

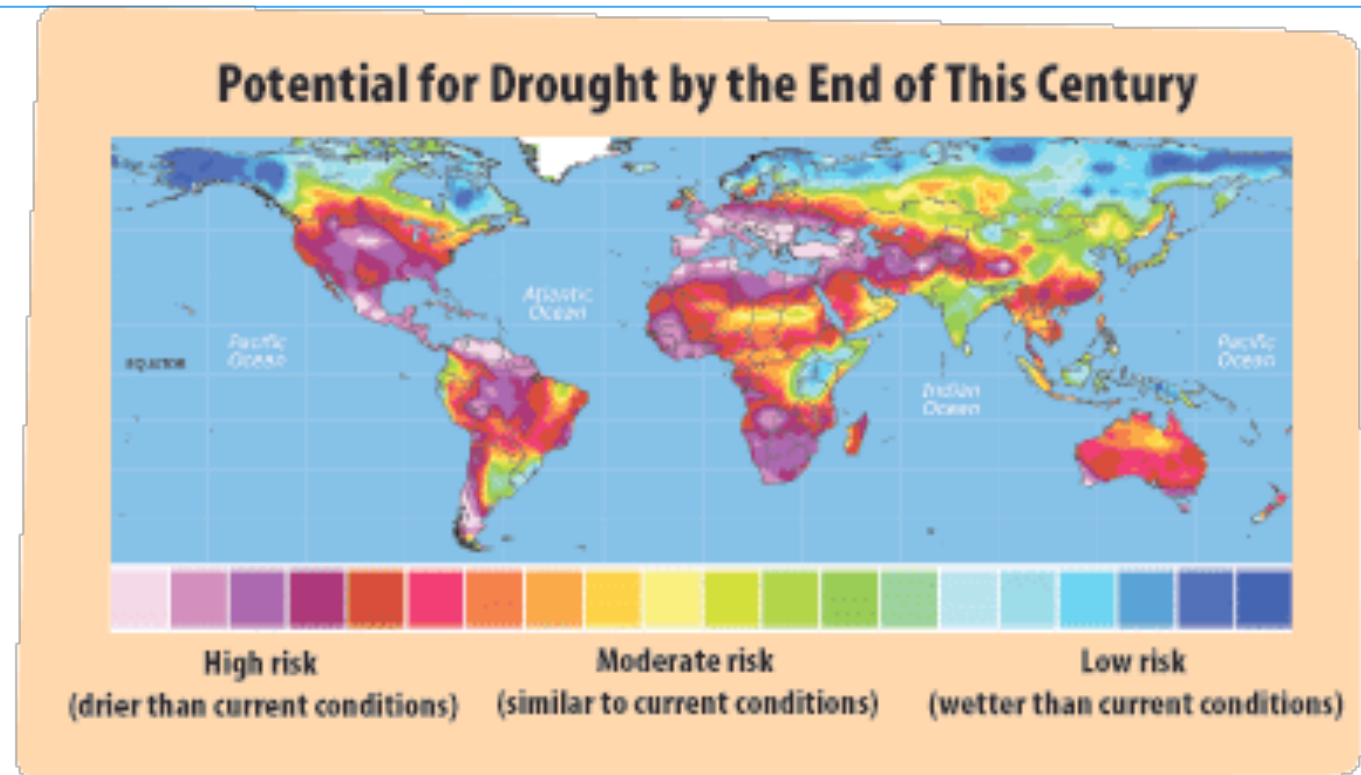


Impact of drought on C forms and fluxes in the soil – plant continuum

Cornelia Rumpel, Muhammad Sanaullah, Maria de la Luz Mora, Marcela Calabi Floody and Abad Chabbi

**CNRS, Institute of Ecology and Environment Paris, France
BIOREN, Universidad de la Frontera, Temuco, Chile
INRAE, Lusignan, France**

Occurrence of drought

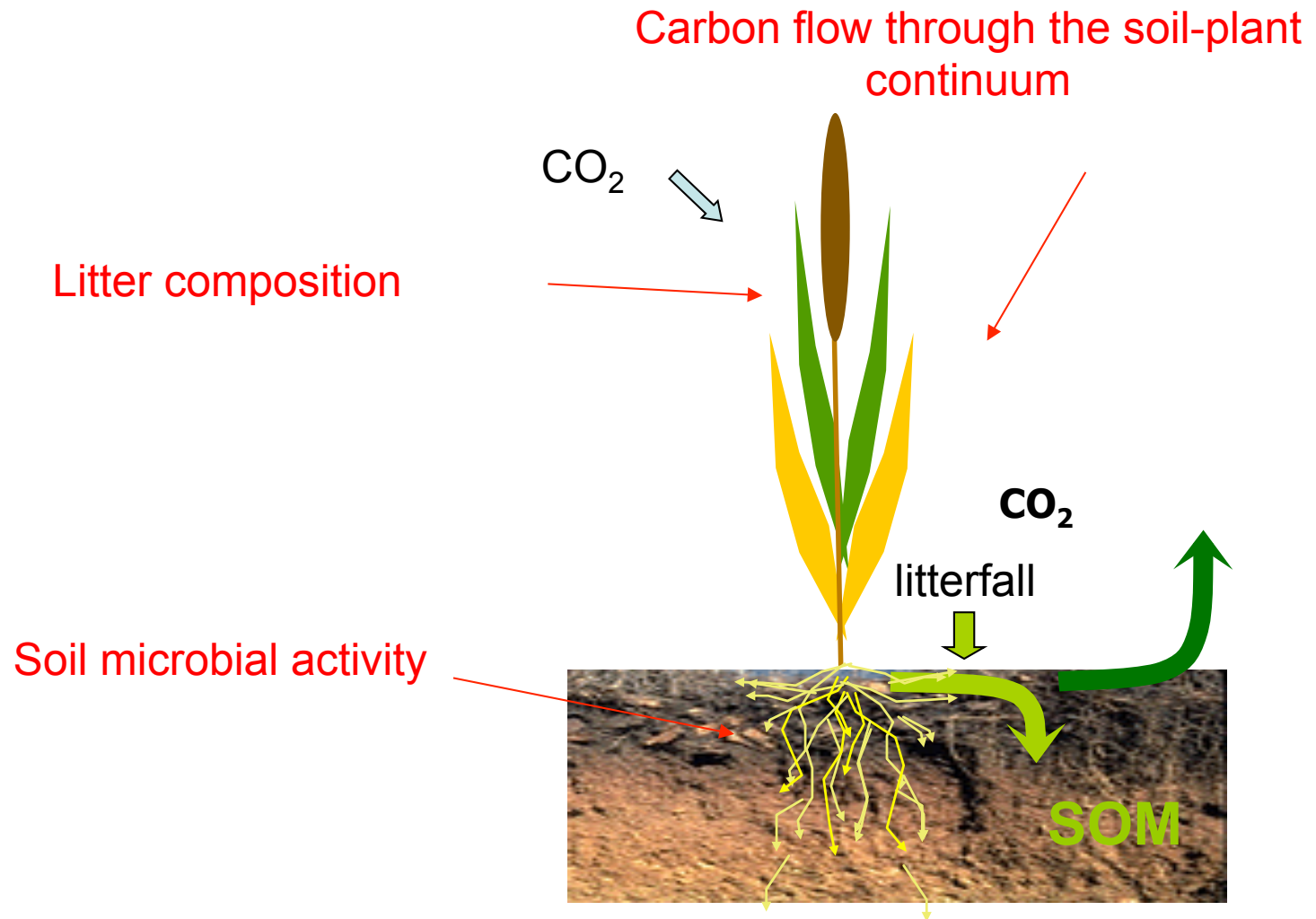


Global warming is likely to increase the risk of drought stress in many parts of the world

Its occurrence limits plant productivity and thereby affects the soil compartment

However the effect of drought on the soil system is poorly known

Drought could impact organic matter formation through its effect on plants and soil



How does drought affect C storage within the plant soil system ?

Specific Objectives

- Evaluate changes in biogeochemical composition of plant material exposed to drought
- Assess the potential mineralisation of drought affected material once added to soil
- Evaluate the drought effect on the mineralisation on plant material of contrasting quality
- Determine drought effects on C flow in the plant-soil continuum

Study site

Long-term Observatory for
Environmental Research (ORE),
Lusignan, France

MAT : 10.5 °C

Annual rainfall: 600 mm

Flat temporary grassland

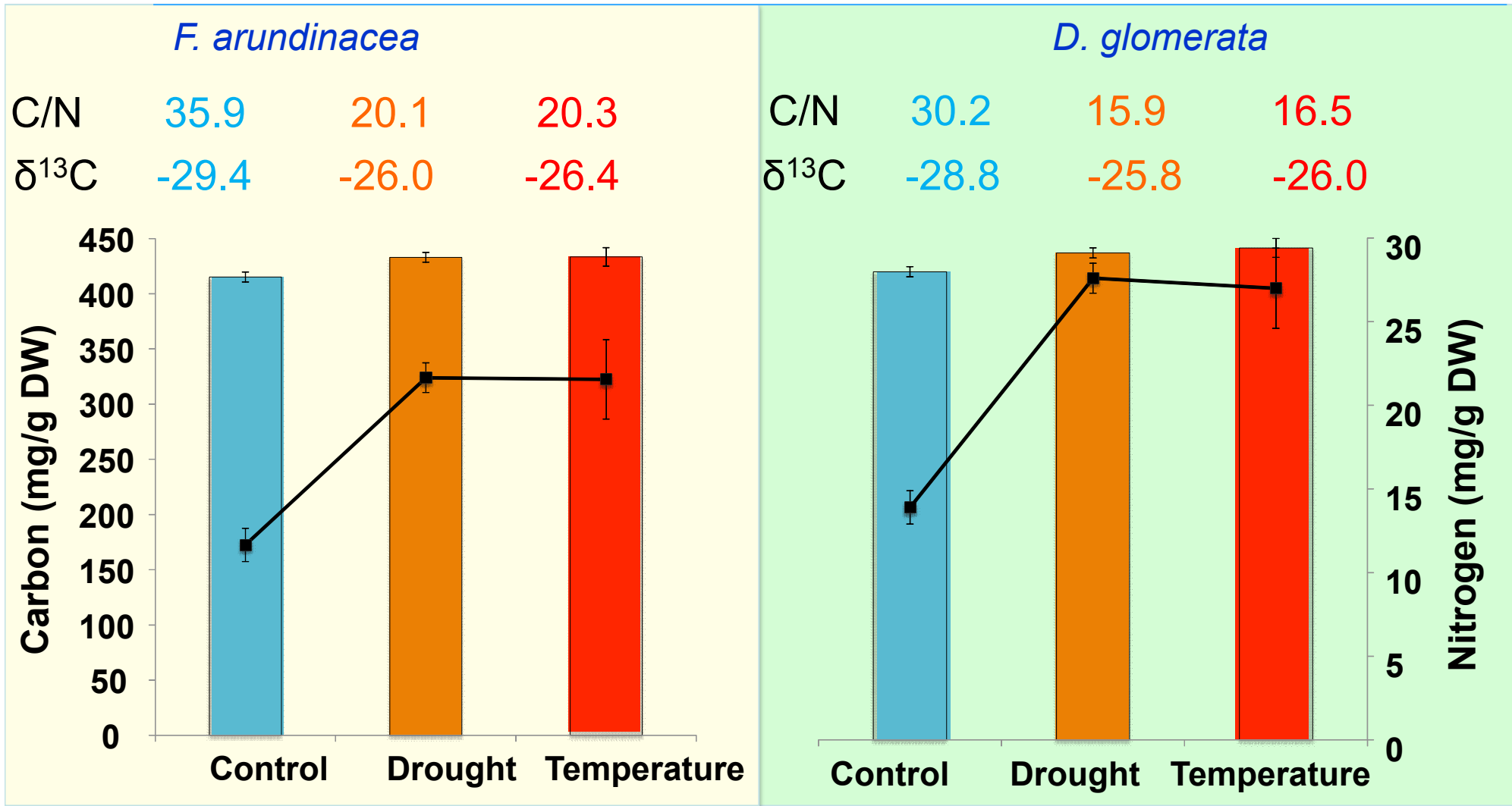
Cambisol with loamy texture



Xavier Charrier - ORE / INRA Lusignan

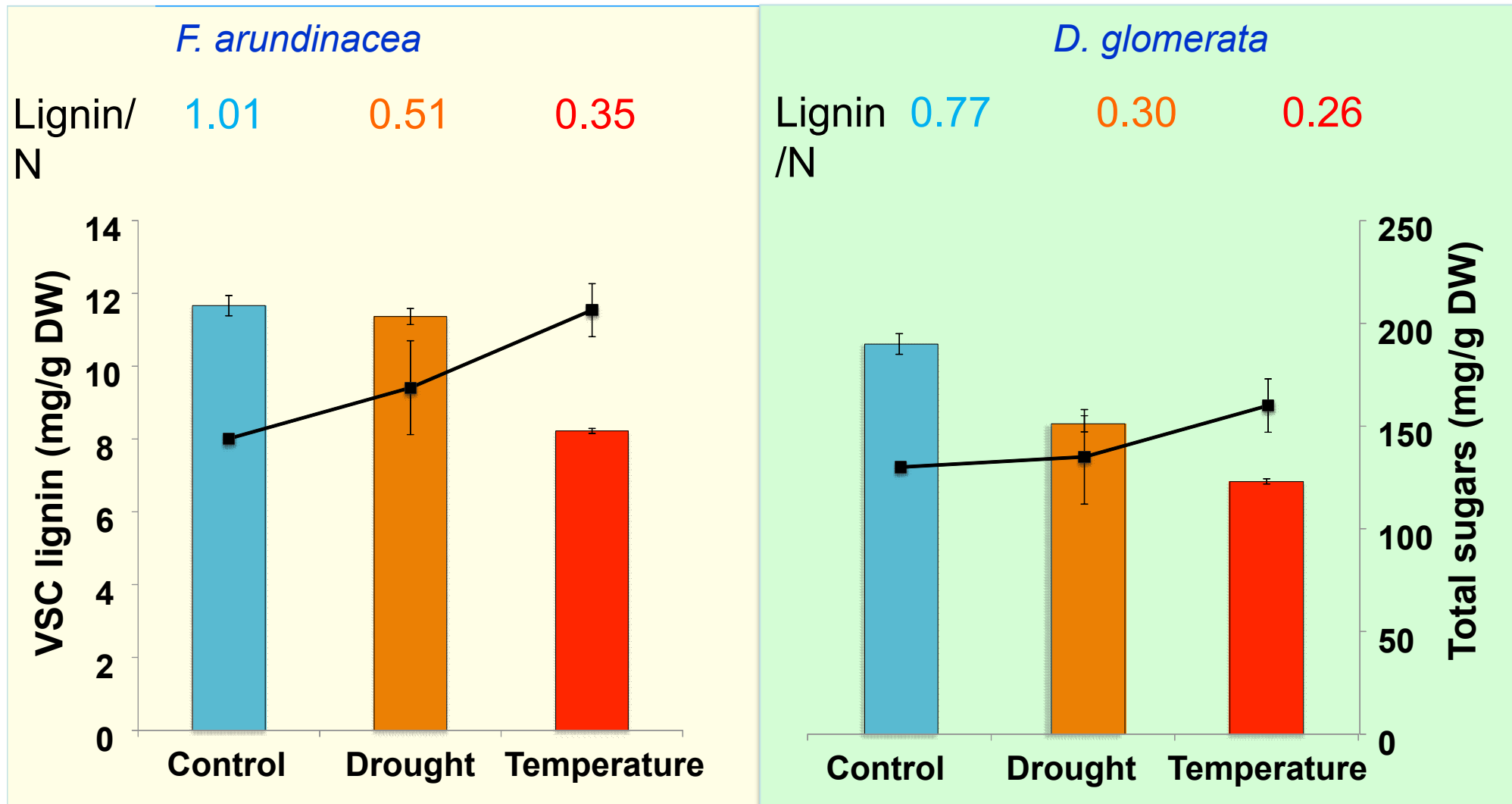


Drought changes plant elemental composition



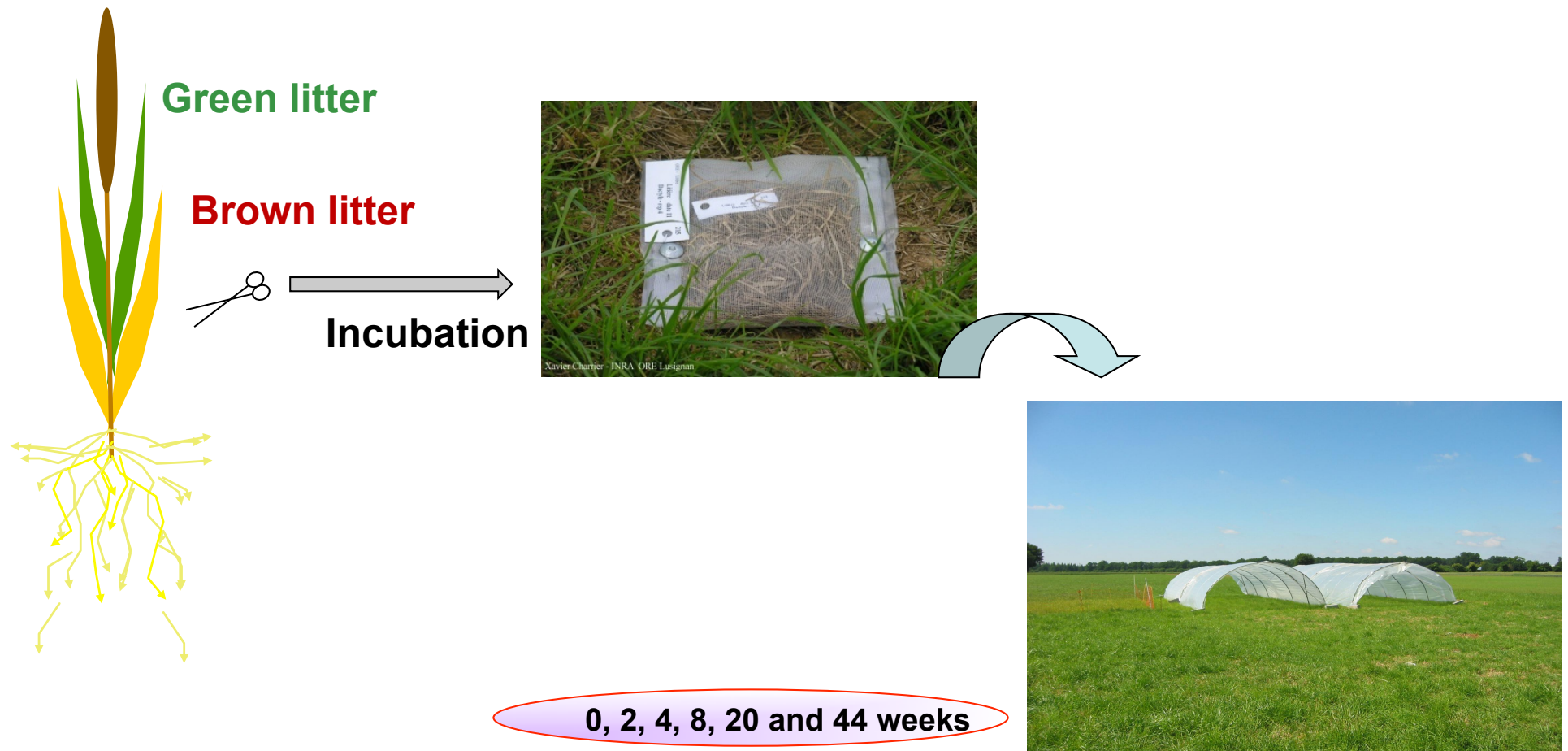
- Drought stress resulted in an increase in N content leading to decrease in the C/N ratio which was more prominent in *D. glomerata*.

Drought changes plant biochemical composition



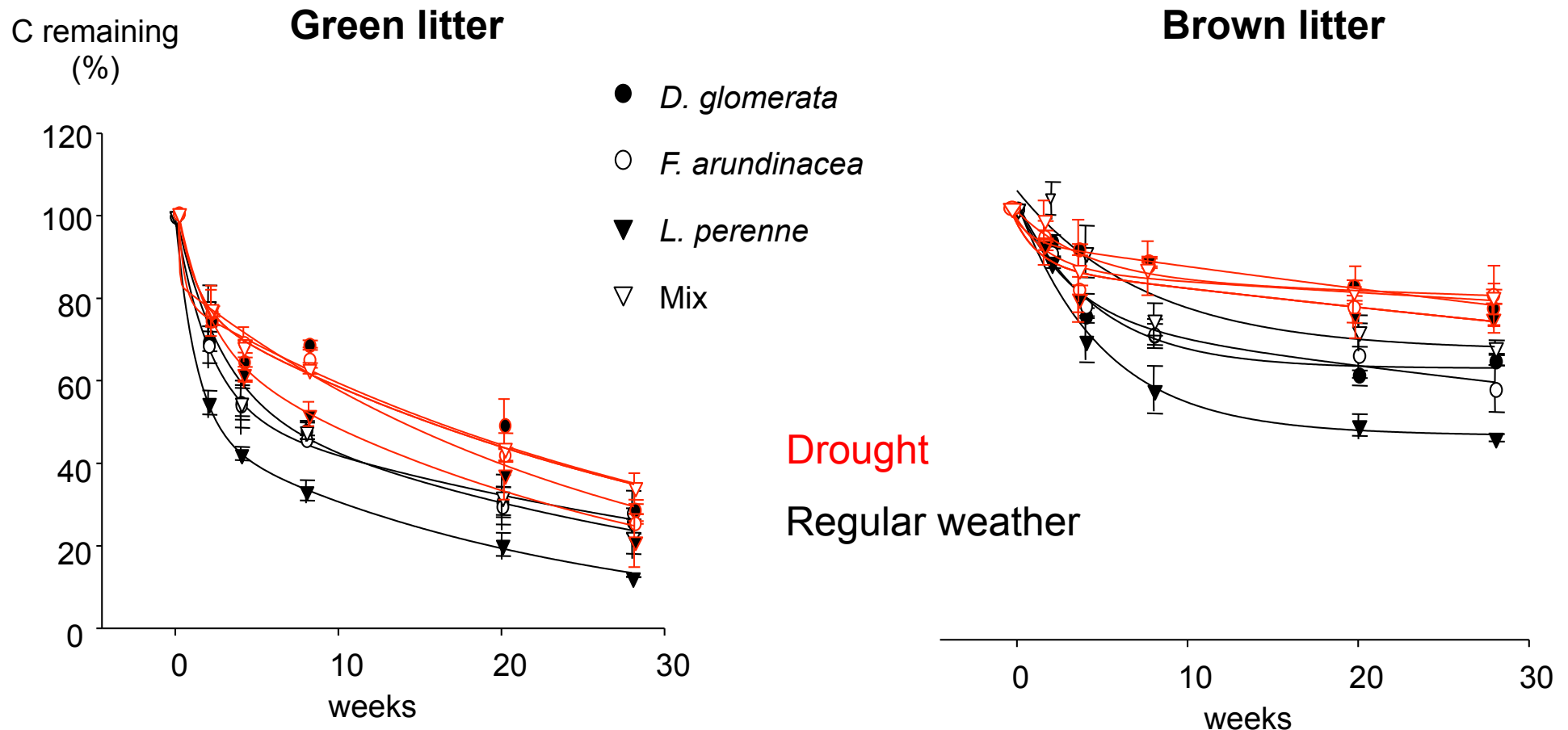
- Drought and elevated temperature treatments resulted in decrease in lignin contents while increase in non-cellulosic sugar contents.

Drought effect on the mineralisation on plant material of contrasting quality



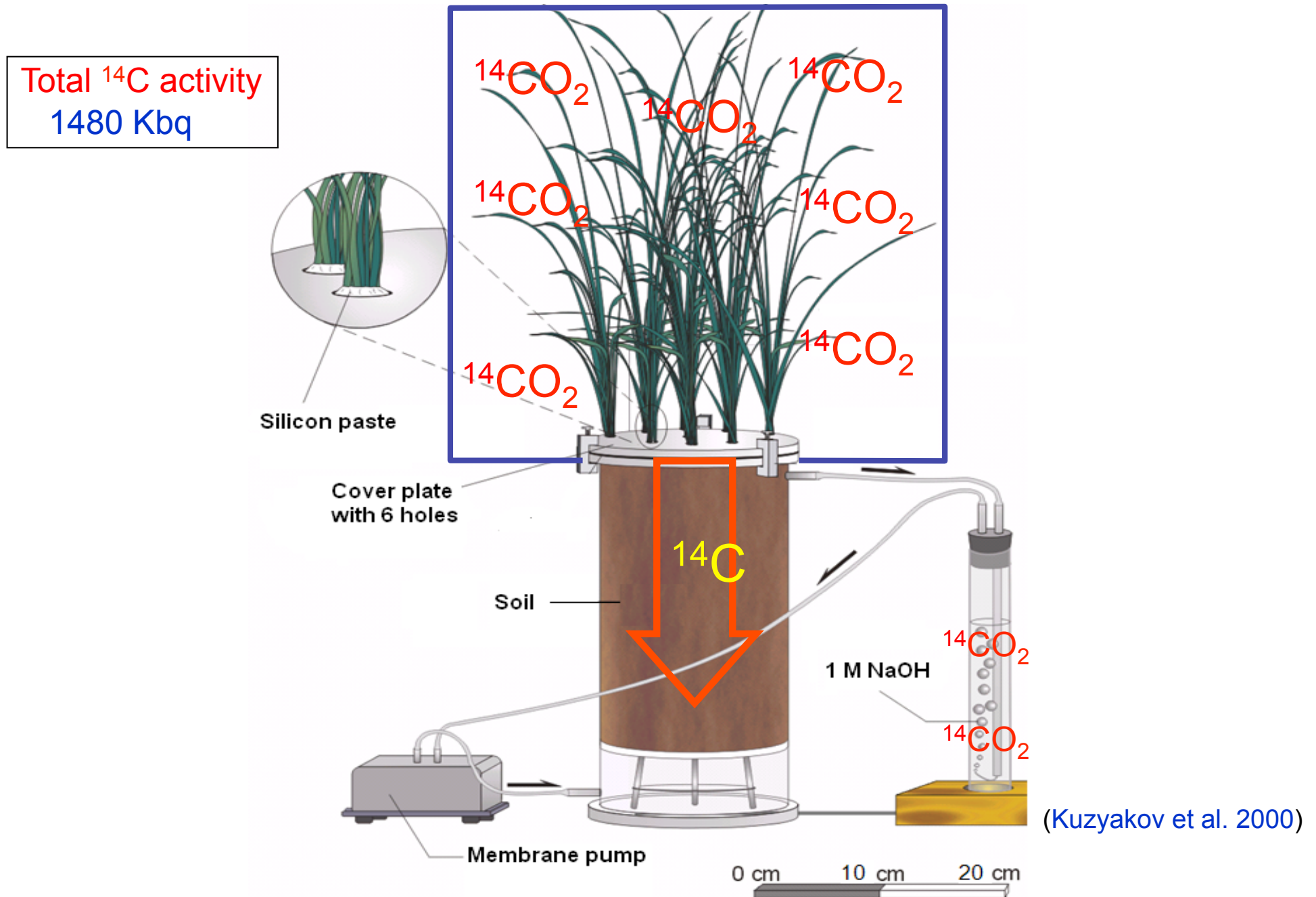
□ Elemental C, N, their stable isotopes, VSC lignin and non-cellulosic sugars were analyzed

Decomposition pattern of plant litter types under regular weather and drought conditions

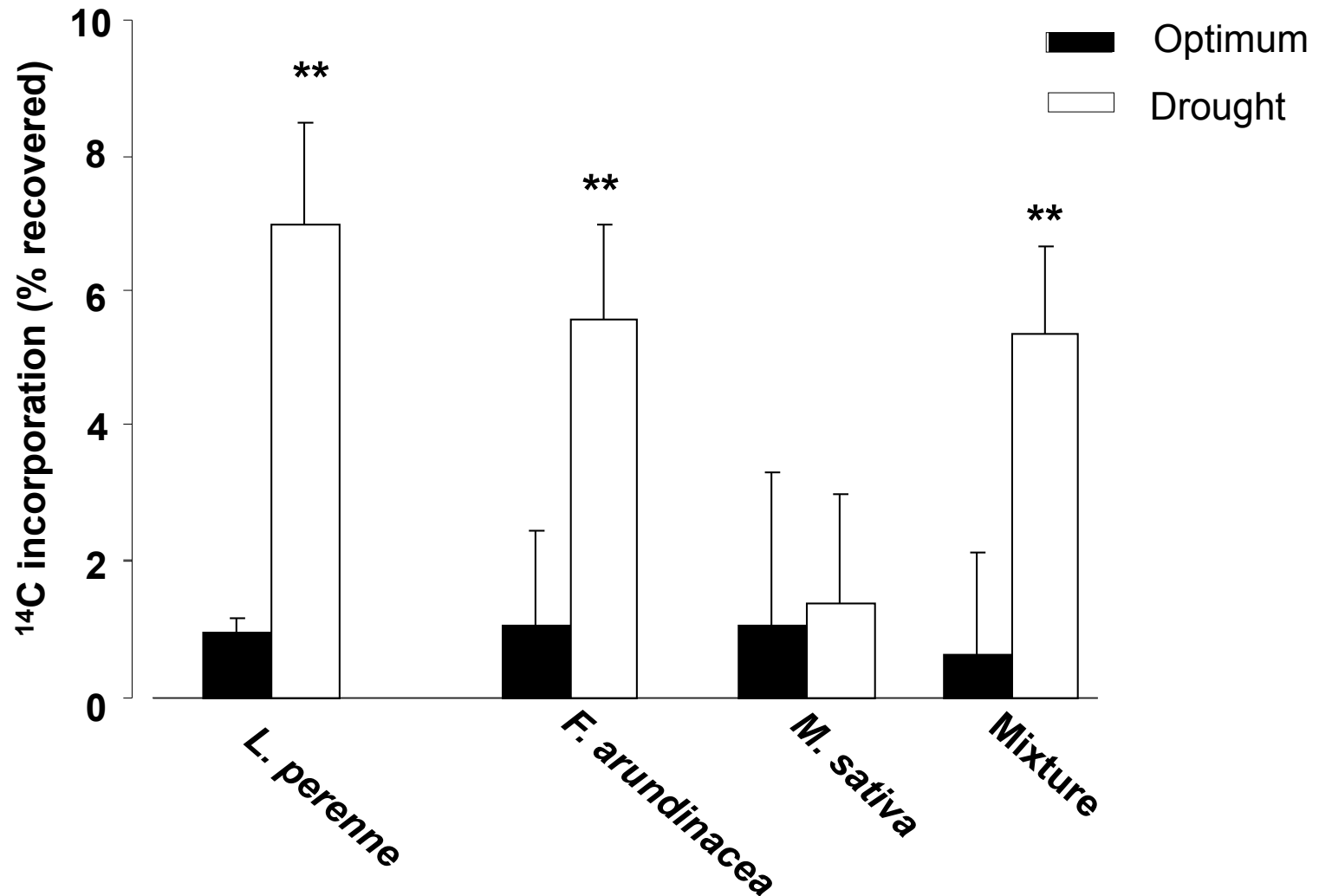


- Brown litter decomposition is slower than decomposition of green litter, especially in the early phase
- Drought reduces degradation of both litter types

Drought effects on C flow and enzyme production

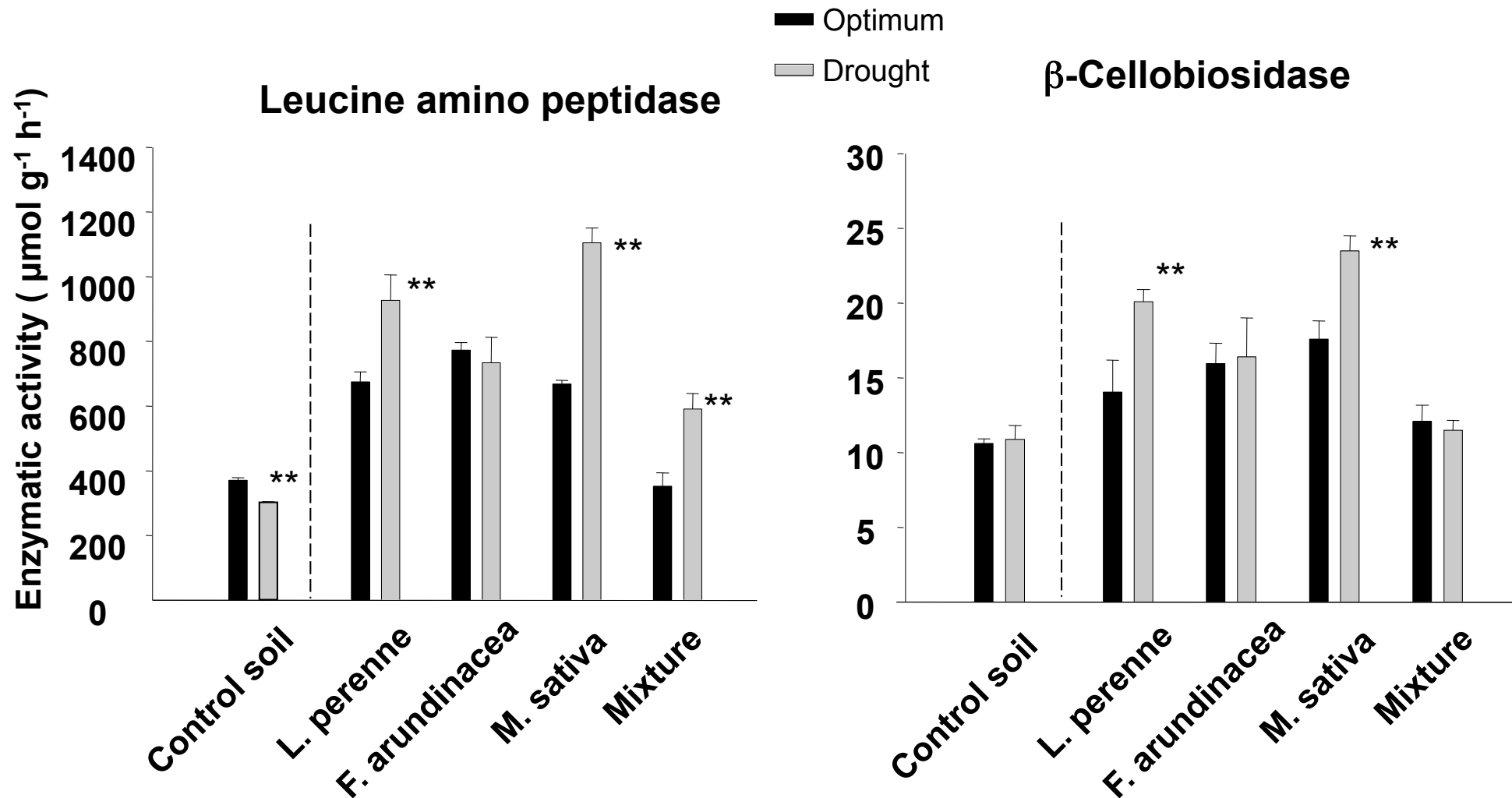


Drought impact on ^{14}C incorporation into dissolved organic carbon



□ Drought increases root exudation, except for M. sativa

Extracellular Enzyme Activity



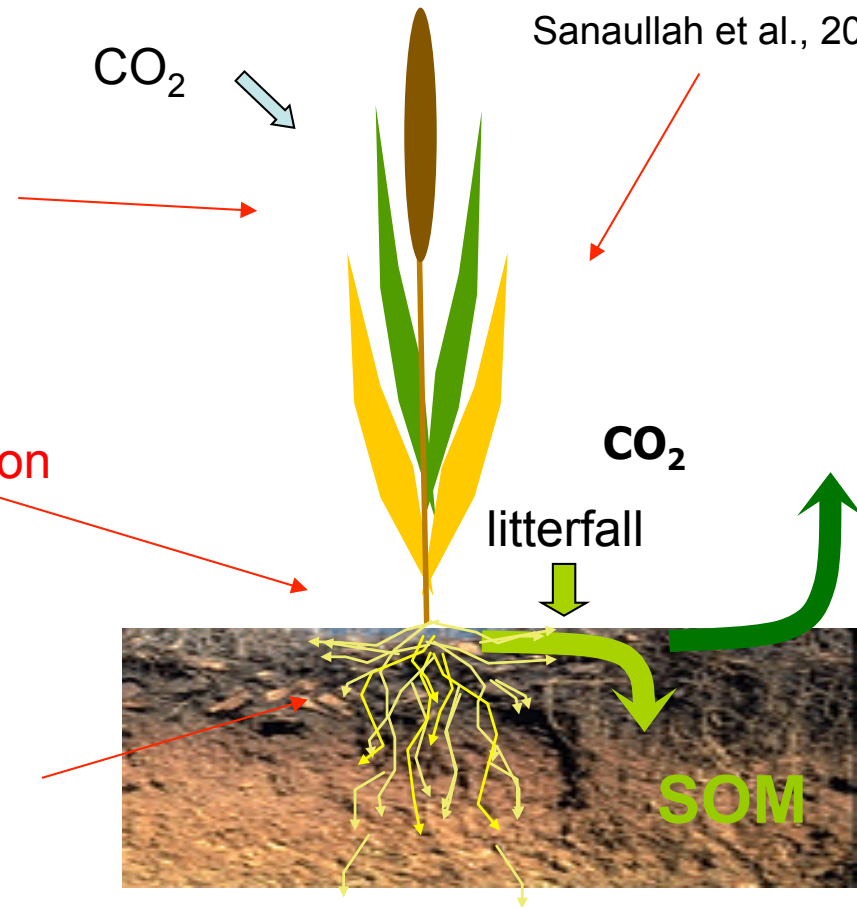
□ Drought affects enzyme activity, especially those involved in the N cycle

Sanaullah et al., 2012, SBB

Sanaullah et al., 2014, Plant and Soil

Sanaullah et al., 2012, Plant and Soil

Sanaullah et al., 2011, Applied Soil Ecology



Drought effects on soil C storage are a combination of these different effects. Plant species specific responses need to be taken into consideration

Acknowledgements

Funding:

- ❑ Higher Education Commission (HEC), Pakistan
- ❑ La Région Poitou-Charentes: Excellence Environnementale et Développement des Eco-Industries
- ❑ MEC program, Fondecyt, Chile

Technical support:

Xavier Charrier, Christophe De Berranger, Gerard Bardoux, Nicolas Pichot, Daniel Billou and Valérie Pouteau