Stable carbon isotopes as a phenotyping tool for WUE

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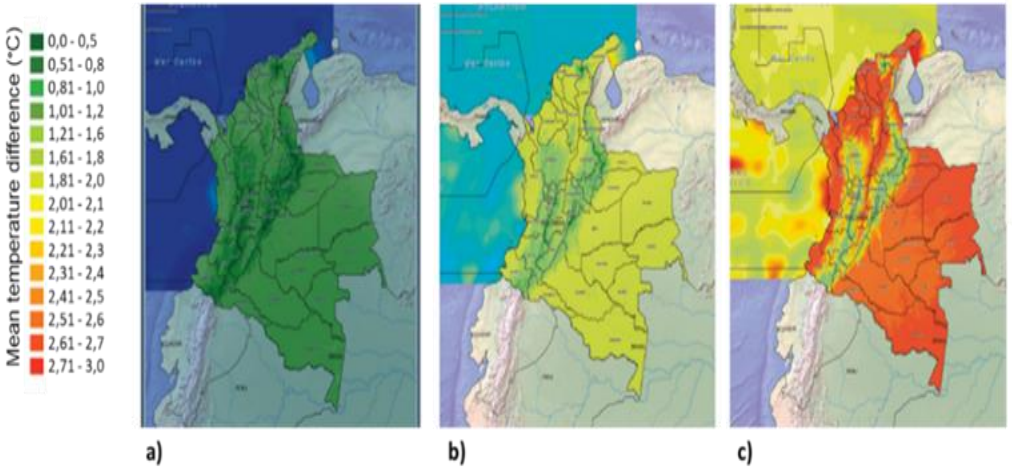
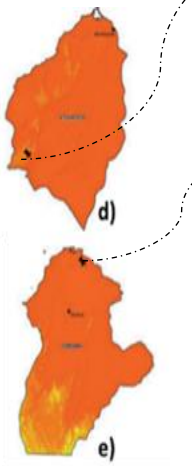
Importance of research performed

1. Consequences of climate change

Temperature (°C)

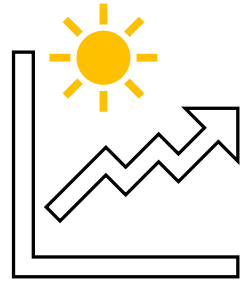




Repelón (Dry Caribbean)

Momil (Humidity Caribbean)

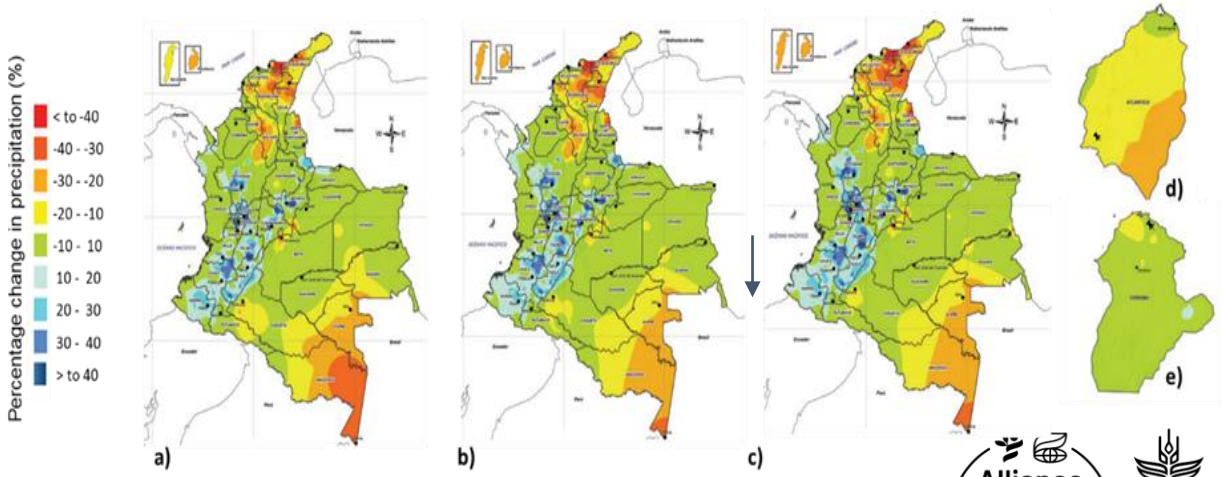
2.2 °C



No. days

11%

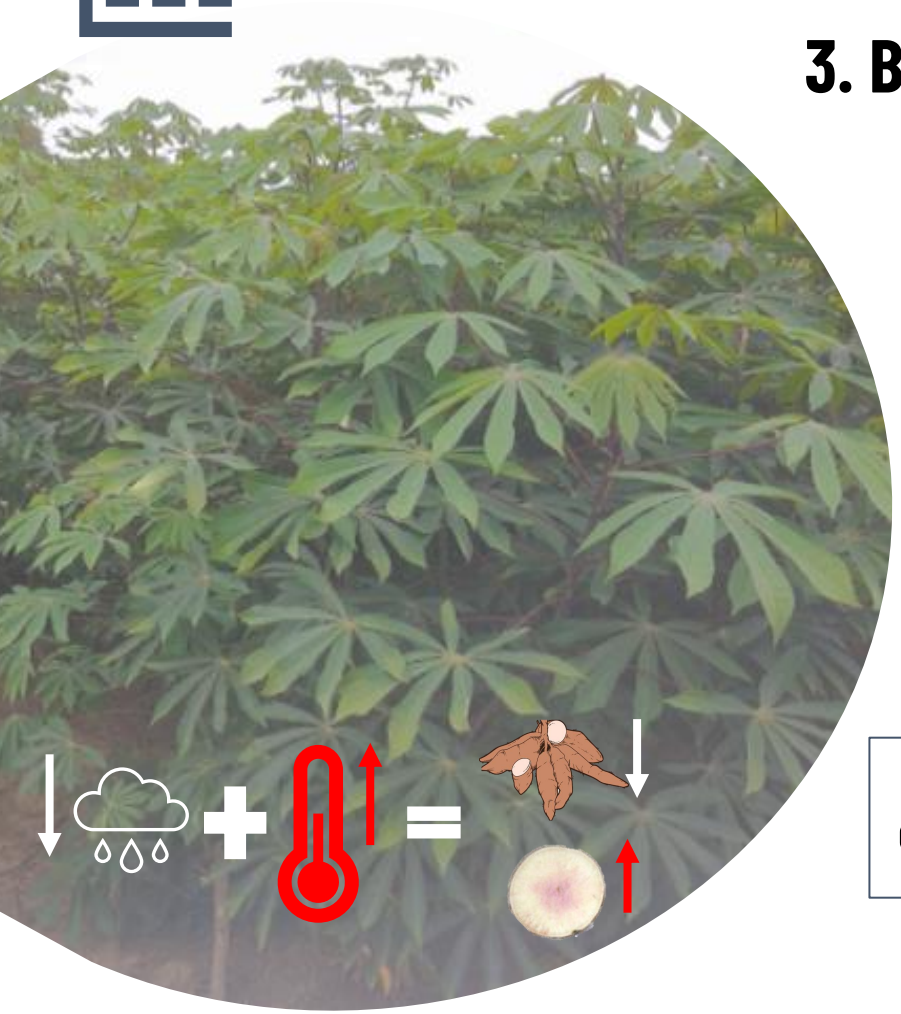
Precipitation (%)



Alliance Bioversity & CIAT

CGIAR

2. Production system alterations and yield declines



3. Breeding using phenotyping tools

Mechanism responses under drought stress

Drought recovery (DR)

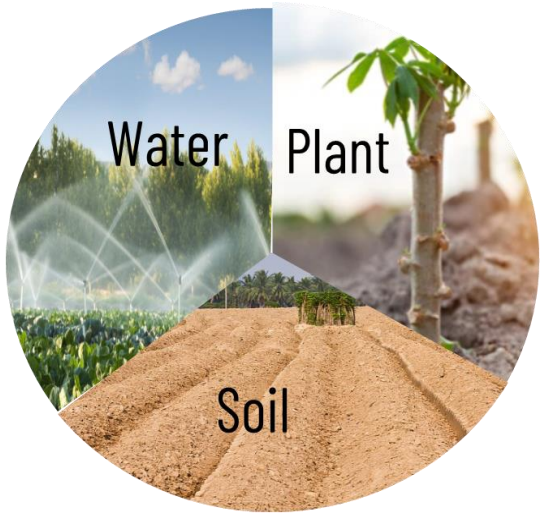
Drought avoidance (DA)

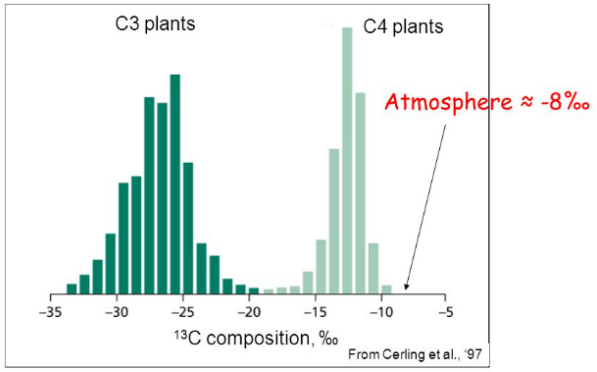
Drought tolerance (DT)

Carbon isotope composition ($\delta^{13}C$)

Water Use efficiency (WUE)

Stable isotopes

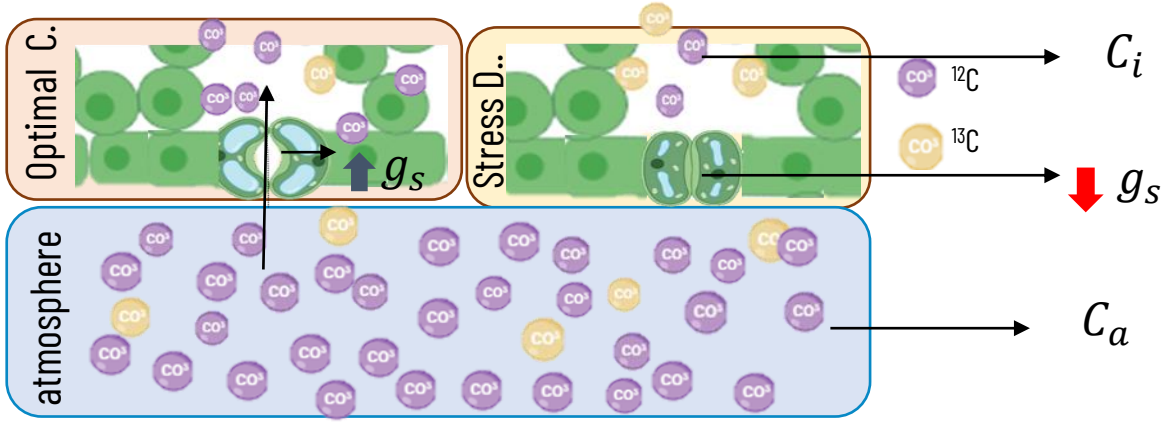




^{12}C **98.9 %**

^{13}C **1.1%**

Stable isotopes carbon

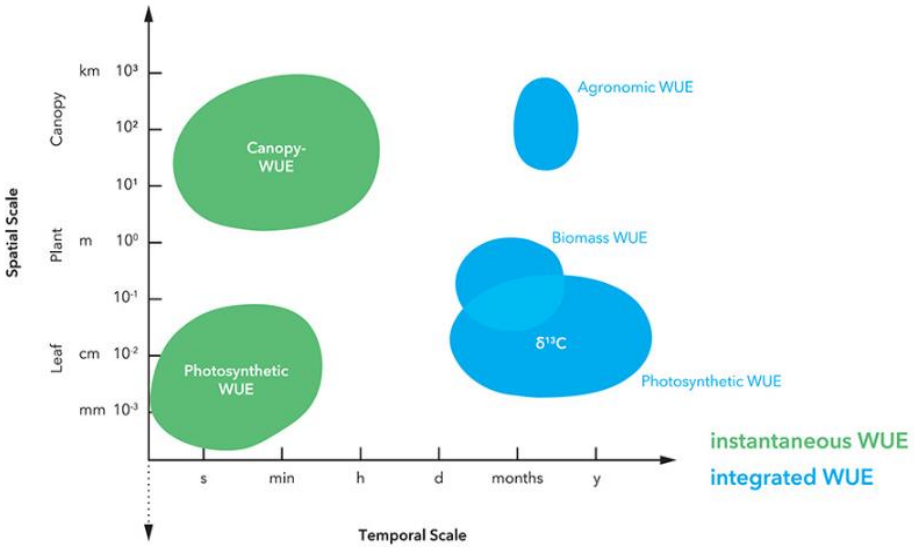


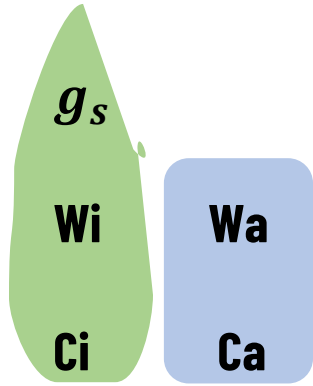
$\frac{C_i}{C_a}$ Change in stomata opening

CO2 demand at chloroplast level

Water use efficiency

Relationship between **carbon gain** and **water loss** via transpiration.



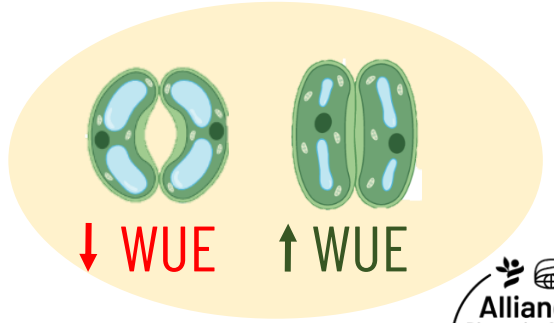


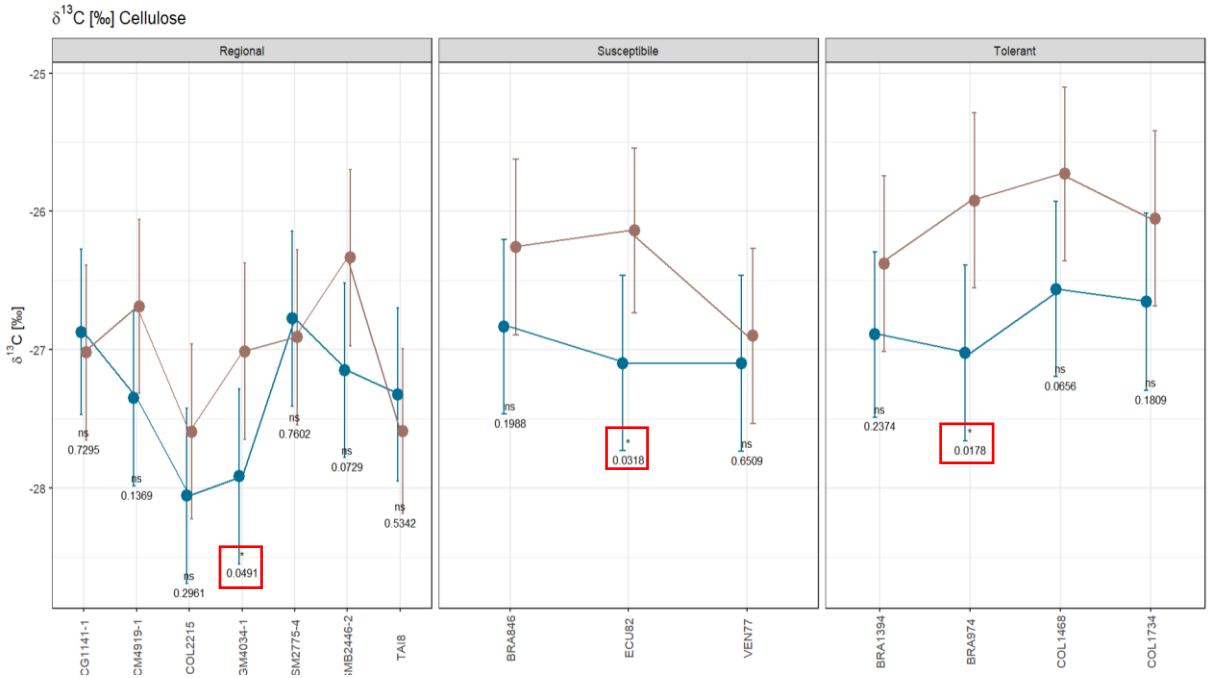
Drougth stress and ↑VPD = Closed stomatal

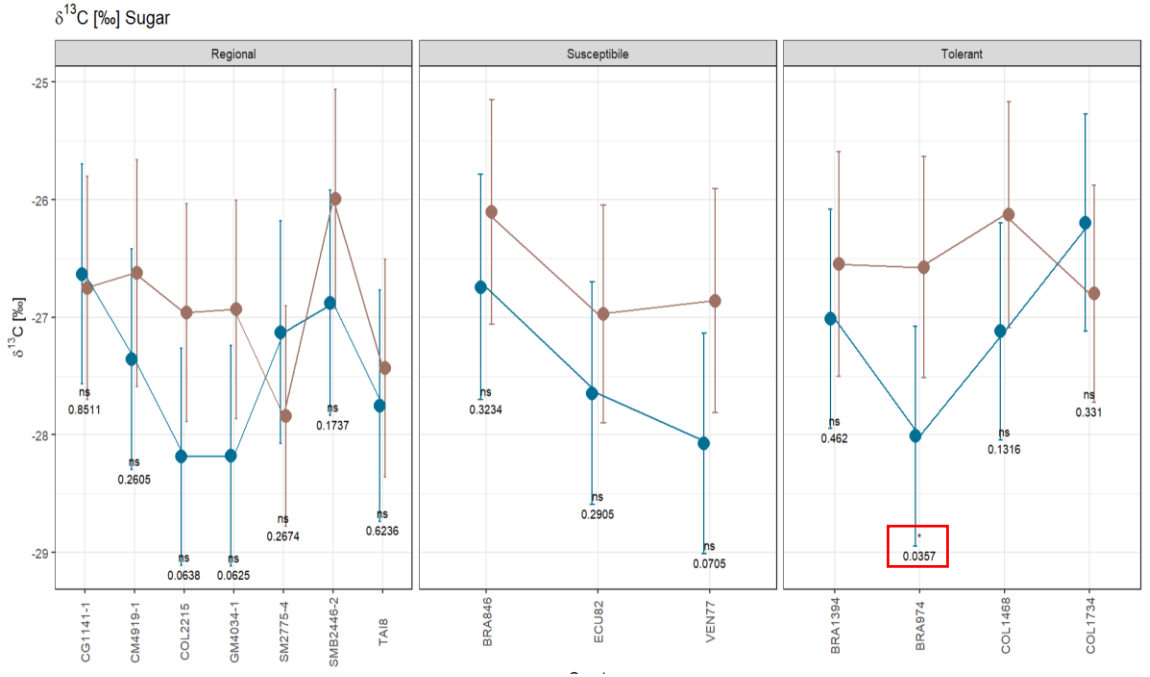
↓ g_s

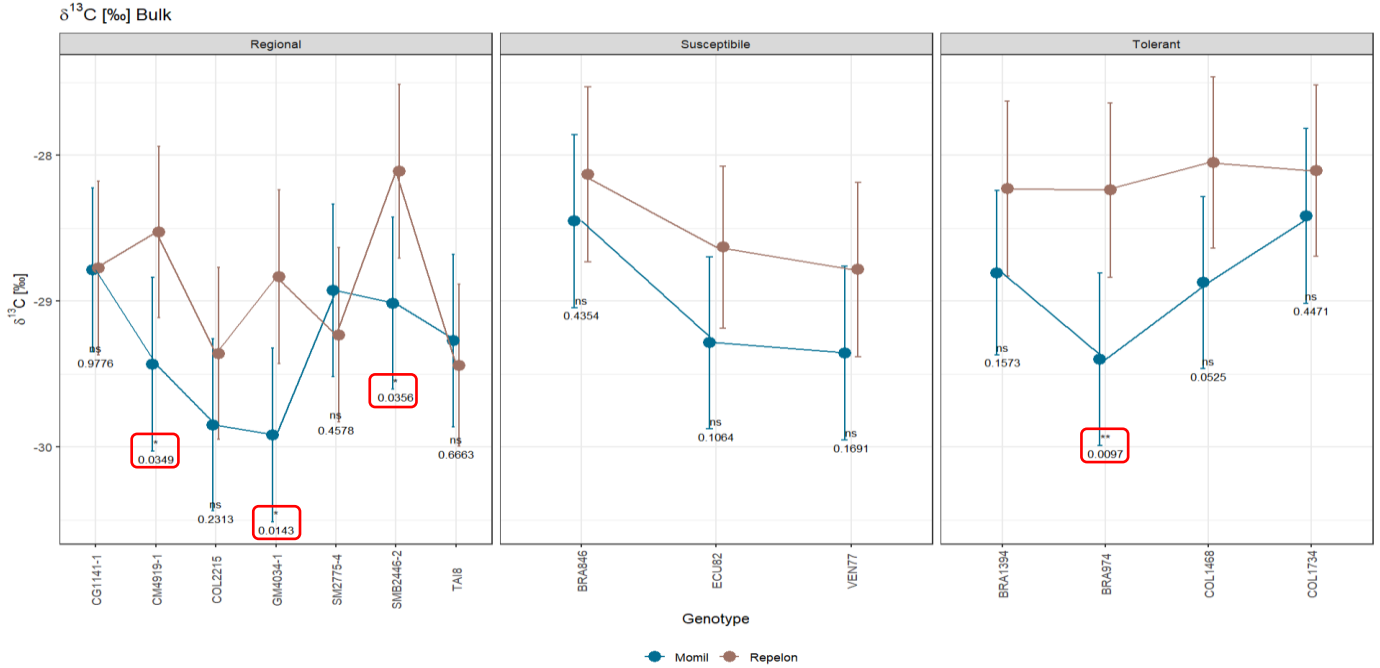
↓ $\delta^{13}C$

↑ WUE

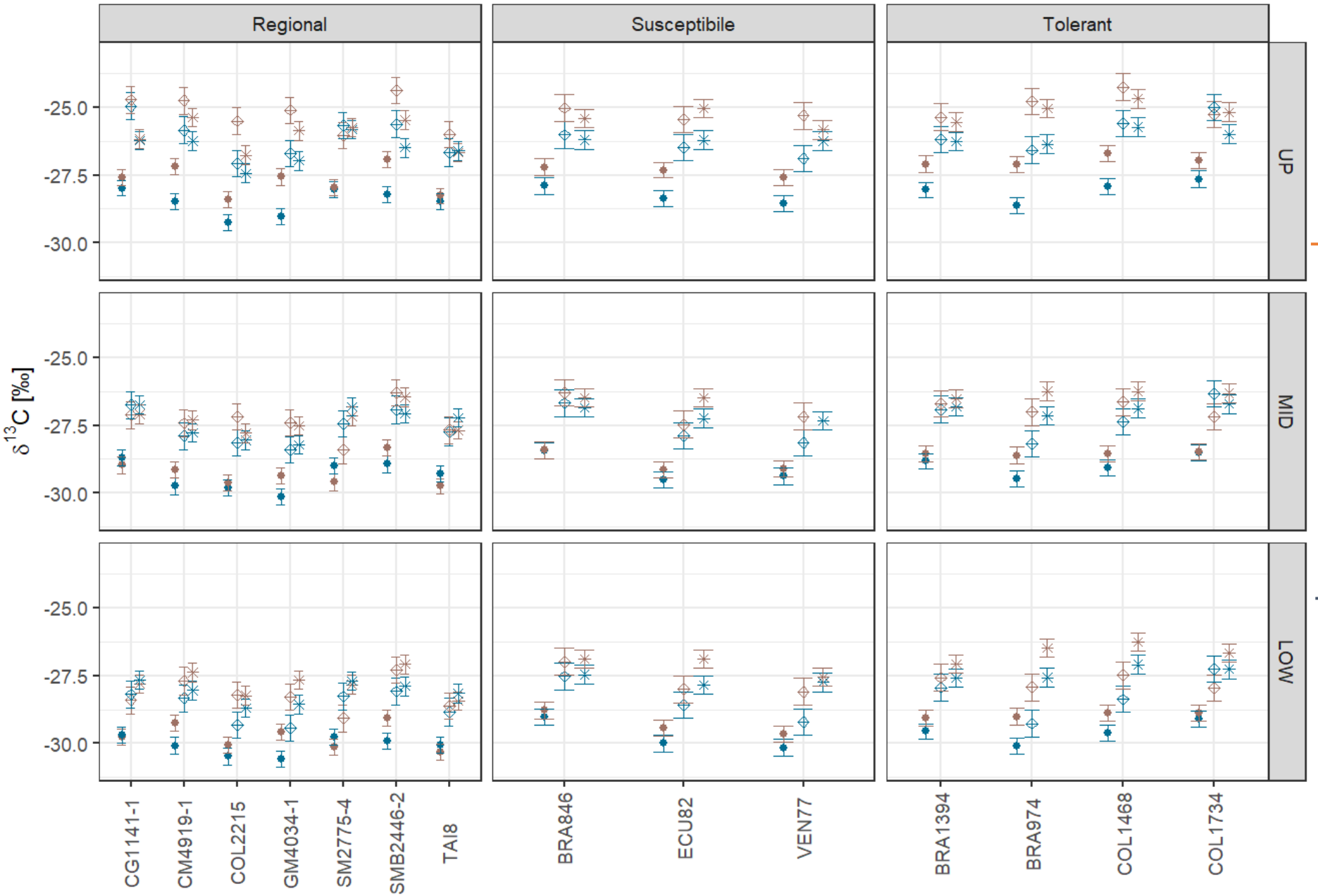


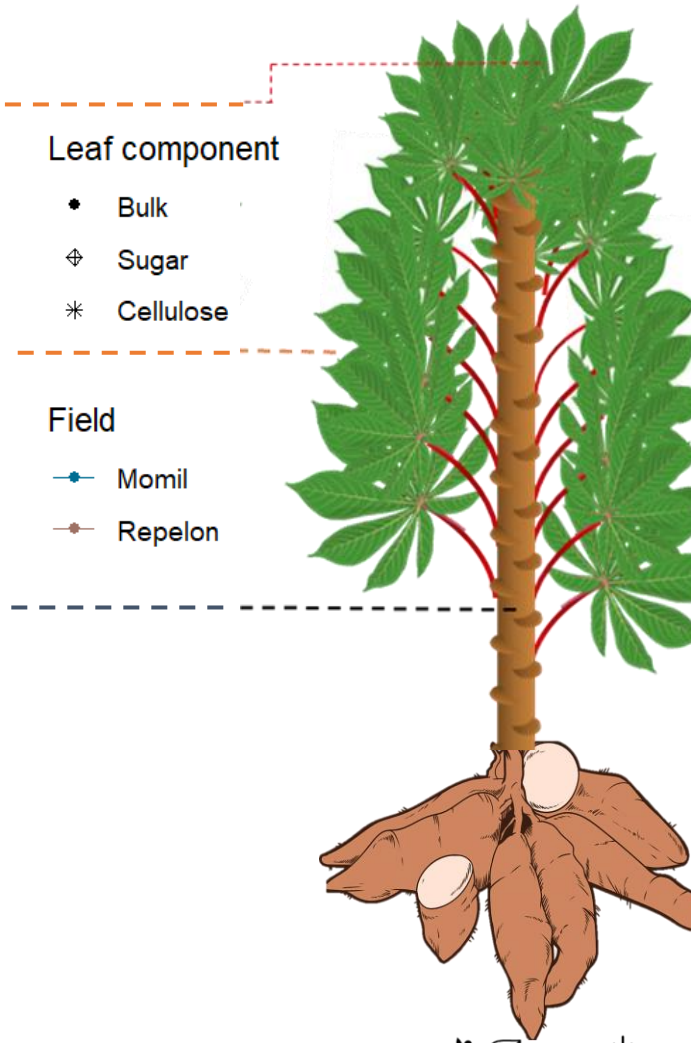


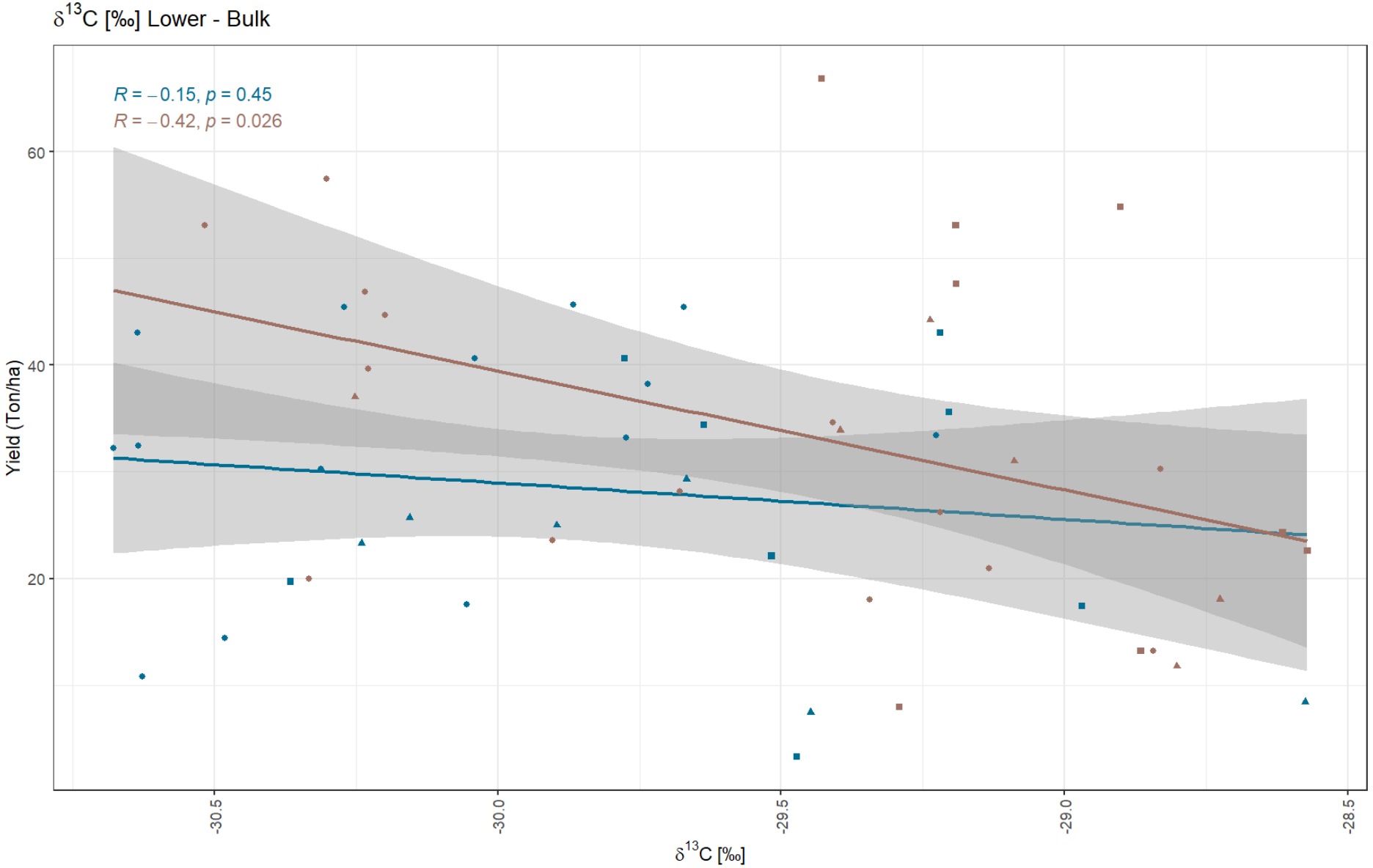




- $\delta^{13}C$ for most of the genotypes in the Repelón locality were lower.
- BRA974 -> Bulk compound p<0.01.
- BULK most significant difference in genotypes


Regional
Susceptibile
Tolerant
UP
MID
LOW
-25.0
-27.5
-30.0
δ13C [‰]
CG1141-1
CM4919-1
COL2215
GM4034-1
SM2775-4
SMB2446-2
TAI8
BRA846
ECU82
VEN77
BRA1394
BRA974
COL1468
COL1734


Leaf component
Bulk
Sugar
Cellulose
Field
Momil
Repelon



Measurements of whole plant WUE is very difficult.

Yield and carbon isotope compositions

sensitivity
- check
- susceptibile
- tolerant

field
- Momil
- Repelon

(Chlorophyll fluorescence and stomatal conductance)

- Repelón shows a better relationship between yield and carbon isotopic composition.
- Carbon isotopic discrimination shows the plant's ability to respond to environmental and soil conditions.

Thanks!