Zinc priming changes germination, early growth and cytogenetic stability of *Triticum aestivum* L. under water stress conditions

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Zinc (Zn) partakes in critical physiological roles during early seedling development and is essential for protection and structural maintenance of cell membranes stability as well as protection of the plant from soil-borne pathogens. Seed priming with zinc has been described as a cost effective and reliable method for crops agronomic biofortification. Since, in some regions the future of water requirements is predicted to exceed water availability it is of importance to identify methods of agronomic biofortification able to enhance germination and growth under lower water potential. The effects of water stress on seed germination, early growth and cytogenetic stability of winter wheat (*Triticum aestivum* L.) cv. Jordão primed with Zn was evaluated using osmotic solutions of polyethylene glycol 6000 of 0 and -1 MPa. Seeds were hydro-primed, as control, and primed with solutions with 0.2, 0.4 and 0.8% of Zn during eight hours. Twenty seeds per treatment (×3 repetitions) were placed in Petri dishes with moistened filter papers and germinated in the dark at 25ºC. Germination was recorded daily for a period of eight days. Root and shoot growth, as well as fresh and dry weight, were measured in five seedlings per Petri dish five days after germination and, similarly, at the end of the experiment. Root-tips of a separate set of seeds, subjected to the same treatments and germination conditions, were collected to perform chromosome spreads. Mitotic index and chromosome instabilities were annotated. Seedlings grown at -1 MPa constantly showed a higher mean time of germination, lower values for root and shoot size as well as fresh

weight than those at 0 MPa. Zn-priming increased the mean time of germination at both water potentials, but it did not affect the total percentage of germinated seeds. Measurements performed five days after germination showed a not significant decrease in fresh weight and water content at both water potentials. Root and shoot sizes of Zn-primed seeds were significantly smaller than control at both water potentials. At the end of the experiment, seeds primed with 0.4 and 0.8 % Zn solutions showed higher dry weight and lower fresh weight at 0 MPa. At -1 MPa there were no significant differences in dry and fresh weight between seeds primed with Zn and the control. At both water potentials, seed subjected to the highest Zn concentration solution showed significantly lower values of water content as well as root and shoot size when compared with the other treatments. Mitotic index progressively decreased with higher concentrations of Zn, whereas cytogenetic instabilities tended to increase. These include micro-nucleus, anaphase bridges, sickness, vagrants and multi-polarity anaphases, among others. Although the Zn concentrations used here are in line with other researches in cereals, where the priming proved beneficial, we found that all of the tested concentrations are detrimental for seedling development. Furthermore, Zn priming treatment was sufficient to cause cytogenetic anomalies and early growth impairment.

Acknowledgements

The authors acknowledge the financial support provided by the FCT-Portuguese Foundation for Science and Technology (Ivo Pavia - PD/BD/113611/2015 and Luis Rocha - PD/BD/113612/2015), under the Doctoral Program “Agricultural Production Chains – from fork to farm” (PD/00122/2012).