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Poster Communication Abstract – 1.27

BIOFORTIFICATION IN MICROELEMENTS BY MODULATING THE ACCUMULATION OF PHYTIC ACID IN DURUM WHEAT

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Phytic acid (myo-inositol 1,2,3,4,5,6-hexakisphosphate, PA) represents the major phosphorus storage sink within the plant seeds. In wheat, about 80% of PA is stored in the aleuronic layer and bran and only in limited quantities within the embryo. Depending on its chemical structure, PA binds important mineral cations such as iron, zinc, potassium, calcium and magnesium precipitating in the form of phytate salts poorly digested by monogastric animals, including humans, due to the lack of phytases in the digestive tract.

Since PA limits the bioavailability of phosphorus and microelements present in the kernel, it is considered an anti-nutritional compound; therefore its reduction or elimination can improve the nutritional quality of semolina and flour.

A reduced bioavailability of microelements in the raw materials is considered one of the main causes of mineral deficiency in populations

whose diet is largely based on the consumption of staple crops. In this regard, the genetic modulation of PA in cereal grains represents a valid strategy of biofortification in essential minerals.

The research here presented is focused on the development and characterization of durum wheat genotypes biofortified in microelements by modulating the accumulation of PA. In detail, the genes encoding the *multidrug-resistance associated proteins 3* (MRP3), a transporter involved in the accumulation of PA in the vacuole, were silenced through a Targeting Induced Local Lesions IN Genomes (TILLING) strategy. Knock-out genotypes lacking the homeoalleles *MRP3-A1* and *MRP3-B1* were identified and crossed to pyramid the two mutations. The selection of the mutant lines was carried out on the F_2 generation through a marker-assisted selection assay based on PCR and HRM-genotyping. The selected partial and complete null MRP3 mutant genotypes were characterized for the content of PA, the concentration of nutrients and the localization of ferrous deposits within the kernel.

The complete null mutant plants showed a significant decrease in number of root tips, root length, volume and surface area compared to the control plants. Differently, root diameter was significantly increased in the mutant genotypes.

The results highlighted that the silencing of the *MRP3* genes is a successful strategy to obtain durum wheat lines able to accumulate a higher quantity of essential microelements (Fe, Mn, Zn).