

MABC use case example

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Maize Lethal Necrosis



KS23-6

CML539



CML574

CML395



Haplotype	HG A DONORS				HG B DONORS			
	DTPF46	CLWN270	CLYN261	CML509	CLRCY034	CML574	CML494	CML543
MLN_01.002							1	
MLN_02.185			1					
MLN_02.194	1		6			2		1
MLN_03.044	1		8			1		
MLN_03.113			2					
MLN_03.133	3	1	2		1	2		
MLN_03.140								9
MLN_03.171							4	
MLN_03.189	2	1	7		1	2		
MLN_06.020								8
MLN_06.166			5					
MLN_07.142							3	
MLN_07.158								2
MLN_08.074	2					1		
MLN_09.108							4	
MLN_09.146			1					
MSV_01.087				3				3
Y1_06.082				3				2

MLN QTL Deployment

- 37 MLN MABC projects
- Target: 10% GY increase vs RP in hybrids
- 6 white + MSV1 donor conversion projects

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ORIGINAL ARTICLE

Genome-wide association and genomic prediction of resistance to maize lethal necrosis disease in tropical maize germplasm

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MLN QTL deployment

MLN Conversions		
CML202	CML539	DTPWC9-F67-2-2-1
CML312	CML540	LPSC7-F103-2-2-2
CML341	CML544	LPSC7-F180-3-1-1
CML343	CML545	LPSC7-F64-2-6-2
CML373	CML546	CKL05015
CML442	CML547	CLRCY034
CML444	CML548	CML574 (CLRCY039)
CML445	CML550	CLYN261
CML489	CZL052	CLWN270
CML507	CZL068	DTPYC9-F46-1-2-1

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** MLN tolerant lines converted from
yellow to white + MSV1



Line conversion MABC strategy

- Multiple intermediate effect QTLs introgressed from seven different donors keeping donors separated by HG
- Three nursery cycles per year
- Maintain multiple lineages within each population (typically 4-6)
- Retained 12-15 BC4F3 families each carrying from 4-8 favorable alleles (+/+ and +/- at 2 to 4 loci)



Version testing

- **Efficacy trial**: Do the QTL alleles work? (Is yield under MLN improved)
 - Inbred Efficacy trial – MLN ratings of BC4F4 families compared with RP
 - Hybrid Efficacy trial – BC4F3 ears testcrossed to MLN tolerant tester and grown under high MLN pressure. Grain yield of BC4F3 testcross hybrids compared to RP testcrossed to same tester.
- **Equivalency trial**: Do the new versions have equivalent (or better) performance for all other important traits including yield in the absence of MLN
 - Hybrid Equivalency trial – BC4F3 testcrosses compared with RP testcrosses under optimal and drought environments



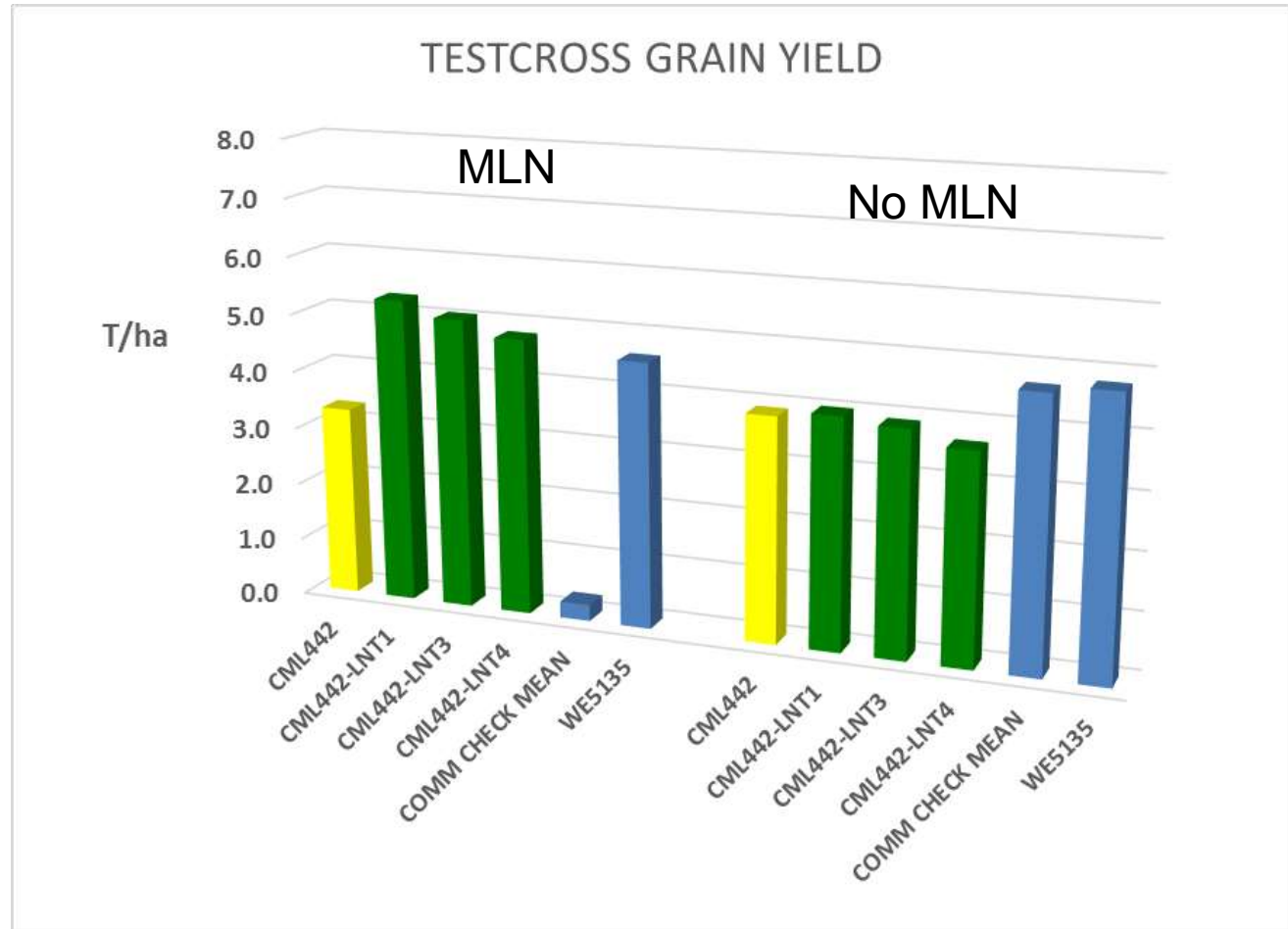
Improved MLN tolerance of elite stress tolerant lines: CML442



CML442*5/CLWN270

CML442

1.8 t/ha testcross yield increase under severe MLN pressure
Yield parity in absence of MLN



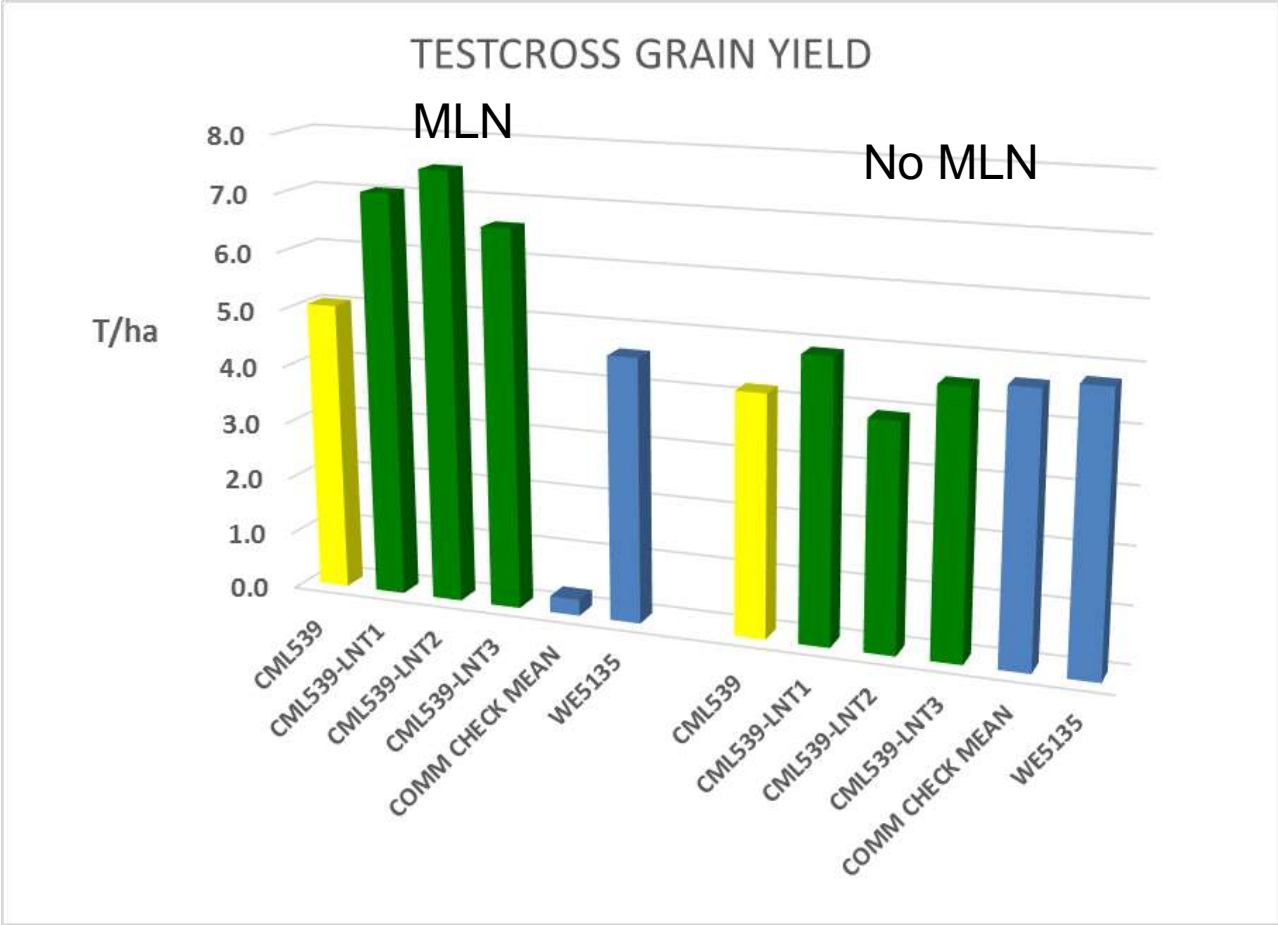
Improved MLN tolerance of elite stress tolerant lines: CML539



CML539*5/DTPYF46

CML539

2.0 t/ha testcross yield increase under severe MLN pressure
Yield parity in absence of MLN



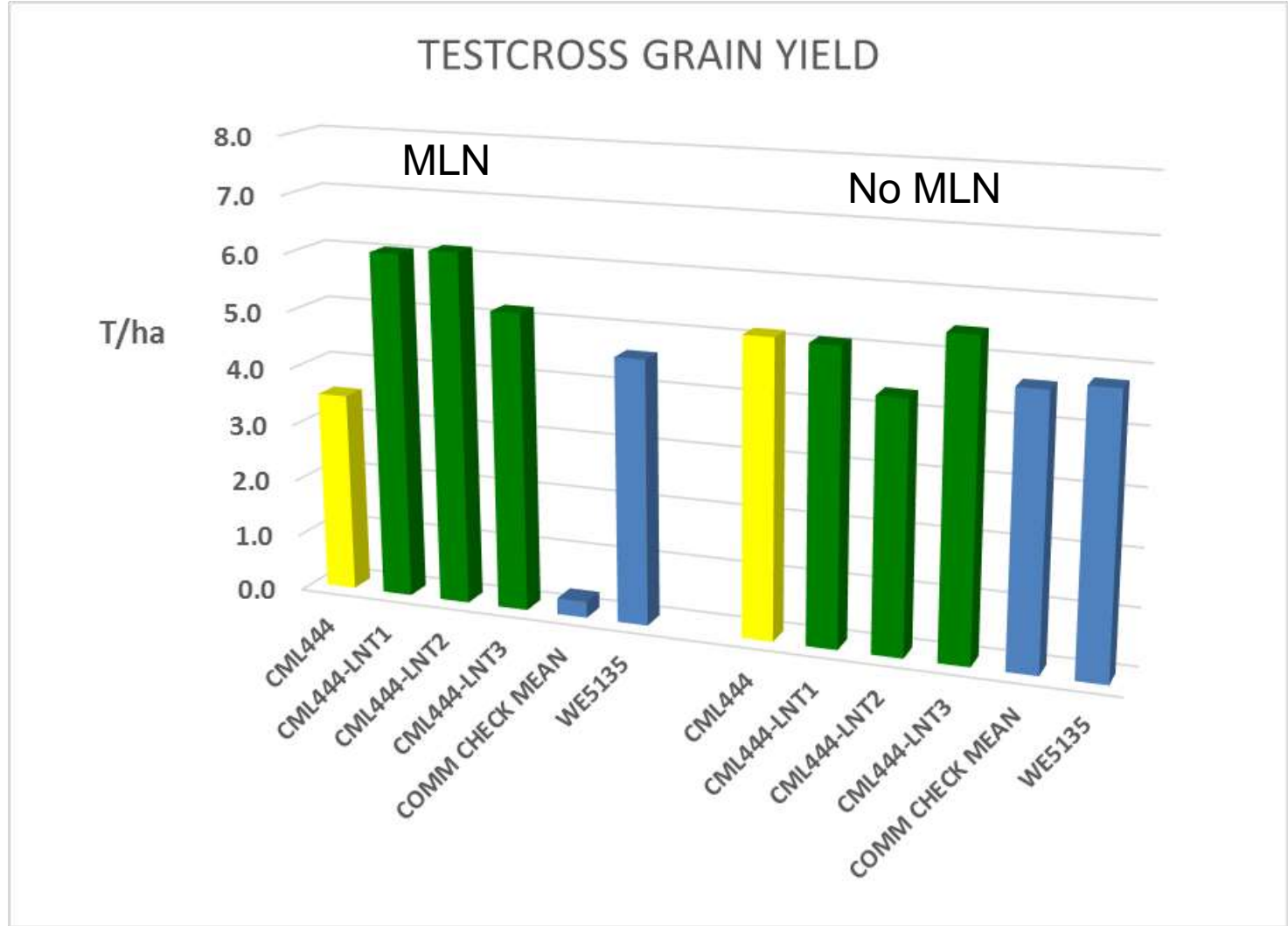
Improved MLN tolerance of elite stress tolerant lines: CML444



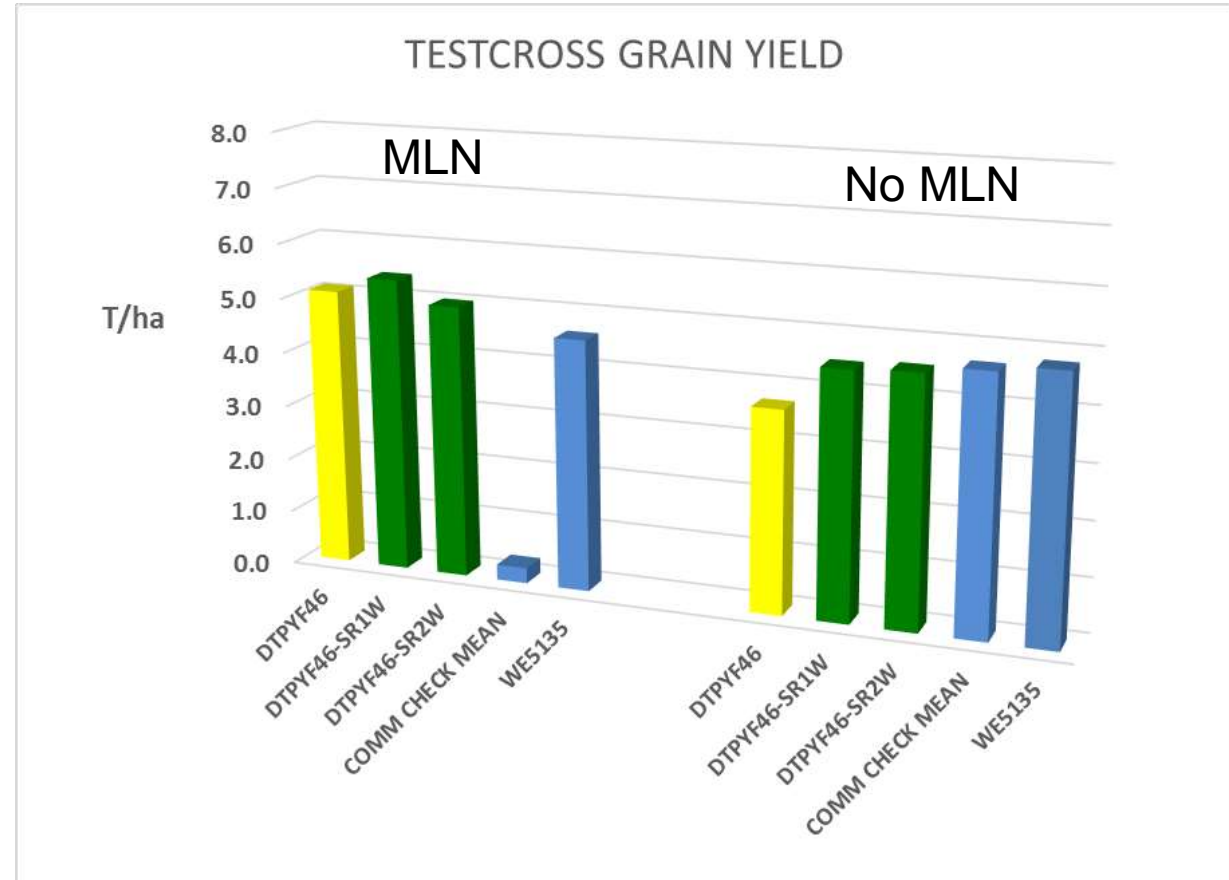
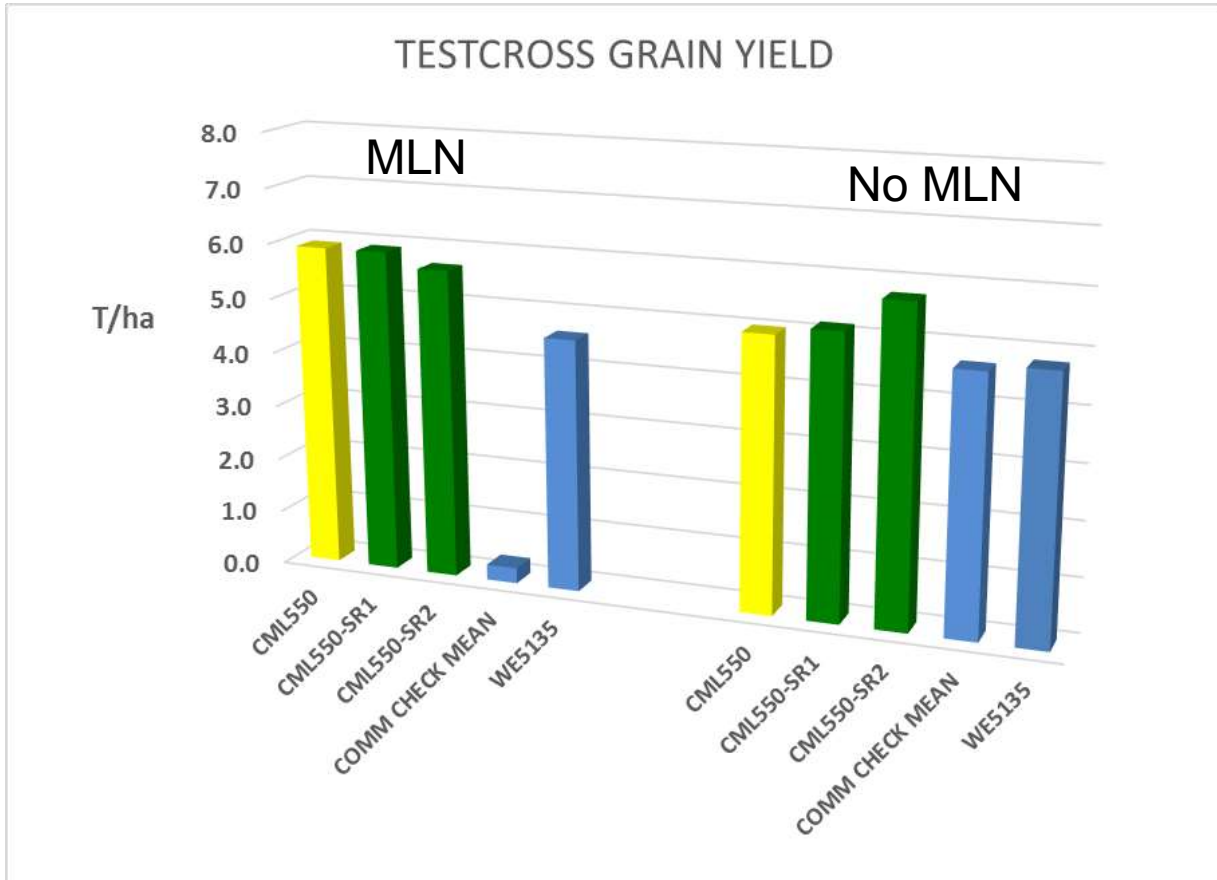
CML444*5/CML494

CML444

2.3 t/ha testcross yield increase under severe MLN pressure
Yield parity in absence of MLN



Improved adaptation of MLN tolerant lines



CML550

+GCA for yield under MLN, susceptible to MSV

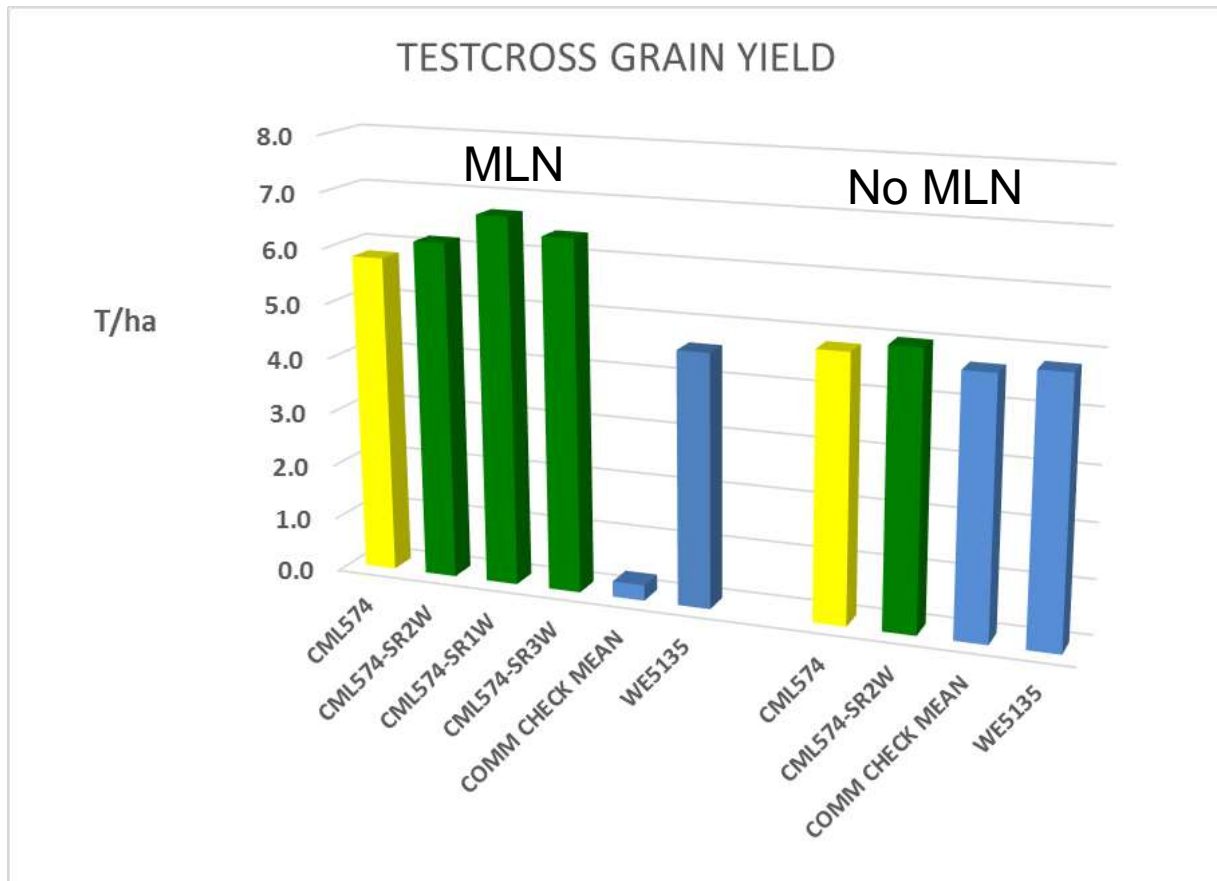
Added MSV1, maintained yield under MLN

DTPYF46

+GCA for yield under MLN, +GCA Heat+Drought, yellow grain

Convert to white, added MSV1, maintained yield under MLN

Improved adaptation of MLN tolerant lines



CML574 (CLRYC039)

+GCA for yield under MLN, FAW tolerant, yellow grain

Convert to white, added MSV1, maintained yield under MLN

Summary

- 23 of 26 RP backgrounds improved for testcross GY under severe MLN pressure
- 4 of 5 MLN tolerant yellow lines converted to white versions with MSV1 allele introgressed
- Best versions included in

