Avesthagen Hybrid-FIT™

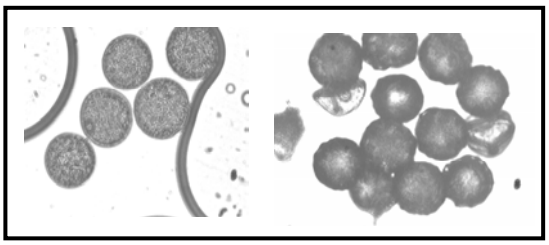
A dedicated team effort by the "**Seed for Food"** group at **Avesthagen** utilizing the state-of-art technology for the improvement and increase in the agricultural produce. Developing novel plant varieties that are not only tolerant to environmental and biotic stress, but also plant products with improved taste, nutrition and longer shelf life

RNA editing - a tool to generate male sterile lines in agronomically important crops

- *Generating male sterile lines by inducing mitochondrial dysfunction using a novel gene product by plant transformation*
- *Powerful tool enabling the breeders to shorten the laborious emasculation and selection procedure*
- *A species/variety independent protocol that can be extended to a number of important crop varieties for F 1 hybrid seed production*

The utility of **Avesthagen Hybrid-Fit™** lies in its economic importance for the production of hybrid seeds. **Cytoplasmic male sterility** is a maternally inherited trait in plant mitochondria resulting in the abortion of pollen grains after meiosis during microsporogenesis. **'RNA-editing'** in plant mitochondria is a process that changes the nucleotide sequence of the RNA molecule from that of the DNA template encoding it. As mRNA editing normally occurs in most plants, the transgenic plants containing genomic (unedited) sequences will therefore, synthesize the mitichondrial protein with a modified (inactive / less active) function, thus producing sterile plants.

a. Edited - viable pollen **b. Un-edited - non-viable pollen**



Avesthagen Hybrid-Fit™ strategy has been successfully utilized in producing male sterile lines of indica rice (variety - basmati). Two forms (unedited and edited) (Figs. a. & b) of one of the multi-protein complexes of the mitochondrial inner membrane protein encoding gene were cloned in plasmid vectors and bombarded in to the indica rice calli. Transgenic calli have been selected and regenerated in to complete plantlets in containment.

Avesthagen Hybrid-Fit™ can be extended to a number of agronomically important crops and vegetables. Currently ***Avesthagen*** is proving the utillity of this technique in oilseeds (sesame and mustard), cereals (sorghum and millet), vegetables (tomato and okra) and cotton.

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 equipped with the latest scientific equipment needed for gene discovery, cloning, sequencing, molecular analysis and transformation, suitably supported by the **Bioinformatics** and **Proteomics** team.

References:

Covello & Gray (1989) RNA editing in plant mitochondria. Nature 341: 662-666.

Gualberto *et al.* (1989) RNA editing in wheat mitochondria results in the conversion of protein sequences. Nature 341: 660-662.

Hernould *et al.* (1993) Male-sterility induction in transgenic tobacco plants with an unedited *atp9* mitochondrial gene from wheat. PNAS 90: 2370-2374.

Morawala-Patell V, Gualberto JM, Lamattina L, Grienenberger JM, Bonnard G (1998) *Cis-* and *trans*-splicing and RNA editing are required for the expression of *nad2* in wheat mitochondria. Mol. Gen. Genet 258:503-511