CAN BIOCHAR AMENDMENT OF FOREST FIRE-AFFECTED SOIL REDUCE SOIL EROSION BY WATER?

Oscar Gonzalez-Pelayo [1,2], Behrouz Gholamahmadi[2], Marjan Jongen[3], Suyan Isaka[2], Isabel Campos[2], Ana Catarina Bastos[2], Ana Caetano[2], Frank G.A. Verheijen[2]

1-MED–CHANGE-Universidade de Évora, Évora, Portugal.

2-Centre for Environmental and Marine Studies (CESAM), Department of Environment and Planning, University of Aveiro, Aveiro, Portugal.

3-MARETEC—Marine, Environment and Technology Centre, LARSyS, Instituto Superior Técnico, University of Lisbon, Portugal.

SOILCOMBAT (PTDC/EAM-AMB/0474/2020)

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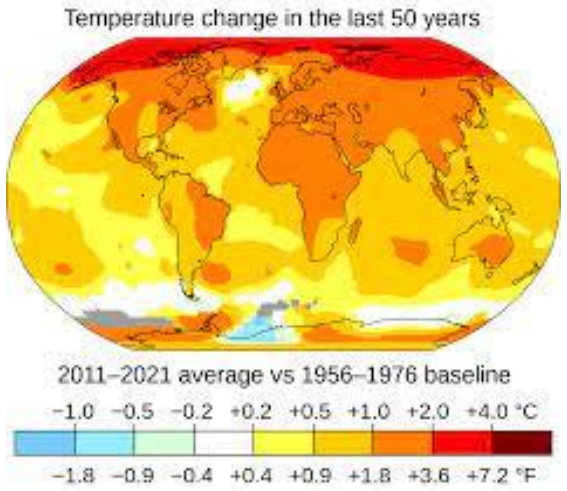
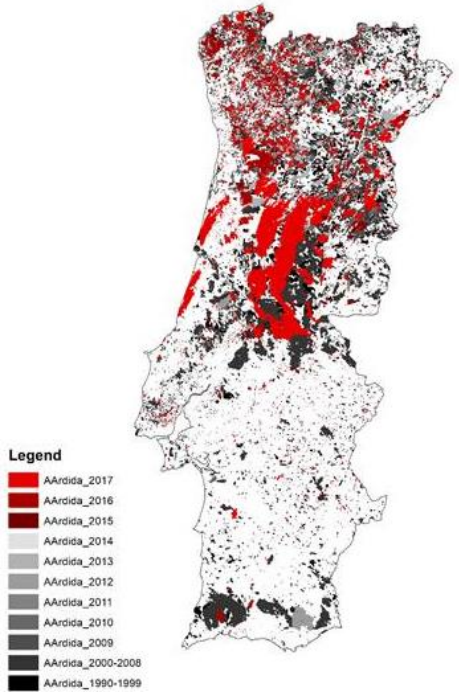
Problem

Climate change + Forest Fires = Alter Soil properties → EROSION





DESERTIFICATION

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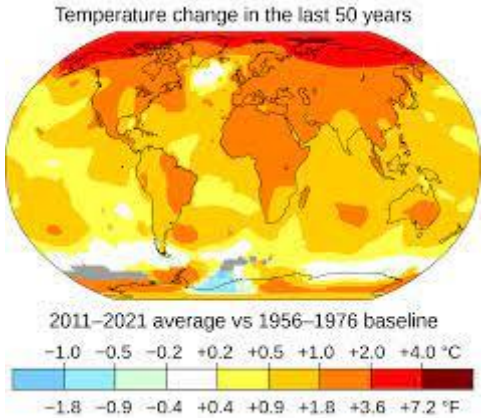
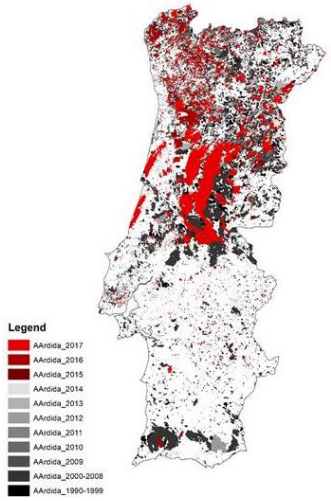
Solution??

Climate change + Forest Fires + Soil Engineering = Water infiltration





BIOCHAR AMENDMENT, mulch,..

Soil Erosion Mitigation Actions

LESS EROSION

Reverse DESERTIFICATION

General Hypothesis

To correct soil limiting factors, thus improve soil functioning

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Previous work

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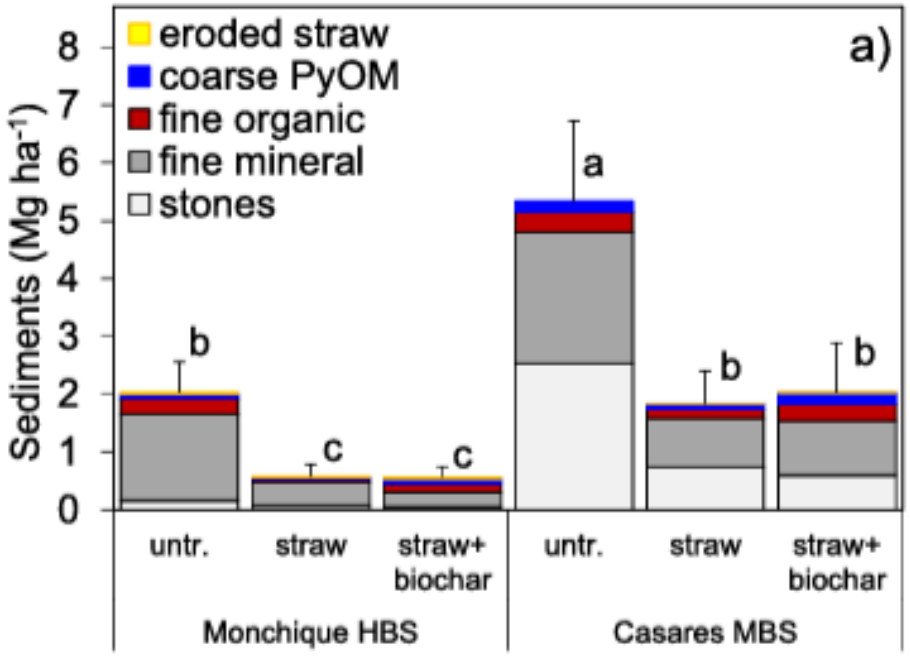
Can straw-biochar mulching mitigate erosion of wildfire-degraded soils under extreme rainfall?

S.A. Prats [a,b,*], A. Merino [c], J.A. Gonzalez-Perez [b], F.G.A. Verheijen [a], J.M. De la Rosa [b]

[a] Earth Surface Processes Team, Centre for Environmental and Maritime Studies (CESAM), Dept. Environment and Planning, University of Aveiro, 3810-193 Aveiro, Portugal
[b] Instituto de Recursos Naturales y Agrobiología de Sevilla, Consejo Superior de Investigaciones Científicas (IRNAS-CSIC), Reina Mercedes Av, 10, 41012 Seville, Spain
[c] Escuela Politécnica Superior, Soil Science and Agricultural Chemistry, University of Santiago de Compostela, 27002 Lugo, Spain



co-application of **straw+biochar mulch** can reduce soil erosion

but….

Does incorporation of alone Biochar can reduce soil erosion???

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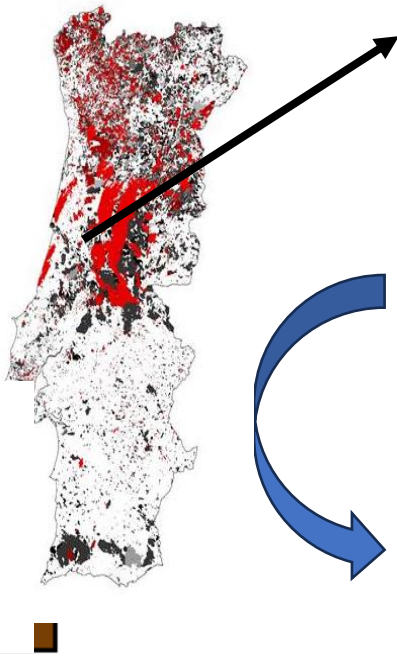
MAT & MET

Dystric leptosol soil, a typical burned forest soil in Portugal



Treatments (3 replicated plot each)

FC	Forest Control soil sample
FB2	Forest soil sample with Biochar - 2%
FC4	Forest soil sample with Biochar - 4%

Treatment	SOM	Texture
FC	11.9	Sandy-loam
FB2	12.3	Sandy-loam
FB4	12.5	Sandy-loam

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MAT & MET

Lysimeters study park in U. Aveiro

Large and small particles of woody feedstock biochar on left and in middle, olive pit feedstock biochar on the right

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MAT & MET

MAT & MET

October 2019 to September 2020 (11 rainfall events)

DATA BASE:

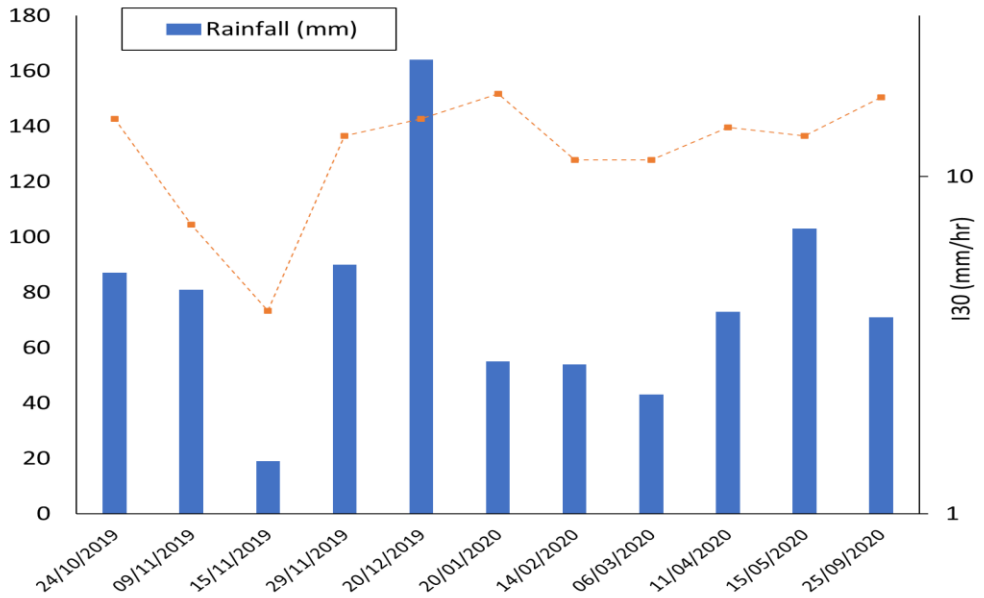
-Rainfall (mm)

-Runoff (mm)

-Erosion (g/m2)

-Soil physical properties as BD, MWD.

-Soil Moisture Content (%)



Method-

Pinpoints and leaf area index (LAI)-For Cover, Bare soil and Relative abundance

The soils were sown with a biodiverse seed mixture to help establish a vegetated soil cover, Oct 2019

-Soil Cover (%)

-Leaf Area Index

-Relative abundance (%)

-Aboveground Biomass (Kg/ha)

Dez 2019 June 2020

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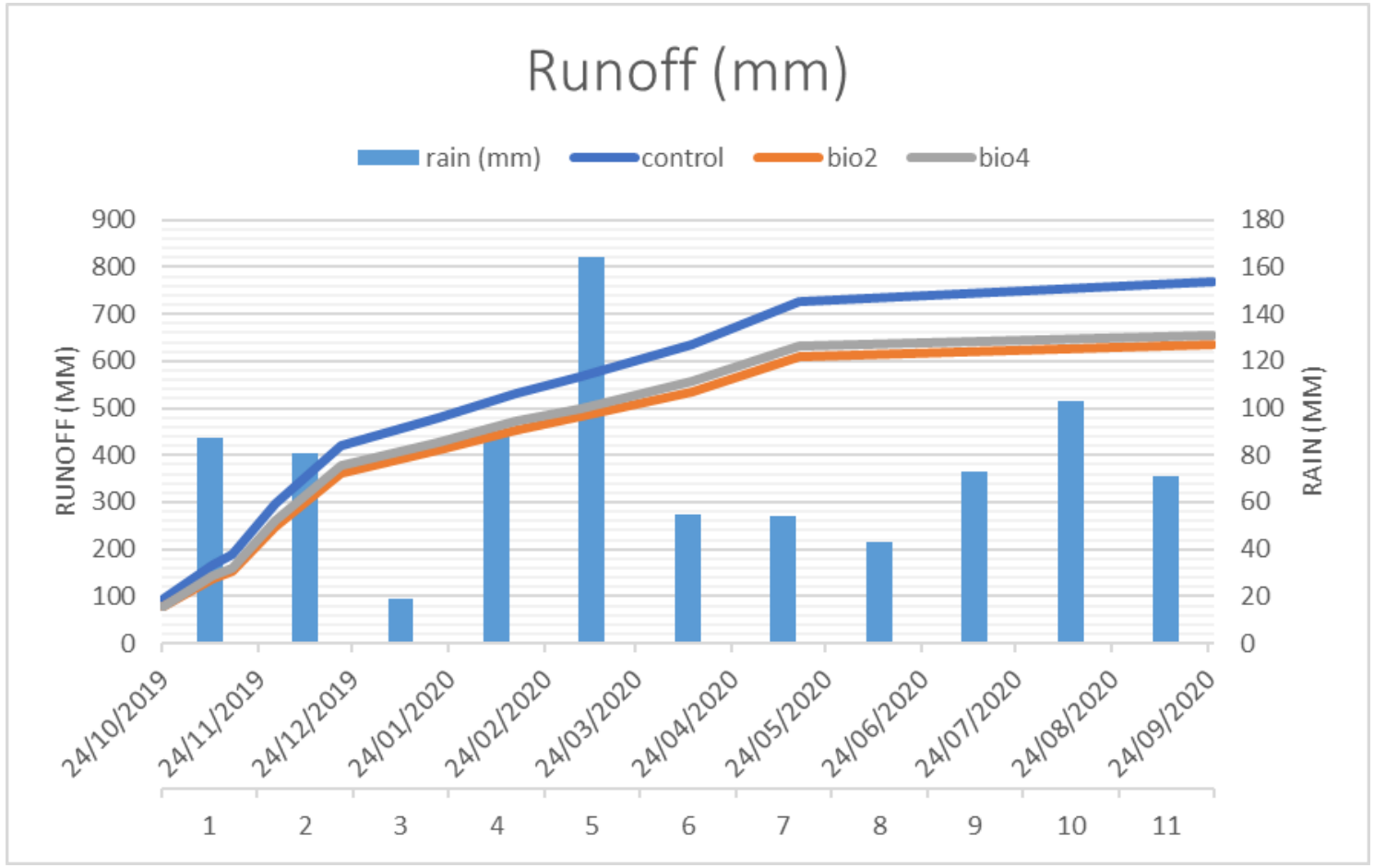
RESULTS

2% Biochar decrease RUNOFF IN **19%**

4% Biochar decrease RUNOFF IN **17%**



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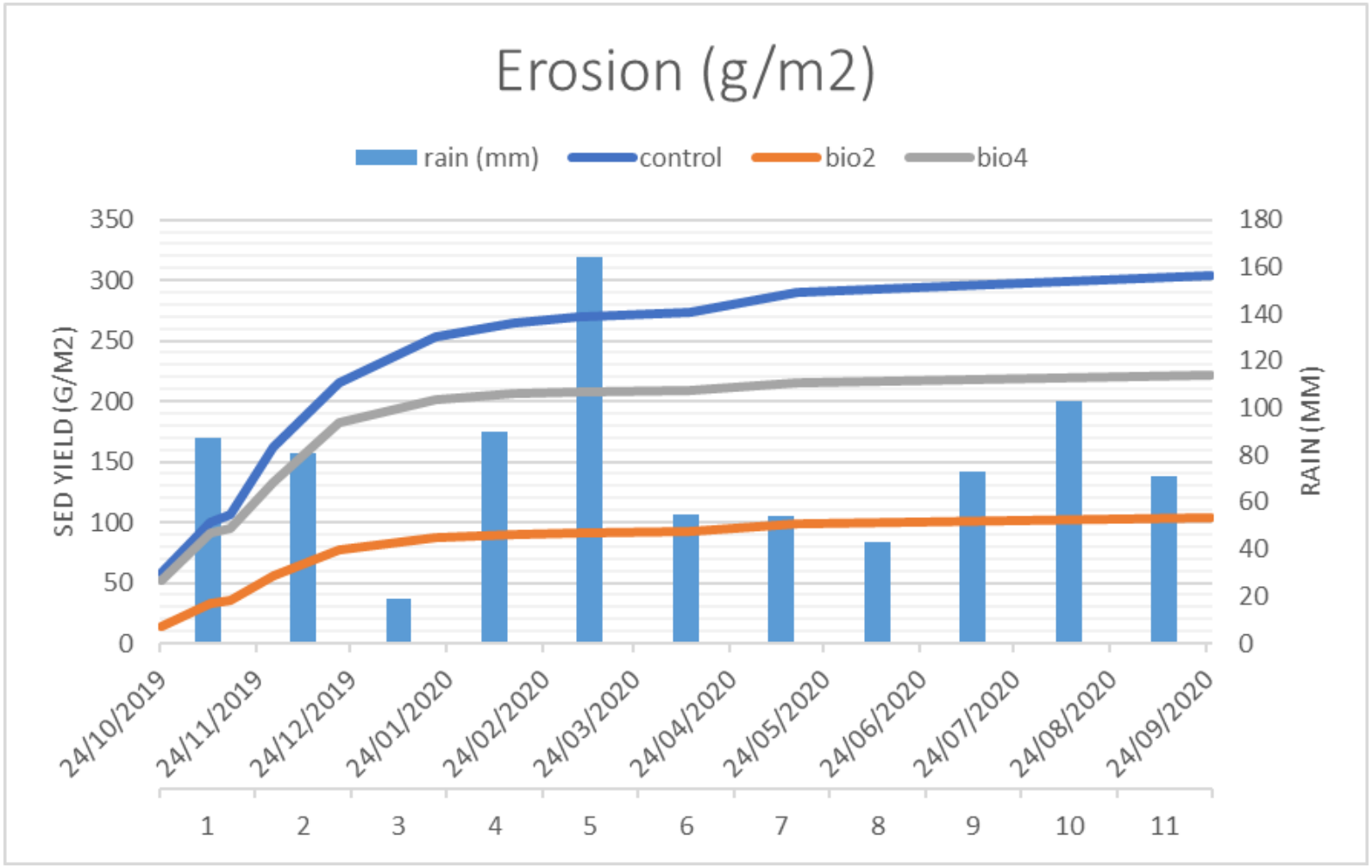
RESULTS

2% Biochar decrease EROSION IN **63%**

4% Biochar decrease EROSION IN **43%**



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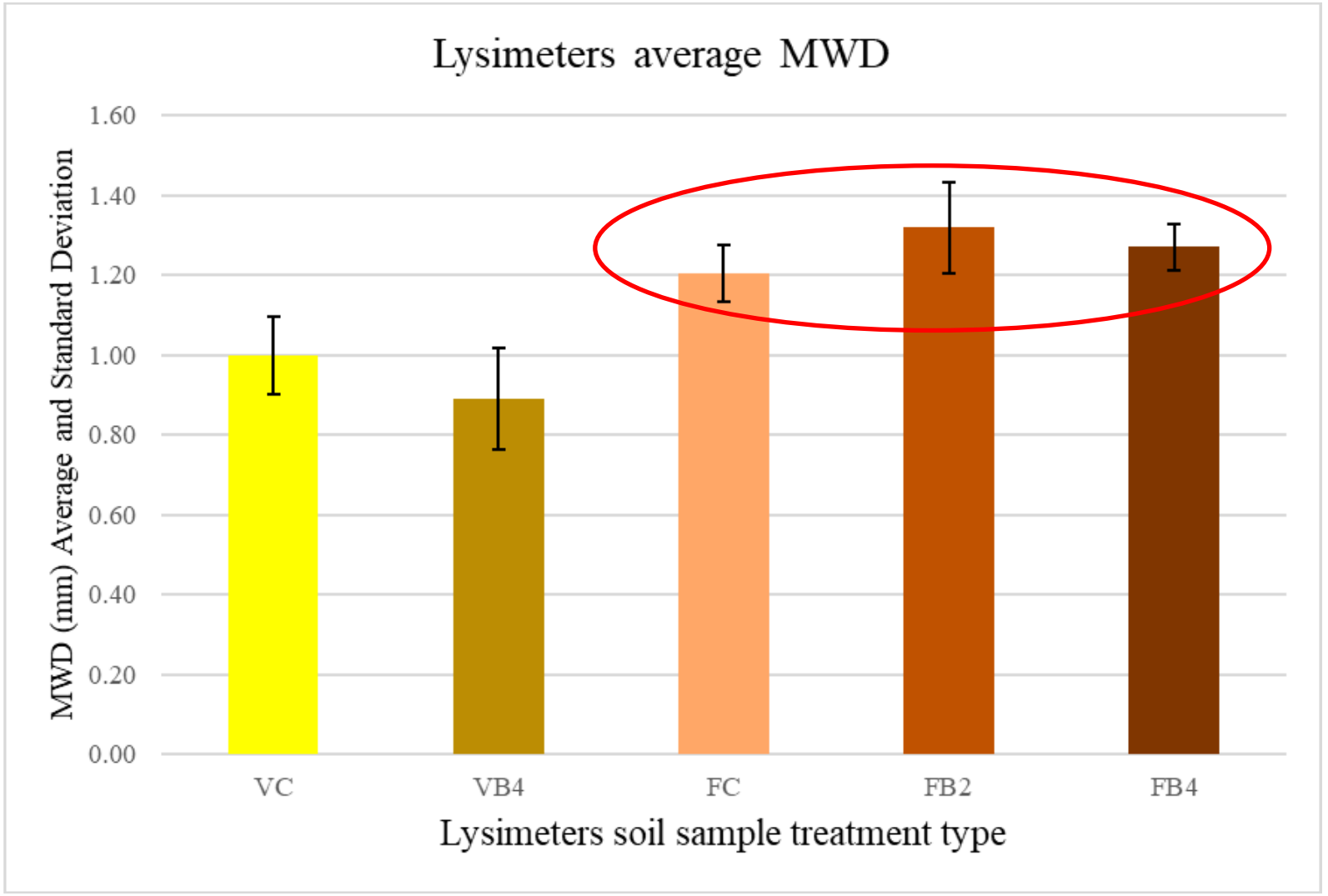
RESULTS

Soil Physical properties



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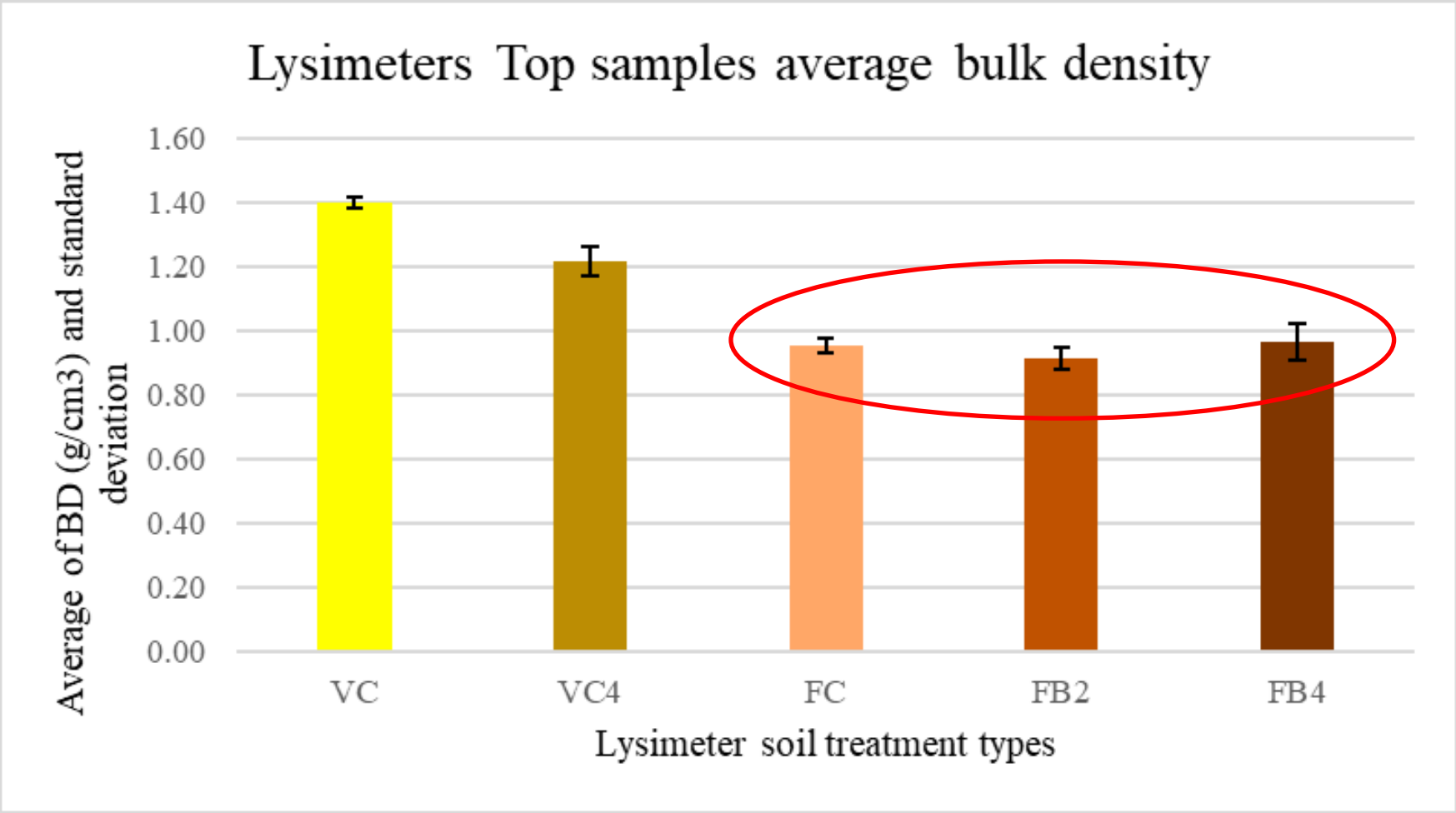
Soil Physical properties



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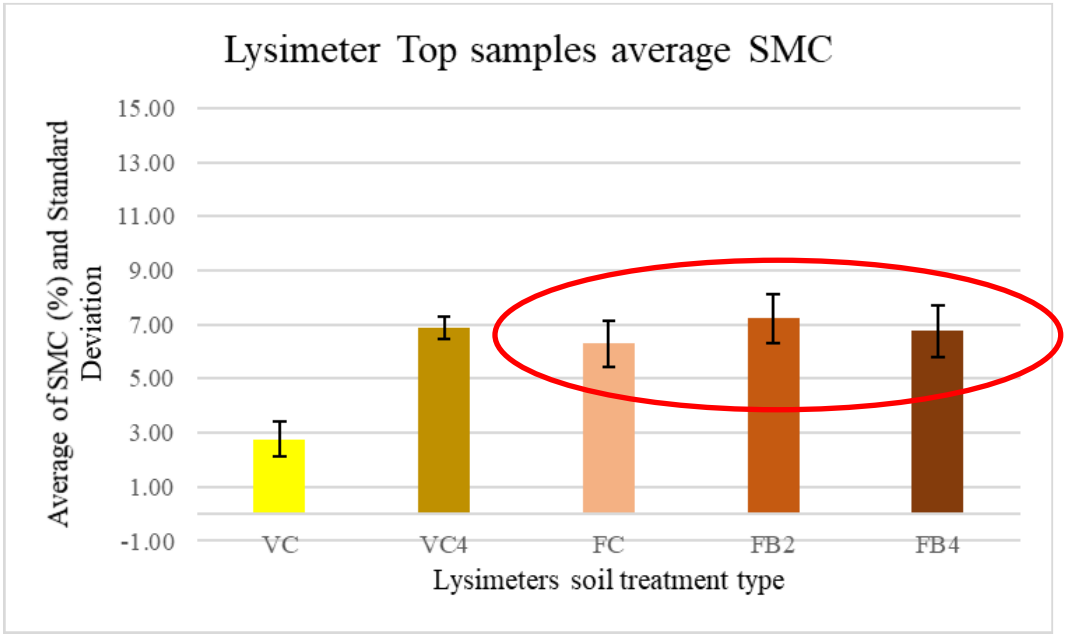
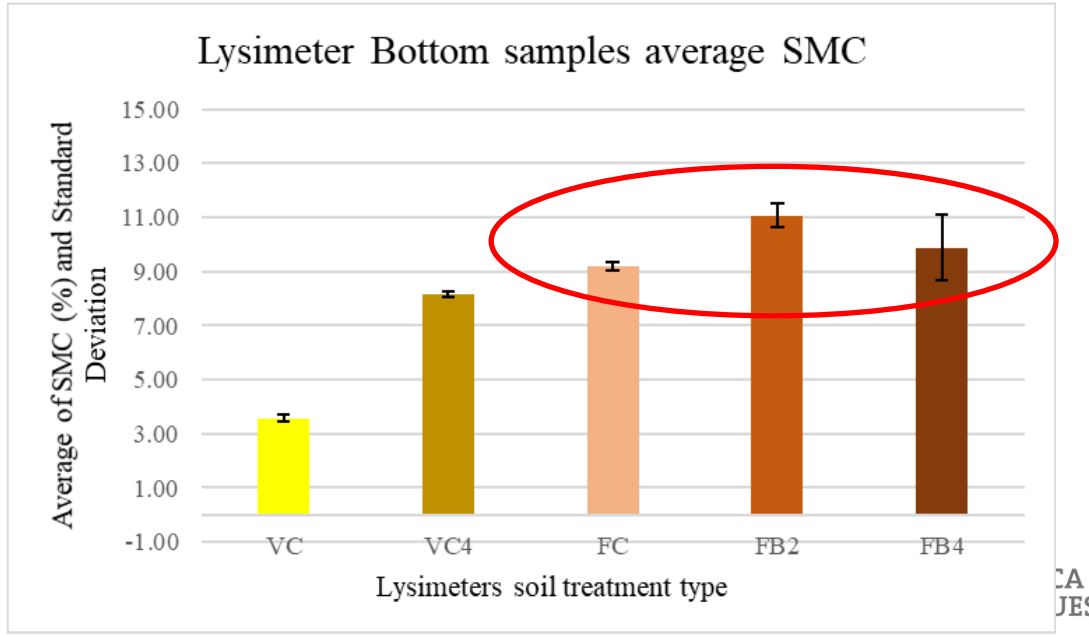
RESULTS

Soil Water





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RESULTS

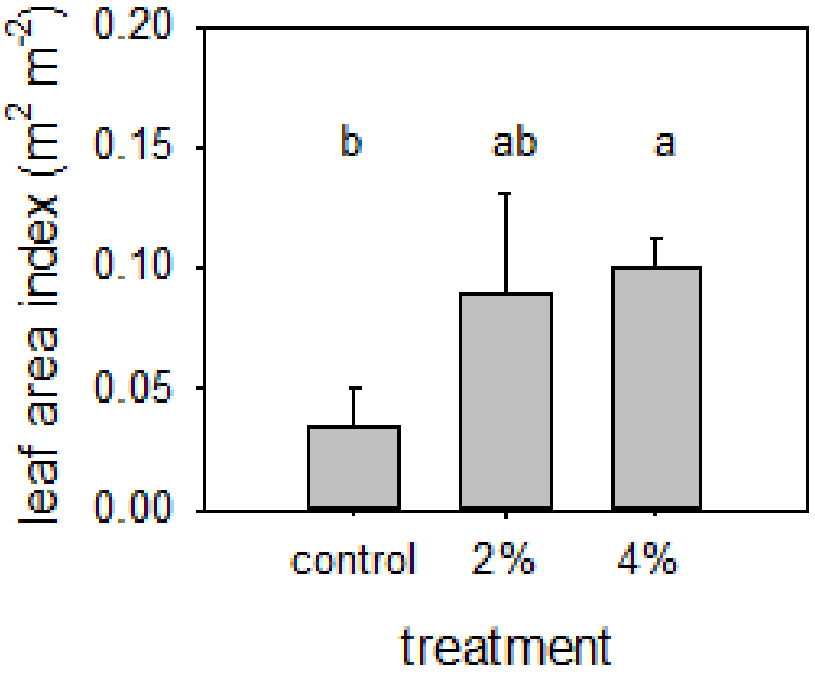
Vegetation

December 2019

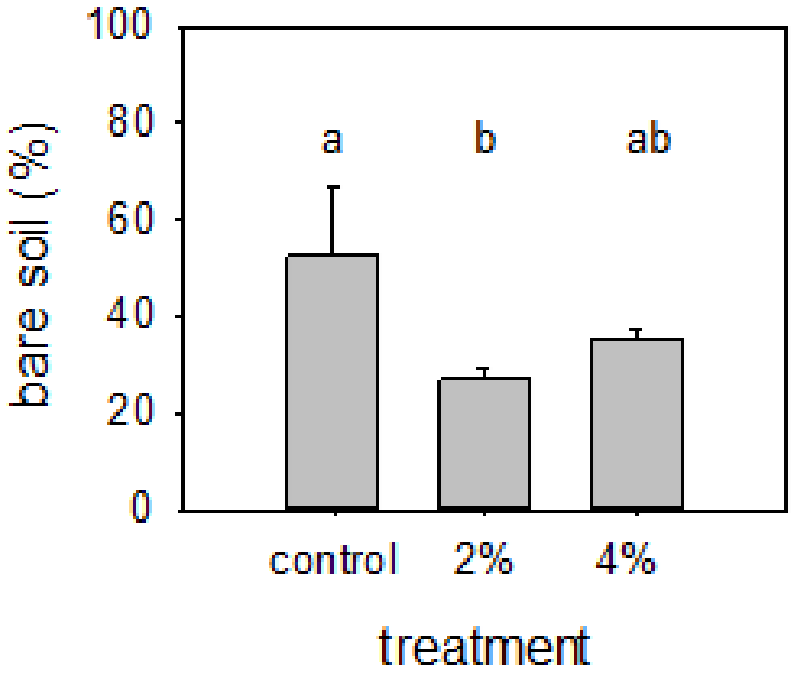
Method:

Pinpoints and leaf area index (LAI) -the projected area of leaves over a unit of land

LAI (m2*m2)



Bare soil (%)



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RESULTS

Vegetation

December 2019

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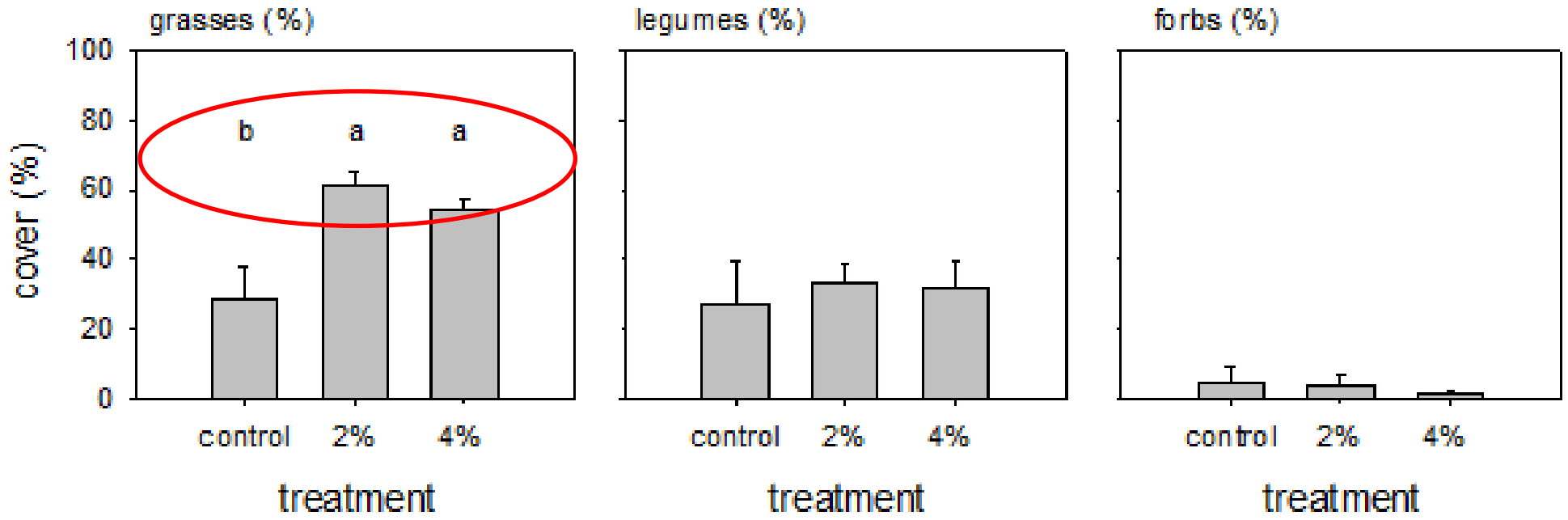
Pinpoints and leaf area index (LAI)



Cover (%)

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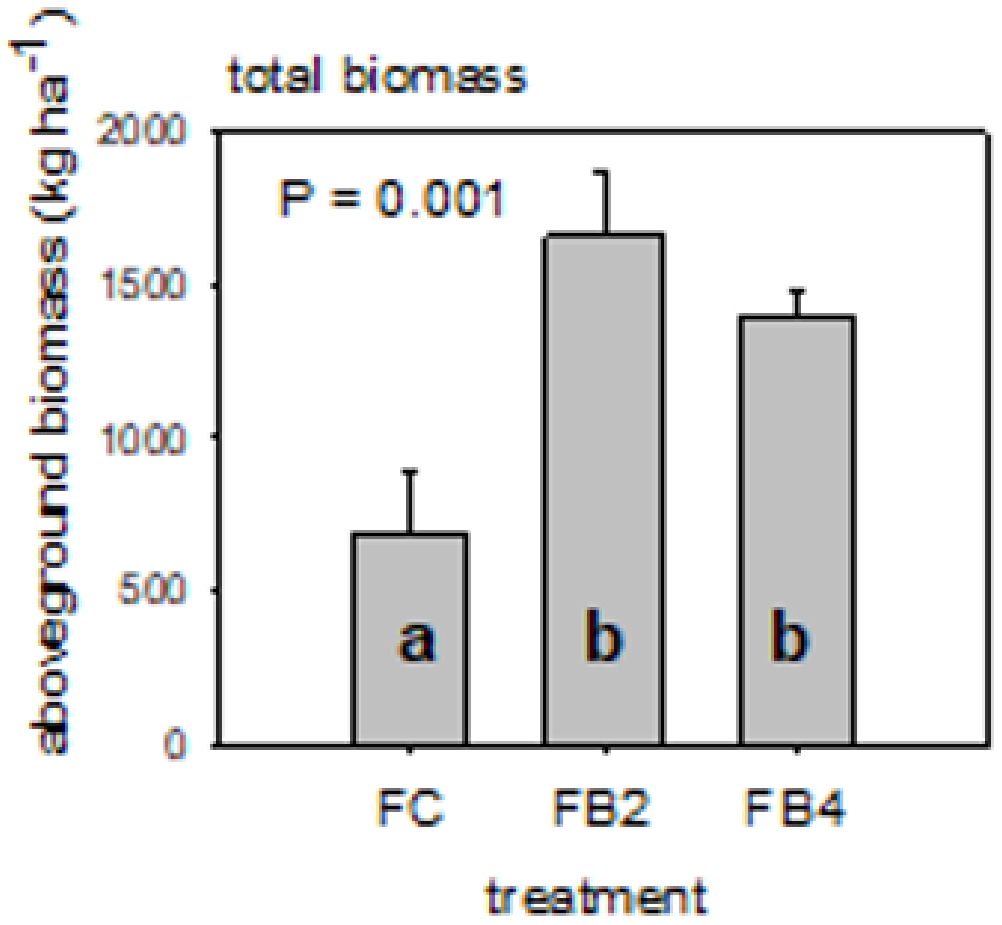
RESULTS

June 2020

Aboveground Biomass
(Kg/ha)



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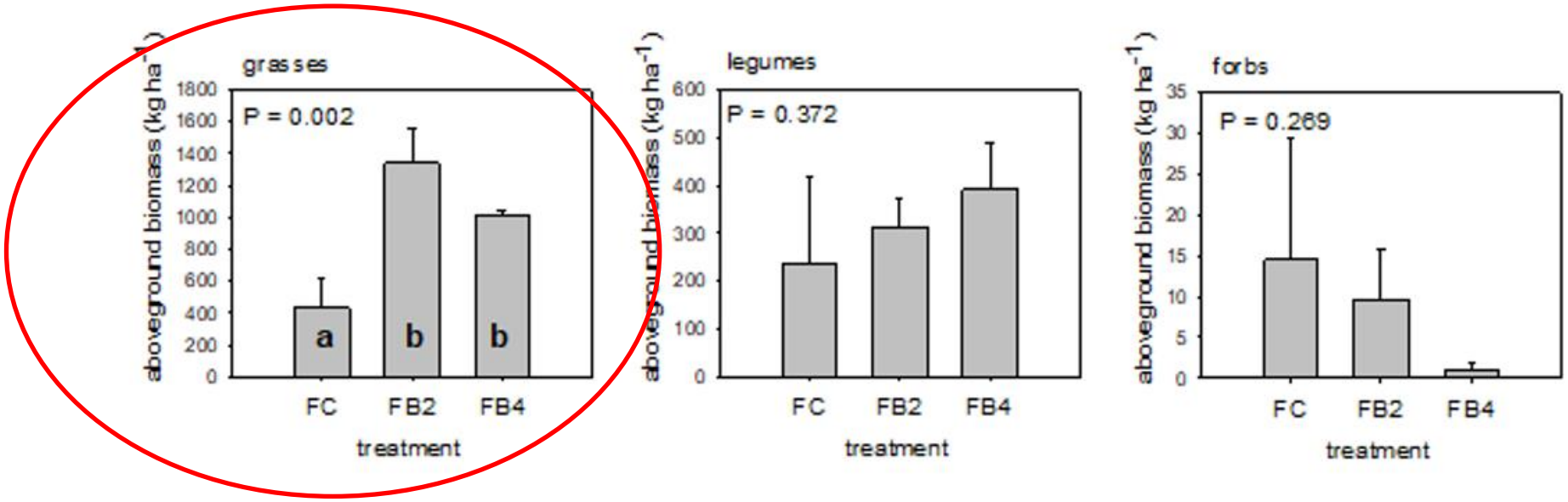
RESULTS

Vegetation

June 2020

Aboveground Biomass (Kg/ha)



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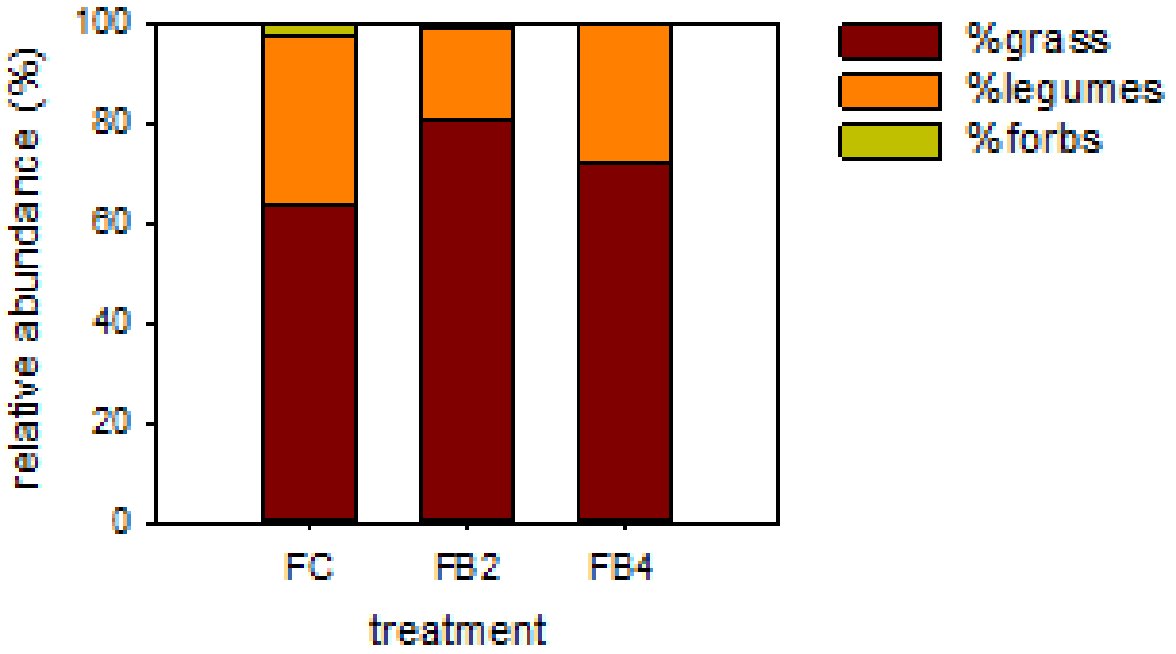
RESULTS

Vegetation

June 2020

Relative abundance (%)



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Key home message

BIOCHAR incorporation into a degraded burned soil:

-Reduces RUNOFF & EROSION. The 2% rate seems more effective.

-Increase ABOVEGROUND BIOMASS (grasses. 2% rate is more successful. **Why????**

-Not significant changes in the relative abundance or cover of grasses

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OBRIGADO / THANK YOU

oscargonzalezpelayo@ua.pt

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