

DEVELOPMENT OF FERTILIZATION APPROACHES FOR EFFICIENT MINERAL NUTRITION IN BREAD WHEAT

FASANI E.*, FURINI A.*, FRANCESCHI C.**, MODENA A.**, DALCORSO G.*

*) University of Verona, Dept. of Biotechnology Strada le Grazie, 15 37134 Verona

**) FOMETm s.p.a. via Vialarga, 25, 37050 San Pietro di Morubio Verona

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Mineral nutrition in crops is a major issue in agriculture; it affects not only plant fitness and productivity, but also the quality of the final products, in particular in terms of nutritional properties. Among crops, wheat is essential due to its extensive cultivation worldwide and its importance in the food chain; furthermore, the nutritional and technological properties of its final products make this crop a valuable target to study plant nutrition and its impact on the food chain.

In this work, two varieties of bread wheat (*Triticum aestivum*) with contrasting traits were considered: Rebelde, a cultivar for strong bread flour production with high nitrogen content, and Bagou, a biscuit wheat with low protein content. The aim of the project was to define a fertilization strategy leading to efficient plant nutrition, suitable yield and improved nutritional properties of the grain, in particular regarding the content in macronutrients such as Ca, Mg and K. Plants were cultivated in microscale trials, adopting manual sowing and fertilization. Seed density and spacing, vernalization and fertilization dosages were chosen to reproduce field conditions. Two fertilization rounds were applied to two phenological phases: early tillering for root fertilization (50 kg/ha N) and heading for foliar fertilization (25 kg/ha N). Different combinations of fertilizers were adopted: mineral versus organic for root application; urea versus Ca, Mg and K nitrates for foliar application, with or without biostimulants of vegetal or animal origin. Phenotypic characterization, chlorophyll content determination and expression analysis of genes encoding

nutrient transporters were performed after each fertilization treatment. Finally, grain yield and elemental quantification were evaluated after harvesting.

Overall, significant differences were observed in the two cultivars: Rebelde was more responsive to fertilization treatments, with significant changes in yield and mineral content. On the other hand, Bagou was scarcely affected by the different treatments and showed an approximately constant performance. In the two cultivars, the two different root fertilization approaches produced comparable results in terms of plant fitness and yield, although mineral fertilization was faster in its effects, as highlighted by both chlorophyll contents and the expression of nitrogen transporter NPF5.20, whereas the organic treatment was effective in the long term. As for the foliar treatment, the different approaches produced changes in grain yield and Mg, Cl and S content in Rebelde wheat; these changes were linked with changes in elemental transporters involved in plant nutrition.

In conclusion, plant mineral needs and their impact on grain yield and quality are extremely specific for different wheat cultivars. In this view, a targeted strategy, also with the help of molecular approaches, should be applied to adapt the most efficient fertilization to the needs of the plants.