

A DIGE PROTEOMIC ANALYSIS OF WHEAT FLAG LEAF TREATED WITH TERRA-SORB® FOLIAR, A FREE AMINO ACID HIGH CONTENT BIOSTIMULATOR

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The flag leaf is the most important source of carbohydrate during wheat kernel filling. Around a 75% of all sugars stored in the kernel come from carbon fixed by this leaf. Terra-Sorb® foliar is an L- α -amino acid-based product from enzymatic hydrolysis for foliar application with a high ratio of free to total amino acids. Previous agronomical studies carried out on grassy, horticultural and tree crops have shown that application of Terra-Sorb® increases plant photosynthetic activity and chlorophyll content, promotes rapid recovery from stress and improves fruit set.

In this work we have undertaken a proteomic approach in order to explore molecular mechanisms potentially involved in the stimulating effect of Terra-Sorb® Foliar on wheat yield when applied in commercial fields. Wheat plants were treated in field at the flag leaf stage and flag leaves were subsequently sampled after two and three days. A DIGE approach was used to compare the proteomes of treated vs control plants in four biological replicates.

Thirty seven protein spots were found to change in abundance (ANOVA $p < 0.05$) out of which 8 were down regulated and 29 up regulated in treated leaves. Twenty six protein spots encoded by 13 different genes were successfully identified by nLC-ESI-MS/MS and NCBI database search.

Two RUBISCO regulatory proteins, namely RUBISCO activase and RUBISCO large subunit binding protein, and phosphoribulose kinase were up regulated thus suggesting an enhanced CO₂ fixation. Protein biosynthetic metabolism would also be promoted as the elongation factors Tu and G and the chaperone HSP-90 were also up regulated. The Cu/Zn superoxide dismutase which protects photosystem II from photooxidation was down regulated, perhaps due to a lower oxidative stress. Minor but statistically significant changes were also found in metabolic proteins.

In conclusion, the improvement of wheat productivity by Terra-Sorb® Foliar application seem to be mediated by a combination of an enhanced CO₂ fixation, a more active protein metabolism and a decrease of oxidative stress.