



The GLDC Innovation Fund

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Annual report 2018-2019

Evaluation of drought tolerance QTL introgression lines during postrainy season and molecular characterization of core set of breeding material from ICAR-IIMR

Twenty four BC3F6 staygreen introgressed lines in two genetic backgrounds (CRS 4- 13 lines; RSLG 262 -11 lines) were evaluated at three locations (Hyderabad, Solapur and Parbhani) under well watered (WW) and water stressed (WS) conditions. Both WW and WS block were irrigated till 45 DAS at all the three locations ensuring that the crop do not face water stress. WS treatment was imposed by withdrawing the irrigation after 45 DAS (henceforth referred as water stressed, WS). The other treatment was irrigated as and when required (henceforth referred as well watered, WW). Soil moisture was monitored during the treatment period at regular intervals (15 days) by gravimetric method. Required data set i.e. phenology, growth parameters, green leaf area retention at regular intervals, panicle weight, grain yield and stover yield were recorded at maturity. At maturity, plants were harvested from middle two rows. The dry weights of vegetative parts and panicles were recorded after drying the samples in a hot air oven for 48 hr at 80°C. The panicles were threshed and grain yield was recorded. Drought susceptibility indices (DSI) were calculated for both grain yield and stover yield using the formula as described by Fischer and Maurer (1978). Results are restricted to the yield components only



Plate 1. Evaluation of staygreen introgressed lines under well watered (WW) and water-stressed conditions at Hyderabad

Results:

Results indicated a improvement in both the grain yield and total biomass accumulation in staygreen introgressed lines over the recipient parents (Table 1). The improvement range varies in both the parameters across locations under both WW and WS conditions. In general the improvement of both parameters in staygreen introgressed lines was more under WS conditions than WW conditions as compared with their respective recipient parent. The grain yield improves more at Solapur, while total biomass improves more at Hyderabad as compared to other two locations

On an average across three locations, staygreen introgression resulted in the improvement of grain yield in 6 lines (C2, C3, C11, C13, C10, C6) and 2 lines (R 10, R 11) under well watered (WW) conditions in CRS 4 and RSLG 262 genetic backgrounds, respectively over their recipient parents (CRS 4 or RSLG 262) (Figure 1A). While under water stressed (WS),

improvement grain yields was recorded in more number of introgressed lines in both the genetic backgrounds. Eight lines in CRS 4 genetic background (C4, C10, C2, C13, C6, C3, C12, C11) and 7 lines in RSLG 262 (R4, R3, R2, R9, R8, R7, R11) over their respective recipient parents (Figure 1B). C3 in CRS 4 background and R 11 in RSLG 262 background were common introgressed lines which recorded improvement in grain yield under both WW and WS conditions.

Average total biomass accumulation across three locations indicated that staygreen introgression resulted in the improvement of biomass accumulation in 3 lines (C3, C2, C13) and 3 lines (R10, R11, R8) under well watered (WW) conditions in CRS 4 and RSLG 262 genetic backgrounds (Figure 2B) respectively over their recipient parents (CRS 4 or RSLG 262). Similarly, total biomass accumulation under water stressed (WS) conditions recorded improvement in more number of introgressed lines in both the genetic background as compared with their respective recipient parents. Four lines in CRS 4 genetic background (C3, C4, C12, C13) and 9 lines in RSLG 262 (R5, R2, R8, R4, R10, R11, R3, R6, R7) over their respective recipient parents (Figure 2B). C3 and C13 in CRS 4 background and R8, R10, R 11 in RSLG 262 background were common introgressed lines which recorded improvement in total biomass accumulation under both WW and WS conditions.

Table 1. Improvement in grain yield and total biomass accumulation in staygreen introgressed lines in two genetic backgrounds (CRS 4 and RSLG 262) over the recipient parents under well-watered (WW) and water stressed (WS) at three locations of Rabi sorghum growing regions.

Parameters	Treat	No of Lines	Grain yield (g m ⁻²)			Total biomass (g m ⁻²)		
			HYD	SOL	PAR	HYD	SOL	PAR
Genetic Background-CRS 4								
Range	WW	13	161-421	279-503	277-447	887-1726	2260-3082	1109-1512
	WS	13	58-194	57-127	151-302	408-1120	831-1473	897-1402
Mean	WW	13	308	393	355	1300	2640	1341
	WS	13	151	90	227	697	1116	1139
Recipient Parent	WW	1	400	344	402	1405	2952	1396
	WS	1	171	71	216	815	1237	996
Maximum Improvement (%)	WW	-	5	46	11	23	4	8
	WS	-	13	78	40	37	19	41
Genetic Background-RSLG 262								
Range	WW	11	174-423	219- 482	250-395	1157-1604	1773-2966	1195-1512
	WS	11	73-180	61-121	191-302	524-954	957-1441	924-1637
Mean	WW	11	292	376	374	1385	2314	1381
	WS	11	127	89	250	672	1249	1222
Recipient Parent	WW	1	323	448	377	1288	2626	1382
	WS	1	124	59	260	556	1207	1076
Maximum Improvement (%)	WW	-	31	8	5	24	13	9
	WS	-	45	105	16	72	19	52

HYD = Hyderabad

SOL = Solapur

PAR = Parbhani

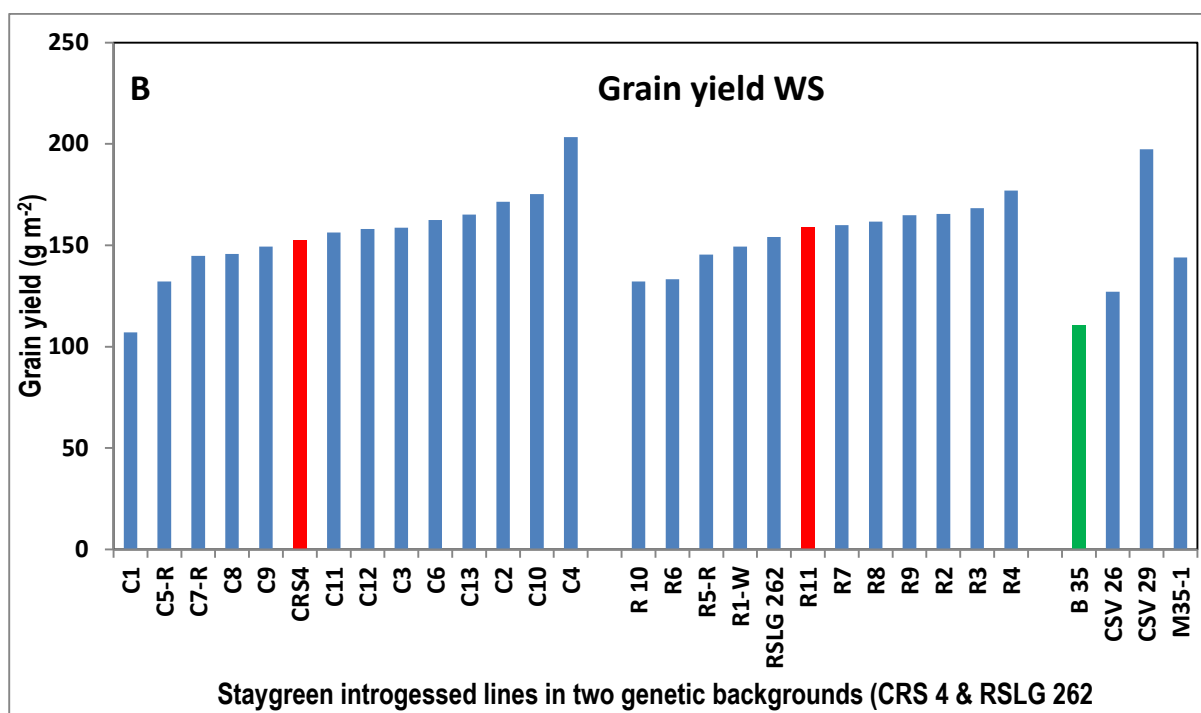
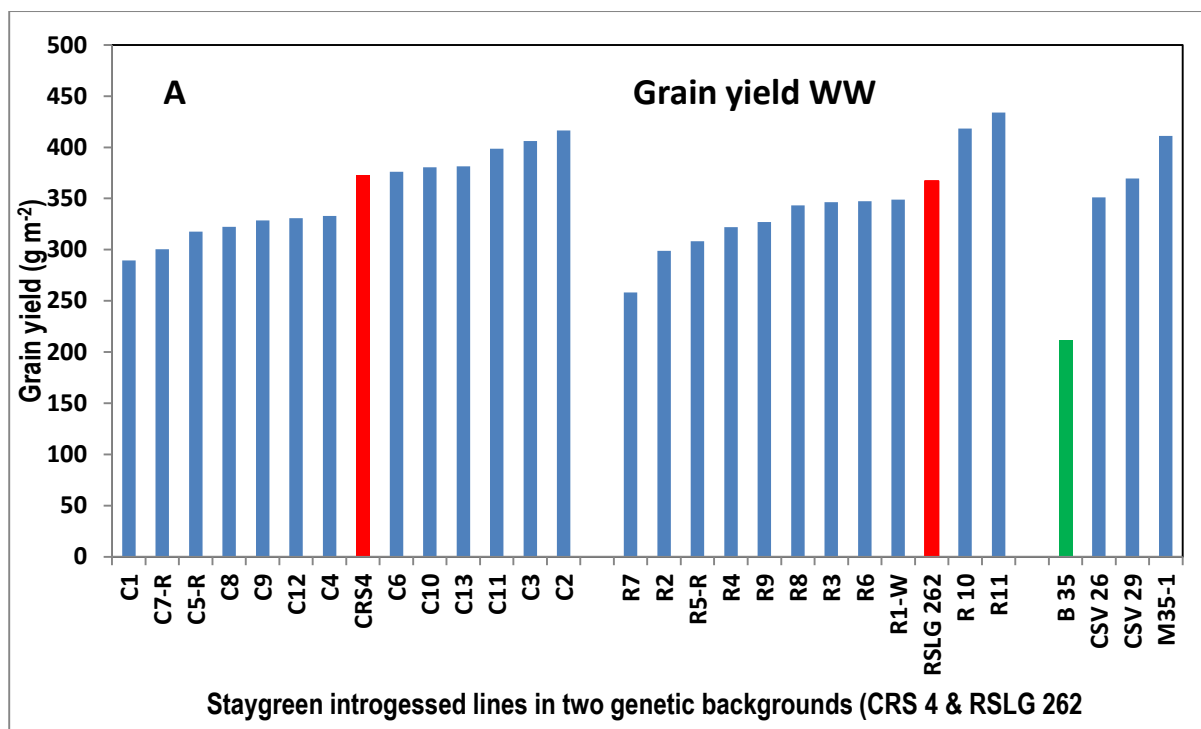


Figure 1: Average grain yield of three locations in 24 staygreen introgressed lines in two genetic background (CRS 4- 13 lines; RSLG 262 -11 lines), recipient parents and checks grown under well watered and (WW) and water stressed conditions at three locations (Hyderabad, Solapur and Parbhani).

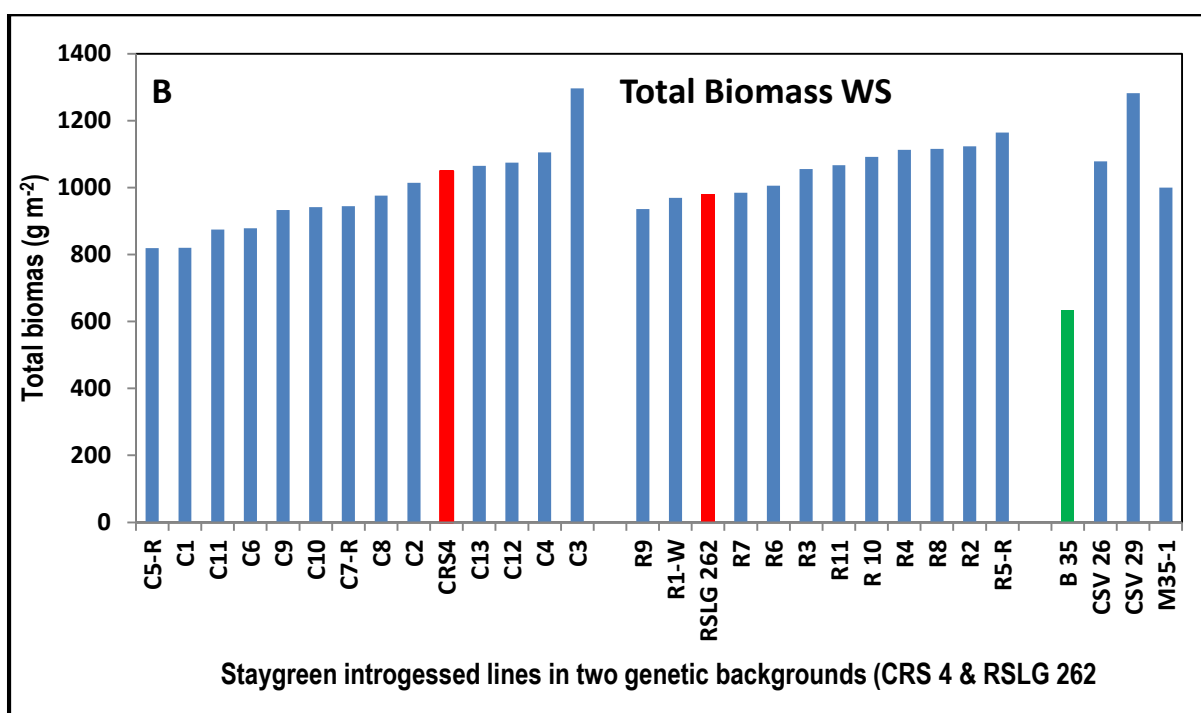
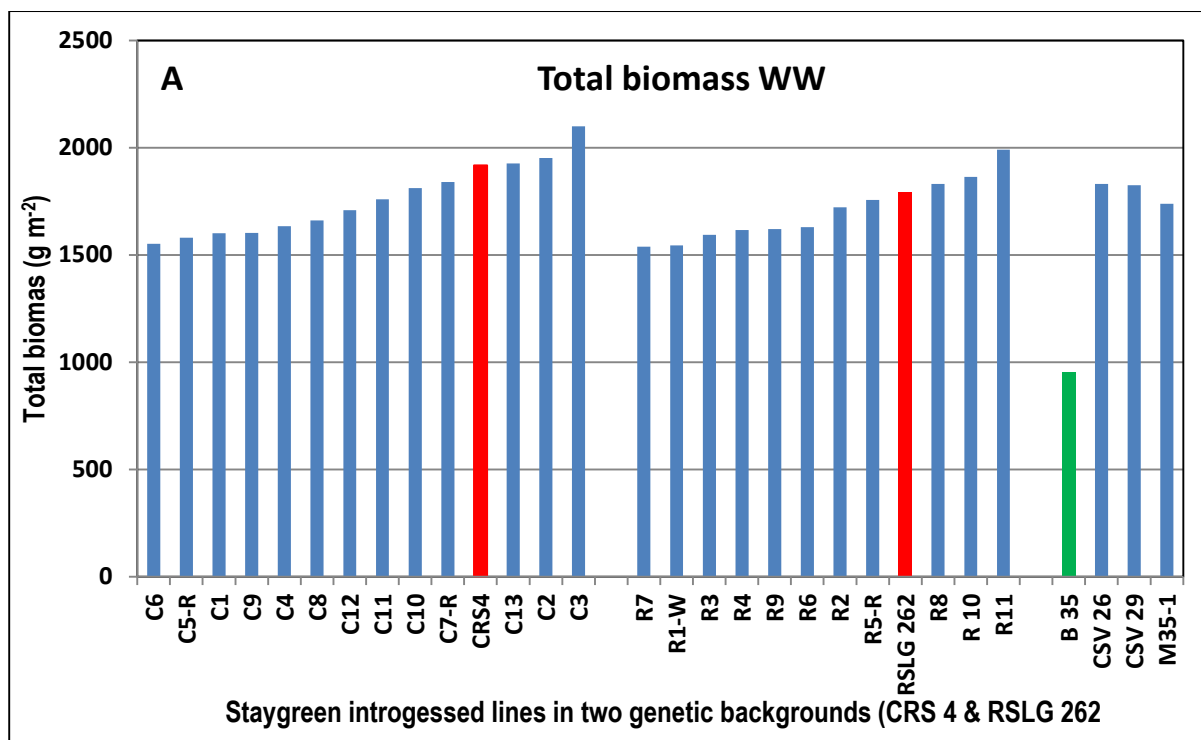


Figure 1: Average biomass accumulation of three locations in 24 staygreen introgressed lines in two genetic background (CRS 4- 13 lines; RSLG 262 -11 lines), recipient parents and checks grown under well watered and (WW) and water stressed conditions at three locations (Hyderabad, Solapur and Parbhani).