EVALUATION OF COPPER SALTS CONSEQUENCE ON *TRITICUM AESTIVUM*

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Copper is an essential micronutrient required for healthy growth of plants and its deficiency can decrease phenolics in the plants [1]. In excessive amounts, it is toxic to plant growth, the toxicity of copper depending on the metal concentration, exposure duration and the developmental stage of plants [2].
In this study was evaluated the influence of the copper (II) sulfate and cupric nitrate on the wheat (Triticum aestivum) plants. In this regard, the effect of the two salts on the content of assimilative pigments, polyphenolic compounds and elemental content of wheat was followed. The possible ultrastructural changes in the leaves of the plants were also followed. It was observed that, the amount of chlorophyll a, chlorophyll b and total carotenoids were lower in the control plants than in the treated ones (Fig. 1), while the amount of polyphenols in the treated plants is lower than in the control ones.

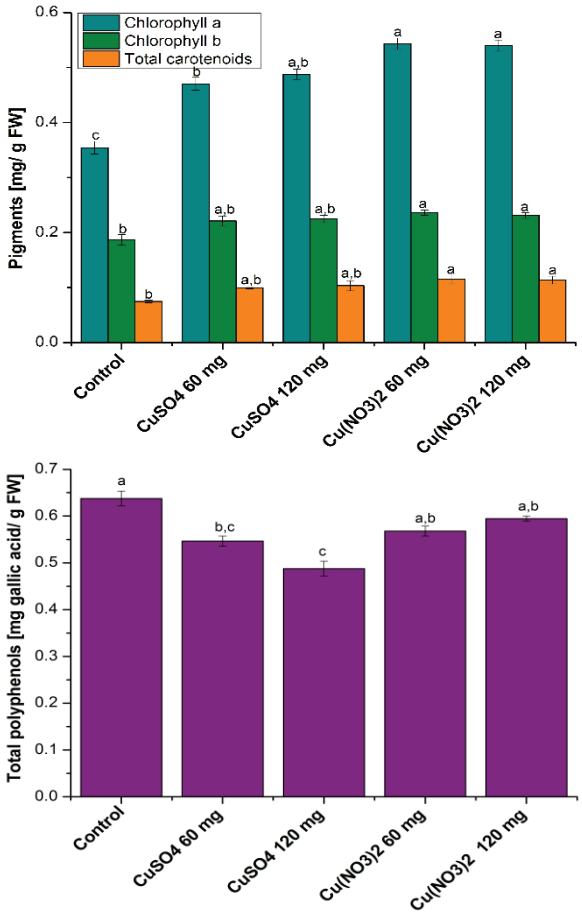

Fig. 1. Comparative diagram of the pigment and polyphenols content.

Comparing the plants treated with the two copper salts, it was observed that the amount of pigments was lower in the case of plants treated with $CuSO_4$ than in those treated with $Cu(NO_3)_2$, with no significant differences in the amount of salt added in soil.

Regarding on the polyphenols content, the type of salt, plants treated with Cu $(NO_3)_2$ have higher amounts of polyphenols compared to those treated with $CuSO_4$. In plants treated with the same salt, with increasing of the $CuSO_4$ amount, the quantity of polyphenols decreases, while in the case of Cu $(NO_3)_2$ increases.
The wheat leaves were analyzed through transmission electron microscopy (TEM), in order to determine if the salts affect the ultrastructure of the cells or chloroplasts. It was found that the leaves start to develop starch granules [3] and the chloroplasts will slowly transform intro amyloplasts [4]. The plants treated with both solutions at 120 mg had electron dense accumulations near the tonoplasts, which could indicate the formation of nanoparticles.
Element content in roots of wheat grown on soil with $CuSO_4$ and $Cu(NO_3)_2$ is mostly positive correlated. Fourteen of 31 elements (Na, Cl, K, Mn, Co, Cu, As, Br, Rb, Ag, Sb, Cs, Ba, Au) have correlation coefficient higher than 0.75. Only a few elements (Mg, Mo, Ta, U) have a negative correlation coefficient but for none of them it is not lower than -0.55.
Cluster analysis was applied to experimental data to give a better insight into uptake of elements by plants and to assess the contribution of specific factors that may have an effect on plant behavior (Fig 2).

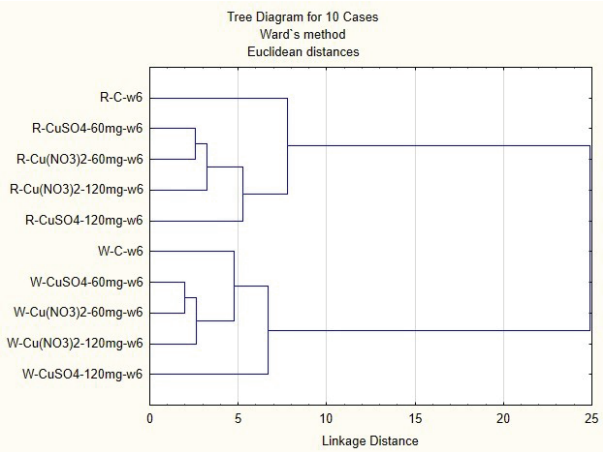

Fig. 2. Hierarchical clustering dendrograms for the analysis of the chemical elements that are present both in the roots and wheat.

It can be concluded that the differences between the roots and the green part of the plants are more significant than other parameters, and the exposure time becomes significant within the green part of wheat.
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