THE INFLUENCE OF ULTRAVIOLET RADIATION WITH DIFFERENT LENGTH ON CULTURE BY *ZEA MAYS*

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Abstract

We performed in vitro tests on leaf tissue and the strain of Zea mays. We investigated the influence of external factors on the calus organogenesis (water, temperature, UV-B type), the regeneration capacity of different explant types (bud nod).

The plants' physiological and development processes are affected by the UVB radiation, the UVB radiation level and also by the production of pollen. Despite the reduction and mitigation mechanisms of these effects and a finite ability to adapt to a high level of UVB radiation, the plants' growth can be directly affected.

The results demonstrated that enzyme activity and morphogenesis were affected, depending on the wavelengths and the culture media used.

Key words: Enzymatic activity, apex, nod, Uv-b radiation

INTRODUCTION

The diversity of protection mechanisms against the UVB radiations depends on the species and varieties of plants (Rozema et al., 1994).

Zea mays is a crop originally from Central America, which is cultivated nowadays in many parts of the world. It contains many hydrocarbons, starch, albumins, lots of vitamins from the B category, vitamin E, iron, phosphorus, magnesium, zinc and potassium. (Cachiţă et al., 1987)

Corn is effective against stress, and the magnesium, which can be found in large quantities in the fruit of the plant, supplements in an excellent manner the lack of this element, due to diseases linked to the aging process of the organism. (Cachiţă et al., 2008)

It is rich in vitamins from the B category, especially vitamin B1, which has an effect on the functioning of the nervous system, muscles, the heart and the production of red blood cells. (Nan et al., 1998)

The effects of the increase in the amount of UV radiation, but also the wavelength variation, include biomass reduction, the inhibition of photosynthesis, photo-morphogenetic and phenological changes, with important implications in maintaining the balance of the ecological system, of preserving certain plant genotypes and/or of the socioeconomic life. (Rowland R.A 1991) A series of studies have shown that plants respond with high variability when subjected to UV-B. (Murashige et. al 1962)

Effect of the UV-B radiation on the plant systems is ambivalent: - on the one hand, it is harmful, producing specific reactions of cellular, molecular, anatomic, mutagenic and photosynthetic stress, having on the other hand, through the UV-B receiver, a role in the acclimatization process, which also involves the protection of the vitamins and minerals content found in the *Zea mays*. (Cona.et al 2006)

As the population grows, so does the food requirement. (Burcea et al 2001) Studying to obtain as large production of crops as possible is very important, as well as studying the external influences that determine a change in the constituent compounds of the plant. (Rao, 2011,209)

The organism is subjected daily to stressful situations and to the attacks of viruses, bacteria, pollution, and these affect the balance of the cells. Because of its rich mineral and vitamin content, corn can energize and is beneficial to the health of the blood vessels. (Pallag et al 2014)

The high content of flavonoids, polyphenols, phytochemicals and antioxidants recommend it as an aid in treating cancer. (Pop, 2011)

MATERIAL AND METHOD

The response related to the hormones and other biostimulating substances, antibiotics, of the 6 days seedlings cultivated in a photoperiod of 12 hours light/ 12 hours darkness, they were placed in micro-plates and preincubated for 24 hours.

On day 7, just before the measurements, 100 μM of ANA solution had been added (α-naftilacetic acid) (Duchefa) for the growth regulators, 250 mM of NaCl solution in order to study the saline stress, and 100 mM of mannitol solution, for the evaluation of the osmotic stress.

In preparing the environment for the cultures, from our experiences with different genotypes of corn (*Zea mays* L.), taking into account the study of the ZP471 and Helga hybrids, we utilized auxin, α-naphthaleneacetic acid (NAA) at low concentrations, 0,5 – 1 mg/l, which, according to the studies in the plants biotechnology field (1), can be successfully used for callus induction and plant regeneration through organogenesis (1), represented by 6-Benzylaminopurine (BAP), of 1 – 1,5 mg/l concentration.

RESULTS AND DISCUSSION

Subjected to different wavelengths during the in vitro organogenesis for the corn**,** have shown the fact that the organogenesis processes for corn are different, depending on the source of the explant, on the culture environments and on the combination of the growth regulators.

This fact is reflected by the difference in size between the seedlings developed from the Helga and ZP471 hybrids.

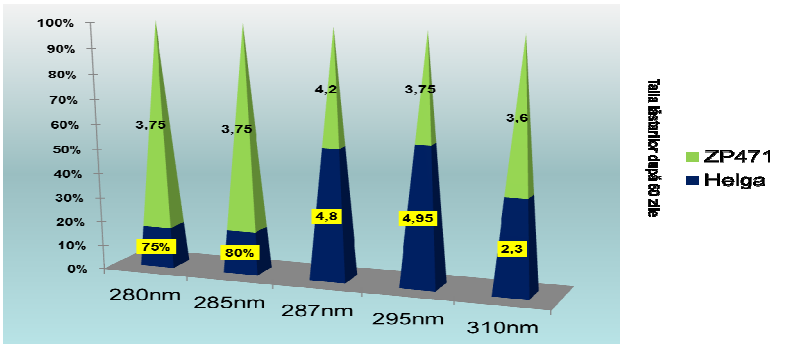


Fig.1. MS environment.The size of the seedlings (mm) developed from meristems from the stem and crown, grown in the MS and LS environments, after 60 days of culture, under the influence of UV-B

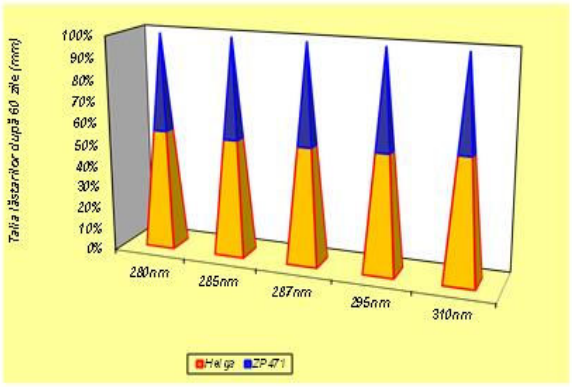
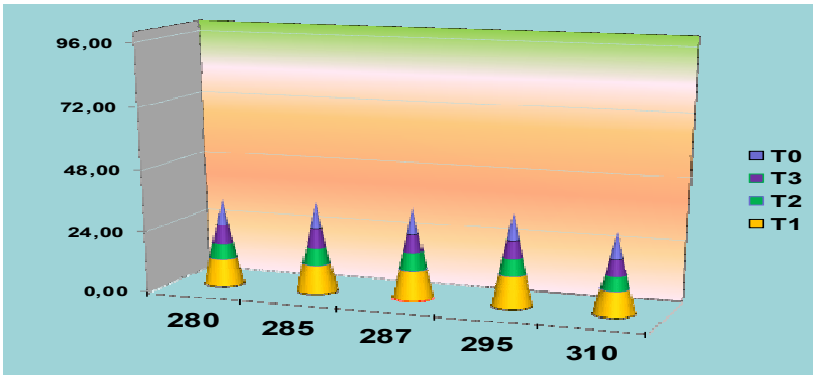


Fig. 2. MS environment. The size of the seedlings (mm) developed from meristems from the stem and crown, grown in the MS and LS environments, after 60 days of culture, under the influence of UV-B

The adaptation capacity of the plants after 60 days of culture under UVB 287 is similar in the two hybrids, but Helga tolerates much better wavelengths of even 295 nm.

The influence of the various wavelengths which was used to irradiate at regular time intervals is exercised by stimulating the growth and development of the neo-plants of the Helga variety, at wavelengths between 287 nm – 295 nm, compared to the ZP471 hybrid.

The node type explants reaction is similar compared to the bud type explant which stands out with slightly lower values. The graphical representation of the results which were presented so far can be seen in the graphs below.



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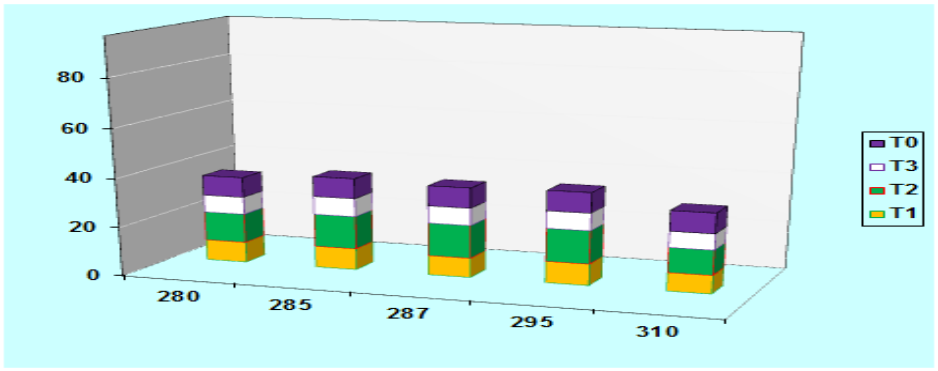

Fig. 3. The in vitro morphogenesis for the bud and node types, under the UV-B influence, over the three abbreviated environments T1, T2, T3 compared with T_0- Helga

The average regeneration capacity has increased to 80%, the lowest value being 50% (Helga, MS culture environment), and the highest value being 75% (ZP471, LS culture environment).

CONCLUSIONS

The hormonal balance associated with the irradiation at 287 nm is capable of inducing the regeneration of plants with a root system. The phytohormones stimulate the in vitro development process; high values of auxin/cytokine support the callogenesis whilst low values induce a proliferation of buds and organogenesis. Auxin and cytokinin favors the organogenesis process.

The size of the regenerated neo-plants vary between 0,35-10 mm (with average values of 0,4-0,5 mm), depending on the culture environment and UV-B type. In the case of the apex for the Helga hybrid and the node and apex for the ZP471 hybrid, we notice a greater influence of the radiation between 285 nm – 287 nm – 295 nm, which actually stimulates the development, growth, regeneration degree, number of developed plants, in comparison to the influence of the wavelength of 310 nm.

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