EFFECT OF CADMIUM(II) IONS ON ACTIVITIES OF AMINOTRANSFERASES IN PLANTS CULTIVATED UNDER VARIOUS LIGHTING CONDITIONS

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Cadmium thanks to its toxicity belongs to one of the most dangerous pollutants, which have been numerous times shown [1], but many biochemical and metabolic pathways connected with action of this metal is still not clear. In this study, we aimed on studying of cadmium(II) ions influence (0, 5, 10, 25, 50 and 100 μM) on maize (Zea mays L.), which were also exposed to (A) 24 hours day or (B) 12 day/12 night. After seven days long treatment, plants were sampled and analysed.

Plants were homogenised with liquid nitrogen and extracted with phosphate buffer. Determination of activities alanine aminotransferase (ALT), aspartate aminotransferase (AST) and gamma glutamyl transpeptidase (GGT) was carried out spectrometrically. Cadmium was quantified using differential pulse voltammetry. Before measuring the samples were mineralized

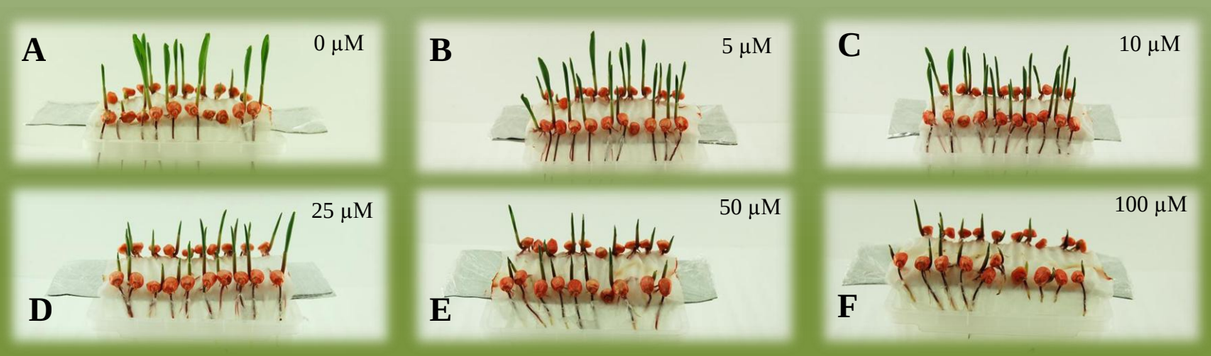

Figure 1.: Photo maize plants after application of cadmium(II) ions (A-0 μM, B-5 μM, C-10 μM, D-25 μM, E-50 μM, F-100 μM). In variant 24 hod light, after 12 days.

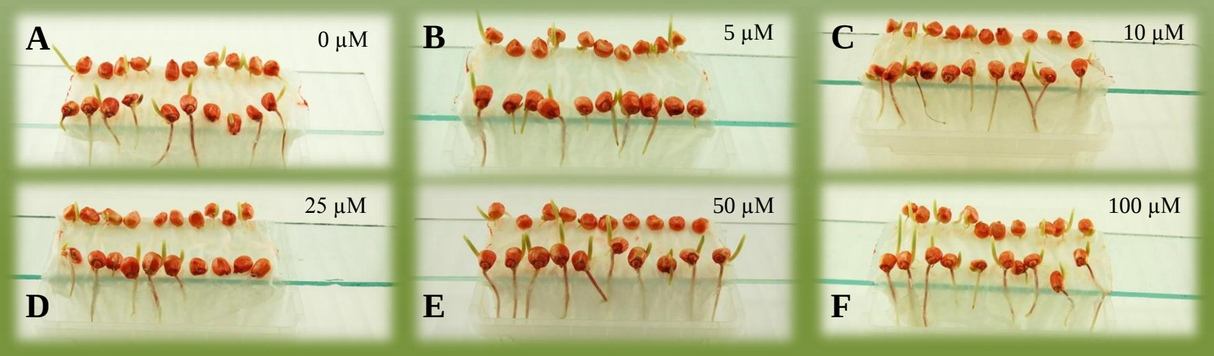

Figure 2.: Photo maize plants after application of cadmium(II) ions (A-0 μM, B-5 μM, C-10 μM, D-25 μM, E-50 μM, F-100 μM). In variant 12 hod light/12 hod dark, after 12 days.

Results

Length of aboveground part of plants called “A” ranged from 12 (treated with 100 μM) to 18 mm (treated with 0 μM), at “B” from 15 (treated with 100 μM) to 33 mm (treated with 0 μM). The effect of continuous illumination significantly ($p = 0.05$) influenced the growth of plants in all studied variants. We found that with increasing concentrations of cadmium(II) ions aminotransferase activity declined, the most significant effect of cadmium was observed at plants treated with 100 μM (ALT (A) 1.5 – 3.5 μcat·l^{-1}/ (B) 1.9 – 3.9 μcat·l^{-1}; AST (A) 1.2 – 1.9 μcat·l^{-1} / (B) 0.9 – 1.5 μcat·l^{-1}. Activities of GGT were (A) 0.35 – 0.70 μcat·l^{-1} / (B) 0.25 – 0.60 μcat·l^{-1}. Cadmium content in plants were from 0 (0 μM) to 9.7 μM (100 μM) in “A”; from 0 (0 μM) to 12.6 μM (100 μM) in “B”.

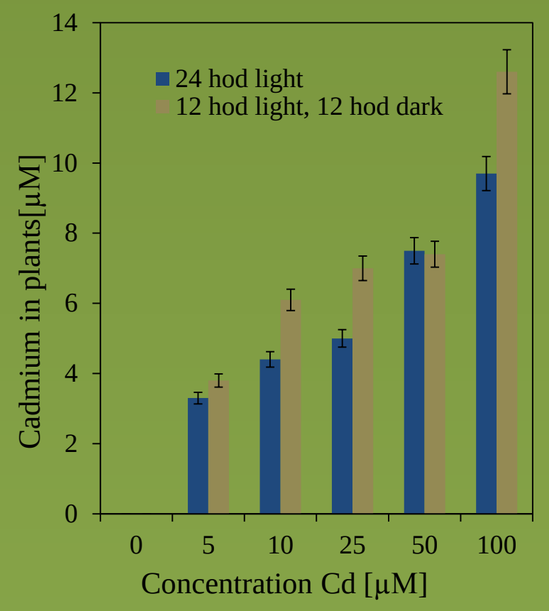

Figure 3.: Content of cadmium ions (μM) according to application of cadmium ions

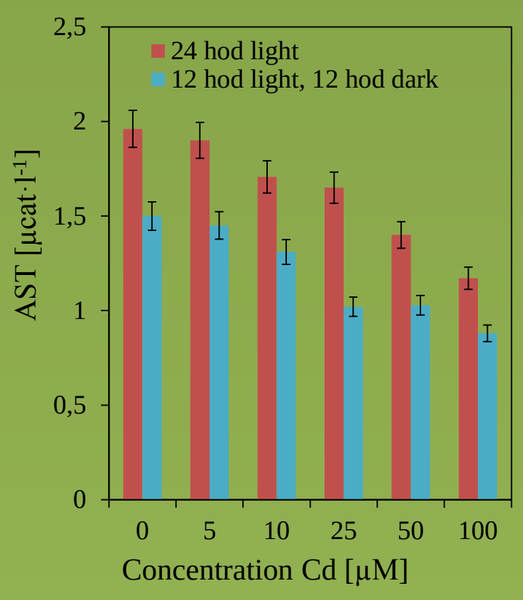

Figure 4.: Activity of AST (μcat·l^{-1}) according to application of cadmium ions

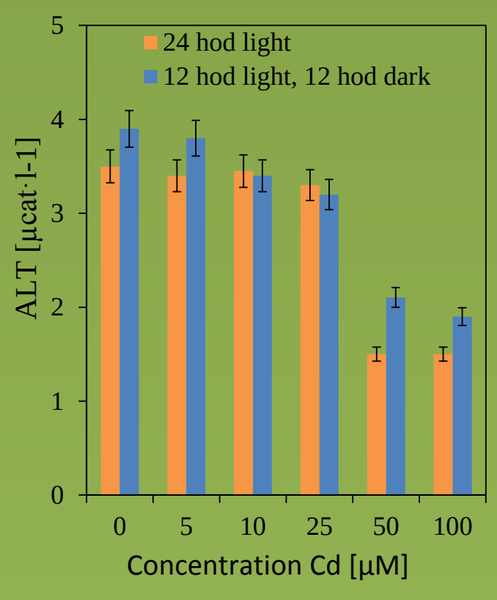

Figure 5.: Activity of ALT (μcat·l^{-1}) according to application of cadmium ions

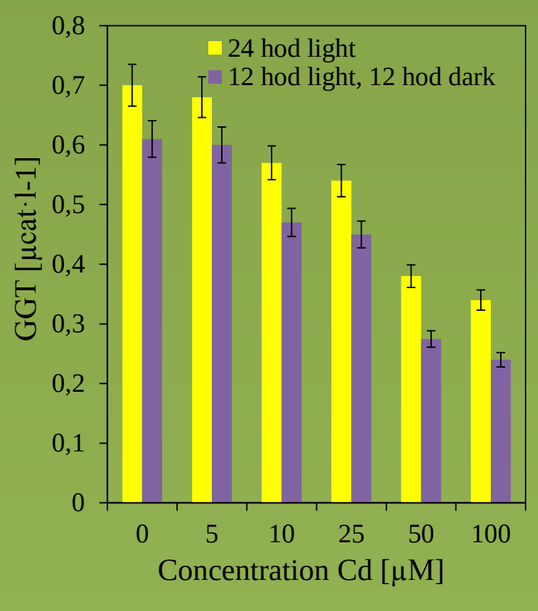

Figure 6.: Activity of GGT(μcat·l^{-1}) according to application of cadmium ions

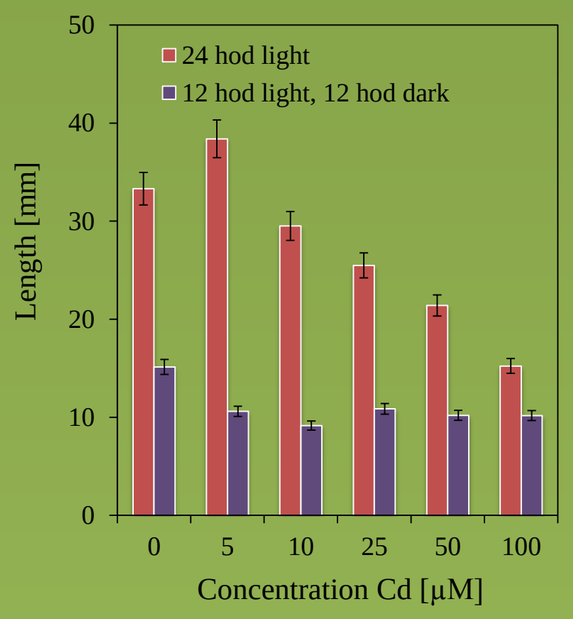

Figure 7.: Length of plants (mm) after 12 days exposure to cadmium ions

Conclusion

It is known that cadmium inhibits fixation of carbon dioxide in photosynthesis of dark stage. In determining ALT, AST and GGT, we confirmed the effect of cadmium in higher plants with the regime light/dark than in plants with a steady light.

Acknowledgements

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References

1. Krystofova, O., et al., Int. J. Electrochem. Sci., 2012. **7**(2): p. 886-907.