



Data analysis DVGN6

**202101DVGN6_ciati
202109DVGN6_momi
202206DVGN6_ciati
202232DVGN6_momi**

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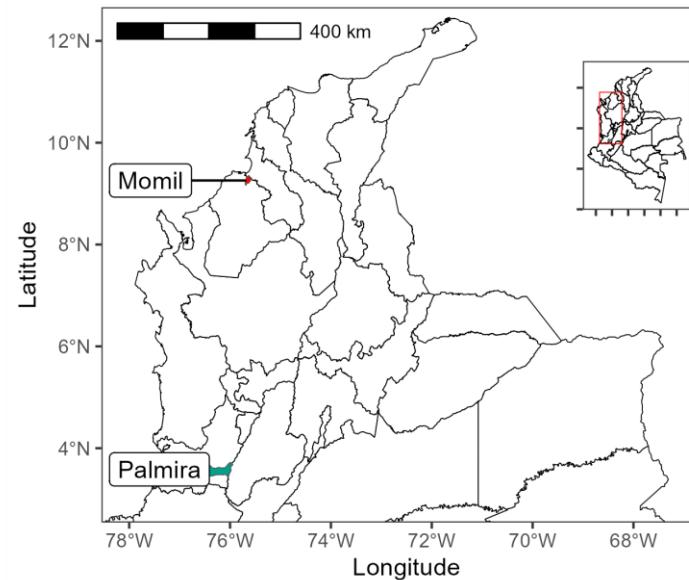


@BiovIntCIAT_eng
@BiovIntCIAT_esp

#Alliance4Science

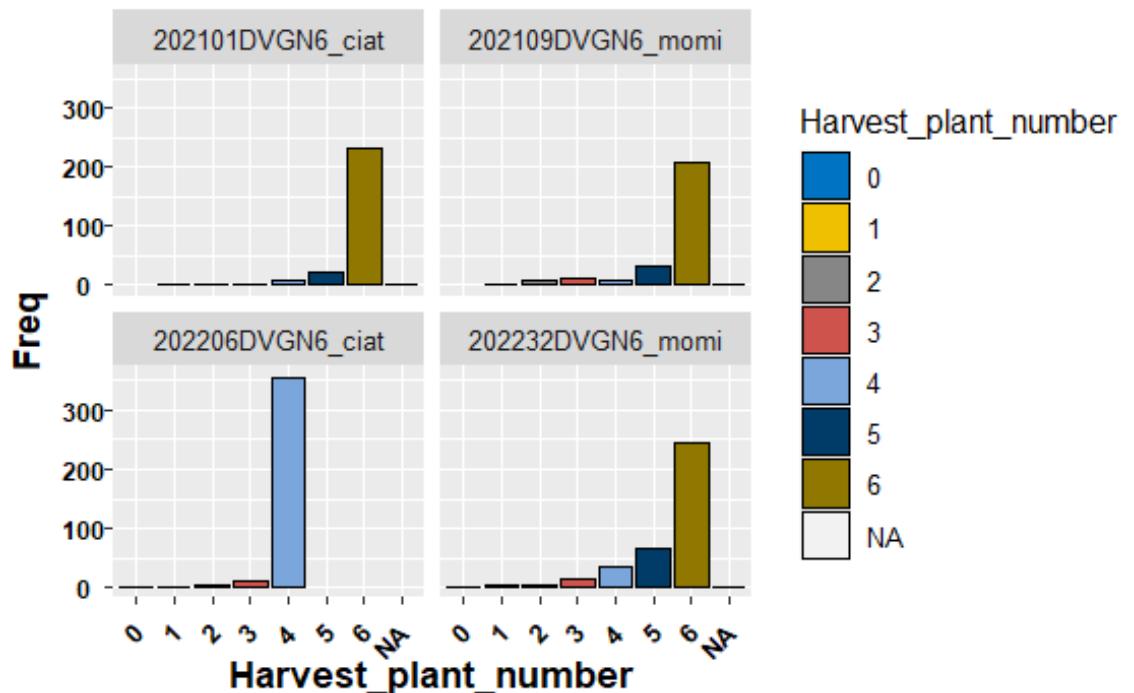
Resolvable row-col with randomized checks

Trial_name	Plant_date	Harvest_date	Harvesting_time	Location	n_gen
202101DVGN6_ciat	2021-March-03	2022-February-04	11month 1day	CIAT. Valle, Colombia	136
202109DVGN6_momi	2021-April-21	2022-March-02	10month 9day	Momil. Cordoba, Colombia	136
202206DVGN6_ciat	2022-March-31	2023-March-03	11month 3day	CIAT. Valle, Colombia	184
202232DVGN6_momi	2022-May-18	2023-February-25	9month 7day	Momil. Cordoba, Colombia	183

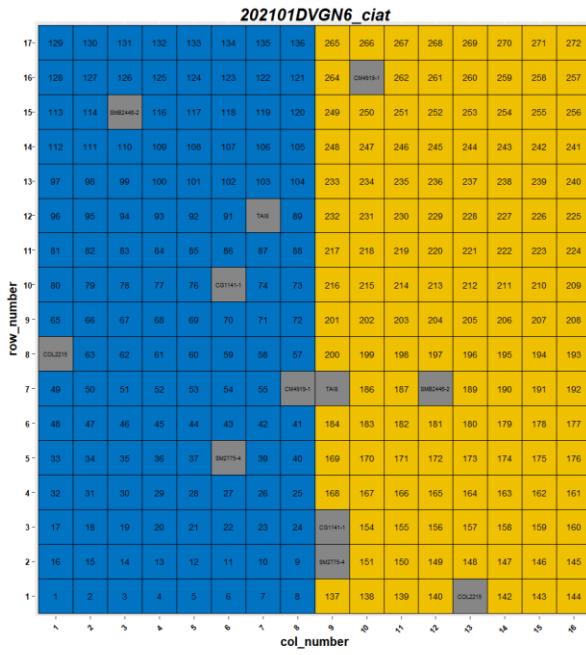


Plot size:

- 202101DVGN6_ciat: **20** plants per plot, harvesting **6** plants for yield
- 202109DVGN6_momi: **20** plants per plot, harvesting **6** plants for yield
- 202206DVGN6_ciat: **10** plants per plot, harvesting **4** plants for yield
- 202232DVGN6_momi: **10** plants per plot, harvesting **6** plants for yield



Trial Design – Resolvable row-col



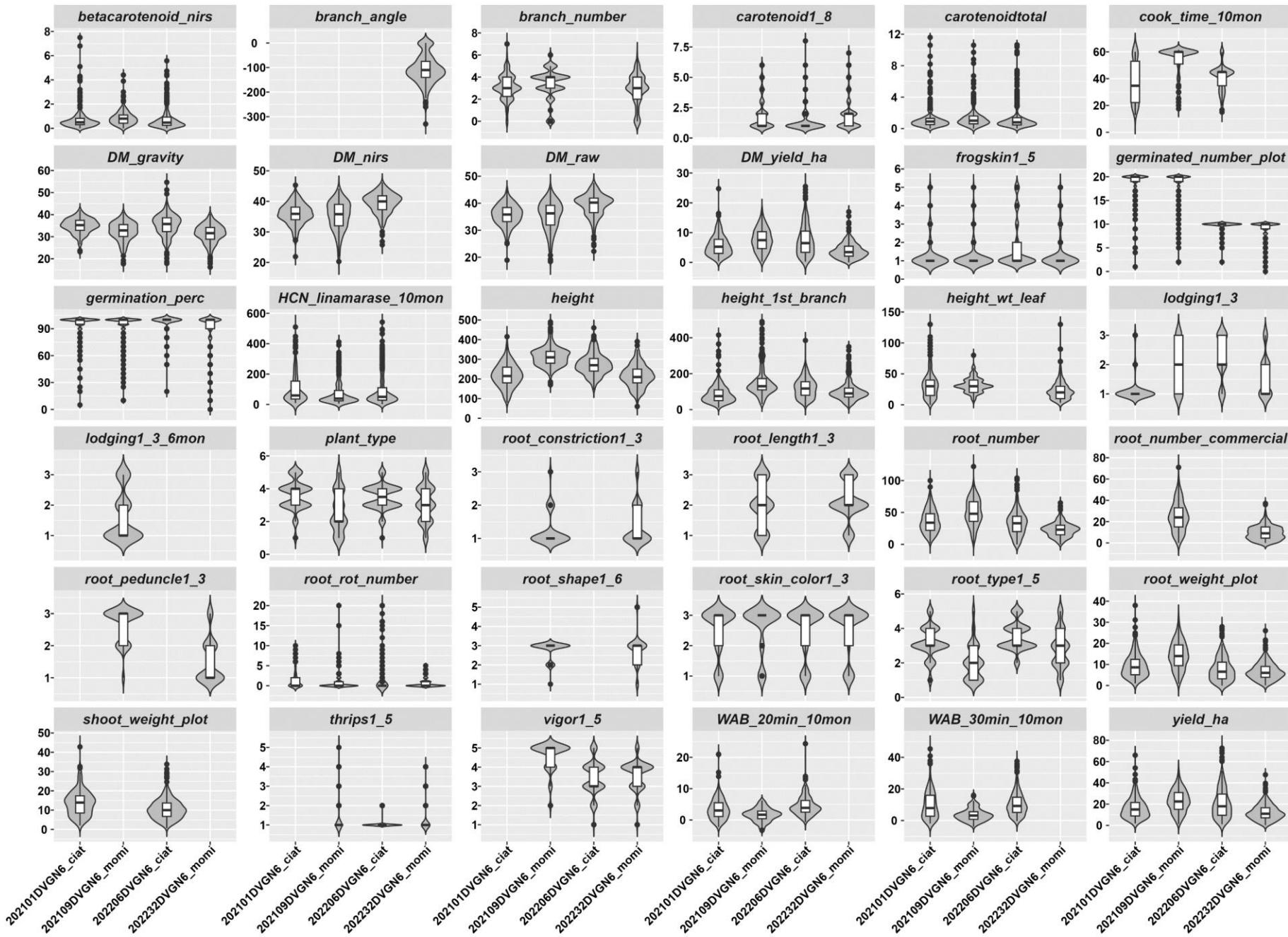
A close-up photograph of green cassava leaves with prominent veins, set against a blurred background of more plants under a clear sky.

Exploratory data analysis

Traits evaluated

Traits evaluated	
betacarotenoid_nirs	plant_type
branch_angle	root_constriction1_3
branch_number	root_length1_3
carotenoid1_8	root_number
carotenoidtotal	root_number_commercial
cook_time_10mon	root_peduncle1_3
DM_gravity	root_rot_number
DM_nirs	root_shape1_6
DM_raw	root_skin_color1_3
DM_yield_ha	root_type1_5
frogskin1_5	root_weight_plot
germinated_number_plot	shoot_weight_plot
germination_perc	thrips1_5
harvest_number	vigor1_5
HCN_linamarase_10mon	WAB_20min_10mon
height	WAB_30min_10mon
height_1st_branch	yield_ha
height_wt_leaf	
lodging1_3	
lodging1_3_6mon	

Trait variation across trials (phenotypic value)

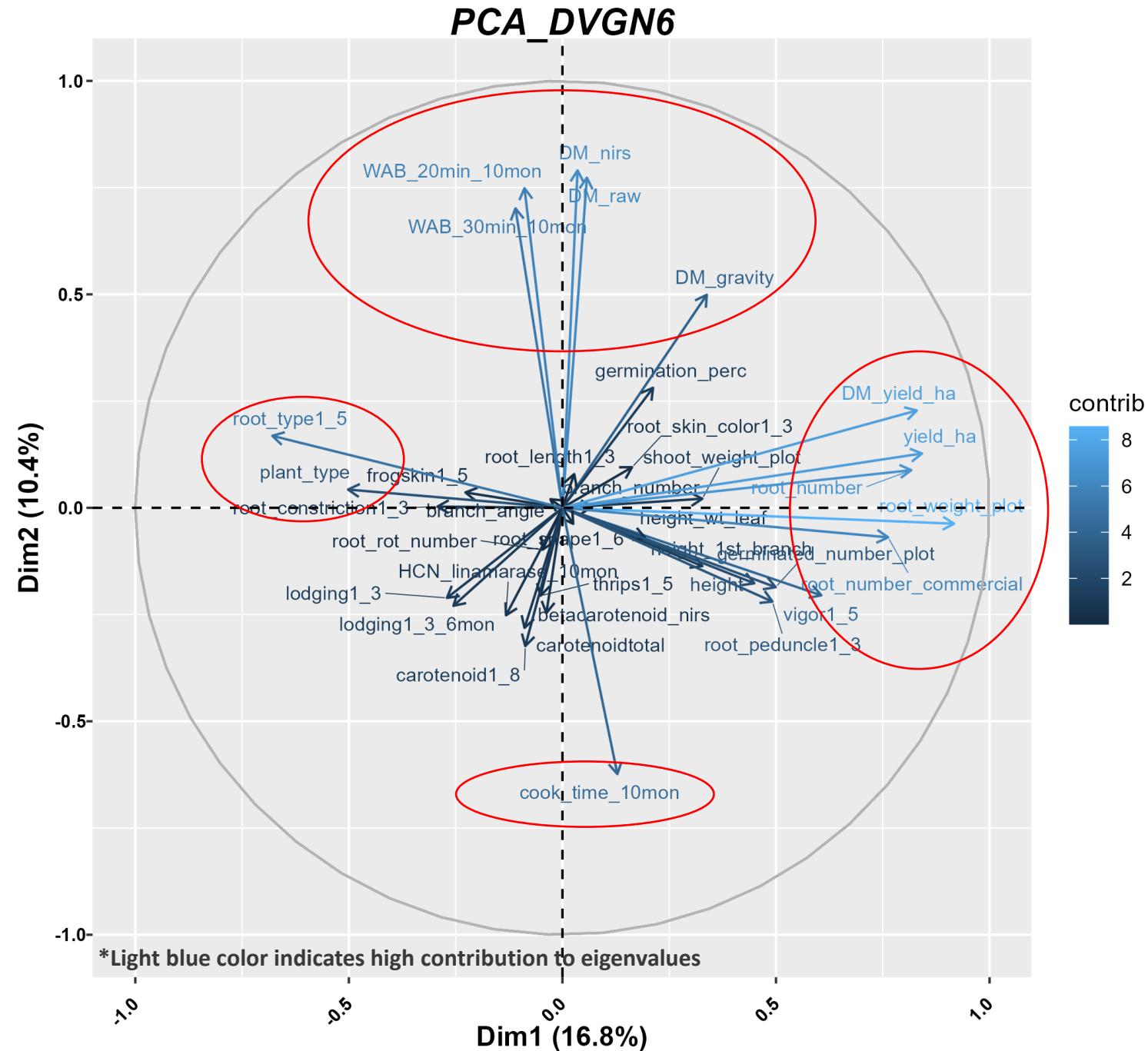


Multiple trait correlation (phenotypic value)

Principal component analysis (phenotypic value)

Two big groups of variable were found.

- ✓ 1: **strong** correlation between WAB and DM.
- ✓ 2: **strong** correlation between yield, commercial_roots and DM_yield
- ✓ **Cooking_time** had strong inverse correlation with WAB and DM.
- ✓ **Strong** correlation between root_type and plant_type.

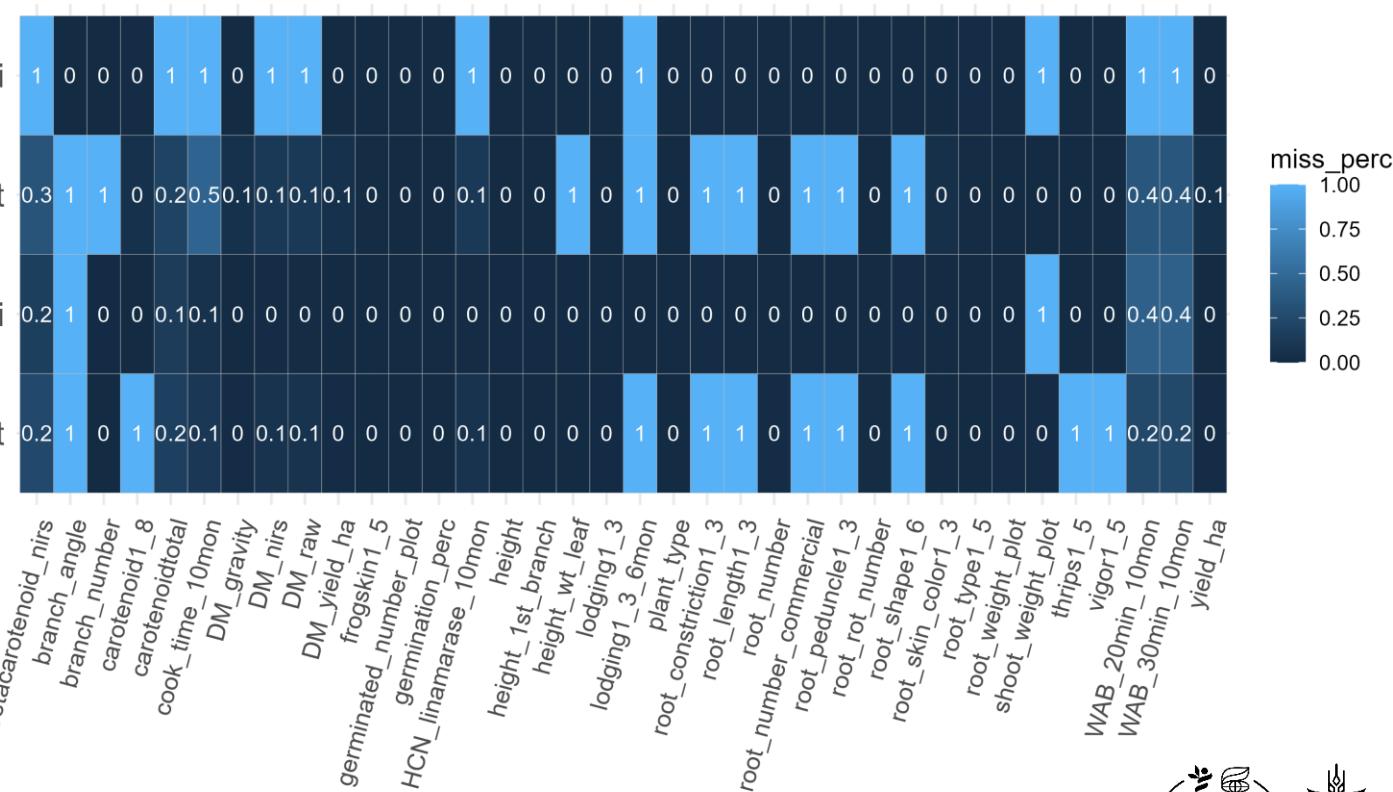


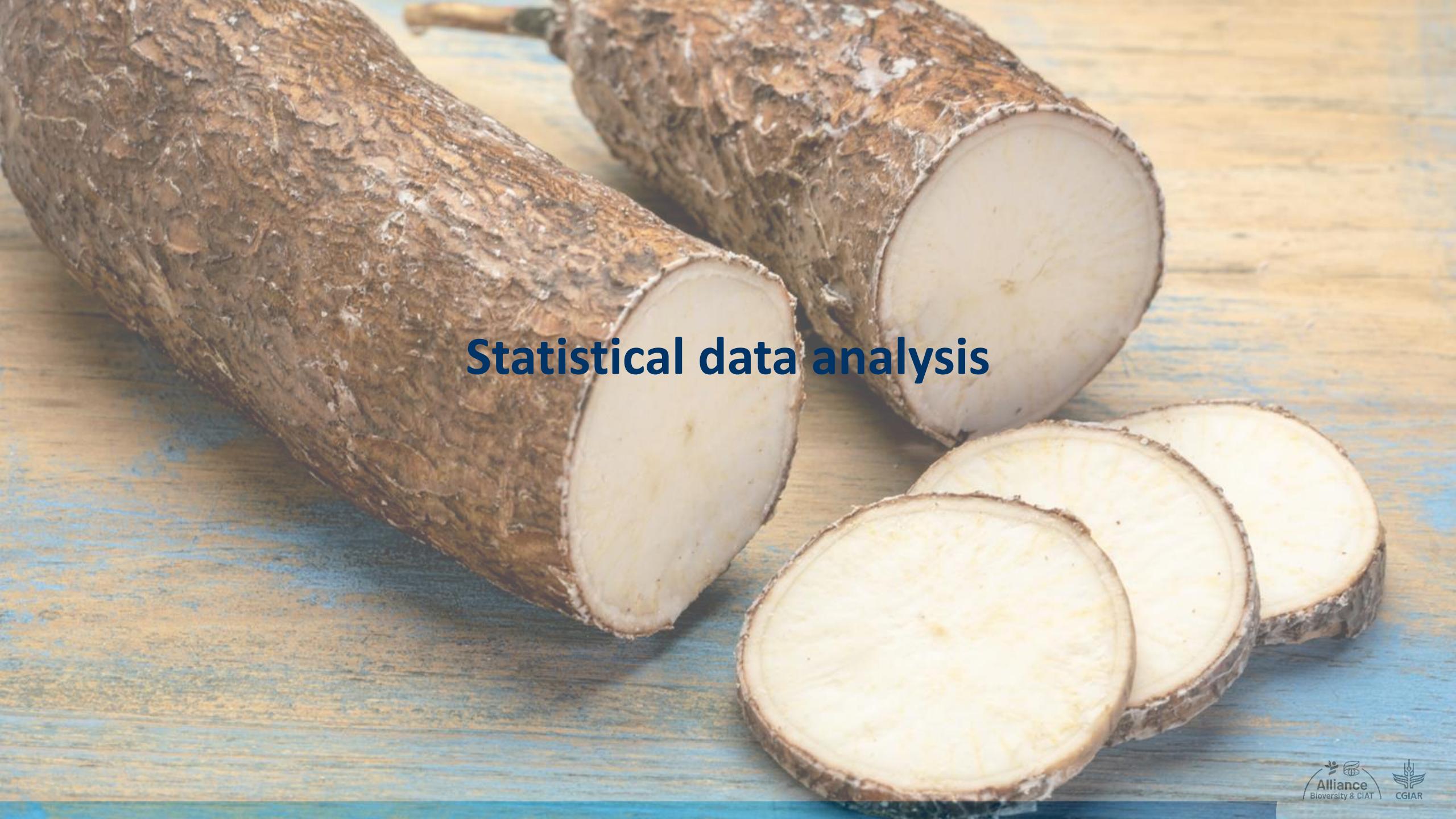
Connectivity Matrix

202232DVG6_momi	131	131	183	183
202206DVG6_ciat	131	131	184	183
202109DVG6_momi	136	136	131	131
202101DVG6_ciat	136	136	131	131

202101DVG6_ciat
202109DVG6_momi
202206DVG6_ciat
202232DVG6_momi

Percentage of missing values (exp/trait)



A large, brown, textured cassava root lies diagonally across the frame. In front of it, four circular cross-section slices of cassava are arranged in a cluster. The cassava is placed on a light-colored wooden surface with visible grain and some blue paint. The lighting highlights the fibrous texture of the cassava's outer skin and the pale, starchy interior.

Statistical data analysis

Single Heritability

trial	betacarotene_nir	branch_angle	branch_number	carotenoid18	carotenoidtotal	cook_time_10mon	DM_gravity	DM_nirs	DM_raw	DM_yield_ha	frogskin15	germited_number_plot	germination_perc	HCN_limarase_10mon	height	height_1st_branch	height_wt_leaf	lodging13
202101DVGN6_ciat	0.96		0.68		0.98	0.8	0.86	0.87	0.89	0.71	0.7	0.82	0.82	0.88	0.82	0.87	0.35	0.36
202109DVGN6_momi	0.91		0.8	0.86	0.97	0.7	0.89	0.91	0.91	0.86	0.66	0.86	0.86	0.96	0.71	0.86	0.48	0.8
202206DVGN6_ciat	0.97			0.81	0.99	0.64	0.72	0.84	0.86	0.74	0.79	0.4	0.4	0.93	0.76	0.88		0.51
202232DVGN6_momi		0.73	0.85	0.86			0.84			0.81	0.85	0.72	0.72		0.71	0.85	0.49	0.61

trial	lodging1_3_6mon	plant_type1_3	root_constriction3	root_length3	root_number	root_number_commercial	root_peduncle1_3	root_rot_number	root_shape	root_skin_color1_3	root_type15	root_weight_plot	shoot_weight_thrips1_5	vigor15	WAB_20min_10mon	WAB_30min_10mon	yield_ha	
202101DVGN6_ciat		0.84			0.63			0.34		0.93	0.6	0.7	0.69		0.72	0.81	0.7	
202109DVGN6_momi	0.64	0.84	0.31	0.62	0.79	0.73	0.52	0.31	0.44	0.96	0.81	0.85		0.57	0.69	0.92	0.93	0.85
202206DVGN6_ciat		0.64			0.69			0		0.96	0.63	0.78	0.82	0.09	0.76	0.69	0.8	0.74
202232DVGN6_momi		0.71	0.47	0.3	0.76	0.71	0.56	0.34	0.41	0.98	0.73	0.79		0.8	0.68			0.79

Moderate to high heritability showing the good trial management at 7 locations.

Blue color boxes indicate low heritability

Heritability GxE

trait	h2
root_skin_color1_3	0.98
carotenoidtotal	0.98
HCN_linamarase_10mon	0.95
betacarotenoid_nirs	0.95
carotenoid1_8	0.93
height_1st_branch	0.9
DM_gravity	0.9
DM_raw	0.88
DM_nirs	0.88
height	0.87
frogskin1_5	0.86
branch_number	0.85
WAB_30min_10mon	0.84
plant_type	0.83
root_number	0.81
root_weight_plot	0.8
WAB_20min_10mon	0.79
DM_yield_ha	0.79
vigor1_5	0.79
germination_perc	0.78
yield_ha	0.78
lodging1_3	0.78
shoot_weight_plot	0.77
root_type1_5	0.75
germinated_number_plot	0.74
root_number_commercial	0.71
cook_time_10mon	0.66
height_wt_leaf	0.61
root_constriction1_3	0.48
root_shape1_6	0.43
root_rot_number	0.03
thrips1_5	-0.09
root_length1_3	-0.18
root_peduncle1_3	-0.24

Traits removed from the analysis:

- ✓ Branch_angle: **only one trial to fit an MET model**
- ✓ lodging1_3_6mon: **only one trial to fit an MET model**
- ✓ root_rot_number
- ✓ thrips1_5
- ✓ root_length1_3
- ✓ Root_peduncle1_3

**Very low GxE h². Overall
BLUP values not trusted**

Heritability GxE after data removal

trait	h2
root_skin_color1_3	0.98
carotenoidtotal	0.98
HCN_linamarase_10mon	0.95
betacarotenoid_nirs	0.95
carotenoid1_8	0.93
height_1st_branch	0.9
DM_gravity	0.9
DM_raw	0.88
DM_nirs	0.88
height	0.87
frogskin1_5	0.86
branch_number	0.85
WAB_30min_10mon	0.84
plant_type	0.83
root_number	0.81
root_weight_plot	0.8
WAB_20min_10mon	0.79
DM_yield_ha	0.79
vigor1_5	0.79
germination_perc	0.78
yield_ha	0.78
lodging1_3	0.78
shoot_weight_plot	0.77
root_type1_5	0.75
germinated_number_plot	0.74
root_number_commercial	0.71
cook_time_10mon	0.66
height_wt_leaf	0.61
root_constriction1_3	0.48
root_shape1_6	0.43

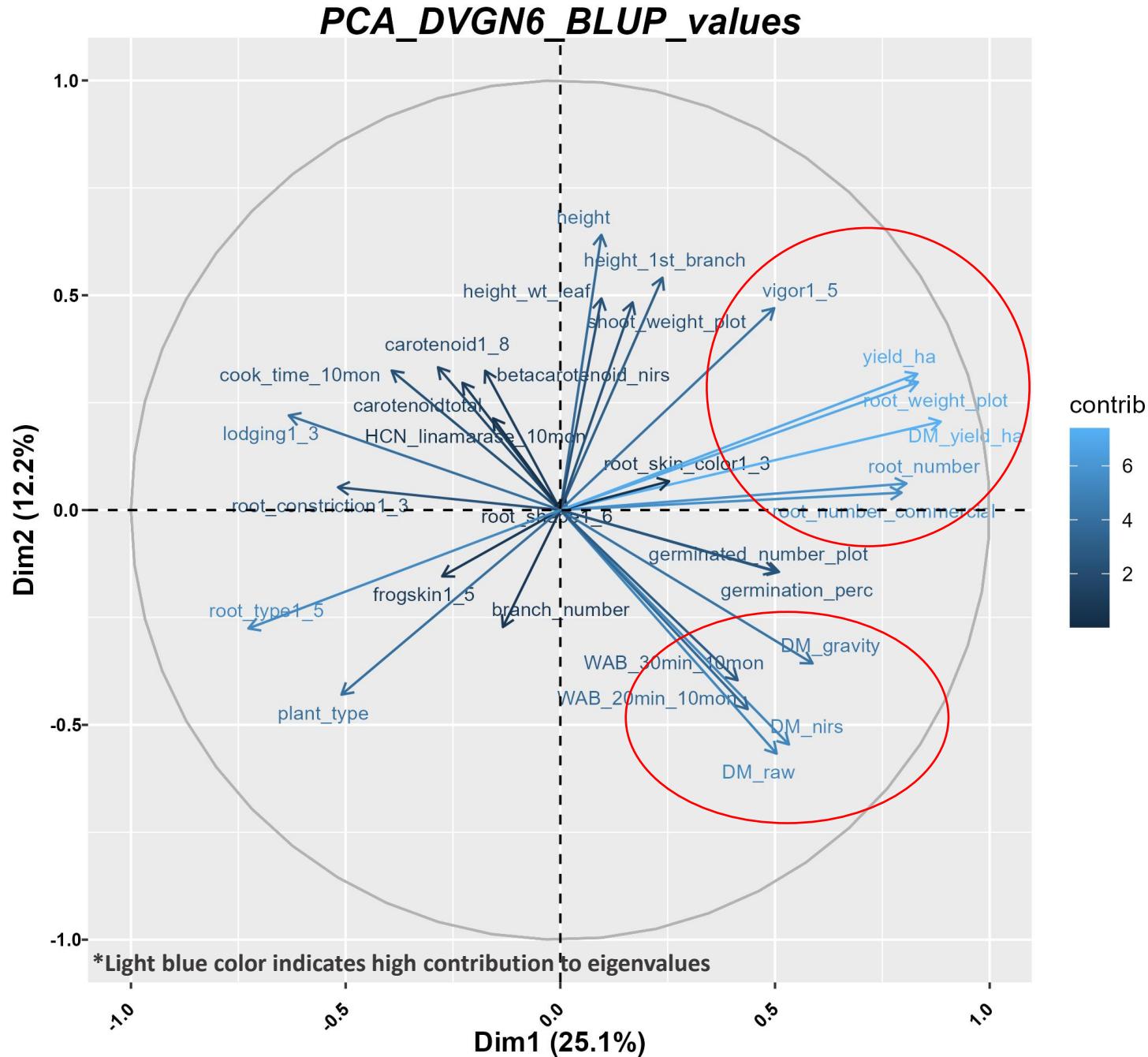
Genotypic correlation (BLUP value)

betacarotenoid_nirs
branch_number
carotenoid1_8
carotenoidtotal
cook_time_10mon
DM_gravity
DM_nirs
DM_raw
DM_yield_ha
frogskin1_5
germinated_number_plot
germination_perc
HCN_linamarase_10mon
height
height_1st_branch
height_wt_leaf
lodging1_3
plant_type
root_constriction1_3
root_number_commercial
root_shape1_6
root_skin_color1_3
root_type1_5
shoot_weight_plot
vigor1_5
WAB_20min_10mon
WAB_30min_10mon

Principal component analysis (BLUP values)

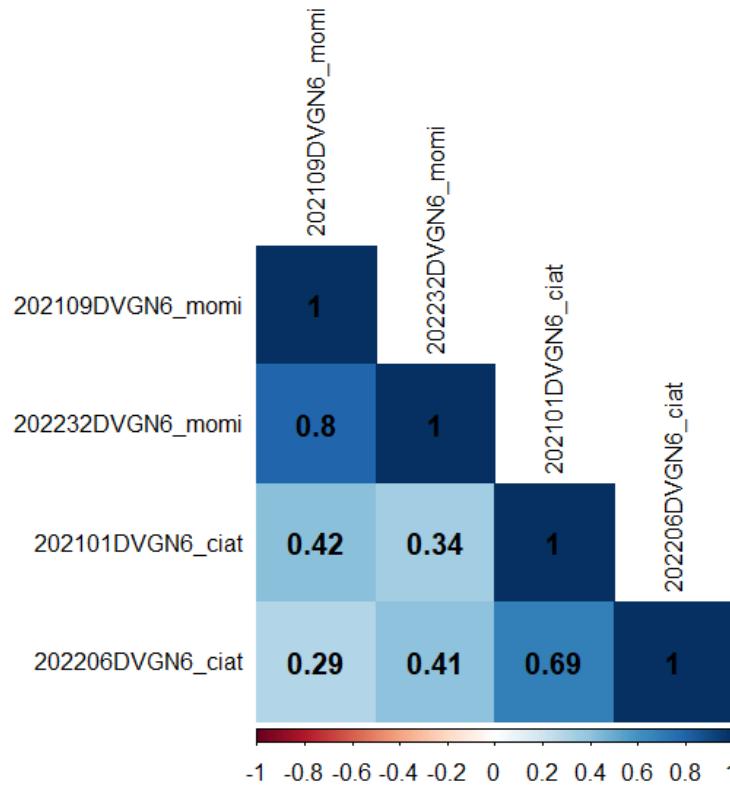
Two big groups of variable were found.

- ✓ 1: **strong** correlation between WAB and DM.
 - ✓ 2: **strong** correlation between yield, commercial_roots and DM_yield

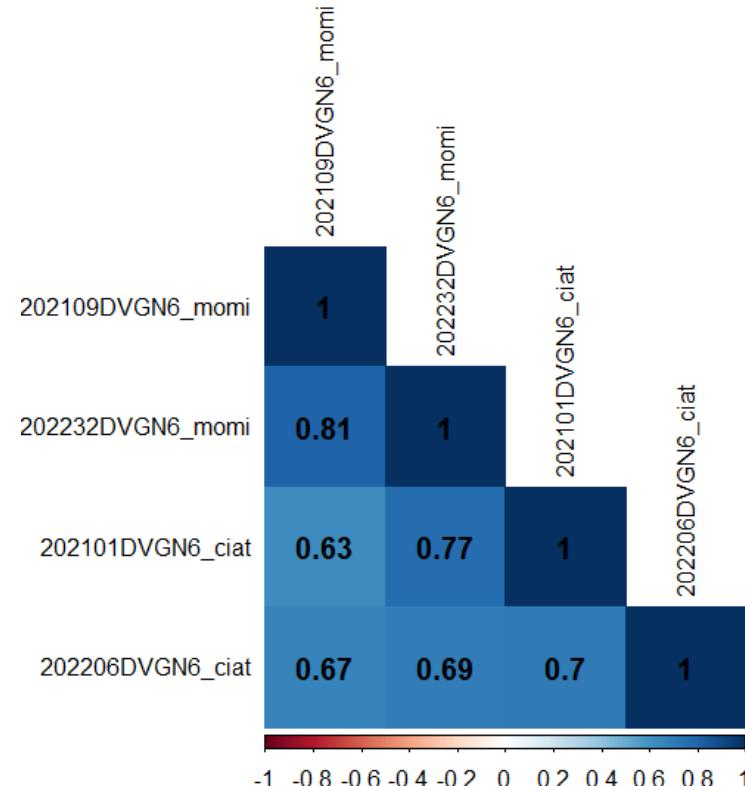


Genotypic Correlation agronomic traits:

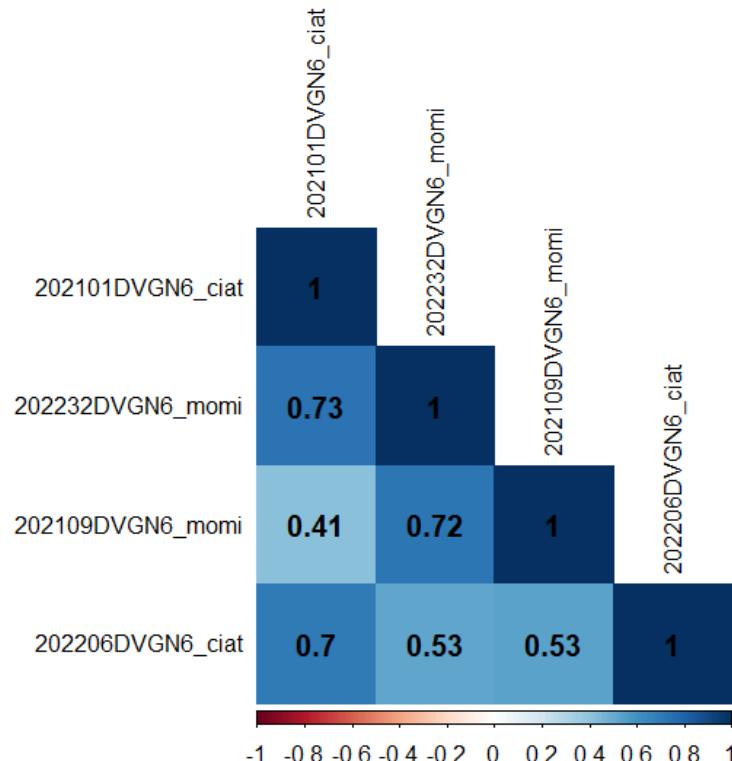
Yield



Dry Matter gravity

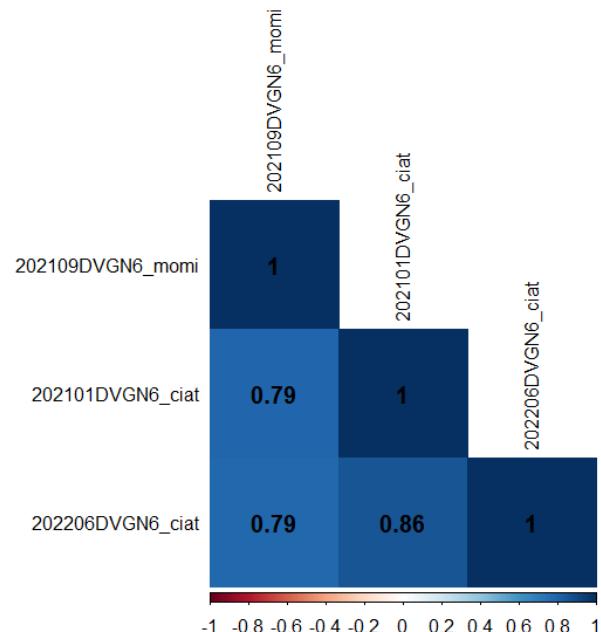


Plant type

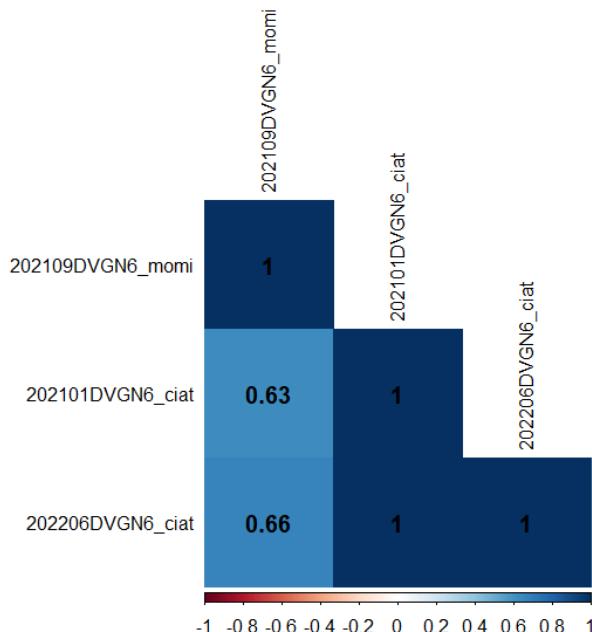


Genotypic Correlation quality traits:

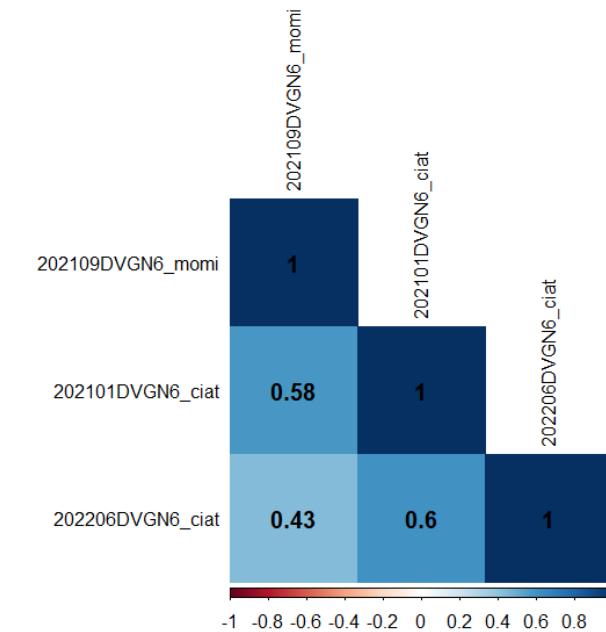
Dry Matter by oven



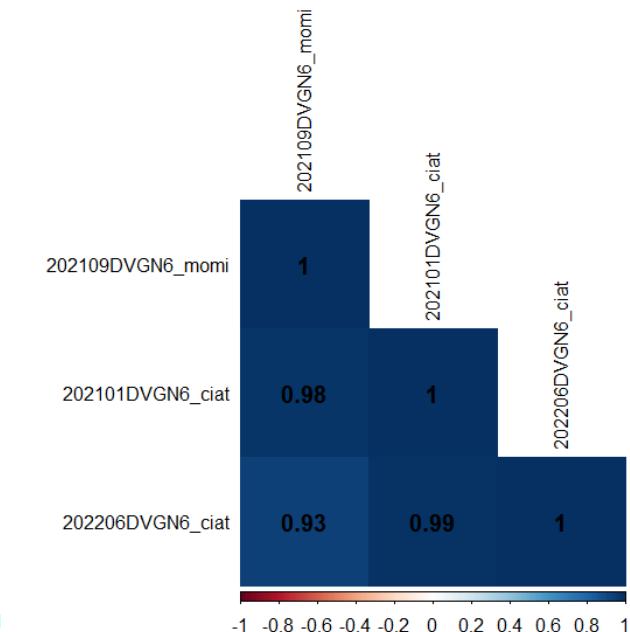
WAB 30 min



Cooking time

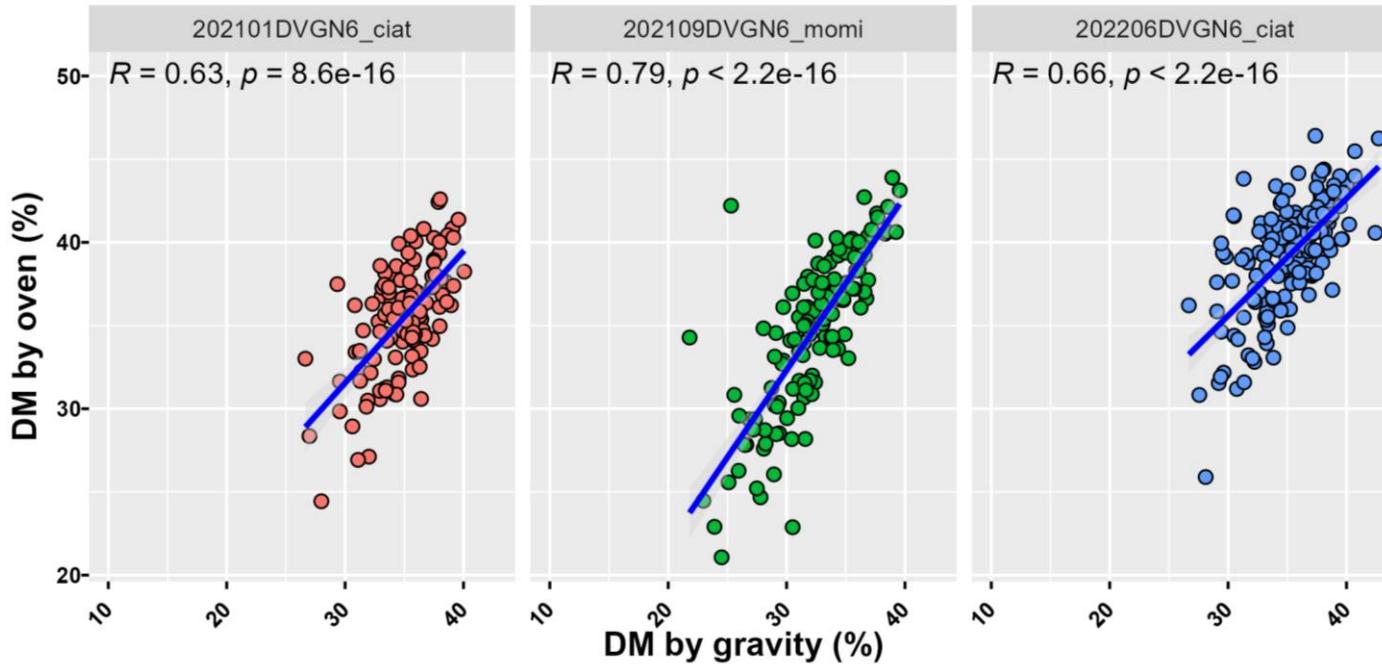


Cyanide content



Genetic correlation between DM_gravity and DM_oven

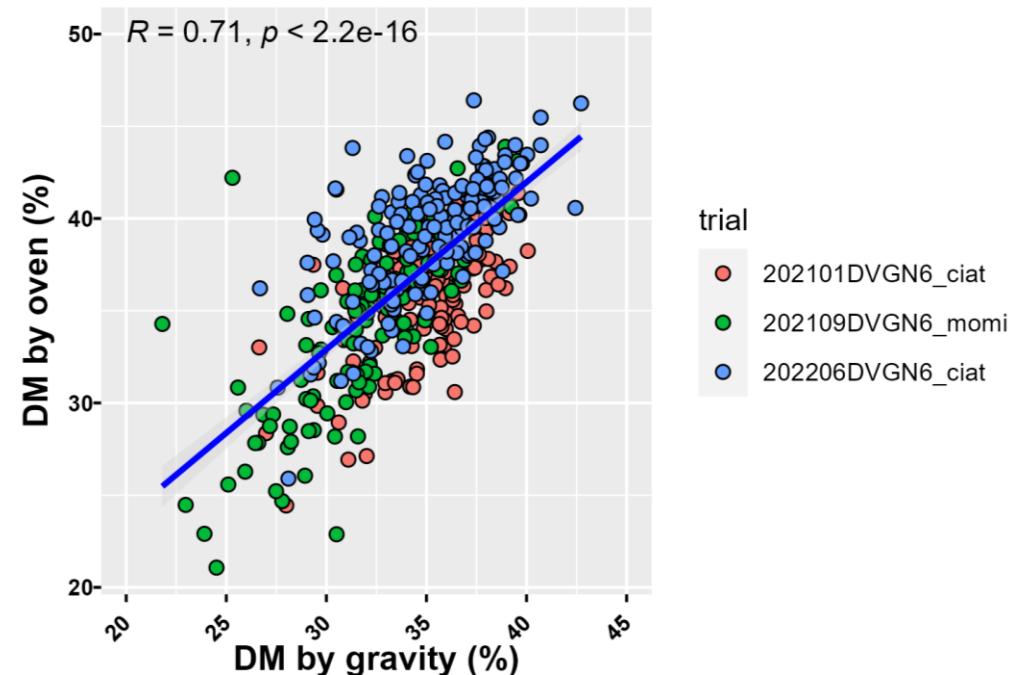
Cor with BLUP values from each trial



BLUP value

Correlation between two methodologies was **moderate**.

Binding of both trials





Thank you!