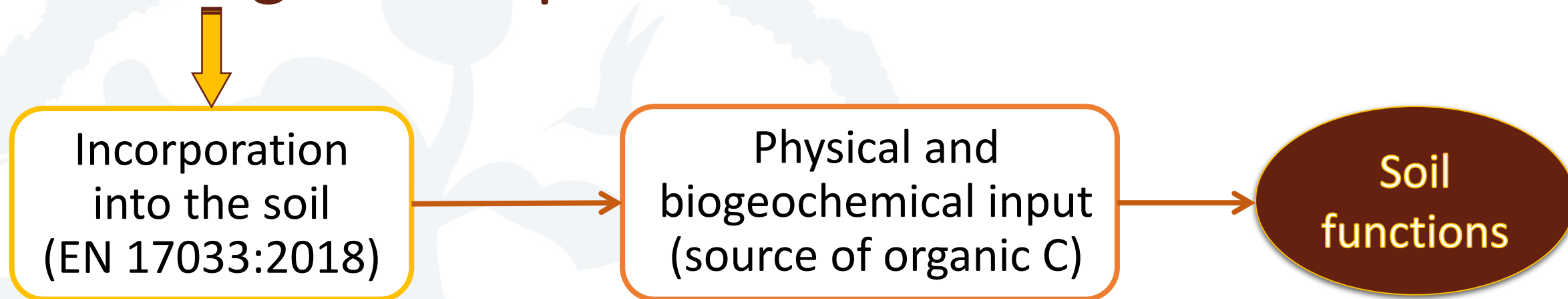


Biodegradable plastics in soil



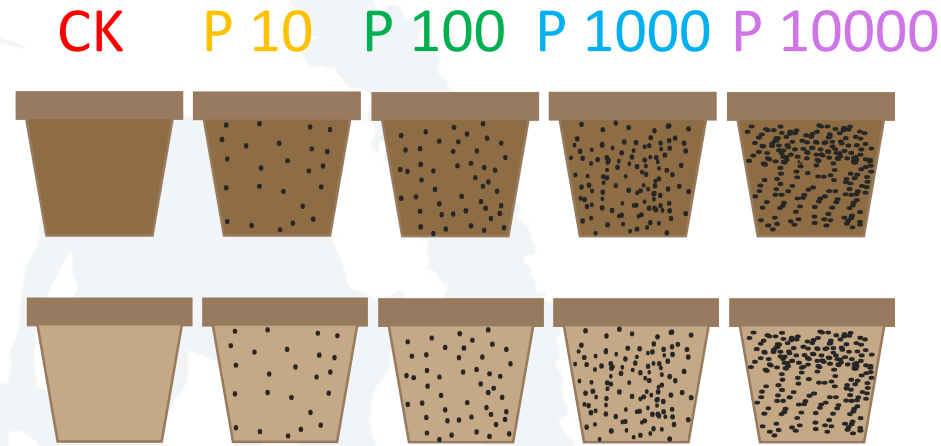
OBJECTIVE

Understand BDP effects on soil quality (microbial biomass, nitrogen cycle, and soil enzyme activities), adding increasing quantities of BDP in two different soils (a loamy and a sandy soil)

The experimentation

Controlled conditions (350 days):
 Soil humidity = 60% WHC
 Temperature = 23°C

	Texture (%)	Total organic C (g kg ⁻¹)	Total N (g kg ⁻¹)
LOAMY SOIL	16 sand 70 loam 14 clay	22.8	2.2
SANDY SOIL	60 sand 32 loam 8 clay	18.0	2.0



Biodegradable plastic (BDP)



Soil biodegradable mulch films

0	0.001	0.01	0.1	1	BDP dose (%)
0	0.006	0.06	0.6	6	C added (g kg _{ds} ⁻¹)

Analysis

CO₂ released (35 days)

C and N pools (dissolved and microbial)

3 enzyme activities (2 hydrolytic, 1 oxidative)

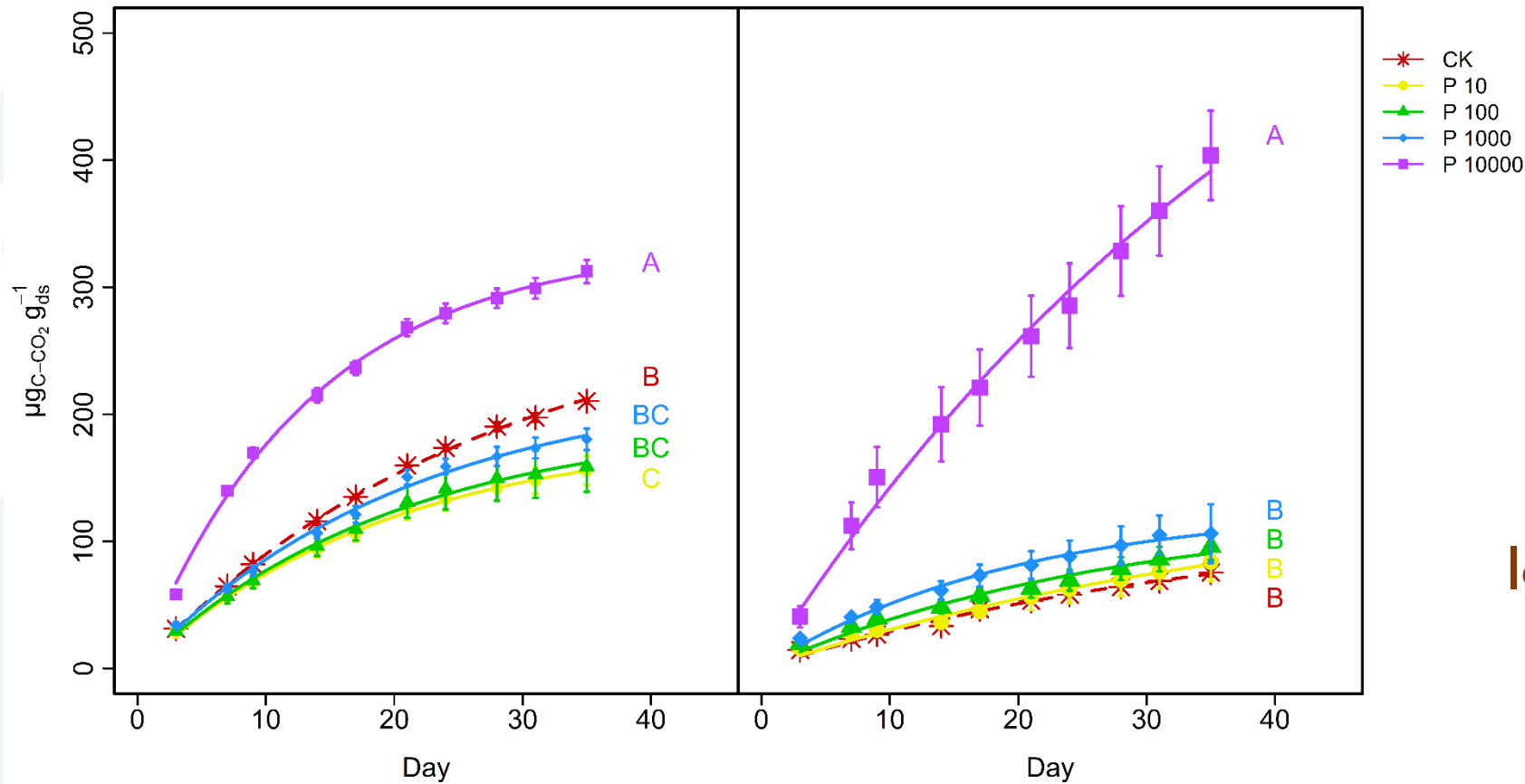
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Results

Loamy soil

Sandy soil



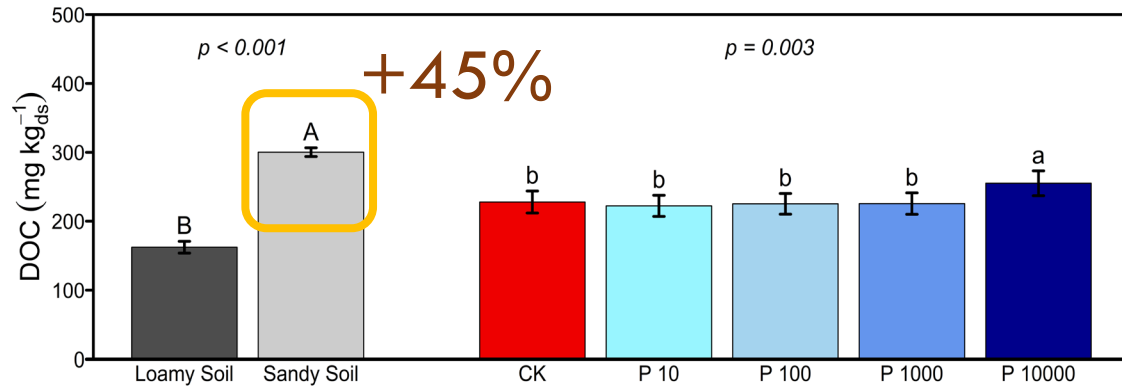
P 10000
 increased CO₂
 release: +49% in
 loamy and +435%
 in sandy soil

$$CO_2 = CO_{2,max} \cdot (1 - e^{-kt})$$

(Creamer et al., 2014)



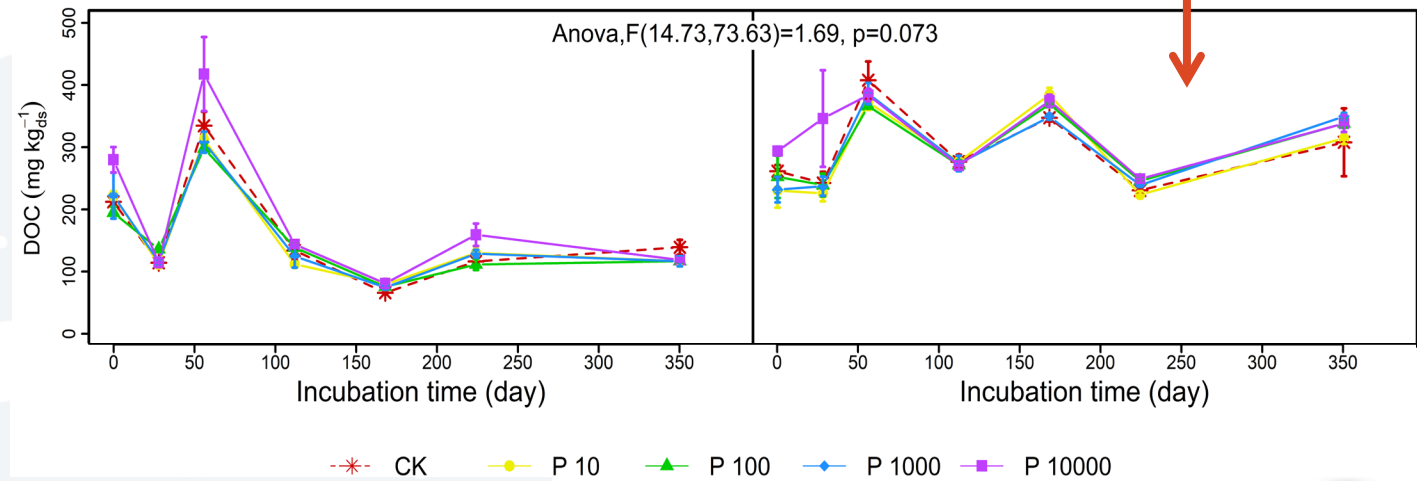
Results – Dissolved Organic C



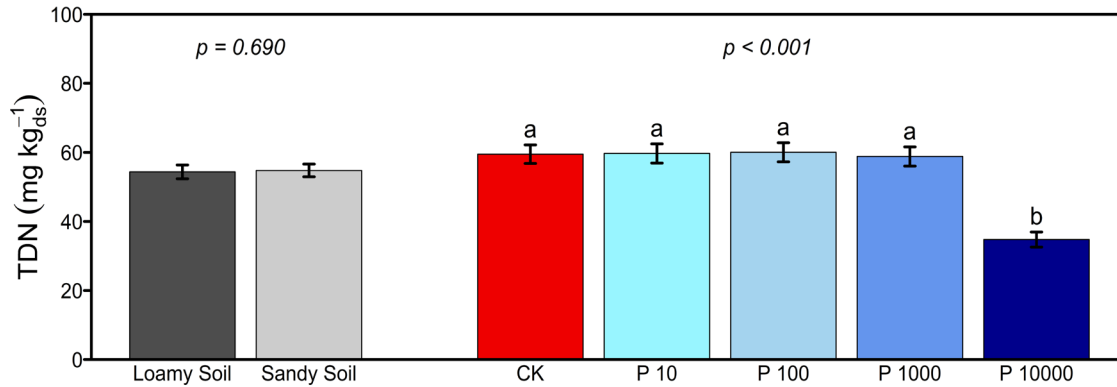
Loamy soil

cycles of immobilisation and release

Sandy soil

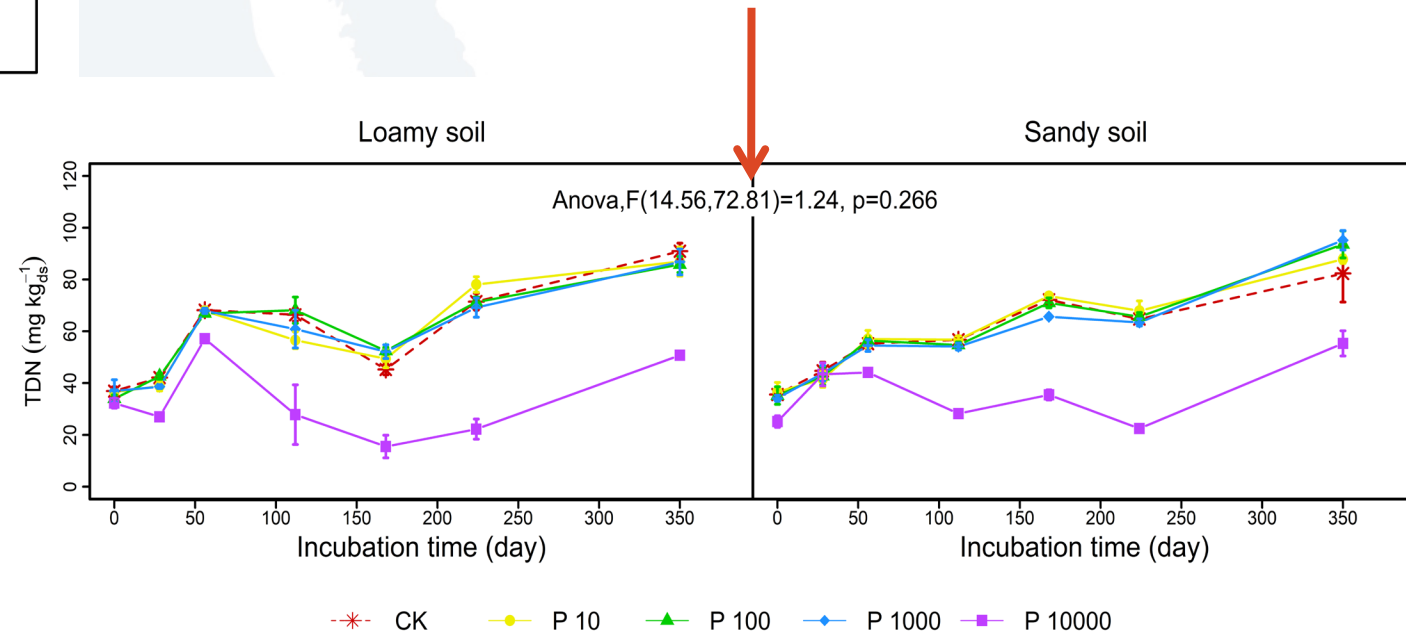


Results – Total Dissolved N

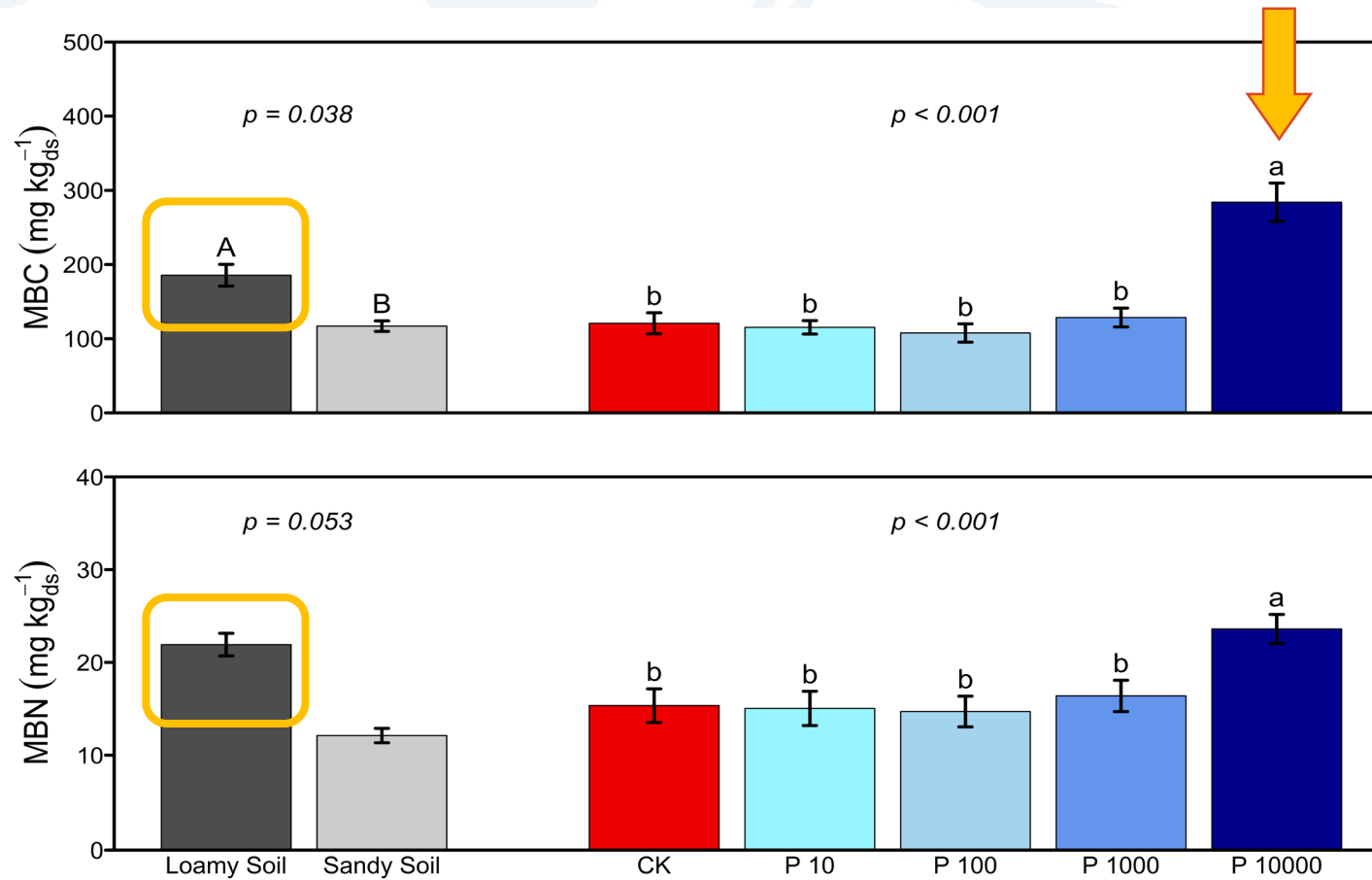


P 10000

N immobilisation in both soils;
TDN decrease reaching 200%
between days 112 and 224

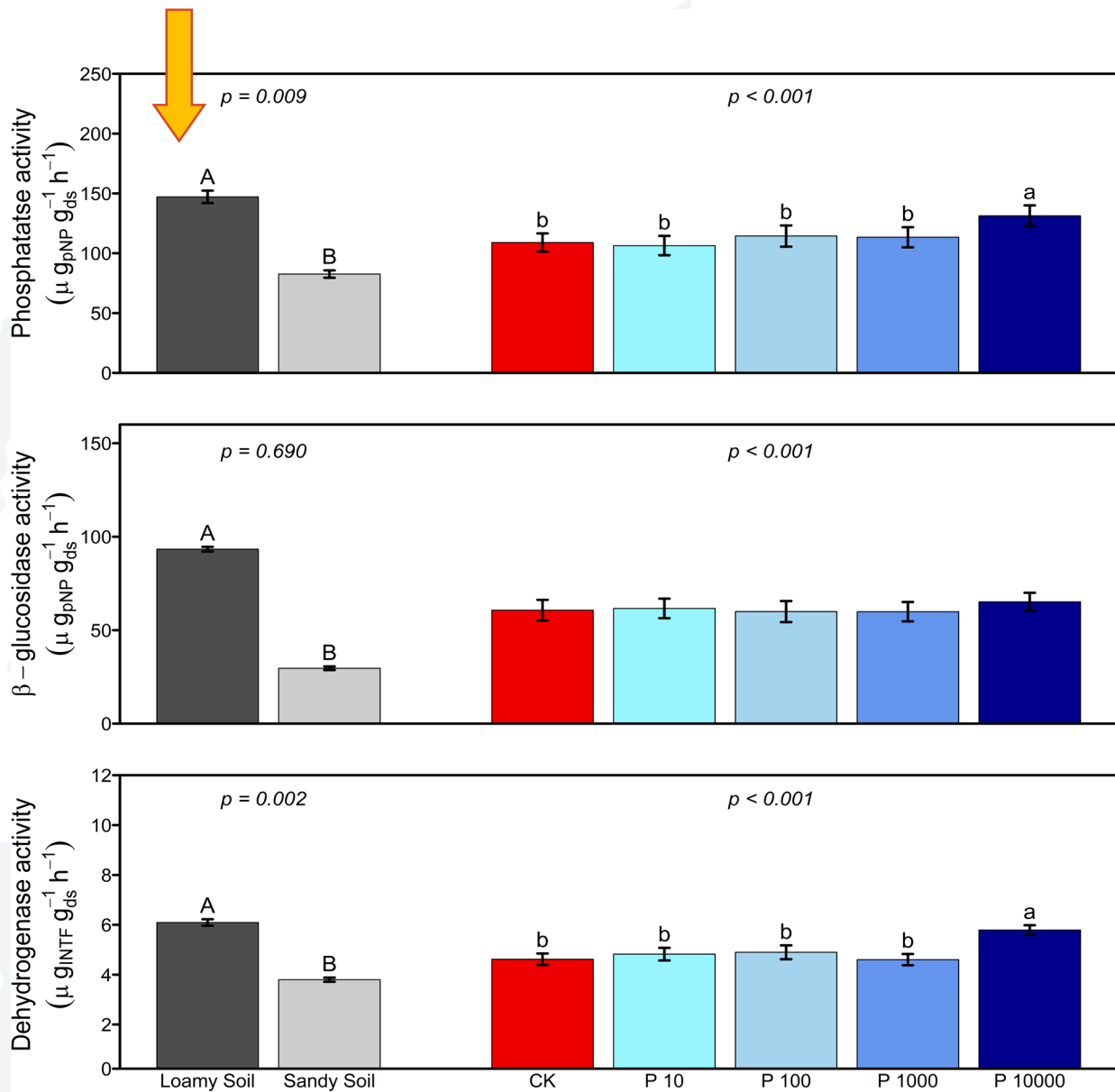


Results – Microbial Biomass



Loamy > Sandy
P 10000 increased
MBC and MBN

Results – Soil Enzyme Activities



Loamy > Sandy
P 10000 increased all the
enzyme activities

BIODEGRADABLE PLASTICS IN SOIL

Lower doses (P10, P100, and P1000) induced results that were comparable to those of the control

Their addition to the soil did not affect the soil biochemistry

Highest BDP dose (P10000) stimulated microbial biomass growth, C mineralization, and available N immobilization

C/N ratio imbalance = N the limiting element
Microbial activity stimulation for SOM decomposition and N mining

Soil texture effects independent of BDP dose

WORK IN PROGRESS

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TAKE
HOME
MESSAGE



Take a look
to the article

Thanks to my co-authors:

*P. Gioacchini, D. Montecchio, S. Rapisarda,
S. Guerrini, C. Ciavatta, C. Marzadori*

Thank you !

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