



Data analysis DVGXE – 9 environments

Year 2022

- 202229DVGXE_stom
- 202289DVGXE_ciat
- 202292DVGXE_arem
- 202293DVGXE_saha
- 202295DVGXE_cere

Year 2021

- 202156DVGXE_repe
- 202155DVGXE_ciat
- 202157DVGXE_polo
- 202158DVGXE_momi

Luis Fernando Delgado Munoz
luis.delgado@cgiar.org
Palmira, September 2022

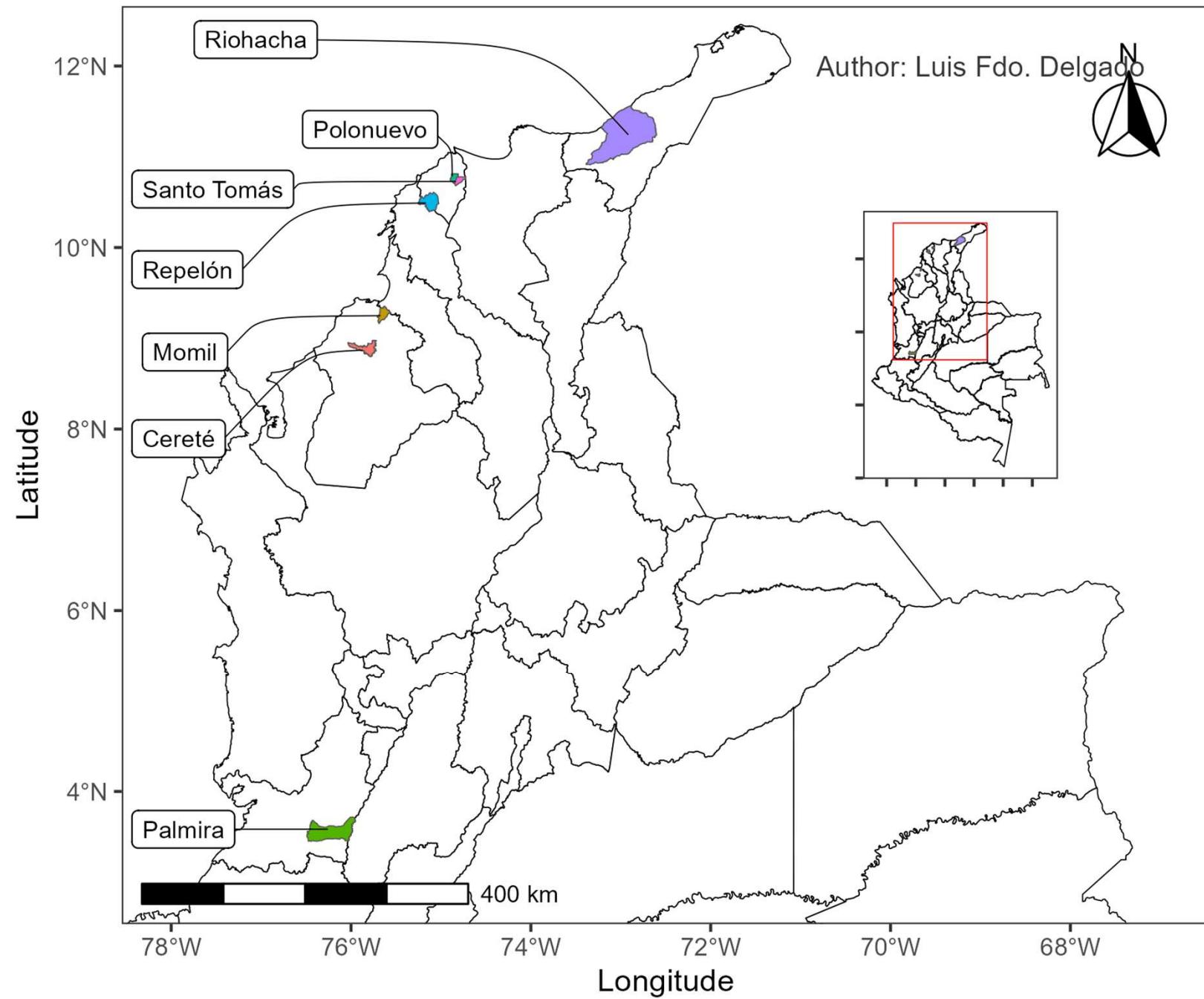


@BiovIntCIAT_eng
@BiovIntCIAT_esp

#Alliance4Science

Locations

- Momil. Cordoba, Colombia
- Cerete. Cordoba, Colombia
- Polonuevo. Atlantico, Colombia
- Repelon. Atlantico, Colombia
- CIAT. Valle, Colombia
- Aremasain. Guajira, Colombia
- Santo Tomas. Atlantico, Colombia
- Sahagun. Cordoba, Colombia

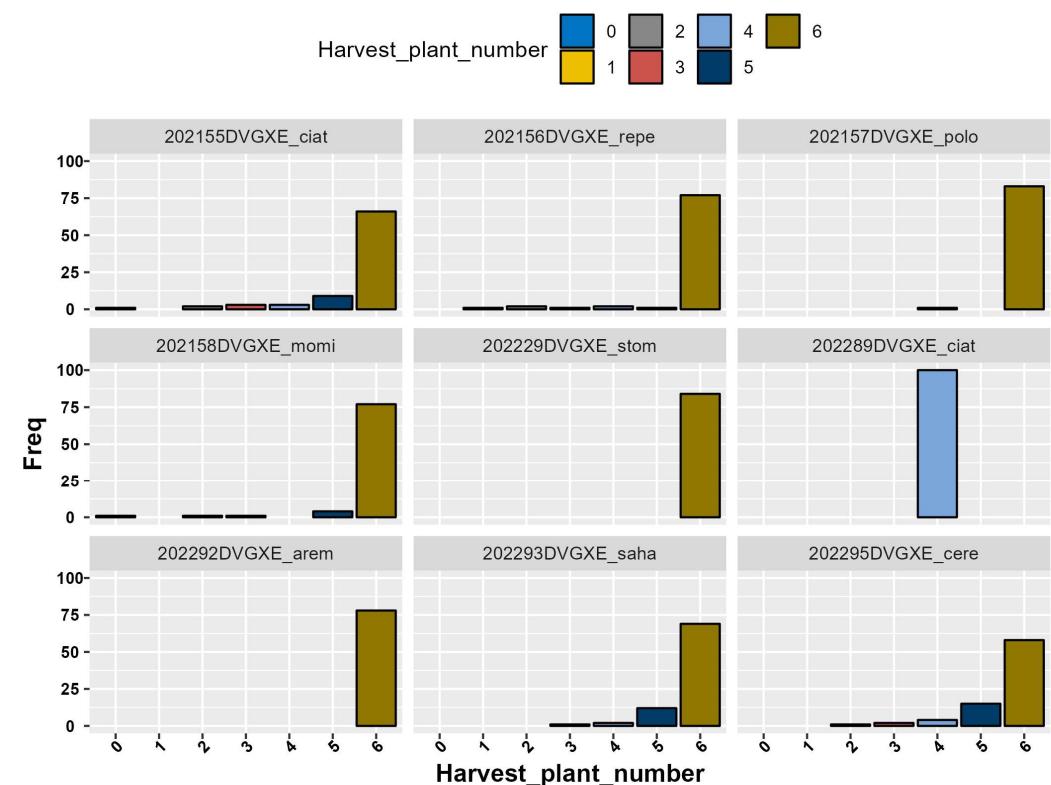


Resolvable row-col with randomized checks

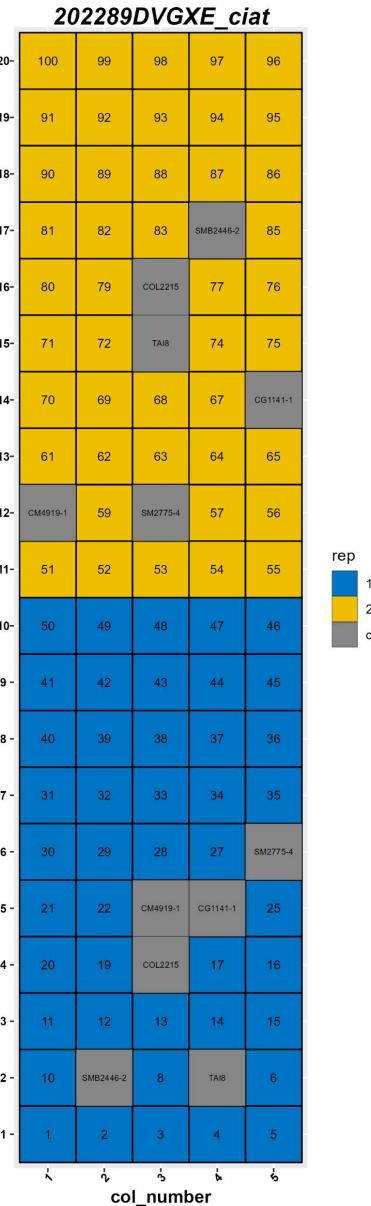
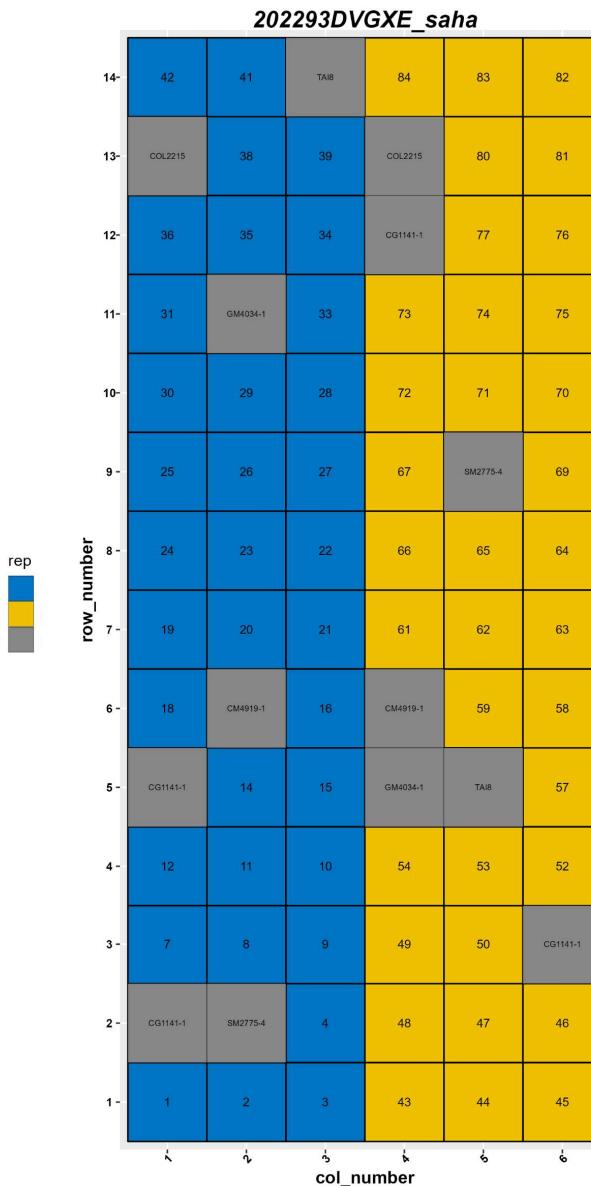
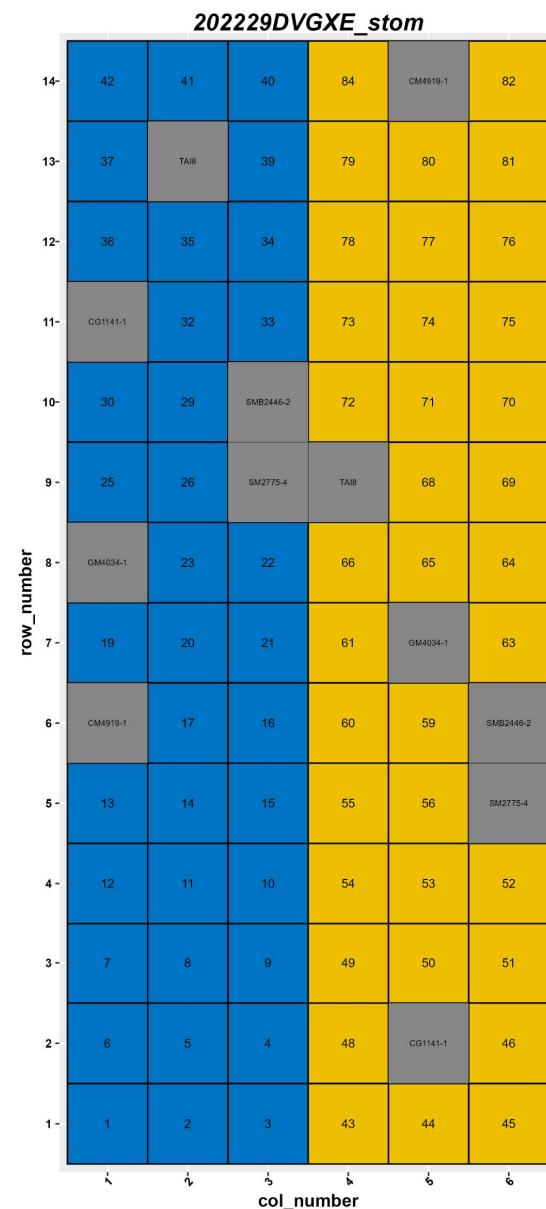
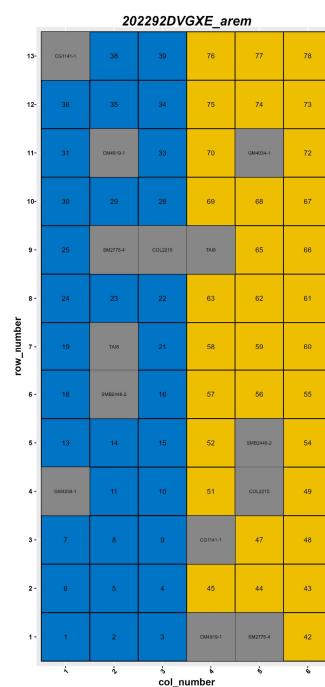
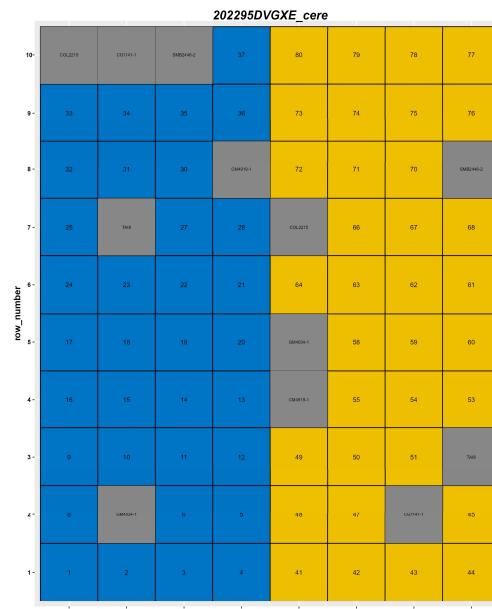
use_trial_name	use_plant_date	use_harvest_date	harvesting_time	use_location	n_gen
202155DVGXE_ciat	2021-August-26	2022-August-19	11month 24day	CIAT. Valle, Colombia	28
202156DVGXE_repe	2021-August-10	2022-August-23	12month 13day	Repelon. Atlantico, Colombia	28
202157DVGXE_polo	2021-August-09	2022-September-01	12month 23day	Polonuevo. Atlantico, Colombia	28
202158DVGXE_momi	2021-August-21	2022-August-27	12month 6day	Momil. Cordoba, Colombia	28
202229DVGXE_stom	2022-September-08	2023-June-21	9month 13day	Santo Tomas. Atlantico, Colombia	41
202289DVGXE_ciat	2022-August-25	2023-June-23	9month 29day	CIAT. Valle, Colombia	50
202292DVGXE_arem	2022-August-29	2023-June-20	9month 22day	Aremasain. Guajira, Colombia	39
202293DVGXE_saha	2022-August-30	2023-June-21	9month 22day	Sahagun. Cordoba, Colombia	40
202295DVGXE_cere	2022-September-08	2023-June-20	9month 12day	Cerete. Cordoba, Colombia	40

Planted – harvested plants per plot

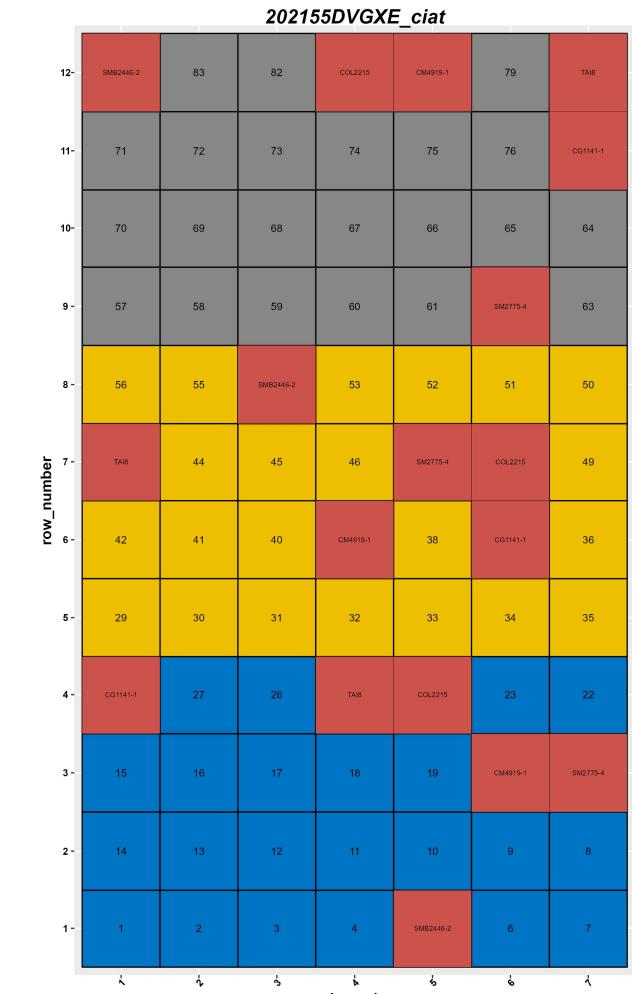
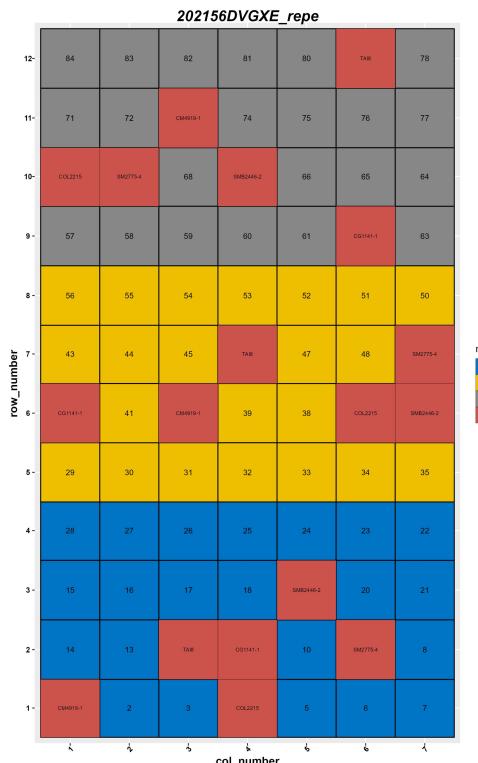
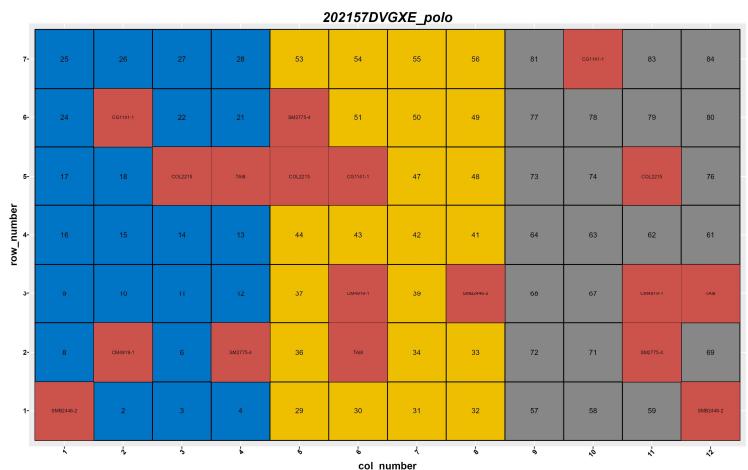
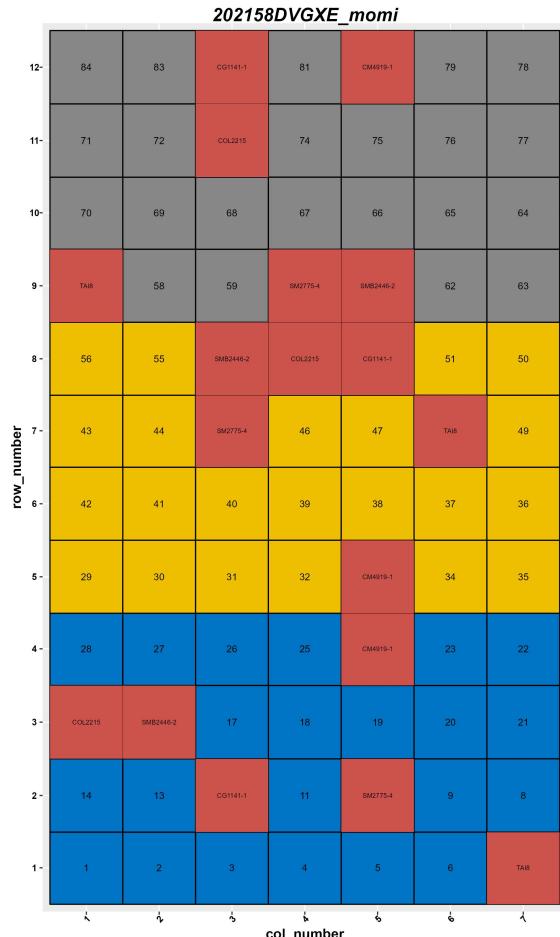
use_trial_name	obs_planted_number_plot	harvested_plants
202155DVGXE_ciat	20	6
202156DVGXE_repe	20	6
202157DVGXE_polo	20	6
202158DVGXE_momi	20	6
202229DVGXE_stom	20	6
202289DVGXE_ciat	20	4
202292DVGXE_arem	20	6
202293DVGXE_saha	20	6
202295DVGXE_cere	20	6



Year 2022: Trial Design – Row col



Year 2021: Trial Design – Row col



Check genotypes

CG1141-1_is_Costena
CM4919-1_is_Veronica
COL2215_is_Venezolana
GM273-57_is_Ropain
GM4034-1_is_Reina_wx
SM1127-8_is_Cubana
SM1411-5_is_Sinuana
SM2775-4_is_Bellotti
SMB2446-2_is_Caiseli
TAI8_is_TA



3 - Unloading cassava. Women processors, Korogho Côte d'Ivoire. Patricio Mendez del Villar / 3 - Déchargement de manioc Femmes transformatrices, Korogho Côte d'Ivoire. Patricio Mendez del Villar

Exploratory data analysis

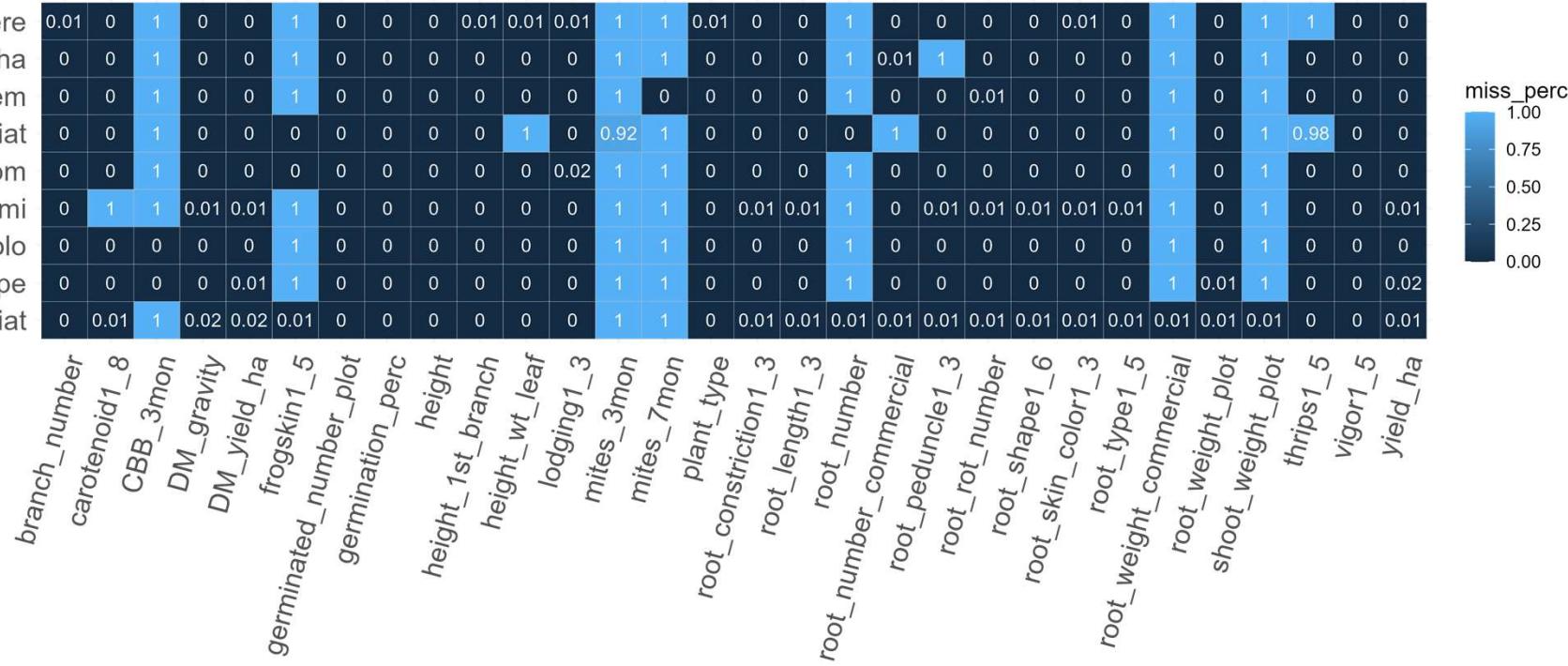
Traits evaluated – missing values



Assessed agronomic traits

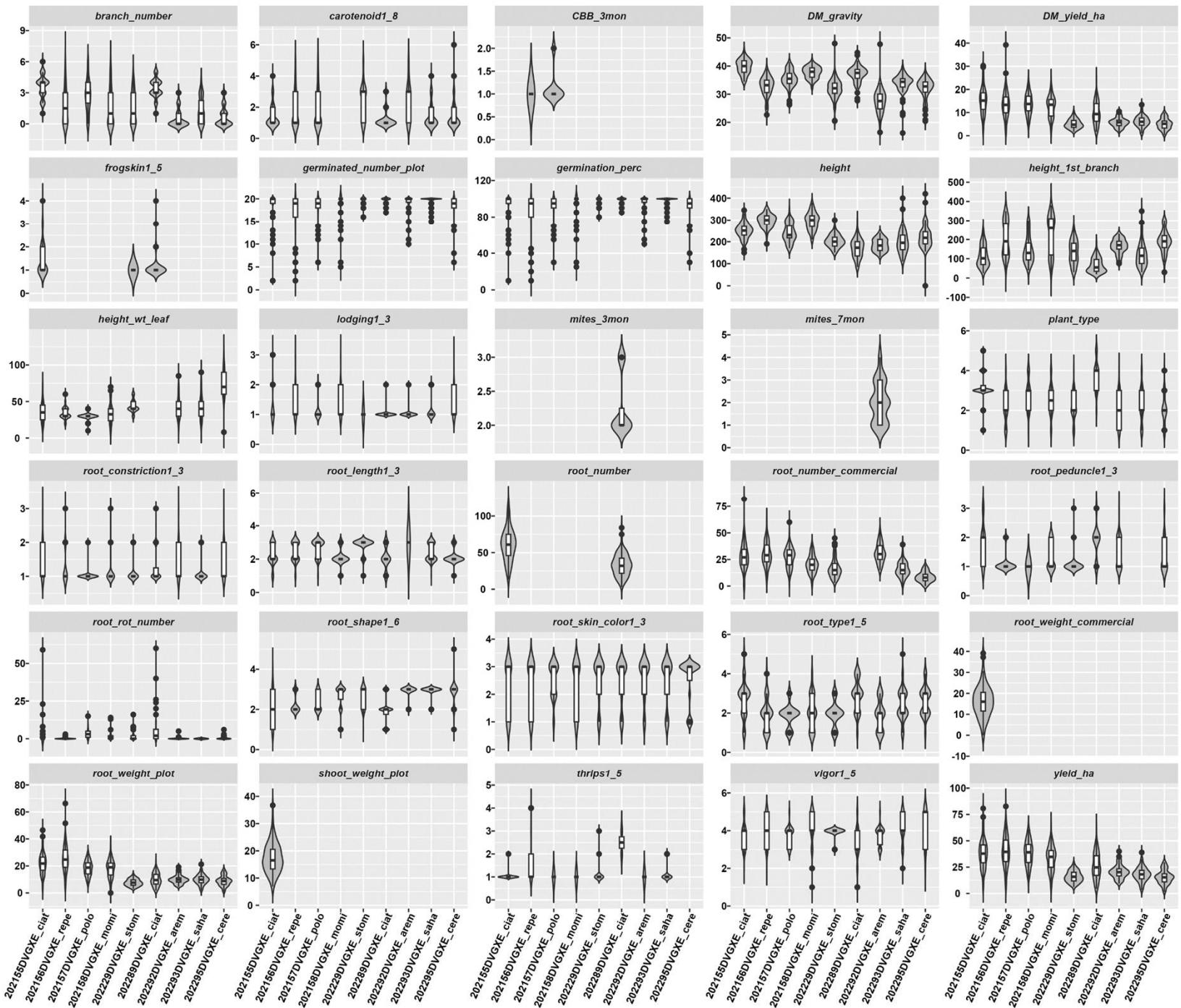
branch_number
CBB_3mon
DM_gravity
height_1st_branch
yield_ha
germination_perc
DM_yield_ha
shoot_weight_plot
root_weight_plot
frogskin1_5
vigor1_5
lodging1_3
root_number_commercial
root_weight_commercial
plant_type
height
height_wt_leaf
mites_3mon
mites_7mon
root_skin_color1_3
root_constriction1_3
root_type1_5
root_length1_3
root_number
root_rot_number
germinated_number_plot
root_peduncle1_3
root_shape1_6
thrips1_5

Percentage of missing values (exp/trait)



Trait variation across trials (phenotypic value)

All traits
evaluated had
variation.



Shared clones among trials

Connectivity Matrix

	202293DVGXE_saha	28	28	28	28	40	36	37	38	40
	202229DVGXE_stom	28	28	28	28	41	35	38	41	38
	202295DVGXE_cere	28	28	28	28	39	35	40	38	37
	202292DVGXE_arem	28	28	28	28	39	39	35	35	36
	202289DVGXE_ciat	28	28	28	28	50	39	39	41	40
	202156DVGXE_repe	28	28	28	28	28	28	28	28	28
	202155DVGXE_ciat	28	28	28	28	28	28	28	28	28
	202157DVGXE_polo	28	28	28	28	28	28	28	28	28
	202158DVGXE_momi	28	28	28	28	28	28	28	28	28

202158DVGXE_momi
202157DVGXE_polo
202155DVGXE_ciat
202156DVGXE_repe
202289DVGXE_ciat
202292DVGXE_arem
202295DVGXE_cere
202229DVGXE_stom
202293DVGXE_saha

Multiple corr trait (phenotypic value)

	branch_number	CBB_3mon	DM_gravity	height_1st_branch	yield_ha	germination_perc	DM_yield_ha	shoot_weight_plot	frogskin1_5	vigor1_5	lodging1_3	root_number_commercial	root_weight_commercial	plant_type	height	height_wt_leaf	mites_3mon	mites_7mon	root_skin_color1_3	root_constriction1_3	root_type1_5	root_length1_3	root_number	root_rot_number	germinated_number_plot	root_peduncle1_3	root_shape1_6	thrips1_5	carotenoid1_8
-0.03 ns		0.17 *** ns		0.1 ns	-0.12 ns																								
0.3 *** ns			0.18 ns	0.4 *** ns	0.14 * ns																								
-0.69 *** ns			0.1 ns	-0.12 ns																									
0.19 *** ns			0.18 ns	0.4 *** ns	0.14 * ns																								
-0.08 ns			0.06 ns	0.18 *** ns	-0.08 *** ns	0.03 ns																							
0.24 *** ns			0.2 *** ns	0.56 *** ns	0.09 ns	0.97 *** ns	0.06 ns																						
0.06 ns				0.06 ns	0.09 ns	0.22 ns	0.1 ns	0.23 ns																					
0.14 * ns			0.04 ns	0.34 *** ns	0.2 *** ns	0.96 *** ns	0 ns	0.93 *** ns	0.22 ns																				
0.12 ns					0.3 *** ns	0.06 ns	0.31 *** ns	0.02 ns	0.33 *** ns	-0.16 ns	0.34 *** ns																		
-0.17 *** ns			0.12 ns	0.05 *** ns	0.22 *** ns	0.22 *** ns	0.2 *** ns	0.21 ns	0.25 *** ns	0.08 ns																			
0.12 ns			-0.12 ns	-0.05 ns	0.08 ns	-0.03 ns	-0.24 *** ns	-0.04 ns	0.35 ns	0.01 ns	-0.01 ns	-0.03 ns																	
0.09 ns			0.17 ns	0.17 ** ns	0.04 ns	0.7 *** ns	0.15 * ns	0.66 *** ns	0.05 ns	0.67 *** ns	0.31 * ns	0.13 ns	-0.19 *** ns																
0.14 ns					0.17 ns	0.01 *** ns	0.95 *** ns	-0.04 ns	0.92 *** ns	0.1 ns	0.95 *** ns	0.05 ns	0.11 ns	-0.39 ns	0.71 *** ns														
0.57 *** ns			-0.1 ns	0.26 *** ns	-0.55 *** ns	-0.05 ns	-0.07 ns	0.01 ns	-0.06 ns	-0.13 ns	-0.01 ns	-0.36 *** ns	0.23 *** ns	-0.12 ns	-0.06 ns														
-0.09 ns			0.17 ns	0.12 ns	0.59 *** ns	0.44 *** ns	-0.15 ** ns	0.42 *** ns	0.38 ns	0.53 *** ns	0.23 * ns	0.29 *** ns	0.26 *** ns	0.19 *** ns	0.03 ns	-0.37 *** ns													
-0.34 *** ns			-0.05 *** ns	-0.24 *** ns	0.2 *** ns	-0.31 *** ns	-0.05 ns	-0.32 *** ns	0.1 ns	-0.28 *** ns	-0.18 ns	0.1 ns	0.08 ns	-0.32 *** ns	0.22 ns	-0.3 *** ns	-0.02 ns												
-0.22 ns				-0.07 ns	-0.43 ns	-0.39 ns		-0.37 ns		-0.39 ns	-0.22 ns	0.15 ns					-0.09 ns	-0.41 ns											
0.23 ns					-0.16 ns	-0.1 ns	-0.11 ns	-0.17 ns	-0.16 ns		-0.11 ns		0.15 ns	0.13 ns	-0.09 ns		0 ns	0.06 ns	-0.27 ns										
-0.14 * ns			0.13 ns	-0.01 ns	0.13 ns	-0.04 ns	0.03 ns	-0.03 ns	0.05 ns	-0.06 ns	0.08 ns	0.08 ns	-0.13 ns	0.02 ns	0.17 ns	-0.17 *** ns	0.06 ns	0.08 ns	-0.17 ns	-0.13 ns									
0.05 ns			-0.09 ns	-0.1 ns	-0.04 ns	-0.05 ns	-0.03 ns	-0.06 ns	0.4 ns	-0.03 ns	0.15 ns	-0.13 ns	0.12 ns	-0.02 ns	-0.1 ns	0.06 ns	-0.03 ns	0.08 ns	0.15 ns	0.09 ns	-0.07 ns								
0.15 ** ns			-0.11 ns	0.05 ** ns	-0.16 *** ns	-0.45 *** ns	-0.08 ns	-0.38 *** ns	0.03 ns	-0.44 *** ns	0.18 *** ns	-0.27 *** ns	0.18 *** ns	-0.43 *** ns	-0.64 *** ns	0.3 *** ns	-0.17 *** ns	0.13 *** ns	-0.41 *** ns	0.08 ns	0.02 ns	0.15 * ns							
-0.1 ns			0.03 ns	-0.27 *** ns	0.04 ns	0.12 ns	0.05 ns	0.06 ns	-0.19 ns	0.11 ns	-0.18 ns	0.07 ns	-0.12 ns	0.26 *** ns	0.54 *** ns	-0.16 ns	-0.06 ns	-0.1 ns	0.36 *** ns		0.01 ns	-0.04 ns	-0.46 *** ns						
-0.08 ns					0.43 *** ns	0.46 *** ns	0.6 *** ns	0.02 ns	0.63 *** ns	0.45 *** ns	0.67 *** ns	0.3 *** ns	0.41 *** ns	0.32 *** ns	0.52 *** ns	0.16 ns	-0.45 *** ns	0.63 *** ns	0.17 *** ns	-0.41 *** ns		0.05 ns	0.02 ns	-0.02 ns	-0.04 ns				
0.18 *** ns			0.24 *** ns	0.12 ns	-0.12 ns	0.04 ns	0.06 ns	0.06 ns	0.17 ns	-0.03 ns	0.07 ns	-0.05 ns	-0.05 ns	0.01 ns	-0.05 ns	0.17 ns	0.05 ns	0.08 ns	0.01 ns	0.1 ns	-0.1 ns	-0.09 ns							
-0.08 ns			0.06 ns	0.18 *** ns	-0.08 ns	0.03 ns	1 *** ns	0.06 ns	0.1 ns	0 ns	0.02 ns	0.22 *** ns	-0.24 ns	0.15 ns	-0.04 ns	-0.07 ns	-0.15 ns	-0.05 ns	-0.17 ns	0.03 ns	-0.03 ns	-0.08 ns	0.05 ns	0.02 ns	0.06 ns				
0.2 *** ns			-0.05 ns	0.15 * ns	-0.23 *** ns	-0.06 ns	0.11 ns	-0.01 ns	0.1 ns	-0.09 ns	0.23 * ns	-0.12 ns	0.01 ns	0.02 ns	-0.13 ns	0.22 *** ns	-0.18 ns	0.05 ns	0.33 ns	0.12 ns	-0.01 ns	0.2 *** ns	-0.27 *** ns	-0.14 ns	-0.06 ns	0.11 ns	0.11 ns		
-0.28 *** ns			0.01 ns	-0.21 ns	0.15 * ns	-0.25 *** ns	0.07 ns	-0.26 *** ns	0.21 ns	-0.21 *** ns	0.04 ns	0.12 ns	0.05 ns	-0.18 ns	-0.2 ns	-0.23 *** ns	0 ns	0.13 ns	-0.54 ns	0.33 ns	0.11 ns	-0.02 ns	-0.09 ns	0.2 ns	0.09 ns	-0.16 ns	0.07 ns	-0.03 ns	
-0.02 ns			-0.09 ns	-0.1 ns	0.12 ns	0 ns	-0.28 *** ns	0 ns	-0.1 ns	0.07 ns	-0.07 ns	-0.21 ns	0.16 ns	-0.01 ns	0.09 ns	0.06 ns	0.11 ns	-0.04 ns	-0.01 ns	0.07 ns	0.05 ns	-0.03 ns	-0.21 ns	-0.06 ns	-0.28 ns	-0.06 ns	-0.13 ns		
-0.2 *** ns			-0.13 ns	-0.34 *** ns	0.17 ** ns	-0.07 ns	-0.03 ns	-0.14 ns	0 ns	-0.06 ns	-0.16 ns	0.02 ns	0.05 ns	0.01 ns	-0.17 ns	-0.18 ns	0 ns	0.05 ns	-0.08 ns	-0.03 ns	-0.12 ns	0.03 ns	-0.02 ns						

A large pile of harvested cassava roots, which are thick, tuberous, and brownish-pink. They are piled high, filling the frame. Some smaller roots and green stems are visible among the larger ones.

Statistical data analysis

Moderate to high heritability among all locations.

Single heritability

trial	branch_number	carotenoid1_8	CBB_3mon	DM_gravity	DM_yield_ha	frogskin1_5	germinated_nuber_plot	germination_perc	height	height_1st_branch	height_wt_leaf	lodgin7mon_g1_3	mites	plant_type	root_constraint1_3	root_length1_3	root_number	root_number_commercial	root_peduncle1_3	root_root_number	root_shape1_6	root_skin_color1_3	root_type1_5	root_weight_commercial	root_weight_ht_plot	shoot_weight_ht_plot	thrips1_5	vigor1_5	yieldha	
202155DVGXE_ciat	0.85	0.85		0.83	0.8	0.76		0.92	0.92	0.88	0.94	0.59	0.88		0.84	0.72	0.64	0.79	0.77	0.36	0.01	0.5	0.96	0.39	0.82	0.78	0.77	0.08	0.71	0.78
202156DVGXE_repe	0.94	0.92		0.95	0.71			0.96	0.96	0.85	0.97	0.82	0.85		0.91	0.64	0.8		0.74	0	0.08	0.68	0.99	0.81		0.71		0.94	0.88	0.76
202157DVGXE_polo	0.77	0.98	0.01	0.94	0.64			0.87	0.87	0.56	0.88	0.36	0.38		0.69	0.04	0		0.5		0.76	0.57	0.99	0.37		0.59			0.53	0.59
202158DVGXE_momi	0.92			0.92	0.65			0.8	0.8	0.77	0.88	0.63	0.86		0.75	0.06	0		0.69	0.22	0.01	0.5	0.99	0.54		0.63			0.59	0.61
202229DVGXE_stom	0.63	0.96		0.84	0.81			0	0	0.79	0.61	0.69			0.76	0.67	0.41		0	0.06	0.59	0.38	0.93	0.71		0.82		0.02	0.69	0.82
202289DVGXE_ciat	0.78	0.93		0.77	0.7	0.2		0.67	0.67	0.88	0.81		0.05		0.79	0.12	0.48	0.7		0.01	0.6	0.51	0.96	0.43		0.7			0.91	0.7
202292DVGXE_larem	0.92	0.97		0.83	0.62			0.52	0.52	0.85	0.89	0.3	0.03	0.46	0.6	0			0.35	0.65	0.11	0	0.99	0.58		0.56			0.36	0.56
202293DVGXE_saha	0.76	0.76		0.92	0.5			0.57	0.57	0.74	0.82	0.78	0.8		0.75	0.26	0.52		0.63			0	0.99	0.52		0.37		0.02	0.2	0.37
202295DVGXE_cere	0.89	0.93		0.7	0.61			0.42	0.42	0.01	0.62	0.08	0.73		0.54	0	0.41		0.6	0.31	0.01	0.03	0.98	0.67		0.64			0.52	0.64

Traits with heritability

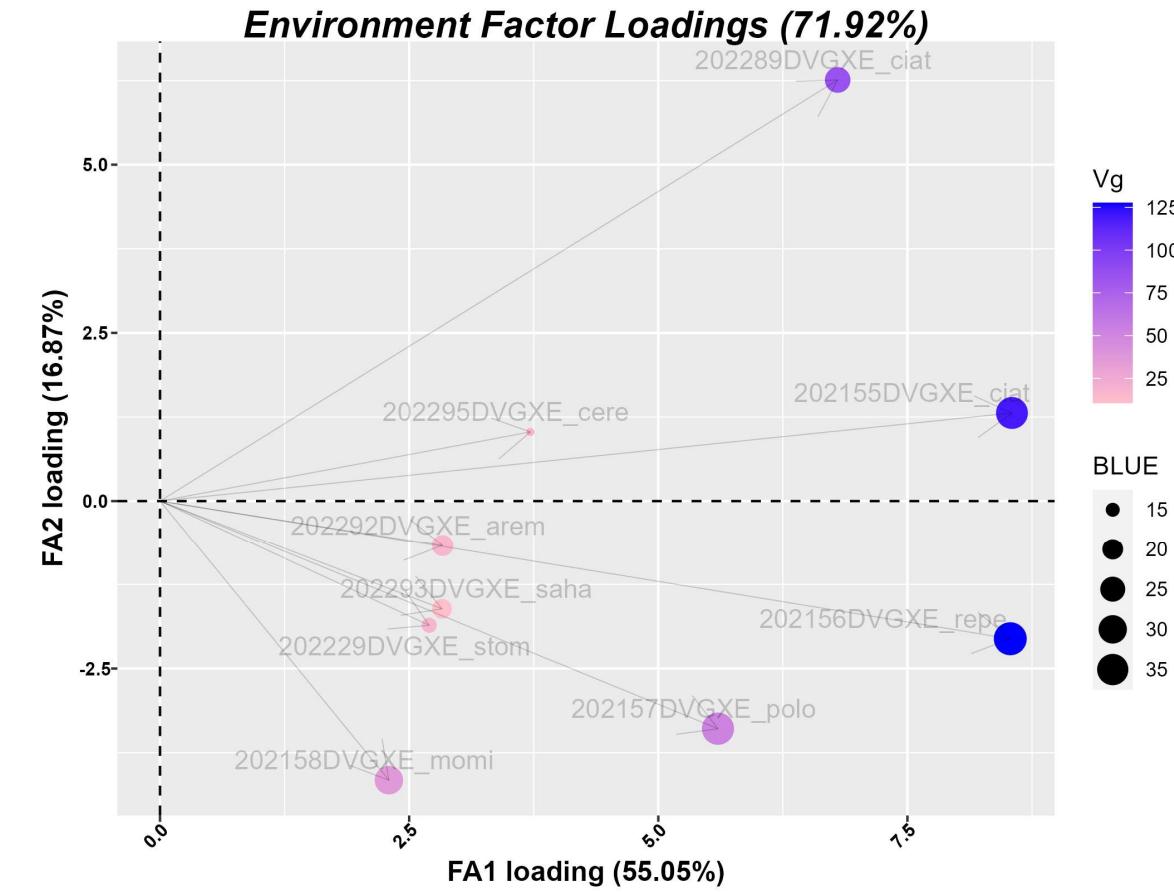
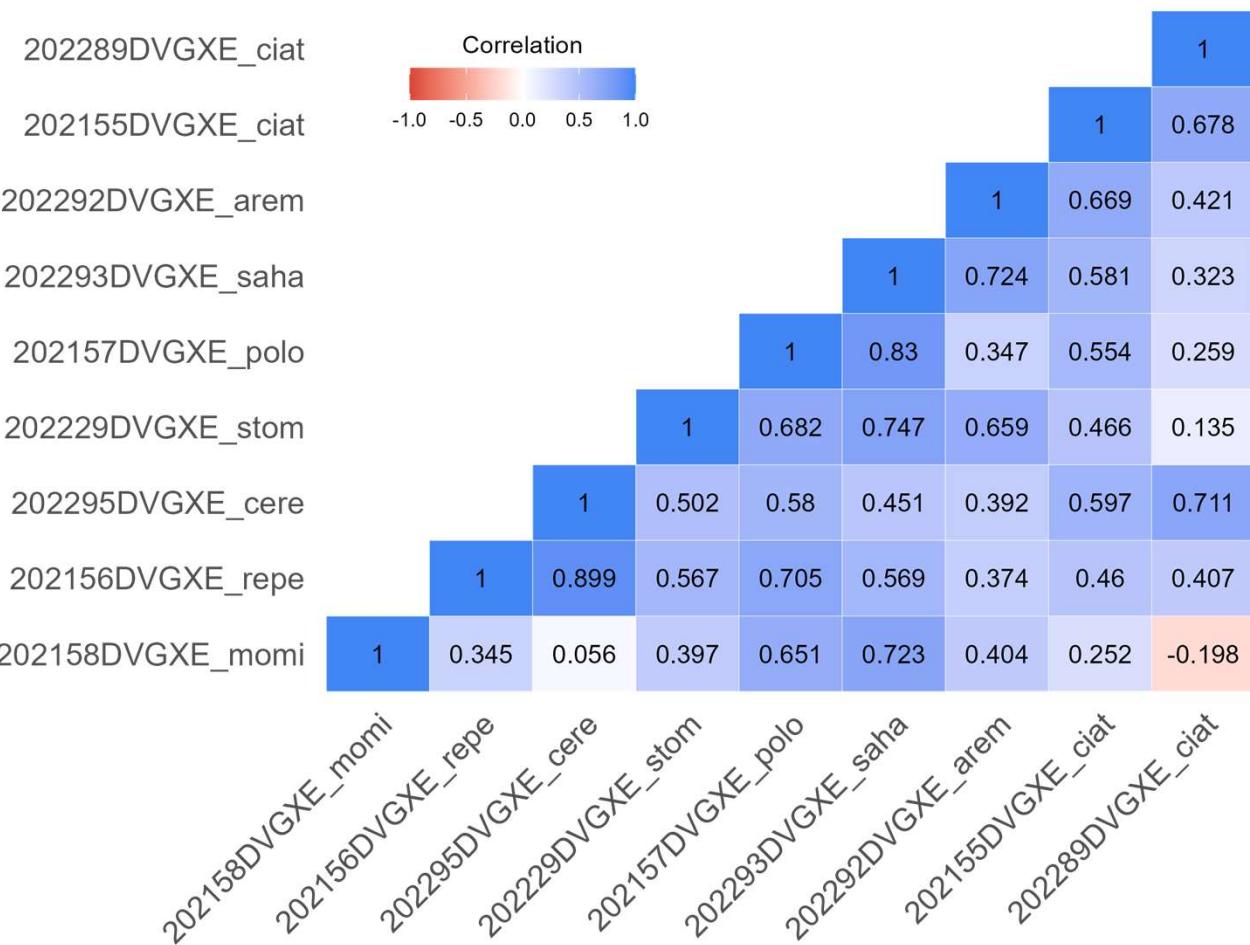
< 0.1 were removed from the GxE analysis.

Heritability gxe all trials

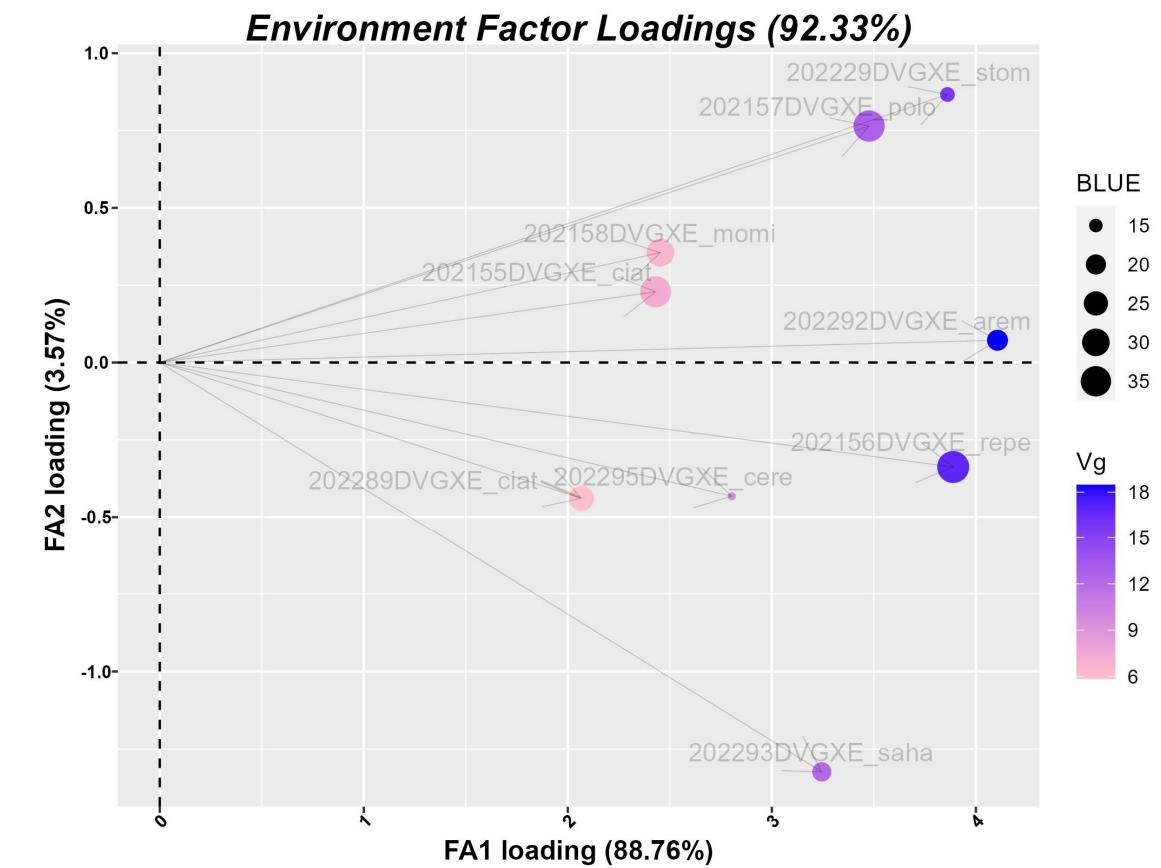
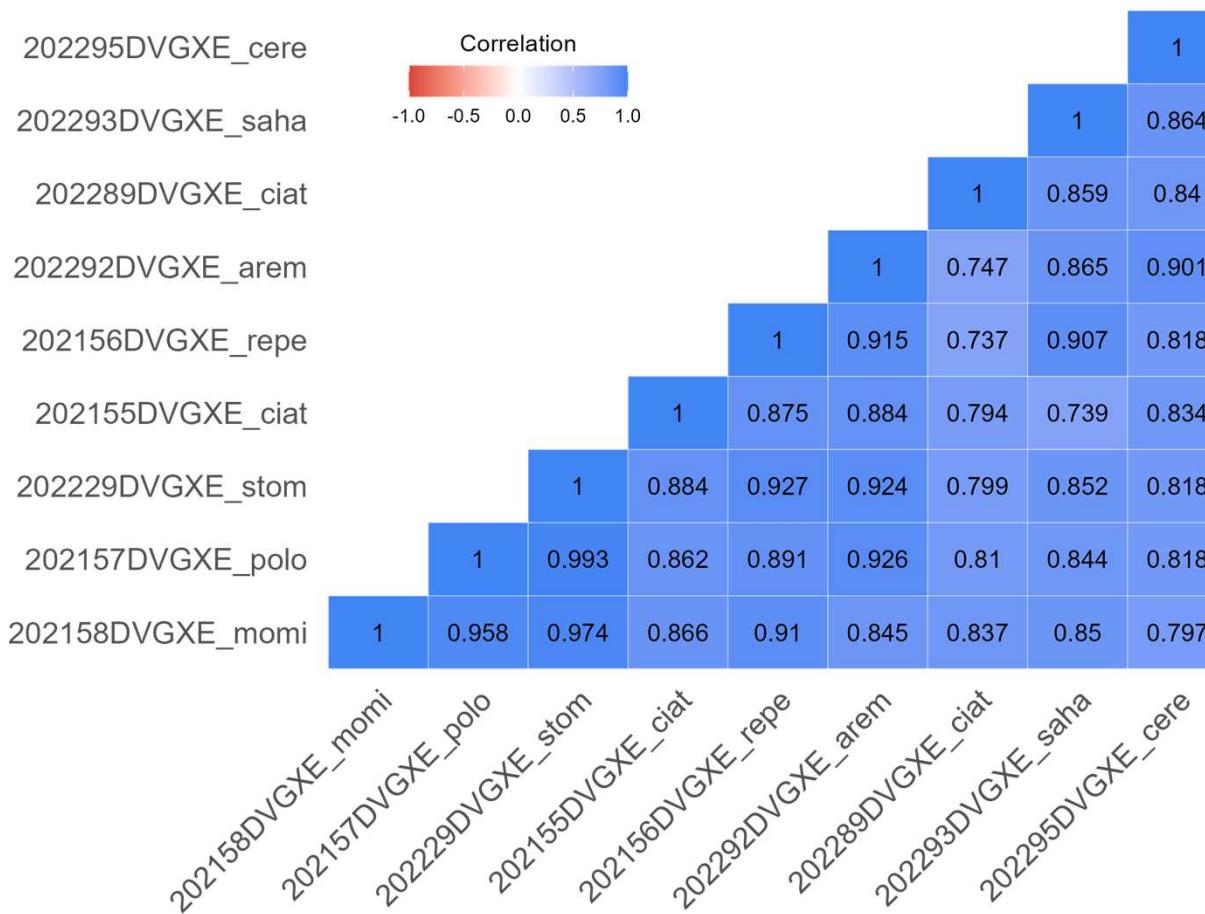
trait	h2
root_skin_color1_3	0.98
carotenoid1_8	0.94
DM_gravity	0.92
height	0.86
height_1st_branch	0.85
branch_number	0.85
lodging1_3	0.8
plant_type	0.78
height_wt_leaf	0.76
DM_yield_ha	0.74
yield_ha	0.73
root_type1_5	0.72
root_weight_plot	0.71
root_peduncle1_3	0.62
root_number_commercial	0.61
root_shape1_6	0.56
vigor1_5	0.53
root_constriction1_3	0.48
root_number	0.45
germination_perc	0.36
germinated_number_plot	0.36
root_length1_3	0.32
frogskin1_5	0.05
root_rot_number	0

For traits with low heritability, please be **careful.** (blue square)

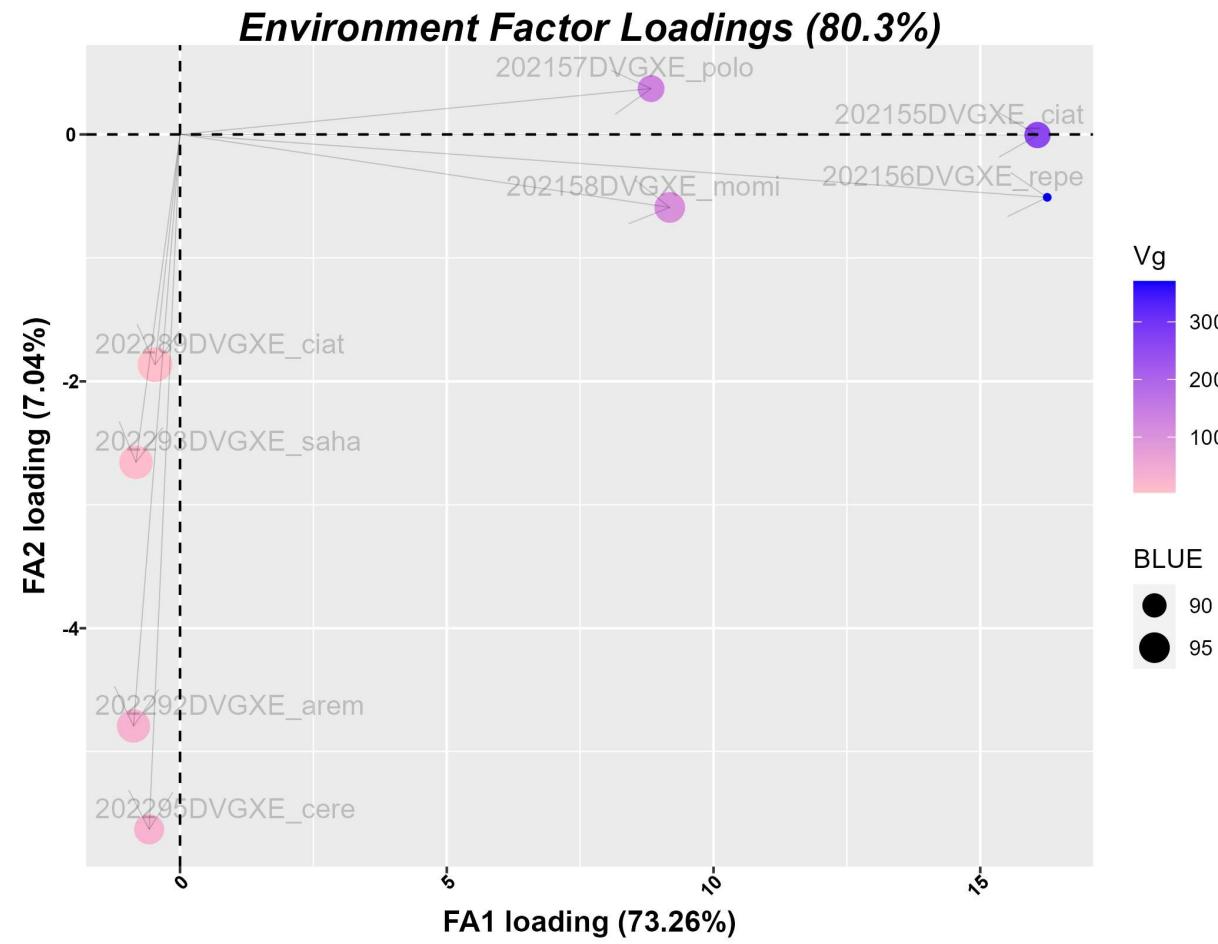
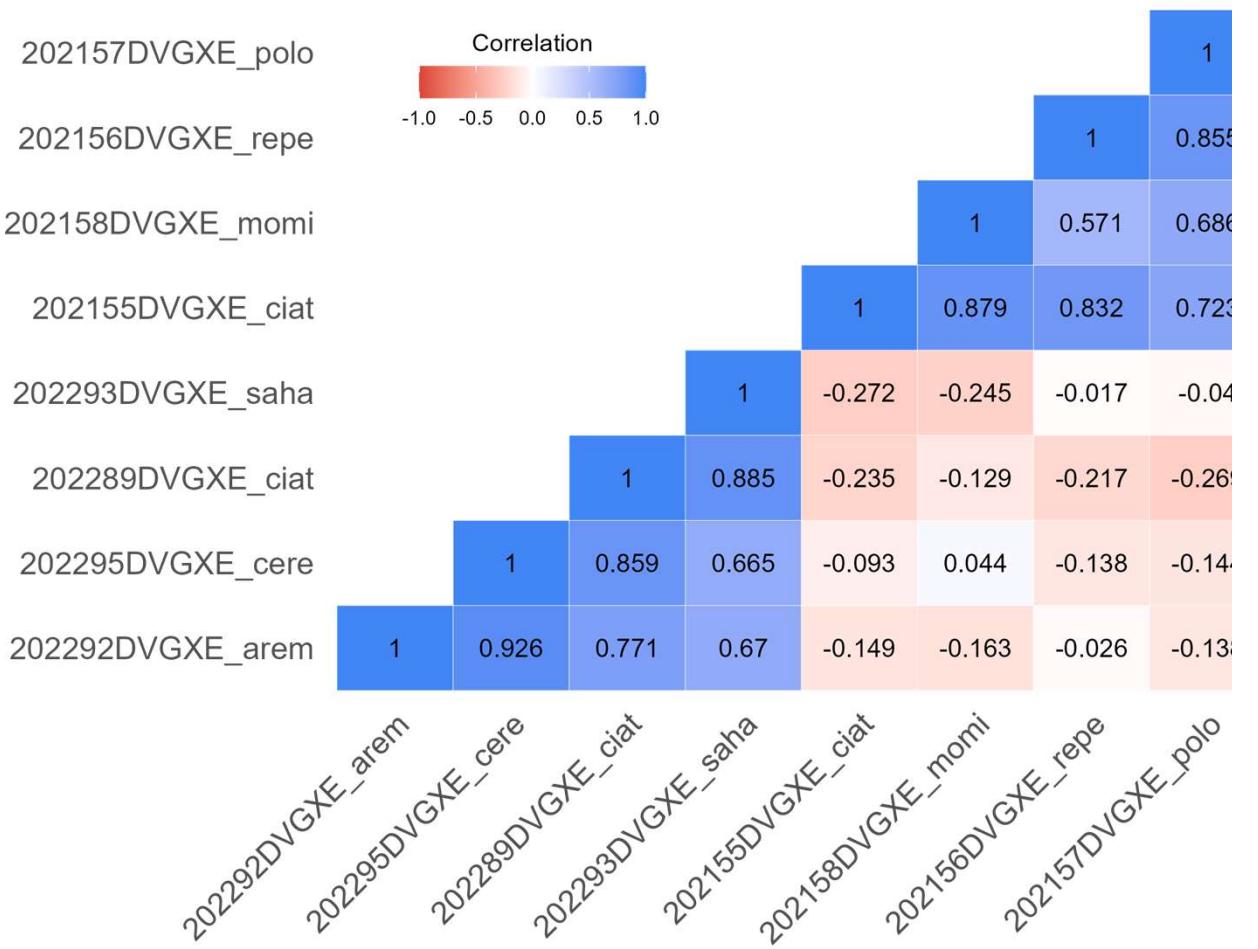
Genotypic Correlation: Locations - Yield



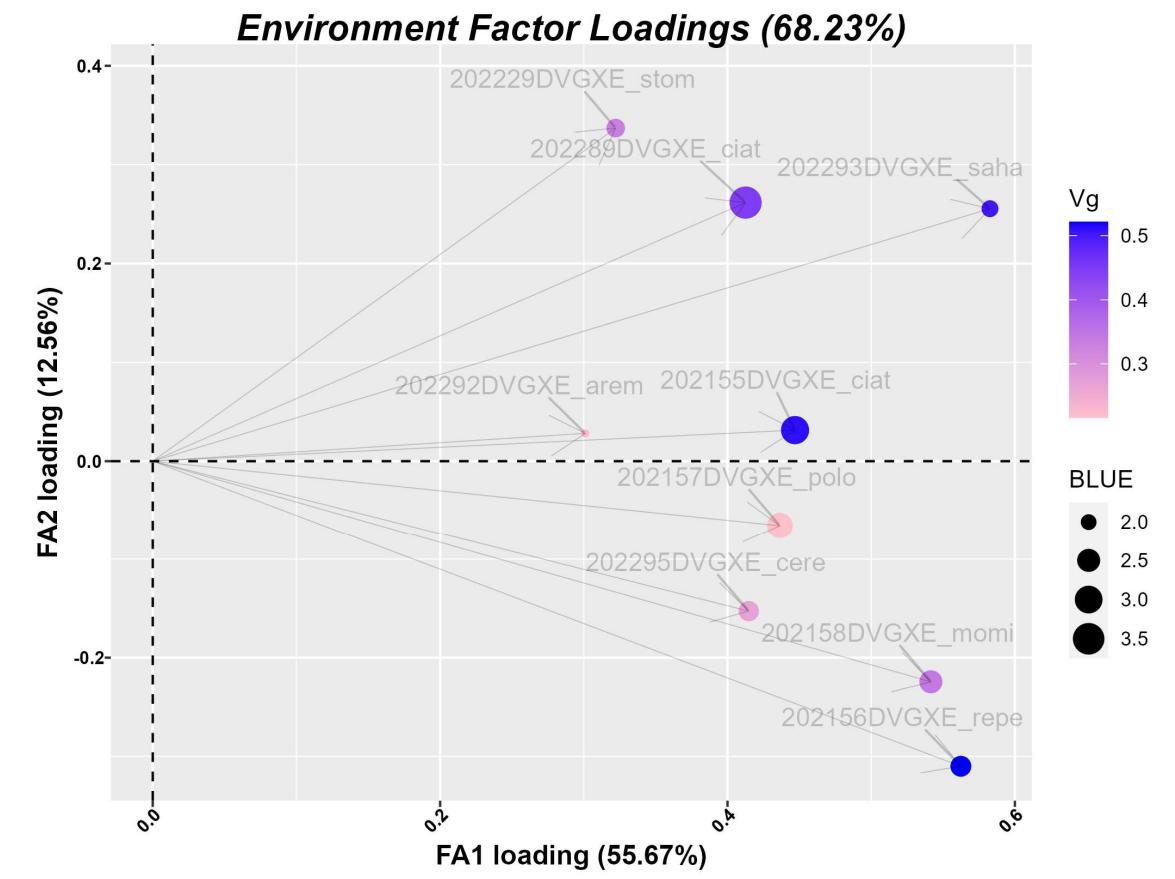
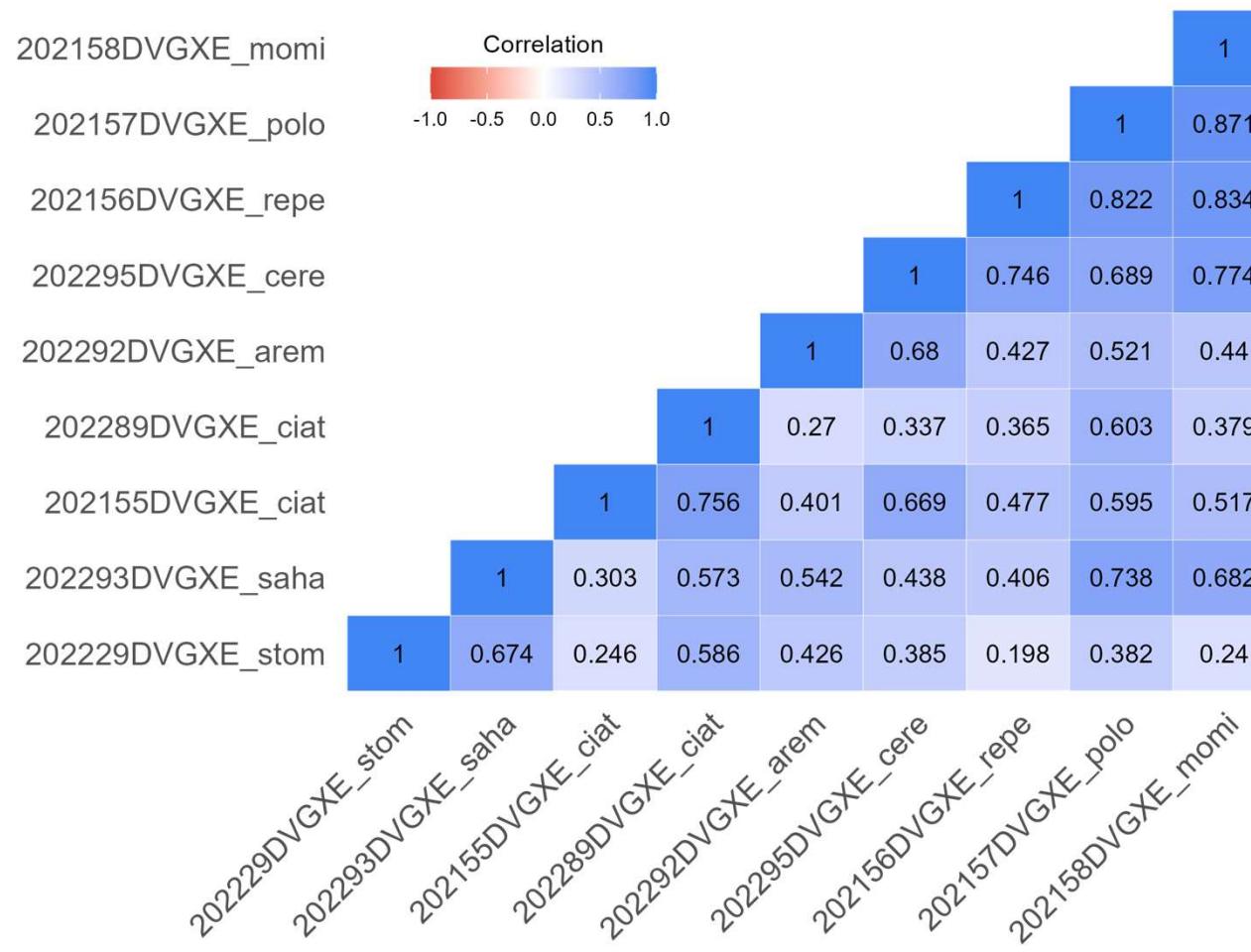
Genotypic Correlation: Locations – Dry Matter



Genotypic Correlation: Locations – Germination

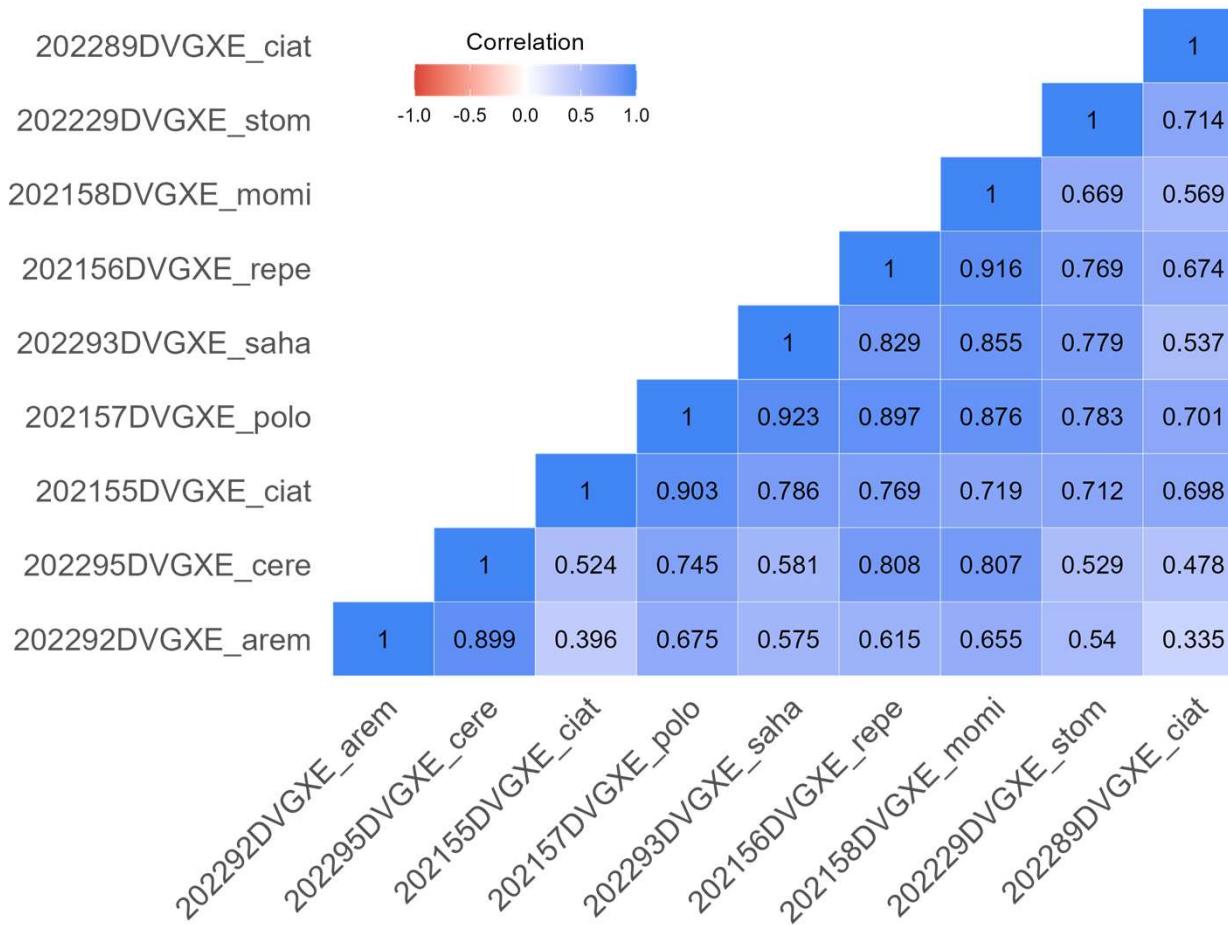


Genotypic Correlation: Locations – Plant type

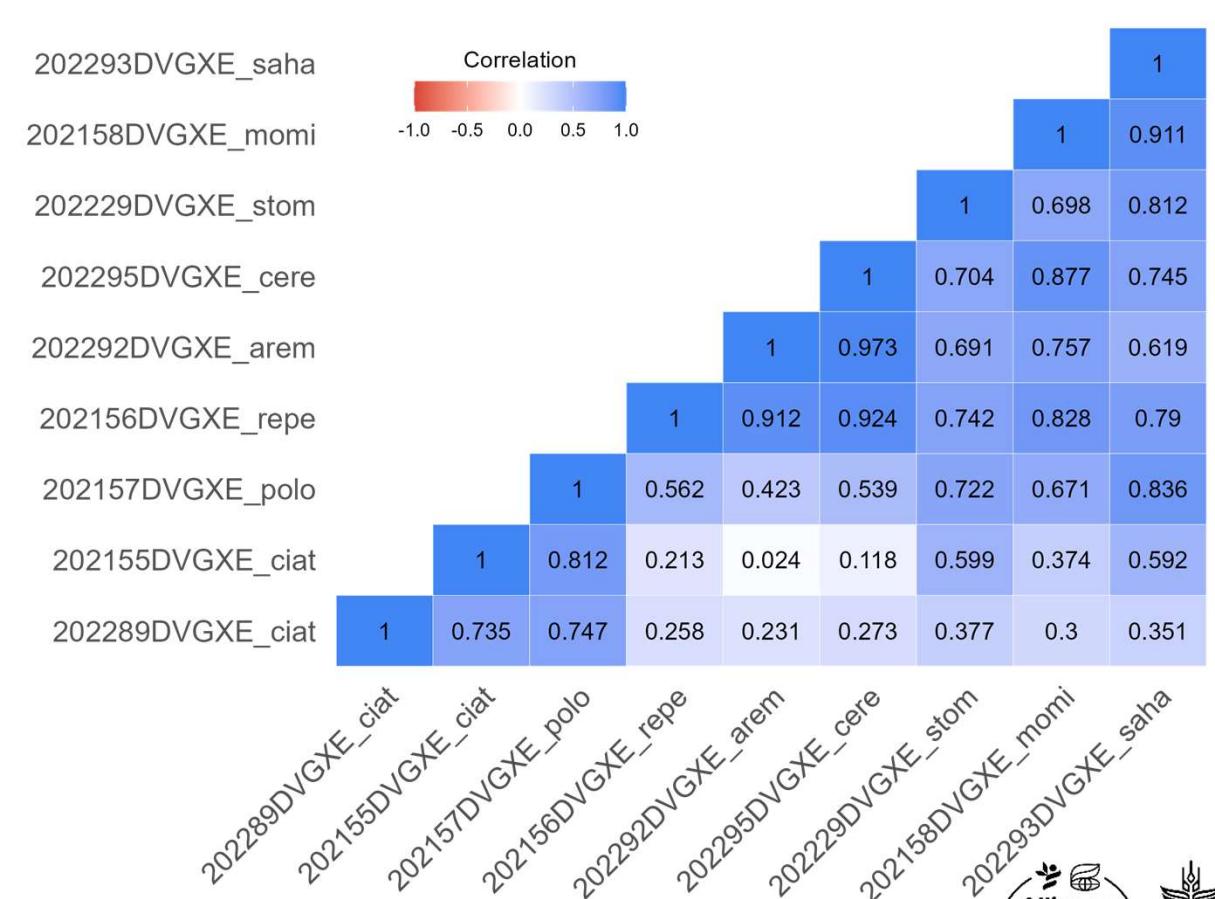


Genotypic Correlation: Locations

Height 1st branch



Branch number



Genotypic Correlation: Traits

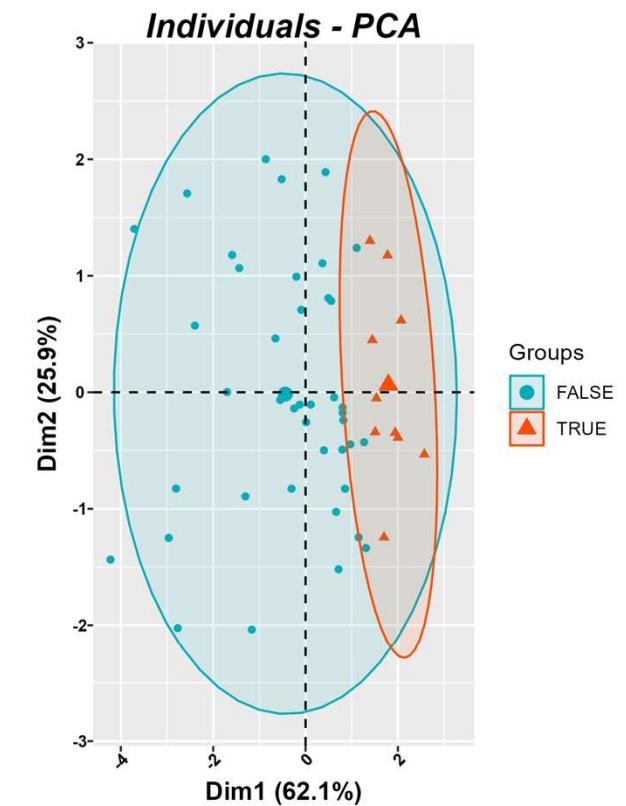
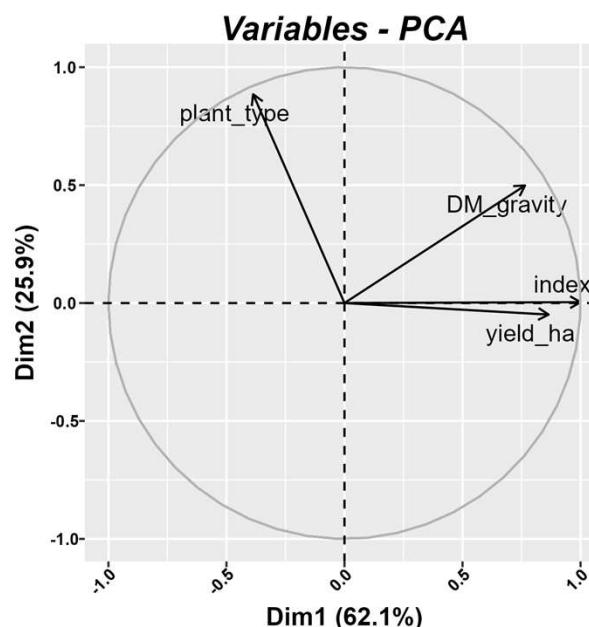
	branch_number	carotenoid1_8	DM_gravity	DM_yield_ha	frogskin1_5	germinated_number_plot	germination_perc	height	height_1st_branch	height_wt_leaf	lodging1_3	plant_type	root_constriction1_3	root_length1_3	root_number	root_number_commercial	root_peduncle1_3	root_rot_number	root_shape1_6	root_skin_color1_3	root_type1_5	vigor1_5	yield_ha
carotenoid1_8	-0.24 ns																						
DM_gravity	-0.14 ns	-0.3 ns																					
DM_yield_ha	-0.29 ns	-0.15 ns	0.65 ***																				
frogskin1_5	-0.24 ns	-0.27 ns	0.31 ns	0.2 ns																			
germinated_number_plot	-0.18 ns	-0.01 ns	0.28 ns	0.42 ns	0.16 ns		1 ***																
germination_perc	-0.18 ns	-0.01 ns	0.28 ns	0.42 ns	0.16 ns																		
height	-0.28 ns	0.03 ns	-0.42 ns	-0.11 ns	-0.03 ns	-0.18 ns	-0.18 ns																
height_1st_branch	-0.77 ***	0.16 ns	-0.15 ns	0.01 ns	0.11 ns	-0.03 ns	-0.03 ns	-0.03 ns	0.58 **														
height_wt_leaf	-0.25 ns	0.45 ns	-0.42 ns	-0.14 ns	-0.22 ns	-0.31 ns	-0.31 ns	0.52 *	0.27 ns														
lodging1_3	0.37 ns	0.21 ns	-0.47 ***	-0.67 ns	-0.31 ns	-0.39 ns	-0.39 ns	0.1 ns	-0.07 ns	0.22 ns													
plant_type	0.61 ***	-0.12 ns	0.04 ns	-0.22 ns	-0.17 ns	-0.16 ns	-0.16 ns	-0.64 ***	-0.69 ***	-0.27 ns	0.47 ns												
root_constriction1_3	0.11 ns	0.07 ns	-0.24 ns	-0.13 ns	0.05 ns	0.03 ns	0.03 ns	0.15 ns	-0.05 ns	0.1 ns	0.14 ns	-0.02 ns											
root_length1_3	0.1 ns	0.01 ns	0.02 ns	0.35 ns	0 ns	0.24 ns	0.24 ns	0 ns	-0.12 ns	-0.04 ns	-0.19 ns	-0.03 ns	-0.15 ns										
root_number	-0.43 ns	0 ns	0.18 ns	0.54 *	0.16 ns	0.13 ns	0.13 ns	0.35 ns	0.42 ns	0.13 ns	-0.28 ns	-0.5 *	0.03 ns	0 ns									
root_number_commercial	-0.26 ns	-0.1 ns	0.48 ns	0.88 ***	0.16 ns	0.54 *	0.54 *	-0.11 ns	-0.05 ns	-0.17 ns	-0.67 ***	-0.26 ns	-0.14 ns	0.36 ns	0.5 ns								
root_peduncle1_3	0.22 ns	0.03 ns	-0.1 ns	-0.05 ns	0.22 ns	0.18 ns	0.18 ns	-0.27 ns	-0.22 ns	-0.18 ns	0.03 ns	0.2 ns	0.05 ns	0.17 ns	-0.25 ns	0.14 ns							
root_rot_number	-0.22 ns	-0.15 ns	-0.07 ns	0.19 ns	0.37 ns	0.06 ns	0.06 ns	0.16 ns	0.17 ns	-0.03 ns	-0.18 ns	-0.04 ns	-0.08 ns	0.09 ns	0.29 ns	0.1 ns	-0.13 ns						
root_shape1_6	-0.05 ns	-0.18 ns	0.13 ns	-0.06 ns	0.22 ns	0.18 ns	0.18 ns	-0.22 ns	-0.11 ns	-0.07 ns	0.15 ns	0.25 ns	-0.24 ns	0.27 ns	-0.18 ns	-0.01 ns	0.19 ns	-0.04 ns					
root_skin_color1_3	-0.1 ns	-0.31 ns	-0.05 ns	-0.01 ns	0.29 ns	0.03 ns	0.03 ns	0.41 ns	0.22 ns	-0.06 ns	-0.1 ns	-0.3 ns	-0.14 ns	-0.03 ns	0.23 ns	0.03 ns	0.17 ns	0.27 ns	0.07 ns				
root_type1_5	0.16 ns	0.1 ns	-0.33 ns	-0.74 ***	0.07 ns	-0.41 ns	-0.41 ns	0.19 ns	0.14 ns	0.09 ns	0.63 **	0.15 ns	0.2 ns	-0.43 ns	-0.18 ns	-0.74 ***	0.13 ns	-0.13 ns	0.03 ns	0.17 ns			
root_weight_plot	-0.25 ns	-0.11 ns	0.44 ns	0.96 ***	0.08 ns	0.41 ns	0.41 ns	-0.04 ns	0.02 ns	-0.03 ns	-0.65 ***	-0.25 ns	-0.11 ns	0.42 ns	0.54 ns	0.88 ***	-0.08 ns	0.24 ns	-0.12 ns	-0.02 ns	-0.82 ***		
vigor1_5	-0.06 ns	-0.07 ns	0.37 ns	0.65 ***	-0.02 ns	0.36 ns	0.36 ns	0.21 ns	0.02 ns	0 ns	-0.47 ns	-0.35 ns	-0.2 ns	0.24 ns	0.41 ns	0.6 **	-0.16 ns	0.07 ns	-0.16 ns	0.22 ns	-0.49 ***	0.65 ***	
yield_ha	-0.25 ns	-0.1 ns	0.43 ns	0.95 ***	0.08 ns	0.4 ns	0.4 ns	-0.03 ns	0.04 ns	-0.03 ns	-0.63 **	-0.25 ns	-0.09 ns	0.43 ns	0.57 **	0.86 ***	-0.08 ns	0.25 ns	-0.13 ns	-0.02 ns	-0.79 ***	1 ***	0.64 ***

A

Selection comments

- 1) DM_gravity, plant_type & yield_ha were used to calculate index selection.
- 2) Scores given were:
 - DM_gravity = 10
 - plant_type = -5
 - yield_ha = 10
- 3) Percentage to be selected: 20%

B





Thank you!