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Production of Durum Wheat (Triticum Durum Desf.) Seedlings Tolerant to Water Deficit from Hydroprimed Seeds

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ABSTRACT

Crop plants are subjected to multiple abiotic stresses during their lifespan that significantly reduce plant productivity and threaten global food security. Recent research suggests that plants can be "primed" to better tolerate different abiotic stresses. In this field, priming, which consists of a pregerminative treatment, is widely studied and even used in order to improve both the development and the yield of plant species, by modulating the metabolic activities of germination before the breakthrough of the radicle. Our research work is part of this perspective and aims to study the effect of hydropriming durum wheat grains on telerance to water deficit stress. Our results indicate that the seedlings resulting from treated grains, and more particularly those which have undergone double hydropriming, do not present after-effects due to water deficit by being characterized by an improvement in growth, a maintenance of cellular turgor and the unaltered membrane integrity. As these plants do not show any effect of oxidative stress. Indeed, hydropriming is an effective method for combating drought.

Keywords: Durum wheat, hydropriming seed, tolerance, drought.

1 Introduction

Drought is one of the most drastic abiotic stresses with adverse effects on plant bioresources and food security. This drought is accentuated by current climate changes. It is therefore necessary and urgent to improve the tolerance of cultivated species to water deficit. In addition to traditional methods (varietal selection, crossing, etc.) and biotechnological (transgenesis, in vitro culture), a new approach can be adopted by pre-germination treatment. This technique, called priming, consists of redehydrating the seeds during the reversible germination phase before putting them back into germination. Hydropriming seeds is the simplest and least expensive method [1-3]. It has been well demonstrated that the positive effects of priming are associated with various physiological, biochemical, cellular, molecular and genetic changes, such as reserve mobilization, albumen degradation, membrane repair, activation of antioxidative systems, neosynthesis of certain proteins, stimulation of osmolyte synthesis and cell cycle activation, all of which are strongly regulated and controlled by the expression of numerous genes [4-7]

2 Experimental

Our work is part of this approach and aims to study the consequences of hydropriming on the germination performance of durum wheat seeds (Triticum durum Desf.) as well as on the tolerance to water stress of plants grown from these seeds. Durum wheat is known for its importance in global food security.

3 Results and discussion

Our results showed that hydropriming improves germination performance and makes it possible to obtain plants resistant to water stress caused by stopping watering (Figure.1). This tolerance is characterized by better growth, maintenance of cell turgor and photosynthetic activity, a high protein content, a high accumulation of proline as well as a low MDA content and less production of reactive species oxygen, compared to plants grown from non-hydroprimed seeds.

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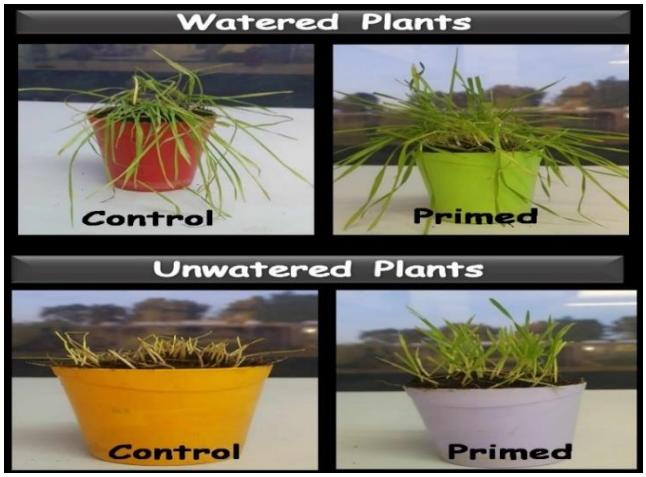

Figure 1: Growth of watered and non-watered durum wheat plants (favorable and stressful conditions) gown from controlled and award-winning seeds.

4 Conclusions

This tolerance can be explained by memorization of certain events occurring during the re-dehydration process which follows the first imbibition. This form of "memory" would be fixed via epigenetic control.

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