



BCPRC 6 environments in the north Cost – Data analysis

**202224BCEAR_cere
202255BCEAR_stom
202328BCPRC_repe
202329BCPRC_stom
202327BCPRC_cere
202326BCPRC_saha**

Breeding team - Colombia
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Palmira, March 2024

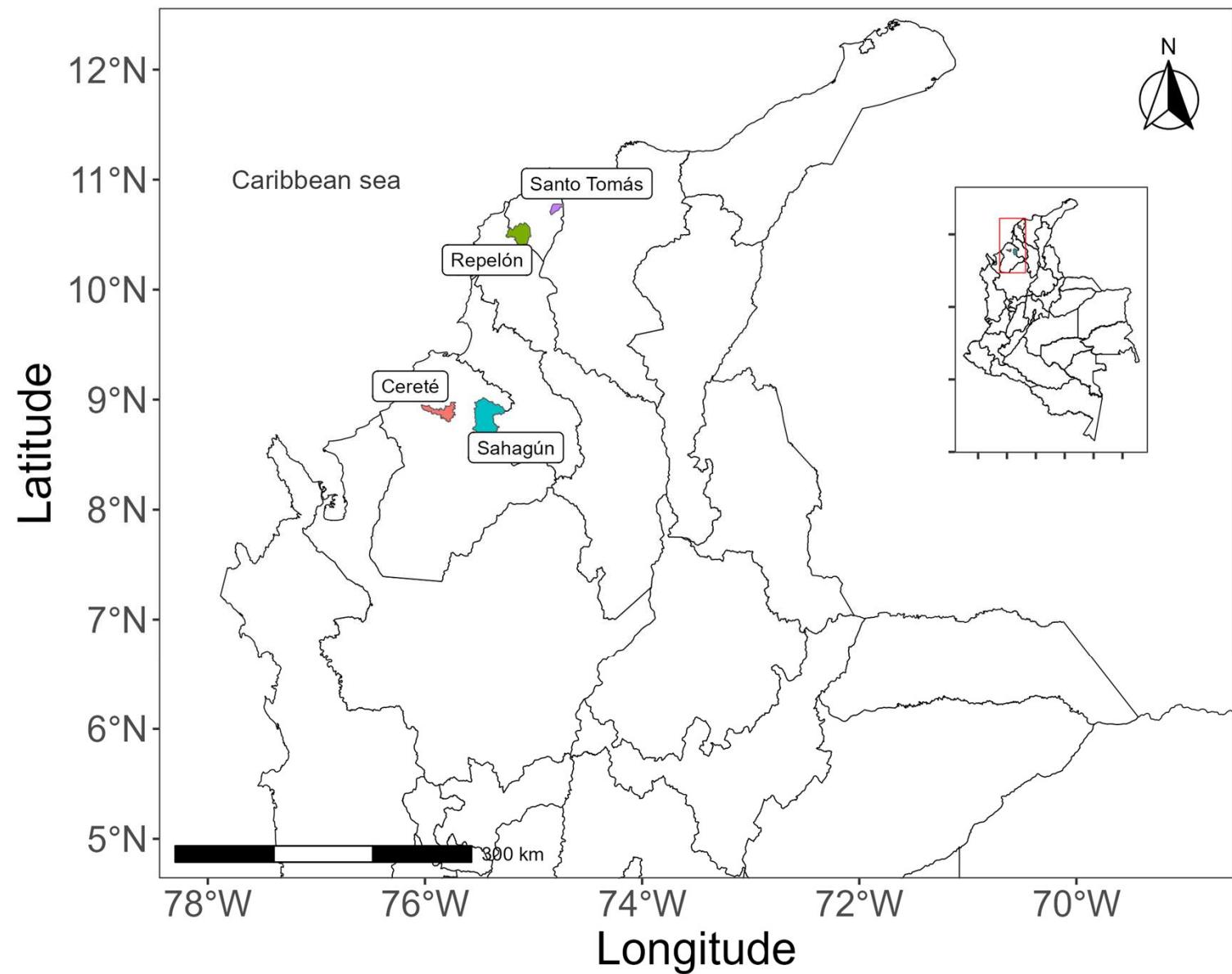


@BiovIntCIAT_eng
@BiovIntCIAT_esp

#Alliance4Science

Locations - Introduction

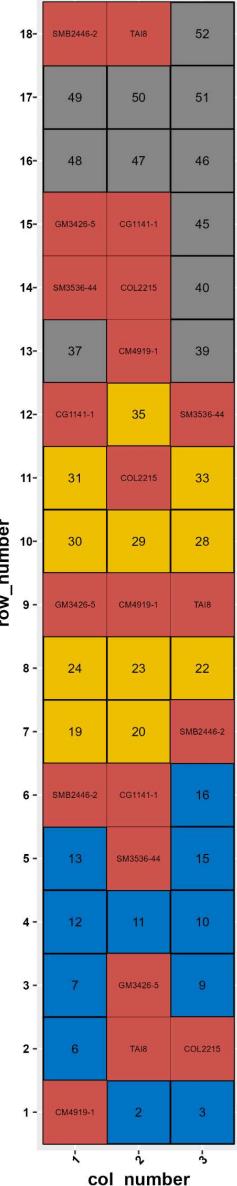
- Santo Tomás
- Repelón
- Cereté
- Sahagún



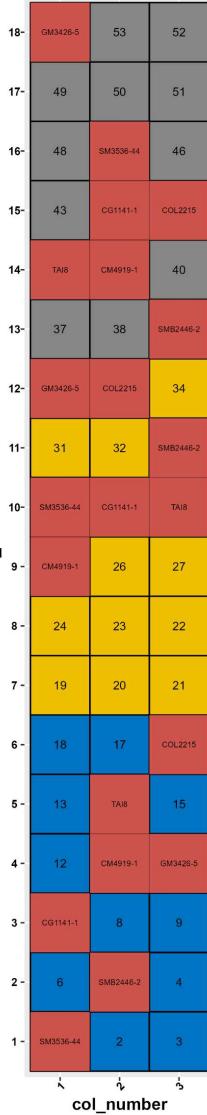
Trial Design 2023 – Resolvable Row col

Check varieties are completely randomized

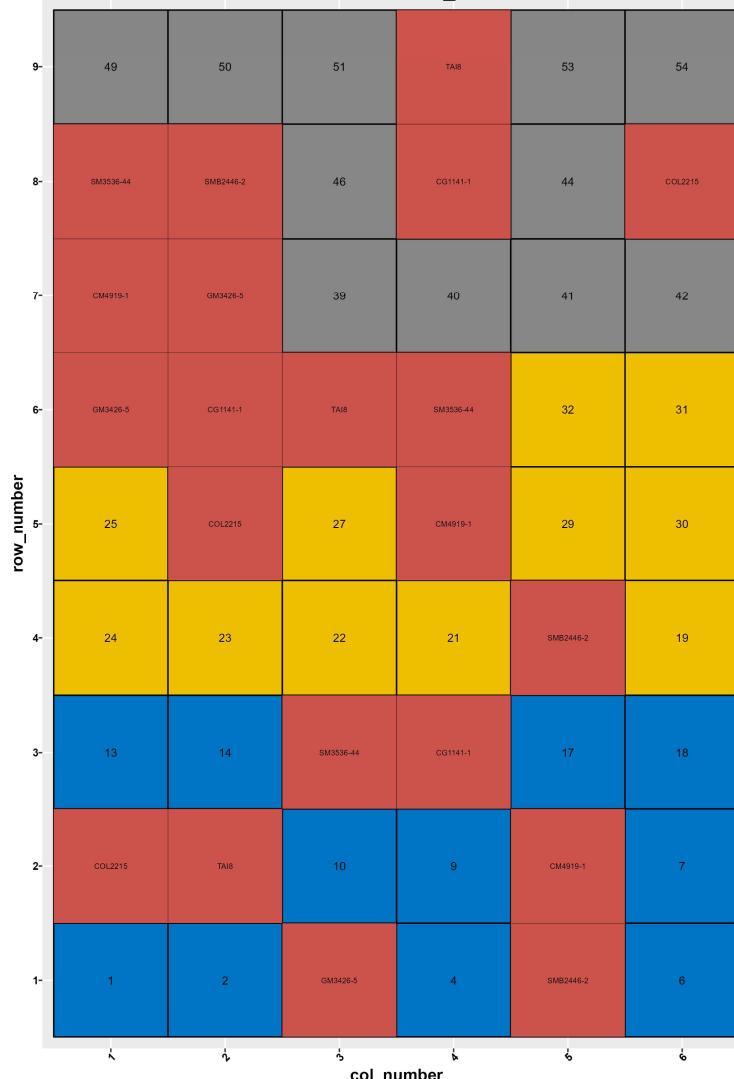
202329BCPRC_stom



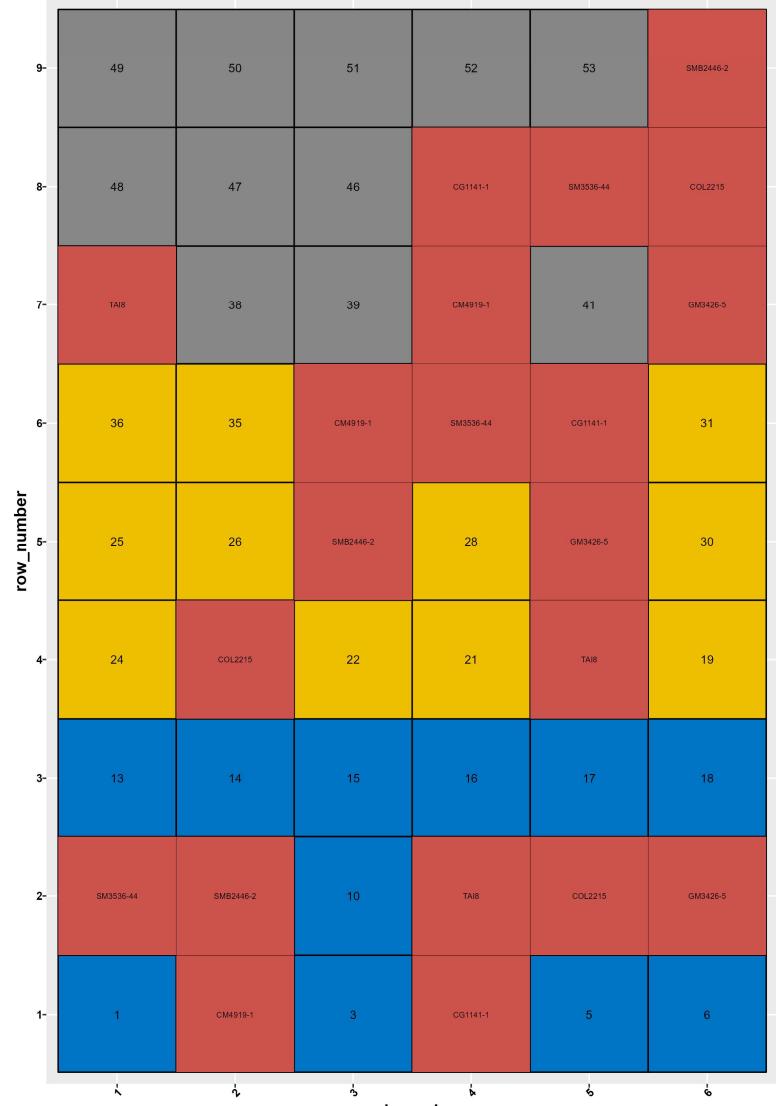
202328BCPRC_repe



202327BCPRC_cere

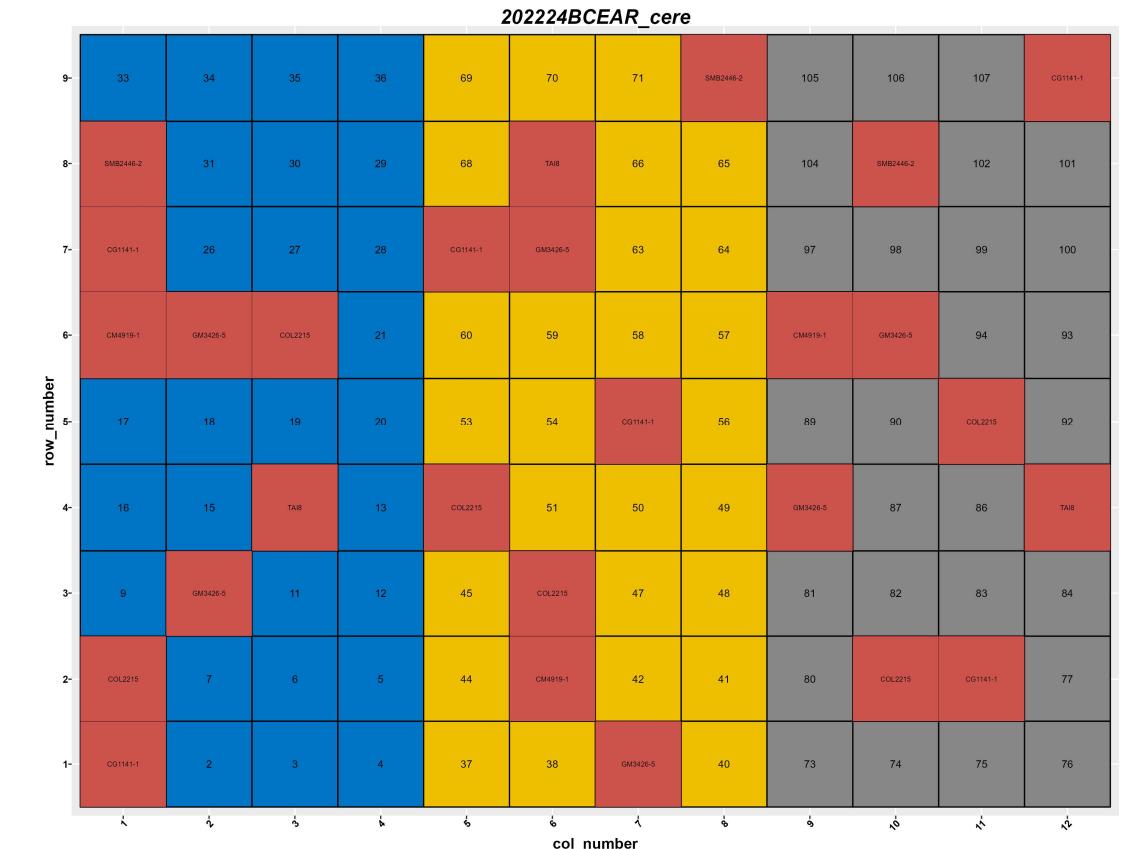
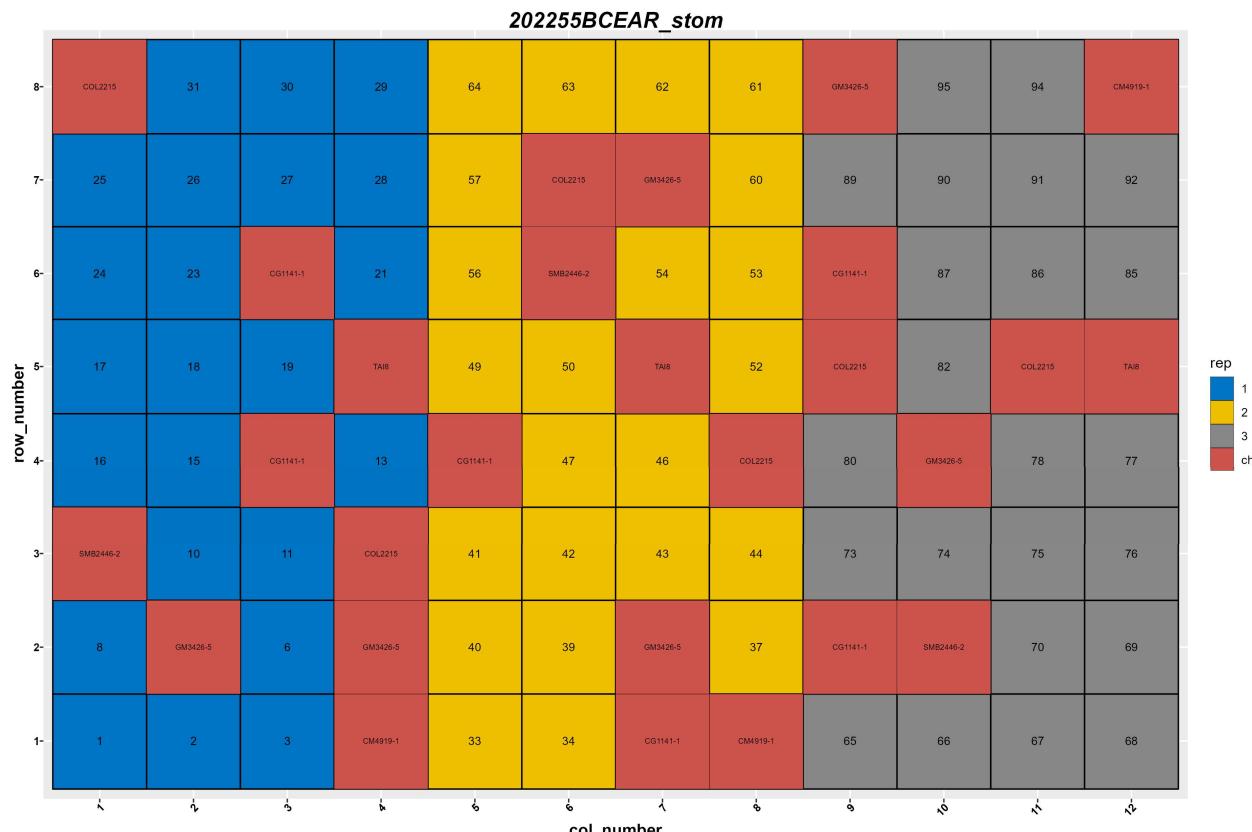


202326BCPRC_saha



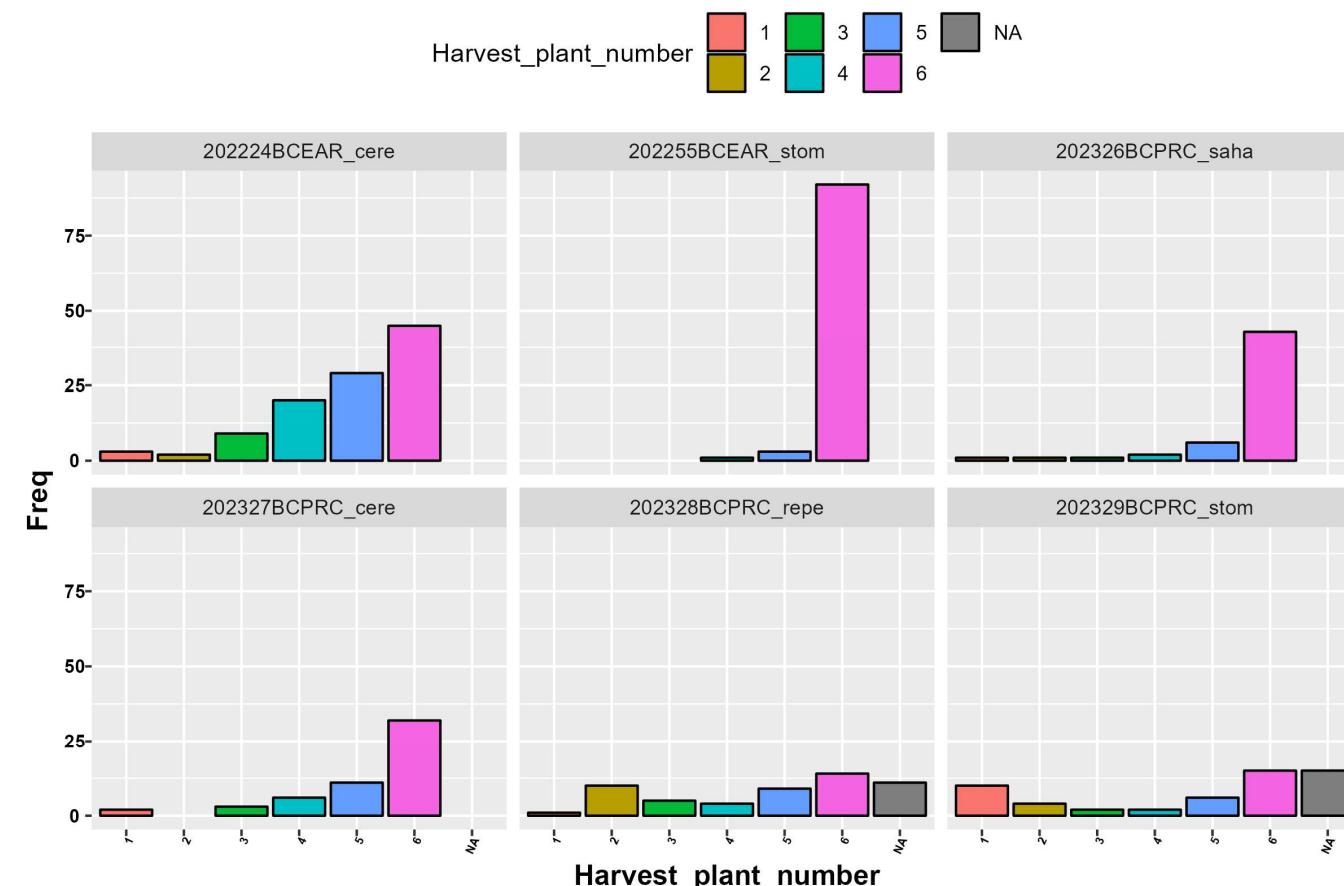
Trial Design 2022 – Resolvable Row col

Check varieties are completely randomized



Resolvable row-col with randomized checks

use_trial_name	use_plant_date	use_harvest_date	harvesting_time	use_location	n_gen
202224BCEAR_cere	2022-June-03	2023-April-10	10month 7day	Cerete. Cordoba, Colombia	33
202255BCEAR_stom	2022-August-05	2023-April-10	8month 5day	Santo Tomas. Atlantico, Colombia	29
202326BCPRC_saha	2023-May-31	2024-February-21	8month 21day	Sahagun. Cordoba, Colombia	18
202327BCPRC_cere	2023-May-31	2024-February-22	8month 22day	Cerete. Cordoba, Colombia	18
202328BCPRC_repe	2023-June-02	2024-February-20	8month 18day	Repelon. Atlantico, Colombia	18
202329BCPRC_stom	2023-June-01	2024-February-19	8month 18day	Santo Tomas. Atlantico, Colombia	18



use_trial_name	obs_planted_number_plot	harvested_plants
202224BCEAR_cere	20	6
202255BCEAR_stom	20	6
202326BCPRC_saha	20	6
202327BCPRC_cere	20	6
202328BCPRC_repe	20	6
202329BCPRC_stom	20	6

Check genotypes

CG1141-1_is_Costena

CM4919-1_is_Veronica

COL2215_is_Venezolana

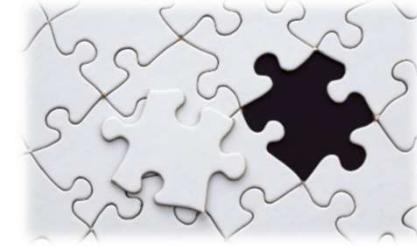
SMB2446-2_is_Caiseli

TAI8_is_TAI

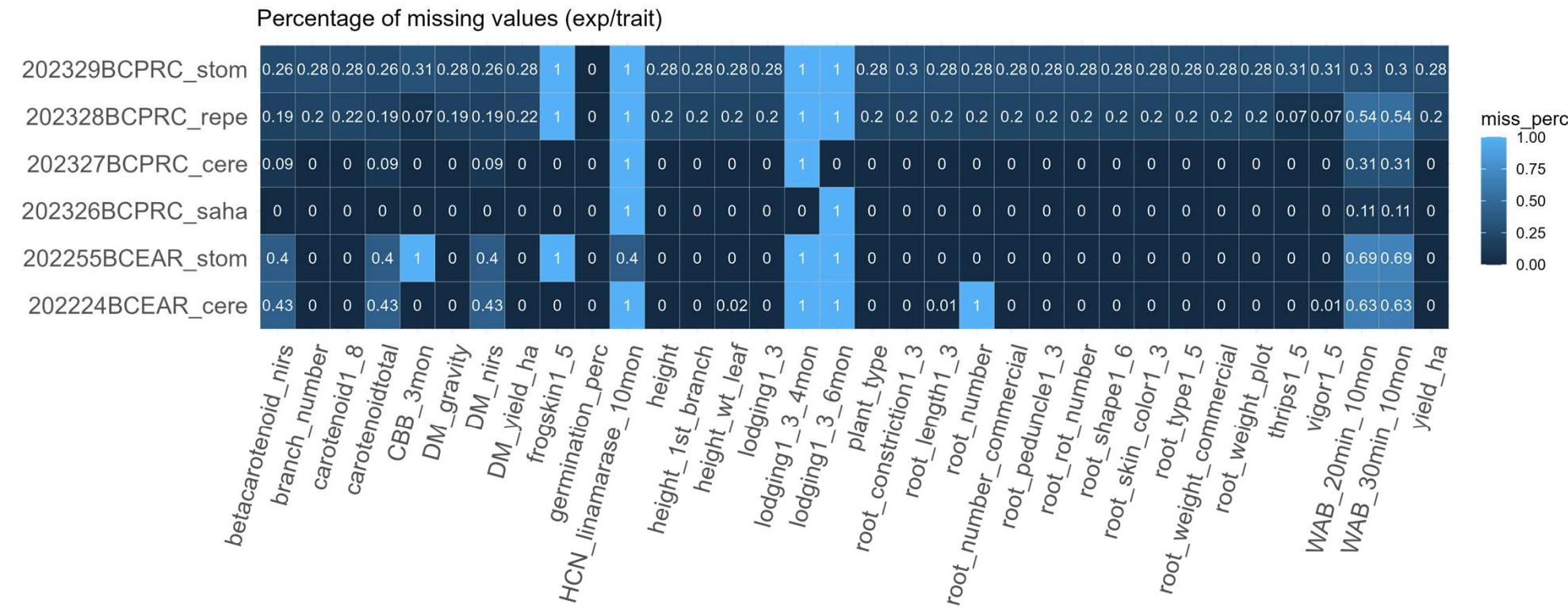


Exploratory data analysis

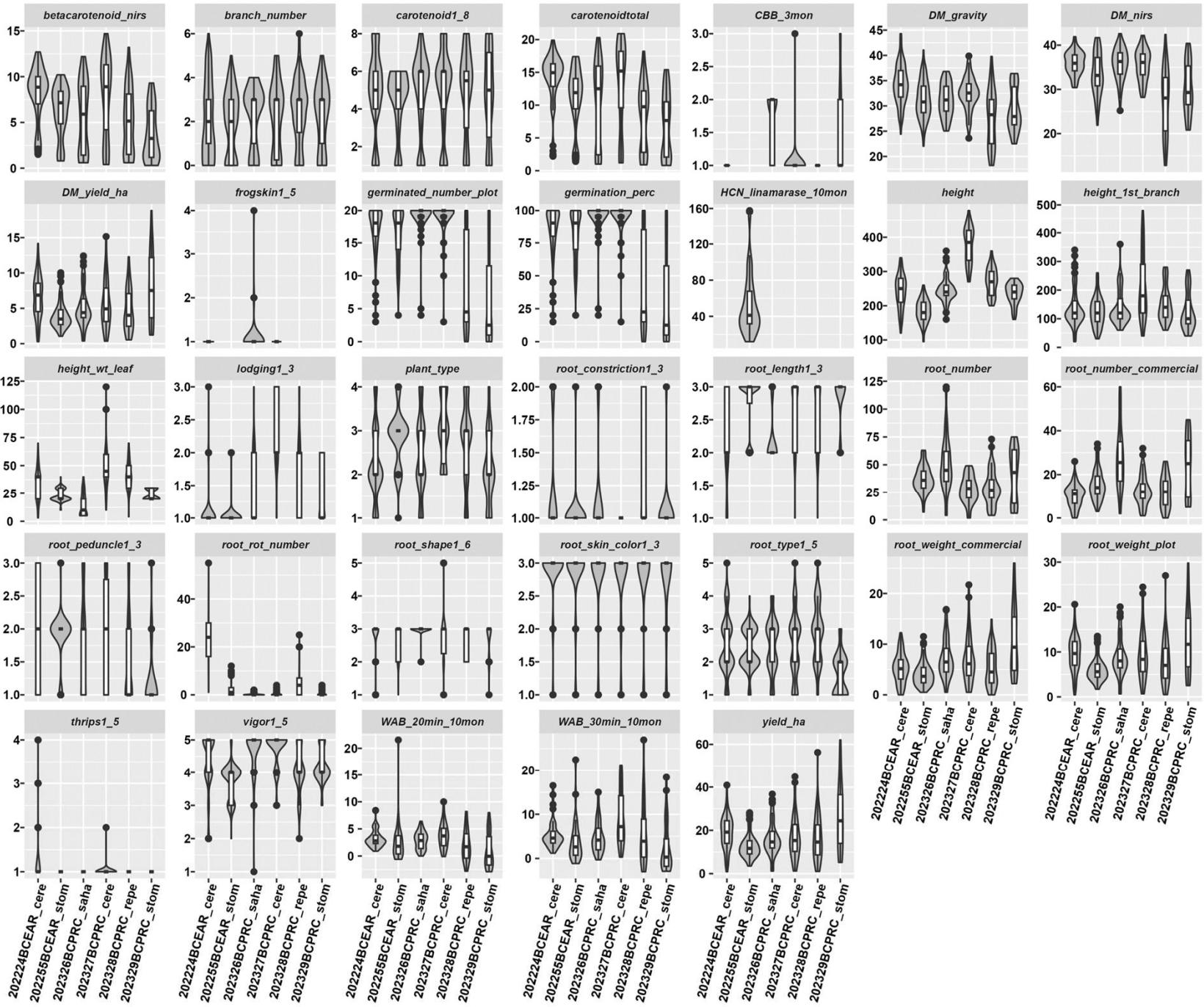
Traits evaluated – missing values



WAB_20min_10mon
WAB_30min_10mon
carotenoidtotal
betacarotenoid_nirs
branch_number
CBB_3mon
DM_gravity
DM_nirs
height_1st_branch
yield_ha
root_weight_plot
frogskin1_5
HCN_linamarase_10mon
vigor1_5
lodging1_3
lodging1_3_6mon
root_number_commercial
root_weight_commercial
plant_type
height
height_wt_leaf
root_skin_color1_3
root_constriction1_3
root_type1_5
root_length1_3
root_number
root_rot_number
root_peduncle1_3
root_shape1_6
thrips1_5
carotenoid1_8
lodging1_3_4mon
germination_perc
DM_yield_ha



Trait variation across trials (phenotypic value)



Shared clones among trials

Connectivity Matrix

202255BCEAR_stom	15	15	15	15	29	29
202224BCEAR_cere	16	16	16	16	33	29
202327BCPRC_cere	18	18	18	18	16	15
202326BCPRC_saha	18	18	18	18	16	15
202328BCPRC_repe	18	18	18	18	16	15
202329BCPRC_stom	18	18	18	18	16	15

202329BCPRC_stom
202328BCPRC_repe
202326BCPRC_saha
202327BCPRC_cere
202224BCEAR_cere
202255BCEAR_stom

Multiple corr trait (phenotypic value)

Multiple corr trait (phenotypic value)

Statistical data analysis

Moderate to high heritability among all locations.

Single heritability

trial	betacarote noid_nirs	branch_n umber	caroten oid1_8	caroteno idtotal	CBB_3 mon	DM_gr avity	DM_nirs	DM_id_ha	frogski n1_5	germinati on_perc	HCN_l inamarah se_10mon	hei ght	height_1st branch	height_w t_leaf	lodgin g1_3	lodging1_ 3_4mon	lodging1_ 3_6mon	plant_type	root_constr iction1_3	root_len gth1_3	root_n umber	root_number_ commercial	root_pedu ncle1_3	root_rot number	root_sh ape1_6	root_skin_c olor1_3	root_ty pe1_5	root_weight_c ommercial	root_weight_p lot	thrip s1_5	vigor 1_5	WAB_20mi n_10mon	WAB_30mi n_10mon	yield ha
202224BCE AR_cere		0.67	0.91			0.78		0.86		0.86		0.55	0.84	0.42	0.41			0.69	0.11	0.44	0.81	0.69	0.74		0	0.97	0.58	0.81	0.84	0.77	0.63			0.84
202255BCE AR_stom		0.91	0.93			0.87		0.87		0.25	0.46	0.86	0.9	0.48	0.0			0.68	0.89	0.26	0.63	0.8	0.68	0.62	0.61	0.97	0.74	0.81	0.82	0.33			0.82	
202326BCP RC_saha	0.97	0.94	0.98	0.99	0.0	0.94	0.9	0.93	0.23	0.83		0.80	0.97	0.69	0.45	0.57		0.84	0.53	0.66	0.85	0.84	0.82	0	0.01	0.98	0.77	0.92	0.01	0.81	0.82	0.92		
202327BCP RC_cere	0.98	0.89	0.99	0.98	0.15	0.86	0.72	0.48		0.71		0.57	0.89	0.47	0.12			0.78	0.74	0.37	0.28	0.65	0.85	0.42	0	0.97	0.58	0.66	0.36	0.01	0.2	0.73	0.87	0.36
202328BCP RC_repe	0.89	0.75		0.89		0.85	0.85	0.09		0.9		0.67	0.84	0.55	0.35			0.77	0.31	0.1	0.59	0.13	0.47	0.21	0.21	0.86	0.42	0	0	0.59			0	
202329BCP RC_stom	0.82	0.78	0.85	0.84	0.47	0.84	0.8	0.68		0.94		0.57	0.74	0.49	0.7			0.68	0	0.77	0.7	0.62	0.68	0	0.69	0.99	0.45	0.59	0.6	0.56	0.81	0.83	0.6	

Traits with heritability
< 0.1 were removed
from the GxE analysis.

202328BCPRC_repe trial had
several plots with several rotten
roots:

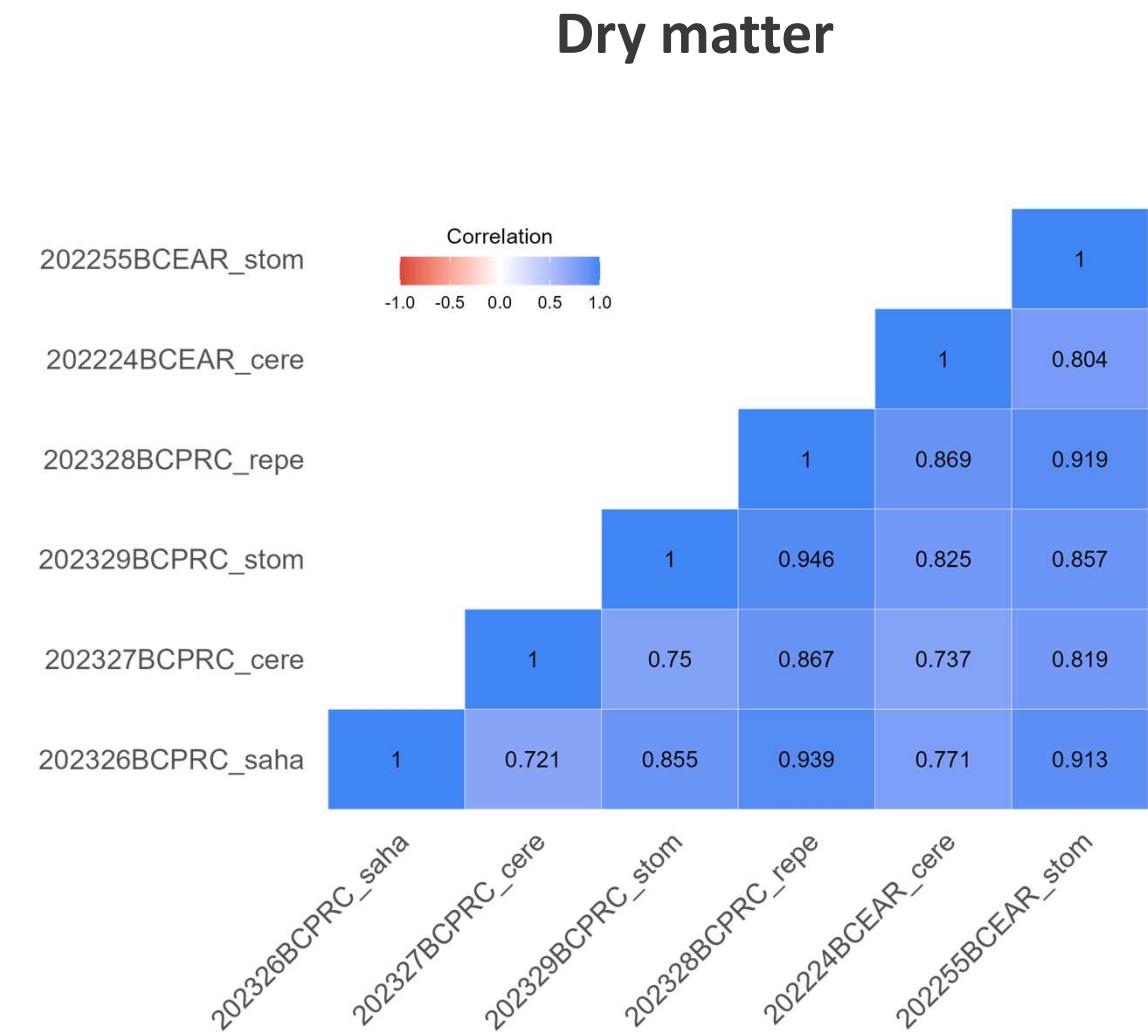
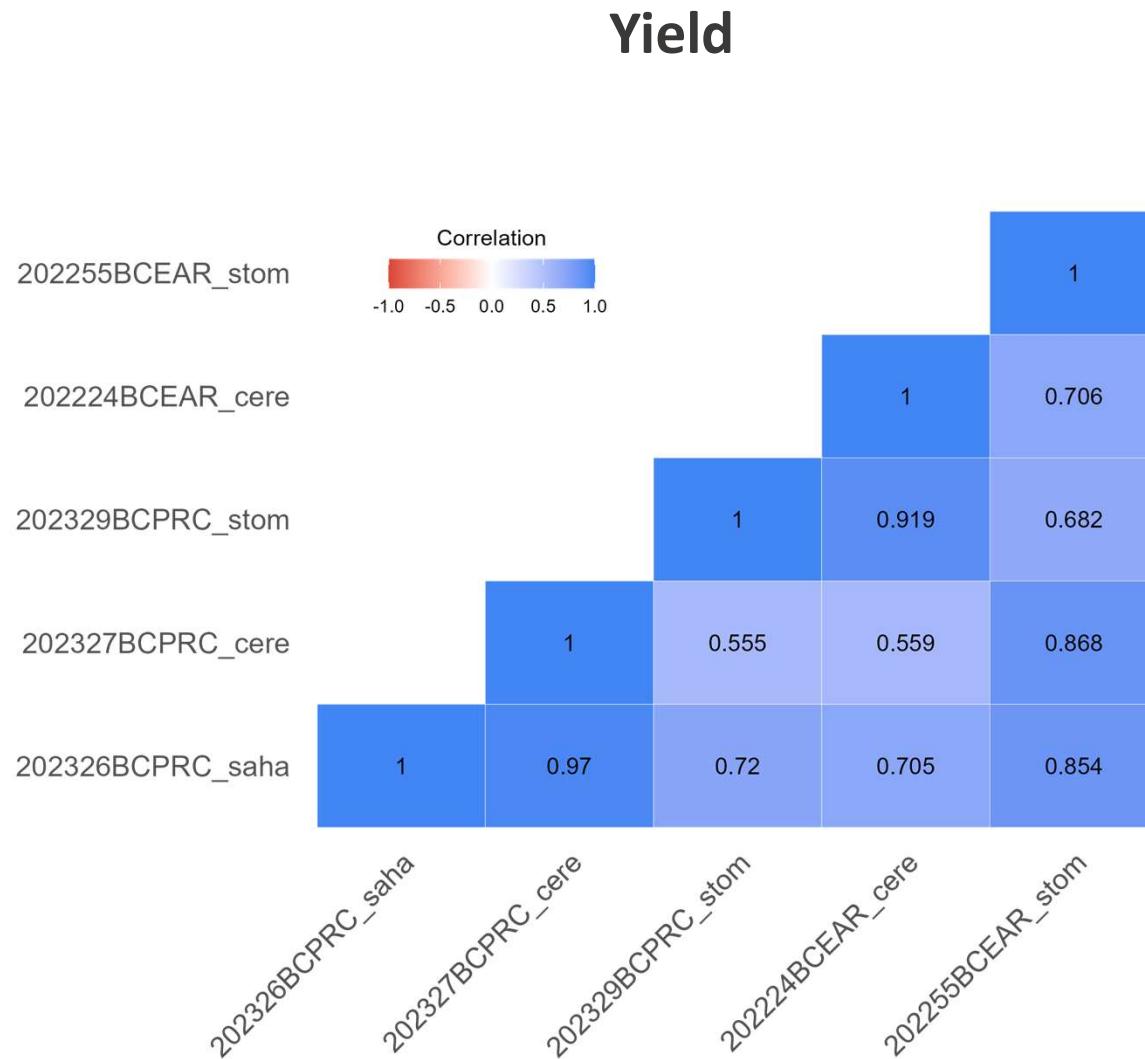
- Very low h² for
 - yield_ha
 - Root_weight_commercial
 - root_weight_plot

Heritability gxe all trials

trait	h2
carotenoidtotal	0.99
betacarotenoid_nirs	0.99
root_skin_color1_3	0.98
carotenoid1_8	0.95
WAB_30min_10mon	0.94
DM_nirs	0.93
WAB_20min_10mon	0.92
branch_number	0.89
DM_gravity	0.88
DM_yield_ha	0.87
height_1st_branch	0.87
root_weight_plot	0.83
yield_ha	0.83
root_weight_commercial	0.81
height	0.79
root_peduncle1_3	0.78
root_number_commercial	0.76
height_wt_leaf	0.68
root_shape1_6	0.68
root_number	0.66
lodging1_3	0.61
germination_perc	0.6
plant_type	0.6
root_type1_5	0.53
root_length1_3	0.43
root_rot_number	0.39
vigor1_5	0.15
root_constriction1_3	0

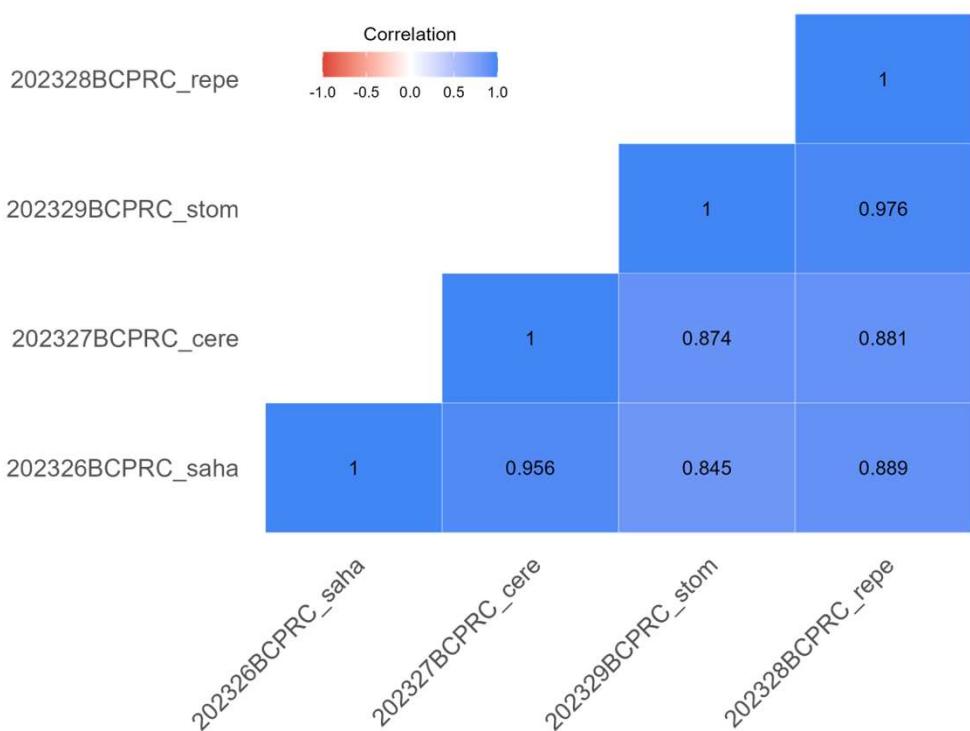
For traits with low heritability, please be **careful**. (blue square)

Genotypic Correlation: Locations

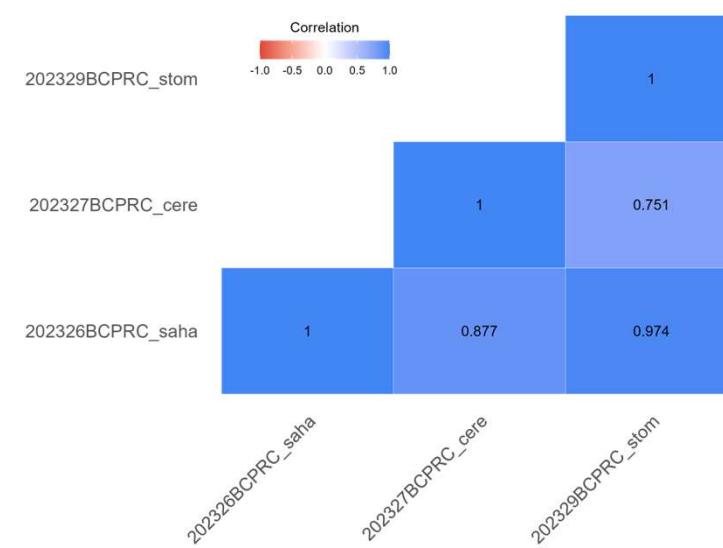


Genotypic Correlation: Locations

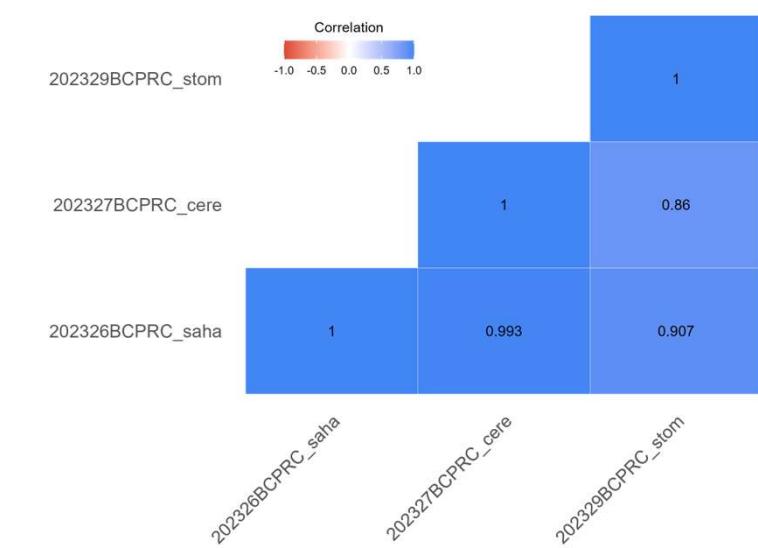
Betacarotenoids



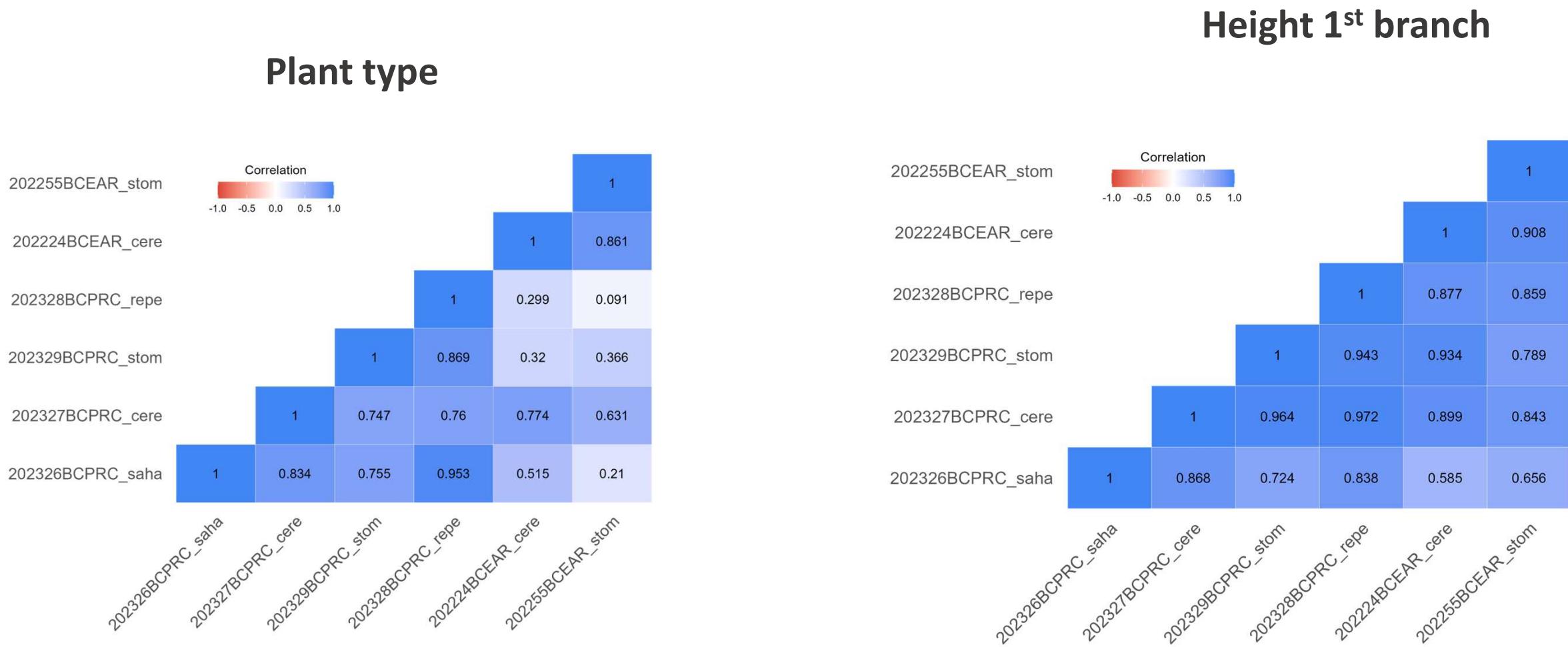
Water absorption 30 min



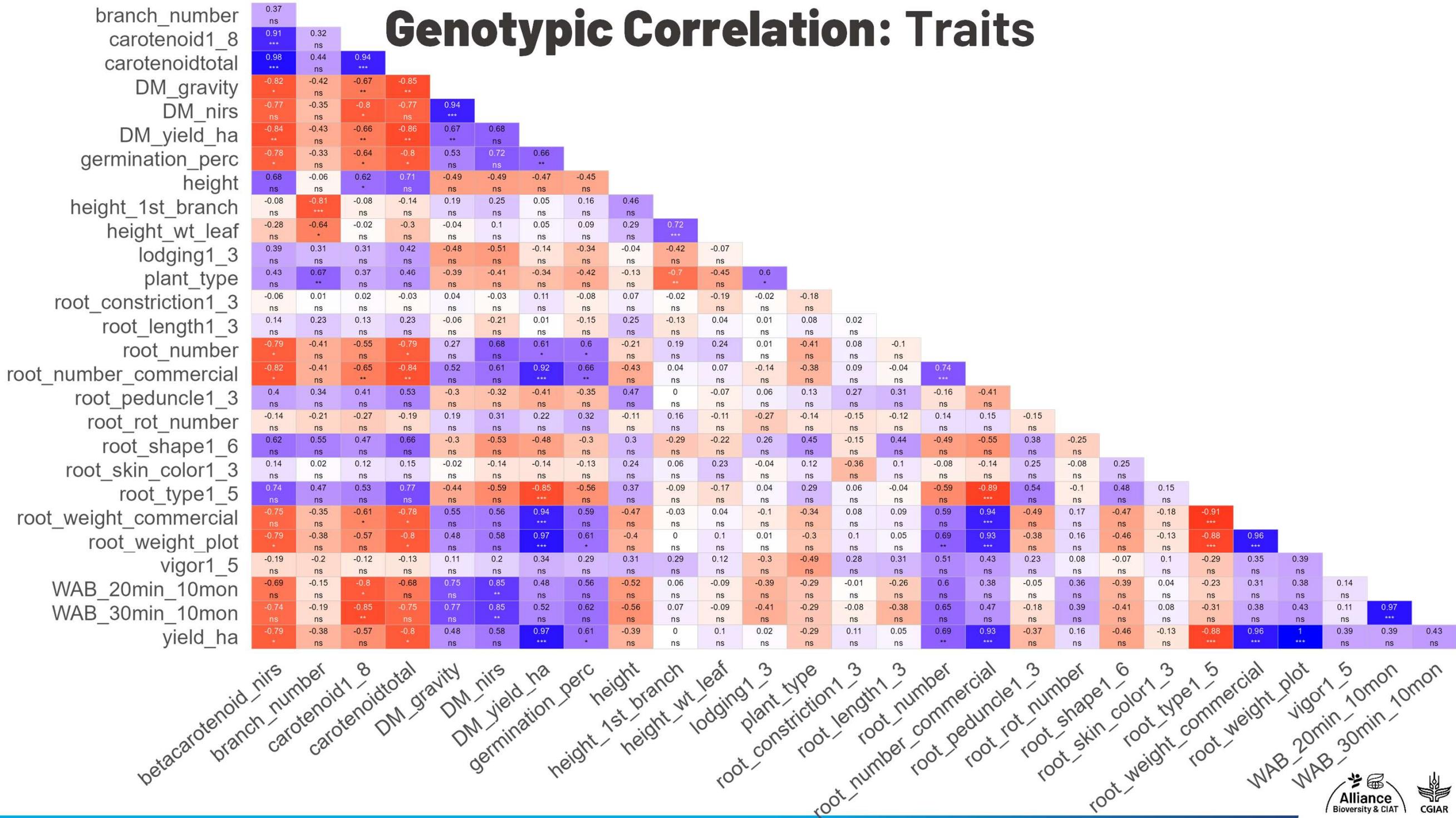
Water absorption 20 min



Genotypic Correlation: Locations



Genotypic Correlation: Traits



Selection suggested

- 1) **DM_gravity, plant_type, yield_ha, betacarotenoid_nirs & WAB_30min_10mon** were used to calculate index selection.
- 2) Weights were calculated using Desire software as follows:
 - **DM_gravity: 2.06**
 - **plant_type: -0.107**
 - **yield_ha: 4.74**
 - **betacarotenoid_nirs: 6.823**
 - **WAB_30min_10mon: 10.48**

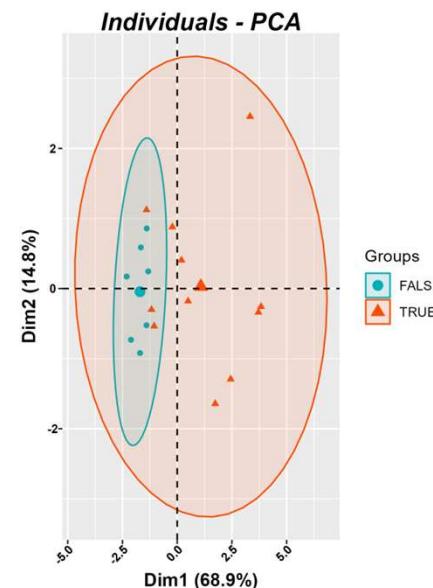
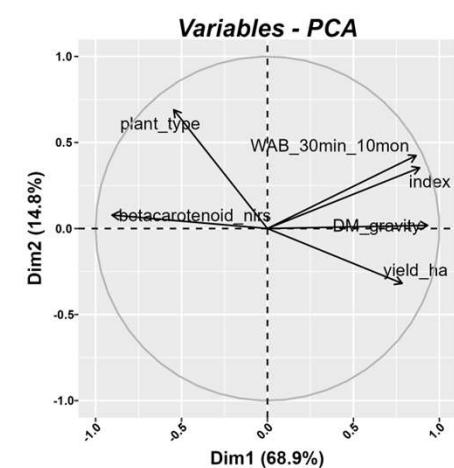
- 3) Percentage to be selected: **60%**

The weights were calculated based on heritability, standard deviation, genetic correlations and desire genetic gain (subjective)



Selections suggested

accession_name	index	selected	DM_gravity	plant_type	yield_ha	betacarotenoid_nirs	WAB_30min_10mon
COL2215_is_Venezolana	19.90114723	TRUE	36.24	3.08	19.64	0.64	15.13
CG1141-1_is_Costena	17.66875916	TRUE	35.35	1.78	23.76	1.01	12.64
SMB2446-2_is_Caiseli	15.50048138	TRUE	36.59	1.91	24.44	1.22	10.97
SM4952-5	9.305168841	TRUE	29.82	2.74	17.15	8.91	6.54
TAI8_is_TAI	4.246021633	TRUE	34.13	2.25	31.03	1.07	4.99
GM3426-5	1.461747671	TRUE	30.92	2.29	16.45	4.36	7.01
SM5008-33	-0.956852038	TRUE	31.86	2.65	14.35	4.07	6.72
GM4486-11	-1.156033949	TRUE	29.34	3.12	12.66	8.1	4.62
GM11319-3	-2.250784791	TRUE	30.92	2.35	12.03	9.54	2.61
CM4919-1_is_Veronica	-2.346703037	TRUE	34.08	2.08	25.95	1.27	3.83
SM4850-8	-2.76204396	TRUE	29.88	2.34	14.76	8.6	2.58
SM4891-13	-5.283839654	FALSE	28.84	3.28	15.92	6.2	3.58
SM4963-25	-5.688827132	FALSE	31.81	3.2	18.45	8.16	-0.02
GM11365-2	-6.485932392	FALSE	29.68	3.22	15.54	7.55	1.81
SM4569-17	-9.575082013	FALSE	27.41	2.65	16.74	8.62	-0.14
SM5564-6	-10.18182276	FALSE	29.32	2.76	8.11	8.83	1.8
GM11781-1	-10.24966706	FALSE	30.42	2.25	10.67	8.47	0.82
SM3536-44	-11.14573712	FALSE	28	2.7	16.35	5	2.23





Thank you!