

The AGT*Sa*/11 - Silver Rice™

State-of-art **Avesthagen Plant Transformation Facility (AaPTF)** has successfully developed and established workable protocols for producing a number of transgenic crops that include cereals, vegetable crops, oilseeds and cotton, using **Biolistic gun- and *Agrobacterium*-mediated** transformation.



The AGT*Sa*/11 - Silver Rice™ salt tolerant variety of Indica rice (IR64)

Background: Several biotic and abiotic factors are important constraints in increasing the quality and yield of rice. Abiotic stress however has been shown to cause more harm to the rice crop than biotic stresses. The major abiotic stress that significantly hamper rice yields are drought, salinity, floods, extremes of temperature and metal toxicity. The molecular responses of plants to abiotic stress are very complex. However, advanced molecular biology techniques offer new strategies to investigate changes in plants, at the cellular and molecular level, in response to abiotic stress. Salinity and water deficit have shown to induce the expression of a number of genes. These gene products have either a regulatory role in gene expression or a functional role in the adaptive responses of plant cells to the stress.

In this study, we have isolated a gene coding for a protease inhibitor in the antisense orientation. This gene, **AGT*Sa*/11**, was isolated from an RNA differential display between salinity stress susceptible (IR64) and tolerant (Rasi) Indica rice lines. Using bioinformatics and molecular modeling, the function of the antisense **AGT*Sa*/11** gene has been deduced as a 'Bowman-Birk II' type protease inhibitor, a gene with a known function in biotic stress resistance.

The Product: The **Seed for Food Group** at **Avesthagen** using the Biolistic gun-mediated transformation system has introduced the antisense version of **AGT*Sa*/11**, driven by a

strong plant promoter (*Ubiquitin*), in indica rice. The phenotype of the transgenic **AGT*Sa*/11-'Silver Rice'™** plants over-expressing the protease inhibitor was assessed for biotic and abiotic stress tolerance. This is a novel approach where the antisense strategy is utilized for generating a new plant phenotype based on the over-expression of the protein encoded by the antisense gene, and not on the down regulation of the endogenous, sense orientation of the gene.

Facility: A complete '**gene to field**' set-up at **Avesthagen** places us in a unique position for not only being a part of the 'gene discovery' and its subsequent cloning, analysis and transformation into plants, but also in raising the transgenic plants in containment, up to the production of hybrid seeds. The facilities at **Avesthagen** include a modern molecular laboratory readied with the latest scientific equipment needed for gene discovery, cloning, sequencing, molecular analysis and transformation, aptly supported by the **Bioinformatics and Proteomics** team.

References:

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