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THE INFLUENCE OF DIFFERENT LENGTH ON THE CLOROFILINE CONTENT OF *ZEA MAYS* L. PLANTS

Oarcea Anca*, Osser Gyongyi *, Boldura Oana *, Movileanu Pletea Ioana *****, Orodan Maria ***** , Nini Gheorghe***** , Movileanu Marian Gelu ******, Popescu Iuliana ****

* The "Vasile Goldiş" Western University, the Faculty of Pharmacy , Arad, L Rebreanu,Romania
** Faculty of Agriculture,USAMVB "King Mihai I of Romania" in TimisoaraCl.Aradului 119,Romania
*** University of Veterinary Medicine,USAMVB "King Mihai I of Romania"Timisoara,Cl Aradului 119,Romania
**** University of Medicine and Farmacy Carol Davila,Bld Eroii Sanitari 8, Bucharest,Romania
*****The "Vasile Goldiş" Western University, the Faculty of Medicine , Arad, L Rebreanu,Romania
******Valahia University of Targoviste ,Al Sinaia 13,Targoviste,Romania.
e-mail: dr.movileanua@yahoo.com

Abstract

For plants and some bacteria, light, so electromagnetic wave, is not only a form of energy that drives and facilitates photosynthesis, it is also a sensor of the environment that brings much information but also a stabilizer and regulator of life or different forms of life.

Plant development is a process influenced by internal factors such as biological clock and gene expression, as well as external factors such as temperature and light.

Light is one of the most important environmental factors in plant growth and growth, a plant with the ability to maximize photosynthesis to evaluate feed-back quality, quantity, and light propagation direction.

Light as a decisive factor in plant life and development influences their respiration, perspiration, closure and opening of stomate osteoles, accumulation of chloroplast assimilable pigments, and many other metabolic processes.

Higher plants use only visible components of solar energy, those outside the visible spectrum being harmful, solar energy transmitted and received as energy quantums called photons.

Key words: Photosynthetic activity, UV radiations, chlorophyll, light reaction, ATP molecule, chemical reaction, energy.

INTRODUCTION

Different culture species have the capacity of tolerating UV-B radiation and retaining chlorophyll in leaves, the results varying for monocotyledonous, in comparison to dicotyledonous ones (0-33% in monocotyledonous species, compared to 10-78% in dicotyledonous species). (Tevini et al., 1981)

The variation in the amount of chlorophyll can be attributed to the dosage ratio of UV-B radiation and to the light spectrum (photosynthetic active radiation – PAR), this explaining the degree of damage caused by the UV-B radiation. (Cassi-Lit 1997, Tevini et al., 1991)

The harmful effects on plants caused by the abiotic stress factors in conjunction with the UV stress, is reflected in alterations of the pant's physiology, causing a reduction in their growth and a decrease in their bioproductivity (Khan, 2003).

Chloroplast damage by overexposure to UV-B radiation can lead to the decrease in the chlorophyll content; this involves ultrastructural changes, a decrease of the photosynthetic

In the wild, plants are subjected to certain stress factors, out of which the UV-B radiations (230-320 nm) play an important role, because more and more UV-B reach the Earth's surface due to the depletion of the stratospheric ozone layer. (Deckmyn et al., 1994, Caldwell et al., 1998)

The UV-B radiation causes a net inhibition of the photosynthesis (Tevini 1993), physiological effects including the reduction of carbon assimilation during photosynthesis, the alteration of the stomatal function. (Teramura 1991) Numerous lab studies have shown that this inhibition seems to result from a malfunction in the photosynthetic cycle, it being affected by the gas exchange at the leaf level. (Teramura 1990; Tevini and Teramura et al., 1989)

In our experiments we sought to answer the question whether the treatment with UV-B radiations, of different wavelengths, between 280 – 310 nm, has a stressful effect on plants, resulting in changes in the photosynthetic activity and chlorophyll content, and if there are any differences between the control plants and the treated ones.(Wellmann 1984, Strid ,1994) et al.

All measurements were performed on days 1, 3 and 4 of the treatment, on young plants, the samples consisting of leaves collected from the plants which had the third leaf fully developed.(Ulm R. et al., 2005, Ulm et al., 1994)

Light-dependent stage (light reaction), chlorophyll absorbs light energy, which stimulates some electrons in pigment molecules, transferring them in layers with higher levels of energy.(Marmur, J. 1961, Prewitt, J.M.S. et al., 1970)

They leave the chlorophyll and passed through a series of molecules to form NADPH (enzyme) and the ATP molecule that stores energy. (Sullivan, J.H., et al., 1997)

The oxygen resulting from the chemical reaction is released into the atmosphere through the pores of the leaves. (Prewitt, J.M.S. et al., 1970)

MATERIAL AND METHOD

Analyzed the effect on photosynthesis through the fluorescent induction, the intracellular carbon dioxide concentration and the relative chlorophyll content measurements.

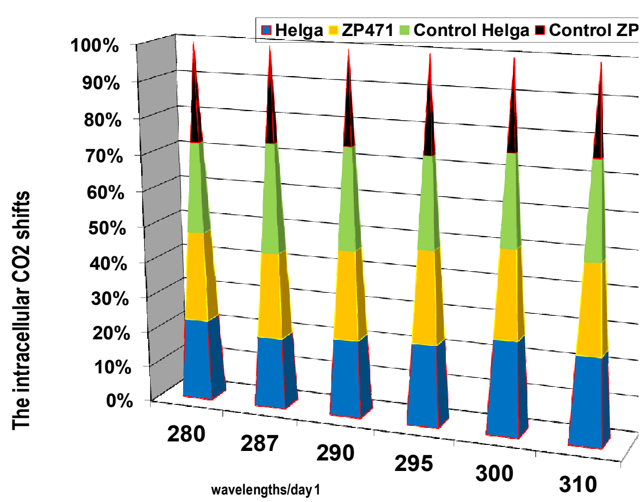
All analyses were performed on days 1, 3 and 4 of the treatment, on young plants, on their third developed leaf.

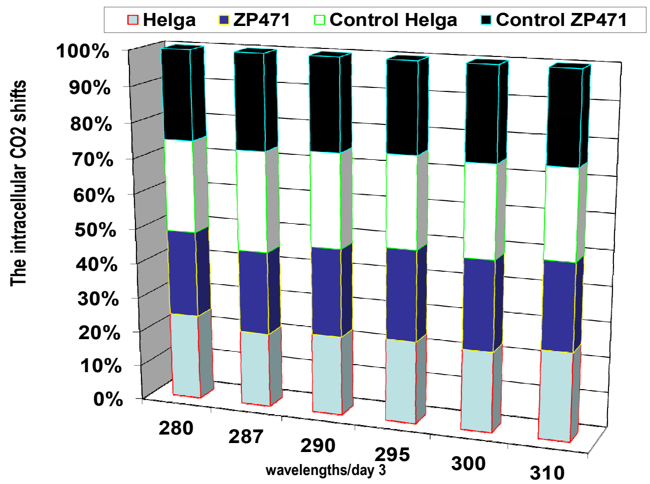
According to results, it can be stated that, for most low wavelength values, the lowest values of chlorophyll variation and of the CO_2 concentration, of the batch of control plants, have been measured.

RESULTS AND DISCUSSION

Data from our experiments, showing significant growth, both for the photosynthetic capacity as well as for the intracellular carbon concentration (Fig. 1)assimilated at wavelengths of 287-290 nm confirm the observations from literature, but point out the importance of these readings in selecting tolerant corn genotypes tolerant to UVB, which can be productive in such conditions.

Based on the values in the table we can state that the intracellular CO2 concentration correlates with the photosynthetic activity for days 3 and 4 of treatment, compared with the control batch, and for days 1 and 3 for the plants treated with the wavelength 287 nm, values were also correlated for both corn hybrids.





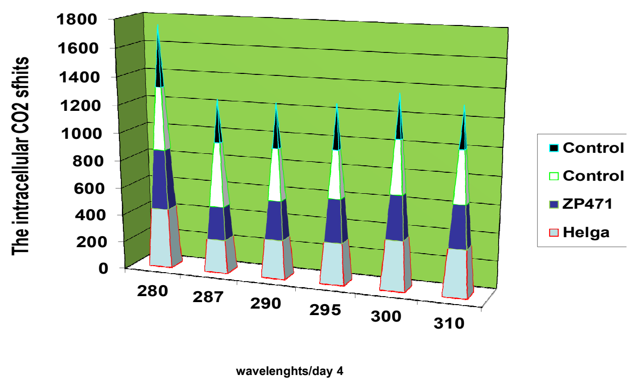


Fig. 1. The intracellular CO_2 shifts (CJ) according to the wavelenghth changes in day 1 (A), 3(B), 4(C) in corn plants for the control and treated batches .*significant values in comparison to the control batch at P<0.05

The main protection mechanism against UVB includes the accumulation of compounds that can absorb this radiation. In the case of two wavelengths (285 nm and 287 nm) we have noticed a significant increase of the chlorophyll content in treated plants, in comparison to the treated batch, throughout the 3 days of measurements, after a period of 1 day of wavelengths exposure.

In the case of the two wavelenghts (285 nm and 287 nm) there has been noticed a significant increase in the chlorophyll content for the batch of treated plants, in comparison to the control batch, throughout the 3 days of measurements, after the 1 day period of exposure.

After the third day of irradiation with ultraviolet UV-B type radiation, with 280-300 nm wavelenghts, a slight change in the chlorophyll content has been noticed, in the case of the corn hybrid ZP471, and equally in the case of the Helga hybrid concerning the control-witness plant, espcially at 287 nm.

CONCLUSIONS

We can conclude that the decrease in the content of chlorophyll ceases after 4 days of irradiation, this being due to the activity of certain antioxidant enzymes, especially the APX enzyme, whose activity increases, thus eliminating the oxidative stress due to wavelengths.

The CO2 accumulation is linked to the increased photosynthetic capacity.

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