Dynamics of the Foliar Pigments Content in some Tomato Cultivars from East Romania under Salt Stress

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ABSTRACT

The biological material was represented by ten local tomatoes populations collected from areas with saline soils from Moldavia region and compared with commercial type salt-tolerant tomato. Determination of photosynthetic pigments of leaves was done by the spectrophotometric method. For determination of photosynthetic pigments of leaves we used a UV spectrophotometer type – 1800. The content of chlorophyll pigments was assessed by light absorption ability of the acetone extract of pigments (1%) in the visible spectrum (400-700 nm). Tomato genotypes in the study were subjected to salt stress for a period of 30 days is constantly wetted with saline solution to a concentration of 100 mM and 200 mM. The pigment content was analyzed at 15 days and 30 days after the saline treatment. After 15 days when the tomato genotypes was subjected to constant stress salt the content of chlorophyll $a_{662-663}$, chlorophyll $a_{431-432}$, chlorophyll $b_{453-454}$ and chlorophyll $b_{616-617}$ showed higher values compared with analyzes performed after 30 days. Analyzed the results based on biphasic model of growth response under salt stress proposed by Munns (1993), and found that tomatoes reacted similarly. The transition from phase I (osmotic stress) to phase II (ions toxicity), is done by salt stress intensity, but mostly by cultivated genotype.

Keywords: *Lycopersicon esculentum*, photosynthetic pigments, salt stress.

INTRODUCTION

The impact of excess soil salinity on crop productivity is sometimes disastrous which results, in the identification and design of new genotypes of plants tolerant to osmotic stress conditions. One of the main reasons is that the basic mechanisms of tolerance to the stress are not fully understood.

Soil salinity is an important abiotic stress factor seriously affecting plant productivity and survival. Growth and development of glycophytes are negatively affected but halophytes tolerate high salt concentrations Doganlar Z.B. *et al.*, (2010).

Currently there are no indicators of salinity tolerance in plants that contribute to the improvement of crops (Asharaf, 2004). Photosynthesis and growth of many plants are inhibited under NaCl salinity. On tomato resistance to salinity Pessarakli (2011) shows a moderate

sensitivity ($T=2.5 \text{ dS } m^{-1}m^{-1}$, $S=9.9\%$) and the cherry tomatoes (*L.lycopersicum* var.cerasiforme), also a moderate sensitivity ($T=1.7 \text{ dS } m^{-1}m^{-1}$, $S=8.1\%$).

AIMS AND OBJECTIVES

We studied the effects of salt stress on the chlorophyll pigments content in some tomato cultivars, by the spectrophotometric method.

MATERIALS AND METHODS

The research was conducted under greenhouse condition and the analysis in the Laboratory of Plant Physiology, Faculty of Agriculture, from USAMV Iași.

The biological material was represented by local tomatoes populations collected from areas with saline soils from Moldavia region and

compared with commercial type salt-tolerant tomato (*Ursula*_{F1}) from Israel. The bifactorial experience was conducted in a pots experiment in randomized blocks with four repetitions. Ten tomato genotypes (*Moşna*₂, *Şcheia*, *Dorohoi*₄, *Dorohoi*₈, *Copalău*₂, *Copalău*₃, *Copalău*₄, *Copalău*₅, *Moşna*₃) studied were subjected to salt stress for a period of 30 days is constantly wetted with saline solution to a concentration of 100 mM and 200 mM. For determination of photosynthetic pigments of leaves we used a UV spectrophotometer type – 1800. The content of chlorophyll pigments was assessed by light absorption ability of the acetone extract of pigments (1%) in the visible spectrum (400-700 nm).

RESULTS AND DISCUSSION

After 15 days the application of saline treatments the experimental results showed value between 1.00 and 1.83 u.a for chlorophyll *a*₆₆₂₋₆₆₃ nm absorbance, the values being the higher *Ursula*_{F1} variety (0,46 u.a), resistant to excess NaCl. The exposure to 100 mM NaCl caused an increase of absorbance values in all 11 genotypes subjected to salt stress compared to the control which is between 1.20 and 1.83 u.a, and compared to salt-tolerant type *Ursula*_{F1} (1.73 u.a.) 100 mM a single cultivar (*Copalău*₅) showed higher values, namely 1.83 u.a. The other 9 cultivars had lower values between 1.20 and 1.53 u.a. The exposure to 200 mM NaCl caused an increase of absorbance values at 8 genotypes subjected to salt stress compared to the control which is between 1.30 and 2.23 u.a, and compared to salt-tolerant type *Ursula*_{F1} (1.30 u.a.) 200 mM, 9 genotypes showed higher values between 1.40 and 2.23 u.a. That shows the variations of the first phase in the specific salt stress, osmotic stress phase, depending on the genotype and on the concentration of the salt solution This phase is reflected by the high pigments content, when is adversely affected only cell elongation but not chlorophyll biosynthesis, the chloroplasts accumulate in a lower volume. In case of chlorophyll *a*₄₃₁₋₄₃₂, chlorophyll *b*₄₅₃₋₄₅₄ and chlorophyll *b*₆₁₆₋₆₁₇, the plants reaction is similar.

After 30 days the application of saline treatments the experimental results showed value between 0.66 and 4.00 u.a for chlorophyll *a*₆₆₂₋₆₆₃ nm absorbance. Compared to *Ursula*_{F1} variety (0,93 u.a), six of the ten genotypes studied showed higher values between 1.10 and 4.00 u.a and the

other four genotypes lower values between 0.66 and 0.80 u. The exposure to 100 mM NaCl caused an decrease of absorbance at 2 of the 11 genotypes with values between 0.66 and 0.86 u.a. compared to the control, and the other genotypes values was higher between 1.20 and 3.00 u.a. Compared to *Ursula*_{F1} variety (3.00 u.a.) 100 mM all genotypes show lower values between 0.66 and 2.00 u.a. The exposure to 200 mM NaCl caused a decrease in absorbance at 5 genotypes compared to the control, this values between 0.56 and 1.36 u.a. This shows they were in stage II of the stress and the other values were higher between 1.53 and 1.90 u.a. of which are still in the first phase of stress. Compared to *Ursula*_{F1} variety (1.46 u.a.) 200 mM 9 of the 10 show lower values between 0.56 -1.53 u.a. In case of chlorophyll *a*₄₃₁₋₄₃₂, chlorophyll *b*₄₅₃₋₄₅₄ and chlorophyll *b*₆₁₆₋₆₁₇, the plants reaction is similar.

Analyzed the results based on biphasic model of growth response under salt stress proposed by Munns (1993), we found that studied tomatoes reacted similarly. The transition from phase I (osmotic stress) to phase II (ions toxicity), is done by salt stress intensity, but mostly by cultivated genotype.

CONCLUSION

After 15 days when the tomato genotypes was subjected to constant stress salt the content of chlorophyll *a*₆₆₂₋₆₆₃ chlorophyll *a*₄₃₁₋₄₃₂, chlorophyll *b*₄₅₃₋₄₅₄ and chlorophyll *b*₆₁₆₋₆₁₇ showed higher values compared with analyzes performed after 30 days. The transition from phase I (osmotic stress) to phase II (ions toxicity), is done by salt stress intensity, but mostly by cultivated genotype.

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