 (1.68)	1.01	1.41 (0.43)	0.48	14.5 (0.90)	0.43
GEN	4	4649.28 (80.52)	804.68 <sup>*</sup> **	5598 (71.64)	30.73	19.25 (46.98)	6.30 <sup>**</sup> *	12446.7 (82.52)	37.10 <sup>**</sup> *	268.24 (82.67)	69.52 <sup>***</sup>	1012.7 (63.34)	22.80 <sup>***</sup>
G×E	8	237.53 (4.11)	82.22 <sup>**</sup> *	827 (11.51)	9.07 <sup>***</sup>	10.13 (24.75)	6.63 <sup>**</sup> *	1290.1 (8.55)	7.69 <sup>***</sup>	13.72 (4.22)	7.11 <sup>***</sup>	116.3 (7.27)	5.23 <sup>***</sup>
Residual	24	17.33 (0.30)		547 (7.00)		9.16 (22.35)		1006.6 (6.67)		11.57 (3.56)		133.2 (8.31)	

<sup>#</sup>Figures presented in parenthesis denotes %SS

**Table S4. Percent of recurrent and donor genome in the promising four MYMIV resistant genotypes**

Genotypes	A%	B%	H%
YMV 1	80	16	4
YMV 2	75.5	20.7	3.8
YMV 11	76.4	19.8	3.8
YMV 16	81	15.2	3.8

A = Recurrent parent allele; B = Donor parent allele; H = Heterozygote allele

**Table S5. Performance of the advanced breeding lines across the 2020 and 2021 years.**

Genotypes	Year	Plant height (cm)	No. of pods	No. of branches	100 seed weight (g)	Grain yield (g)	Maturity (days)
E 13-5	2020	27.47	27.13	1.73	8.30	372.93	75.00
	2021	37.40	31.33	2.07	12.27	958.33	80.00
	Mean	32.43	29.23	1.90	10.28	665.63	77.50
E 21-4	2020	25.47	20.40	1.67	7.71	445.09	75.00
	2021	40.93	31.20	1.80	14.00	599.33	76.67
	Mean	33.20	25.80	1.73	10.85	522.21	75.83
E 7-2	2020	27.93	20.60	1.80	8.63	583.57	72.00
	2021	28.40	25.13	2.67	14.40	1102.00	75.00
	Mean	28.17	22.87	2.23	11.52	842.78	73.50
E 7-1	2020	24.33	19.87	1.67	7.73	321.70	75.00
	2021	28.47	26.27	2.53	12.07	668.67	74.00
	Mean	26.40	23.07	2.10	9.90	495.18	74.50
E 21-2	2020	26.80	21.47	1.47	8.13	383.97	75.00
	2021	39.53	29.40	1.73	13.70	659.67	78.00
	Mean	33.17	25.43	1.60	10.92	521.82	76.50
NRC 252	2020	33.60	26.80	1.60	8.07	373.95	69.00
	2021	38.40	31.33	2.47	12.27	810.33	73.00
	Mean	<b>36.00</b>	<b>29.07</b>	<b>2.03</b>	<b>10.17</b>	<b>592.14</b>	<b>71.00</b>
E 21-2-2	2020	24.87	23.13	1.53	7.97	458.57	75.00
	2021	36.00	32.60	2.47	13.73	808.00	80.00
	Mean	30.43	27.87	2.00	10.85	633.28	77.50
E 7-1-1	2020	25.80	22.40	1.33	7.87	328.07	75.00
	2021	37.87	25.40	1.73	12.60	542.67	76.67
	Mean	31.83	23.90	1.53	10.23	435.37	75.83
E 21-6	2020	24.93	20.60	1.47	8.53	378.47	79.00
	2021	46.20	33.60	1.67	14.17	860.33	79.00
	Mean	35.57	27.10	1.57	11.35	619.40	79.00
E 65-2	2020	44.87	42.07	2.67	10.43	1128.43	98.00
	2021	55.60	37.60	2.27	13.83	1108.00	92.00

	Mean	50.23	39.83	2.47	12.13	1118.22	95.00
YMV 16	2020	51.87	47.07	2.53	12.67	1253.13	101.33
	2021	61.87	64.07	4.27	12.77	1654.33	106.00
	Mean	56.87	55.57	3.40	<b>12.72</b>	<b>1453.73</b>	<b>103.67</b>
YMV 11	2020	52.07	42.67	2.40	12.97	1168.50	100.00
	2021	62.00	52.33	3.00	13.33	1655.33	99.00
	Mean	57.03	47.50	2.70	<b>13.15</b>	<b>1411.92</b>	99.50
E 65-1	2020	47.33	35.07	2.40	12.70	1333.03	99.00
	2021	61.40	41.80	2.07	12.63	1238.00	99.00
	Mean	54.37	38.43	2.23	12.67	1285.52	99.00
E 38-5	2020	49.93	25.93	1.80	9.73	825.73	102.00
	2021	51.27	44.27	4.33	11.13	514.00	114.00
	Mean	50.60	35.10	3.07	10.43	669.87	108.00
E 54-1	2020	44.60	25.27	1.93	8.73	1042.70	99.00
	2021	70.80	56.93	5.93	8.43	891.00	114.00
	Mean	57.70	41.10	3.93	8.58	966.85	106.50
YMV 2	2020	50.93	42.00	2.47	12.50	1267.20	100.00
	2021	62.93	34.07	1.07	<b>12.57</b>	1512.00	<b>99.00</b>
	Mean	56.93	38.03	1.77	12.53	<b>1389.60</b>	<b>99.50</b>
YMV 1	2020	43.80	40.20	2.27	<b>13.93</b>	1507.90	100.00
	2021	59.07	35.00	2.20	11.37	1337.33	99.00
	Mean	51.43	37.60	2.23	<b>12.65</b>	<b>1422.62</b>	<b>99.50</b>
M 8-77	2020	45.13	26.87	1.93	11.33	913.27	102.00
	2021	71.87	49.87	4.13	11.07	624.00	114.00
	Mean	58.50	38.37	3.03	11.20	768.63	108.00
JS 20-69	2020	56.40	39.07	3.40	9.33	1172.67	102.00
	2021	62.13	54.60	4.60	8.53	1291.00	108.67
	Mean	59.27	46.83	4.00	<b>8.93</b>	<b>1231.83</b>	<b>105.33</b>
JS 20-29	2020	48.73	35.13	3.13	9.00	606.20	99.00
	2021	53.07	35.13	4.07	9.27	283.67	106.00
	Mean	50.90	35.13	3.60	9.13	444.93	102.50
JS 20-34	2020	26.73	27.33	1.73	9.43	323.13	93.67
	2021	40.27	32.67	2.07	14.07	1260.67	92.00
	Mean	<b>33.50</b>	<b>30.00</b>	<b>1.90</b>	<b>11.75</b>	<b>791.90</b>	<b>92.83</b>
JS 335	2020	44.87	22.33	3.00	7.33	277.73	100.00
	2021	65.93	43.13	4.27	8.97	795.67	114.00
	Mean	55.40	32.73	3.63	8.15	536.70	107.00