



Rhizosphere Enzyme Activities in Sorghum under Limited Resource Availability in sub-Saharan Africa

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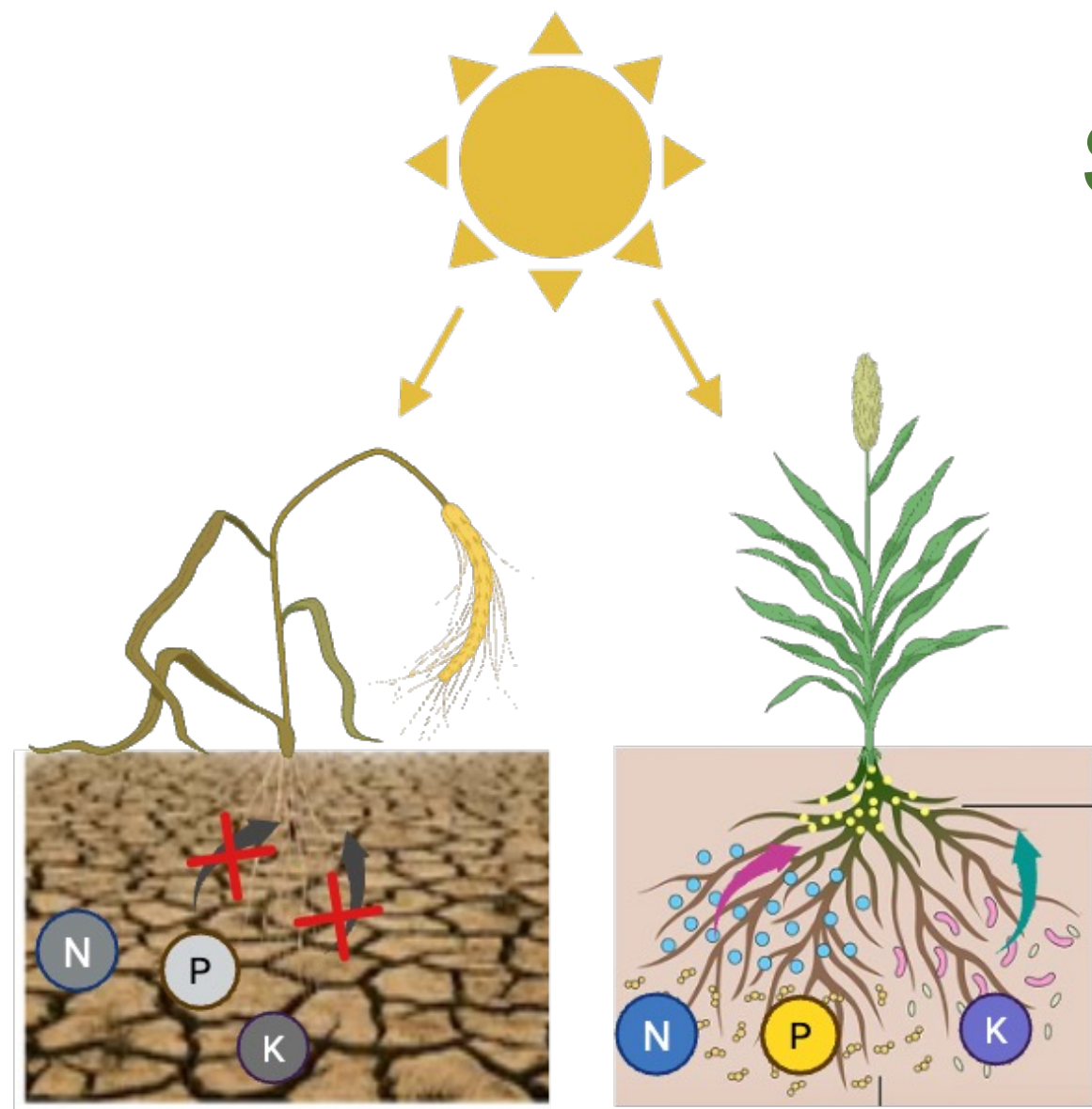
Objective

Crop production in sub-Saharan Africa faces nutrient limitations under increasing drought

Sorghum → Drought-adapted crop with potential for resistance



Assess enzyme activities, microbial responses, in sorghum genotypes under drought



Approach



Field trial with 3 genotypes in Siaya, Kenya

Breeding

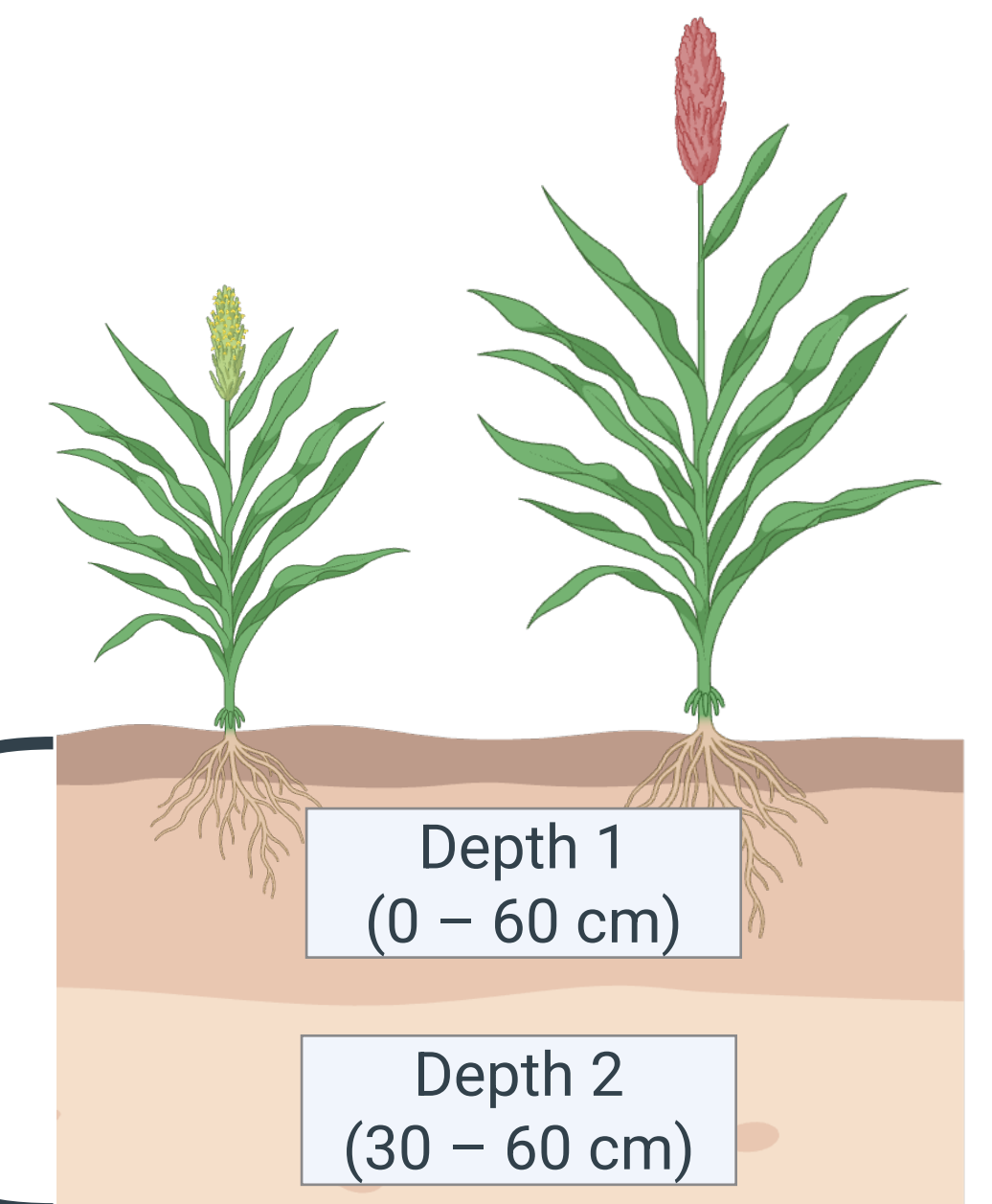
ICRISAT hybrid (IESH)
Open-pollinated Gadam (Gd)
Landrace Makueni local (Mkl)

Drought simulated by rain-out shelters



Rhizosphere sampling

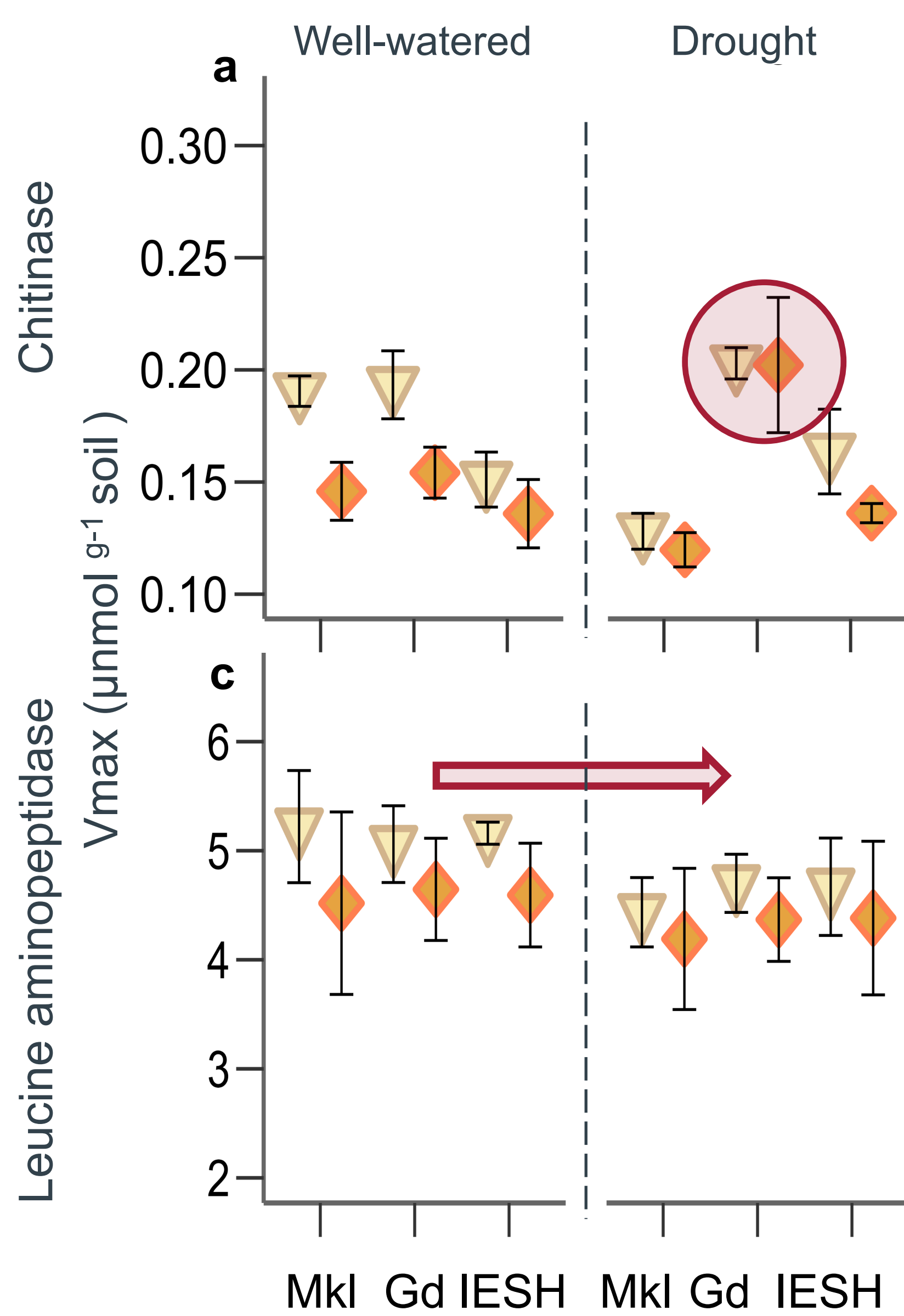
Time Point 1 → Time Point 2
Flowering → Grain-filling



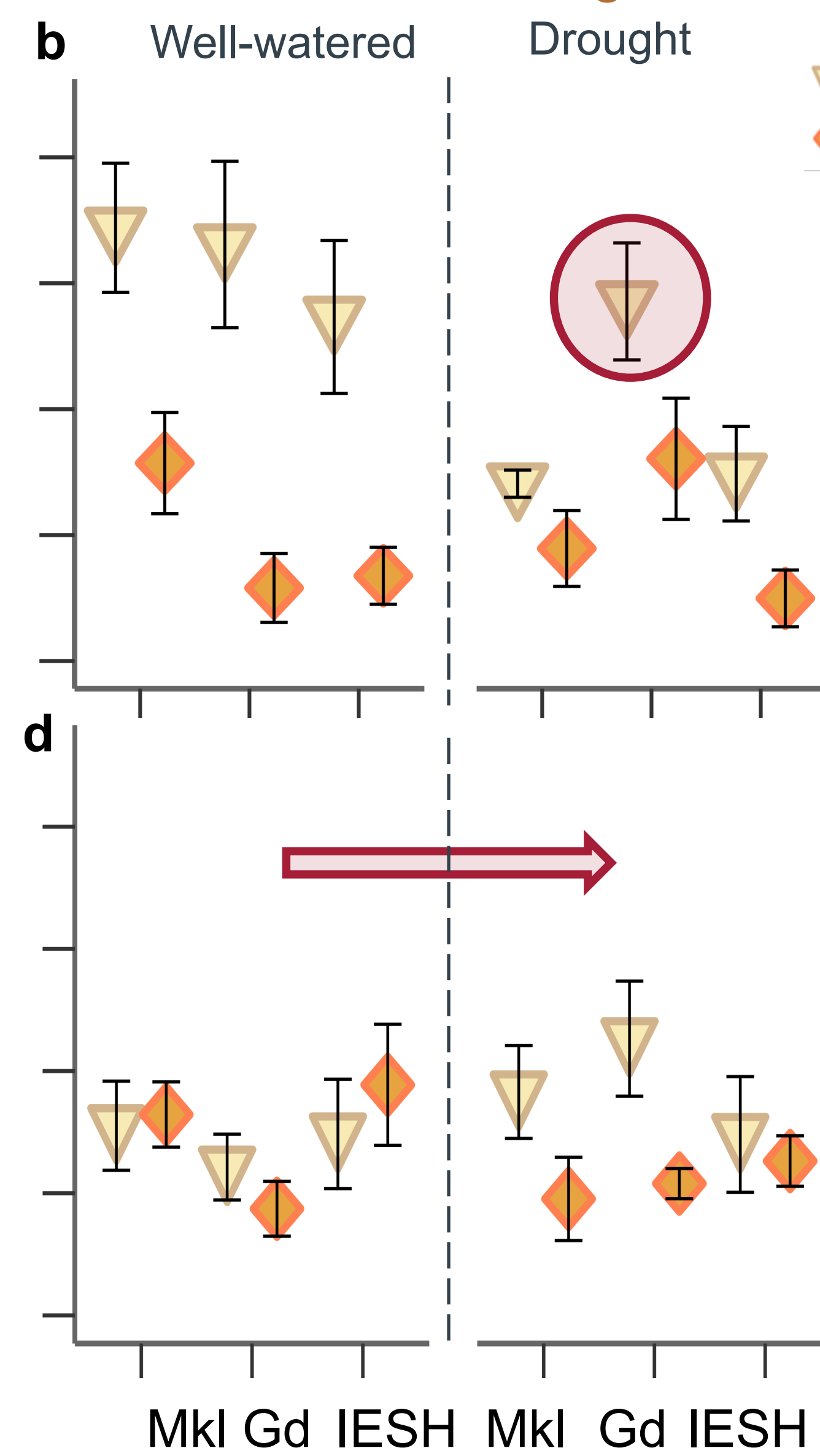
Outcomes

Extracellular Enzyme Assay

Flowering



Grain-filling

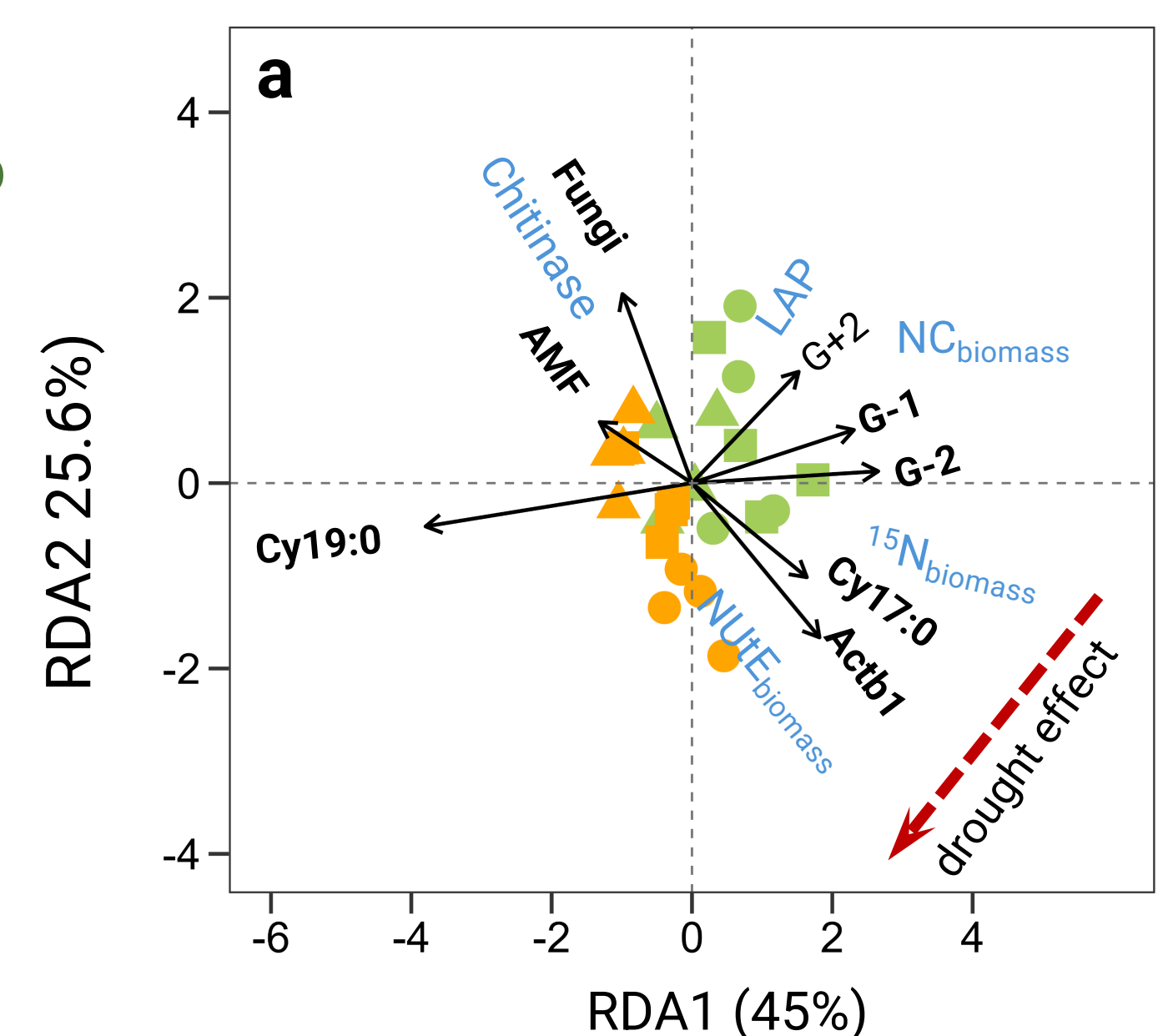


Microbial communities shift with drought + growth stage

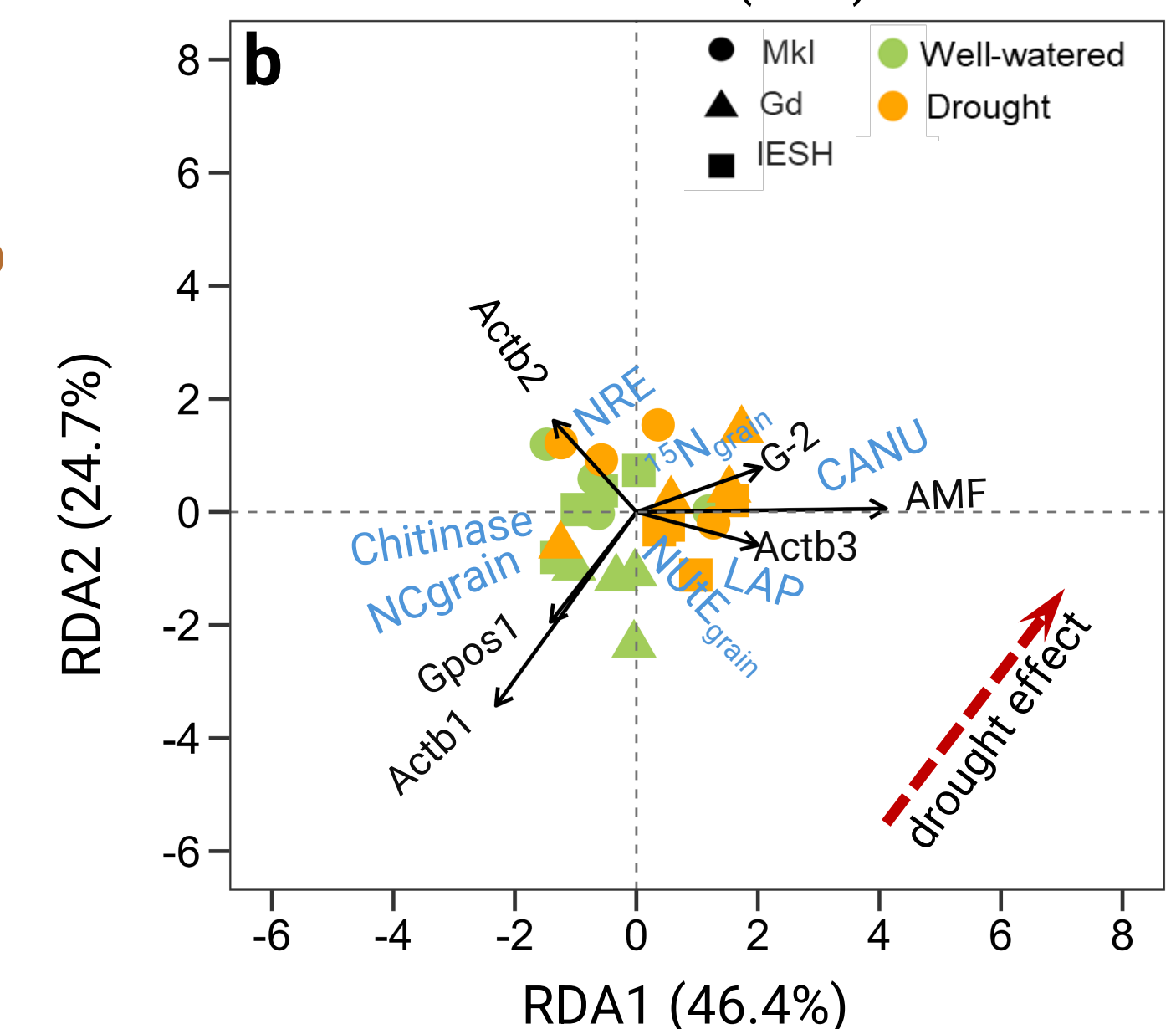
- Legend**
- **NUtE_{grain}**: Nitrogen utilisation efficiency
 - **CANU**: Contribution of post anthesis N uptake
 - **LAP**: Leucine aminopeptidase
 - **¹⁵N_{grain}**: ¹⁵N recovery in grains
 - **NRE**: N remobilisation efficiency
 - **NC_{grain}**: N content in grains
 - **Actb**: Actinobacteria
 - **Gpos1**: Gram-positive
 - **G-2**: Gram-negative

Phospholipid Fatty Acid Analysis

Flowering



Grain-filling



Conclusion



Open-pollinated **Gadam** variety was most drought resistance

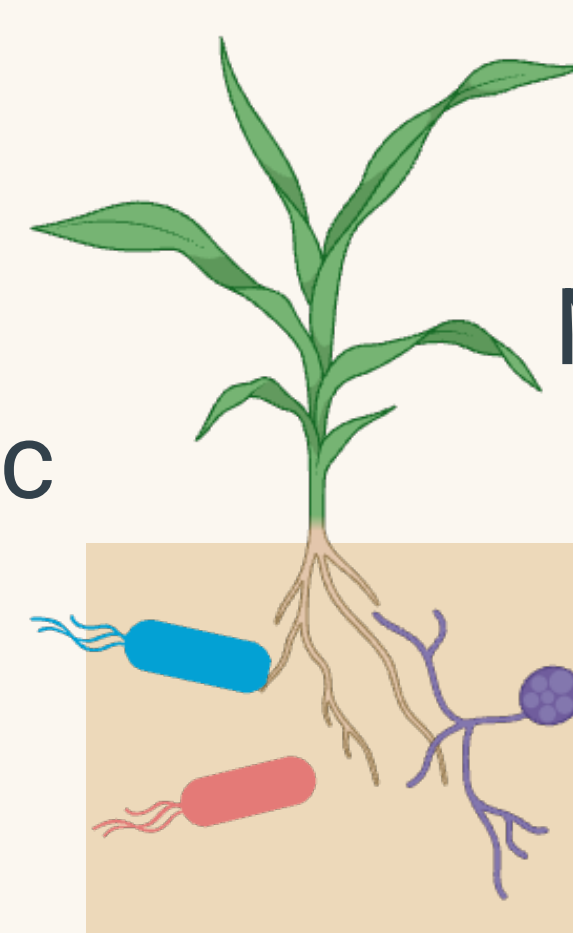
Drought changed **rhizosphere enzyme activity** and **microbial communities**, with genotype-specific effects on nutrient availability



Chitinase ↓
Leucine amino peptidase →
Enzyme activities

Genotype specific

Plant-microbial Interaction



Microbial-support stabilisation

Nutrient uptake ↑



Rhizosphere traits fuelled by plant C

