Effects of Antibiotics in Indoor Plant Growth: An Assessment Using Molecular Fluorescence Spectroscopy

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Global populational growth, along with climate change uncertainties, have boosted agricultural expansion with sustainable practices and precision agriculture. In this scene, artificial illumination and vertical farming are trending alternatives, as well as water reuse for irrigation. However, water reuse is associated with some risks, such as the presence of pharmaceuticals, as in antibiotics, which have been highly prevalent in wastewater. Given that these are recalcitrant micropollutants, complete removal is a challenge to many treatment systems. It is therefore important to shed light onto effects of the presence of antibiotics in agricultural production, such as possible incorporation by plants, and effects their health. Here, we aimed to make a preliminary assessment of the effects of amoxycillin (AMX) on Lactuca sativa (var. butterhead) seedlings, grown in an indoor system with photonic supply. First, seeds were germinated for 24 h in phenolic foam humidified with water (23°C). After germination, the phenolic foam was transferred to individualized cells of a growth chamber (18°C, 18 h light / 6 h dark) with photonic supply provided by light emitting diodes (LEDs) at 4:1:1:1 (red/green/blue/white) and leading to a total photosynthetic photon flux density (PPFD) of 100 µmmol/m^2/s. The system was supplied with continuous fertigation in the floating mode using hydroponic nutrient solution (PM3 and PM4), supplemented with iron. The lettuce seedlings were grown in these conditions for 21 days and then, were individualized and exposed to the hydroponic solution now containing AMX at 150 µM. Fresh mass was determined after the exposure. Physiological status of the plants was monitored for seven days by fluorescence spectroscopy *in vivo* (405 and 532 nm excitation) using a portable spectrofluorometer made out of two lasers, one monochromator (USB 2000 FL – Ocean Optics), and an optical fiber in Y. The obtained results did not show a significant difference in fresh mass ($p > 0.05$). However, fluorescence analysis suggested a suppression in the fluorescence associated with chlorophyll a *in vivo* for both wavelengths. This result leads to an inference on a probable influence of AMX on the photosynthetic profile of lettuce during plant development. It is key that future studies address the details of the incorporation of antibiotics in the face of photonic supplementation.