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SHORT COMMUNICATION

Antioxidant potential of fresh and after-ripened dry embryos of two wheat cultivars contrasting in drought tolerance

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Abstract Seed of wheat cv. C 306 was more dormant, higher ABA-sensitive and more desiccated than PBW 343. Dormancy and ABA-sensitivity decreased, and seed moisture content increased during after-ripening, where decrease in ABA-sensitivity was greater in PBW 343. Dry embryo of C 306 contained lesser level of ROS (H_2O_2 and superoxides) and nitric oxide than that of PBW 343. ROS and nitric oxide increased during after-ripening, and such increase was higher in PBW 343. Dry embryo of C 306 contained higher level of ascorbate, glutathione, lesser level of proline and similar level of phenolics than that of PBW 343. All these non-enzymatic antioxidants except ascorbate decreased during after-ripening. Dry embryo of C 306 showed higher activities of ascorbate peroxidase (APX), catalase (CAT), and lower activity of peroxidase (POX) than that of PBW 343. Activities of APX and CAT did not change, POX decreased, while GR increased during after-ripening, and decrease in POX activity was greater in PBW 343.

Keywords After-ripening · Antioxidants · Dormancy · Seed · *Triticum aestivum*

Seed dormancy is initiated early during seed maturation and reaches a maximum in harvest-ripe seeds. During subsequent dry storage (after-ripening), the dormancy status reduces until seeds are able to maximum germination when imbibed under favourable conditions (Finkelstein et al. 2008). Molecular mechanisms, which decreases dormancy during after-ripening are not well understood (Holdsworth et al. 2008). Seed dormancy is related with ROS levels of seed, where dormant (fresh) seeds have lower ROS level than non-dormant (after-ripened) seeds. ROS level increases during storage and are higher at non-dormant stage at which seeds germinate. If non-dormant seeds are further stored, seeds go to aged state, where ROS level increases to the highest level, at which stage seeds do not germinate. There is oxidative window, *i.e.*, certain level of ROS, where seeds germinate, while below and above this level, seeds do not germinate (El-Maarouf-Bouteau and Bailly 2008). Seed dormancy is suggested as a desirable trait in crops because it prevents pre-harvest sprouting (PHS) under wet conditions (Gerjets et al. 2010). Resistance to pre-harvest sprouting is positively related to dormancy and ABA-sensitivity (Gerjets et al. 2010; Schramm et al. 2013). In stress related studies, especially in wheat, ABA-sensitivity level of the cultivar is positively related to drought and cold tolerance, where ABA up-regulated antioxidant potential (Kaur et al. 2014a, b) and expression of LEA genes (Kobayashi et al. 2004, 2006; Kaur et al. 2014b). As dormancy is related to ABA-sensitivity, and ABA-sensitivity is related to stress tolerance due to higher antioxidant potential, there can be a relation between dormancy and stress tolerance. Antioxidant potential of embryo/seed could keep the ROS level low and hence could increase dormancy. Therefore, the aim of this study was to compare two wheat cultivars contrasting in drought tolerance at fresh and after-ripened seed/embryo stages for dormancy status, ABA-sensitivity, ROS levels and antioxidant potential, so to find if positive relation exists among these with stress tolerance.

Freshly harvested seeds of wheat cultivars C 306 (drought tolerant) and PBW 343 (drought susceptible),

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