TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

ORTO BOTANICO

IRON-FUNCTIONALIZED CALCIUM CARBONATE NANOPARTICLES: ENHANCING LETTUCE GROWTH IN AQUAPONICS

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EXPERIMENTAL FLOW

Lactuca sativa L. cv. Foglia di Quercia Verde

Oreochromis niloticus L.

Iron depletion: iron-based smart fertilizer as a solution

Investigated concentrations: 10, 50, and 250 ppm
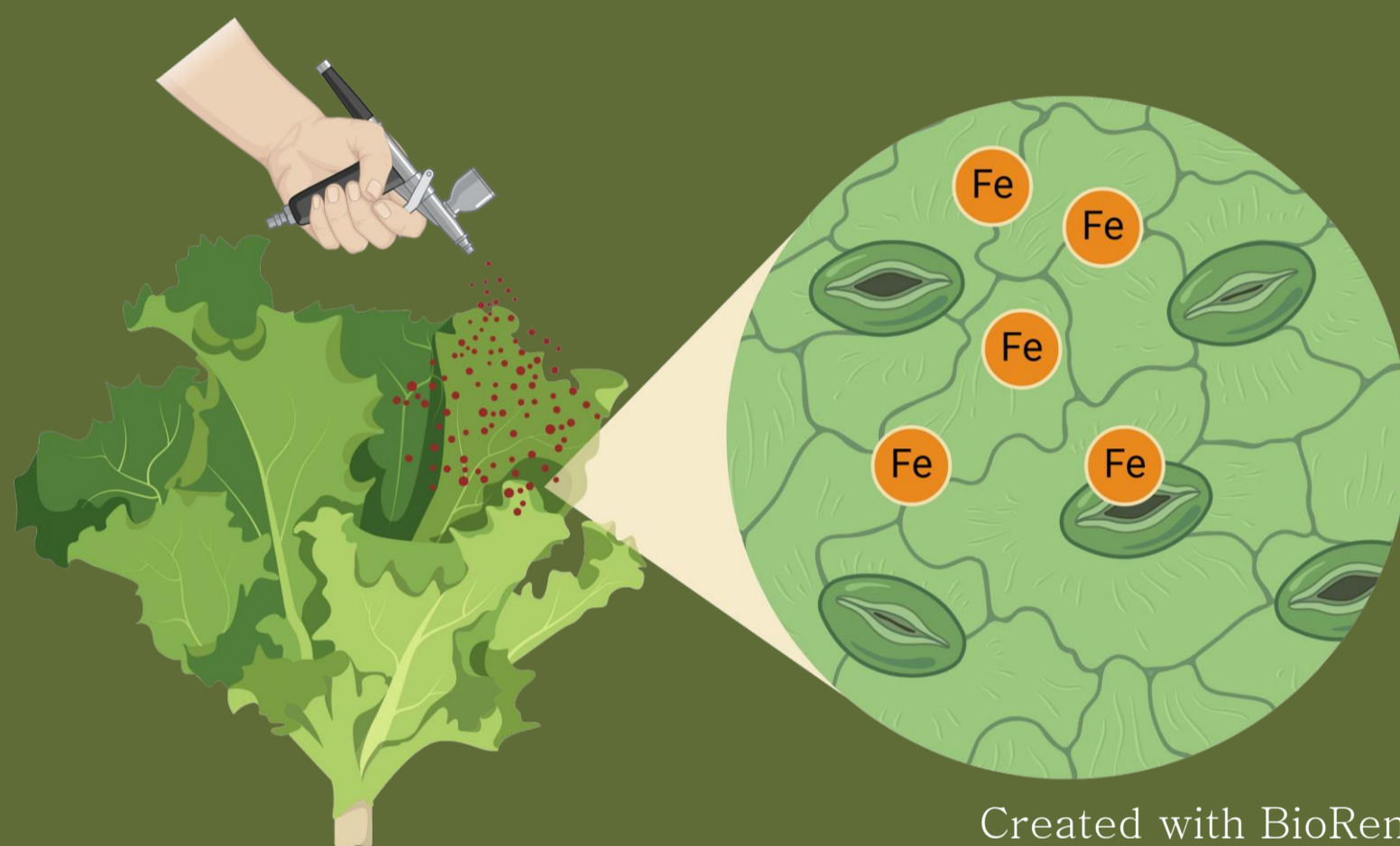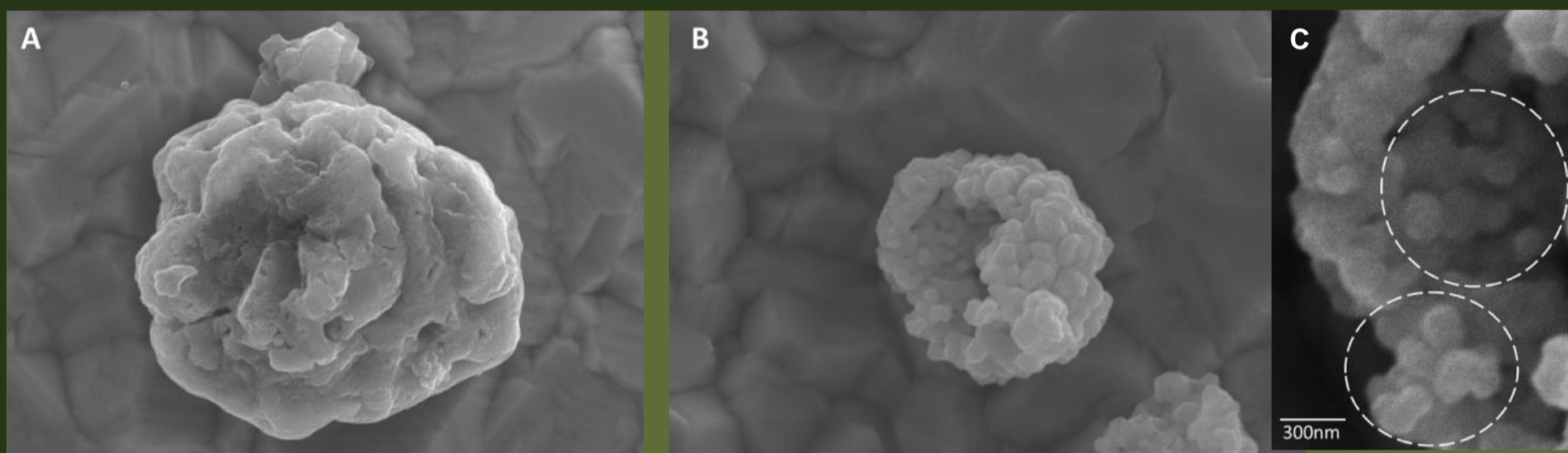
Administration method: foliar spraying

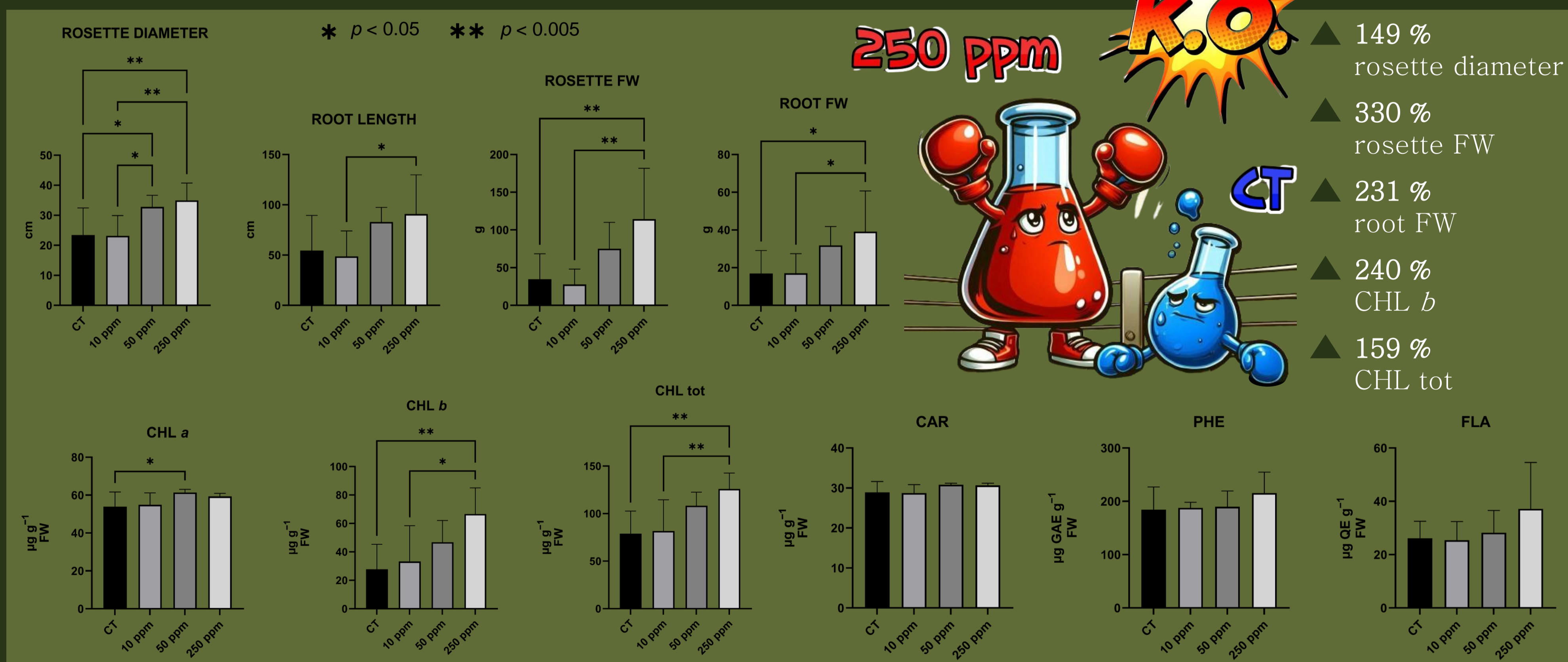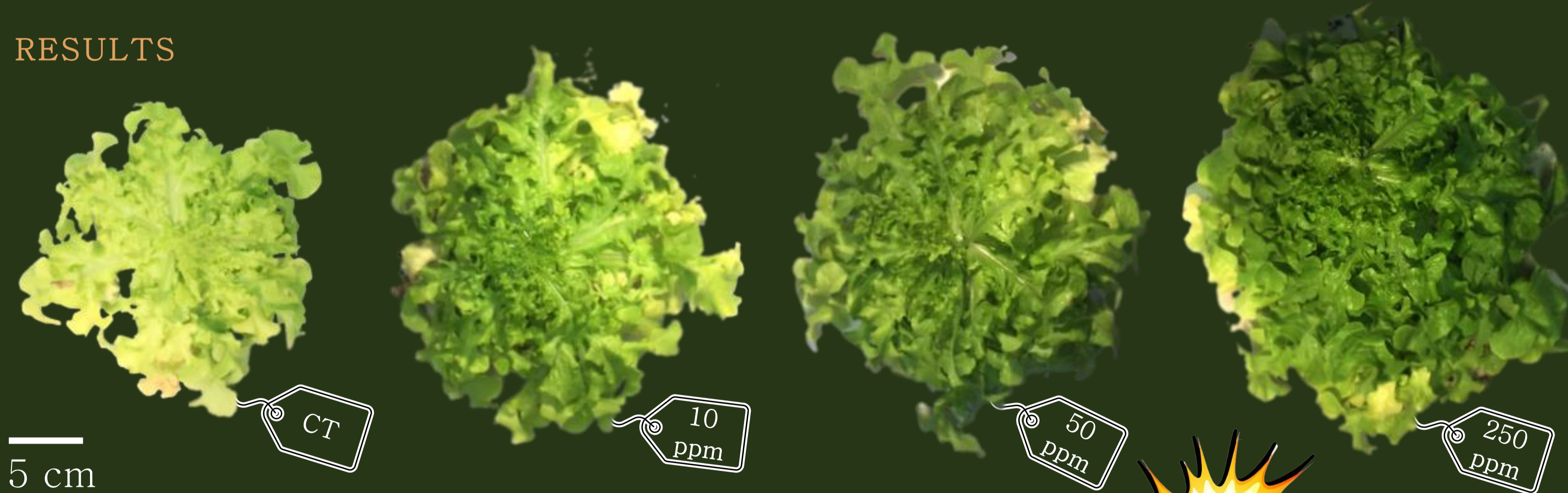Experimental setting: 15 plants for each treatment, including a DDH_2O control group

Evaluated parameters: dimension, fresh weight, photosynthetic pigments, phenols, and flavonoids

SMART FERTILIZER

(A) SEM magnification 10 K of the calcium-carbonate micro-vector; (B) SEM magnification 10 K showing the micro-vector inner cavity; (C) detail of (B) showing the iron nanoparticles subunits inside the micro-vector

Created with BioRender.com

RESULTS

CT
10 ppm
50 ppm
250 ppm

5 cm

ROSETTE DIAMETER   * $p < 0.05$ ** $p < 0.005$

ROOT LENGTH

ROSETTE FW

ROOT FW

250 ppm

K.O.

CT

▲ 149 % rosette diameter
▲ 330 % rosette FW
▲ 231 % root FW
▲ 240 % CHL *b*
▲ 159 % CHL tot

CHL *a*

CHL *b*

CHL tot

CAR

PHE

FLA

CONCLUSIONS

The experiment showed that the application of the iron-based nanotechnological fertilizer improved the lettuce yield and photosynthetic pigment concentration. In detail, the 250 ppm administration had the best results both in terms of biomass production and physiological state of the cultivated lettuce plants.