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PRELIMINARY RESULTS ON LIPID CONTENT OF SOYBEAN (*GLYCINE MAX* (L.) MERR.) AND RAPESEED (*BRASSICA NAPUS* L.) SEEDLINGS UNDER SALT STRESS

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Abstract: Seedlings of *Brassica napus* L. and *Glycine max* (L.) Merr. were investigated in terms of lipid accumulation, under moderate NaCl salt stress. No significant differences were recorded between control variants and salt-exposed seedlings when measured after four or seven days. Overall, soybean seedlings accumulated large amounts of lipids compared with those of rapeseed, despite that within soybean working variants, no consistent differences have been found.

INTRODUCTION

Rapeseed (*Brassica napus* L.) plants belong to the *Brassicaceae* (*Cruciferae*) family and represent the third most important edible oilseed crop source in the universe, after soybean (*Glycine max* (L.) Merr., *Fabaceae*) and palm (Ashraf and McNeilly 2004). Rapeseed, widely cultivated in several temperate regions, is major oil crop, accounting for more than 60 million tons of seed (Guo et al., 2014).

In plants, the lipid content response to abiotic factor is different depending on the species and class of lipids. Generally, in several species, the total lipid amount of leaves shows a decrease as a response to drought stress (Zhong et al., 2011). In mustard (*Brassica juncea*) seeds, total and neutral lipids declined considerably with increasing salt level, while phospholipids and glycolipids increased (Parti et al., 2003). Likewise, total lipid content in canola (*Brassica juncea* L.) was diminished with increasing NaCl levels (Keshtehgar et al., 2013). In addition, Bybordi (2011) found that the plasma membrane phospholipids were increased in some canola (*Brassica napus*) cultivars (*Elite*, *Licord*, and *Fornax*) but did not change significantly in other (*SLM046* and *Okapi*) after exposure to NaCl salinity stress. Alqarawi et al. (2014) found that salt stress determined in *Ephedra alata* a significant decrease in total lipids, triacylglycerol and sterol and at the same time with an increase in diacylglycerol, sterol ester, and non-esterified fatty acids.

MDA is regarded as a marker for evaluation of lipid peroxidation or damage to plasmalemma and organelle membranes that increases with environmental stresses (Esfandiari et al., 2007). Generally, with the augmenting level of salt stress, the level of lipid peroxidation increased. For instance, within four investigated rapeseed cultivars, only in two of them an increase of lipid peroxidation has been reported (Farhoudi et al., 2015) On the other hands, lipid peroxidation was synchronized with increased of the salinity level which had a relation with plant species like tomato (Neumann, 2001), wheat (Hala et al., 2005), corn (Carrasco-Ríos and Pinto, 2014) etc. Furthermore, the fatty acid composition of the *Chlamydomonas mexicana* and *Scenedesmus obliquus* freshwater species was also improved by the increased NaCl concentration (Salama et al., 2013).

In order to continue the previous research (Oprica et al., 2011; Oprica, 2013) regarding the response of important economic plants to salt stress, the goal of this study was to determine the total lipid content in seedlings of two important edible oilseed *Brassica napus* L. cultivars (Exagone and Exgold) and *Glycine max* (L.) Merr.

MATERIAL AND METHODS

Soybean seeds necessary for the experiment were provided by the Laboratory of Microbiology, Faculty of Biology, Iasi. Rapeseed seeds were obtained from the Territorial Institute for Quality Seeds and Planting Material Iasi; two cultivars (*Exagone* and *Exgold*) of rapeseed were used in this study. Apparently, there are no data about salinity tolerance of these two cultivars. Firstly, 100 rape and soybean seeds were sterilized in 3% H_2O_2 and then rinsed to remove H_2O_2. These seeds were subjected to the treatment with 50mM, 100mM, and 150mM NaCl, by immersion in a correspondent salt solution for 4 hours. Control seeds for rape and soybean were stored for 4 hours in distilled water. Then the seeds were transferred into sterile Petri dishes, containing 2 layers of Whatman 1 paper, moistened with 10 ml of 50, 100, and 100 mM NaCl solutions and distilled water for the control sample. Each Petri dish contained 100 seeds and three repetitions for each working variant were further used. The Petri dishes were kept in the dark, at 25^0C to promote the germination. After that, these were transferred to a room, assuring the normal conditions for seedling growth and watered with distilled water every

2 days (Oprica and Stefan, 2014). For lipid content determinations, the fresh seedlings were randomly sampled from each treatment at four and, seven days, respectively after exposure to NaCl salt treatment.

Dry weight content was determined using a gravimetric method by the maintenance of the biological material at 105°C to constant weight. The results are expressed in g dry matter/100g fresh biological material (Boldor et al., 1983).

Lipid content. The content of total lipids was established using Soxhlet gravimetric methods, which consist in the extraction of the total lipids from dry weight of soybean and rapeseed seedlings, using petroleum ether. The total content of lipids was calculated depending on degreased samples and the results being expressed in g/100 g dried material (Artenie and Tanase, 1981).

All experiments were carried out with three independent repetitions. The results were expressed as the means value and standard errors of the mean.

RESULTS AND DISCUSSIONS

The effect of increasing of salinity stress on lipid content in *Brassica napus* cultivars and *Glycine max* seedlings of the two cultivars after 4 and 7 days after salinity treatment is shown in Figure 1. Generally, there are no significant differences between control and salt-exposed seedlings; this seems to be true for both moments of determination, at four and seven days, respectively. Increased salt stress seems not to induce alterations in lipid content of seedlings. Moreover, there are not differences between the two cultivars of rapeseed; only when exposed to 150 mM NaCl, *Exgold* cultivar seemed to accumulate a larger amount of lipids, a situation available only for the four-day determination.

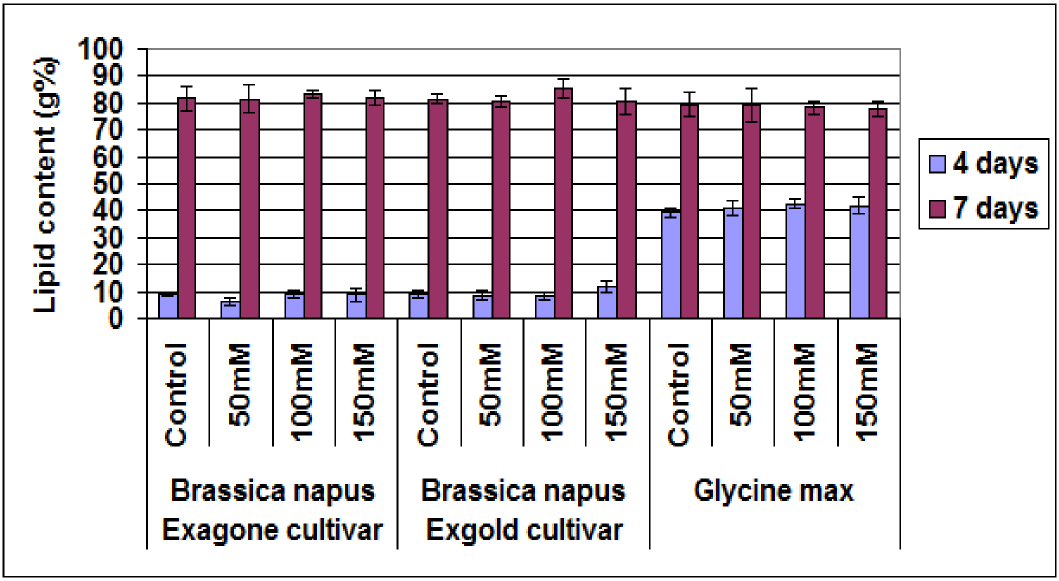

Figure 1. Lipid content in soybean and in two rapeseed cultivars (*Exagone* and *Exgold*)

However, the linear-like pattern of lipid accumulation measured after seven days in all analyzed samples may suggest either salt stress has not been so intense to induce noticeable differences or the time exposure was too short to enable the seedlings to build up responses in terms of lipid accumulation. It is well known that plants respond in different ways to salt stress, depending on stress intensity, developmental stage, and laboratory work conditions (Grigore et al., 2011; 2012).

Soybean accumulated a larger amount of total lipids than both cultivars of rapeseed, but with no differences within the control and salt-exposed seedlings.

CONCLUSIONS

Our study revealed that there are no significant differences regarding total lipid accumulation in rapeseed and soybean seedlings exposed to NaCl salt stress. Nevertheless, prospective and extended studies will facilitate a deeper evaluation of the salinity tolerance of investigated cultivars/species, in order to achieve a better understanding of the general mechanisms involved in salt tolerance of highly valuable economic plants.

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