SUMO Mutant Wheat Lines Looking Promising

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Professor Anna-Maria Botha-Oberholster from Stellenbosch University has developed SUMO mutant wheat lines. These mutant lines should dramatically improve plant growth and yield under stressful environments.

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Below is a more detailed description of SUMO mutant lines :

Plants capture solar energy and atmospheric carbon dioxide (CO_2) through photosynthesis, which is the primary component of crop yield, and needs to be increased considerably to meet the growing global demand for food.

Environmental stresses, which are increasing with climate change, adversely affect photosynthetic carbon metabolism (PCM) and limit yield of wheat. Plant adaptation to environmental stress is mediated by a variety of morphological, phenological, and physiological mechanisms, controlled by a multitude of genes, proteins, metabolites, and their respective regulatory networks. Post-translational modifications of proteins play a critical role in most cellular signaling processes.

In recent years, SUMO (Small Ubiquitin-like Modifier) has emerged as an influential class of molecules for target protein management. SUMO-proteases play a vital role in regulating pathway flux and are therefore ideal targets for manipulating stress-responsive SUMOylation. In Arabidopsis and cotton, SUMOylation has been shown to dramatically improve plant growth and yield under stressful environments.

Both genetic engineering (GE) and non-GE approaches offer hope for improving yield under changing environments.

This project had pursued both strategies of harnessing SUMO regulatory mechanisms to improve stress tolerance and secure improved yield. Professor Anna-Maria Botha-Oberholster and her team have recently identified and cloned the SUMO homologs *OTS1, OTS2* and *ICE1* and introduced them into spring wheat under the control of constitutive and inducible promotors. SUMO proteases are attractive targets for manipulating stress responsive SUMOylation.