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DOUBLE ACTION APPLIED BY QUANTITY GRADUATION OZONE AND ULTRAVIOLET RADIATION UV-B TYPE ON PLANT *ZEA MAYS* L.

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Abstract

The presence of ozone in the stratosphere is essential for the existence of living creatures on Earth. The role the ozone layer plays for the biosphere lies in its ability to effectively absorb the ultraviolet (UV) radiation.

The ozone is responsible for the loss of a part of the harvest, which is larger than those caused by any other air pollutants. Establishing a relationship between the ozone loss in the stratosphere and the increase in UV-B radiation levels on the ground is not easy, mainly due to the difficulties in measuring the amount of ultraviolet radiation from the environment; this amount varies, depending on a number of factors, such as: greenhouse gases, aerosols, clouds, geographical positioning etc.

A chronic exposure of the plants to ozone, for an extended period of time, can lead to a decrease in growth, a smaller harvest, inhibition of photosynthesis, premature aging of the leaves, a faulty distribution of the biomass, an impairment in the multiplication processes etc. the UV-B radiations have exactly the amount of energy necessary to break the chemical bond of an oxygen atom from the ozone molecule Summer is favorable to ozone production, due to the intense sunrays, high temperatures, high atmospheric pressures etc.

INTRODUCTION

The most important protection against the harmful, high-energy UV effect is ensured by the ozone layer, from the upper part of the atmosphere (Adam A. Et al, 1995, Aebi M.,1984).

The resulting ozone absorbs the UV-B radiations with wavelengths below 300 nm, which are very harmful to living organisms (Hochholdinger F. et al, 2008). It is therefore noted that the UV-A radiations are absorbed only in a small amount by the ozone layer, but their energy is relatively small when compared to that of the other two ranges of ultraviolet radiation.

This is means that the impact they have on life is significantly reduced (Aldrich J. R., 1988, Ghidra, V. et al, 2004). In this way, the UV radiations help create ozone in the upper atmosphere layers (Hausman J.V. et al, 1994).

The plant growth and development is highly influenced by various environmental factors, such as: heavy metals, salinity, heat, cold, water scarcity, ozone, UV radiation etc.(Ambasht N.K. et al, 1995, Han J. Lee et al, 2004)

In plants, the harmful effects of these abiotic stress factors are reflected in alterations in the physiology of the plant, causing a reduction in growth and a decrease in their bioproductivity.(Hausman J.V. et al, 1995)

Generally, the flavonoids from the plants' leaves have the capacity to substantially absorb UV radiations and, to a lesser extent, visible light. (Heloir M.C. et al, 1996). The anthocyanins mostly absorb the visible light.

The amount of flavonoids in plants varies, depending on the species and the ontogenetic development stage; quite often, the amount of flavonoids also varies between the epidermis and mesophyll of the same leaf (Haszpra L. et al, 2005). The flavonoid content of the leaves and their composition are frequently altered by the ambient conditions.

MATERIAL AND METHOD

In the 10th day since their placement in the ozonisation room, the survival percentage of the plantlets was determined, along with their length and the number of "spots" present on their epidermis.

The mean values of the indexes, marked on the 10th day since the placement of the plantlets in the room, were compared to the data registered at the start of the acclimation process; the latter was considered referential data.

The plantlets that were prepared, which had already been subjected to the stress of irradiation with different wavelengths, according to the previous research, were placed in the ozonisation room.

The soil had been watered beforehand and the plantlets periodically humidified with a pulveriser, in order to avoid their dehydration.

RESULTS AND DISSCUSIONS

The length of the leaflets exhibits changes throughout their growth, a phenomenon which is prominent at 287 nm, 10 days after the treatment. Comparing the results obtained for the Helga hybrid and ZP471, insignificant differences were noticed.

The hybrids reacted almost the same under the influence of the various ozone dosages.

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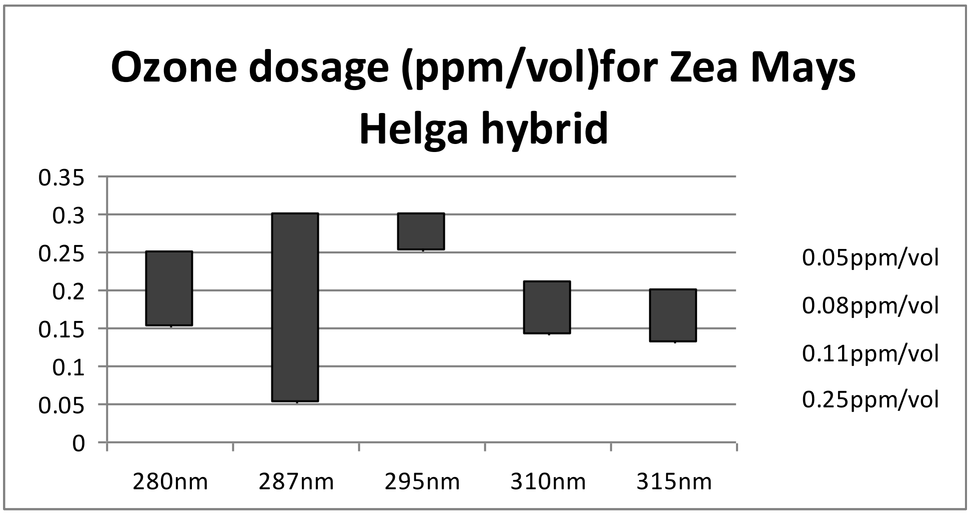

Fig 1. The influence of the ozone dosage on the number of leaflets, at different values of the ozone dosage for the Zea Mays, Helga hybrid

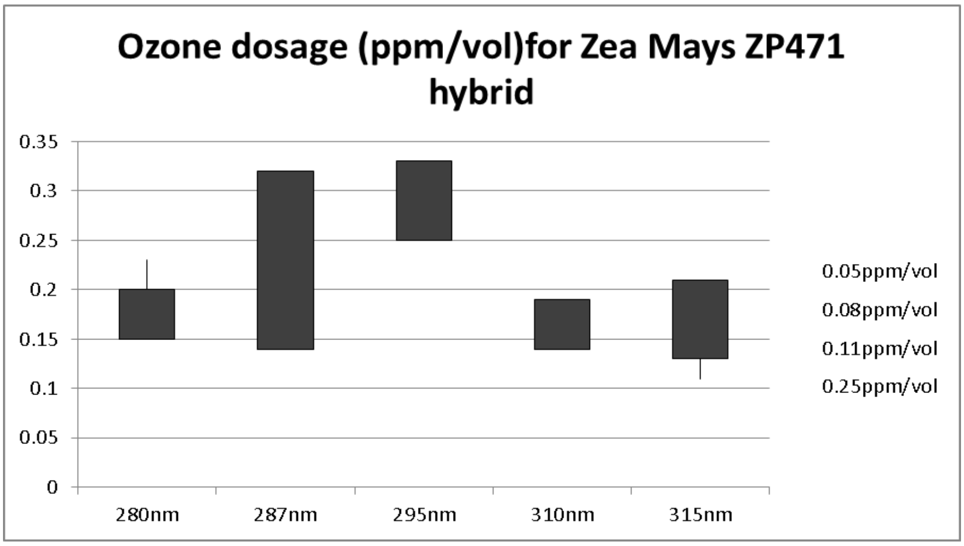

Fig. 2 The influence of the ozone dosage on the number of leaflets, at different values of the ozone dosage for the Zea Mays, ZP471 hybrid

Simultaneously, the neoplantlets' leaflets, their petiole and even their stalks exhibited their epidermis sprinkled with brown-maroon specks, both on the top and bottom of the foliar limbs, slightly more intense than in the plantlets shown above (Table 75), with a yellowish – coppered color.

Taking into consideration the ozone dosage adjustment, one can notice that at an insignificant dosage, the neoplantlets' leaves showed a relative increase in size.

The number of affected leaflets was relatively lower than in the case of irradiation with 287 nm wavelengths, where the ozone dosage was insignificant and medium, and the environment (0,0055 – 0,01 ppm/ ozonisation chamber volume) and caused a less intense discoloration of the intense green.

The epidermis shows fewer specks of light color for the insignificant and medium ozone dosage (0,0055 – 0,01 ppm/volume), as opposed to the higher ozone dosage (0,025 ppm/volume).

The survival rate of the *Zea Mays* plantlets – the *Helga and ZP471* hybrids – 10 days after the commencement of the acclimatization procedure, with various ozone doses, was 100% for the three types of graduation, for the plants that were exposed to a 287 nm wavelength irradiation, compared to the surviving plantlets which were exposed to a more intense stress (310 nm) (Fig 1 and Fig 2).

CONCLUSIONS

A chronic exposure of the plants to ozone, for an extended period of time, can lead to a decrease in growth, a smaller harvest, inhibition of photosynthesis, premature aging of the leaves, a faulty distribution of the biomass, an impairment in the multiplication processes etc. the UV-B radiations have exactly the amount of energy necessary to break the chemical bond of an oxygen atom from the ozone molecule.

Summer is favorable to ozone production, due to the intense sunrays, high temperatures, high atmospheric pressures etc.

In their natural environment, the plants are subjected to stress factors, including UV-B radiations (280 – 320 nm) which play an important role, as an increasing number of UV-B radiations reaches Earth's surface because of the stratospheric ozone layer's depletion.

The length of the leaflets exhibits changes throughout their growth, a phenomenon which is prominent at 287 nm, 10 days after the treatment. Comparing the results obtained for the Helga hybrid and ZP471, insignificant differences were noticed. The hybrids reacted almost the same under the influence of the various ozone dosages.

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